COLD - FORMED STEEL STRUCTURES IN FIRE CONDICTIONS

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ABSTRACT

In the last years had appeared a lot of prescriptive fire regulations all over the world. This fact do that actually the fire situation becomes a special point to study in the steel structures design. Generally the resistance to fire of the purlins is not considerate in the global resistance of the structure, but sometimes it's very important to consider this kind of elements because it can help to the global stability of the structure.

Is important to take into account that a good design may help us to obtain a good resistance in case of fire. There are a lot of factors that influence in the behaviour of the cross-section in this situation, for example the thickness or the yield strength. The stability of thin-walled steel compression and flexural members will be studied with special attention given to the distorsion of the cross-section.

In this work the behaviour of cold-formed thin walled open cross-sections at high temperatures was studied through the method given in the Eurocode 3 part 1-2. This method is based on the definition of the degree of utilisation and provides the critical temperature. This temperature is defined as the temperature for which the load bearing capacity becomes equal to the effect of the applied load, failure will then occurs. This method is also based on the assumption that the temperature increase follows the standard fire curve (ISO 834). At least the use of the nomogram gives the fire resistance time, which we have to check with the national requirements in each case. These requirements depend on the number of floors, the use and the type of the building and other parameters.

In the design of the purlins we study the different situations that they may to have, one of these situations is the action of wind. The stresses to the free flange, not directly connected to the sheeting, should be calculated by superposing the effects of in-plane bending and the effects of torsion, including lateral bending due to cross-sectional distorsion. In the free flange the resistance to lateral buckling should also be verified. These requirements are very important to the design of the purlin and can help us in case of fire.

A good design may sometimes not to be enough to obtain the required resistance. In this case we have to apply a passive fire protection system. Some of these systems are intumescent coatings, sprays (cementitious or gypsum based coatings) or boards and blankets.

KEYWORDS: Fire conditions, critical temperature, mechanical properties, purlins.