

# **2014 ASHRAE® HANDBOOK**

# **REFRIGERATION**

**Inch-Pound Edition**

**ASHRAE**, 1791 Tullie Circle, N.E., Atlanta, GA 30329  
[www.ashrae.org](http://www.ashrae.org)

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## ASHRAE Research

ASHRAE is the world's foremost technical society in the fields of heating, ventilation, air conditioning, and refrigeration. Its members worldwide are individuals who share ideas, identify needs, support research, and write the industry's standards for testing and practice. The result is that engineers are better able to keep indoor environments safe and productive while protecting and preserving the outdoors for generations to come.

One of the ways that ASHRAE supports its members' and industry's need for information is through ASHRAE Research. Thousands of individuals and companies support ASHRAE Research annually, enabling

ASHRAE to report new data about material properties and building physics and to promote the application of innovative technologies.

Chapters in the ASHRAE Handbook are updated through the experience of members of ASHRAE Technical Committees and through results of ASHRAE Research reported at ASHRAE conferences and published in ASHRAE special publications and in *ASHRAE Transactions*.

For information about ASHRAE Research or to become a member, contact ASHRAE, 1791 Tullie Circle, Atlanta, GA 30329; telephone: 404-636-8400; [www.ashrae.org](http://www.ashrae.org).

## Preface

The 2014 *ASHRAE Handbook—Refrigeration* covers the refrigeration equipment and systems for applications other than human comfort. This volume includes data and guidance on cooling, freezing, and storing food; industrial and medical applications of refrigeration; and low-temperature refrigeration.

An accompanying CD-ROM contains all the volume's chapters in both I-P and SI units.

Some of this volume's revisions are described as follows:

- Chapter 1, Halocarbon Refrigeration Systems, has three new sections to address issues involving the Montreal Protocol and the phaseout of halocarbons. It also has a new introduction, plus updates to sections on Applications and System Safety.
- Chapter 2, Ammonia Refrigeration Systems, has been extensively reorganized and updated for current practice.
- Chapter 6, Refrigerant System Chemistry, has new sections on additives and process chemicals.
- Chapter 7, Control of Moisture and Other Contaminants in Refrigerant Systems, has added moisture isotherm data for refrigerants R-290 and R-600a. It also contains a new section on system sampling in conjunction with retrofits, troubleshooting, or routine maintenance.
- Chapter 10, Insulation Systems for Refrigerant Piping, has revised insulation table values to comply with ASTM *Standard* C680-10.
- Chapter 12, Lubricants in Refrigerant Systems, has expanded content on hydrofluorocarbons (HFCs) and new guidance on retrofits.
- Chapter 15, Retail Food Store Refrigeration and Equipment, has updates to sections on multiplex compressor racks, secondary and CO<sub>2</sub> systems, gas defrost, liquid subcooling, and heat reclaim.
- Chapter 17, Household Refrigerators and Freezers, has updates on LED lighting in cabinets.

- Chapter 24, Refrigerated-Facility Loads, includes new content on packaging loads from moisture, updated motor heat gain rates, and a new example of a complete facility load calculation.
- Chapter 25, Cargo Containers, Rail Cars, Trailers, and Trucks, updated throughout, has a major revision to the section on Equipment.
- Chapter 27, Air Transport, has major revisions to the extensive section on Galley Refrigeration.
- Chapter 51, Codes and Standards, has been updated to list current versions of selected publications from ASHRAE and others. Publications are listed by topic, and full contact information for publishing organizations is included.

This volume is published, as a bound print volume and in electronic format on CD-ROM and online, in two editions: one using inch-pound (I-P) units of measurement, the other using the International System of Units (SI).

Corrections to the 2011, 2012, and 2013 Handbook volumes can be found on the ASHRAE web site at <http://www.ashrae.org> and in the Additions and Corrections section of this volume. Corrections for this volume will be listed in subsequent volumes and on the ASHRAE web site.

Reader comments are enthusiastically invited. To suggest improvements for a chapter, **please comment using the form on the ASHRAE web site** or, using the cutout page(s) at the end of this volume's index, write to Handbook Editor, ASHRAE, 1791 Tullie Circle, Atlanta, GA 30329, or fax 678-539-2187, or e-mail [mowen@ashrae.org](mailto:mowen@ashrae.org).

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