Water-Based Systems
Leak Assessment and Prevention Program

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Summary

WATER-BASED SYSTEMS | LEAK ASSESSMENT AND PREVENTION STRATEGIES

Preventing water leaks begins with a broad assessment and determination of base building and leased premises water-based systems and equipment having the potential to leak due to system or equipment degradation, component failure, human error, or weather-related effects. The assessment will consider the system's location and supporting infrastructure in place as it relates to the likelihood of a leak and the scale of damage should a water leak occur. For example, a restroom plumbing system might have potential for a flush valve water leak, however, the leak would likely be totally contained if a restroom floor drain is in place.

The potential for water leaks will vary based upon several factors including the type and age of the system, equipment, operational features, and its location, including exposure to temperature variations such as cold outside air.

The assessment of a building's central HVAC water-based system, located on a top floor mechanical room, with no or inadequate floor drains, might benefit from the planned implementation of several water leak prevention and mitigation measures. An identical HVAC system, situated on the ground floor level of a building, might not necessarily require these same risk prevention measures. The implementation of proactive and thoughtful preventive measures can reduce the likelihood of building system leak occurrences, provide detection and early warning to building operators, and reduce or eliminate the scale of the water leak and related property and contents water damage.

WATER-BASED SYSTEMS | LEAK ASSESSMENT AND PREVENTION STRATEGIES

The experienced building owner-operator will have a practical understanding of operating systems subject to assessment and subsequent implementation of mitigation and prevention measures. The information provided in this BuildingsOne document will include an overview of the most common base building and tenant premises water-based operating systems and equipment having the potential to experience system degradation or component failure resulting in water leaks. Preventive measures, specifically leak detection and component labelling, will provide direct benefits to the property's emergency procedures program. Distinct **water rupture emergency response procedures** - *procedure template available in* BuildingsOne *documents library* - will ensure immediate and effective response to building water leak incidents.

"An essential element of a property's water leak assessment and prevention program is the detailed inventory and labeling of key system components including critical valves and related shut off devices, e.g., motor-starters, that are fundamental to the building operators' prevention of, and response to, a system water leak."

The building operating team's complete understanding of the location and operating characteristics of all water-based systems provides the foundation from which a comprehensive water leak prevention program can be developed. The detailed inventory of water-based systems and components, arranged by system/category and input into the building's computer-based preventive maintenance (PM) program (CMMS - computerized maintenance management system), will support the ongoing periodic inspection and maintenance process. Key system components, including critical isolation (shut-off) valves, will be

labelled *in the field* (at the component itself) with a protocol that simplifies and enables the identification and purpose of these devices during emergency responders' and building operators' response to a water rupture incident. **Plain language identification** is the preferred methodology. For example, a cooling tower drain valve would be labelled "Cooling Tower Drain" vs. "Valve CT1A".

"For complex base building systems, the development and *wall placement* of a system drawing/plan, or basic 8" x 11" one-line sketch, supplementing the field-labeling of valves and other control devices, will enhance building operators' identification of system critical components prior to, and during, a water leak incident."

Enhanced leak detection and mitigation, through installation of preventive and containment measures and components, should be considered based on the assessed potential for water leaks and estimated range of damage should a leak occur. From a broad perspective, a water leak within the leased premises can result in significant damage to both property and valuable contents. Installation of water sensing, alarm, and prevention devices would be imperative for water-based systems and equipment located above or near high-value equipment, e.g., computer data center. Technological advances in leak detection products have led to low-cost water leak prevention solutions including automatic flood-stop devices. These devices are worth every penny and should be considered and enforced by the landlord's representative during the installation of water-based systems and equipment in high-risk areas.

BASE BUILDING WATER-BASED SYSTEMS

Base building systems assessed for water leak potential are typically within the Mechanical (HVAC & Sprinkler) and Plumbing classifications. Base building systems will periodically be exposed to outside weather conditions, such as freezing temperatures, whereas most leased premises' water-based systems aren't regularly subject to these added risks. In fact, freezing and subsequent expansion and failure of water-based equipment is a typical cause of building system water leaks. The graphic below outlines some common freeze protection measures associated with representative base building water systems.

HVAC | Cooling Tower & Condenser Water Systems

- Condenser Water Pipe Insulation and Electrical Heat Tape
- Cooling Tower Winterization - Draining of Cooling Tower
- Cooling Tower Winterization - Glycol or Other Freeze Prevention Solution (add to condenser water - consult expertise to prevent corrosion of metal surfaces)
- Cooling Tower Basin (sump) Electric or Steam Heating Element - Maintain Water Temperature Above Freezing
- Condenser Water Recirculating Pump - Circulate Water to Prevent Freezing

HVAC | Air Handling Units-Coils

- Cooling Coil Winterization - Seasonal Draining of Cooling Coil | Recirculating Pump Operation
- Cooling Coil Winterization - Glycol or Other Freeze Prevention Solution (add to cooling coil system - consult expertise to prevent corrosion of metal surfaces)
- Outside Fresh Air Damper (louver) Controls - Ensure Tight Seal When Dampers Are Closed
- Coil Freeze Stat Device - Shut Down of Air Handler at Prescribed Cold Air Temperature (upon failure of Air Handling Unit pre-heat coil or damper controls)

Parking Structure and Loading Dock Sprinkler & Other Water-Based Systems

- Sprinkler Piping Low Point Moisture Chambers - Collect & Drain Internal Condensate
- Water-Based System Pipe Insulation and Electrical Heat Tape

BASE BUILDING WATER-BASED SYSTEMS

FREEZE PROTECTION

Freeze protection measures will vary based upon several factors and should be carefully assessed as part of the water-based system leak assessment process and overall building preventive maintenance program.

LEASED PREMISES AND TENANT WATER-BASED SYSTEMS AND EQUIPMENT

The potential for significant water leaks, associated with leased premises water-based systems, is occasionally overlooked. While most leases include language that typically holds the tenant accountable for the inspection, maintenance, and repair of installed water-based systems and equipment serving their specific use, the prudent owner-operator communicates as necessary to ensure these responsibilities are understood and implemented. Without proper communication and landlord oversight, it is likely the tenant might only conduct repairs upon system and equipment failure. In a large high-rise building, a water leak can cause significant damage to base building equipment in addition to tenants' and occupants' personal contents. While the Waiver of Subrogation insurance clause, routinely included in most landlord-tenant leases, compels each tenant accountable to insure their premises and contents against water damage caused by other tenants, the landlord's property management representative will surely lead the water damage and restoration efforts throughout the building. For these reasons, the landlord property management representative's efforts, in proactively ensuring the assessment, inspection, and maintenance of all tenant premises water-based systems and equipment, is well worth the time and effort.

① ②

① Tank-less Hot Water Heater with PVC Connectors

② Hot Water Heater at End of Useful Life Cycle

LEASED PREMISES AND TENANT WATER-BASED SYSTEMS AND EQUIPMENT

The most common source of tenant premises' water leaks occurs in the kitchen-cafeteria-lunch room areas. In restaurant leases, one would certainly expect a relatively higher likelihood for water leaks due to the presence and operation water-based systems and equipment: dishwashing equipment, ice machines, multiple floor drains, grease traps, beverage container service areas, and sinks. For restaurant premises situated on the ground floor, the *below floor* damages associated with water-based system leaks is significantly reduced.

"For high-rise office premises, the *below floor* damages resulting from a hot water heater or water filtration drinking system leak can be extensive. The scale of damage and repairs, in addition to the costs associated with business disruption, from undetected water leaks occurring out of normal business hours are drastically higher when compared to the restoration activities required in response to leak incidents occurring during normal business hours."

LEASED PREMISES AND TENANT WATER-BASED SYSTEMS AND EQUIPMENT

Landlord-Tenant communication is an essential element in the prevention of water leaks potentially occurring from the leased premises. The landlord's accurate **inventory of leased premises water-based systems and equipment** represents the first step in an effective water-based system and equipment leak assessment and prevention program. With this accurate inventory, the landlord operator can effectively communicate with each tenant in scheduling inspections and periodic routine maintenance and replacing equipment before it reaches the end of its expected life cycle. The recommended minimum periodicity for inspecting tenant premises-located water-based systems and equipment is annual.

> "Utilization of the building's preventive maintenance program will help the owner-operator facilitate the periodic inspection, maintenance, repairs, and replacement of leased premises water-based systems & equipment."

Leased Premises Water-Based System Equipment Inventory

Tenant	Floor	Location	Description
Tenant A	6	Kitchenette - Break Room	13KW Electric Tank-Less Hot Water Heater | Yr. 2002
Tenant B	10	Employee Cafeteria	Electric Hot Water Heater | Yr. 2006 | 50 Gallon
Tenant C	14	Kitchenette - Break Room	Bottle-less Hot & Cold Water Filtration Station with PVC piping

The effective management and control of leased premises water-based systems and equipment begins with the **owner-operator review of the proposed space plans and mechanical drawings** submitted during

LEASED PREMISES AND TENANT WATER-BASED SYSTEMS AND EQUIPMENT

the onset of the tenant premises improvement project. The landlord's authorization of water-based systems and equipment, within the tenant premises, will consider the type of system, quality of materials and installation methods used, and location of the equipment. If a leak occurs, is there damage exposure to critical base building or tenant operating systems situated on floors below? Is the proposed hot water tank location above a restroom's suspended ceiling where a leak might potentially injure/scald occupants using the facilities. For plumbing related systems, such as hot water heaters or water filtration systems: Is PVC piping or braided stainless steel hose being utilized? Is flexible tubing and PVC connectors being utilized? The tendency to install inexpensive materials, such as flexible tubing and connectors, amplify the potential for water leaks and property and contents damage. These considerations are indicators of the increased liabilities associated with water-based systems and equipment within the leased premises.

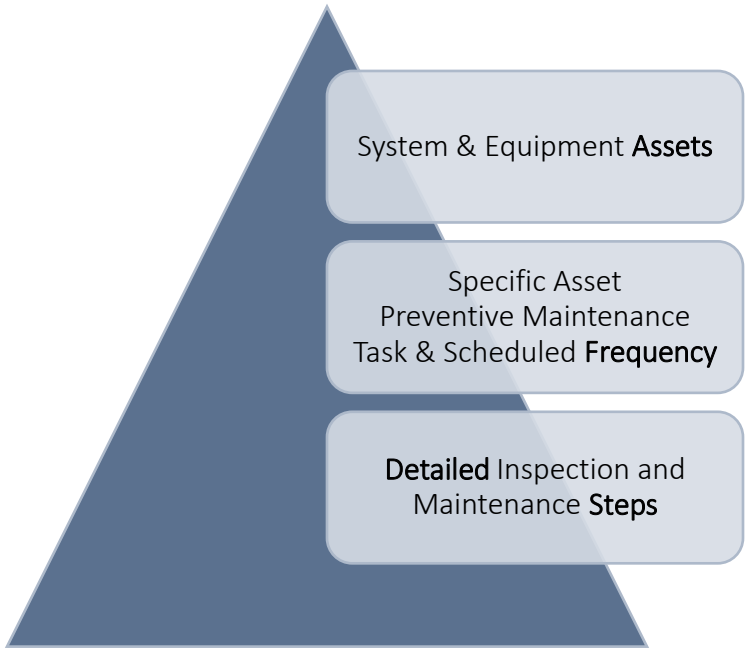
The landlord representative's review and response to a tenant's proposed water-based system, as outlined in their construction plans-drawings, will consider these risks in protecting the interests of the property owner and tenants-in-common. A thorough review, and subsequent high quality water-based system installation, will reduce considerable time and labor in the future inspection, maintenance, and repair of these systems.

"The drawing review process provides a distinct opportunity to require a level of materials and installation quality that will significantly reduce the likelihood of a water leak."

For water filtration systems, requiring the use of properly installed copper pipe, PVC pipe, or braided stainless steel hose, in lieu of flexible PVC tubing and connectors, will specifically reduce the risk of major water leaks commonly associated with the failure of lower-quality flexible tubing components. As an added risk mitigation feature, the plumbing supplies industry offer innovative and inexpensive products to prevent water leaks and costly water damage. A **flood-stop device**, commonly referred to as a "flood-stop" or "flood-stopper" is a point-of-use water detection system that senses water flow for a prescribed period-of-time and automatically shuts off water supply to systems experiencing a water leak. Requiring an "overspill pan" can also help to contain damage associated with small water leaks occurring from hot water heaters and other water storage devices.

PREVENTIVE MAINTENANCE PROGRAM

A **computerized preventive maintenance (PM) program**, also referred to as a computerized maintenance management system - CMMS, is central to the organization, inventory, inspection, maintenance, repair, and replacement of both base building and premises-located water-based systems and equipment. The preferred preventive maintenance program hierarchy will facilitate the automatic scheduling and documentation of water-based systems' *leak prevention* inspection, maintenance, and repair tasks under the overall asset system / equipment category, e.g., "Tenant Premises Hot Water Heaters" or "Cooling Tower". For example, the preventive maintenance (PM) task: Annual Condition Assessment Inspection could be scheduled (in April) each year for all building tenant premises hot water heaters. *Note: The recommended practice of replacing hot water heaters, prior to the end of the expected life cycle (regardless of condition), will reduce the likelihood of failure between inspections.* The PM task, Seasonal Freeze Protection could be scheduled annually (in October - prior to winter season) for the building's cooling tower and condenser water system.



Preventive Maintenance (PM) Program Hierarchy

PREVENTIVE MAINTENANCE PROGRAM

"The PM task, Seasonal Freeze Protection might be scheduled annually (in October) for the building's cooling tower and central Air Handling Unit (AHU) chill water coils."

SUMMARY

Building owners and operators will always be subject to the risks and liabilities associated with the presence of base building and premises-located water-based systems and equipment. While water leaks and incidents are never 100% preventable, they can certainly be reduced considerably starting with the owner-operator's thoughtful and planned assessment of water-based systems in place at their facility. An assessment that considers the type, age, and quality of system equipment and components, supporting infrastructure and controls in place (floor drains, containment systems, and vigilant operating personnel), and location of the systems (floor level and proximity to high-value equipment and contents) will positively contribute to an effective program of water leak prevention and mitigation.

Following a comprehensive assessment, identification and labelling of equipment and critical isolation (shut-off) valves is essential. Implementation of an automated Preventive Maintenance (PM) system, for the organization, scheduling, and documentation of periodic water-based equipment inspections, maintenance, and repairs, will prove instrumental in facilitating the water-based leak prevention program.

The owner-operator's approach to their facilities' water-based system leak prevention program will consider base building systems and tenant premises-located systems. Inexpensive water filtration systems can be installed in hours and cause the most damage if left unchecked. While a tenant might be responsible for installing, inspecting, and maintaining their specific water-based systems, the proactive owner-operator's oversight and involvement will include:

1. Project drawing review
2. Requiring a standard of system and equipment quality
3. Enforcing installation of flood prevention devices
4. Overseeing the property's ongoing water-based systems inspection and maintenance program

In closing, even the owner-operator with the most comprehensive water-based systems leak prevention plan will be well-served by having water rupture emergency procedures in place. Proper planning will include the availability of emergency response personnel and restoration contractors, familiar with the building's water-based systems, should a water leak occur.