

LIBRARY REFERENCE ONLY

DSIR AND FOC  
FIRE RESEARCH  
ORGANIZATION  
REFERENCE LIBRARY  
A99FR.430

F.R. Note No.430/1960.  
C.I.B./C.T.F./60/19(UK).

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE  
JOINT FIRE RESEARCH ORGANIZATION

THE USE IN BUILDING CODES OF THE INSULATION REQUIREMENT  
OF FIRE RESISTANCE TESTS

by

L. A. Ashton

SUMMARY

It is suggested that some relaxation might be made in the fire resistance requirements for walls and partitions in buildings without a significant reduction in fire safety. The implications of the proposal are discussed.

April, 1960.

Fire Research Station,  
Boreham Wood,  
Herts.

## THE USE IN BUILDING CODES OF THE INSULATION REQUIREMENT OF FIRE RESISTANCE TESTS

by

L. A. Ashton

The desirable properties for a separating element of structure from the fire safety aspect are, in order of importance: stability, integrity and insulation. There is no question that collapse of walls and floors or their penetration by flames or smoke are the factors in actual fires that lead to extension of damage, and to loss of life. Evidence is lacking at present that fires passing from one part of a building to another solely by heat transmission through an element of structure are a significant factor in fire spread, even where late discovery of a fire has provided the most hazardous conditions. On this account a case could be made for permitting a relaxation of present requirements in Building Codes and Byelaws.

An increase in temperature of 139°C on the unexposed face of a specimen in the test is regarded as constituting failure of the element as an insulator. There is in fact a margin of safety with this criterion, even when temperatures on the unexposed face are measured by the British Method<sup>(1)</sup>. The factor of safety is even greater where the temperatures are measured under asbestos pads, as is the practice specified in other Standards, since few materials will ignite spontaneously after exposure for short periods to such temperatures.

In specifying the requirements for the separating elements of structure in a building a mandatory Code should take into consideration all factors which check spread of fire, such as the availability of the Fire Services. It appears to be reasonable that, where efficient fire-fighting capacity exists, and sprinklers or fire alarms are installed, a significant relaxation of the insulation requirement might be permitted for the separating elements, on the grounds that they could be cooled with water if their unexposed surfaces appeared to be reaching dangerous temperatures.

There are two methods of relaxing the insulation requirement. One is to increase substantially the maximum temperature permitted for the unexposed face; the other is to specify that an element need comply with the present temperature limitations for a minimum period, say half an hour, or for a fraction, say one half, of the period required for stability and integrity, with a minimum time of half an hour.

The second method is accepted now in international regulations dealing with structural fire protection for passenger ships<sup>(2)</sup>. Where sub-divisions of accommodation spaces between the main vertical zones are required to be fire resisting, they are required to satisfy the integrity and insulation requirements of the standard fire test for 30 minutes, with the proviso that they need fulfil the insulation requirements for only 15 minutes when constructed entirely of non-combustible materials. The method is also used in the Byelaws of local authorities in England and Wales<sup>(3)</sup> for certain structural elements in small houses. For example in two storey houses the upper floor must be of a type which can satisfy the collapse requirement of the standard fire resistance test for  $\frac{1}{2}$  hour and the integrity and insulation requirements for 15 minutes. For certain loadbearing walls in small houses a fire resistance of  $\frac{1}{2}$  hour is required, without account being taken of temperature rise on the unexposed face.

In Great Britain new building regulations are being made and the Fire Research Station is proposing relaxations on these lines. At present only external walls are being considered, as here the need for relaxation is greatest and scarcely needs arguing. The requirements now for many types of building are that their external walls should have a fire resistance (from  $\frac{1}{2}$  hour to 4 hours) as defined

in B.S. 476 when either side is exposed to fire. Consideration of the functions of external walls has shown that these requirements are unnecessarily severe and it is proposed to make the following relaxation. Where an external wall is not on the site boundary (where it would be in effect part of a separating wall), it should satisfy the stability and integrity requirements of the standard for the full period specified but need only meet the insulation requirement for 15 minutes.

A relaxation in insulation requirements for external walls as described above should lead to economies in construction and greater freedom in the use of materials with no loss in fire safety. This will be evident from a knowledge of the behaviour of separating elements in fire resistance tests where performance is limited by failure under the insulation requirement.

#### References

- (1) British Standard 476 : Part 1 : 1953, Fire Tests on Building Materials and Structures. British Standards Institution.
- (2) International Convention for Safety of Life at Sea, 1948. Regulation 26. Her Majesty's Stationery Office.
- (3) Ministry of Housing and Local Government. Model Byelaws Series IV. Buildings, 1953. Her Majesty's Stationery Office.