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Fire containment — Elements of building construction —

Part 1: Ventilation ducts

Endiguement du feu — Éléments de construction —

Partie 1: Conduits de ventilation

(Revision of ISO 6944:1985)

ICS 13.220.50; 91.140.30

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6944-1 was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 2, *Fire containment*.

This edition cancels and replaces ISO 6944 (1985).

ISO 6944 consists of the following parts, under the general title *Fire containment — Elements of building construction*:

— *Part 1: Ventilation ducts*

— *Part 2: Grease ducts*

Introduction

The purpose of this test is to measure the ability of a representative duct or duct assembly that is part of an air distribution system, to resist the spread of fire from one fire compartment to another with fire attack from inside or outside the duct. It is applicable to vertical and horizontal ducts, with or without branches, taking into account joints and exhaust openings, as well as suspension devices and penetration points.

This International standard is very similar to EN 1366-1, but includes an alternative arrangement for testing elbows.

The test measures the length of time for which ducts, of specified dimensions, suspended as they would be in practice, satisfy defined criteria when exposed to fire from (separately) both inside and outside the duct.

All ducts inside the furnace are fully restrained in all directions. Outside the furnace, ducts exposed to fire from the outside are tested unrestrained, while ducts exposed to fire from the inside (horizontal only) are tested restrained.

The test takes into account the effect of fire exposure from the outside where a 300 Pa underpressure is maintained in the duct as well as the effect of fire entering the ducts in conditions where forced air movement may or may not be present by maintaining an air velocity of 3 m/s.

Ducts exposed to fire from the inside are supplied with air in a manner which is indicative of the "fan off" and "fan on" situations which could arise in practice.

Fire containment — Elements of building construction —

Part 1:
Ventilation ducts

CAUTION —

The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, their testing and disposal of test residues.

It is strongly recommended that the duct assembly is allowed to cool completely after the fire test before dismantling to minimise the possibility of ignition of combustible residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

1 Scope

This International Standard specifies a method for determining the fire resistance of vertical and horizontal ventilation ducts under standardised fire conditions. The test examines the behaviour of ducts exposed to fire from the outside (duct A) and fire inside the duct (duct B). This Standard is used in conjunction with ISO 834-1.

This International Standard is not applicable to:

a) ducts whose fire resistance depends on the fire resistance performance of a ceiling;

b) ducts containing fire dampers at points where they pass through fire separations;

c) doors of inspection openings, unless included in the duct to be tested;

d) two or three sided ducts;

e) fixing of suspension devices to floors or walls.

NOTE Annex A provides general guidance and gives background information.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 834-1, *Fire resistance tests – Elements of building construction – Part 1: General requirements*

EN 1366-1, *Fire resistance tests for service installations – Part 1: Ducts*

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices – Part 1: Orifice plates, nozzles and venturi tubes inserted in circular cross-section conduits*

ISO 5221, *Air distribution and air diffusion – Rules to methods of measuring air flow rate in an air handling duct*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 834-1, ISO 13943 and the following apply.

3.1
fire resisting duct
a duct used for the distribution or extraction of air and designed to provide a degree of fire resistance

3.2
suspension device
the components used for suspending and fixing a duct from a floor or supporting a duct from a wall

3.3
supporting devices
the wall, partition or floor which the duct passes through in the test

3.4
compensator
a device that is used to prevent damage from the forces generated by expansion

4 Test equipment

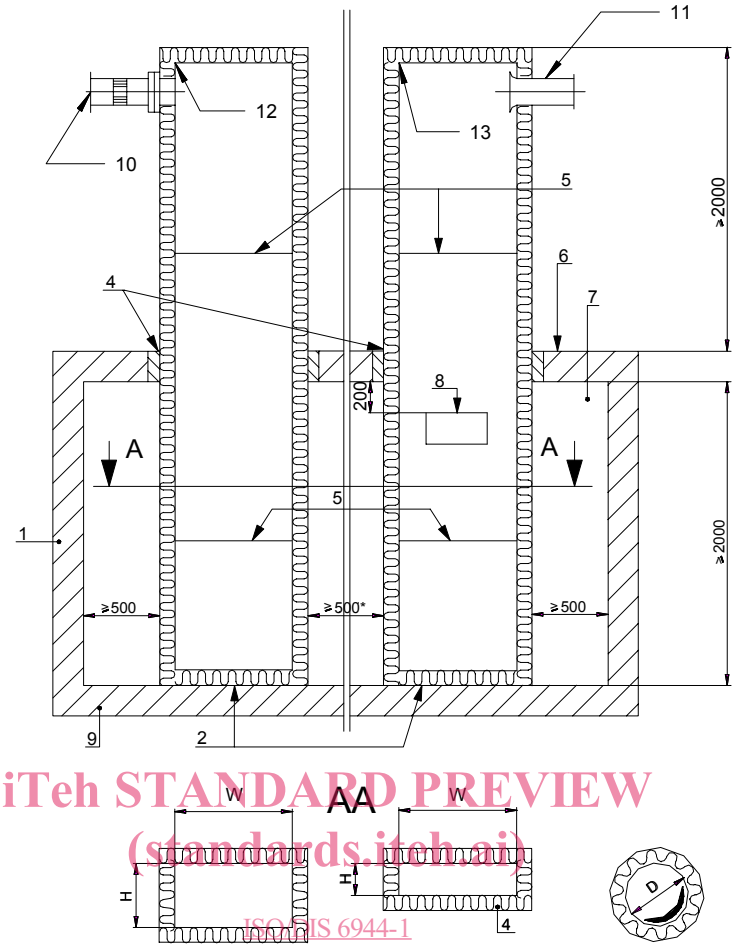
4.1 General

In addition to the test equipment specified in ISO 834-1, the following is required:

4.2 Furnace

This shall be capable of subjecting ventilation ducts to the standard heating and pressure conditions specified in ISO 834-1 and be suitable for testing ducts in the vertical (see figure 1) or horizontal (see figure 2) orientation.

Dimensions in millimetres



Key

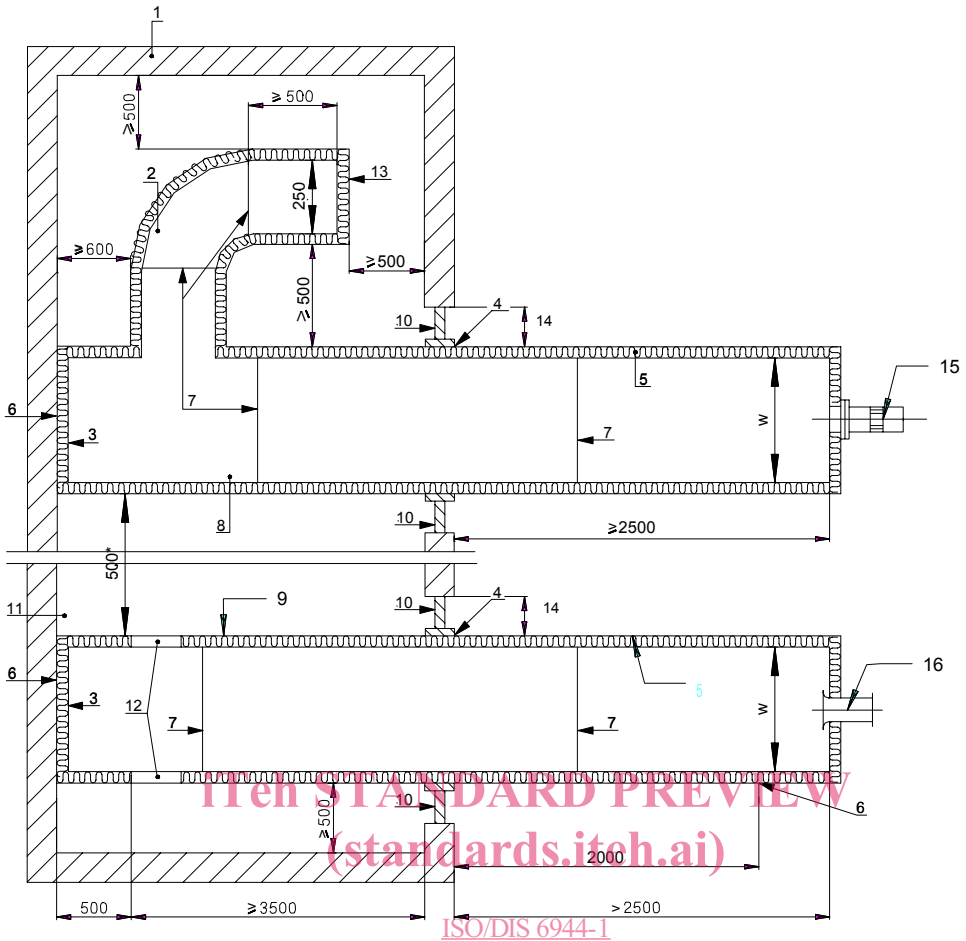
1 furnace wall
2 sealed end
3 fire stopping as in practice
4 fire protection system
5 joint in fire protection system
6 furnace roof
7 furnace chamber
8 openings providing a total area of 50% of duct cross section
9 furnace floor
10 leakage measuring station (see figure 3 for details)
11 gas velocity measuring station (see figure 4 for details)
12 duct A
13 duct B

W width
H height
D diameter

Note – The drawing shows two ducts being tested together. It is also permitted to test each duct singularly in the furnace.

Figure 1 — Test arrangement for vertical ducts

Dimensions in millimetres



Key

1 furnace wall
2 duct with 90° elbow
3 sealed end
4 fire stopping as in practice
5 fire protection system
6 location of restraint positions
7 joints in fire protection system
8 duct A
9 duct B
10 supporting construction
11 furnace chamber
12 openings providing a total area of 50% of duct cross section
13 sealed end of elbow
14 200 mm minimum supporting construction
15 leakage measuring station (see figure 3 for details)
16 gas velocity measuring station (see figure 4 for details)

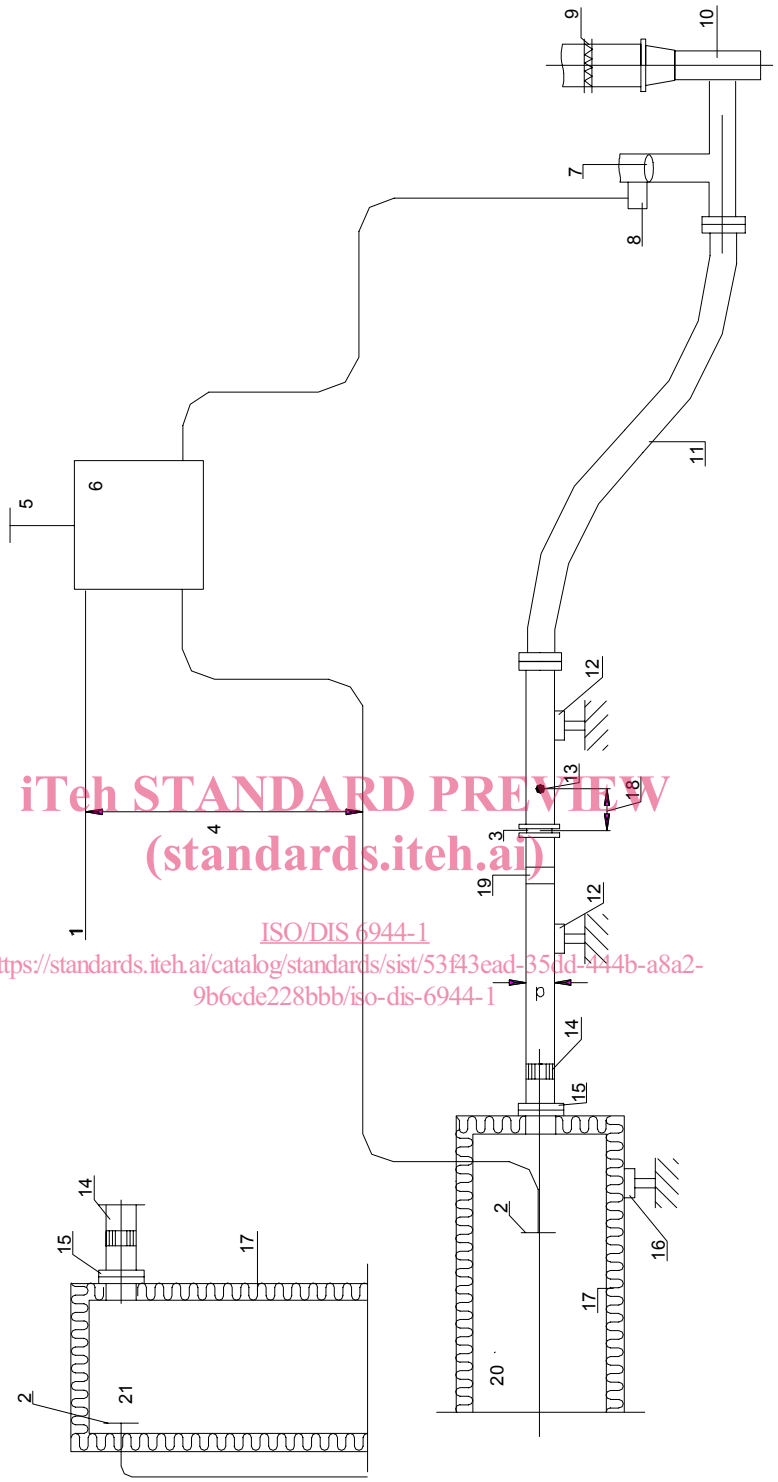
W Width or diameter

Note – The drawing shows two ducts being tested together. It is also permitted to test each duct singularly in the furnace.

Figure 2 — Test arrangement for horizontal ducts

4.3 Fan A

This shall be able to produce at the start and throughout the test an underpressure of (300 ± 15) Pa within duct A (see figure 3) and shall be connected either directly, or by a suitable length of flexible ducting, to the measuring station described in 4.5.



Key

1 pressure sensor to furnace
2 pressure sensor on centre line of duct
3 office plate, venture or similar
4 pressure differential (300 Pa)
5 pressure sensor in laboratory
6 pressure differential control box
7 pressure control dilution damper
8 pneumatic actuator manual control
12 support for flow measuring system
13 thermocouple 1,5 mm diameter
14 flow straightener (where necessary)
15 flange
16 support for duct outside furnace
17 test duct
18 thermocouple located 2d from 3
19 condensing device

9 balancing damper
10 fan
11 flexible connecting duct
20 horizontal duct A
21 vertical duct A

Figure 3 — Leakage measuring station for duct A

4.4 Fan B

This shall be able to produce an air velocity when extracting gas from duct B (see figure 4), of at least 3 m/s measured at ambient temperature in the duct before the test. It shall be connected either directly, or by a suitable length of flexible ducting, to the velocity measuring station described in 4.8. The fan shall be provided with a by-pass vent that can be opened prior to the damper described in 4.7 being shut.