Abstract

The construction of family housings with steel light structure has turned in the last years an opposite alternative to conventional construction. Someone reasons that have motivated this situation, are the easy assembly, the low cost, the good quality of thermal isolation and even these dispositions have a huge versatility applications.

The steel light structure is formed in several sections cold shaped, in general using laminated profiles or flat bars of steel struder. The principal idea of this type of sections is to obtain enough capacity across the form of the section instead of increasing the thickness of the element. Then considering the relative facility of shaping the steel in cold, let us produce a great quantity of sections so we can adapt the construction to the needs of the design.

Using this type of profile the building construction has incorporated some new normative in order to regulate this innovative method. The geometry of this type of profile suffers several phenomenons that do not happen in the profiles laminated in warmly. In consequence in general we can say that its calculation is more complex.

So from the beginnings of regulations draft in 1940, formulation is based on laboratory test programs. Some fictitious models are created to simulate the behaviour of the profile, using this laboratory test program.

This tesis has been created under the context of European project of investigation: “Seismic Design of Light-Gauge Steel Frame Buildings”. In this project is included a wide experimental campaign divided in 5 phases which aim is to study from more to less detail behaviours of a light-gauge x-braced shear wall.

In the first phase are analyzed behaviours of different king of union between sheets of steel. The second phase consists of a study about behaviour union between straps and gussets. Over more, the third phase and the fourth are analyzed behaviour of the low and top corners respectively; finally the fifth part practises the complete frame.

This tesis approaches the accomplishment of the last three phases of this extended campaign. In the part 3 and 4 have practised two basic types of specimen, the Finnish and the Spanish ones. For each typology it have been practised several specimens, and changing parameters like the thickness and width of the diagonals or the thickness of the gussets, in order to analyze its influence over the behaviour.

In the fifth phase is has been tried two models to scale under simulated seismic charges, two reduced X-braced panels. These frames were formed by profiles shaped in cold. They are habitual sections and thickness in residential construction; also with an approximate scale two times lower than the habitual one. The curve force–displacement is obtained after analyzing all result’s tests.

The expected results were obtained. The hysteretic response (force-displacement curve) is virtually identical for the two specimens. Due to its large slenderness, the compressed diagonal strap exhibits flexural out-of-plane buckling while the other one yields under tension. This leads to a large pinching of the hysteretic cycles.

The main conclusion is that x-braced frames are indeed an adequate way to provide lateral stiffness and ductility under seismic conditions, provided that they are designed in such a way that the dissipative action of the x-brace can take effect.