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Young Scientists' Researches

On resistance and stability of the structural elements subjected to temperature variations width application in construction and industrial installations

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Summary

The master's degree paper analysis the behavior of the strength elements for constructions and installations from the point of view of strength and stability to high temperatures, fire included, objective of great actuality on the world level, especially in the present context of the spectacular return of steel in constructions.

In our country there is an intense preoccupation concerning the fire behavior of the structural elements such that one can distinguish three levels regarding the precision of the utilized methods: simplified approximate methods, determination of mechanical resistance at high temperatures, and global structure behavior. Yet, if at an international level there are advanced analytical stipulations for the estimation of fire resistance of the elements, sub- assemblies and structures, in our country the present norms do not include any stipulations concerning the analytical evaluation of fire resistance.

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One of the utilized criterion is that of the experimental tests or the utilization of normative proposals. Yet, these present a lot of shortcomings, determined either by the lack of precisions of the presented relationships, or by the impossibility to classify a significant number of practical problems within these norms.

These last facts occurs since the present computational norms do not present the theoretical basis of the problem in order to offer the design engineers the design instrument for each kind of component element and mainly to intervene on the parameters that condition the fire resistance and stability of elements and structures. In order to monitor the efficiency of a urban zone from the standpoint of fire safety, it is necessary, first of all, to make complete the calculation of structural and non-structural elements with adequate modern methods, based on numerical and automated calculation methods concerning the resistance and stability of structures subjected to large temperature variations.

The study of the resistance structures behavior at high temperatures developed especially during fires is a highly complex problem.

Assuring **through computation**, the resistance and stability of elements and structures for constructions represents an essential demand that request a first priority solution., without underestimating the esthetics and operability, largely developed at the present moment, even taking the chance of creating a prejudice to a proper utilization, sometimes even under normal conditions of exploitation. Yet, it is necessary to ensure a good exploitation of the structures even when they are subjected to extreme actions, not compulsorily during the catastrophes, with reference in this context, to the **fire phenomenon**. The resistance structures must ensure, even in these unwanted conditions, a necessary minimum protection of goods and human lives.

From a theoretical point of view, the problem of the thermal- mechanical behavior of structures and elements has to be divided in two distinctive parts:

- The evaluation of the heat exchanges within a idealized medium and the computation of the material temperature evolution;
- The computation of the elements resistance and stability at high temperatures, namely at fire, based on the results from point 1.

The doctoral thesis is structured in seven chapters which develop logically aspects connected to the conduct of structural elements at big variations of temperature (fire). The main approaches of fire conduct study are critically presented- experimental studies, theoretical analyses on designs/examples-pointing out the

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advantages and disadvantages of each of them, defining the actual study of researches in this domain.

The paper is made up of various theoretical and numerical case studies upon the conduct of strength thermo-mechanical steel elements under high temperatures.

Keywords: thermo-physical features, thermo-elastic and thermo-mechanical of materials at high temperatures, fire, methods for the study of thermic transfer, critical temperature and fire resistance

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