

## Fiber installation and security in case of fire

Three factors affect the (personal) security in a fire:

1. Fire propagation class (specify how easy material ignites and burns)
2. Smoke emission (is it possible to see through the smoke?)
3. Gases (how toxic gases are?)

The Swedish procurement of cables and ducting pipes for indoor use often only indicates that halogen free materials is preferred. The purchaser will probably not know that he has not made demands on one of the above three factors. The material may then burn and give much smoke, and gases may be toxic as long as they do not contain halogens. Sometimes you will see that the customer wants so called LSZH (LSOH) material and then the customer has placed certain requirements on the factor smoke, while the other two factors is more or less without the requirement. Reasonably one should require all three factors.

### Fire propagation class

Among the three factors fire propagation class is the most important. It depends partly on the material's total energy content and partly on how easy it ignites and burn. Materials with high energy content, such as various plastics, can be given relatively good fire



properties by the addition of various substances. The most common additives are halogens and / or salts which h give off water when heated. In Europe, customers often demands that materials shall be free of halogens and that leaves only the addition of salts that produce water. The vertical cable shafts through building should be imposed on higher fire propagation class than for single cable that runs horizontally. The Swedish standard SS4241475 divides the (power) wires in 4 fire propagation classes for inflammability and fire propagation. The classes named F1, F2, F3 and F4, where F1 has the lowest requirements (no need at all) and F4 maximum requirements. In order to

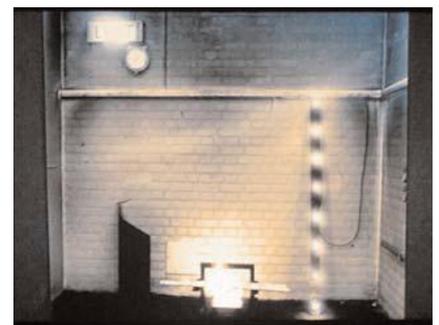
achieve class F2 cables are tested according to IEC60332-1, which is an inflammability test with small gas flame on a vertically hanging cable. Class F3 has no counterpart in international standardization, but is a slightly higher fire rating than F2. The Swedish fire class F4 tested according to IEC60332-3. The test is performed on a larger amount of cables and thus not only on a single cable. Finally, in the United States there is an even higher Fire propagation class, which lacks counterpart in Swedish and European Standardization. It's called "plenary" and the test is performed in a so-called Steiner Tunnel according to the test method UL910.



PVC after six minutes



PVC after six minutes



Low smoke material after six minutes

## Smoke emission

Second most important factor is how much smoke is emitted at the fire. Smoke in this sense is mainly carbon particles, spread in the air and reduces sight. If a fire starts it is essential that people can find a way out as quickly as possible. Some plastics give off so much smoke that visibility in a room is close to zero in just a minute. Smoke emission is usually tested in a cube with 3 m side according to standard IEC61034. The amount of smoke is measured by measuring how much light that is let through. Plastic materials with low smoke emission are usually called LS (Low Smoke).

## Gases

The last and perhaps least important factor is for flue gas toxicity. To discuss if one of flue gas is slightly more toxic than the other is to shift the focus from the main issue. No fumes are healthy and of the most poisonous gases is carbon monoxide, which is always present at all fires. The principle is that all people should leave the building as quickly as possible in case of fire. First after satisfying requirements has been set for the first two factors should demands on concentration of toxicity be considered.

Swedish fire authorities need access to information on what materials that are used to assess the risks associated with firefighting personnel exposed to a fire. When customers specify that a material should be halogen-free, so do they partly because the halogens produce toxic gases in case of fire, and partly because that gases are corrosive. Metal parts of the building can corrode and make the building more difficult to recover after a fire. Halogen-free is usually described ZH (Zero Halogen) or OH (0 Halogen). Halogen is no guarantee of non-toxicity.

## Regulations

Fiber cables and ducting tubes, used indoors, should meet certain minimum requirements in case of a fire. I write should be as crystal clear Swedish rules are lacking today. If it applied to electric cables, so had Wiring regulations been in force and material would had to satisfy a minimum fire propagation class F2, but since the cables are leading light instead of electricity, the rules are not mandatory. Instead you have to go to the National Board of Housing's more general rules on how to build houses and the material you may use. The base is legislation relating to "Safety in event of fire".

The industry has still generally interpreted the provisions so that the same fire regulations should apply for fiber installations in a building as for electrical installations.

## Summary

Cables and ducting tubes without fire classification (i.e. for outdoor use) should not be used indoors more than a few meters and they will not go through the barrier between the two fire cells. Cables and ducting tubes, used indoors should at least meet fire class F2 (IEC60332-A). All materials indoors should be of type Low Smoke and should give as little toxic gases as possible at a fire. Finally, a serious supplier should be able to produce test reports by independent, well-known testing institutions of approved fire test.