



Property Risk Consulting Guidelines

LIQUID DAMAGE

INTRODUCTION

Any location can have a loss from liquid damage. The term “liquid damage” describes both the peril and the resulting incident in which a liquid causes property damage. The incident may result in a business interruption loss. This section does not include damage due to riverine and surface water flooding. See PRC.15.4 for flood control.

Liquids are normally stored in tanks or other type of containment and are often transferred through piping or hose and moved by gravity or pump. Damage occurs when liquids escape.

The intent of this section is to assist personnel in identifying sources of potential liquid damage and recommending measures to prevent or mitigate losses.

POSITION

The key to minimizing losses is to identify potential exposures to liquid damage and take remedial action before damage occurs. Because causes of losses vary widely, loss potentials can be difficult to identify. The survey guide PRC.16.6.A has been developed to assist in evaluating the hazards.

Piping

When installing new and inspecting existing piping check for the following:

- They are not located over critical equipment such as computer servers, MRI and CAT scan machines, and control rooms. If lines are installed over this type of equipment, re-route them or protect the equipment below from possible damage.
- They are not located near windows or other openings where freezing weather could affect them.
- They are braced from swaying and protected from impact from other equipment and vehicles.

Drainage

Installing and maintaining drains requires using competent plumbers and pipe fitters. Experienced personnel should check older installations at least annually to detect corrosion or other potential failures. Also follow these recommendations:

- Provide adequate floor drains. Where drains are difficult to install because of grade elevations, substitute a sump with an automatic pump connected to an outdoor discharge.
- Do not connect drains directly to storm sewers or other systems, which may back up from flooding or heavy rainfall.
- Equip drains susceptible to backup with backflow preventers.

- Equip drains used regularly for waste drainage with suitable traps, which can be cleaned and serviced. Provide a formal maintenance program to ensure periodic cleaning.

Roofs

- Design and maintain roofs to be effective under all weather conditions, wind, snow, and rain. Conduct a structural analysis of a roof when the structural integrity is in doubt. See PRC.2.0.1.1, PRC.2.0.3, and PRC.2.0.4.
- Provide a generously designed roof drain system, particularly where parapets may contain rain or snow or create other impedence to runoff. See PRC.16.1.
- Ensure that all vents are high enough and all roof penetrations are properly sealed to exclude water. Unexpected roof failures can be avoided if the following minimum recommendations are followed:
 - Periodically inspect the roof for its general condition and for evidence of ponding. Routine roof inspections are also recommended in temperate latitudes. Do not ignore a roof simply because it does not exhibit obvious leaks; unexpected failures can occur.
 - Inspect roof drains frequently for clogging, especially during winter and other wet periods such as hurricane and typhoon season.
 - Clear snow buildup from the roof and unclog frozen drains.
 - Inspect the perimeter flashing and flashing around roof penetrations to make sure they are secured and in good condition.
 - Do not store equipment on the roof. Remove any loose equipment when finished.
 - Check security cables to make sure they are in good condition.

Finished Goods

Place storage of goods and materials sensitive to liquid damage on pallets, racks or other elevated platforms off the floor. Inserting an impermeable sheet material between layers of boxes upwards can minimize wicking action. Slip-sheets may also suffice.

Dikes

Dike all large tanks and any smaller tanks containing dangerous liquids, such as acids or very toxic substances.

Specialized Process Systems

Conduct frequent inspection and maintenance on tankage, piping, reactor vessels and fluid transfer equipment located in industries, such as petrochemical plants, refineries and chemical plants.

Critical and Expensive Equipment/Material

Locate critical and expensive equipment such as computer servers, emergency generators and switchgear, libraries, imaging equipment, etc. on upper floors.

New Construction Sites

Carefully evaluate drainage and diking at new construction sites. Temporary drainage ditches or earthen diking may be required to prevent liquid damage to an existing facility. Whenever an earthen berm or a new roadway is used to contain and divert water, make sure drainage is provided through the berm or roadway to a natural runoff.

Protective Barriers

Provide protective barriers made of filled pipe or concrete to protect tanks or piping exposed to damage from vehicles, trucks, rail cars and other load-handling equipment.

Emergency Planning

Provide emergency plans to ensure that:

- Shutoff valves on domestic, process, and sprinkler lines are clearly marked and accessible.
- Roof drains are free of debris.
- Material is available for any spill.
- A visual inspection is made of piping to ensure it does not show signs of corroded or leaking.
- Checking the heating system before the onset of freezing weather.
- Check windows, exterior doors, and other openings (air-intakes, etc.) to see that freezing weather does not affect the piping.

The plans should assign responsibility to an individual for control and cleanup. Give second and third shift managers the authority to request emergency services. The plans should also include a list of supplies of equipment or materials needed for cleanup and protective clothing and breathing apparatus as required for some liquids.

DISCUSSION

General

AXA XL Risk Consulting has created WaterWorks, a 12 page brochure covering an introduction to the issue of water damage, how to mitigate water damage, how to prevent water ingress damage, and loss prevention measures for fire sprinklers. A copy of the brochure can be ordered free of charge through the AXA XL Risk Consulting Store (https://xlstore.nextlms.com/product_info.php?products_id=140).

New Construction Sites

New construction can create obvious liquid damage potentials. Excavated foundations and structures are open to rain and water damage. If not properly protected, machinery or equipment being installed may be damaged. Where new construction adjoins an existing facility or building, excavation or other land alterations will expose the existing facility to liquid damage potential.

Protective Barriers

Protective barriers are needed where hazardous or dangerous liquids are stored in tanks exposed to damage from vehicles, trucks, rail cars and other load handling equipment. Tanks of propane, liquid oxygen, LP gas, acids or other industrial fuels and liquids may be located in or adjacent to a busy facility. The more hazardous the liquid, the greater the need for barriers.

Domestic Water Systems

Domestic water lines are one of the more common sources of liquid damage. They are found in most buildings. Systems are frequently neglected and difficult to access. Often, piping is out of sight in walls, concealed spaces, above dropped ceilings, or in basements.

In an older building, the domestic water system is even more of potential liquid damage hazard. Older systems corrode or crack. When buildings settle and age they can overstress installed piping systems. Careless and improper repairs and installations can also lead to failures.

When properly installed in accordance with building codes and manufacturers' instructions, PVC and other plastic piping are reasonably reliable. However, improperly joined piping and improper installations have led to failures, particularly where plastic fittings join metal fittings. Some plastic components have failed due to anomalies in molding and forming. Errors in quality control of plastics have caused components to fail after installation. Because the strength of plastic is limited, particular care is required to avoid unusual stress and overpressure.

Roofs, Piping and Floor Drains

Roof structures are designed to support their own weight plus loads imposed by wind, snow, hail, rain and ice. Most large roofs have drainage systems to control water runoff and channel it to appropriate storm drainage systems. Severe weather systems can create problems for roofs that function normally under normal weather conditions. Drains clog from melting and freezing cycles and from accumulations of debris. As a result, water may pond or seek alternate avenues of drainage. Alternate melting and freezing periods may create ice dams, which cause water to move along rooftops and leak through openings, or, if the water does not find an opening, it may accumulate. Heavy rains, snow or ice may overload the roof and cause it to collapse.

Regular inspections are needed to reveal ponded areas, inadequate drainage or poor repair. An engineering analysis may also be needed, because a visual inspection may not reveal all the deficiencies. If leakage occurs, floor drains prevent liquids from building up, providing the drains are properly functioning. A clogged drain can back up inside a building and cause damage.

Failures have also occurred in piping systems related to air conditioning equipment, chiller systems, cooling systems, process systems and drains. Mechanical vibration, corrosion or careless repairs cause many failures. Inexperienced personnel are sometimes tempted to use flexible hose, hose clamps and other improper equipment and material to make repairs.

Machinery, Equipment and Stock

Relatively expensive concentrations of equipment, materials or furnishings must be identified and protected. Substantial losses can result where expensive items such as computers, lasers and sophisticated laboratory equipment are stored. Almost any electrical or electronic equipment can be easily damaged by liquids. Raw steel stock and iron or steel parts can rust from moisture or condensation. Office furnishings, paneling, carpeting and office machinery are damageable and expensive to replace. Concentrations of paper storage require special attention. Liquid can cause rolled paper to be unsaleable even if the paper absorbs moisture only on the roll end. Finished goods packed in fiberboard cartons sitting on the floor can be damaged by absorbing water or other liquids. Liquid can also migrate to areas high off the floor, not directly in contact with spilled liquid.

Damage is not always evident. If toxic, carcinogenic or radioactive liquids are deposited in buildings, the properties are usually unfit for human occupancy until they are cleaned and decontaminated. Costs for cleaning and business interruptions are usually very large.

Industries, such as petrochemical plants, refineries and chemical plants, may have extensive tankage, piping, reactor vessels and fluid transfer equipment. These systems often contain materials that can severely damage surrounding property due to their flammable, explosive, corrosive or other environmentally unacceptable properties.

Tankage

Tanks of all sizes, shapes and configurations store liquid raw materials, process fluids and products inside or outside of buildings. Many tanks are designed to a consensus standard. If they are under pressure, they may have to meet pressure vessel code requirements. Contents may range from chemicals, petrochemicals and solvents to foodstuffs, such as milk or molasses. Some tanks store hazardous products and may need to be constructed of special materials that prevent oxidizing or corrosion.

Tanks fail from being overfilled with heavy products; they also fail from corrosive effects, poor welding and poor maintenance. Larger tanks, such as those in tank farms or distribution terminals, are usually designed to contain products of a particular density. But if tanks are converted for storage of another product and the new product is heavier, an analysis of tank strength versus product weight is needed to determine safe fill limits, otherwise, the tank may fail or completely collapse. Catastrophic tank failure can severely damage surrounding structures and equipment and cause corrosive, toxic, flammable or other hazardous effects as well. A tank without diking filled with a potentially contaminating solution poses a considerable risk. Contamination will incur high costs for cleaning, even if there is no physical damage.

Diking is the most common loss prevention and control measure for protecting bulk liquids stored in tanks. A suitable dike can greatly reduce damage and simplify cleanup operations. Dikes should be able to contain a tank's contents should it fail or collapse. Many governments require dikes to contain certain kinds of liquid storage to prevent liquid spills from contaminating the environment.

Emergency Planning

Emergency planning is critical to controlling the spill and minimizing damage. Once liquid has breached its normal containment, the amount of damage will depend largely on the speed and efficiency of cleanup operations.

SURVEY GUIDE

1. Is management aware of potential for liquid damage hazards?
2. Other than sprinkler systems, do any heating or piping systems exist that carry liquids, such as water, chemicals or vapors?
3. Are there any tanks for liquid storage, such as water or chemicals?
4. Are there any chemicals or other liquids stored in containers, such as cans or drums?
5. Do piping systems, tanks or other liquid containment systems operate at pressures over 120 psi (8.3 bar)?
6. Are there any valuable materials, or finished products, susceptible to substantial damage from wetting or contamination by water? Are they palletized?
7. Are there any valuable materials, finished products, areas or equipment susceptible to substantial damage by corrosive or otherwise harmful liquid chemicals?
8. Are any materials or equipment subject to liquid damage difficult or impossible to replace?
9. Are all areas subject to liquid accumulations equipped with adequate floor drainage systems?
10. Are there adequate drainage systems for roofs, parking lots or other surfaces subject to the weather or to liquid leakage? Are such drainage systems vulnerable to sewer backup?
11. Are there any areas such as basements or low outdoor areas used for storage of materials or equipment?
12. Are roofs and drainage systems well maintained and monitored at all seasons of the year?
13. Are all piping systems, tanks and other liquid containers well maintained?
14. Are all major tanks designed to hold the products they contain?
15. Do process piping systems vulnerable to erosion or corrosion require periodic replacement?
16. Are liquid-proof covers available for material, equipment or products subject to liquid damage? Products include those being readied for shipment on loading docks or other exposed areas.