INTERNATIONAL STANDARD ISO 834-1975/AMENDMENT 2

Published 1980-09-01

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION · МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ · ORGANISATION INTERNATIONALE DE NORMALISATION

Fire-resistance tests — Elements of building construction

AMENDMENT 2

Amendment 2 to International Standard ISO 834-1975 was developed by Technical Committee ISO/TC 92, *Fire tests on building materials, components and structures*, and was circulated to the member bodies in March 1979.

It has been approved by the member bodies of the following countries :

Australia
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South Africa, Rep. of
Spain
Sweden
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Turkey
United Kingdom
USA
USSR
Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

France
Germany, F.R.

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a) Replace A.3.1 by the following :

A.3.1 Furnace

A precise definition of a time-temperature curve for a fire-resistance test according to 4.1.1 is not sufficient as the sole characteristic for determining the temperature fields in an element of building construction exposed to a fire. Another essential factor is the coefficient of heat transfer to the surfaces of the element exposed to the fire. This coefficient is primarily influenced by the convection and radiation conditions.

For a prescribed time-temperature curve, the convection and radiation conditions can vary considerably from one furnace to another, depending on variables such as the geometry of the furnace chamber and the thermal properties of its lining material, the type of fuel, the number, type and location of the burners, and the method of ventilating the furnace. For this reason, test results obtained in different laboratories may be difficult to correlate. Ideally, it would be preferable to control furnaces so as to regulate the total heat flux at the surface of the test assembly. Until the serious instrumental difficulties inherent in such a scheme are solved it is necessary to retain the time-temperature approach.

UDC 69.02 : 699.81 : 620.1

Ref. No. ISO 834-1975/A2-1980 (E)

Descriptors : buildings, construction materials, structural members, floors, walls, partition walls, columns (supports), beams, roofing, tests, fire tests, testing conditions.

Price based on 1 page

Printed in Switzerland

If the heat flux incident upon the specimen is principally radiation, the effects of most of the furnace variables are minimized. This control can be achieved by using lining materials for the furnace chamber whose surface temperatures will follow closely the temperature of the furnace gases. Thus the walls of the furnace chamber will radiate strongly to produce more uniform heating of the specimen, to improve reproducibility of the test conditions between laboratories, and more closely to simulate the heat transfer to a building structure from the flames of a real fire. Accordingly, it is recommended that primarily new furnaces, and existing furnaces when repaired, should mainly be lined with material having a minimum thickness of 50 mm and a thermal inertia ($\sqrt{k\varrho c}$*) at 773 K not greater than

600 W $s^{1/2}/m^2.K$**

Such refractory lining materials are readily available in the form of fibrous batts, solid blocks and castable material. Though not solving the complex problem entirely, the use of such (or equivalent) linings will improve the control of furnace temperatures and will allow the tolerances in 4.1.3 to be reduced considerably when ISO 834 is reviewed.

Another factor which can also influence the test results and make comparative estimations more difficult, but to a lesser degree than the convection and radiation within the furnace, relates to the characteristics of the environment of the furnace. During a test to avoid too great a variation of temperature within the space outside the furnace, it is necessary that the volume of the building containing the furnace be large, unless the environment is ventilated, and that the surrounding structure of this building have a comparatively high degree of thermal inertia. If possible, the ambient temperature at a distance of more than 250 mm from the furnace, should not lie outside the range 25 ± 15 °C.

Also, in testing elements which include combustible material, the oxygen content in the furnace should be sufficient to ensure combustion and should be below 10 % when measured in the flue.

b) Add the following footnotes at the bottom of the same page :

* where

k is the thermal conductivity of the material, in watts per metre kelvin;

ϱ is its density, in kilograms per cubic metre;

c is its specific heat capacity, in watt seconds per kilogram kelvin.

** 1 kcal/h equals approximately 1,163 W.