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TESTS APPLIED TO SMOKE DAMPERS AND CLASSIFICATION CRITERIA OF SMOKE DAMPERS

Although the importance given to fire compartments and walls has a long history, the damage caused by smoke during a fire has been understood relatively recently and countermeasures have begun to be taken. It has been seen in many statistics that the smoke that occurs at lower temperatures in the early stages of the fire progresses through the ventilation ducts and causes loss of life and property in many different parts of the buildings. Carbon monoxide, a particularly odorless but highly toxic gas, could even affect people far from the fire scene. The legal limit is 50 ppm of carbon monoxide in Turkey. From the 5th minute of the fire, carbon monoxide levels rise above 3300 ppm levels. When exposed to a concentration of 3300 ppm carbon monoxide, death occurs within an hour. Figure 1.1 shows the effects of carbon monoxide concentration on the body. [1]

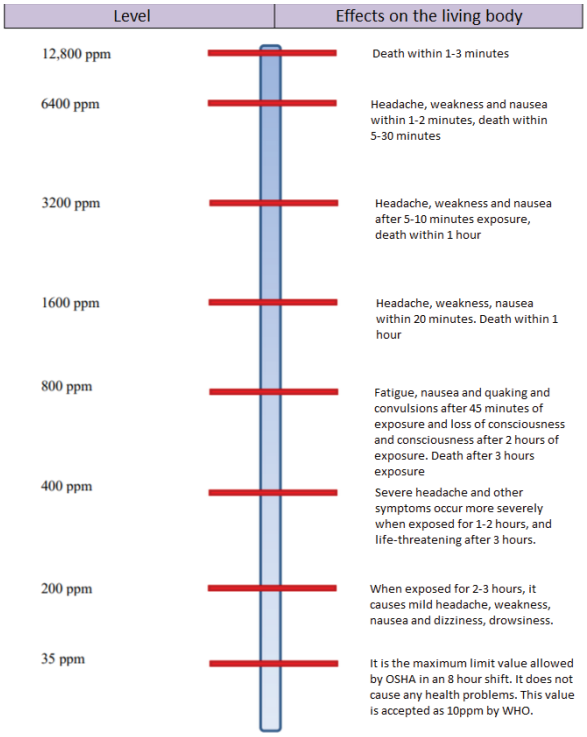

Figure 1.1 effects of carbon monoxide on the body

The accident that took place in Las Vegas in 1980 and in which 85 people died, revealed our need for smoke dampers. [2]. Because in that accident, the fire occurred on the first floors, but the majority of those who lost their lives were between the

14th and 24th floors. As mentioned above, the smoke that emerged after the fire and especially the movement of carbon monoxide in the building caused people to lose their lives despite being away from the fire.

As a result of this accident, the concept of dividing structures into compartments has started around the world. According to this concept, if a fire breaks out in one part of the building, the flames and smoke will be trapped in that compartment, thus protecting the life safety of the people in the other compartments.

When the heat sensitive triggering mechanisms of conventional fire dampers were not sufficient against this danger known as cold smoke, dampers that can be turned off with a signal from smoke detectors came to the fore. Motor fire dampers were produced for this. These dampers are also used in fire compartment passages like fire dampers and can isolate the compartment at a much earlier stage than a fire damper with the signal from the smoke detection system.

Smoke dampers, which are so critical in terms of life safety, must be produced and applied according to certain standards. In this context, smoke dampers are tested according to EN 1366-10 Smoke Dampers Test Standard.

In this test;

- Subjected to the fire resistance and / or high temperature test applied to EN1366-2 / Fire Dampers.
- On / Off Test is performed.
- Subjected to leakage test.

If we explain the tests carried out under the EN 1366-10 standard;

High Temperature Test

The primary task of smoke dampers is to ensure life safety in case of fire. In case of a possible fire, it is inevitable to be exposed to a certain temperature compared to the proximity to the area where the fire originated. Therefore, it is important that it functions under these temperatures. With the high temperature test, smoke dampers are exposed to 300 or 600 degrees Celsius according to their classification. This test period is determined as 90 or 120 minutes according to its classification. During testing, it is expected that the smoke damper will maintain its integrity and will not leak smoke above the limits.

Opening/Closing Test

As mentioned a lot, smoke dampers are systems developed to protect human health in emergency situations. Therefore, when an emergency occurs, it is expected to work in all conditions. During this test, the motor is operated 15% below and 10% above the nominal power supply value. The total time of opening and closing during one complete cycle cannot exceed 120 seconds. Thus, it is expected to fulfill its function completely even in cases where there is fluctuation in the power coming from the source due to an emergency. Again, according to the classification within the scope of this test, the smoke dampers are opened and closed 300 or 10,000 times.

Leakage Test

Actually, the biggest task of smoke dampers is to trap smoke and toxic gases in an area or to evacuate them from the building without affecting safe areas. In this context, the sealing properties of smoke dampers are the most important features. The amount of air leaked from the smoke damper in the closed position cannot exceed 200 m^3/h m^2. This is primarily the requirement of a smoke damper. In addition, it is necessary to operate under different pressure values due to the atmospheric conditions of the areas where smoke dampers are applied or the working pressure of the ventilation systems they are used together. Again, according to their classification, they are tested according to the pressure values of 500, 1000 and 1500 Pascal. It is expected to meet the impermeability criteria under these applied pressure values.

As a result, after some painful events have happened throughout the history of humanity, precautions have been taken against these events. It is very important for everyone to develop systems that will ensure our safety even in the event of a very strong disaster such as fire. It is also very important to test and classify these systems in the most severe conditions in terms of security. In this way, hundreds of people's lives can be saved as a result of a fire in a building with certified smoke damper.

As a result of these tests, they have classifications to EN 13501-4 standard. As an example, a damper classification is made as $E_{600}120\ (V_{ed}\ i \longleftrightarrow o)S_{1000}C_{300}\ AA\ single$ The symbols shown here are defined below.

- E (Integrity) Criterion : 300°C, 600°C or E90/120
- I (Insulation Criteria) : EI 90/120 (not required for 300 and 600°C)
- S (Leakage Criteria) : The amount of air escaping from the damper in the closed position cannot exceed 200 m^3/h m^2. The values given as sub-index show the pressure value that the sealing criterion meets. The dampers must meet the tightness criteria from negative pressure classes P_1 (500 Pa), P_2 (1000 Pa), P_3 (1500 Pa) to 500 Pa positive pressure classes. It should also fulfill the function of opening and closing when these pressure values are applied..
- Ved/Vew/Vewd – Hod/How/Hodw : It specifies the mounting direction of the dampers and the properties of the structure to be mounte. And classification dampers can be mounted vertically, while those with Ho classification can be mounted horizontally. The subscript “d” signifies the duct and the subscript “w” indicates the wall mountability. If two subscripts are together, it is stated that it is suitable for two structures. According to the Ved classification given in the example, the smoke damper with this certificate is suitable for vertical duct installation.

- i->o, i<-o, i<->o : It shows that the dampers are suitable for air flow in one direction or both directions.
- C (Opening and Closing) : It shows resistance to 300 times, 10,000 times of opening and closing tests.
- AA/MA (Start Command) : Smoke dampers can be operated manually or they can work automatically with the information they receive from the sensors. Smoke dampers with AA classification have an automatic start feature. Those with MA classification have the ability to work manually.
- Single/Multi : Smoke dampers can be used in a compartment alone or with other fire elements. Smoke dampers with a single certificate are the system used alone in that compartment. The one with multi compartment can work with other systems. For example, a smoke damper that works with a fire curtain will have a Multi certificate.

Later, the smoke dampers obtain a certificate according to the EN 12101-8 standard.

References

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