SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1657 APR2011

Issued 1993-06
Stabilized 2011-04

Superseding J1657 FEB1999

Selection Criteria for Retrofit Refrigerants to Replace CFC-12 (R-12) in Mobile Air-Conditioning Systems

RATIONALE

The technical report covers technology, products, or processes which are mature and not likely to change in the foreseeable future.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Interior Climate Control Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

SAENORM.COM : Click to view the full PDF of j1657_201104

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2011 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/J1657_201104

***Foreword*—**Refrigerants and refrigerant mixtures that might contain CFCs, HCFCs, HFCs, and hydrocarbons are being considered for introduction into the automotive aftermarket as retrofit refrigerants to service some of the existing motor vehicles equipped with CFC-12 (R-12) mobile air-conditioning (A/C) systems. This document provides criteria for determining the acceptability of candidate retrofit refrigerants to replace CFC-12 (R-12) in mobile A/C systems originally designed to use CFC-12 (R-12).

1. Scope

***Scope*—**The purpose of this SAE Recommended Practice is to provide criteria for determining the acceptability of candidate retrofit refrigerants to replace CFC-12 (R-12) in mobile A/C systems originally designed to use CFC-12 (R-12).

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J639—Safety and Containment of Refrigerant for Mechanical Vapor Compression Systems Used for Mobile Air-Conditioning Systems
SAE J1627—Rating Criteria for Electronic Refrigerant Leak Detectors
SAE J1628—Technician Procedure for Using Electronic Refrigerant Leak Detector for Service of Mobile Air-Conditioning Systems
SAE J1658—Alternate Refrigerant Consistency Criteria for Use in Mobile Air-Conditioning Systems
SAE J1659—Vehicle Testing Requirements for Replacement Refrigerant for CFC-12 (R-12) Mobile Air-Conditioning Systems
SAE J1660—Fittings and Labels for Retrofit of CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)
SAE J1661—Procedure for Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)
SAE J1662—Material Compatibility With Alternate Refrigerants
SAE J1989—Recommended Service Procedure for the Containment of CFC-12 (R-12)
SAE J1990—Extraction and Recycle Equipment for Mobile Automotive Air-Conditioning Systems
SAE J1991—Standard of Purity for Use in Mobile Air-Conditioning Systems
SAE J2064—HFC-134a (R-134a) Refrigerant Automotive Air-Conditioning Hose

SAENORM.COM : Click to view the full PDF of j1657_201104

SAE J2099—Standard of Purity for Recycled HFC-134a (R-134a) for Use in Mobile Air-Conditioning Systems
SAE J2196—Service Hose for Automotive Air-Conditioning
SAE J2197—HFC-134a (R-134a) Service Hose Fittings for Automotive Air-Conditioning Service Equipment
SAE J2209—Extraction Equipment for Mobile Automotive Air-Conditioning Systems
SAE J2210—HFC-134a (R-13a) Recycling Equipment for Mobile Air-Conditioning Systems
SAE J2211—Recommended Service Procedure for the Containment of HFC-134a (R-134a)

2.1.2 ASHRAE PUBLICATION—Available from ASHRAE, 1791 Tullie Circle, N.E., Atlanta, GA 30329.

ASHRAE Standard 34—Number Designation and Safety Classification of Refrigerants

2.1.3 ASTM PUBLICATIONS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 2670-81—Method for Measuring Wear Properties of Fluid Lubricants (Falex Method)
ASTM E 681-85—Test Method for Limits of Flammability of Chemicals

2.1.4 ACGIH PUBLICATION—Available from American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211.

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

2.1.5 OSHA PUBLICATION—Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

OSHA Hazard Communication Standard (29 CFR 1910.1200)

3. General Requirements

3.1 Retrofit refrigerants shall, in addition to meeting the requirements of this document, meet the requirements of SAE J1658, J1659, and J1662.

3.2 For each refrigerant candidate, a recommended companion lubricant shall be identified.

3.3 Each retrofit refrigerant candidate shall be accompanied by a recommended retrofit procedure written in sufficient detail to allow automotive service technicians to successfully retrofit any vehicle for which the candidate refrigerant is marketed from CFC-12 (R-12) to the candidate refrigerant. Such procedure shall take into consideration, and offer a remedy for, any incompatibility of the refrigerant and/or lubricant with typical A/C system materials of construction. (Refer to SAE J1658, J1659, J1660, J1661, and J1662 for additional retrofit requirements.)

4. Noncompliance with Acceptance Criteria

4.1 Failure to meet the requirements of Sections 5, 6, and 7 shall be cause for rejection of the candidate refrigerant as a suitable mobile A/C refrigerant.

4.2 Failure to meet the acceptance criteria of any remaining section shall require documentation in the accompanying retrofit procedure of such failure and the remedial action necessary to overcome the deficiency.

SAENORM.COM : Click to view the full PDF of j1657_201104

5. Refrigerant Properties—Safety

5.1 Refrigerant Toxicity

5.1.1 The refrigerant shall be listed on the U.S. EPA's Chemical Inventory List as required by the Toxic Substance Control Act (TSCA). To obtain this listing, the refrigerant manufacturer must provide EPA with sufficient toxicological information for the EPA to determine that the material can be sold commercially.

5.1.2 The refrigerant shall have a Threshold Limit Value-Time Weighted Average (TLV-TWA), or equivalent exposure limit, meeting the requirements of the U.S. EPA Significant New Alternatives Program for mobile A/C application. For refrigerant blends, this criterion must be met, as formulated and under "worst case" fractionation scenarios described in the flammability section (5.2.2 and 5.2.4). ASHRAE Standard 34 provides a basis upon which to compare the relative safety of refrigerants.

TLV-TWA is the "time-weighted average concentration for a normal 8-h workday and a 40-h work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect" (from American Conference of Governmental Industrial Hygienists).

5.1.3 SAFETY CRITERIA

5.1.3.1 The refrigerant must be accompanied by a Material Safety Data Sheet (MSDS), which provides the minimum requirements specified by OSHA's Hazard Communication Standard (29 CFR 1910.1200).

5.1.3.2 Beyond those criteria listed previously, the refrigerant candidate must be capable of being handled safely in mobile air conditioning service facilities when such facilities are employing the safety and handling practices used for CFC-12 (R-12) or HFC-134a (R-134a). Safety considerations should include, but not be limited to, those specified in SAE J639.

5.2 Refrigerant Flammability

5.2.1 DETERMINATION OF FLAMMABILITY OF THE REFRIGERANT OR REFRIGERANT BLEND

5.2.1.1 The test method to be used is ASTM E 681-85, conducted at atmospheric pressure and 25 °C, and modified as follows:

a. A magnetically driven agitator, as shown in Figure 1 of ASTM E 681-85, shall be substituted for the stirring bar.
b. A match is to be secured between the electrodes and electrically ignited.
c. All samples are to be introduced as vapor.

NOTE—These modifications are basically those recommended by the Halogenated Hydrocarbons Committee of the Compressed Gas Association in their deliberations to develop a standard procedure for flammability.

5.2.1.2 The use of this method results in a diagram or chart that defines the flammable and nonflammable regions of mixtures of the refrigerant or refrigerant blend with any concentration of air.

5.2.2 DETERMINATION OF THE EFFECTS OF REFRIGERANT FRACTIONATION ON THE FLAMMABILITY OF A BLEND REFRIGERANT DUE TO VAPOR LEAKAGE FROM SERVICE EQUIPMENT OR THE A/C SYSTEM

5.2.2.1 The following testing shall be performed at two refrigerant temperatures: 2 °C ± 1 °C and 66 °C ± 1 °C to simulate evaporator and condenser conditions.

SAENORM.COM : Click to view the full PDF of j1657_201104