Abstract

Light gauge steel framing has had a big expansion on the construction of residential buildings during the last years, due to several reasons such as economic, aesthetic, quickness of building-up and ecological. Problems relative to the description of the behaviour of this kind of structures in a realistic , using simple formulas raise the need of using numerical simulations as a new step on the design process.

The phenomena that define this kind of structure are leaded by its lightness. Buckling and deformation are relevant due to steel structures physical properties, which are enhanced by the sectional lightness of the structures we shall consider in this work.

A 3-D succession of porticos defines the geometric properties of the light metal structures. The geometry follows a repetetive pattern, and so informatic calculus means agreat help to the designer. Computer symulation means a lower economical effort, which represents an added advantage. A great virtue to this structures: its huge versatility; few elements result in many structural shapes. Using computing programs introduces this versatility to the calculus; any change we may make on the initial geometric pattern is inmediatly corrected.

Another feature that typifies light gauge steel framing is the way in which structural members are contructed. Generally, they are formed by assembling single elements. Joints can be bolted or welded. This joints have great rigidity and harmonize the effort of the structural elements. Global structural analysis is remarked due to the great interaction among the sereval porticos which conform the main structural frame.

All along our exposition applied calculus methods are described, first with brieve examples showing each step of implementation and resolution, followed by the analysis of the whole residential building. Each implementation step (mesh design and generation, mathematical pattern definition, problem solving and result analysis and related post-production processes) is illustrated through an example which describes the way the structure has been symulated using finit elements. A posteriori, response of a building structure consisting on light gauge steel porticos has been discussed when exposed to several loads causing deformation, effort and tension. The results have been compared to the criteria stablished by the *Eurocode 3: Design of steel structures – Part 1-3: General Rules – Supplementary rules for cold formed thin gauge members and sheeting*.

Structural inestability has been studied in detail, weather in a global or specific frame level. Each specific eigenvalue has been considered using several load situation hypotesis so to analize the structure response and be able to find the critical load which creates instability. Most affected sections by buckling are carefully considered and alternative geometrical symulations are performed to study the different porticos' contribution to the global work of the structure and its influence to the local failure break-up in some structural elements.