

6.7 Secondary Containment

Introduction

Proper design and installation of phosgene handling equipment is essential in preventing phosgene leaks and accidents.^{1,4} Proper design installation, along with an effective maintenance program and operator training, enhances the safety of phosgene operations. However, to further increase the safety level of the operation, some companies employ “secondary containment” systems.² The purpose of these secondary systems is to provide a safety net to prevent chemical releases to the open atmosphere. Examples of secondary containment include double walled construction, structural airtight enclosures, and dump tanks. A description of each type follows. See NFPA 55³ for additional guidance in design considerations.

The information provided in this section should not be considered as a directive or as an industry standard that readers must adopt or follow. Instead, the information is intended to provide helpful ideas and guidance that users may wish to consider in a general sense (See Section 1.1 *Preface and Legal Notice*). Also included is a reference list of useful resources.

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6.7.1 Double Walled Construction

These types of systems are often called a “pipe within a pipe” or “wall within a wall.” The design concept is essentially a two-layer approach where the inside layer or inside wall is in contact with the chemical and the outside layer or outside wall surrounds the inner layer. The void or plenum area between the walls is often monitored for chemical leakage. Sometimes this area is filled with a gas such as nitrogen to prevent moisture build-up.

Double walled systems also provide protection against foreign object impingement or contact. The same principle is sometimes used in the transportation industry for railcars and barges.

6.7.2 Secondary Enclosures

Secondary containment can consist of either a structural enclosure or an external vessel to house the phosgene equipment. Structural enclosures can be described as a sealed building or box. From the outside, these structural enclosures may appear similar to other buildings in the operational process. However, they will normally have special features, such as an airtight seal, possibly maintained under vacuum with ventilation to a scrubber, controlled access, and dedicated leak detection monitors. Containment vessels are similar to the structural enclosures as they will also normally have special features, such as an airtight seal, possibly maintained under vacuum with ventilation to a scrubber and dedicated leak detection monitors.

Some cautions when using enclosures of any type that involve the possible containment of process flammables such as carbon monoxide or hydrocarbons and the possible need to use PPE when entering a sealed enclosure. If personnel are to enter the secondary containment, consider taking precautions outside of the scope of the Phosgene Safe Practices Guidelines to address the design and maintenance such as OSHA’s confined space entry procedures.

6.7.3 Dump Tanks

Dump tanks can be used to transfer a liquid mixture from the process vessel to an emergency holding or containment vessel. In most cases, dump tanks are not used for any other purpose. They are sized to contain the largest applicable operating volume and normally remain empty. Transfer to the dump tank can be either manual or automatic and by either process pressure or with nitrogen pressure. Due to the special nature of most phosgene processes, dump tanks are not routinely used.

6.7.4 Secondary Containment - Matrix

	Pros	Cons
Double Walled	<ul style="list-style-type: none">• Excellent impact protection.• Easy to maintain.• Reliability of containment.• Capable of continuous leak monitoring of plenum area.	<ul style="list-style-type: none">• Sometimes extremely difficult to locate point of leak.• Difficult to repair internal wall.• Focused secondary containment.• Complex gasketing.
Enclosures	<ul style="list-style-type: none">• Reliability of containment.• Can encompass large processing sections.• Quick detection of leaks possible.	<ul style="list-style-type: none">• Special personnel procedures used for entry and work inside enclosure.• Extends duration of maintenance activities.
Dump Tanks	<ul style="list-style-type: none">• Provide focused containment.	<ul style="list-style-type: none">• Limited purpose.

References

1. National Service Center for Environmental Publications (NSCEP)
2. US Department of Energy Office of Scientific and Technical Information
3. National Fire Protection Association (NFPA) 55 “Compressed Gases and Cryogenic Fluids Code”, section 7.9, Toxic and Highly Toxic Gases
4. I, Chem.E.Symposium Series No. 110, “Guidelines for Safe Storage and Handling of High Toxic Hazard Materials, Croce, Paul A., Dennis E. Wade, Robert A. Smith and Richard Munson