



CGA G-1.7—2020

STANDARD FOR STORAGE AND HANDLING OF CALCIUM CARBIDE IN CONTAINERS

SIXTH EDITION

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Acetylene Committee

NOTE—Technical changes from the previous edition are underlined.

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Contents	Page
1 Introduction.....	1
2 Scope and purpose	1
2.1 Scope	1
2.2 Purpose	1
3 Definitions.....	1
4 General Information.....	1
4.1 Nomenclature	1
4.2 Physical properties	2
4.3 Chemical properties.....	2
4.4 Typical grades	2
4.5 Special precautions	2
5 Calcium carbide packaging	3
5.1 Regulatory and code requirements	3
5.2 Containers	3
5.3 Container marking, labeling, and placarding	4
5.4 Inspections	7
5.5 Handling “hot” containers	9
5.6 Unloading bulk containers	9
5.7 Handling empty bulk containers	10
5.8 Returning empty containers.....	11
6 Outdoor storage	11
6.1 Location.....	11
6.2 Posting.....	11
6.3 Container management.....	11
7 Indoor storage	11
7.1 Location.....	11
7.2 Posting.....	12
7.3 Electrical equipment	12
7.4 Bonding and grounding	12
7.5 Dust collection	12
8 Fire and explosion hazards	13
8.1 Calcium carbide and acetylene generation	13
8.2 Fire prevention.....	13
8.3 Firefighting.....	13
8.4 Emergency response	14
8.5 Cleanup of spills and leaks.....	14
9 Health and hygiene	14
9.1 Health hazards	14
9.2 Protective equipment and personal hygiene	15
9.3 First aid.....	16
10 Employee training requirements.....	16
11 References	16

Table

Table 1—Typical grades of calcium carbide	2
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Figures

Figure 1—DANGEROUS WHEN WET label/placard for calcium carbide..... 6

Figure 2—Typical warning sign for calcium carbide storage areas..... 7

Figure 3—Typical receiving inspection checklist for 2-1/2 ton calcium carbide containers..... 8

Figure 4—Typical purge schematic for bulk containers 10

1 Introduction

This publication is one of a series compiled by the Compressed Gas Association, Inc. to provide information on the production, transportation, handling, and storage of compressed gases, cryogenic liquids, and related products.

2 Scope and purpose

2.1 Scope

This standard covers the storage and handling of calcium carbide in containers from the calcium carbide manufacturer to the point of use.

2.2 Purpose

The purpose of this standard is to provide information on the storage and handling of calcium carbide and to provide background for training employees in the handling of calcium carbide.

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.

3.1.3 **May**

Indicates that the procedure is optional.

3.1.4 **Will**

Is used only to indicate the future, not a degree of requirement.

3.1.5 **Can**

Indicates a possibility or ability.

4 General Information

4.1 Nomenclature

Chemical names: Calcium carbide
Calcium dicarbide

Common names: Calcium carbide
Carbide

Chemical formulas: CaC_2 = Calcium carbide
 CaO = Calcium oxide, lime, quick lime
 Ca(OH)_2 = Calcium hydroxide, slaked lime, lime hydrate, carbide lime
 C_2H_2 = Acetylene

4.2 Physical properties

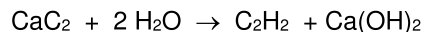
Calcium carbide is a grey, brown, or black granular solid that reacts with water to form acetylene and carbide lime. When crushed, calcium carbide is a rock-like solid with sharp, angular surfaces representing irregular fracture planes. The older the calcium carbide, the smoother these surfaces become due to reaction with moisture in the air. Calcium carbide has a unique odor that has been described as garlic-like, due primarily to trace impurities given off when the calcium carbide reacts with atmospheric moisture. These impurities include phosphine, ammonia, hydrogen sulfide, and organic sulfides [1].¹

Calcium carbide has a specific gravity of 2.2. The bulk density of calcium carbide is approximately 67 lb/ft³ (1100 kg/m³); however it varies with particle size.

Calcium carbide itself will not burn or explode. It is made in an electric furnace and is tapped from the furnace white hot at approximately 3600 °F (1980 °C) into molds open to the air.

4.3 Chemical properties

Calcium carbide reacts readily with water, water-moistened materials, or moisture in any form (fog, mist, spray or vapor) to form acetylene and calcium hydroxide.



This reaction liberates heat and expands the volume of the reactants. The liberated heat and the alkalinity of the lime hydrate can irritate exposed skin, and the eyes, nose, or throat. For detailed information on carbide lime, see CGA G-1.5, *Carbide Lime—Its Value and Uses* [2].

Acetylene is a highly flammable gas with a wide range between the lower explosive limit (LEL) of 2.5% by volume in air and the upper explosive limit (UEL) of 81% by volume in air. An air mixture containing 30% acetylene by volume at atmospheric pressure can be ignited at about 581 °F (305 °C). Acetylene is slightly lighter than air (air = 1, acetylene = 0.906). Additional information on acetylene can be found in CGA G-1, *Acetylene*, and in Section 7 of this publication [3].

4.4 Typical grades

Calcium carbide is crushed and sized in the following standard commercial grades in the United States and Canada shown in Table 1.

Other sizes are available for special applications.

Table 1—Typical grades of calcium carbide

Commercial designation	14 ND	Rice	Quarter (pea)	Miners	Nut	Egg
Nominal size range	10 x 40 mesh	6 x 20 mesh	1/4 x 1/12	1/2 x 1/4	1-1/4 x 3/8	2 x 1
Upper (in/mm)	0.066/1.676	0.132/3.352	0.265/6.731	0.50/12.7	1.06/26.924	2.00/50.8
Lower (in/mm)	0.016/0.406	0.033/0.838	0.055/1.397	0.094/2.387	0.25/6.35	0.375/9.525

4.5 Special precautions

Water (in any form) shall be kept away from contact with calcium carbide. One of the more dangerous conditions is water contacting the bottom of a pile of calcium carbide. The heat of reaction of calcium carbide and water generates warm, moist acetylene that reacts with the upper layers of carbide forming more acetylene and higher temperatures. Continued access of water to the bottom of the pile will continue heating the carbide until the carbide temperature exceeds the temperature necessary to ignite an acetylene-air mixture.

When moist air contacts calcium carbide dust, the acetylene-air mixture generated can combust spontaneously due to the heat generated when the moisture reacts with calcium carbide.

¹ References are shown by bracketed numbers and are listed in order of appearance in the reference section.

When removing carbide from a container, proper bonding and grounding procedures shall be used to avoid static electricity buildup and discharge.

5 Calcium carbide packaging

5.1 Regulatory and code requirements

Calcium carbide containers shall comply with the following applicable regulations and codes:

- Title 29 of the U.S. *Code of Federal Regulations* (29 CFR) Part 1910 [4];
- Workplace Hazardous Materials Information System (WHMIS) in Canada;
- NFPA 55, *Compressed Gases and Cryogenic Fluids Code* [5];
- NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes* [6]; and
- Title 49 of the U.S. *Code of Federal Regulations* (49 CFR) Parts 100 to 180 and/or Transport Canada's *Transportation of Dangerous Goods Regulations* [7, 8]. Commercial calcium carbide typically meets the requirements for Packing Group 1. The corresponding packaging standards shall be met [7, 8].

5.2 Containers

5.2.1 Container sizes

Common container sizes for calcium carbide are:

- 10 gal (38 L), 30 gal (114 L), and 55 gal (208 L) steel drums;
- 2 ton and 2-1/2 ton cylindrical containers; and
- 2-1/2 ton and 5 ton cubical containers (regarded by U.S. Department of Transportation (DOT) and Transport Canada (TC) as portable containers, sometimes called flo-bins).

Bulk calcium carbide is transported in covered hopper trailers and railcars from 20 tons to 100 tons.

Containers larger than 450 L (119 gal) water volume are considered bulk containers in the U.S., and containers greater than 450 L water capacity are considered large means of containment in Canada [7, 8].

5.2.2 Packaging

Calcium carbide shall only be packaged or repackaged by designated hazmat employees who have knowledge of the hazards related to calcium carbide.

5.2.3 Bulk container fabrication and requalification requirements

Each container shall be fabricated in compliance with the applicable DOT or TC design and construction requirements and shall be requalified to the retest requirements noted in the following sections [7, 8]. A container requalification usually consists of pressure test, visual inspection, container marking, and record keeping.

NOTE—TC regulations may specify visual inspection more frequently than the required hydrostatic or pneumatic retest.

5.2.3.1 Pneumatic pressure test

A container shall be retested at a minimum pressure by designated hazmat employee(s). During each pressure test, the entire surface of all joints under pressure shall be coated with or immersed in a solution of soap and water, heavy oil, or other material suitable for the purpose of detecting leaks. The pressure shall be held for a period of time sufficiently long to ensure detection of leaks.