OCCUPANCY CLASSIFICATION AND REQUIREMENTS

Chlorine containment vessels used as part of water treatment facilities and the impact that these vessels may have in mitigating potential hazards associated with chlorine gas is not intended to satisfy the requirements of UBC Section 307.1.6 but does consider the issue from three different viewpoints. These viewpoints are:

1. Manufacturer's experience with chlorine, a description of the vessel, and its design features.
2. Authorities considered the use of these vessels in satisfying Uniform Fire Code (UFC) and Uniform Building Code (UBC) requirements.
3. A comparison of the performance of these vessels as an alternative method of construction against the existing code requirements.

Vessel Description

TGO Technologies, Inc. is the developer and manufacturer of the "ChlorTainer®," a vessel designed to contain the accidental release of liquid chlorine or chlorine gas. TGO Technologies, Inc. "is a practicing packager of chlorine and their work is based on many years of practical experience." The ChlorTainer® is designed in accordance with ASME requirements and is capable of containing pressure releases of up to 250 psig at 300 degrees F. In the event of a failed cylinder, the system will protect the operator as well as the external environment from exposure to toxic gas. Since the gas is totally contained, it satisfies the code requirement as a treatment system and provides an alternative to the conventional method of mechanical scrubber systems.

In the event of seismic activity, the system can be equipped with a seismic switch that will put the system in a standby mode and automatically reset after the event. Should a pipe line containing toxic gas external to the vessel break, the amount of toxic gas released would be limited to the amount of gas in the line. The system will sense the break in the line and will not allow the chlorine to continue dispensing. It will seal the stored chlorine from adding to the release through the broken pipe.

Back-up emergency and/or standby power is not required as the ChlorTainer® does not require power to contain gas releases.

In the event that a leak occurs in a stored cylinder, it can be contained by immediately placing the cylinder in the ChlorTainer®. The leaking cylinder may be removed after safely purging the ChlorTainer® by processing the gas through the on-site chlorinator. The chlorine containment vessels can be equipped with a quick release, two-bolt chain-drive door option which is the fastest method of sealing the vessel and containing a leak.
Experts in the field of chlorine handling and systems have reviewed the design features and operational characteristics of the ChlorTainer® vessel and consider it to be the safest way to satisfy the requirements of Article 80 of the Uniform Fire Code (UFC).

The system is very well accepted for its use. Systems have been installed under varying conditions: some in enclosed facilities with chlorine stored outside the operating ChlorTainer®, and others installed in outdoor locations. Due to the differing installation conditions, various occupancy/no occupancy classifications were assigned to the installations. Installations where chlorine is also stored were assigned an H2 occupancy classification. Outdoor storage locations do not have an occupancy classification associated with them as the building code does not specifically address outdoor storage. These sites were classified by the governing jurisdictions as outdoor storage due to the fact that a significant percentage of the perimeter was not enclosed. The UFC requires that outdoor storage of hazardous materials be provided with weather protection consisting of an overhead canopy and supporting structure (Refer to UFC Section 8003.1.14). In installations where half of the perimeter was open, the governing jurisdictions considered the installation to be outdoor and therefore, not required to be addressed by the building code. Sites have been checked and approved by many jurisdictions, i.e., Los Angeles County Fire Department and the Department of Building and Safety.

Alternative Method of Construction

Sites should be designed to shelter the chlorine storage/dispensing area from sunlight and rain while keeping it as open as possible to prevent the possibility of any accumulation of chlorine within a confined space for operator safety. This is accomplished by providing two distinct enclosed elements on either side of the chlorine dispensing area. Often a metal roof covers the area above the chlorine storage/dispensing area. Sun screens hung from the sides of the building structure also provide additional protection from heat and sun exposure. Security is sometimes accomplished via wrought iron perimeter fencing and gates. No combustibles should be used in the construction of the facility or stored at the site. The area where the vessels are to be stored should be set back from adjoining property lines in compliance to Chapters 3 and 5 of the Uniform Building Code (UBC), 1997 Edition. The chlorine storage/dispensing area is usually designed to minimize exposure from an outside fire hazard/source.

There are two approaches that can be taken in the review of these installations. The first is as an enclosed building with an associated occupancy. Normally, this occupancy classification would be considered as an H2 occupancy due to the amount of chlorine present and its properties as an oxidizing gas.

Often the area where the chlorine is stored is less than 500 square feet. Therefore, no special access or setback requirements exist for the "building" area that "encloses" the chlorine storage/dispensing area. Special construction features, such as emergency or standby power, spill containment, and ventilation
are either provided by the ChlorTainer® system in compliance to Article 80 of the UFC and the corresponding sections of the UBC, or are not required due to the simplicity of the design of the ChlorTainer® vessel. For example, emergency or standby power normally required by code for operation of treatment systems such as scrubbers and associated control systems, is not required for proper operation of the total containment system offered by ChlorTainer®. The system will fail safe during emergency conditions; it does not require power to activate or operate the containment. The system may also be shut down manually complying with Sections 8001.4.3.4 (5) and 8001.16.3 of the UFC. Fire alarm devices are not required to initiate or continue treatment during system operation or emergency conditions. Fire sprinklers may be useful in cooling the ChlorTainer® vessel, but are not required in order to mitigate the exposure to fire from an external source. This has been accomplished by construction requirements related to the exterior walls and their proximity to the property lines. Fire Department personnel have expressed concern over having fire sprinklers at locations due to incompatibilities with chlorine. The proposed containment system for these installations exceeds the performance of other types of construction approved for such applications identified in Section 8001.10 of the UFC.

The second approach to reviewing the proposed installations is to give consideration to the area where the chlorine is stored as outdoor storage as allowed in the UFC. The UFC places restrictions on outdoor storage of toxic and highly toxic compressed gases. These restrictions are:

1. Shielding of gas from other exposures (Section 8003.3.2.2.2)
2. Distance limitations to public ways or other buildings (50' per Section 8003.3.2.2.3)
3. Distance limitations to air intakes (75' per Section 8003.3.2.2.4)

It should be noted that these provisions are for outdoor storage of unprotected cylinders or outdoor closed dispensing systems. Installations include a containment vessel that prohibits an accidental release from the system under normal or emergency conditions. This system is superior to other provisions of the code relating to all types of installations, whether indoor or outdoor, because of its reliability, simplicity, maintenance requirements and the protection it provides as compared to exhaust scrubbers or other measures, such as distance limitations, allowed by the codes. Industry experts recognize it as the best protection available because of these factors. It complies with Article 80 of the UFC and has been used successfully at many installations.

The UFC is silent on distance limitations for buildings housing storage or dispensing operations for the proposed hazardous material (chlorine gas) being dispensed. The reason for this is that in complying with the UBC, Uniform Mechanical Code (UMC) and UFC requirements for buildings, the public exposure to an accidental release of hazardous materials has been mitigated to acceptable limits by the construction techniques required by the codes for these occupancies. Outdoor storage has distance limitations placed on some sites due to the fact that no mitigating construction barriers were provided
that are required in enclosed or occupied areas within building construction.

It has already been shown that TGO Technologies' ChlorTainer® product satisfies the requirements of Article 80 of the UFC for indoor applications, thereby satisfying the requirements that gas cabinets, gas rooms, exhausted enclosures and conventional scrubber treatment systems provide. Because of this, it is a logical and reasonable understanding and interpretation that installing a total containment system surpassing more conventional construction techniques currently allowed by code as proposed for these projects, would also be an acceptable alternative to providing the distance separations and barriers otherwise required by the UFC for outdoor storage.

The inclusion of TGO Technologies, Inc., ChlorTainer® system mitigates the hazards associated with the use of chlorine beyond acceptable limits allowed by the codes and will substantially improve the safety of the existing operations of water wells at various locations and provide the simplest, safest way to improve safety at treatment sites.
UBC Related Issues

1. Standby power (UBC Sec. 307.2.6)
2. Fire alarm/suppression (307.7, 307.9)
3. Spill containment (307.2.4.2)
4. Building height (307.2.9)
5. Detached storage (NA per Table 3-G)
6. Multiple occupancies (307.2.9)
7. Ventilation (307.5.2, 1202.2.1, 1202.2.3)

UFC Related Issues

Indoor Storage and Dispensing

Storage
1. Piping (UFC sect. 8001.4.3)
2. Construction requirements (8001.10)
3. Occupancy (8001.15.2.3)
4. Spill and secondary containment (8003.1.3)
5. Ventilation (8003.1.4)
6. Fire extinguishing systems (8003.1.6)
7. Standby/Emer pwr (8003.1.8/8003.3.1.4)
8. Pressure control (8003.1.9.3)
9. Emergency alarm (8003.1.10)
10. Supervision (8003.1.11)

11. Toxic gases (8003.3)
   a. Fire extinguishing systems
   b. Ventilation
   c. Gas rooms/exhausted enclosures
   d. Treatment systems
   e. Emergency power
   f. Limit controls
   g. Gas detection
   h. Smoke detection
12. Oxidizers (8003.6.1)
13. Corrosives (8003.14.1)

Dispensing
1. Limit controls (8004.1.5)
2. Standby/emergency power (8004.1.6)
3. Supervision (8004.1.7)
4. Fire extinguishing systems (8004.1.10)
5. Emer shut off for ox gases (8004.1.12)
6. Ventilation (8004.1.11)
7. Spec'l req for toxic comp gas (8004.2.3.7)
8. Smoke detection (8004.2.3.7.7)

Code Issues

TGO Containment Vessel Compliance

- Not required for proper operation of containment
- Not required to activate containment during emergency conditions.
- Contained within the Chlortainer vessel
- Building complies—not a Chlortainer issue NA
- Unmanned facility I possible consideration as outdoor storage
- Natural ventilation provided instead of mechanical (UFC allows natural ventilation)

TGO Containment Vessel Compliance

• Will comply
• Total containment eliminates the need for gas room, exhausted enclosure, or cabinets
• Hazardous materials not allowed to be stored in other than H occupancies per UBC 307.2.9-must be H occupancy if not classified as outdoor storage, but Chlortainer meets UBC H occupancy requirements and mitigates personnel exposure to hazardous materials
• Contained within Chlortainer vessel
• Natural ventilation complies
• Not desirable with chlorine
• Not required for operation of containment
• Provided by Chlortainer vessel
• Unmanned facility
• Chlortainer vessel will contain release-system equipped w/ gas detection system and automatic shut down features-supervised by SCADA (not 24 hrs)

• See pt. 6 above
• See pt. 5 above
• See pt. 2 above
• Complies as a treatment system
• See pt. 7 above
• See pt. 8 above
• Provided with unit in containment
  • na
  • na
• Containment w/in vessel
• Complies
• Not required for operation during emergency conditions
• Unmanned facility
• Not desirable with chlorine
• Complies
• Natural ventilation
• Complies
  • na
Outdoor Storage and/or Dispensing

Storage
1. Distance from stg to exposure (8003.3.2.2)
   a. Shielding
   b. Openings
   c. Air intakes
2. Canopies (8003.3.2.3)
3. Piping/Controls (8003.3.2.4)
4. Special provisions (8003.3.3)
   ▪ Seismic (8003.3.3.1)
   ▪ Security (8003.3.3.2)
   ▪ Leaking cylinders (8003.3.3.3)
5. Local exh for leaking port tanks (8003.3.3.4)
6. Oxidizers (8003.6.2)
7. Corrosives (8003.14.2)

Dispensing
1. Location (8004.3.2)
2. Fire Extinguishing systems (8004.3.3)
3. Spill control/cont'mt.-Closed sys (8004.3.4.2)
4. Special req'ts for toxic compressed gases
   a. Ventilation/arrangement
   b. Gas cabs/exh. encl (8004.3.6.2 & 6.3)
   c. Treatment systems (8004.3.6.4)
   d. Gas detection (8004.3.6.5)
   e. Fire extinguishing system (8004.3.6.6)
   f. Special req'ts for ox gases (8004.3.8)

The UFC is silent on distance limitations for buildings housing storage or dispensing operations for the proposed hazardous material (chlorine gas) being dispensed. The reason for this is that in complying with these requirements, the public exposure to an accidental release of hazardous materials has been mitigated to acceptable limits by these construction techniques required by the codes for these occupancies. Outdoor storage has distance limitations placed on it due to the fact that no mitigating construction barriers have been provided that are required in enclosed or occupied areas within building construction. It has already been shown that TGO Technologies' Chlortainer product satisfies the requirements of Article 80 of the UFC for indoor applications, thereby satisfying the requirements that gas cabinets, gas rooms, exhausted enclosures and conventional scrubber treatment systems provide. Because of this, it would be a reasonable understanding that providing a total containment system as proposed for these projects would be an acceptable alternative to providing the distance separations and barriers otherwise required by the UFC. This classification of the storage areas as "outdoor" storage would not compromise the public safety and welfare the codes are endeavoring to protect and maintain.