

Fixings that outlive fire

An article for the CFA website

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In this article, written when he was Technical Manager of fischer fixings, Simon Poole explains how manufacturers are providing data to enable fixings to be specified in applications requiring fire ratings.

CFA WORK IN FIRE

Fixings play an important role not only with regard to the connection of building elements, but also where durability, maintaining structural capacity and safety are concerned. Often the stability of structural components in fire conditions will depend on the fixing elements. The stability of the structural components in a fire is essential for ensuring that escape is possible and that safety routes or exits remain accessible. It is for this reason that members of the Construction Fixings Association have been working for years in collaboration with research and material testing institutes in the area of passive fire protection.

Through their extensive involvement in the area of fire protection, members of the CFA have contributed to the development of fixing technology for anchors exposed to extreme fire conditions. In addition, it is seen as an important, if not vital, contribution to safety, when those responsible for design and specification of public building projects avail themselves of the CFA members' experience.

By selecting the most technically advanced fixings with proven durability in fire it helps to limit damage and save lives.

FIRE RATINGS

The duration of fire resistance for a structural member indicates the resistance to fire over a certain period of time. An example of a fire resistance for a structural member would be the designation of the rating F30. The F30 reference would indicate that the structural member has, under the conditions referred to by the temperature/time curve, a fire resistance duration of 30 minutes. For an F30 rating the term "fire retardant" is used. Structural components that have fire ratings starting from F90 and higher are generally referred to as "fireproof". The fire rating is classified with regard to the minimum resistance for 30, 60, 90, 120, 180 minutes.

The fire rating class for anchors uses the same designation as previously explained for structural members. In general, the use of fixings is regulated through approval systems. These approvals do not yet contain information concerning fire resistance although the ETA system is expected to introduce a fire test and associated design method in the near future. If anchors are required for applications where they must maintain their function in case of fire or significantly elevated ambient temperatures, then expert information about the specific behaviour of the fixing can be provided by the manufacturer.

PERMISSIBLE LOADS IN FIRE

The principles governing anchor approvals mean that permissible loads specified within official approvals are only a fraction of the anchor's failure load under normal conditions. This means that any variations caused by irregularities in the building material, inaccurate assembly and unforeseen stresses in the structural member are accounted for.

During fire tests, the durability of an anchor is determined under controlled fire conditions with a specific load which may be the normal recommended load under ambient temperatures or a reduced load. The permissible loads for different periods of exposure are determined from these tests with the use of a suitable factor of safety.

To use this data the normal calculations must be carried out to determine the allowable load taking into account effects such as close edge and spacing distance, concrete strength, direction of loading etc. The applied load must be checked to be no greater than this load or the permissible load for the required fire exposure.

ANCHORS WITH APPROVALS IN FIRE

In order to allow anchors with ETAs to be specified in fire situations as broadly as possible EOTA HAVE introduce additional requirements to the ETAG 001 Metal anchors for use in concrete. This enables two possible approaches. A fire test procedure is set out based on standard time/temperature curves. From the results allowable loads may be deduced for different exposures. For manufacturers who have yet to carry out the tests a more conservative approach may be applied without the need for tests. From a comprehensive study of the data taken from many tests of anchors subject to standard time/temperature curves, conservative load/exposure values have been derived which may be applied for any anchor with a European Technical Approval to ETAG 001.

For further information regarding the use of fixings in fire conditions refer initially to the Guidance Note – Fixings and Fire. For more detailed information contact individual manufacturers – see “Who we are” page.