# The use of standard fire curves for determining fire resistance

Engineering

The paper " The Use of Standard Fire Curves for Determining Fire Resistance' is a great example of a term paper on engineering and construction.

- Standard fire curves are preferred to be the simplest ways of representing fire by showing the arbitrary relationships between time and temperature; these relationships are independent on conditions of boundary and ventilation. Initially, they were developed for verification and classification of fire fighting furnace tests of building elements and materials. They do not stand for the actual natural fire. Differences in the speed of heating, the strength of the fire and the period between the standardized and the actual fire is likely to result in completely different structural behavior. For instance, a fire with a high temperature can end up spalling concrete and exposing steel reinforcement due to the thermal shock even if the duration exposed is short. However, a low-temperature fire taking a long period of time can end up in an average temperature which is a bit higher in the concretes hence a great reduction in the strength of the concrete (Armer & O'Dell 2001).
- The standard fires also do not stand for the severe most fire situations. The structural members who have adapted the standard fire version are likely not to survive when it comes to the real fire. For example, people have different devices containing hydrocarbon fuels all in the name of decorations, for instance, electronic devices and some other furniture which hence their fire can be more severe compared to the conventional (Franssen et al 2009).
- Uses of standard fire curves for determining fire resistance

- The rating of fire resistance basically means the time for which passive fire protection can hold a fire-resistance standard test. This is simply seen as the measure of time or other criteria which entails other verifications of functionality or fitness for purpose. These standard fire curves are used as a guide to put up a building with the capability of resisting fire. Buildings should be constructed in columns, walls, floors and other elements that can resist fire or can withstand it for a period of time; this ability is determined by exposure in a furnace to sustain high temperatures.
- Different temperature-time curves are used internationally depending on the application but all aim towards a common objective. An example below is a curve which evaluates the ISO 834 test, the hydrocarbon fire (ASTM E1529), and external fire exposures to the standard ASTM E119 curve (Grant & Pagni 2000).
- Temperature-time curves for fire resistance tests
- The different curves in various countries come as a result of the use of the pipes shield the furnace thermocouples inside the (North American Free Trade Agreement) NAFTA testing laboratories. This slows the time taken for the materials to respond to fire hence a more conservative test.
- Furnace pressure is also a matter relating to standardized tolerances for testing to attain the ratings of fire-resistance. The figure below is a graph showing European tolerances, subject to NEN-EN 1363-1. The different graphs represent the different levels of rating or the

resistance expected from the minimum to the maximum, (American Institute of Architects 2008).

- Germany’s DINA102 includes an important test for a potential firewall which is however applied on the unexposed side instead of the exposed side. As a result of the large differences in the test regimes all over the world even for similar products and systems, the organizations which really need to market their products are required to carry out thorough and wide research based on different countries. The results should be slightly different for the residents to consider the research to be unique.
- The temperature of the fire in a petrochemical industry exceeds those of the ordinary buildings because of the fuels from the hydrocarbons as it burns hotter and faster compared to other elements. The graph below shows the comparison between the hydrocarbon curve and the ASTM119 curve. From the results, it is clear that the frames with hydrocarbons burn with the highest degree of temperature compared to the rest (Franssen et al 2009).
- The information portrayed by this graph should best be put into consideration by those constructing the buildings or equipping them this is because people of today’s generation are carelessly putting up buildings in the name of having fire extinguishers and others are spending all the money equipping their houses and offices with the materials containing hydrocarbons hence when there is a fire outbreak they all burn to ashes. It is necessary that people are informed of the

elements which are fire resistance and how to use them to avoid the risks.

- The fires in tunnels are also complicated, the environment inside a tunnel is known as microclimate. No space for the heat to escape like in the open environment but fire is contained in a narrow space leading to the rapid increase of heat and pressure in a little room for escape and no chance of compartmentalization. This kind of fire burns everything and the heat explodes as it looks for a space to escape through. This requires that the building be allowed enough inner space (Kodur & Structural Engineering Institute 2009).
- The standardized curves also help in the planning of the building to be put up depending on the intended purpose. For example, those for commercial purpose whereby many of the elements involved contains hydrocarbons, others factors of reducing fire risks should be considered like using building materials which have higher capabilities of resisting fire or putting up many layers though in a well-strategized way to prevent the risks of falling. The most important way of planning structures for fire safety is to ensure that the power of the fire resistance of a structure is greater than the harshness of the fire to which it is exposed to.
- These curves also make it easier to test the strength of the ability of an element to resist fire. This mostly determined by the ability of the structure to resist fire spread, collapse or other failures that are likely to occur when the structure is exposed to the fire of any strength or the destructive impacts of the fire or its temperature. All these things

are considered by the researchers when gathering information related and are included in the final result, which is in the standard curves (Kodur & Structural Engineering Institute 2009).

- According to the nature of space together with the use and the expected combustible loading fuel as well as the tolerance of the risks by the jurisdiction, various approaches should be measured with reverence to the choices of a load of fire to be applied to the structural elements. The best option to be looked into is the use of the standard time-temperature curve. Most of the nations prefer the International Standard ISO 834 or set their own standards based on the ISO 834.
- Although the United States prefers the ASTM E 119 standard of fire, the ISO 834 is generally comparable although more severe. So the ISO standards time-temperature curve has been adopted by most of the nations.
- Conclusion
- The fire risks are affecting the economic status of the economists in various nations and the whole world at large not forgetting the health conditions of the residents. Big businesses are burnt down leading to losses of many properties and many people are also burnt and others have health problems as a result of the pollution caused by the fire (Frolov & Baecher 2006). The philosophers and thinkers are trying to research on ways of overcoming this problem. They have come up with elements and new ways of putting up structures to make them fire resistance or increase the length of time they take to burn. This information is represented in the standard time-temperature curve

which shows the length of time an elenmen6t can take to be heated up or to be overcome by the severity of the fire. The constructors and architectures should put the information provided in these curves when carrying out their duties so as to reduce or control the occurrence of risks.

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