

Data Centres – Construction

Data centres are highly engineered buildings that are exposed to a number of hazards and risks, many of which are impacted by the management of the construction works

This Loss Prevention Standard discusses these risks in more detail and provides guidance on constructing data centres to help prevent losses and mitigate damage events.

Data Centres – Construction

Introduction

Data centres are mission-critical facilities whose construction brings unique challenges, particularly around fire safety, resilience and business continuity. While the buildings are often simple in structure, they contain complex, sensitive and high-value mechanical and electrical systems representing a high proportion of the overall project cost.



Data centres are highly sensitive to both fire and escape of water incidents, with the greatest risks occurring towards the end of the project during testing and commissioning, when most of the project's value is already installed. Gaps in oversight and site control can be of concern with multiple contractors often operating at the same site under separate contracts, which can negatively impact work quality and increase the potential for defects and loss incidents.

This Loss Prevention Standard is one in a series of documents on data centres and sets out Aviva's minimum expectations for managing these risks during the construction, fit out, and testing and commissioning phases of data centre projects.

Client and Project Management

- The Client should have extensive experience in data centre project development, otherwise should consider hiring a project manager or development partner.
- Appoint a Principal Contractor with demonstrable experience of data centre construction and commissioning.
- A single Principal Contractor should be appointed to have control of the site and the risk management processes.
 - ✓ Data centres will often have multiple contractors on site at once, sometimes with different clients if the data centre is to be fitted out by the tenant.
 - ✓ To reduce the risks, one party should maintain overall control of the site, including issuing permits to work, so that activities and risks are coordinated.
- Establish a formal Construction Risk Management Plan.

Refer to the Aviva Loss Prevention Standard **Delivering Successful Projects** for further guidance.

Programme

- Ensure sufficient time is allowed to deliver the project to meet all stakeholder needs.
 - ✓ The rapid increase in demand for data centres and pressure to deliver projects quickly can result in poor planning and build quality.
- Data centre buildings should be weather-tight before fit-out and installation of sensitive or vulnerable equipment, any site drainage and flood risk mitigations installed.
- Fitting out of the data halls, if by the tenant/others, should be scheduled after construction is completed. If concurrent construction/fit out is unavoidable, the fit-out contractor should be subcontracted to the principal contractor and adhere to their site rules and processes.

Work Methods

Lifting

Cranes may be necessary to lift heavy materials or equipment. Guidance on the use of cranes, including the Lifting Management Plan, contractor competency and risk management can be found in the Aviva Loss Prevention Standard **Cranes**.

Temporary Works

Temporary works are generally not extensive on data centre projects because of the tendency for off-site construction; however, guidance is provided in the Aviva Loss Prevention Standard **Temporary Works** and **Temporary Works - Scaffolding**.

Quality

Data centres employ a large number of repeatable components, meaning a design flaw could have a major knock-on impact on the operation of the infrastructure. Long lead-times and high demand for data centre equipment may result in delays to business operations.

- Use proven technologies from suppliers with previous experience.
 - ✓ If new technologies are employed, these should be deployed first at a smaller scale and progressively increased.
- Modular solutions exist for hot aisle containment, cooling systems and central utility plants (CUPs) which can improve quality, but a stringent assurance regime needs to be in place and the components stored appropriately whilst awaiting installation.
- Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT) are required for all major components.

Fire

Guidance on managing fire risks on construction projects can be found in [The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation](#).

Refer to other Aviva Loss Prevention Standards in this series for specific fire related guidance, including:

- **Data Centres - Fire and Smoke Resilience**
- **Data Centres - Fire Detection and Protection**
- **Data Centres - Planning and Design**

Hot Works. Hot work operations present a significant fire risk on construction projects. Refer to the Aviva Loss Prevention Standard **Hot Work Operations** for further guidance.

Temporary Fire Detection. Fire detection systems and alarms should be installed; wireless temporary detection systems should be used where permanent cabling is not feasible.

- Temporary alarms should be connected to a 24/7 monitored station or security room and include all temporary accommodation, storage units and off-site facilities.

Housekeeping. Ensure robust housekeeping management systems are in place to include:

- Daily waste removal from the project and scaffolding.
- No overnight storage of large combustible loads inside the structure.
- Segregated, external skips at least 10 metres from the building envelope.
- Prohibit storage of combustible materials and waste between structures that could create a path for fire to spread.

Protection of High-Value Equipment. As critical IT, UPS, switchgear, and cooling systems arrive on site early, they should be protected from physical and environmental damage. All such equipment should be delivered to site as needed to minimise temporary storage and should be:

- Stored in protected internal areas only after the building is weather-tight.
- Raised above slab level to avoid flood or other water damage.
- Stored at least 10 metres from any areas where hot works are undertaken.
- Protected by approved flame-retardant coverings.

Note: In the United Kingdom these are materials compliant with **LPS 1207: Requirements for the LPCB approval and listing for fire performance of temporary protective covering materials for use in the interior of buildings.**

- Stored in areas where fire detection and/or fire protection systems have been installed.

Electrical Systems - Energisation and Testing Risks

HV/LV Energisation. Energisation should follow a documented safe energisation protocol including:

- Area isolation and restricted access.
- Verification of correct earthing.
- Use of thermal cameras to detect unusual heat patterns.

UPS and BBUs. Lithium-ion batteries are commonly used in UPS and BBUs and present a fire and explosion risk that can cause significant damage.

- Battery rooms must be fully completed, ventilated, and commissioned before battery delivery.
- Strict controls for handling and installing lithium-ion batteries:
 - ✓ No smoking zones and ignition control.
 - ✓ Temporary fire detection and gas monitoring.
- Commissioning to follow Original Equipment Manufacturer (OEM) safety procedures.
- Emergency response arrangements to be formalised.

Refer to the Aviva Loss Prevention Standards **Data Centres - Planning and Design** for further guidance.

Roof Mounted Solar Photovoltaic (PV) Installations. Where roof mounted solar photovoltaic systems are planned, refer to the Aviva Loss Prevention Standards:

- **Roof Mounted Photovoltaic Solar Panel Systems - Planning and Design**
- **Roof Mounted Photovoltaic Solar Panel Systems - Installation**

Battery Energy Storage Systems (BESS). BESS may be incorporated into the data centre energy plan. Guidance on any associated Battery Energy Storage Systems (BESS) can be found in:

- **Grid-Scale Battery Energy Storage Systems - Construction**
- **Grid-Scale Battery Energy Storage Systems - General Considerations**
- **Small Scale Battery Energy Storage Systems**

Escape of Water and Water Ingress

Water damage is a critical risk in data centre construction.

- Roof integrity must be verified before installation of sensitive equipment.
- Temporary rainwater drainage should be maintained during roof works.
- Pipe pressure tests should be supervised and logged; drip trays installed beneath overhead pipework during construction.
- Flow monitoring and automatic shut-off devices should be fitted to all temporary and permanent water supplies, including any liquid cooling for the server racks.
- Fire suppression systems should not be made operational until construction works are complete to prevent accidental activation.
- If the buildings are to include basement levels, refer to the Aviva Loss Prevention Standard **Construction Sites and Latent Defects - Basement Waterproofing** for specific guidance on waterproofing.

The Aviva Loss Prevention Standards **Data Centres - Escape of Water and Other Fluids** provides further guidance.

Natural Hazards

Construction materials and equipment can be exposed to adverse weather conditions. Guidance is provided in the Aviva Loss Prevention Standards:

- **Data Centres - Planning and Design**
- **Flood Guidance and Mitigation (Global)**
- **Flood Guidance and Mitigation (UK)**
- **Weather-Related Property Damage**
- **Lightning Protection**

Important: Lightning protection should be installed and verified as construction progresses.

Site Security

Given the high value of data centre equipment and components, data centre construction sites can be targeted by thieves, as well as potential targets for protesters and vandalism.

Ensure:

- Site access points are controlled with turnstiles and a sign-in management system.
- Perimeter fencing and continuously monitored Video Surveillance Systems (VSS) are in place.
- Segregated contractor/visitor routes are provided to protect installed equipment.
- Off-site storage security is commensurate with on-site storage arrangements.

Refer to the Aviva Loss Prevention Standard **Video Surveillance Systems - Introduction** for further guidance.

Testing and Commissioning

Ensure an agreed and defined commissioning process, such as the ASHRAE **Guideline 0 The Commissioning Process**, from pre-design through to completion.

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- Construction Site Security - [VPS](#)

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Sources and Useful Links

- [Requirements for the LPCB approval and listing for fire performance of temporary protective covering materials for use in the interior of buildings](#)
- [The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation](#)
- [LPS 1531: Issue 1.2 Requirements for the LPCB approval and listing of companies installing or applying passive fire protection products.](#)
- [EN 13501-1 Fire classification of Construction Products and Building Elements - Classification Using Data from Reaction to Fire Tests.](#)
- [BS EN 13501-2:2016 - Fire classification of construction products and building elements - Classification using data from fire resistance tests, excluding ventilation services](#)
- [LPS1208: LPCB Fire Resistance Requirements for Elements of Construction Used to Provide Compartmentation](#)
- [LPS 1500: Requirements for the LPCB Approval and Listing of Companies Installing Construction Elements Used to Provide Compartmentation in Buildings](#)

- [ASTM E2924-14\(2020\) Standard Practice for Intumescent Coatings](#)
- [The Joint Code of Practice on the Prevention and Management of Escape of Water on Construction Sites and Buildings Undergoing Renovation](#)

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 - Cooling and Environmental Controls**
- **Data Centres - Escape of Water and Other Fluids**
- **Data Centres - Fire Detection and Protection**
- **Data Centres - 15 Top Tips**
- **Data Centres - Planning and Design**
- **Data Centres - Fire and Smoke Resilience**
- **Delivering Successful Projects**
- **Temporary Works**
- **Temporary Works - Scaffolding**
- **Cranes**
- **Hot Work Operations**
- **Fire Compartmentation**
- **Fire Doors, Shutters, Dampers and Collars**
- **Construction Sites and Latent Defects - Basement Waterproofing**
- **Arson Prevention**
- **Lightning Protection**
- **Data Cabling**
- **Flood Guidance and Mitigation Global**
- **UK Flood Guidance and Mitigation**
- **Escape of Water on Construction Sites**
- **Roof Mounted Photovoltaic Solar Panel Systems - Planning and Design**
- **Roof Mounted Photovoltaic Solar Panel Systems - Installation**
- **Grid-Scale Battery Energy Storage Systems - Construction**
- **Grid-Scale Battery Energy Storage Systems - General Considerations**
- **Small Scale Battery Energy Storage Systems**
- **Planning a Battery Energy Storage System - 12 Top Tips**

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.*

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