

Technical Article

Water Ingress In Structured Cabling Systems

According to a recent report from the Energy Savings Trust* London's future as an international centre for trade and commerce is under threat from the risk of a major storm surge in the capital, which, it predicts could cause direct damage running to £20 billion. In the wider Thames region, some 150km² lies below high tide levels. In the country as a whole, £222 billion worth of assets, including one in 13 houses in the UK, is now at risk of flooding.

Despite these figures and wide publicity surrounding the issue of global warming and its highly visible effects on the UK climate in recent years, it is still the case that many businesses have not considered the effects of flooding on their IT systems. There is seldom a winter month passes when the Molex Premise Networks Technical Support department fails to get a call about the effect of water on the most vulnerable part of the system, the structured cabling infrastructure.

This article looks at the effects of water ingress on data cables and how different cables may be affected by flooding. It discusses the issues that the IT manager and cabling installer should be aware of regarding the possibility of flooding of the cabling system and what measures can be taken to prevent damage.

Effect on Electrical Performance

The ingress of water into the data cabling system can have a serious affect on its ability to support high bit rate data applications like Fast Ethernet and Gigabit Ethernet. In some cases, cables that are already near the link length limit (and therefore the attenuation budget) for the standard may fail after flooding. This is because when the cable gets wet, its dielectric performance is changed and this affects impedance and the related parameters of attenuation and return loss.

Cable Construction and Water Ingress

It is a common misunderstanding that PVC, the material used to coat standard data cable, is waterproof. It is not, it is hygroscopic. Standard Category 5e and Category 6 cables have a PVC coating and are designed for indoor use and are not suitable for use in wet conditions.

Cables designed for use outdoors where moisture or water is present in any quantity incorporate waterproofing measures such as barrier tapes and gel filling which are costly and sometimes degrade electrical performance. It is also worth noting that many of these waterproofing gels are petroleum based and are therefore unsuitable for use indoors (other than to a demarcation point) as they represent a fire risk. Indeed the distance such cables can be run within a building is usually limited by national standards.

Further, the construction of the cable affects water ingress. Low smoke zero halogen (LSOH) cables tend to have a lower resistance to water ingress because the sheathing materials used are even more hygroscopic than PVC. FTP cables with a longitudinal foil screen have better resistance to water

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ingress as the screening material acts like a water barrier tape. However, it should be noted that FTP is still not 'waterproof'.

Severity of Exposure

The effect of water ingress is also dependent on where the water has been and for how long. Short term exposure of the middle of a PVC cable run to a small quantity of clean water is unlikely to have any long term deleterious effect. On the other hand, if LSOH cables lying directly on a concrete floor slab with no containment or protection are submerged for a week, then the risk of damage is much greater. Water containing dissolved contaminants from, say, a dusty screed floor also represents a greater risk.

An even greater threat than the effects of water ingress through the cable sheath is posed by the open end of a cable being exposed to water. The tightly twisted pairs inside a data cable encourage a capillary action which can draw water significant distances into the cable, destroying the electrical characteristics. Cable affected in this way will nearly always have to be replaced.

Prevention is Better Than Cure

Replacing a wet cabling system is time consuming, expensive and disruptive. Preventing cables getting wet is obviously the best policy. Ideally, businesses located in high risk areas should consider the threat of flooding at network design stage, but even for existing networks there are measures which can be taken.

If it is possible, suspend cables in containment in the ceiling void. This will be less susceptible to flooding than under floor wiring. Consider containment: Cable baskets offer better draining in the event of cables getting wet, but closed containment provides better protection from small amounts of water.

Where cables have to be routed through the floor void, then position the cable tray or basket as high up away from the slab as is possible within the height constraints of the raised floor.

Because small floods caused by something as mundane as a burst water pipe can be every bit as damaging as a large scale river flooding, it makes sense to keep wet services away from large concentrations of cable, for example around telecommunications rooms and / or equipment rooms. Don't run water pipes through these communications spaces and don't locate kitchens or toilets nearby. Avoid placing telecommunications rooms or equipment rooms in basements - particularly when adjacent to rivers!

If segregation is not possible then consider feeding racks or cabinets from above, and / or building bund walls to contain flood water within less sensitive areas.

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Conclusion

In the event that cables do get wet, the action required depends on the number of cables affected, the balance of replacement cost and the risk to the business of not replacing the cables.

Cables in which water has entered via capillary action through the open end should always be replaced. Cables which have suffered severe water ingress through the sheath may also need to be replaced. Have the network thoroughly tested and take advice from your manufacturer or a trusted installer. If there are any doubts then replace the cables.

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