ANSI/ASHRAE Standard 15-2007
(Supersedes ANSI/ASHRAE Standard 15-2004)
Includes ANSI/ASHRAE Addenda listed in Appendix J

ASHRAE STANDARD

Safety Standard for Refrigeration Systems

See Appendix J for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, and the American National Standards Institute.

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CONTENTS

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Safety Standard for Refrigeration Systems

NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at http://www.ashrae.org.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

ANSI/ASHRAE Standard 15-2007 is the most recent edition of one of ASHRAE's oldest standards. This edition is a republication of ANSI/ASHRAE Standard 15-2004 with addenda b and c incorporated. Addendum b provided modifications to enhance the safety of pressure protection designed for relief internal to systems. Addendum c revised Informative Appendix F, which outlines a method for determining the required relief capacity for positive displacement compressors. Addendum c also expanded the list of refrigerants and the corresponding properties required for determining compressor relief capacity. In addition, it revised the relief-capacity determination method to more clearly demonstrate calculations for positive displacement compressors equipped with capacity modulation.

While Standard 15-2007 is generally written as a self-sufficient document, it does normatively reference several other standards (see Normative Appendix E). One of those standards is ANSI/ASHRAE Standard 34, Designation and Safety Classification of Refrigerants*, which prescribes the Refrigerant Classification System as well as refrigerant quantity limits that are vitally important in the context of this standard. Although changes to Standard 15 are closely coordinated with those to Standard 34, users of Standard 15 should also review the most recent version of Standard 34 and its associated addenda for the latest information related to refrigerant designations and safety classifications.*

Presently, Table 1 in Standard 15 shows the amount of refrigerant in a given space that, when exceeded, requires a machinery room. When a refrigerant is not classified in Standard 34 or its addenda or not shown in Table 1, it is the responsibility of the owner of a refrigerating system to make this judgment. For blends, Informative Appendix A is offered to aid in determining allowable concentrations.

This standard is directed toward the safety of persons and property on or near the premises where refrigeration facilities are located. It includes specifications for fabrication of tight systems but does not address the effects of refrigerant emissions on the environment. For information on the environmental effects of refrigerant emissions, see ASHRAE Guideline 3-1996, Reducing Emission of Halogenated Refrigerants in Refrigeration and Air-Conditioning Equipment and Systems.

While the user of this document should be familiar with the entire standard, its organization into the following sections allows faster location of information. The topics included in these sections are:

***General (Sections 1–6):** Purpose, Scope, Definitions, Occupancy Classification, Refrigerating System Classification, Refrigerant Classification, Precedence with Conflicting Requirements, Listed Equipment.*

***Restrictions (Sections 7–8):** Restrictions on Refrigerant Use, Installation Restrictions.*

***Design and Construction (Section 9):** Materials, System Design Pressure, Refrigerant-Containing Pressure Vessels, Pressure Relief Protection, Setting of Pressure-Relief Devices, Marking of Pressure-Relief Devices and Fusible Plugs, Pressure Vessel Protection, Positive Displacement Compressor Protection, Pressure-Limiting Devices, Refrigerant Piping, Valves, Fittings and Related Parts, Components Other than Pressure Vessels and Piping, Service Provisions, Fabrication, Factory Tests, and Nameplate.*

***Operation and Testing (Section 10):** Field Tests, General Requirements.*

The hazards of refrigerants are related to their physical and chemical characteristics as well as to the pressures and temperatures occurring in refrigerating and air-conditioning systems. Personal injury and property damage from inadequate precautions may occur from a number of origins, such as:

- *Rupture of a part or an explosion with risk from flying debris or from structural collapse.*
- *Release of refrigerant from a fracture, due to a leaking seal or incorrect operation.*
- *Fire resulting from or intensified by burning or deflagration of escaping refrigerant or lubricant.*

Personal injury resulting from the accidental release of refrigerants may also occur from:

- *Suffocation from heavier-than-air refrigerants in inadequately ventilated spaces.*
- *Narcotic and cardiac sensitization effects.*
- *Toxic effects of vapor or the decomposition products due to vapor contact with flames or hot surfaces.*
- *Corrosive attack on the eyes, skin, or other tissue.*
- *Freezing of tissue by contact with liquid.*

Care should be taken to avoid stagnant pockets of refrigerant vapors by proper location of ventilation inlet and exhaust openings (all commonly used refrigerants except ammonia [R-717] and water [R-718] are heavier than air). All machinery rooms are required to have detectors that will activate on alarm and mechanical ventilation at a value not greater than the corresponding TLV-TWV (or toxicity measure consistent therewith). Informative Appendix I provides guidance on integrating the requirements of this standard with occupational health and safety programs.

The following short publishing history of this code traces the origins of these safety provisions. In 1919, the American Society of Refrigerating Engineers (ASRE) proposed a Tentative Code for the Regulation of Refrigerating Machines and Refrigerants. Over the next 11 years, representatives from the American Gas Association, American Institute of Electrical Engineers, American Institute of Refrigeration, American Chemical Society, American Society of Heating and Ventilation

Engineers, American Society of Mechanical Engineers, National Electrical Refrigerator Manufacturers Association, National Fire Protection Association, and ASRE met to expand the code to address all of the issues raised on the use of refrigeration equipment. The first Safety Code for Mechanical Refrigeration, recognized as American Standard B9 in October 1930, appeared in the first edition, 1932–1933, of the ASRE Refrigerating Handbook and Catalog*. ASRE revisions designated ASA B9 appeared in 1933 and 1939. ASRE revisions designated ASA B9.1 appeared in 1950, 1953, and 1958. After the formation of ASHRAE, editions appeared as ASA B9.1-1964, ANSI B9.1-1971, ANSI/ASHRAE Standard 15-1978, ANSI/ASHRAE Standard 15-1989, ANSI/ASHRAE Standard 15-1992, ANSI/ASHRAE Standard 15-1994, ANSI/ASHRAE Standard 15-2001, and ANSI/ASHRAE Standard 15-2004.*

1. PURPOSE

This standard specifies safe design, construction, installation, and operation of refrigeration systems.

2. SCOPE

2.1 This standard establishes safeguards for life, limb, health, and property and prescribes safety requirements.

2.2 This standard applies

a. to the design, construction, test, installation, operation, and inspection of mechanical and absorption refrigeration systems, including heat pump systems used in stationary applications,
b. to modifications including replacement of parts or components if they are not identical in function and capacity, and
c. to substitutions of refrigerant having a different designation.

3. DEFINITIONS

approved: acceptable to the authority having jurisdiction.

approved, nationally recognized laboratory: one that is acceptable to the authority having jurisdiction, which provides uniform testing and examination procedures and standards for meeting design, manufacturing, and factory testing requirements of this code; is organized, equipped, and qualified for testing; and has a follow-up inspection service of the current production of the listed products.

back pressure: the static pressure existing at the outlet of an operating pressure-relief device due to pressure in the discharge line.

balanced relief valve: a pressure-relief valve that incorporates means of minimizing the effect of back pressure on the operational characteristics of the valve (opening pressure, closing pressure, and relieving capacity).

blends: refrigerants consisting of mixtures of two or more different chemical compounds, often used individually as refrigerants for other applications.

brazed joint: a gas-tight joint obtained by the joining of metal parts with metallic mixtures or alloys that melt at temperatures above 1000°F (537°C) but less than the melting temperatures of the joined parts.

companion* or *block valves: pairs of mating stop valves that allow sections of a system to be joined before opening these valves or separated after closing them.

compressor: a machine used to compress refrigerant vapor.

compressor unit: a compressor with its prime mover and accessories.

condenser: that part of the refrigerating system where refrigerant is liquefied by the removal of heat.

condenser coil: a condenser constructed of pipe or tubing, not enclosed in a pressure vessel.

condensing unit: a combination of one or more power-driven compressors, condensers, liquid receivers (when required), and regularly furnished accessories.

containers, refrigerant: a cylinder for the transportation of refrigerant.

corridor: an enclosed passageway that limits travel to a single path.

critical pressure, critical temperature,* and *critical volume: a point on the saturation curve where the refrigerant liquid and vapor have identical volume, density, and enthalpy, and there is no latent heat.

design pressure: the maximum pressure for which a specific part of a refrigerating system is designed.

dual pressure-relief device: two pressure-relief devices mounted on a three-way valve that allows one device to remain active while the other is isolated.

duct: a tube or conduit used to convey or encase: (a) *air duct* is a tube or conduit used to convey air (air passages in self-contained systems are not air ducts); (b) *pipe duct* is a tube or conduit used to encase pipe or tubing.

evaporator: that part of the refrigerating system designed to vaporize liquid refrigerant to produce refrigeration.

evaporator coil: an evaporator constructed of pipe or tubing, not enclosed in a pressure vessel.

fusible plug: a plug containing an alloy that will melt at a specified temperature and relieve pressure.

header: a pipe or tube (extruded, cast, or fabricated) to which other pipes or tubes are connected.

heat pump: a refrigerating system used to transfer heat into a space or substance.

highside: those portions of the refrigerating system that are subject to approximate condensing pressure.

horsepower: the power delivered from the prime mover to the compressor of a refrigerating system.

IDLH (immediately dangerous to life or health): the maximum concentration from which unprotected persons are able