CGA

Compressed Gas Association

The Standard For Safety Since 1913

CGA P-12—2023

GUIDELINE FOR SAFE HANDLING OF CRYOGENIC AND REFRIGERATED LIQUIDS

SEVENTH EDITION

IN CASE OF A TRANSPORTATION EMERGENCY
INVOLVING A CRYOGENIC LIQUID

In the UNITED STATES, ask for advice through CHEMTREC[1)], the Chemical Transportation Emergency Center at the American Chemistry Council in Arlington, VA.

48 contiguous states, Puerto Rico, Virgin Islands, Alaska, Hawaii, and if transporting Canadian products in the United States (toll free)	(800) 424-9300
For foreign locations (exclusive of Canada) call collect	(202) 483-7616

In CANADA, ask for advice through CANUTEC, Transport Dangerous Goods Directorate, Transport Canada, Ottawa, Ontario.

In an emergency, from all points within Canada, call collect 24 hours a day	(613) 996-6666
For non-emergency information only, call	(613) 992-4624

[1)] CHEMTREC only deals with transportation emergencies and is only available to registered suppliers. Some companies have developed alternative means for complying with emergency response regulations.

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Work Item 20-025
Bulk Distribution Equipment and Standards Committee

NOTE—Technical changes from the previous edition are underlined.

SEVENTH EDITION: 2023
SIXTH EDITION: 2017
FIFTH EDITION: 2009
FOURTH EDITION: 2005
THIRD EDITION: 1993

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1 Introduction

Large quantities of cryogenic and refrigerated liquids have been safely transported, handled, and stored for over half a century. Liquid oxygen was first shipped by tank truck in 1932. Today, it is common to see portable liquid containers, cryogenic trailers, trucks, and railroad tank cars transporting large quantities of cryogenic and refrigerated liquids over land. Cryogenic tanker ships transport liquefied natural gas (LNG) overseas. Air transportation is used to transport some liquefied gases, especially liquid helium.

The cost of large-scale transportation and storage of cryogenic and refrigerated liquids is lower than the cost of transporting and storing compressed gases. Cryogens can be used in the liquid state (e.g., liquid nitrogen refrigeration systems), but the liquid is usually vaporized and used as a gas (e.g., vaporized liquid oxygen used in hospitals, welding, and steelmaking).

Safe handling practices are based on understanding each cryogenic and refrigerated liquid's specific properties, using procedures that were developed based on those specific properties, and knowing each liquid's material compatibility. The compressed gas industry has developed safe handling, delivery, and equipment design methods that are specific to each cryogenic and refrigerated liquids discussed in this publication by obtaining a thorough understanding of the risks and hazards associated with each cryogenic and refrigerated liquid. This individualized approach makes the handling and use of cryogenic and refrigerated products as risk free as possible. Anyone handling cryogenic or refrigerated products should strictly adhere to the safety practices.

2 Scope

This publication provides general information about the properties, transportation, storage, safe handling, and safe use of the cryogenic and refrigerated liquids commonly used by industry and institutions. It is intended for cryogenic and refrigerated liquid users, shippers, carriers, distributors, equipment designers or installers, safety administrators, and anyone seeking an introduction to cryogenic and refrigerated liquids. If more detailed or specialized information is required, consult your cryogenic and refrigerated liquid supplier. The information in this publication is intended to complement federal, state, provincial/territorial, local, and insurance company safety requirements.

Among common industrial gases that are transported, handled, and stored as cryogenic liquids, the most prevalent cryogenic liquids are oxygen, nitrogen, argon, hydrogen, and helium. Three rare atmospheric gases, neon, krypton, and xenon, are also transported, handled, and stored as cryogenic liquids. Typical refrigerated liquids include carbon dioxide and nitrous oxide. Although not usually classified as industrial gases, LNG, liquid methane, ethylene, and carbon monoxide are also transported, handled, and stored as cryogenic liquids.

Some gases, including fluorine (boiling point –306.8 °F [–188.2 °C]) and nitric oxide (boiling point –241.2 °F [–151.8 °C]), can exist as cryogenic liquids due to their low boiling points. Both fluorine and nitric oxide are extremely reactive and hazardous to handle without extraordinary precautions; they are not normally handled as cryogenic liquids due to their reactive nature; it is more common for them to be handled as gases at ambient temperatures in the compressed gases industry. They are not discussed in this publication due to their specialized nature and hazards.

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.