



**CGA G-6.11—2016
CONCENTRATION OF
IMPURITIES IN BULK
CARBON DIOXIDE
STORAGE TANKS AT
CUSTOMER SITES**

SECOND EDITION

Currently in preview. Click buy full version

PLEASE NOTE:

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the Compressed Gas Association, Inc. and others. However, the Association or its members, jointly or severally, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions herein contained. Moreover, it should not be assumed that every acceptable commodity grade, test or safety procedure or method, precaution, equipment or device is contained within, or that abnormal or unusual circumstances may not warrant or suggest further requirements or additional procedure.

This document is subject to periodic review, and users are cautioned to obtain the latest edition. The Association invites comments and suggestions for consideration. In connection with such review, any such comments or suggestions will be fully reviewed by the Association after giving the party, upon request, a reasonable opportunity to be heard. Proposed changes may be submitted via the Internet at our website, www.cganet.com.

This document should not be confused with federal, state, provincial, or municipal specifications or regulations; insurance requirements; or national safety codes. While the Association recommends reference to or use of this document by government agencies and others, this document is purely voluntary and not binding unless adopted by reference in regulations.

A listing of all publications, audiovisual programs, safety and technical bulletins, and safety posters is available via the Internet at our website at www.cganet.com. For more information contact CGA. Phone: 703-788-2700, ext. 799. E-mail: customerservice@cganet.com.

Work Item 12-048
Carbon Dioxide Committee

NOTE—Technical changes from the previous edition are underlined

SECOND EDITION: 2016

FIRST EDITION: 2008

© 2016 The Compressed Gas Association, Inc. All rights reserved.

All materials contained in this work are protected by United States and international copyright laws. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording, or any information storage and retrieval system without permission in writing from The Compressed Gas Association, Inc. All requests for permission to reproduce material from this work should be directed to The Compressed Gas Association, Inc., 8484 Westpark Drive, Suite 220, McLean, VA 22102. You may not alter or remove any trademark, copyright or other notice from this work.

Contents	Page
1 Introduction.....	1
2 Scope	1
3 Definitions.....	1
4 Typical piping schematics	2
5 Common issues.....	2
5.1 Nonvolatile residue.....	2
5.2 Nonvolatile organic residue.....	2
5.3 Sensory issues.....	2
5.4 Other impurities.....	2
6 Troubleshooting.....	5
7 Bulk carbon dioxide systems best practices.....	7
7.1 General.....	7
7.2 Transfer and sample lines	7
7.3 Product withdrawal	7
7.4 Piping installation.....	7
7.5 Particulate filters.....	8
7.6 Adsorbent filters.....	8
7.7 Lubricants	8
7.8 Materials of construction.....	8
7.9 Inspections	8
8 References	8
Figures	
Figure 1—Piping schematic of typical carbon dioxide container.....	3
Figure 2—Typical carbon dioxide cargo tank transfer piping schematic.....	4
Tables	
Table 1—Type of contamination at customer site.....	5
Table 2—Source of contamination at customer site	5

This page is intentionally blank.

Currently in preview, click buy full version

1 Introduction

Multiple factors can lead to the concentration of impurities over time in product delivered within specification to bulk carbon dioxide installations at customer sites.

Unlike other industrial gases, carbon dioxide is a polar molecule with properties similar to water. Therefore, most impurities tend to be soluble in liquid carbon dioxide. For information on the physical and chemical properties, physiology, toxicity, special hazards, production, regulations, storage, handling, and applications of carbon dioxide, see CGA G-6, *Carbon Dioxide* [1].¹

2 Scope

This publication provides best practices for preventing the introduction or concentration of impurities in bulk carbon dioxide installations. This publication defines these impurity categories and includes a troubleshooting table that assists in determining the source of the contaminant. It also addresses impurity issues commonly experienced at customer sites and includes a review of bulk installation equipment and best practices to prevent the introduction or buildup of these impurities.

This publication does not cover the product specifications or supply requirements. For information on carbon dioxide specifications and testing procedures, see G-6.2, *Commodity Specification for Carbon Dioxide* [2].

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 where 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 intent a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Nonvolatile organic residue (NVOR)

Solvent-soluble impurities.

NOTE—NVORs are typically an oil or oil-like residue that can be found in vaporizers or process equipment that distills the carbon dioxide.

3.2.2 Nonvolatile residue (NVR)

Particulates (typically black), rust, debris, and other small solid objects.

NOTE—Examples of NVRs include trace amounts of dirt, rust, metal oxides, metal fines, filter media (carbon, alumina, etc.), oil, or grease.

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