6.2 Materials of Construction

Introduction

The information presented in this section is a general composite of best practices and current information about the materials and design of process equipment for pure phosgene. It also contains information about containment of spills, trenches and drains and vessel design.

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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6.2 Materials of Construction

An example of materials of construction include carbon steel, which is often used. Austenitic stainless steel, duplex stainless steel, and high nickel alloys have also been used. As with other sections of the Guidelines, consult with Metallurgic expertise to help ensure the appropriate material is selected for the process.

6.2.1 General Design Considerations

In this section, the design of process equipment for pure phosgene is discussed. Unless otherwise specified, the information provided below generally applies to the design of storage and non-storage vessels.

Phosgene processing equipment has been sited either above or below ground depending on local conditions. Influencing factors can include, but are not limited to:
• Consequence of a major spill on the locality (e.g., the local population and the weather conditions).

• Venting, draining, etc. of the immediate area if a major spill occurs.

• Risk from falling objects and accidental damage from other sources (e.g., traffic).

• Risks from external vessel corrosion (e.g., environment and ground conditions if sited in a buried storage).

• Accessibility for vessel inspection (external as well as internal)

• Approachability to the vessel from all directions to allow access during emergency conditions

Above-ground vessels may, however, be a desirable choice for future installations unless special environmental conditions dictate otherwise.

**Containment of Spills**

Development of a containment area around phosgene processing equipment can be used to help prevent an uncontrollable spread should a leak occur. This area might be bounded by retaining walls with facilities for the addition of absorbing chemicals, or be fitted with special drains leading to vessels containing neutralization facilities and fume extraction or any other measure that addresses potential conditions. The size of any equipment for this duty depends on the maximum release considered possible before the system could be safeguarded (i.e., contents transferred to another vessel, a temporary repair made which controls the spill, etc.). The area might also be fitted with a storm water drainage system that could be manually controlled to lift water out of the containment area. The purpose of this arrangement is to keep inadvertently released chemicals out of the effluent system.

**Trenches and Drains**

To help prevent the spread of fire into a phosgene process area, maintain an appropriate distance between the equipment and a service trench. A similar distance should be considered between a drain and the processing equipment unless the drain system is completely isolated from any other drains that could transport flammable liquids. Refer to NFPA 30 “Flammable and Combustible Liquids Code,” and NFPA 1 “Fire Code” for more information on appropriate distance.¹

**Vessel Design**

Consider required pressure rating, operating temperature, and absolute vacuum conditions within the vessel during design. A corrosion allowance
may also be incorporated into the design. A number of companies can provide design and fabrication materials to follow lethal service requirements.

Tubular Exchanger Manufacturers Association\(^2\) Class R and American Society of Mechanical Engineers\(^3\), Section VIII (paragraph UW-2(a)) provide further information on the lethal service requirements.

Users can take steps to help ensure that the vessels are protected against over-pressurization. (Refer to Section 6.6 Relief Devices of the Guidelines). High-pressure alarms serve in this capacity. Consider setting the alarm approximately mid-way between normal operating and the burst disc failure pressure to give warning of a potentially dangerous occurrence.

Extra protective devices may be required as a function of the site chosen for the vessel. (See Section 6.1 Plant Layout and Siting of the Guidelines). For example, the vessel may be double walled to reduce the risk of damage from falling objects, corrosion and subsequent leaks.

Lifting plans can be developed to address lifting activities required in the area of the vessel. The plan may incorporate appropriate use of special permits and supervision. Use of a lifting plan helps reduce risk of accidental damage by falling or swinging loads.

Consider designing branch connections of processing equipment above the liquid level. However, if use of this approach presents a problem, consider alternatives, for example evaluate including a remotely operated valve in branch lines below the liquid level.

Where cold storage is practiced, the processing equipment can be insulated to reduce warming of the contents during the summer months. Lagging also reduces the rate of heating should a fire develop in the close proximity. Consider potential problems related to corrosion under insulation (CUI).

Fire drench sprays have been fitted over insulated phosgene equipment. Spraying the surfaces helps reduce vessel warming in the case of a local fire. National Fire Protection Agency\(^4\) 15 offers further information on the subject. Evaluate whether provisions to address water runoff are adequate.

Consider the flange rating and branch size of vessel nozzles. For example, a threaded connection may be undesirable because of the risks of leaks.

Certain jurisdictions may require vessels to be registered and/or inspected as pressure vessels. American Petroleum Institute\(^5\) 510 (Pressure Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration) offers further information on the subject.
Consider whether the material of construction for level devices and other instrumentation in contact with phosgene is suitable.

References

1 NFPA 30 “Flammable and Combustible Liquids Code,” and NFPA 1 “Fire Code” for more information on appropriate distance.
   http://www.nfpa.org

2 Tubular Exchanger Manufacturers Association Class R
   http://www.tema.org/

3 American Society of Mechanical Engineers, Section VIII (paragraph UW-2(a))
   http://www.asme.org/

4 National Fire Protection Agency

5 American Petroleum Institute 510 (Pressure Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration)
   http://www.api.org/