

FIRE SAFETY

FLEXIBLE DUCTING

1. INTRODUCTION

Why is the fire safety of a duct so important?

An air duct system will be used for the diffusion of the air in a building. This means that the air will be transported from several rooms in the building into a central place: a fan casing or an air conditioning system. When a fire breaks out in one of the connected rooms, there could be a chance that the flames will be transported through the duct system, together with the air which is sucked in.

If the duct system has been built up out of incombustible materials the diffusion in the duct will be restricted. If the system, however, has been built up out of combustible materials there will be a chance that the fire will be transmitted through the duct. In this case the fire can be transferred to a fan casing or an air conditioning system. After destroying these parts the fire will expand to other rooms in the building. A fire is able to reproduce extremely fast to the different stocks of a building by way of air duct systems. Therefore the combustibility of the air duct is of great importance. The wall of a duct has to keep the fire from transmitting as long as possible.

Each country has its own requirements concerning fire safety of ducts and hoses. The requirements are very variously especially comparing Europe with the United States. Many ducts, used in buildings in the United States, are prohibited in Europe for a long time in view of the fire safety. Because no definitive standard has been developed in Europe until now, a manufacturer should have the ducts tested per country, looking forward to a European standard.

DEC INTERNATIONAL® products have been tested in the following countries:

- **The Netherlands**
- **United Kingdom**
- **France**
- **Germany**
- **Austria**
- **Italy**
- **Sweden**
- **Switzerland**

In order to give you a general view about the differences and agreements the, most asked, test results per country will be explained. It is not possible to mention all of them, because the test criteria are moving all the time.

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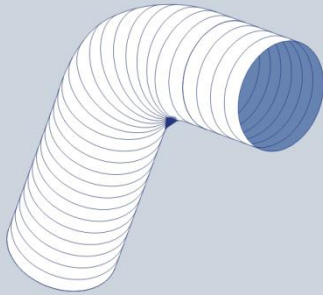
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2 THE NETHERLANDS

Until 1996 the **NEN 3883** was operative in the Netherlands for the testing of flexible ducts. This norm gives methods for the defining of the contribution to fire transmitting and the method to the defining of the degree of smoke development, caused by the duct in case of a fire. In 1996 the **NEN 3883** has been split up into **NEN 6065** and **NEN 6066**.

NEN 6065 describes the testing methods for the defining of the flame transmission and the contribution to spreading of the flames. **NEN 6066** describes the testing methods for the defining of the smoke production.

2.1. SPREADING OF THE FLAMES

For the defining of the spreading of the flames a sample of the test material will be exposed to the heat of radiation, in such a way that the incident radiation will flow over the surface of the sample in a special direction. At the same time on the place of the greatest radiation intensity a gas flame of a certain dimension will make contact with the sample. The distances over which the flames will move during the first 10 minutes are representative for the spreading of flames of the testing material. This distance will be translated into a flame spreading class.

2.2. FLASH OVER OF THE FLAMES

To the defining of the contribution to the flashing over of the flames two samples of the testing material will be arranged vertically and parallel to one another in a testing cabinet. By means of electrical spiral filaments so much warmth will be added to the cabinet, that flame spreading might occur. The electric energy flow, occurring after some time, are representative for the contribution to flame spreading from the tested side of the material. The materials will be divided into classes during these tests referring to the way the material comes out of the test.

2.3. SMOKE NUMBER INSULATION MATERIALS

The smoke development of an insulation material is explained in the (**smoke number**) (**R**). According to **NEN 3881**:

R < 5	weak smoke development
5 > R < 60	moderate smoke development
60 > R < 150	strong smoke development
R > 150	very strong smoke development

The degree of toxicity of gases, given off in case of a fire, has been defined according to a norm

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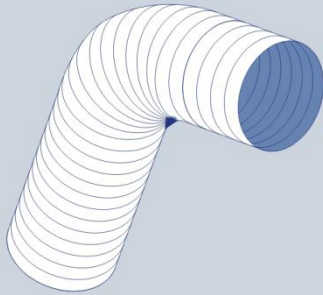
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3 UNITED KINGDOM

In the United Kingdom three different test methods are applicable to flexible ducts. These three methods are described in one standard: **BS 476 (BS = British Standards)**. This standard has been divided into more paragraphs, where the paragraphs 6, 7 and 20 are applicable to flexible ducts.

3.1. BS 476 part 6

The method, described in **part 6** gives an indication about the amount of energy, released by an increasing of the temperature. This method shows how much the contribution of energy is in case of a fire. During this test a sample will be heated in an oven and the amount of combustible gases, released out of the material, will be measured. The measurement data are controlled with the data of an incombustible material.

3.2. BS 476 part 7

The **BS 476 Part 7** is comparable with the Dutch **NEN 6065**. Here the products are also divided into classes, the lower the class number the less combustible gas will be released out of the product.

3.3. BS 476 part 20

The purpose of **BS 476 part 20** is to observe the properties of a flexible duct in order to prevent that the fire in the duct will be moved from the inside to the outside. The duct has to keep the fire as long as possible inside, in order to prevent the surroundings of the duct to get on fire. The velocity of spreading of a fire in a building depends among other things on this property. During the test in **part 20** an air flow of heated gases, arouse in a hot-air oven, will be lead through a duct in the same way as a fire would move. The temperature of the gas is determined in the **BS 476 part 20**. The test will be stand if the duct (hose) will not produce any holes or spontaneous combustion after 15 minutes. In the report delivered by the testing authority has been stated when exactly this happens. For **DEC INTERNATIONAL**[®] laminate ducts this happened between 20 and 30 minutes. So the test was stand without any problems.

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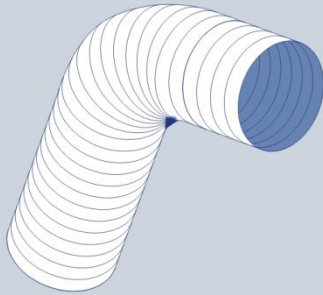
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4 GERMANY

In Germany a great range of tests are applicable to the fire safety or flexible tests, we will describe the most important ones. The German standard for these tests is **DIN 4102**. In Germany the fire class has been divided in two classes: A and B.

4.1. CLASS A

The A-class points to the combination of the elements. A product from the **A1 class** has been built up out of incombustible elements. A product with an **A2** classification has been built up out of combustible and incombustible elements. The tests belonging to this class contain among other things a flame-spreading test. The **A-class** has a control-contract as well. If a product has been tested and classified a contract has to be fixed with the controlling authorities. This authority controls by means of a yearly sampling test whether the product still comes up to the requirements. The inspection will be unannounced and therefore very objective. Each product type will get its own certificate number; this number has to be attached to the product.

4.2. CLASS B

Within the B-class the following difference will be made:

- B1** = hardly combustible
- B2** = not easily combustible
- B3** = easily combustible

The division of the product will be made according to a few, e.g. spreading of the flames.

4.3. TOXICITY

If a duct burns is not only the combustibility of the duct important but also the combination of the smoke. In Germany the combustion products of the **ALUDEC 112** have been tested on toxicity. The combustion gases have been classified into the category: "**Unbedenklich**"

5 FRANCE

In France the flexible ducts have been tested according to the standard **NF P92-501/509**. The sample will be tested in different ways, according to the thickness. During the tests the spreading of the flames and the energy, which will be released, will be tested. According to these data a product will be classified into a M1 class. The M class ranges from M0 up to and including M5. M0 is the best class, in several French building projects the ducts, which are prescribed, have to conform to the class M0 or M1.

The dividing will be made according to the spreading of the flames.

The **DEC INTERNATIONAL®** products have been tested in France by **CSTB/LNE**.

6 AUSTRIA

Austria has, just like Germany, the **fire classes A and B**. The A-class has not been divided, but stays just A. If the product does not burn up at a 750°C temperature it comes up to the classes.

The **B class** has also like in Germany, been divided in the categories **B1, B2 and B3**. The standards for this division and the accompanying test methods have been fixed in the Austrian standard: **Önorm 3800**. The products will be tested, among other things, on spreading of the flames, smoke density and dripping.

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