

ABSTRACT

Although high strength steel has not been commonly used in Spain, it has gained ground in the world market of steel construction in last decades. Resistant properties of high strength steels have been improved recently and these type of steels has been used for the design of steel and composite bridges and industrial buildings. The main reason for using high strength steel is economy, but there is an additional environmental interest in saving resources.

Hybrid steel plate girders are representative of structural elements where high strength steel may be used in a efficient way, because this steel is only used for the flanges. Spanish Code CTE does not consider the use of high strength steel for structural design either the design of hybrid steel girders, using different grades of steel for the different parts of the girders (flanges and web). On the other hand, Eurocode EN 1993-1.5 is now considering the use of high strength steel up to 460 N/mm². Moreover, the European code is considering the use of hybrid structural elements, then it is necessary to carry out a deep study.

The aim of the research report is to study hybrid steel plate girders subjected to concentrated loads (*patch loading*). Concentrated loads are usually found in bridge girders or gantry cranes. Although the phenomenon of *patch loading* is described in the European code, it is necessary to carry out a deep review too. The main reason of this review is to assess the effect of transversal stiffeners in the ultimate load capacity.

In order to reach it, an experimental campaign of four hybrid steel plated girders subjected to patch loading was carried out. The parameter varying between the tests was primarily the distance between transversal stiffeners.

Moreover, a detailed analysis of results has been presented. In order to contrast the results of this work, this analysis has been evaluated with the actual code on one hand and with a numerical model on the other hand. Finally, conclusions and future recommendations are presented.