

6.7 Secondary Containment

6.7.1 Introduction

Proper design and installation of phosgene handling equipment is essential in preventing phosgene leaks and accidents¹. 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” systems². 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, dump tanks and containment vaults. A description of each type follows. NFPA 55³ may be used for additional guidance in design considerations.

6.7.2 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.

6.7.3 Structural Enclosures

Structural enclosures can be described as a sealed building or box. From the outside, these enclosures may appear similar to other buildings in the operational process. However, they will normally have special features, such as an air tight seal, possibly maintained under vacuum with ventilation to a scrubber, controlled access, and dedicated leak detection monitors.

The material of construction can vary from standard concrete blocks to special “cocoon” sealed corrugated metal to fully welded steel sheets. No matter what the materials of construction, the success of the enclosure or box depends upon its ability to fully contain any phosgene leaks and direct them to a safe neutralization system.

Some cautions when using enclosures 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. These factors are considered in the design of the enclosure as well as in development of procedures and special steps for maintenance activities inside an enclosure.

6.7.4 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.

6.7.5 Containment Vaults

A vault can be described as an under pit designed to contain a liquid spill. The spill would be directed into the valve vault where it would be contained and vented or purged to a neutralization unit. Most vaults remain water or moisture free. Also, vaults have limitations and are not usually effective for gas release containment.

Because of the special nature of most phosgene processes, vaults are not routinely used.

6.7.6 Secondary Containment - Matrix

	Pluses	Minuses
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.
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"> • Operational and maintenance cost. • Special personnel procedures used. • Extends maintenance duration.

Dump Tanks	<ul style="list-style-type: none"> • Provide focused containment. 	<ul style="list-style-type: none"> • Dedicated for liquid processes. • Limited purpose.
Vaults	<ul style="list-style-type: none"> • Provide focused containment. 	<ul style="list-style-type: none"> • Underground. • Limited purpose. • Remain moisture free.

6.7.7 References

1. [National Service Center for Environmental Publications \(NSCEP\)](#)
2. <http://www.osti.gov/>
3. National Fire Protection Association (NFPA) 55, section 7.9, Toxic and Highly Toxic Gases