



## Standard Guide for Designing Systems for Oxygen Service<sup>1</sup>

This standard is issued under the fixed designation G 88; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (€) indicates an editorial change since the last revision or reapproval.

€<sup>1</sup> NOTE—Keywords were added editorially in March 1998.

### 1. Scope

1.1 This guide applies to the design of systems for oxygen or oxygen-enriched service but is not a comprehensive document. Specifically, this guide addresses system factors that affect the avoidance of ignition and fire. It does not address the selection of materials of construction for which Guides G 63 and G 94 are available, nor does it concern mechanical, economic or other design considerations for which well-known practices are available.

NOTE 1—The American Society for Testing and Materials takes no position respecting the validity of any evaluation methods asserted in connection with any item mentioned in this guide. Users of this guide are expressly advised that determination of the validity of any such evaluation methods and data and the risk of use of such evaluation methods and data are entirely their own responsibility.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

G 63 Guide for Evaluating Nonmetallic Materials for Oxygen Service<sup>2</sup>

G 72 Test Method for Autogenous Ignition Temperature of Liquids and Solids in a High-Pressure Oxygen-Enriched Environment<sup>2</sup>

G 74 Test Method for Ignition Sensitivity of Materials to Gaseous Fluid Impact<sup>2</sup>

G 93 Practice for Cleaning Methods for Material and Equipment Used in Oxygen-Enriched Environments<sup>2</sup>

G 94 Guide for Evaluating Metals for Oxygen Service<sup>2</sup>

#### 2.2 ASTM Adjuncts:

Oxygen Safety Video<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *direct oxygen service*—service in contact with oxygen during normal operations. Examples: oxygen compressor piston rings, control valve seats.

3.1.2 *indirect oxygen service*—service in which oxygen is not normally contacted but in which it might be as a result of a reasonably foreseeable malfunction, operator error, or process disturbance. Examples: liquid oxygen tank insulation, liquid oxygen pump motor bearings.

3.1.3 *oxygen-enriched atmosphere*—a fluid mixture (gas or liquid) that contains more than 25 mol % oxygen.

3.1.4 *qualified technical personnel*—persons such as engineers and chemists who, by virtue of education, training, or experience, know how to apply physical and chemical principles involved in the reactions between oxygen and other materials.

### 4. Significance and Use

4.1 The purpose of this guide is to furnish qualified technical personnel with pertinent information to use in designing oxygen systems. It emphasizes factors that cause ignition and enhance propagation throughout a system's service life so that the occurrence of these conditions may be avoided or minimized. It is not intended as a specification for the design of oxygen systems.

### 5. Factors Affecting the Design for an Oxygen or Oxygen-Enriched System

5.1 *General*—An oxygen system designer should understand that oxygen, fuel, and heat (source of ignition) must be present to start and propagate a fire. Since combustible materials and oxygen are usually present, the design of a system for oxygen or oxygen enriched service is primarily a matter of understanding the factors that are potential sources of ignition or which aggravate consequential propagation. The goal is to eliminate these factors or compensate for their presence. Preventing fires involves both minimizing system environments that enhance fire and maximizing the use of system materials with properties that resist ignition and combustion.

#### 5.2 Factors Recognized as Causing Fires:

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee G-4 on Compatibility and Sensitivity of Materials in Oxygen Enriched Atmospheres and is the direct responsibility of Subcommittee G04.02 on Recommended Practices.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>3</sup> Available from ASTM Headquarters, Order PCN 12-700880-31.