



**CGA P-8.7—2016**  
**SAFE LOCATION OF OXYGEN**  
**AND INERT GAS VENTS**

**FIRST EDITION**

## PREFACE

As part of a program of harmonization of industry standards, the Compressed Gas Association (CGA) has issued CGA P-8.7, *Safe Location of Oxygen and Inert Gas Vents*, jointly produced by members of the International Harmonization Council and originally published by the European Industrial Gases Association (EIGA) as EIGA Doc 154, *Safe Location of Oxygen and Inert Gas Vents*.

This publication is intended as an international harmonized standard for the worldwide use and application of all members of the Asia Industrial Gases Association (AIGA), Compressed Gas Association (CGA), European Industrial Gases Association (EIGA), and Japan Industrial and Medical Gases Association (JIMGA). Each association's technical content is identical, except for regional regulatory requirements and minor changes in formatting and spelling.

### 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 web site, [www.cganet.com](http://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.

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](http://www.cganet.com). For more information, contact CGA at Phone: 703-788-2700, ext. 799. E-mail: [customerservice@cganet.com](mailto:customerservice@cganet.com)

Work Items 06-102 and 06-102a  
Atmospheric Gases and Equipment Committee

FIRST EDITION: 2016

2016 © – Reproduced with permission from, the European Industrial Gases Association. All rights reserved.

<b>Contents</b>	<b>Page</b>
1 Introduction.....	1
2 Scope and purpose .....	1
2.1 Scope .....	1
2.2 Purpose .....	1
3 Definitions.....	1
4 Hazards of oxygen-enriched or oxygen-deficient atmospheres .....	2
5 Factors for consideration in the location of vents .....	2
5.1 General considerations.....	2
5.2 Selection of concentration criteria for specific circumstances .....	3
5.3 Vent locations .....	4
5.4 Effect of weather and release conditions.....	5
5.5 Venting of cryogenic liquid.....	6
6 Calculations for the determination of safe vent locations .....	6
6.1 Introduction.....	6
6.2 Choice of software.....	7
6.3 Weather conditions.....	7
6.4 Release temperature.....	7
6.5 Release angle.....	8
6.6 Release velocities.....	8
6.7 Concentration limits .....	8
6.8 Ambient conditions .....	9
6.9 Interpretation of the tables.....	9
6.10 Limitations on the calculation methodology.....	10
7 Recommendations .....	10
8 References .....	13
 <b>Figures</b>	
Figure 1—Example of warm oxygen vertical release with 23.5% oxygen concentration .....	11
Figure 2—Example of warm oxygen horizontal release with 23.5% oxygen concentration .....	11
Figure 3—Horizontal vent separations.....	12
Figure 4—Vertical vent separations .....	12
Figure 5—Angled vent separations.....	13
 <b>Appendices</b>	
Appendix A—Warm high pressure oxygen.....	14
Appendix B—Cold high pressure oxygen.....	15
Appendix C—Warm high pressure nitrogen.....	16
Appendix D—Cold high pressure nitrogen.....	17
Appendix E—Warm high pressure argon.....	18
Appendix F—Cold high pressure argon.....	19
Appendix G—Equivalent release rates.....	20
Appendix H—Influence of release speed.....	24
Appendix I—Oxygen adjustment mathematics.....	25

## Appendices tables

Table A-1—Warm high pressure oxygen venting horizontally at high velocity .....	14
Table A-2—Warm high pressure oxygen venting vertically at high velocity .....	14
Table A-3—Warm high pressure oxygen venting angled at high velocity .....	14
Table B-1—Cold high pressure oxygen venting horizontally at high velocity .....	15
Table B-2—Cold high pressure oxygen venting vertically at high velocity .....	15
Table B-3—Cold high pressure oxygen venting angled at high velocity .....	15
Table C-1—Warm high pressure nitrogen venting horizontally at high velocity .....	16
Table C-2—Warm high pressure nitrogen venting vertically at high velocity .....	16
Table C-3—Warm high pressure nitrogen venting angled at high velocity .....	16
Table D-1—Cold high pressure nitrogen venting horizontally at high velocity .....	17
Table D-2—Cold high pressure nitrogen venting vertically at high velocity .....	17
Table D-3—Cold high pressure nitrogen venting angled at high velocity .....	17
Table E-1—Warm high pressure argon venting horizontally at high velocity .....	18
Table E-2—Warm high pressure argon venting vertically at high velocity .....	18
Table E-3—Warm high pressure argon venting angled at high velocity .....	18
Table F-1—Cold high pressure argon venting horizontally at high velocity .....	19
Table F-2—Cold high pressure argon venting vertically at high velocity .....	19
Table F-3—Cold high pressure argon venting angled at high velocity .....	19
Table G-1—Equivalent release rates for oxygen at 10 °C, venting at 20m/s and 10m/s .....	20
Table G-2—Equivalent release rates for oxygen at -183 °C, venting at 20m/s and 10m/s .....	20
Table G-3—Equivalent release rates for oxygen at 10 °C, venting at 160m/s .....	21
Table G-4—Equivalent release rates for oxygen at -183 °C, venting at 90m/s .....	21
Table G-5—Equivalent release rates for nitrogen at 10 °C, venting at 20m/s and 10m/s .....	21
Table G-6—Equivalent release rates for nitrogen at -195 °C, venting at 20m/s and 10m/s .....	22
Table G-7—Equivalent release rates for nitrogen at 10 °C, venting at 170m/s .....	22
Table G-8—Equivalent release rates for nitrogen at -195 °C, venting at 90m/s .....	22
Table G-9—Equivalent release rates for argon at 10 °C, venting at 20m/s and 10m/s .....	23
Table G-10—Equivalent release rates for argon at -186 °C, venting at 20m/s and 10m/s .....	23
Table G-11—Equivalent release rates for argon at 10 °C, venting at 160m/s .....	23
Table G-12—Equivalent release rates for argon at -186 °C, venting at 85m/s .....	23

## 1 Introduction

This publication defines the criteria for the design of process vents to ensure the safe disposal of oxygen and inert gases.

Industrial gas producers are subject to more and more stringent demands from authorities to demonstrate that the operation of their plants is safe. A number of incidents have been reported where enriched or deficient atmospheres from venting operations have created operational safety issues [1, 2]. As air separation unit (ASU) capacity has increased, the risk of oxygen-enriched and oxygen-deficient atmospheres has become a significant safety concern.

## 2 Scope and purpose

### 2.1 Scope

This publication applies to air separation and cryogenic liquefaction plants in which the venting of oxygen, nitrogen, oxygen/nitrogen mixtures, argon, or air occurs.

Disposal of cryogenic liquid is not covered in this publication although the potential for vent releases to have some liquid present is included (see 5.5).

The recommendations contained in this publication for elevations and horizontal separation distances are not applicable to customer station tanks. Safety distances for such tanks are governed by the design criteria for plant layout or national regulations/codes of practice, whichever are more stringent [3, 4].

### 2.2 Purpose

This publication is designed to give a basis on which to determine the safe location of oxygen or nitrogen and argon gas vents for normal operating, upset, and emergency conditions. This determination can be made by calculation against the criteria specified or by use of the tables provided in the appendices as a guide.

The publication contains calculated safe separation distances for a range of vent sizes and orientations based on commonly encountered but specific design conditions. If these design criteria are not met particularly with regard to vents intended to operate over a large range of flows (for example, product vents having turndown flows), the tables may not be appropriate and detailed calculations should be carried out.

This publication should be used for new designs but can be used on existing plants to determine whether existing vents are safely located or whether modifications/temporary structures will interfere with the original design intent.

## 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.