

§ 82.166 Reporting and recordkeeping requirements.

(a) Effective November 14, 1994, all persons who sell or distribute any class I or class II substance for use as a refrigerant must retain invoices that indicate the name of the purchaser, the date of sale, and the quantity of refrigerant purchased.

(b) Purchasers of any class I or class II refrigerants who employ certified technicians may provide evidence that at least one technician is properly certified to the wholesaler who sells them refrigerant; the wholesaler will then keep this information on file and may sell refrigerant to the purchaser or his authorized representative even if such purchaser or authorized representative is not a properly certified technician. In such cases, the purchaser must notify the wholesaler in the event that the purchaser no longer employs at least one properly certified technician. The wholesaler is then prohibited from selling class I or class II refrigerants to the purchaser until such time as the purchaser employs at least one properly certified technician. At that time, the purchaser must provide new evidence that at least one technician is properly certified.

(c) Approved equipment testing organizations must maintain records of equipment testing and performance and a list of equipment that meets EPA requirements. A list of all certified equipment shall be submitted to EPA within 30 days of the organization's approval by EPA and annually at the end of each calendar year thereafter.

(d) Approved equipment testing organizations shall submit to EPA within 30 days of the certification of a new model line of recycling or recovery equipment the name of the manufacturer and the name and/or serial number of the model line.

(e) Approved equipment testing organizations shall notify EPA if retests of equipment or inspections of manufacturing facilities conducted pursuant to § 82.158(j) show that a previously certified model line fails to meet EPA requirements. Such notification must be received within thirty days of the retest or inspection.

(f) Programs certifying technicians must maintain records in accordance with section (g) of appendix D of this subpart.

(g) Reclaimers must maintain records of the names and addresses of persons sending them material for reclamation and the quantity of the material (the combined mass of refrigerant and contaminants) sent to them for reclamation. Such records shall be maintained on a transactional basis.

(h) Reclaimers must maintain records of the quantity of material sent to them for reclamation, the mass of refrigerant reclaimed, and the mass of waste products. Reclaimers must report this information to the Administrator annually within 30 days of the end of the calendar year.

(i) Persons disposing of small appliances, MVACs, and MVAC-like appliances must maintain copies of signed statements obtained pursuant to § 82.156(f)(2).

(j) Persons servicing appliances normally containing 50 or more pounds of refrigerant must provide the owner/operator of such appliances with an invoice or other documentation, which indicates the amount of refrigerant added to the appliance.

(k) Owners/operators of appliances normally containing 50 or more pounds of refrigerant must keep servicing records documenting the date and type of service, as well as the quantity of refrigerant added. The owner/operator must keep records of refrigerant purchased and added to such appliances in cases where owners add their own refrigerant. Such records should indicate the date(s) when refrigerant is added.

(l) Technicians certified under § 82.161 must keep a copy of their certificate at their place of business.

(m) All records required to be maintained pursuant to this section must be kept for a minimum of three years unless otherwise indicated. Entities that dispose of appliances must keep these records on-site.

(n) The owners or operators of appliances must maintain on-site and report to EPA at the address listed in § 82.160 the following information, where such reporting and recordkeeping is required and within the timelines specified under § 82.156 (i)(1), (i)(2), (i)(3) and

(i)(5). This information must be relevant to the affected appliance and must include: identification of the facility; the leak rate; the method used to determine the leak rate and full charge; the date a leak rate of greater than the allowable annual leak rate was discovered; the location of leaks(s) to the extent determined to date; and any repair work that has been completed thus far and the date that work was completed.

(1) The reasons why more than 30 days are needed to complete the work and an estimate of when repair work will be completed must be submitted with the initial information submitted with the information listed in paragraph (n) of this section. If changes from the original estimate of when work will be completed result in moving the completion date forward from the date submitted to EPA, the reasons for these changes must be documented and submitted to EPA within 30 days of discovering the need for such a change.

(2) If the owners or operators intend to establish that the appliance's annual leak rate does not exceed the applicable allowable annual leak rate in accordance with § 82.156(i)(3)(v), the owner or operator is required to submit a plan to fix other outstanding leaks for which repairs are planned but not yet completed to achieve a rate below the applicable allowable leak rate with the information listed in paragraph (n) of this section. Identification of the facility and date the original information regarding additional time beyond the initial 30 days was filed, and notification of the determination that the leak rate no longer exceeds the allowable annual leak rate must be included within 30 days of making such determination.

(3) The dates and types of all initial and follow-up verification tests performed and the test results for all initial and follow-up verification tests must be maintained and submitted to EPA within 30 days after conducting each test where recordkeeping and reporting is required within the timelines specified under § 82.156 (i)(1), (i)(2), (i)(3) and (i)(5).

(o) The owners or operators of appliances must maintain on-site and report to EPA at the address specified in

§ 82.160 the following information where such reporting and recordkeeping is required and in the timelines specified in § 82.156 (i)(7) and (i)(8), in accordance with § 82.156 (i)(7) and (i)(8). This information must be relevant to the affected appliance and must include:

- (1) The identification of the industrial process facility;
- (2) The leak rate;
- (3) The method used to determine the leak rate and full charge;
- (4) The date a leak rate of 35 percent or greater was discovered;
- (5) The location of leaks(s) to the extent determined to date;
- (6) Any repair work that has been completed thus far and the date that work was completed;
- (7) A plan to complete the retrofit or replacement of the system;
- (8) The reasons why more than one year is necessary to retrofit to replace the system;
- (9) The date of notification to EPA; and
- (10) An estimate of when retrofit or replacement work will be completed.

(i) If the estimated date of completion changes from the original estimate and results in moving the date of completion forward, documentation of the reason for these changes must be submitted within 30 days of occurring.

(ii) If the estimated date of completion changes from the original estimate and results in moving the date of completion forward, the date of notification to EPA regarding this change and the estimate of when the work will be completed must be maintained and submitted.

(p)(1) Owners or operators who wish to exclude purged refrigerants that are destroyed from annual leak rate calculations must maintain records on-site to support the amount of refrigerant claimed as sent for destruction. Records shall be based on a monitoring strategy that provides reliable data to demonstrate that the amount of refrigerant claimed to have been destroyed is not greater than the amount of refrigerant actually purged and destroyed and that the 98 percent or greater destruction efficiency is met. Records shall include flow rate, quantity or concentration of the refrigerant in the vent stream, and periods of purge flow.

(2) Owners or operators who wish to exclude purged refrigerants that are destroyed from annual leak rate calculations must maintain on-site and make available to EPA upon request the following information after the first time the exclusion is utilized by the facility:

(i) The identification of the facility and a contact person, including the address and telephone number;

(ii) A general description of the refrigerant appliance, focusing on aspects of the appliance relevant to the purging of refrigerant and subsequent destruction;

(iii) A description of the methods used to determine the quantity of refrigerant sent for destruction and type of records that are being kept by the owners or operators where the appliance is located;

(iv) The frequency of monitoring and data-recording; and

(v) A description of the control device, and its destruction efficiency.

This information must also be included, where applicable, in any reporting requirements required for compliance with the leak repair and retrofit requirements for industrial process refrigeration equipment, as set forth in paragraphs (n) and (o) of this section.

(q) Owners or operators choosing to determine the full charge as defined in §82.152 of an affected appliance by using an established range or using that methodology in combination with other methods for determining the full charge defined in the following information:

(1) The identification of the owner or operator of the appliance;

(2) The location of the appliance;

(3) The original range for the full charge of the appliance, its midpoint, and how the range was determined;

(4) Any and all revisions of the full charge range and how they were determined; and

(5) The dates such revisions occurred.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42957, Aug. 19, 1994; 60 FR 40443, Aug. 8, 1995]

APPENDIX A TO SUBPART F OF PART 82— SPECIFICATIONS FOR FLUOROCARBON REFRIGERANTS

This appendix is based on Air-Conditioning and Refrigeration Institute Standard 700-93:

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to evaluate and accept/reject refrigerants regardless of source (new, reclaimed and/or repackaged) for use in new and existing refrigeration and air-conditioning products.

1.1.1 This standard is intended for the guidance of the industry including manufacturers, refrigerant reclaimers, repackagers, distributors, installers, servicemen, contractors and for consumers.

1.2 *Review and Amendment.* This standard is subject to review and amendment as the technology advances. The dynamics of this technology is advancing so rapidly that changes to this standard must be frequent.

Section 2. Scope

2.1 *Scope.* This standard specifies acceptable levels of contaminants (purity requirements) for various fluorocarbon refrigerants regardless of source and lists acceptable test methods. These refrigerants are R11; R12; R13; R22; R113; R114; R123; R124; R500; R502 and R503 as referenced in the ANSI/ASHRAE Standard Number Designation and Safety Classification of Refrigerants (American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., Standard 34 1992). Copies may be obtained from ASHRAE Publications Sales, 1791 Tullie Circle, NE., Atlanta, GA 30329. Copies may also be inspected at Public Docket No. A-92-01, Waterside Mall (Ground Floor) Environmental Protection Agency, 401 M Street, SW., Washington, DC in room M-1500. In addition the following blends are listed: R22/152a/124 (53/13/34); R22/152a/124 (61/11/28); R125/290/22 (60/2/38); R125/290/22 (38/2/60).

Section 3. Definitions

3.1 *“Shall”, “Should”, “Recommended”, or “It Is Recommended”.* “Shall”, “should”, “recommended”, or “it is recommended” shall be interpreted as follows:

3.1.1 *Shall.* Where “shall” or “shall not” is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.1.2 *Should, Recommended, or It is Recommended.* “Should”, “recommended”, or “it is recommended” is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. Characterization of Refrigerants and Contaminants

4.1 *Characterization.* Characterization of refrigerants and contaminants addressed are listed in the following general classifications:

4.1.1 *Characterization:*

- a. Gas Chromatography
- b. Boiling point and boiling point range

4.1.2 *Contaminants*

- a. Water
- b. Chloride
- c. Acidity
- d. High boiling residue
- e. Particulates/solids
- f. Non-condensables
- g. Impurities including other refrigerants

Section 5. Sampling, Summary of Test Methods and Maximum Permissible Contaminant Levels

5.1 *Referee Test.* The referee test methods for the various contaminants are summarized in the following paragraphs. Detailed test procedures are included in Parts 1 through 9, 12 through 15, and 19 through 23 of Appendix-93 to ARI Standard 700: Analytical Procedures of ARI Standard 700-93, 1994, the Air-Conditioning and Refrigeration Institute. These parts of Appendix-93 to ARI 700 are incorporated by reference. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the Air-Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, Arlington, Virginia 22203. Copies may also be inspected at Public Docket No. A-92-01, Waterside Mall (Ground Floor) Environmental Protection Agency, 401 M Street, SW., Washington, DC in room M-1500 or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC. If alternate test methods are employed, the user must be able to demonstrate that they produce results equivalent to the specified referee method.

5.2 *Refrigerant Sampling.*

5.2.1 *Sampling Precautions.* Special precautions should be taken to assure that representative samples are obtained for analysis. Sampling shall be done by trained laboratory personnel following accepted sampling and safety procedures.

5.2.2 *Gas Phase Sample.* A gas phase sample shall be obtained for determining the non-condensables. Since non-condensable gases, if present, will concentrate in the vapor phase of the refrigerant, care must be exercised to eliminate introduction of air during the sample transfer. Purging is not an acceptable procedure for a gas phase sample since it may introduce a foreign product. Since R11, R113 and R123 have normal boiling points at or above room temperature, non-condensable determination is not required for these refrigerants.

5.2.2.1 *Connection.* The sample cylinder shall be connected to an evacuated gas sampling bulb by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling bulb.

5.2.2.2 *Equalizing Pressures.* After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Allow the pressure to equilibrate and close valves.

5.2.3 *Liquid Phase Sample.* A liquid phase sample is required for all tests listed in this standard except the test for non-condensables.

5.2.3.1 *Preparation.* Place an empty sample cylinder with the valve open in an oven at 230 °F [110 °C] for one hour. Remove it from the oven while hot, immediately connect to an evacuation system and evacuate to less than 1 mm mercury (1000 microns). Close the valve and allow it to cool.

5.2.3.2 *Manifolding.* The valve and lines from the unit to be sampled shall be clean and dry. The cylinder shall be connected to an evacuated gas sampling cylinder by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling cylinder.

5.2.3.3 *Liquid Sampling.* After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Take the sample as a liquid by chilling the sample cylinder slightly. Accurate analysis requires that the sample container be filled to at least 60% by volume, however under no circumstances should the cylinder be filled to more than 80% by volume. This can be accomplished by weighing the empty cylinder and then the cylinder with refrigerant. When the desired amount of refrigerant has been collected, close the valve(s) and disconnect the sample cylinder immediately.

5.2.3.4 *Record Weight.* Check the sample cylinder for leaks and record the gross weight.

5.3 *Refrigerant Purity Characterization.*

5.3.1 *Primary Method.* The primary method shall be gas chromatography (GC) as described in Appendix-93 to ARI Standard 700. The chromatogram of the sample shall be compared to known standards.

5.3.2 *Alternative Method.* Determination of the boiling point and boiling point range is an acceptable alternative test method which can be used to characterize refrigerants. The test method shall be that described in the Federal Specification for "Fluorocarbon Refrigerants," BB-F-1421 B, dated March 5, 1982, section 4.4.3 which is incorporated by reference. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the U.S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP,

Washington, DC 20402-9328. Copies may also be inspected at Public Docket No. A-92-01, Waterside Mall (Ground Floor) Environmental Protection Agency, 401 M Street, SW., Washington, DC in room M-1500 or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

5.3.3 *Required Values.* The required values for boiling point and boiling point range are given in table 1, Physical Properties of Fluorocarbon Refrigerants and Maximum Contaminant Levels.

5.4 Water Content.

5.4.1 *Method.* The Coulometric Karl Fischer Titration shall be the primary test method for determining the water content of refrigerants. This method is described in Appendix-93 to ARI Standard 700. This method can be used for refrigerants that are either a liquid or a gas at room temperature, including refrigerants 11 and 113, and 123. For all refrigerants, the sample for water analysis shall be taken from the liquid phase of the container to be tested. Proper operation of the analytical method requires special equipment and an experienced operator. The precision of the results is excellent if proper sampling and handling procedures are followed. Refrigerants containing a colored dye can be successfully analyzed for water using this method.

5.4.2 *Alternative Method.* The Karl Fischer Test Method is an acceptable alternative test method to the Coulometric Karl Fischer Titration for determining the water content of refrigerants. This method is described in ASTM E700-79, (Reapproved 1990), Standard Test Method for Water in Gases Using Karl Fischer Reagent (American Society for Testing and Materials, Philadelphia, PA), which is incorporated by reference. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Society for Testing and Materials, Philadelphia, PA. Copies may also be inspected at Public Docket No. A-92-01, Waterside Mall (Ground Floor) Environmental Protection Agency, 401 M Street, SW., Washington, DC in room M-1500 or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

5.4.3 *Limits.* The value for water content shall be expressed as parts per million by weight and shall not exceed the maximum specified (see tables 1 and 1a).

5.5 *Chloride.* The refrigerant shall be tested for chloride as an indication of the presence of hydrochloric acid and/or metal chlorides. The recommended procedure is intended for use with new or reclaimed refrigerants. Significant amounts of oil may interfere with the results by indicating a failure in the absence of chloride.

5.5.1 *Method.* The test method shall be that described in Appendix-93 to ARI Standard 700. The test will show noticeable turbidity at chloride levels of about 3 ppm by weight or higher.

5.5.2 *Turbidity.* The results of the test shall not exhibit any sign of turbidity. Report the results as "pass" or "fail."

5.6 Acidity.

5.6.1 *Method.* The acidity test uses the titration principle to detect any compound that is highly soluble in water and ionizes as an acid. The test method shall be that described in Appendix- 93 to ARI Standard 700. This test may not be suitable for determination of high molecular weight organic acids; however these acids will be found in the high boiling residue test outlined in 5.7. The test requires a 100 to 120 gram sample and has a detection limit of 0.1 ppm by weight calculated as HCl.

5.6.2 *Limits.* The maximum permissible acidity is 1 ppm by weight as HCl.

5.7 High Boiling Residue.

5.7.1 *Method.* High boiling residue shall be determined by measuring the residue of a standard volume of refrigerant after evaporation. The refrigerant sample shall be evaporated at room temperature or at a temperature 50 °F [28K], above the boiling point of the sample using a Goetz bulb as specified in Appendix- 93 to ARI Standard 700. Oils and or organic acids will be captured by this method.

5.7.2 *Limits.* The value for high boiling residue shall be expressed as a percentage by volume and shall not exceed the maximum percent specified (see tables 1 and 1a).

5.8 Particulates/Solids.

5.8.1 *Method.* A measured amount of sample is evaporated from a Goetz bulb under controlled temperature conditions. The particulates/solids shall be determined by visual examination of the Goetz bulb prior to the evaporation of refrigerant. Presence of dirt, rust or other particulate contamination is reported as "fail." For details of this test method, refer to Appendix-93 to ARI Standard 700.

5.9 Non-Condensables.

5.9.1 *Sample.* A vapor phase sample shall be used for determination of non-condensables. Non-condensable gases consist primarily of air accumulated in the vapor phase of refrigerants. The solubility of air in the refrigerants liquid phase is extremely low and air is not significant as a liquid phase contaminant. The presence of non-condensable gases may reflect poor quality control in transferring refrigerants to storage tanks and cylinders.

5.9.2 *Method.* The test method shall be gas chromatography with a thermal conductivity detector as described in Appendix-93 to ARI Standard 700.

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5.9.3 *Limit.* The maximum level of non-condensables in the vapor phase of a refrigerant in a container shall not exceed 1.5% by volume (see table 1 and 1a).

5.10 Impurities, including Other Refrigerants.

5.10.1 *Method.* The amount of other impurities including other refrigerants in the subject refrigerant shall be determined by gas chromatography as described in Appendix-93 to ARI Standard 700.

5.10.2 *Limit.* The subject refrigerant shall not contain more than 0.50% by weight of

impurities including other refrigerants (see table 1 and 1a).

Section 6. Reporting Procedure

6.1 *Reporting Procedure.* The source (manufacturer, reclaimer or repackager) of the packaged refrigerant shall be identified. The refrigerant shall be identified by its accepted refrigerant number and/or its chemical name. Maximum permissible levels of contaminants are shown in table 1. Test results shall be tabulated in a like manner.

Acidity	ppm by weight	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Chlorides*	No visible turbidity	5.6	5.5	1.0	1.0	1.0	1.0	1.0	1.0

*Boiling points and boiling point ranges, although not required, are provided for informational purposes.

**Recognized Chloride level for pass/fail is 3ppm.

[59 FR 42957, Aug. 19, 1994]

APPENDIX B TO SUBPART F OF PART 82—
PERFORMANCE OF REFRIGERANT RECOVERY, RECYCLING AND/OR RECLAIM EQUIPMENT

This appendix is based on Air-Conditioning and Refrigeration Institute Standard 740-93.

REFRIGERANT RECOVERY/RECYCLING
EQUIPMENT

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish methods of testing for rating and evaluating the performance of refrigerant recovery, and/or recycling equipment, and general equipment requirements (herein referred to as "equipment") for containment or purity levels, capacity, speed, and purge loss to minimize emission into the atmosphere of designated refrigerants.

1.1.1 This standard is intended for the guidance of the industry, including manufacturers, refrigerant reclaimers, repackers, distributors, installers, servicemen, contractors and for consumers.

1.1.2 This standard is not intended to be used as a guide in defining maximum levels of contaminants in recycled or reclaimed refrigerants used in various applications.

1.2 *Review and Amendment.* This standard is subject to review and amendment as the technology advances.

Section 2. Scope

2.1 *Scope.* This standard defines general equipment requirements and the test apparatus, test mixtures, sampling and analysis techniques that will be used to determine the performance of recovery and/or recycling equipment for various refrigerants including R11, R12, R13, R22, R113, R114, R123, R134a, R500, R502, and R503, as referenced in the ANSI/ASHRAE Standard 34-1992, "Number Designation of Refrigerants" (American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.).

Section 3. Definitions

3.1 *Recovered refrigerant.* Refrigerant that has been removed from a system for the purpose of storage, recycling, reclamation or transportation.

3.2 *Recover.* To remove refrigerant in any condition from a system and store it in an external container without necessarily testing or processing it in any way.

3.3 *Recycle.* To reduce contaminants in used refrigerant by oil separation, non-condensable removal and single or multiple passes through devices which reduce moisture, acidity and particulate matter, such as replaceable core filter-driers. This term usually applies to procedures implemented at the field job site or in a local service shop.

3.4 *Reclaim.* To reprocess refrigerant to new product specifications by means which may include distillation. Chemical analysis of the refrigerant is required to determine that appropriate product specifications are met. The identification of contaminants, required chemical analysis, and acceptable contaminant levels will be established in the latest edition of ARI Standard 700 "Specifications of Fluorocarbon and other Refrigerants." This term usually implies the use of processes or procedures available only at a reprocessing or manufacturing facility.

3.5 *Standard Contaminated Refrigerant Sample.* A mixture of new and/or reclaimed refrigerant and specified quantities of identified contaminants which are representative of field obtained, used refrigerant samples and which constitute the mixture to be processed by the equipment under test.

3.6 *Push/Pull Method.* The push/pull refrigerant recovery method is defined as the process of transferring liquid refrigerant from a refrigeration system to a receiving vessel by lowering the pressure in the vessel and raising the pressure in the system, and by connecting a separate line between the system liquid port and the receiving vessel.

3.7 *Recycle Rate.* The amount of refrigerant processed (in pounds) divided by the time elapsed in the recycling mode in pounds per minute. For equipment which uses a separate recycling sequence, the recycle rate does not include the recovery rate (or elapsed time). For equipment which does not use a separate recycling sequence, the recycle rate is a maximum rate based solely on the higher of the liquid or vapor recovery rate, by which the rated contaminant levels can be achieved.

3.8 *Equipment Classification.*

3.8.1 *Self Contained Equipment.* A refrigerant recovery or recycling system which is capable of refrigerant extraction without the assistance of components contained within an air conditioning or refrigeration system.

3.8.2 *System Dependent Equipment.* Refrigerant recovery equipment which requires for its operation the assistance of components contained in an air conditioning or refrigeration system.

3.9 *"Shall", "Should", "Recommended" or "It is Recommended", "Shall", "Should", "recommended", or "it is recommended"* shall be interpreted as follows:

3.9.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.9.2 *Should, Recommended, or It is Recommended, "Should", "recommended",* is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. General Equipment Requirements

4.1 The equipment manufacturer shall provide operating instructions, necessary maintenance procedures, and source information for replacement parts and repair.

4.2 The equipment shall indicate when any filter/drier(s) needs replacement. This requirement can be met by use of a moisture transducer and indicator light, by use of a sight glass/moisture indicator, or by some measurement of the amount of refrigerant processed such as a flow meter or hour meter. Written instructions such as “to change the filter every 400 pounds, or every 30 days” shall not be acceptable except for equipment in large systems where the Liquid Recovery Rate is greater than 25 lbs/min [11.3 Kg/min] where the filter/drier(s) would be changed for every job.

4.3 The equipment shall either automatically purge non-condensables if the rated

level is exceeded or alert the operator that the non-condensable level has been exceeded. While air purge processes are subject to the requirements of this section, there is no specific requirement to include an air purge process for “recycle” equipment.

4.4 The equipment’s refrigerant loss due to non-condensable purging shall not be exceeded 5% by weight of total recovered refrigerant. (See Section 9.4)

4.5 Internal hose assemblies shall not exceed a permeation rate of 12 pounds mass per square foot [5.8 g/cm²] of internal surface per year at a temperature of 120 F [48.8 °C] for any designated refrigerant.

4.6 The equipment shall be evaluated at 75 F [24 °C] per 7.1. Normal operating conditions range from 50 °F to 104 F [10 °C to 40 °C].

4.7 Exemptions:

4.7.1 Equipment intended for recovery only shall be exempt from sections 4.2 and 4.3.

TABLE 1—STANDARD CONTAMINATED REFRIGERANT SAMPLES

	R11	R12	R13	R22	R113	R114	R123	R134a	R500	R502	R503
Moisture content: PPM by weight of pure re- frigerant	100	80	30	200	100	85	100	200	200	200	30
Particulate content: PPM by weight of pure re- frigerant character- ized by ¹	80	80	80	80	80	80	80	80	80	80	80
Acid content: PPM by weight of pure re- frigerant— (mg KOH per kg refrig.) char- acterized by ²	500	100	NA	500	400	200	500	100	100	100	NA
Mineral oil content: % by weight of pure refrig- erant	20	5	NA	5	20	20	20	5	5	5	NA
Viscosity (SUS)	300	150	300	300	300	300	150	150	150
Non conden- sable gases air content % volume ³ ≤	NA	3	3	3	NA	3	3	3	3	3	3

¹ Particulate content shall consist of inert materials and shall comply with particulate requirements in ASHRAE Standard 63.2, “Method of Testing of Filtration Capacity of Refrigerant Liquid Line Filters and Filter Driers.”

² Acid consists of 60% oleic acid and 40% hydrochloric acid on a total number basis.

³ Synthetic ester based oil.

Section 5. Contaminated Refrigerants

5.1 The standard contaminated refrigerant sample shall have the characteristics specified in Table 1, except as provided in 5.2

5.2 Recovery equipment not rated for any specific contaminant can be tested with new or reclaimed refrigerant.

Section 6. Test Apparatus

6.1 Self Contained Equipment Test Apparatus. The apparatus as shown in Figure 1 consists of a 3 cubic foot [0.085 m³] mixing chamber with a conical-shaped bottom, although a larger mixing chamber is permissible. The size of the mixing chamber depends upon the size of the equipment. The

outlet at the bottom of the cone and all restrictions and valves for liquid and vapor refrigerant lines in the test apparatus shall be a minimum of 0.375 in. [9.5 mm] inside diameter or equivalent. The minimum inside diameter for large equipment for use on chillers shall be 1.5 in. [38 mm.]. The mixing chamber shall contain various ports for receiving liquid refrigerant, oil, and contaminants. A recirculating line connected from the bottom outlet through a recirculating pump and then to a top vapor port shall be provided for stirring of the mixture. Isolation valves may be required for the pump. Alternative stirring means may be used if demonstrated to be equally effective.

6.1.1 For liquid refrigerant feed, the liquid valve is opened. For vapor refrigerant feed, the vapor valve is opened and refrigerant passes through an evaporator coil. Flow is controlled by a thermostatic expansion valve to create 5 F [3 °C] superheat at an evaporator temperature of 70 F \pm 3 F [21 °C \pm 2°]. The evaporator coil or equivalent evaporator means shall be either sized large enough for the largest system or be sized for each system.

6.1.2 An alternative method for vapor refrigerant feed is to pass through a boiler and then an automatic pressure regulating valve set at refrigerant saturation pressure at 75 F \pm 3 F [24 °C \pm 2 °C].

6.2 System Dependent Equipment Test Apparatus. This test apparatus is to be used for final recovery vacuum rating of all system dependent equipment.

6.2.1 The test apparatus shown in Figure 2 consists of a complete refrigeration system. The manufacturer shall identify the refrigerants to be tested. The test apparatus can be modified to facilitate operation or testing of the system dependent equipment if the modifications to the apparatus are specifically described within the manufacturer's literature. (See Figure 2.) A ¼ inch [6.3 mm] balance line shall be connected across the test apparatus between the high and low pressure sides, with an isolation valve located at the connection to the compressor high side. A ¼ inch [6.3 mm] access port with a valve core shall be located in the balance line for the purpose of measuring final recovery vacuum at the conclusion of the test.

FIGURE 1

Test Apparatus for Self-Contained Equipment

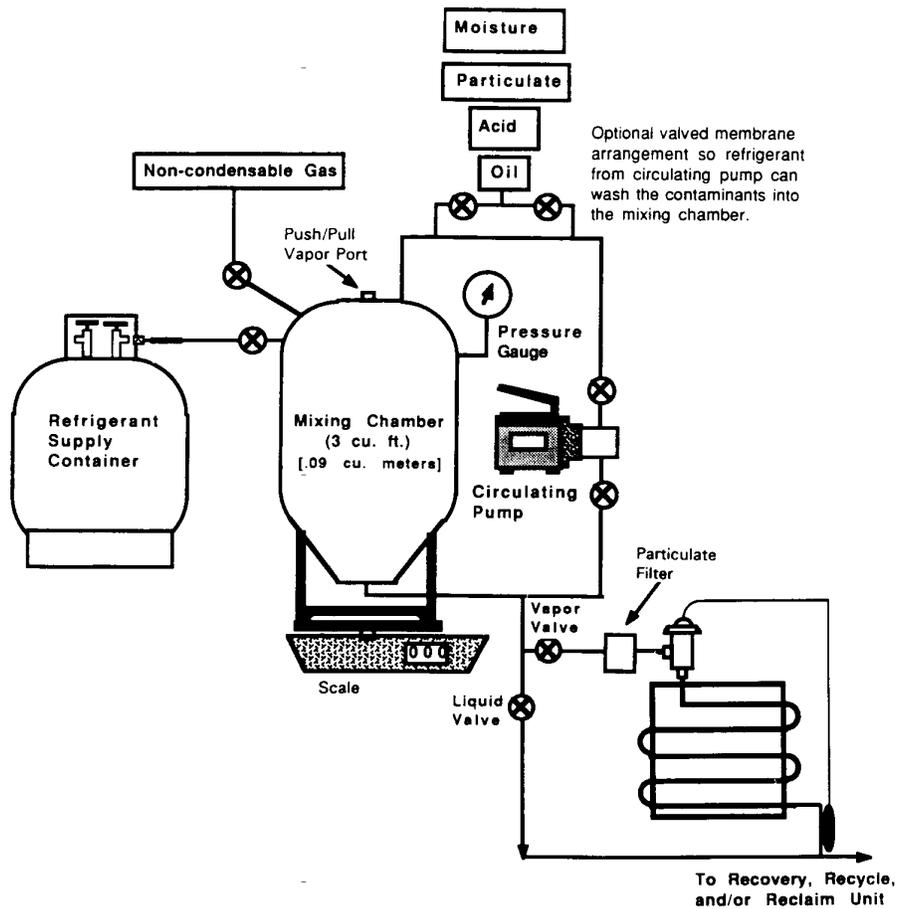
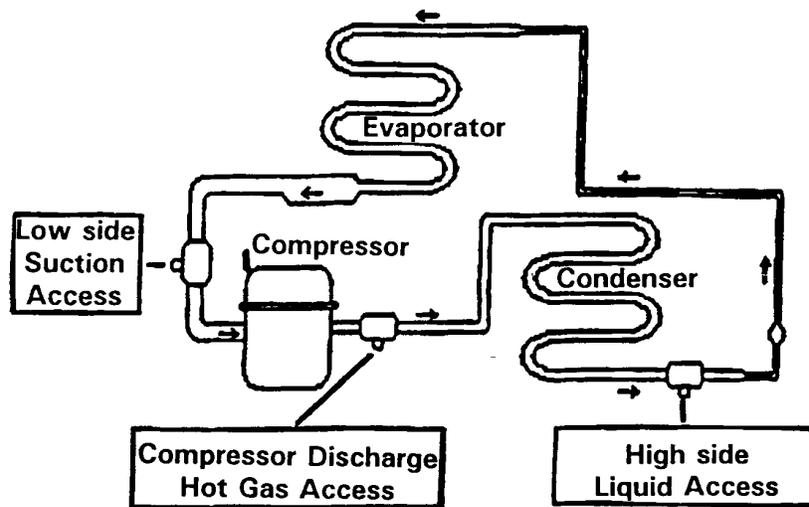


FIGURE 2

System-Dependent Equipment Test Apparatus

Configuration of a standard air conditioning or refrigeration system for use as a test apparatus



Section 7. Performance Testing

7.1 Contaminant removal and performance testing shall be conducted at $75\text{ F} \pm 2\text{ F}$ [$23.9\text{ }^{\circ}\text{C} \pm 1.1\text{ }^{\circ}\text{C}$].

7.1.1 The equipment shall be prepared for operation per the instruction manual.

7.1.2 The contaminated sample batch shall consist of not less than the sum of the amounts required to complete steps 7.1.2.2 and 7.1.2.3 below.

7.1.2.1 A liquid sample shall be drawn from the mixing chamber prior to starting the test to assure quality control of the mixing process.

7.1.2.2 Vapor refrigerant feed testing, if elected, shall normally be processed first. After the equipment reaches stabilized conditions of condensing temperature and/or storage tank pressure, the vapor feed recovery rate shall be measured. One method is to start measuring the vapor refrigerant recovery rate when 85% of refrigerant remains in the mixing chamber and continue for a period of time sufficient to achieve the accuracy in 9.2. If liquid feed is not elected, complete Step 7.1.2.4.

7.1.2.3 Liquid refrigerant feed testing, if elected, shall be processed next. After the equipment reaches stabilized conditions, the liquid feed recovery rate shall be measured. One method is to wait 2 minutes after starting liquid feed and then measure the liquid refrigerant recovery rate for a period of time sufficient to achieve the accuracy in 9.1. Continue liquid recovery operation as called for in 7.1.2.4.

7.1.2.4 Continue recovery operation until all liquid is removed from the mixing chamber and vapor is removed to the point where the equipment shuts down per automatic means or is manually stopped per the operating instructions.

7.1.2.5 After collecting the first contaminated refrigerant sample batch, the liquid and vapor value of the apparatus shall be closed and the mixing chamber pressure recorded after 1 minute as required in 9.5. After preparing a second contaminated refrigerant sample batch, continue recovery until the storage container reaches 80% liquid fill level. After recycling and measuring

the recycle rate per section 7.1.3, set this container aside for the vapor sample in 8.2.2.

7.1.2.6 Interruptions in equipment operations as called for in instruction manual are allowable.

7.1.3 Recycle as called for in equipment operating instructions. Determine recycle rate by appropriate means as required in 9.3.

7.1.4 Repeat steps 7.1.2, 7.1.2.4, and 7.1.3 with contaminated refrigerant sample until equipment indicator(s) show need to change filter(s). It will not be necessary to repeat the recycle rate determination in 7.1.3.

7.1.4.1 For equipment with a multiple pass recirculating filter system, analyze the contents of the previous storage container.

7.1.4.2 For equipment with a single pass filter system, analyze the contents of the current storage container.

7.1.5 Refrigerant loss due to the equipment's non-condensable gas purge shall be determined by appropriate means. (See Section 9.4.)

7.2 System Dependent Equipment. This procedure shall be used for vacuum rating of all system dependent equipment. Liquid refrigerant recovery rate, vapor refrigerant recovery rate, and recycle rate are not tested on system dependent systems.

7.2.1 The apparatus operation and testing shall be conducted at $75\text{ F} \pm 2\text{ F}$. [$23.9\text{ }^\circ\text{C} \pm 1.1\text{ }^\circ\text{C}$].

7.2.2 The apparatus shall be charged with refrigerant per its system design specifications.

7.2.3 For measurement of final recovery vacuum as required in 9.5, first shut the balance line isolation valve and wait 1 minute for pressure to balance. Then connect and operate the recovery system per manufacturers recommendations. When the evacuation is completed, open the balance line isolation valve and measure the pressure in the balance line.

Section 8. Sampling and Chemical Analysis Methods

8.1 The referee test methods for the various contaminants are summarized in the following paragraphs. Detailed test procedures are included in Appendix A "Test Procedures for ARI STD 700." If alternate test methods are employed, the user must be able to demonstrate that they produce results equivalent to the specified referee method.

8.2 Refrigerant Sampling.

8.2.1 *Sampling Precautions.* Special precautions should be taken to assure that representative samples are obtained for analysis. Sampling shall be done by trained laboratory personnel following accepted sampling and safety procedures.

8.2.2 *Gas Phase Sample.* A gas phase sample shall be obtained for determining the non-condensables. Since non-condensable gases, if present, will concentrate in the vapor phase of the refrigerant, care must be exer-

cised to eliminate introduction of air during the sample transfer. Purging is not an acceptable procedure for a gas phase sample since it may introduce a foreign product. Since R11, R113 and R123 have normal boiling points at or above room temperature, non-condensable determination is not required for these refrigerants.

8.2.2.1 The sample cylinder shall be connected to an evacuated gas sampling bulb by means of a manifold. The manifold should have a valve arrangement that facilitates evacuation of all connecting tubing leading to the sampling bulb.

8.2.2.2 After the manifold has been evacuated, close the valve to the pump and open the valve on the system. Allow the pressure to equilibrate and close valves.

8.2.3 *Liquid Phase Sample.* A liquid phase sample is required for all tests listed in this standard, except the test for non-condensables.

8.2.3.1 Place an empty sample cylinder with the valve open in an oven at 230 F [$110\text{ }^\circ\text{C}$] for one hour. Remove it from the oven while hot, immediately connect to an evacuation system and evacuate to less than 1 mm. mercury (1000 microns). Close the valve and allow it to cool.

8.2.3.2 The valve and lines from the unit to be sampled shall be clean and dry. Connect the line to the sample cylinder loosely. Purge through the loose connection. Make the connection tight at the end of the purge period. Take the sample as a liquid by chilling the sample cylinder slightly. Accurate analysis requires that the sample container be filled to at least 60% by volume; however under no circumstances should the cylinder be filled to more than 80% by volume. This can be accomplished by weighing the empty cylinder and then the cylinder with refrigerant. When the desired amount of refrigerant has been collected, close the valve(s) and disconnect the sample cylinder immediately.

8.2.3.3 Check the sample cylinder for leaks and record the gross weight.

8.3 Water Content.

8.3.1. The Coulometric Karl Fischer Titration shall be the primary test method for determining the water content of refrigerants. This method is described in Appendix A. This method can be used for refrigerants that are either a liquid or a gas at room temperature, including Refrigerants 11 and 13. For all refrigerants, the sample for water analysis shall be taken from the liquid phase of the container to be tested. Proper operation of the analytical method requires special equipment and an experienced operator. The precision of the results is excellent if proper sampling and handling procedures are followed. Refrigerants containing a colored dye can be successfully analyzed for water using this method.

8.3.2 The Karl Fischer Test Method is an acceptable alternative test method for determining the water content of refrigerants. This method is described in ASTM Standard for "Water in gases Using Karl Fisher Reagent" E700-79, reapproved 1984 (American Society for Testing and Materials, Philadelphia, PA).

8.3.3 Report the moisture level in parts per million by weight if a sample is required.

8.4 *Chloride.* The refrigerant shall be tested for chlorides as an indication of the presence of hydrochloric or similar acids. The recommended procedure is intended for use with new or reclaimed refrigerants. Significant amounts of oil may interfere with the results by indicating a failure in the absence of chlorides.

8.4.1 The test method shall be that described in Appendix A "Test Procedures for ARI-700." The test will show noticeable turbidity at equivalent chloride levels of about 3 ppm by weight or higher.

8.4.2 The results of the test shall not exhibit any sign of turbidity. Report results as "pass" or "fail."

8.5 *Acidity.*

8.5.1 The acidity test uses the titration principle to detect any compound that is highly soluble in water and ionizes as an acid. The test method shall be that described in Appendix A. "Test Procedures for ARI-700." The test may not be suitable for determination of high molecular weight organic acids; however these acids will be found in the high boiling residue test outlined in Section 5.7. The test requires about a 100 to 120 gram sample and has a low detection limit of 0.1 ppm by weight as HCl.

8.6 *High Boiling Residue.*

8.6.1 High boiling residue will be determined by measuring the residue of a standard volume of refrigerant after evaporation. The refrigerant sample shall be evaporated at room temperature or a temperature 50 F [10°C], above the boiling point of the sample using a Goetz tube as specified in Appendix A "Test Procedures for ARI-700." Oils and organic acids will be captured by this method.

8.6.2 The value for high boiling residue shall be expressed as a percentage by volume.

8.7 *Particulates/Solids.*

8.7.1 A measured amount of sample is evaporated from a Goetz bulb under controlled temperature conditions. The particulates/solids shall be determined by visual examination of the empty Goetz bulb after the sample has evaporated completely. Presence of dirt, rust or other particulate contamination is reported as "fail." For details of this test method, refer to Appendix B "Test Procedures for ARI-700."

8.8 *Non-Condensables*

8.8.1 A vapor phase sample shall be used for determination of non-condensables. Non-

condensable gases consist primarily of air accumulated in the vapor phase of refrigerant containing tanks. The solubility of air in the refrigerants liquid phase is extremely low and air is not significant as a liquid phase contaminant. The presence of non-condensable gases may reflect poor quality control in transferring refrigerants to storage tanks and cylinders.

8.8.2 The test method shall be gas chromatography with a thermal conductivity detector as described in Appendix A "Test Procedures for ARI-700."

8.8.2.1 The Federal Specification for "Fluorocarbon Refrigerants," BB-F-1421B, dated March 5, 1992, section 4.4.2 (perchloroethylene method) is an acceptable alternate test method.

8.8.3 Report the level of non-condensable as percent by volume.

Section 9. Performance Calculation and Rating

9.1 The liquid refrigerant recovery rate shall be expressed in pounds per minute [kg/min] and measured by weight change at the mixing chamber (See Figure 1) divided by elapsed time to an accuracy within .02 lbs/min. [.009 kg/min]. Ratings using the Push/Pull method shall be identified "Push/Pull". Equipment may be rated by both methods.

9.2 The vapor refrigerant recovery rate shall be expressed in pounds per minute [kg/min] and measured by weight change at the mixing chamber (See Figure 1) divided by elapsed time to an accuracy within .02 lbs/min. [.009 kg/min].

9.3 The cycle rate is defined in 3.7 and expressed in pounds per minute [kg/min] of flow and shall be per ASHRAE 41.7-84 "Procedure For Fluid Measurement Of Gases" or ASHRAE 41.8-89 "Standard Method of Flow of Fluids—Liquids."

9.3.1 For equipment using multipass recycling or a separate sequence, the cycle rate shall be determined by dividing the net weight W of the refrigerant to be recycled by the actual time T required to recycle the refrigerant. Any set-up or operator interruptions shall not be included in the time T. The accuracy of the cycle rate shall be within .02 lbs/min. [.009 kg/min].

9.3.2 If no separate recycling sequence is used, the cycle rate shall be the higher of the vapor refrigerant recovery rate or the liquid refrigerant recovery rate. The cycle rate shall match a process which leads to contaminant levels in 9.6. Specifically, a recovery rate determined from bypassing a contaminant removal device cannot be used as a cycle rate when the contaminant levels in 9.6 are determined by passing the refrigerant through the containment removal device.

9.4 Refrigerant loss due to non-condensable purging shall be less than 5%. This rating shall be expressed as "passed" if less than 5%.

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This calculation will be based upon net loss of non-condensables and refrigerant due to the purge divided by the initial net content. The net loss shall be determined by weighing before and after the purge, by collecting purged gases, or an equivalent method.

9.5 The final recovery vacuum shall be the mixing chamber pressure called for in 7.1.2.5 expressed in inches of mercury vacuum, [mm Hg or kP]. The accuracy of the measurement shall be within ±1 inch [±2.5mm] of Hg and rounding down to the nearest whole number.

9.6 The contaminant levels remaining after testing shall be published as follows:

- Moisture content, PPM by weight
- Chloride ions, Pass/Fail
- Acidity, PPM by weight

- High boiling residue, percentage by volume
- Particulate/solid, Pass/Fail
- Non-condensables, % by volume

9.7 Product Literature: Except as provided under product labelling in Section 11, performance ratings per 9.1, 9.2, 9.3, and 9.5 must be grouped together and shown for all listed refrigerants (11.2) subject to limitations of 9.8. Wherever any contaminant levels per 9.6 are rated, all ratings in 9.6 must be shown for all listed refrigerants subject to limitations of 9.8. The type of equipment in 11.1 must be included with either grouping. Optional ratings in 9.8 need not be shown.

9.8 Ratings shall include all of the parameters for each designed refrigerant in 11.2 as shown in Tables 2 and 3.

TABLE 2—PERFORMANCE

Parameter/type of equipment	Recovery	Recovery/ recycle	Recycle	System dependent equipment
Liquid refrigerant recovery rate	(2)	(2)	N/A	N/A
Vapor refrigerant recovery rate	(2)	(2)	N/A	N/A
Final recovery vacuum	(1)	(1)	N/A	(1)
Recycle rate	N/A	(1)	(1)	N/A
Refrigerant loss due to non-condensable purging	(3)	(1)	(1)	N/A

¹ Mandatory rating.
² For a recovery or recovery/recycle unit, one must rate for either liquid feed only or vapor feed only or can rate for both. If rating only the one, the other shall be indicated by "N/A."
³ For Recovery Equipment, these parameters are optional. If not rated, use N/A.

TABLE 3—CONTAMINANTS

Contaminant/type of equipment	Recovery	Recovery/ recycle	Recycle	System dependent equipment
Moisture content	(*)	x	x	NA.
Chloride ions	(*)	x	x	NA.
Acidity	(*)	x	x	NA.
High boiling residue	(*)	x	x	NA.
Particulates	(*)	x	x	NA.
Non-condensables	(*)	x	x	NA.

* For Recovery Equipment, these parameters are optional. If not rated, use N/A.
 xMandatory rating.

Section 10. Tolerances

10.1 Any equipment tested shall produce contaminant levels not higher than the published ratings. The liquid refrigerant recovery rate, vapor refrigerant recovery rate, final recovery vacuum and recycle rate shall not be less than the published ratings.

Section 11. Product Labelling

11.1 *Type of equipment.* The type of equipment shall be as listed:

- 11.1.1 Recovery only
- 11.1.2 System Dependent Recovery
- 11.1.3 Recovery/Recycle
- 11.1.4 Recycle only

11.2 Designated refrigerants and the following as applicable for each:

- 11.2.1 Liquid Recovery Rate
- 11.2.2 Vapor Recovery Rate
- 11.2.3 Final Recovery Vacuum
- 11.2.4 Recycle Rate

Section 12. Voluntary Conformance

12.1 *Conformance.* While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within its Purpose (Section 1) and Scope (Section 2) unless such claims meet all of the requirements of the standards.

ATTACHMENT TO APPENDIX B

Particulate Used in Standard Contaminated Refrigerant Sample.

1. Particulate Specification

1.1 The particulate material pm will be a blend of 50% coarse air cleaner dust as received, and 50% retained on a 200-mesh screen. The coarse air cleaner dust is available from: AC Spark Plug Division, General Motors Corporation, Flint, Michigan.

1.2 Preparation of Particulate Materials

To prepare the blend of contaminant, first wet screen a quantity of coarse air cleaner dust on a 200-mesh screen (particle retention 74 pm). This is done by placing a portion of the dust on a 200-mesh screen and running water through the screen while stirring the dust with the fingers. The fine contaminant particles passing through the screen are discarded. The +200 mesh particles collected on the screen are removed and dried for one hour at 230 F [110 °C]. The blend of standard contaminant is prepared by mixing 50% by weight of coarse air cleaner dust as received after drying for one hour at 230 F [110 °C] with 50% by weight of the +200 mesh screened dust.

1.3 The coarse air cleaner dust as received and the blend used as the standard contaminant have the following approximate particle size analysis: Wt. % in various size ranges, pm.

Size range	As received	Blend
0-5	12	6
5-10	12	6
10-20	14	7
20-40	23	11
40-80	30	32
80-200	9	38

[58 FR 28712, May 14, 1993, as amended at 59 FR 42960, Aug. 19, 1994]

APPENDIX C TO SUBPART F OF PART 82—
METHOD FOR TESTING RECOVERY DEVICES FOR USE WITH SMALL APPLIANCES

Recovery Efficiency Test Procedure for Refrigerant Recovery Equipment Used on Small Appliances

The following test procedure is utilized to evaluate the efficiency of equipment designed to recover ozone depleting refrigerants (or any substitute refrigerant subject to the recycling rules promulgated pursuant to section 608 of the Clean Air Act Amendments of 1990) from small appliances when service of those appliances requires entry into the sealed refrigeration system or when those appliances are destined for disposal. This procedure is designed to calculate on a

weight or mass basis the percentage of a known charge of CFC-12 refrigerant removed and captured from a test stand refrigeration system. Captured refrigerant is that refrigerant delivered to a container suitable for shipment to a refrigerant reclaimer plus any refrigerant remaining in the recovery system in a manner that it will be transferred to a shipping container after additional recovery operations.

The test stand refrigeration system required for this procedure is constructed with standard equipment utilized in currently produced household refrigerator and freezer products. The procedure also accounts for compressor oils that might be added to or removed from the test stand compressor or any compressor used in the recovery system.

I. TEST STAND

Test stands are constructed in accordance with the following standards.

1. Evaporator—⁵/₁₆ in. outside dia. with 30 cu. in. volume.
2. Condenser—¹/₄ in. outside dia. with 20 cu. in. volume.
3. Suction line capillary heat exchanger—appropriate for compressor used.
4. An 800-950 Btu/hr high side case (rotary) compressor; or (depending on the test scenario);
5. An 800-9500 Btu/hr low side case (reciprocating) compressor.

A person seeking to have its recovery system certified shall specify the compressors by manufacturer and model that are to be used in test stands constructed for evaluation of its equipment, and the type and quantity of compressor to be used in those compressors. Only a compressor oil approved for use by the compressor's manufacturer may be specified, and the quantity of compressor oil specified shall be an appropriate quantity for the type of oil and compressor to be used. In order to reduce the cost of testing, the person seeking certification of its recovery system may supply an EPA approved third party testing laboratory with test stands meeting these standards for use in evaluating its recovery system.

II. TEST CONDITIONS

Tests are to be conducted at 75 degrees F, plus or minus 2 degrees F (23.9 C +/- 1.1 C). Separate tests are conducted on both high side case compressor stands and low side case compressor stands. Separate tests are also conducted with the test stand compressor running during the recovery operation, and without the test stand compressor running during the recovery operation, to calculate the system's recovery efficiency under either condition.

These tests are to be performed using a representative model of all equipment used in the recovery system to deliver recovered

refrigerant to a container suitable for shipment to a refrigerant reclaimer. The test stands are to be equipped with access valves permanently installed as specific by the recovery system's vendor to represent the valves used with that system in actual field operations.

A series of five (5) recovery operations are to be performed for each compressor scenario and a recovery efficiency is calculated based on the total quantity of refrigerant captured during all five (5) recoveries. Alternatively, at the request of the recovery system's vendor, a recovery efficiency is to be calculated for each recovery event. In this case, a statistically significant number of recovery operations are to be performed. Determination of what is a statistically significant number of recoveries is to be calculated as set out below. These individual recovery efficiencies are then averaged.

There are four (4) compressor scenarios to be tested. These are a high side case compressor in working condition; a high side case compressor in nonworking condition; a low side case compressor in working condition; and a low side case compressor in nonworking condition. Recovery efficiencies calculated for the two working compressor scenarios are to be averaged to report a working compressor performance. The two nonworking compressor efficiencies are also to be averaged to report a nonworking compressor performance.

If large scale equipment is required in the system to deliver recovered refrigerant to a refrigerant reclaimer (eg. carbon desorption equipment) and it is not possible to have that equipment evaluated under the procedure, the system's vendor shall obtain engineering data on the performance of that large scale equipment that will reasonably demonstrate the percentage refrigerant lost when processed by that equipment. That data will be supplied to any person required to evaluate the performance of those systems. The following procedure will also be modified as needed to determine the weight of refrigerant recovered from a test stand and delivered to a container for shipment to the large process equipment for further processing. The percentage loss documented to occur during processing is then to be applied to the recovery efficiencies calculated in this modified procedure to determine the overall capture efficiency for the entire system.

The following are definitions of symbols used in the test procedure.

Test Stand:

"TSO" means an original test stand weight.

"TSC" means a charged test stand weight.

Shipping Containers:

"SCO" means the original or empty weight of shipping container(s).

"SCF" means the final or full weight of shipping container(s).

Recover/Transfer System:

"RSO" means the original weight of a recovery/transfer system.

"RSF" means the final weight of a recovery/transfer system.

"OL" means the net amount of oil added/removed from the recovery device and/or transfer device between the beginning and end of the test for one compressor scenario.

Weighing steps are conducted with precision and accuracy of plus or minus 1.0 gram.

III. Test Procedure

1. Evacuate the test stand to 20 microns vacuum (pressure measured at a vacuum pump) for 12 hours.

2. Weigh the test stand (TSO).

3. If this is the first recovery operation being performed for a compressor scenario (or if a recovery efficiency is to be calculated for each recovery event), then weigh all devices used in the recovery system to deliver recovered refrigerant to a container suitable for shipment or delivery to a refrigerant reclaimer. Weigh only devices that can retain refrigerant in a manner that it will ultimately be transferred to a shipping container without significant release to the atmosphere (RSO).

4. Weigh final shipping containers (SCO).

5. Charge the test stand with an appropriate CFC-12 charge (either 6 oz. or 9 oz.).

6. Run the test stand for four (4) hours with 100% run time.

7. Turn off the test stand for twelve (12) hours. During this period evaporate all condensation that has collected on the test stand during step 6.

8. Weigh the test stand (TSC).

9. Recover CFC-12 from the test stand and perform all operations needed to transfer the recovered refrigerant to one of the shipping containers weighed in step 4. All recovery and transfer operations are to be performed in accordance with the operating instructions provided by the system's vendor. The compressor in the test stand is to remain "off" or be turned "on" during the recovery operation depending on whether the test is for a nonworking or working compressor performance evaluation. If a recovery efficiency is to be calculated for each recovery event, transfer the captured refrigerant to a shipping container and then skip to step 13. Otherwise continue. If the system allows for multiple recovery operations to be performed before transferring recovered refrigerant to a shipping container, the transfer operation can be delayed until either the maximum number of recovery operations allowed before a transfer is required have been performed, or the last of the five (5) recovery operations has been performed.

10. Perform any oil removal or oil addition operations needed to properly maintain the test stand and the devices used for recovery or transfer operations. Determine the net

weight of the oil added or removed from the recovery device and/or transfer device. (OP1 for oil added, OP2 for oil removed).

11. Evacuate the test stand to 20 microns vacuum for 4 hours.

12. Return to step 2 unless five (5) recovery operations have been performed.

13. Weigh all final shipping containers that received recovered refrigerant (SCF).

14. Weigh the equipment weighed in step three (3) above (RSF). If a recovery effi-

ciency is to be calculated for each recovery event, perform calculations and return to step one (1) for additional recoveries.

IV. CALCULATIONS

A. For Five (5) Consecutive Recoveries

Refrigerant Recoverable equals the summation of charged test stand weights minus original test stand weights.

$$\text{Refrigerant Recoverable} = \sum_{i=1}^5 (TSC_i - TSO_i)$$

Oil Loss equals the net weight of oil added to and removed from the recovery device and/or transfer device.

$$OL = \sum_{i=1}^5 (OP1_i - OP2_i)$$

Refrigerant Recovered equals the final weight of shipping containers minus the initial weight of final shipping containers, plus final recovery system weight, minus original recovery system weight, plus the net value of all additions and removals of oil from the recovery and transfer devices.

$$\text{Refrigerant Recovered} = \left(\sum_{i=1}^n SCF_i - SCO_i \right) + RSF - RSO - OL$$

n=number of shipping containers used.

Recovery Efficiency equals Refrigerant Recovered divided by Refrigerant Recoverable times 100%.

$$\text{Recovery Efficiency} = \frac{\text{Refrigerant Recovered}}{\text{Refrigerant Recoverable}} 100\%$$

B. For Individual Recoveries

Refrigerant Recoverable equals the charged test stand weight minus the original test stand weight.

$$\text{Refrigerant Recoverable} = TSCO - TSO$$

Refrigerant Recovered equals the final weight of the shipping container minus the initial weight of the shipping container plus the final weight of the recovery system minus the original recovery system weight.

$$\text{Refrigerant Recovered} = SCF - SCO + RSF - RSO$$

Recovery Efficiency equals Refrigerant Recovered divided by Refrigerant Recoverable times 100 percent.

$$\text{Recovery Efficiency} = \frac{\text{Refrigerant Recovered}}{\text{Refrigerant Recoverable}} 100\%$$

C. Calculation of a Statistically Significant Number of Recoveries

$$N_{\text{add}} = \left((t * sd) / (.10 * X) \right)^2 - N$$

Where:

- N_{add}=the number of additional samples required to achieve 90% confidence.
- sd=Standard deviation, or $(X/(N-1))^{.5}$
- X=Sample average
- N=Number of samples tested

Number of samples	t for 90% confidence
2	6.814
3	2.920
4	2.353
5	2.132
6	2.015
7	1.943
8	1.895
9	1.860
10	1.833

Procedure:

1. Compute N_{add} after completing two recoveries.
2. If N_{add}>0, then run an additional test.
3. Re-compute N_{add}. Continue to test additional samples until N_{add}<0.

V. Test Procedure Approval and Certification

Each vendor of capture equipment for small appliances desiring certification will provide a representative model of its capture system and its recommended recovery procedures to an EPA approved third party laboratory for testing in accordance with this procedure. The third party laboratory will certify recovery systems that when tested in accordance with this procedure demonstrate a sufficient recovery efficiency to meet EPA regulatory requirements.

APPENDIX D TO SUBPART F OF PART 82—STANDARDS FOR BECOMING A CERTIFYING PROGRAM FOR TECHNICIANS

Standards for Certifying Programs

a. Test Preparation

Certification for Type II, Type III and Universal technicians will be dependent upon passage of a closed-book, proctored test, administered in a secure environment, by an EPA-approved certifying program.

Certification for Type I technicians will be dependent upon passage of an EPA-approved test, provided by an EPA-approved certifying program. Organizations providing Type I certification only, may chose either an on-site format, or a mail-in format, similar to what is permitted under the MVACs program.

Each certifying program must assemble tests by choosing a prescribed subset from the EPA test bank. EPA expects to have a test bank with a minimum of 500 questions, which will enable the certifying program to generate multiple tests in order to discourage cheating. Each test must include 25 questions drawn from Group 1 and 25 questions

drawn from each relevant technical Group. Tests for Universal technicians will include 100 questions (25 from Group 1 and 25 from each relevant technical Group). Each 50-question test represents 10 percent of the total test bank. Questions should be divided in order to sufficiently cover each topic within the Group.

Each certifying program must show a method of randomly choosing which questions will be on the tests. Multiple versions of the test must be used during each testing event. Test answer sheets or (for those testing via the computer medium) computer files must include the name and address of the applicant, the name and address of the certifying program, and the date and location at which the test was administered.

Training material accompanying mail-in Type I tests must not include sample test questions mimicking the language of the certification test. All mail-in material will be subject to review by EPA.

Certifying programs may charge individuals reasonable fees for the administration of the tests. EPA will publish a list of all approved certifying programs periodically, including the fees charged by the programs. This information will be available from the Stratospheric Ozone Protection Hotline.

b. Proctoring

A certifying program for Type II, Type III and Universal technicians must designate or arrange for the designation of at least one proctor registered for each testing event. If more than 50 people are taking tests at the same time at a given site, the certifying organization must adhere to normal testing procedures, by designating at least one additional proctor or monitor for every 50 people taking tests at that site.

The certification test for Type II, Type III and Universal technicians is a closed-book exam. The proctors must ensure that the applicants for certification do not use any notes or training materials during testing. Desks or work space must be placed in a way that discourages cheating. The space and physical facilities are to be conducive to continuous surveillance by the proctors and monitors during testing.

The proctor may not receive any benefit from the outcome of the testing other than a fee for proctoring. Proctors cannot know in advance which questions are on the tests they are proctoring.

Proctors are required to verify the identity of individuals taking the test by examining photo identification. Acceptable forms of identification include but are not limited to drivers' licenses, government identification cards, passports, and military identification.

Certifying programs for Type I technicians using the mail-in format, must take sufficient measures at the test site to ensure that

tests are completed honestly by each technician. Each test for Type I certification must provide a means of verifying the identification of the individual taking the test. Acceptable forms of identification include but are not limited to drivers' licenses numbers, social security numbers, and passport numbers.

c. Test Security

A certifying program must demonstrate the ability to ensure the confidentiality and security of the test questions and answer keys through strict accountability procedures. An organization interested in developing a technician certification program will be required to describe these test security procedures to EPA.

After the completion of a test, proctors must collect all test forms, answer sheets, scratch paper and notes. These items are to be placed in a sealed envelope.

d. Test Content

All technician certification tests will include 25 questions from Group I. Group I will ask questions in the following areas:

- I. Environmental impact of CFCs and HCFCs
- II. Laws and regulations
- III. Changing industry outlook

Type I, Type II and Type III certification tests will include 25 questions from Group II. Group II will ask questions covering sector-specific issues in the following areas:

- IV. Leak detection
- V. Recovery Techniques
- VI. Safety
- VII. Shipping
- VIII. Disposal

Universal Certification will include 75 questions from Group II, with 25 from each of the three sector-specific areas.

e. Grading

Tests must be graded objectively. Certifying programs must inform the applicant of their test results no later than 30 days from the date of the test. Type I certifying programs using the mail-in format, must notify the applicants of their test results no later than 30 days from the date the certifying programs received the completed test and any required documentation. Certifying programs may mail or hand deliver the results.

The passing score for the closed-book Type I, Type II, Type III and Universal certification test is 70 percent. For Type I certification tests using the mail-in format, passing score is 84 percent.

f. Proof of Certification

Certifying programs must issue a standard wallet-sized identification card no later than 30 days from the date of the test. Type I certifying programs using mail-in formats must

issue cards to certified technicians no later than 30 days from the date the certifying program receives the completed test and any required documentation.

Each wallet-sized identification card must include, at a minimum, the name of the certifying program including the date the certifying program received EPA approval, the name of the person certified, the type of certification, a unique number for the certified person and the following text:

[name of person] has been certified as [Type I, Type II, Type III and/or Universal—as appropriate] technician as required by 40 CFR part 82, subpart F.

g. Recordkeeping and Reporting Requirements

Certifying programs must maintain records for at least three years which include, but are not limited to, the names and addresses of all individuals taking the tests, the scores of all certification tests administered, and the dates and locations of all testing administered.

EPA must receive an activity report from all approved certifying programs by every January 30 and June 30, the first to be submitted following the first full six-month period for which the program has been approved by EPA. This report will include the pass/fail rate and testing schedules. This will allow the Agency to determine the relative progress and success of these programs. If the certifying program believes a test bank question needs to be modified, information about that question should also be included.

Approved certifying programs will receive a letter of approval from EPA. Each testing center must display a copy of that letter.

h. Additional Requirements

EPA will periodically inspect testing sites to ensure compliance with EPA regulations. If testing center discrepancies are found, they must be corrected within a specified time period. If discrepancies are not corrected, EPA may suspend or revoke the certifying programs's approval. The inspections will include but are not limited to a review of the certifying programs' provisions for test security, the availability of space and facilities to conduct the administrative requirements and ensure the security of the tests, the availability of adequate testing facilities and spacing of the applicants during testing, a review of the proper procedures regarding accountability, and that there is no evidence of misconduct on the part of the certifying programs, their representatives and proctors, or the applicants for certification.

If the certifying programs offer training or provide review materials to the applicants,

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these endeavors are to be considered completely separate from the administration of the certification test.

i. Approval Process

EPA anticipates receiving a large number of applications from organizations seeking to become certifying programs. In order to certify as many technicians as possible in a reasonable amount of time, EPA will give priority to national programs. Below are the guidelines EPA will use:

First: Certifying programs providing at least 25 testing centers with a minimum of one site in at least 8 different states will be considered.

Second: Certifying programs forming regional networks with a minimum of 10 testing centers will be considered.

Third: Certifying programs providing testing centers in geographically isolated areas not sufficiently covered by the national or regional programs will be considered.

Fourth: All other programs applying for EPA approval will be considered.

Sample application forms may be obtained by contacting the Stratospheric Ozone Hotline at 1-800-296-1996.

j. Grandfathering

EPA will grandfather technicians who successfully completed voluntary programs whose operators seek and receive EPA approval to grandfather these technicians, in accordance with § 82.161(g). As part of this process, these certifying programs may be required to send EPA-approved supplementary information to ensure the level of the technicians' knowledge. Technicians will be required to read this supplementary information as a condition of certification. The certifying programs will also issue new identification cards meeting the requirements specified above.

k. Sample Application

EPA has provided a sample application. The Agency designed the application to demonstrate the information certifying programs must provide to EPA. Programs are not required to use this form or this format.

[58 FR 28712, May 14, 1993, as amended at 59 FR 42960, 42962, Aug. 19, 1994; 59 FR 55927, Nov. 9, 1994]

Subpart G—Significant New Alternatives Policy Program

SOURCE: 59 FR 13147, Mar. 18, 1994, unless otherwise noted.

§ 82.170 Purpose and scope.

(a) The purpose of these regulations in this subpart is to implement section

612 of the Clean Air Act, as amended, regarding the safe alternatives policy on the acceptability of substitutes for ozone-depleting compounds. This program will henceforth be referred to as the "Significant New Alternatives Policy" (SNAP) program. The objectives of this program are to identify substitutes for ozone-depleting compounds, to evaluate the acceptability of those substitutes, to promote the use of those substitutes believed to present lower overall risks to human health and the environment, relative to the class I and class II compounds being replaced, as well as to other substitutes for the same end-use, and to prohibit the use of those substitutes found, based on the same comparisons, to increase overall risks.

(b) The regulations in this subpart describe persons and substitutes subject to reporting requirements under the SNAP program and explain preparation and submission of notices and petitions on substitutes. The regulations also establish Agency procedures for reviewing and processing EPA's determinations regarding notices and petitions on substitutes. Finally, the regulations prohibit the use of alternatives which EPA has determined may have adverse effects on human health or the environment where EPA has identified alternatives in particular industrial use sectors that on an overall basis, reduce risk to human health and the environment and are currently or potentially available. EPA will only prohibit substitutes where it has identified other substitutes for a specific application that are acceptable and are currently or potentially available.

(c) Notifications, petitions and other materials requested shall be sent to: SNAP Document Control Officer, U.S. Environmental Protection Agency (6205-J), 401 M Street, SW., Washington, DC 20460.

§ 82.172 Definitions.

Act means the Clean Air Act, as amended, 42 U.S.C. 7401 *et seq.*

Agency means the U.S. Environmental Protection Agency.

Application means a specific use within a major industrial sector end-use.