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10.5 Recovery Test Fixture Test Option

If an equipment manufacturer chooses, as an alternative to the actual vehicle, it may certify to SAE J2788 with a laboratory fixture that is composed entirely of all the original equipment parts of a single model year for the 3.0 lb capacity front/rear A/C system in the 2005–07 Chevrolet Suburban. All parts must be those OE-specified for one model year system and no parts may be eliminated or bypassed from the chosen system, or reproduced by a non-OE source. No parts may be added and/or relocated from the OE position in the 2005–07 Suburban. No parts may be modified in any way that could affect system performance for testing under this standard, except adding refrigerant line bends and/or loops to make the system more compact. Reducing the total length of the lines, however, is not permitted. The fixture system shall be powered by an electric motor, run at a speed not to exceed 2000 rpm, and for this test option, no system warm-up or equivalent procedure may be used. The certifying laboratory shall maintain records of all parts purchased, including invoices and payments. The assembly of the parts shall, as an outside-the-vehicle package, duplicate the OE system and its routing, including bends, except for permitted additions of bends and/or loops in refrigerant lines. Aside from the absence of engine operation and the limitations posed by the standard and the use of the electric motor, the test shall otherwise be the same as the test on the Suburban, including test temperature.

[72 FR 63495, Nov. 9, 2007]

APPENDIX D TO SUBPART B OF PART 82—SAE J2810 STANDARD FOR RECOVERY ONLY EQUIPMENT FOR HFC–134a REFRIGERANT

FOREWORD

This Appendix establishes the specific minimum equipment requirements for the recovery of HFC–134a that has been directly removed from, motor vehicle air-conditioning systems.

1. Scope

The purpose of this SAE Standard is to provide minimum performance and operating feature requirements for the recovery of HFC–134a (R–134a) refrigerant to be returned to a refrigerant reclamation facility that will process it to the appropriate ARI 700 Standard or allow for recycling of the recovered refrigerant to SAE J2788 specifications by using SAE J2788-certified equipment. It is not acceptable that the refrigerant removed from a mobile air-conditioning (A/C) system with this equipment be directly returned to a mobile A/C system.

This information applies to equipment used to service automobiles, light trucks, and other vehicles with similar HFC–134a (R–134a) A/C systems.

1.1 Improved refrigerant recovery equipment is required to ensure adequate refrigerant recovery to reduce emissions and provide for accurate recharging of mobile air conditioning systems. Therefore, 12 months following the publication date of this standard, it supersedes SAE J1732.

2. References

2.1 Applicable Publications

The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096–0001, Tel: 877–606–7323 (inside USA and Canada) or 724–776–4970 (outside USA), *http://www.sae.org*.

SAE J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems.

SAE J1739 Potential Failure Mode and Effects Analysis in Design (Design FMEA) and Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA) and Effects Analysis for Machinery (Machinery FMEA).

SAE J1771 Criteria for Refrigerant Identification Equipment for Use with Mobile Air-Conditioning Systems.

SAE J2196 Service Hose for Automotive Air Conditioning.

SAE J2296 Retest of Refrigerant Container.

SAE J2788 HFC–134a (R–134a) Recovery/Recycling Equipment and Recovery/Recycling/Recharging for Mobile Air-Conditioning Systems.

2.1.2 ARI Publication

Available from Air-Conditioning and Refrigeration Institute, 4100 North Fairfax Drive, Suite 200, Arlington, VA 22203, Tel: 703–524–8800, *http://www.ari.org*.

ARI 700 Specifications for Fluorocarbon Refrigerants.

2.1.3 CGA Publication

Available from Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151–2923, Tel: 703–788–2700, *http://www.cganet.com*.

CGA S–1.1 Pressure Relief Device Standard Part 1—Cylinders for Compressed Gases.

2.1.4 DOT Specification

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402–9320.

CFR 49, Section 173.304 Shippers—General Requirements for Shipments and Packagings.

2.1.5 UL Publication

Available from Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062–2096, Tel: 847–272–8800, *http://www.ul.com*.

UL 1769 Cylinder Valves.

3. Specifications and General Description

3.1 The equipment must be able to recover (extract) HFC–134a (R–134a) refrigerant from a mobile A/C system per the test procedure of sections 7 and 8.

3.2 The equipment shall be suitable for use in an automotive service garage environment as defined in 6.8.

3.3 Equipment Certification

The equipment shall be certified by an EPA-listed laboratory to meet this standard. SAE J2810.

3.4 Label Requirements

The equipment shall have a label with bold type, minimum 3 mm high, saying ''Design Certified by (certifying agent, EPA listed laboratory) to meet SAE J2810 for use only with HFC–134a (R–134a). If it is to be re-used in an A/C system, the refrigerant recovered with this equipment must be processed to the appropriate ARI 700 specifications or to specifications by using equipment certified to perform to SAE J2788.''

3.5 SAE J1739

Potential Failure Mode and Effects Analysis in Design (Design FMEA), Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA), and Potential Failure Mode and Effects Analysis for Machinery (Machinery FMEA) shall be applied to the design and development of service equipment.

4. Safety Requirements

4.1 The equipment must comply with applicable federal, state, and local requirements on equipment related to the handling of HFC–134a (R–134a) material. Safety precautions or notices, labels, related to the safe operation of the equipment shall also be prominently displayed on the equipment and should state ''CAUTION—SHOULD BE OPERATED ONLY BY CERTIFIED PERSONNEL.'' The safety identification shall be located on the front near the controls.

4.2 The equipment must comply with applicable safety standards for the electrical and mechanical systems.

5. Operating Instructions

5.1 The equipment manufacturer must provide operating instructions that include information required by SAE J639, necessary maintenance procedures, and source information for replacement parts and repair.

5.1.1 The instruction manual shall include the following information on the lubricant removed. Only new lubricant, as identified by the system manufacturer, should be replaced in the mobile A/C system. Removed lubricant from the system and/or the equipment shall be disposed of in accordance with the applicable federal, state, and local procedures and regulations.

5.2 The equipment must prominently display the manufacturer's name, address, the type of refrigerant it is designed to extract (R–134a), a service telephone number, and any items that require maintenance or replacement that affect the proper operation of the equipment. Operation manuals must cover information for complete maintenance of the equipment to assure proper operation.

5.3 The equipment manufacturer shall provide a warning in the instruction manual regarding the possibility of refrigerant contamination from hydrocarbons, leak sealants and refrigerants other than R–134a in the mobile A/C system being serviced.

5.4 Recovery equipment having refrigerant identification equipment shall meet the requirements of SAE J1771.

5.5 Recovery equipment not having refrigerant identification capability shall have instructions warning the technician that failure to verify that the system contains only R–134a potentially exposes him or her to danger from flammable refrigerants and health hazards from toxic refrigerants. The instructions also shall alert to possible contamination problems to the recovery equipment from sealants and refrigerants other than R–134a, and to the fact that a refrigerant other than R–134a would require special handling by someone with specific expertise and equipment.

6. Function Description

6.1 The equipment must be capable of continuous operation in ambient temperatures of 10 °C (50 °F) to 49 °C (120 °F). Continuous is defined as completing recovery operation with no more than a brief reset between servicing vehicles, and shall not include time delays for allowing a system to outgas (which shall be part of the recovery period provided by this standard).

6.1.1 The equipment shall demonstrate ability to recovery a minimum of 95.0% of the refrigerant from the test vehicle in 30.0 minutes or less, without prior engine operation (for previous eight hours minimum), external heating or use of any device (such as shields, reflectors, special lights, etc.), which could heat components of the system.

The recovery procedure shall be based on a test at 21 °C to 24 °C (70 °F to 75 °F) ambient temperature. The test system for qualifying shall be a 1.4 kg (3.0 lbs) capacity orifice tube/accumulator system in a 2005–07 Chevrolet Suburban with front and rear A/C or the test option described in section 9.

6.1.2 The equipment shall demonstrate ability to recover a minimum of 85% of the refrigerant from the test vehicle or system of 6.1.1. in 30.0 minutes or less, at an ambient temperature of 10 °C to 13 °C (50 °F to 55 °F), subject to the same restrictions regarding engine operation and external heating.

6.1.3 During recovery operation, the equipment shall provide overfill protection so that the liquid fill of the storage container does not exceed 80% of the tank's rated volume at 21 °C (70 °F). This will ensure that the container meets Department of Transportation (DOT) Standard, CFR Title 49, section 173.304 and the American Society of Mechanical Engineers.

6.1.4 Portable refillable tanks or containers used in conjunction with this equipment must be labeled ''HFC–134a (R–134a) and meet applicable Department of Transportation (DOT) or Underwriters Laboratories (UL) Standards, and incorporate fittings per SAE J2197.

6.1.5 The cylinder valves shall comply with the standard for cylinder valves UL 1769.

6.1.6 The pressure relief device shall comply with the Pressure Relief Device Standard Part 1—Cylinders for Compressed Gasses CGA Pamphlet S–1.1.

6.1.7 The tank assembly shall be marked to indicate the first retest date, which shall be five years from the date of manufacture. The marking shall indicate that retest must be performed every subsequent five years. SAE J2296 provides an inspection procedure. The marking shall be in letters at least 6 mm (0.25 in) high. If ASME tanks, as defined in UL–1963, are used, they are exempt from the retest requirements.

6.2 If the marketer permits use of a refillable refrigerant tank, a method must be provided (including any necessary fittings) for transfer to a system that ensures proper handling (recycling or other, environmentally-legal disposal).

Restricting the equipment to use of non-refillable tanks eliminates compliance with this provision.

6.3 Prior to testing under this standard, the equipment must be preconditioned with a minimum of 13.6 kg of the standard contaminated HFC–134a (R–134a) at an ambient of 21 °C before starting the test cycle. Sample amounts are not to exceed 1.13 kg with sample amounts to be repeated every 5 min. The test fixture shown in Figure 1 shall be operated at 21 °C. Contaminated HFC–134a (R–134a) samples shall be processed at ambient temperatures of 10 °C and 49 °C (50 °F to 120 °F), without the equipment shutting down due to any safety devices employed in this equipment.

6.3.1 Contaminated HFC–134a (R–134a) sample shall be standard contaminated HFC–134a (R–134a) refrigerant, 13.6 kg sample size, consisting of liquid HFC–134a (R–134a) with 1300 ppm (by weight) moisture at 21 °C (70 °F) and 45 000 ppm (by weight) of oil (polyalkylene glycol oil with 46–160 cst viscosity at 40 °C) and 1000 ppm by weight of noncondensable gases (air).

6.3.2 Portable refillable containers used in conjunction with this equipment must meet applicable DOT Standards. The color of the container must be blue with a yellow top to indicate the container holds used HFC–134a (R–134a) refrigerant. The container must be permanently marked on the outside surface in black print at least 20 mm high, ''CONTAMINATED HFC–134a (R–134a)—DO NOT USE, MUST BE REPROCESSED.''

Figure 1—Test Fixture

6.3.3 The portable refillable container shall have a ½ in ACME thread.

6.4 Additional Storage Tank Requirements.

6.4.1 The cylinder valve shall comply with UL 1769.

6.4.2 The pressure relief device shall comply with CGA Pamphlet S–1.1.

6.5 All flexible hoses must meet SAE J2196 for service hoses.

6.6 Service hoses must have shutoff devices located at the connection points to the system being serviced to minimize introduction of noncondensable gases into the recovery equipment during connection and the release of the refrigerant during disconnection.

6.7 The equipment must be able to separate the lubricant from recovered refrigerant and accurately indicate the amount removed from the simulated automotive system during processing in 20 mL (0.7 fl oz) units.

6.7.1 The purpose of indicating the amount of lubricant removed is to ensure that a proper amount of new lubricant is returned to the mobile A/C system for compressor lubrication, if the system is to be charged with equipment meeting SAE J2788.

6.7.2 Refrigerant dissolved in this lubricant must be accounted for to prevent lubricant overcharge of the mobile A/C system.

6.8 The equipment must be capable of continuous operation in ambient temperatures of 10 °C to 49 °C (50 °F to120 °F) and comply with 6.1 to 6.4 of this standard.

6.9 For test validation, the equipment is to be operated according to the manufacturer's instructions.

7. Test Procedure A at 21 °C to 24 °C (70 °F to 75 °F).

The test vehicle (2005–2007 Chevrolet Suburban with rear A/C system—1.4 kg/ 3.0 lb) or laboratory fixture per section 10.5 of SAE

J2788, shall be prepared as for SAE J2788, section 10.3, following Steps 1, 2, 3, 4, and then the following:

7.1 Using a machine certified to SAE J2788 and with the machine on a platform scale with accuracy to within plus/minus 3.0 grams at the weight of the machine, charge the system to the vehicle manufacturer's recommended amount of refrigerant (1.4 kg–3.0 lb). The actual charge amount per the reading on the platform scale shall be used as the basis for the recovery efficiency of the recovery-only machine being tested to this standard. Run the engine (or operate test fixture with electric motor) for up to 15 minutes at up to 2000 rpm to circulate oil and refrigerant. The system then must rest for eight hours.

7.2 Place the recovery machine on the platform scale and record the weight with the hoses draped over the machine. Ambient temperature shall be within the range of 21 °C to 24 °C (70 °F to 75 °F) for this test, which shall be performed without the immediately prior engine operation permitted by SAE J2788, Section 10.3, Step No.1. The only permitted engine operation is as specified in 7.1.

7.3 Start the timer. Connect the service hoses to the system of the test vehicle and perform the recovery per the equipment manufacturer's instructions. The vehicle system's service valve cores must remain in the fittings for this procedure.

7.4 When recovery is completed, including from the service hoses if that is part of the recommended procedure, disconnect the hoses and drape over the machine. Stop the timer. The elapsed time shall be no more than 30 minutes.

7.5 Remove the oil reservoir, empty and reinstall. The platform scale shall indicate that a minimum of 95.0% of the refrigerant has been recovered, based on the charge amount indicated by the platform scale. If the machine has recovered the minimum of 95.0% within the 30.0 minutes, the next test shall be performed. If it fails this test, the marketer of the equipment must document changes to the equipment to upgrade performance before a retest is allowed. If it passes, the laboratory can proceed to Test Procedure B–10 °C to 13 °C (50 °F to 55 °F).

8. Test Procedure B at 10 °C to 13 °C (50 °F to 55 °F).

The test vehicle (2005–2007 Chevrolet Suburban front/rear A/C system (1.4 kg/3.0 lb) or test fixture per section 10.5 of SAE J2788, shall be prepared as per 7.0 and 7.1 of this standard, and then the following:

8.1 Place the recovery machine on the platform scale and record the weight with the hoses draped over the machine.

Ambient temperature at this time shall be no higher than 10 °C to13 °C (50 °F to 55 °F).

8.2 Start the timer. Connect the service hoses to the system of the test vehicle and perform the recovery per the equipment manufacturer's instructions. This also shall be performed without the immediately prior engine operation permitted by SAE J2788, section 10.4, Step No. 1. The vehicle system's service valve cores must remain in the fittings for this procedure.

8.3 When recovery is completed, including from the service hoses if that is part of the recommended procedure, disconnect the hoses and drape over the machine. Stop the timer. The elapsed time shall be no more than 30 minutes.

8.4 Remove the oil reservoir, empty and reinstall. The platform scale shall indicate that a minimum of 85.0% of the refrigerant has been recovered, based on the charge amount indicated by the platform scale. If the machine has recovered the minimum of 85.0% within the 30 minutes, it has passed the test procedure and if it meets all other requirements of this standard, it is certified.

9. Test Option

As in SAE J2788, Section 10.5, as an alternative to a 2005–2007 Chevrolet Suburban with rear A/C (1.4 kg–3.0 lb) system, a laboratory test fixture may be used to certify to SAE J2810 the fixture must be composed entirely of all the original equipment parts of a single model year for the 1.4 kg (3.0 lb) capacity system. All parts must be those OE-specified for one model year system and no parts may be eliminated or bypassed from the chosen system or reproduced from a non-OE source. No parts may be added and/or relocated from the OE position in the 2005–07 Suburban. No parts may be modified in any way that could affect system performance for testing under this standard, except adding refrigerant line bends and/or loops to make the system more compact. Reducing the total length of the lines, however, is not permitted.

The fixture systems for this standard shall not be powered by an electric motor during recovery, although a motor can be used, run at a speed not to exceed 2000 rpm, as part of the preparatory process, including installation of the charge.

[73 FR 34647, June 18, 2008]

APPENDIX E TO SUBPART B OF PART 82—THE STANDARD FOR AUTOMOTIVE REFRIGERANT RECYCLING EQUIPMENT INTENDED FOR USE WITH BOTH CFC-12 AND HFC-134a

SAE J2211, Recommended Service Procedure for the Containment of HFC-134a, as set forth under Appendix C of this subpart, and SAE J1989, Recommended Service Procedure for the Containment of CFC-12, as set forth under Appendix A of this subpart, also apply to this Appendix E of this subpart.

SAE J1770, issued December, 1995.