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# BEHAVIOR ANALYSIS OF BOLTED CONNECTED Z COLD FORMED STEEL BEAMS

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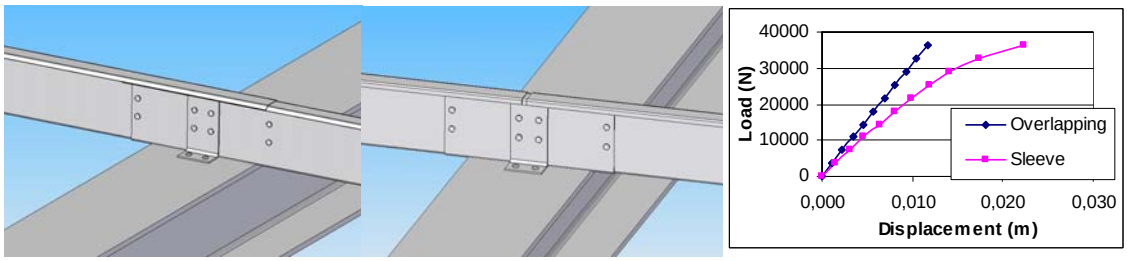
## ABSTRACT

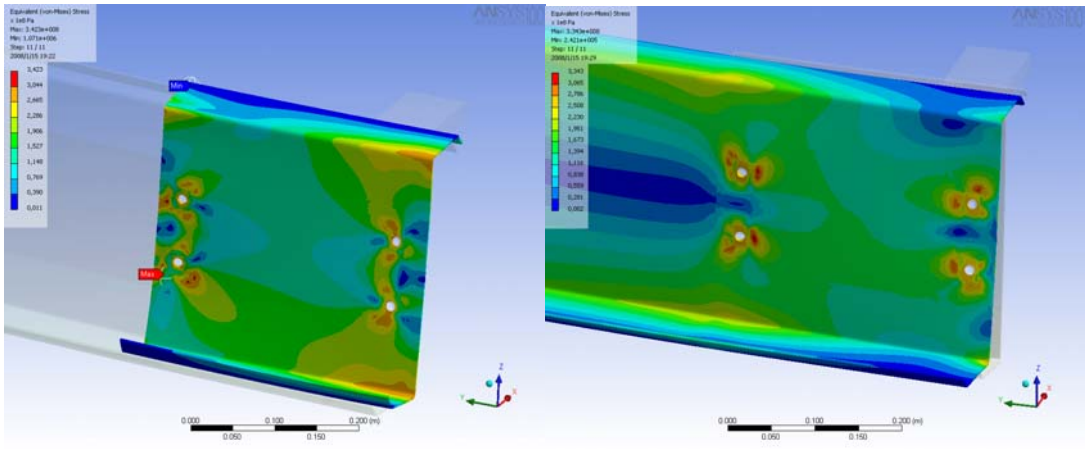
Cold formed profiles are a frequent solution for secondary structure in steel building industry. These profiles are linear slenderness thin-walled members employed as purlins, girts or roof and wall sheeting. A lot of effort is devoted to analyse and optimize the behaviour of the secondary structure [1, 2, 3]. The objective of this paper is to study the joints in bolted cold-formed steel purlins lines.

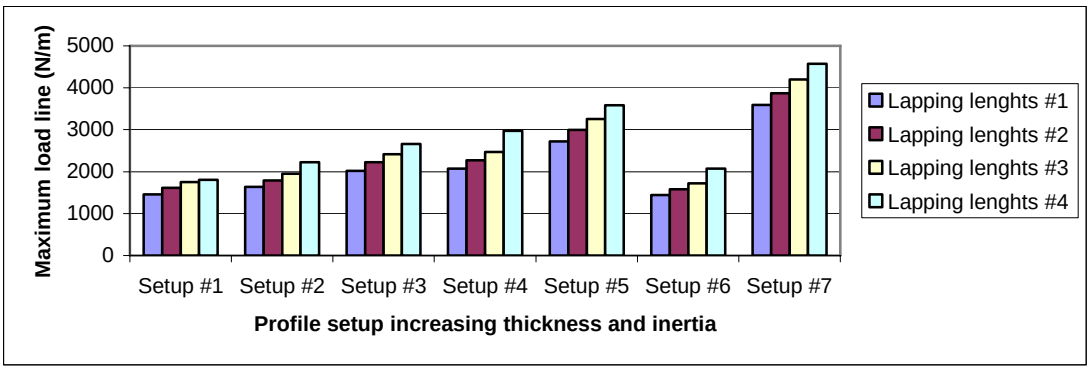
To provide continuity, two usual types of connexion are studied. First type, called overlapping system, is made lapping the purlins and bolting through the webs. Z-sections are equal-width flanges with 135º sloping lips. Regarding second type, called sleeve system, Z-sections are unequal-width flanges. The connection between purlins is made with a piece of Z located lapping both purlins and bolted through each web. In this case, purlins are oriented in the same vertical direction, but the piece of Z is inverted to have to fit the union pieces. All holes are slotted to facilitate the assembly.




In order to study stiffness and resistance of the union under flexion a finite element (FE) model of a simple span equivalent system is generated for each connection. The FE model includes contact between different components and material nonlinearity. It allows the simulation of structural behaviour and the evaluation of stress distribution. These models will be validated by experimental results. The load prescribed by Spanish standards [4] produces a few material plastic points near the holes, but globally, material behaviour is elastic. The studied overlapping connection provides linear

behaviour all over the load process. However, the sleeve connection behaviour is linear until 65% of the current load.






Authors have developed a design tool for multiple-span lapped connected purlin lines, considering non uniform moment of inertia and accounting for the additional stiffness of the lapped regions [5]. This tool provides the theoretical failure load according Spanish standard, allowing for different span number and span length. The graphic reflects the results for a line of ten spans of 10 m. The profiles for the first span can be different from the rest. For example, profile setup #1 means a Z 200x2.0 profile for the first span and a Z 200x1.8 profile for the rest of the spans. Also, it is possible to select the lapped length over the second support and the lapped length over the rest as a percentage of the span length. Lapping lengths #1 means a 14% span length for the lapped region over the second support and 4% over the rest.

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