TITLE:
LA FATIGA EN LAS BARRAS DE ACERO CORRUGADO PARA REFUERZO DE HORMIGÓN

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ABSTRACT

In order to invest society resources for infrastructures optimally, a proficient knowledge of construction materials behaviour and properties is needed in the civil engineering.

Based on this statement, the objective of this degree thesis is to add some knowledge on the modelization of corrugated steel bars for concrete reinforcement and their fatigue behaviour.

Fatigue can be defined as the mechanical alteration of materials under the effect of repetitive loads. In civil engineering, fatigue acts on structures under several load-unload cycles, especially those dedicated to mass transportation and structures under wind or waves loading.

The materials response to fatigue is characterised by the number of load cycles before failure (N) facing a cyclic constant amplitude load (S). Testing for different values of the action amplitude the S-N curve may be drawn, representing the material behaviour. The concrete response to fatigue depends on the concrete response and on the reinforcement steel response. In order to increase its fatigue performance and durability, care on constructive details must be taken, as fatigue consequences grow with other degradation processes like concrete cracking and reinforcement rusting.

Data analysed in this degree thesis has been obtained from Celsa company files, which uses them to assure its production quality. This degree thesis is the first complete and integrated study of the several fatigue tests conducted until now. The tests are on materials produced under Spanish and United Kingdom specifications as well.

Linear regression data analysis intends to explore the material behaviour in the stress range where we account data. Outside this range, regression obtained values show no concordance with observed reality. For lower stress range values, specimens fail to break before the maximum level of cycles is attained, providing non-concrete information on material resistance over the specified cycle number boundary.

The analysis shows material behaviour depending on specimen diameter and steel grade analysed. The bigger the diameter, the less fatigue resistance. Regarding the steel grade, higher ductility steels show better fatigue performance than normal ductility steels.

In a practical point of view, this degree thesis states that steel reinforcing bars compliant with present standards meet the necessary fatigue requirements for most structures. In case of intense fatigue loaded structures, the use of high ductility steel grades and special care of construction details to avoid other pathologies that increase fatigue effects is highly recommended.