Data Centres – Escape of Water and Other Fluids

Data centres contain highly sensitive equipment and systems. Escape of water, fluid leakage and condensation incidents can cause significant damage to such equipment, the buildings as well as leading to downtime and business interruption losses.

This Loss Prevention Standard discusses the risk in more detail and provides guidance on preventing such incidents or mitigating the extent of damage.

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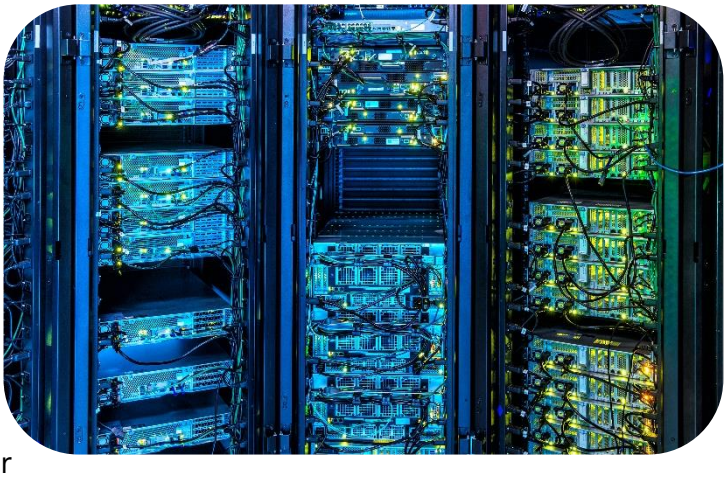
Introduction



Data centres house computer hardware and ancillary equipment for the processing, management, and storage of data, and other related systems including telecommunications.

The highly sensitive equipment used in data centres is particularly susceptible to liquid related damage, whether direct contact or corrosion via humidity and high atmospheric water content.

Incidents involving escape of water, or other fluids in data centres, can also cause significant damage to buildings, including but not limited to:

- Structural damage to load-bearing elements.
- Failure of, and damage to wall surfaces, ceilings and floors.
- Rot and mould.

Escape of water and other liquid incidents can require extensive cleaning and protracted periods of dehumidification, often occur in concealed areas, and may not be immediately discovered, potentially compounding the damage.

This is one in a series of Loss Prevention Standards which provide risk management guidance in respect of data centres. This document provides an overview of the main risks of liquid related damage along with guidance on reducing the potential for loss or damage. Other standards in this series are detailed later in this document.

Note: This document relates to escape of water incidents in data centres. It is not for on-site data processing and storage facilities, typically provided within business premises to support other trading activities. Please refer to the Aviva Loss Prevention Standard Server/Comms Rooms for further guidance on such facilities. This document focusses on Property loss prevention and related risk management guidance and is not intended to address Business Interruption or Liability exposures. The presumption is that all regulatory requirements, such as Fire Risk Assessments, have been met.

Understanding the Risks

A variety of liquids can be present in data centres and present damage risks. These include:

- **Coolants**. Chilled water used in cooling and ventilation equipment and heat exchangers. Glycol-based and non-conductive fluids can also be used in some coolant system components, e.g., cold location, immersion cooling tanks, and may have corrosive properties. Ammonia has been used as a cooling fluid but is not common.
- **Humidity**. Humidity in the data centre needs to be tightly controlled. Where humidity is too low the risks of electrostatic discharges increase. Where humidity is too high the risk of condensation and corrosion increase.
- **Condensate**. Condensate from return and drain lines can leak. Condensate drains can also become blocked causing them to back up and cause localised flooding.
- **Plumbing Systems**. Plumbing systems for bathrooms, kitchen areas, etc., can be permanently charged with water under pressure and can leak. Many plumbing systems now feature compression and push-fit joints and fittings which can be more prone to failure if not installed correctly or if pushed out of position or moved.
- **Guttering and Drainage**. Rainwater can enter buildings due to inadequate design, leaks, blockages and flooding events.
- **Fire Protection**. Sprinklers and other active fire protection systems utilise water and other liquid based suppression agents. These can be stored within cylinders, tanks and pipework. Whilst unexpected system activations are rare, simple actions can further reduce the risks of leakage and damage related losses.
- **Oils and Fuels**. Lubrication liquids for general maintenance, diesel for generators and sprinkler pumps.
- **Cleaning Chemicals**. Spillages or leaking receptacles can lead to fluid related damage.

Managing the Risks

Risk Assessment

Identifying all potential sources of water and fluids that are both present and which could arise within the data centre buildings, and regularly assessing the associated risks is critical. Areas to consider include:

- Identifying and logging internal and relevant external water services, cooling and ventilation systems, condensate drain lines, plumbing pipework, foul water systems, guttering and drainage systems and any associated attenuation fittings, tanks, joints and connectors; appliances such as water coolers, toilets, cisterns, sinks, basins, showers, outside taps plumbed into internal systems, etc.
- Reviewing the associated risks and hazards, these include but are not limited to:
  - ✓ Leaks.
  - ✓ Humidity and corrosion.
  - ✓ Physical damage.
- Assessments of overall condition and the ability to exercise valving and isolate the system, etc.
- Suitability of existing inspection and maintenance regimes.
- Availability of spares and replacement parts.
- Vulnerabilities, e.g., sensitive components and equipment, valuable assets or critical functions in close enough proximity or below.

- Suitability of protective measures such as lagging, trace heating and manual isolation devices.
- Extent and sufficiency of any leak detection and automatic isolation systems.
- Standard of assessment reporting, record keeping/documentation and systems for implementing corrective actions within appropriate timescales.
- Extent and suitability of existing emergency response procedures.
- Review procedures to ensure continual improvement and identification of changes, etc.

Important: In any multi-storey building, it is essential to assess what is located above, below, and adjacent to data halls, switch rooms, UPS rooms, control areas, and other critical spaces. It is equally important to identify any potential sneak paths, where a leak originating in one area can migrate into another space before becoming visible, potentially causing unexpected water damage or service disruption.

Risk Control Measures

Implementing risk control measures during the planning and design phases is critical to reduce the risk of escape of water/fluid incidents. Ensure:

- Wet services are eliminated from exposing business critical areas.
- Wet data centre services are not installed directly over data halls wherever possible.
- All wet services and/or the voids housing these systems, including wet cooling systems within the data centre are fitted with leak detection and flow monitoring equipment to detect leaks, pressure losses or unusual flow patterns, often indicative of escape of water events.
  - ✓ Leak detection points should be detailed on drawings and shared with relevant personnel and displayed in a prominent location (typically alongside fire alarm and sprinkler plans).
  - ✓ Ensure appropriate emergency response training is provided to relevant personnel to help ensure prompt isolation to water related events.

  Aviva Specialist Partners Leaksafe and Quensus can assist with such protections.
- Condensation should be minimised as far as practicable by identifying potential cold surfaces and ensuring they are adequately insulated.
- Humidity and airflow control equipment is installed and maintained in line with professional guidance following risk assessment, ensuring:
  - ✓ Sensors are installed to air intakes, return and supply paths and floor and ceiling voids.
  - ✓ Adequate redundancy has been factored into the system design.
  - ✓ Systems are adequately monitored to identify deviations promptly.
  - ✓ Humidity alarms are be configured to provide very prompt notification of rising or falling humidity immediate response by site maintenance teams.
- Any condensate-return pipework associated with air-cooling systems should be located away from data hall areas. This pipework should be inspected regularly to prevent blockages and related issues.
- Any pipework, both externally and within any internal unheated areas of the data centre buildings, are adequately protected against cold temperatures.
  - ✓ Trace heating and/or lagging should be installed for any exposed pipework.

- Sprinkler pipes, valves and water storage tanks, etc., are adequately protected against freezing.
  - ✓ Sprinkler contractors should be requested to inspect insulation and trace heating prior to the onset of winter and ensure the precautions remain adequate. Refer to the Aviva Loss Prevention Standard **Sprinkler Systems Winter Precautions** for further guidance.
  - ✓ Ensure any sprinkler heads that are vulnerable to impact or other accidental damage are adequately protected.
- Liquid storage vessels are located or stored external to the data centre, and where necessary bunded to ensure 110% of the contents would be captured in the event of failure or damage resulting in discharge or diverted to a safe zone remote to the data centre buildings.
- Bathrooms or other wet rooms are not located directly over or adjacent to data halls, or where escaping water could track down into the facility.
  - ✓ Bathrooms are recommended at ground levels only and should be fitted with appropriate drainage so as to prevent water build up in the event of escape or leaks.
  - ✓ Consider the use of timers linked to solenoid valves to prevent water being held within plumbing systems until needed.
  - ✓ Non-return/backwater valves should also be installed to foul water drainage systems at ground and basement levels.
  - ✓ Copper pipes embedded in concrete should be fitted with protected sleeves to prevent corrosion.
- Drainage systems including guttering, interceptor and attenuation tanks, non-return valves, etc., are correctly specified and consider the benefits of building additional capacity into the designs to help remove rainwater water promptly during even the most severe wet weather.

Important: Roof based water attenuation systems should not be installed on data centre buildings given the vulnerability of data centre equipment to even minor water related exposures.

Management Controls

Suitable management controls will help to reduce the risk of escape of water occurring and limit the extent of any damage.

- Accurate and up to date drawings of the system(s) should be readily available and accessible, detailing the:
  - ✓ Layout, key stop and isolation valves or controls.
  - ✓ Drain lines and drain line isolation valves.
- Ensure all wet equipment piping and isolation valves are clearly labelled.
- Ensure all wet equipment, services and appliances are subject to formal servicing arrangements as recommended by Original Equipment Manufacturers or installers.
- Ensure all valves and isolating switches are exercised/tested at least monthly.
- Ensure liquid cooling agents and additives are suitable for environments housing sensitive equipment to minimise corrosion risks.

- Implement formal self-inspection programmes for all wet services, drainage systems, generator fuel systems, pipework and equipment and associated equipment and services. This needs to include condensate piping systems, floor and ceiling voids as appropriate.
  - ✓ The frequency of such inspections should be based on risk assessment with daily, weekly and monthly checks undertaken based on criticality and vulnerability of equipment and components.
  - ✓ These should identify leaks, corrosion, discolouration, condensation, airflow or humidity issues, etc., as well the correct performance of any monitoring, reporting and alarm systems.
  - ✓ Ensure persons carrying out such inspections are appropriately trained and authorised to request remedial actions.
  - ✓ This should include any ceiling or flood voids.
  - ✓ Ensure any remedial actions identified are undertaken promptly.
  - ✓ Ensure generator fuel supplies, pipework, valves, seals, etc., and containment bunding for evidence of leaks, etc.
- Implement a formal Emergency Response and Recovery Plan for any water, condensation or humidity related event.
  - ✓ Include relevant emergency contact numbers for maintenance workers, key contractors, tenants/service users, etc.
  - ✓ Provide an incident response pack providing the Emergency Response and Recovery Plan, water mains/pipework layout of the building, locations of isolation valves and contact details for emergency staff/contractors who can respond to any incident.
- Ensure occupants and responsible persons at the premises receive regular training/refresher training on the water related exposures and key risk and management controls.
- The storage of any liquid agents, such as cleaning materials, fuels, etc. should be prohibited from within a data hall and adjacent, if there is a possibility of leak and ingress.
  - ✓ Liquids should be stored in a dedicated area, with bunding or other containment devices to collect any accidental spillages and/or leaking liquids. .

Refer to Aviva Loss Prevention Standards **Self-Inspections**, **Maintenance Regimes**, and **Managing Contractors – Property** for further guidance.

Specialist Partner Solutions

Aviva Risk Management Solutions can offer access to a wide range of risk management products and services at preferential rates via our network of Specialist Partners.

- Leak detection and prevention - Leaksafe
- Leak detection and prevention - Quensus
- Thermal Imaging Cameras and PAT Testing Equipment - Pass

For more information please visit: Aviva Risk Management Solutions – Specialist Partners

Sources and Useful Links

- Aviva Escape of Water Risk Management Guidance
- Escape of Water Prevention and Management on Construction Sites
- BS EN 806 - Specifications for installations inside buildings conveying water for human consumption
- BS 8558 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806

Note: Whilst UK standards and legislation are referenced in this document, other international standards and legislation should be referenced where applicable.

Additional Information

Relevant Aviva Loss Prevention Standards include:

- **Data Centres - Planning and Design**
- **Data Centres - Construction**
- **Data Centres -Detection and Fire Protection**
- **Data Centres - Cooling and Ventilation**
- **Data Centres - Fire and Smoke Resilience**
- **Escape of Water and Other Fluids**
- **Escape of Water on Construction Sites**
- **Escape of Water - Installation and Maintenance**
- **Escape of Water - 10 Top Tips**
- **Escape of Water - Responding to Incidents**
- **Escape of Water - Water Management Planning**
- **Work on Wet Systems**
- **Self-Inspections**
- **Maintenance Regimes**
- **Managing Contractors - Property**
- **Weather-Related Property Damage**
- **Wind and Windstorm - Property**
- **Sprinkler Systems Winter Precautions**

To find out more, please visit Aviva Risk Management Solutions **or speak to one of our advisors.**

Email us at riskadvice@aviva.com or call 0345 366 6666.*

*The cost of calls to 03 prefixed numbers are charged at national call rates (charges may vary dependent on your network provider) and are usually included in inclusive minute plans from landlines and mobiles. For our joint protection telephone calls may be recorded and/or monitored.

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