TABLE OF CONTENTS

1.0 PURPOSE 1

2.0 SCOPE 2

3.0 reference documents 2

3.1 TI ESH Standard 03.01C Hazard Communication and Chemical Labeling 2

3.2 TI ESH Standard 03.01E Chemical Storage and Spill Control 2

3.3 TI ESH Standard 05.01 Egress and Evacuation 2

3.4 TI ESH Standard ENV 05.01 Air Emissions Management 2

3.5 National Fire Protection Association (NFPA) 704 Standard System for the Identification of the Hazards of Materials for Emergency Response 2

3.6 SEMI Standard S2 Environmental, Safety and Health Guidelines for Semiconductor Manufacturing Equipment 2

3.7 SEMI Standard S8 Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment 2

3.8 SEMI Standard S10 Safety Guideline for Risk Assessment and Risk Evaluation Process 2

3.9 NFPA 318-2015 Standard for the Protection of Semiconductor Fabrication Facilities 2

3.10 International Fire Code (IFC) Chapters 27 Semiconductor Fabrication Facilities, Ch. 50 Hazardous Materials, Ch. 54 Corrosive Materials, Ch. 55 Cryogenic Fluids, Ch. 57, Flammable and Combustible Liquids, Ch. 60 Highly Toxic and Toxic Materials, Ch. 62 Organic Peroxides, Ch. 63 Oxidizers, Oxidizing Gas and Oxidizing Cryogenic Fluids, Ch. 64 Pyrophoric Materials, Ch. 67 Water-reactive Solids and Liquids 2

4.0 Definitions 2

5.0 Requirements 2

5.1 Hazard Assessment 2

5.2 Labeling 2

5.3 Chemical Rooms (Storage and Distribution Areas) 3

5.4 Chemical Dispense Units 3

5.5 Chemical Containers 3

5.6 Manufacturing/AT Equipment Chemical Dispense Units 3

5.7 Cryogenic Fluids and Refrigerants 3

5.8 Exhaust Systems 3

5.9 Valve Manifold Box (VMB) 3

5.10 Piping and Distribution Systems 3

5.11 Training Requirements 3

6.0 STANDARD Approval 3

7.0 Revision history 3

APPENDIX XX

# PURPOSE

This Standard establishes the minimum requirements for the safe use of installed and fixed liquid chemical systems including bulk, chemical dispense systems, chemical mixing units, chemical filter units and the associated storage of chemical sources at TI sites worldwide. It also includes the safe use and installation of cryogenic chemicals.

Exceptions: This standard does not apply to bulk diesel storage tanks greater than 200 liters (55 gallons), diesel tanks attached to generators, heavy oils used for oil-fired boilers or generators, city water storage tanks or fire water storage tanks.

# SCOPE

The provisions of this Standard apply to all TI employees, suppliers, vendors, and visitors at TI sites worldwide.

# reference documents

## TI ESH Standard 03.01C Hazard Communication and Chemical Labeling

## TI ESH Standard 03.01E Chemical Storage and Spill Control

## TI ESH Standard 05.01 Egress and Evacuation

## TI ESH Standard ENV 05.01 [Air Emissions Management](https://sps01.itg.ti.com/sites/wwf/esh/standards/Knowledge_Bank/ENV05-01.doc)

## National Fire Protection Association (NFPA) 704 Standard System for the Identification of the Hazards of Materials for Emergency Response

## SEMI Standard S2 Environmental, Safety and Health Guidelines for Semiconductor Manufacturing Equipment

## SEMI Standard S8 Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment

## SEMI Standard S10 Safety Guideline for Risk Assessment and Risk Evaluation Process

## NFPA 318-2015 Standard for the Protection of Semiconductor Fabrication Facilities

## International Fire Code (IFC) Chapters 27 Semiconductor Fabrication Facilities, Ch. 50 Hazardous Materials, Ch. 54 Corrosive Materials, Ch. 55 Cryogenic Fluids, Ch. 57, Flammable and Combustible Liquids, Ch. 60 Highly Toxic and Toxic Materials, Ch. 62 Organic Peroxides, Ch. 63 Oxidizers, Oxidizing Gas and Oxidizing Cryogenic Fluids, Ch. 64 Pyrophoric Materials, Ch. 67 Water-reactive Solids and Liquids

# Definitions

[TI ESH Standards & Specifications Definitions Glossary](https://sps01.itg.ti.com/sites/wwf/esh/standards/Knowledge_Bank/00.01.xlsx)

# Requirements

## Hazard Assessment

### After the effective date of this standard, a hazard assessment shall be conducted, before any new system installation or modification, on highly hazardous chemicals (See list in Appendix A) or when identified by 03.01A Chemical and Material Screening process to evaluate the risk of the process and installation. This assessment shall include, at a minimum, the following:

#### The location of the chemical installation;

#### A description of the required Personal Protective Equipment for service and maintenance activities, and;

#### An assessment of the entire system that evaluates the consequences of component failures and human errors and proposes recommendations on actions that would eliminate or at least reduce the risks to acceptable levels.

### Sites shall maintain drawings, diagrams and other records pertaining to each chemical delivery system requiring a hazard assessment.

## Hazardous Chemical Rooms (Storage and Distribution Areas)

### After the effective date of this standard, new or modified hazardous chemical rooms shall be provided with mechanical exhaust ventilation.

#### Mechanical exhaust drops located between 12 (30 cm) and 36 (91 cm) inches above the floor level shall beprovided.

### Hazardous chemical rooms shall be provided with spill containment that prevents the chemical from escaping the room.

### Hazardous chemical rooms containing flammable liquids shall be provided with the following:

#### LEL detection; and

#### Intrinsically safe electrical design

### A means for incident notification (such as hazardous production material (HPM) pull stations, incident alarm buttons, telephones, etc.) shall be provided outside each hazardous chemical room.

#### The travel distance to such a device shall not be more than 45.7 m (150 ft.).

### Access to hazardous chemical rooms and areas containing hazardous chemical systems external to the building shall be properly secured (i.e. badge reader or lock and controlled key) and limited to authorized personnel at all times.

### The entrances to chemical rooms shall be posted with the following information:

#### Identification of the general hazard categories of the materials in the room (examples: flammable chemical, corrosive chemical, oxidizing chemical, pyrophoric chemical, cryogenic fluid),

#### NOTE: If the room is designated as a flammable/combustible/pyrophoric storage/dispense room then a warning label shall be placed on the door in the local language to indicate “No Spark Producing Equipment Allowed.”

#### A complete chemical list,

#### Chemical hazard classification information (e.g. NFPA 704 Diamond),

#### Authorized Personnel Only and,

#### Emergency contact number(s)

### After the effective date of this standard, new or modified hazardous chemical rooms (excluding refrigerated/cold chemical storage rooms) shall have two exit doors equipped with panic hardware.

#### The exit doors must open in the direction of travel from the room.

#### The site shall ensure that emergency responders have access to these rooms.

### Only compatible hazardous chemicals may be stored in or dispensed from the same hazardous chemical room.

### Access and Egress, Working Clearances within Chemical Rooms:

#### Exit pathways from hazardous chemical areas/rooms shall be in accordance with TI ESH Standard 05.01 Egress and Evacuations;

##### A minimum clearance of 3 ft. (0.91m) shall be maintained in front of all chemical cabinets and dispense units; and

##### An approach aisle of 3 ft. (0.91 m) width shall be maintained for chemical delivery and movement;

## Chemical Dispense Units

### Chemical dispense units containing a hazardous chemistry shall be provided with leak detection and shall alarm to a continuously monitored location.

### Flammable Dispense Units shall be designed to be intrinsically safe.

### After the effective date of this standard, newly installed or modified dispense units conveying highly hazardous chemicals (example: >30% HF and >5% TMAH) shall have the chemistry drawn out of the source container (i.e., tote or drum) using negative pressure and shall not be pushed by a pump or a “push” gas using positive pressure (e.g., N2 or Ar) until the system is fully protected by double containment. Splash/spray guards are not considered double containment.

### The connection point at the source container(s) containing >5% TMAH shall be protected from splashes/sprays (example: shall be provided with splash curtain or shall be bagged).

## Chemical Systems and Containers

### Chemical systems and containers shall be properly maintained and labeled per TI ESH Standard 03.01C Hazardous Communication and Chemical Labeling.

### Hazardous chemical containers shall be inspected in accordance with manufacturer’s recommendations.

## Manufacturing/AT Equipment Chemical Dispense Units

### Chemical containers and the equipment housing the container shall be properly maintained and labeled per TI ESH Standard 03.01C Hazardous Communication and Chemical Labeling.

### Flammable/combustible chemical dispense units shall be grounded to prevent electrostatic build-up.

### Hazardous chemical transport containers (e.g. POCl container) shall be inspected in accordance with manufacturer’s recommendations.

## Cryogenic Fluids and Refrigerants

### Maintenance on systems and handling containers containing cryogenic fluids shall require PPE in accordance with TI ESH Standard 01.01 Personal Protective Equipment.

### Areas inside buildings containing cryogenic fluids and/or refrigerants shall be provided with area (ambient) monitor if an oxygen deficient atmosphere could occur and shall alarm at a continuously monitored location.

#### When the oxygen concentration drops below 19.5%, a local audible and visual evacuation alarm shall be activated. .

## Exhaust Systems

### An exhaust system shall be required on TCS dispense systems and HCl monitoring shall be provided in the exhaust duct.

#### HCl leak detection shall alarm to a continuously monitored location.

### Each exhaust line connecting a chemical cabinet or ventilated enclosure shall be provided with a damper secured at the appropriate position to meet the engineering designed flow rate. For new installations or modifications, dampers for exhaust of hazardous chemicals shall have minimum-position blocking devices to prevent restricting the flow below the required velocity or volume.

## Valve Manifold Box (VMB)

### Only compatible chemicals shall be installed or plumbed in any individual VMB;

### Penetrations in a VMB, except for designed air inlets, shall be sealed.

### After the effective date of this standard, newly installed or modified VMBs containing a chemical meeting the requirements of 5.9.5 shall be provided with leak detection and a method to drain the enclosure.

#### Leak detection shall alarm to a continuously monitored location.

## Piping and Distribution Systems

### Piping, tubing, valves, fittings and related components shall be designed and fabricated from materials that are compatible with the chemical to be contained and shall be of adequate strength and durability to withstand the pressure, structural and seismic stress and exposure to which they are subject.

### Piping and tubing shall be identified in accordance with per TI ESH Standard 03.01C Hazardous Communication and Chemical Labeling.

### Manual emergency shutoff valves and controls for remotely activated emergency shutoff valves shall be identified and the location shall be clearly visible, accessible and indicated by means of a sign.

### Backflow prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials.

### After the effective date of this standard, newly installed or modified chemical systems conveying liquids having a hazard ranking of health class 3 or 4, flammability class 4, instability class 3 or 4 in accordance with NFPA 704 or flammability or health class 1or 2 or unstable in accordance with GHS and are carried in pressurized piping above 15 pounds per square inch gauge (psig) (103 kPa) shall be welded throughout or double contained and provided with an approved means of leak detection and emergency shutoff.

## Training Requirements

### Only trained individuals shall be authorized to design, operate and maintain (including repairs and calibration) chemical systems and chemical leak detection systems..

### Training shall be based on the specific job duties the individual is expected to perform and shall include at a minimum the following:

#### Hazards associated with tasks they are required to perform,

#### Hazards of the systems they are required to operate, maintain or service,

#### Emergency shut-down and response procedures, and

#### Required personal protective equipment (PPE).

### Training may include documented job experience.

### Verification of job training and/or job experience shall be maintained as required by SP&P 04-07-01.

### Awareness training shall be provided for persons who need to know the meaning of an alarm and their response.

# STANDARD Approval

This standard has been approved by Zane Broadhead, TI Vice President.

# Revision history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Rev#** | **Date** | **Nature of Revision** | **Author/Editor** | **Approver** |
| A |  | Initial Document | R. Graves, H. Baker |  |
| B |  |  |  |  |
| C |  |  |  |  |
|  |  |  |  |  |

Appendix A – List of Highly Hazardous Chemicals

>30% Hydrofluoric Acid

>5% Tetramethyl Ammonium Hydroxide

Pyrophoric Chemicals