Loss Prevention Standards – Asset Classes

Data Cabling

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Data cabling is vital for IT systems, but it can pose a significant fire hazard. Careful selection, installation and maintenance of data cabling can reduce the risk it represents.

Data Cabling

Introduction

Advances in computing and communication have multiplied the amount of cabling installed in plenum spaces such as ductwork, ceilings, risers and underfloor in commercial buildings. Over time, this cabling adds to the building fire load. Proper precautions must be taken to protect an organisation's people and property.

Identifying Hazards

Volume of cables

New cables are commonly installed alongside existing redundant or abandoned cables that are not cost effective to remove. Communications, data and security cables continue to be laid down and re-routed as existing systems are upgraded, leading to a build-up of large volumes of cables of different ages and materials.

Cable material

Electrical performance requirements are usually given priority when selecting cables, and fire rating factors that go beyond minimum standards are not often given due consideration. As a result, fires can spread rapidly throughout buildings, fuelled by the cables and following their routing.

This can pose a serious risk, as cables contribute significant fuel load to a fire and release toxic gases and particulates. Penetrations in fire compartments can result in rapid spread of smoke and fire throughout the building. Cable fire temperatures in voids can sometimes exceed 1500ºC, producing particulates that can cause further mini explosions.

A typical four-pair unshielded twisted-pair (UTP) cable is designed for use within the hidden plenum space of dropped ceilings which handle air flow.

Commonly used materials for cable insulation include:

- Polyethylene (PE)
- Polyvinylchloride (PVC)
- Fluorinated ethylene propylene (FEP)

Whilst all three offer excellent electrical insulation properties, PE is highly combustible and generates dense smoke. PVC, while still combustible, offers better fire performance although it has poor flexibility, but the addition of plasticisers will increase combustibility. Of the three, FEP gives the most favourable result in respect of fuel load and smoke generation.

Limited combustible cables (LCC) are available which improve the fuel load, combustibility and smoke generation of these materials. They must pass rigorous tests including degradation due to temperature aging, humidity and jacket slitting.

Low Smoke Zero Halogen (LSZH) cables may generate less smoke when on fire, but they can rapidly burn and promote the spread of smoke. Communications Multipurpose Plenum (CMP) rated cables do resist and restrict fire growth, although they are generally more expensive.

Fire rated cables are classified as either 'fire resistant' or 'fire retardant'. Fire resistant cables are designed to maintain circuit integrity, while fire retardant cables limit generation and spread of fire and smoke. However, they are still combustible, meaning that after a given time, they will add fuel to a fire situation.

Voids, compartmentation and cable runs

Many voids carrying cables are large and without compartmentation. Even when cavity barriers are installed, they are often breached to allow the passage of new cables or other services and imperfectly resealed. Large voids and cavities have oxygen readily available to support combustion and a greater volume of cabling, resulting in a corresponding increase in the fire load. The potential for spread through concealed spaces and penetrations between fire compartments risks human life and property damage. A small localised fire may quickly spread, leading to serious implications and interruptions in the business.

The physical arrangements of the cable runs can also increase the fire risk:

- Power cables are an ignition source and data cables can be a large fuel load, so both should not be located in the same cable tray run or bundle
- Due to the physics of fire, vertical cable runs promote fire spread quicker than horizontal cable runs
- Holding cable bundles together for longer reduces the available surface area for the fire to spread and grow on. Once a cable bundle splits and each individual cable is available for the fire, the fire grows quicker. Metal cable ties have better integrity, making them superior to plastic in fire performance

Controlling the Hazards

Fire resistant cables

Materials used in the construction of any building should not make a significant contribution to its fire load, so the type of cables used should be able to resist fire or be protected from fire. Fire resistant cables that have been tested in accordance with an internationally recognised standard and approved by an independent third-party organisation – such as the Loss Prevention Certification Board (LPCB) or UL LLC (formerly Underwriters Laboratories) – have passed the most stringent large scale fire tests.

Fire safety classifications

From 1 July 2017, the new Construction Products Regulation (CPR) fire safety classifications became mandatory, requiring all cabling sold through the European Economic Area (EEA) to carry a CE mark and Declaration of Performance Certificate (covered by European Standard EN 50575). Whereas previous regulations only classified cables on flame spread, there are now seven main classifications of fire performance, including heat release and flame spread, plus three sub-classifications covering smoke production, flaming droplets and production of acidic gases.

The new cable classifications are Aca, B1ca, B2ca, Cca, Dca, Eca, and Fca. This is a scale of performance, where Aca is non-combustible and Fca is a cable that burns completely. Most cables used in buildings will have a minimum performance requirement of Eca, although a higher rating is recommended. Classes B1ca, B2ca (maximum performance against fire), and Cca, Dca (basic level of safety) also have sub-classes:

Opacity of smoke emitted – s	
s1	Little production and slow propagation of smoke
s1a	S1 with visibility over 80%
s1b	S1 with visibility over 60%
s2	Intermediate values of production and propagation of smoke
s3	Neither s1 or s2

Droplets released in combustion – d	
d0	No fall of droplets or flamed particles
d1	Fall of droplets and flamed particles that persist for less than ten seconds
d2	Neither d0 or d1

Smoke acidity/toxicity – a	
a1	Low acidity
a2	Intermediate values of acid
a3	Neither a1 or a2

A full Reaction to Fire Code covers Class + Smoke + Droplets + Acidity. For example, a high-performance cable that has smoke emission with 80% visibility, no droplets or flamed particles, and low acidity smoke, would be referenced as B2ca-s1a-d0-a1.

On 30 November 2017, British Standards issued BS 6701:2016+A1:2017, an amendment to the 'Telecommunications Equipment and Telecommunications Cabling – Specification for installation, operation and maintenance' standard, which states the minimum acceptable Euro class cable is Cca–s1b-d1-a1. BS 7671 'Requirements for Electrical Installations', published on the same day, gives a minimum acceptable Euro class cable installed within a non-flame propagating containment system (a stainless steel tube with fire stop at each end) shall be Cca–s1b-d2-a2. However, Aviva's preference would be for B2ca-s1a-d0-a1.

Removal of cables

Following concerns for life safety, the National Electrical Code (NEC) specifically called for the removal of abandoned cables to reduce the fire load and toxic gasses in fires. When alterations or additions are made to an installation, all abandoned or redundant cables should be removed wherever possible, to reduce the fire load.

Fire Stopping

Compartmentation

Section 17 of the Fire Protection Association (FPA) Design Guide core document Protection of Openings and Service Penetrations from Fire recognises the potential fire risk in hidden voids. Buildings are divided into fire resistant compartments, each of which must be capable of withstanding a fire for a minimum stated period. These compartments are penetrated by openings for doors, ducting, pipes and cables, etc., reducing the fire-resistant capabilities and allowing fire, smoke and hot gases to spread rapidly from one compartment to another and throughout the building.

To maintain the integrity of a compartment, the openings must be fire stopped to the minimum allowed fire rating and when penetrating a compartment wall, the fire stopping must be fit for purpose. Cavity barriers should be designed, installed and maintained at intervals of not more than 20 metres in any direction, and must have a minimum fire resistance of 30 minutes integrity and insulation. It is recommended that ceilings have a fire resistance of 60 minutes integrity and insulation.

Fire detection

To ensure the highest level of property protection, an addressable remotely monitored automatic fire detection system should be installed within all areas, conforming to BS 5839 Part1:2017 Category P1. In some cases, an automatic fire suppression or extinguishing system should also be installed to protect cavities.

Management Procedures

Employers have a duty to protect employees and users of the building from fire. Prosecutions under this legislation carry a fine and up to 2 years imprisonment.

Fire separating elements

Approved Document B states that for a fire separating element to be effective, every opening in a fire rated element needs to be reinstated:

> *"Where a wiring system passes through elements of building construction such as floors, walls, roofs, ceilings, partitions or cavity barriers, the openings remaining after passage of the wiring systems shall be sealed according to the degree of fire resistance required of the element concerned."*
>
> *"Where a wiring system such as a conduit, cable ducting, cable trunking, busbar or busbar trunking penetrates an element of building construction having specified fire resistance, it shall be internally sealed so as to maintain the degree of fire resistance of the respective element as well as being externally sealed to maintain the required fire resistance."*

Responsible persons

In an existing building, the Regulatory Reform (Fire Safety) Order 2005 (in England and Wales) and the Fire (Scotland) Act 2005, requires every employer to appoint a 'Responsible Person' who will ensure their company complies with these regulations. Their responsibilities include identifying structural features that could promote the spread of fire, and to take steps to reduce the potential for rapid fire growth. Such features include ducts, flues, openings, combustible linings and other penetrations to the fabric of the building, which must be sealed.

Cabling safety

All cabling is expected to be clearly identified on all outlets and panels. For every 48-way panel, a 1U management bar should be installed. Velcro ties should be used to secure cables throughout the installation, and cable management socks are to be used in all cabinets. Manufacturer specifications should be met throughout, and all bend radii regulations should be met.

General Guidance

- Be aware of the increased fire load that cables can introduce into a building and assess the extent of the problem in your premises
- Remove obsolete cables
- Provide separate routes for power and communication cables
- Use approved cables, such as LPCB or UL LLC
- Provide fire resistant voids for cables
- Ensure hatches and doors into voids have an equivalent fire resistance as the void
- Provide cavity barriers and ensure that their integrity is maintained
- Consider providing automatic fire detection and/or extinguishment in cable voids, particularly for high risk areas such as computer suites and control rooms
- Keep records of products used, who supplied and installed them, and the location, date and time of installation
- Clearly identify fire stops, with instructions on resealing if penetrated
- Ensure cable contractors are aware of fire stops
- Enforce a Permit to Work scheme incorporating a formal review and approval process for cabling works, in addition to pre- and post-inspections of work areas, particularly where fire stopping may be breached

Checklist

A generic Data Cabling Checklist is presented in Appendix 1 which can be tailored to your own organisation.

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For more information please visit:

Aviva Risk Management Solutions – Specialist Partners

Sources and Useful Links

- NFPA 262: Standard Method of Test for Flame Travel and Smoke of Wires and Cables for use in Air-Handling Spaces
- Construction Products Regulation
- RedBookLive - Fire Rated Cables

Additional Information

Relevant Loss Prevention Standards include:

- Managing Change – Property
- Permit to Work Systems

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.*

*Calls may be recorded and/or monitored for our joint protection.

Appendix 1 – Data Cabling Checklist

Location	
Date	
Completed by (name and signature)	

	Data Cabling	Y/N	Comments
1.	Has a risk assessment for the site been completed that includes the exposures of the data cables?		
2.	Do you have drawings showing the layouts and routes of the data and power cabling?		
3.	Do you have drawings showing fire compartment walls? Does this identify doors, dampers, etc. and the fire resistance rating?		
4.	Do you know the nature/type of the data cabling in use?		
5.	Do you separate power and data cables from the same cable run/cable tray?		
6.	Are all cable penetrations through fire compartment walls appropriately fire stopped, including: • Floor voids? • Ceiling voids? Is this formally checked after every change? Is this formally checked annually?		
7.	Is cable management considered part of your Management of Change process?		
8.	Are obsolete or redundant cables removed when new cables are introduced?		

	Data Cabling Contd.	Y/N	Comments
9.	Do you understand what cable ties are being used and implications of using plastic vs metal (especially for vertical cable runs)?		
10.	Are appropriate fire breaks created in service risers, floor voids and ceiling/roof voids to prevent fire spread?		
11.	Where cabling is present, is an addressable automatic fire detection system in place in all voids and compartments? Are the addresses clear so you know if there is an issue in a void area?		
12.	Are all void areas where cabling is present maintained clean and included in regular housekeeping checks? For floors, are appropriate floor tile pullers available?		
13.	Has a business interruption risk assessment considered the data cabling routes and the impact of the fire exposures to this? Can a small fire expose any important or critical cables?		
14.	Additional comments:		

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