

SEMI F6-92

GUIDE FOR SECONDARY CONTAINMENT OF HAZARDOUS GAS PIPING SYSTEMS

This Standard was technically approved by the Facilities Global Technical Committee. Originally published in 1992.

NOTICE: This Standard or Safety Guideline has an Inactive Status because the conditions to maintain Current Status have not been met. Inactive Standards or Safety Guidelines are available from SEMI and continue to be valid for use.

1 Purpose

1.1 To provide a guide for the design, fabrication, and operation of secondarily contained distribution piping for hazardous production material (HPM) gases.

2 Scope

2.1 This Guide covers the general requirements for hazardous production material distribution piping in those industries that are included under the H-6 Classification of the Uniform Building Code, or Articles 51 or 80 of the Uniform Fire Code, or of other applicable local codes. This Guide does not include requirements for individual exhausted enclosures (e.g., valve boxes and gas cabinets).

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 SEMI Standards and Safety Guidelines

SEMI F1 — Specification for Leak Integrity of Toxic Gas Piping Systems

SEMI F2 — Specification for Seamless Austenitic Stainless Steel Tubing for Semiconductor Manufacturing Applications

SEMI F3 — Guide for Welding Stainless Steel Tubing for Semiconductor Manufacturing Applications

SEMI S2 — Safety Guidelines for Semiconductor Manufacturing Equipment

SEMI S4 — Safety Guideline for the Segregation/Separation of Gas Cylinders Contained in Cabinets

3.2 ASME Standard¹

ASME B31.3 — Chemical Plant and Petroleum Refinery Piping

3.3 Federal Regulations²

29 CFR — Title 29 of the Code of Federal Regulations (CFR), Part 1910

49 CFR — Title 49 of the Code of Federal Regulations (CFR), Chapter I

3.4 ICBO Codes³

UBC CH 9 — Chapter 9 of the Uniform Building Code, Requirements for Group H Occupancies

UFC ART 51 — Article 51 of the Uniform Fire Code, Semiconductor Fabrication Facilities Using Hazardous Production Materials

UFC STD 79-3 — Standard No. 79-3 of the Uniform Fire Code

¹ American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, USA; Telephone: +1.973.882.1170, Fax: +1.973.882.1717, <https://www.asme.org>

² Available from the U.S. Government Publishing Office; <https://www.govinfo.gov>

³ International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, CA 90601, USA.

UFC ART 80 — Article 80 of the Uniform Fire Code, Hazardous Materials

UFC ART 90 — Article 90 of the Uniform Fire Code, Regulation of Facilities Where Materials Which Are or May Become Toxic Gases Are Found

3.5 NFPA Standards⁴

NFPA 70/ART 500 — Article 500 of the National Electrical Code, Hazardous (Classified) Locations

NFPA 497M — Classification of Gases, Vapors and Dusts for Electrical Equipment in Hazardous (Classified) Locations

NFPA 704 — Identification of the Fire Hazards of Materials

3.6 ACGIH Publication⁵

TLV® — American Conference of Governmental Industrial Hygienists Threshold Limit Values and Biological Exposure Indices

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 Definitions

4.1.1 *closed secondary containment* — secondary containment that has a sealed annulus. In closed containment systems, the annular space either holds a certain pressure of gas or a certain level of vacuum. In closed containment, a change in the pressure or vacuum would be indicative of a leak in either the primary or secondary system.

4.1.2 *controlled work area* — a space within a building where HPM's may be stored, handled, dispensed, or used.

4.1.3 *equilibrium vapor concentration (EVC)* — the state of a material at which vapor pressure has stabilized and is no longer rising or falling. The EVC value (in parts per million) of a material is determined by multiplying the vapor pressure by 10^6 and dividing by atmospheric pressure (760 mmHg at sea level).

4.1.4 *hazardous production material (HPM)* — a solid, liquid, or gas that has a degree-of-hazard rating in health, flammability, or reactivity of Class 3 or 4 as ranked by NFPA 704 and that is used directly in research, laboratory, or production processes that have as their end product materials that are not hazardous.

4.1.5 *highly toxic gas* — a chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

4.1.6 *immediately dangerous to life and health (IDLH)* — a concentration of airborne contaminants, normally expressed in parts per million or milligrams per cubic meter, which represents the maximum level from which one could escape within thirty minutes without any escape-impairing symptoms or irreversible health effects. This level is established by the National Institute of Occupational Safety and Health (NIOSH).

4.1.7 *level of concern (LOC)* — equal to 0.1 of the IDLH value.

4.1.8 *lower detectable limit of instrument (LDL)* — the lowest concentration of a substance that will give an instrument response with a signal-to-noise ratio of at least 3 db.

4.1.9 *material hazard index (MHI)* — a numeric value used for ranking chemical production materials in order to determine the level of controls necessary for regulation. MHI is determined by dividing the equilibrium vapor concentration (EVC) of a material at 25°C by the level of concern (LOC) value for the material.

4.1.10 *open secondary containment* — secondary containment with an open-ended annular space. This annulus must be directed to a system designed to handle the contained HPM.

⁴ National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269, USA; Telephone: +1.617.770.3000, Fax: +1.617.770.0700, <http://www.nfpa.org>

⁵ American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211, USA.