Hollow core slab is a prestressed precast concrete structural element very commonly used in the industrial construction context. It is manufactured in highly industrialized precast factories where its design parameters are under control. Hollow core slab optimization takes particular advantage of this aspect. Moreover, up to now there are no other works related to this topic where clear conclusions about optimal hollow core slab design had been obtained.

Therefore, the main aim of this research work is to obtain significant conclusions related to the optimal design of hollow core slab series through a multi-objective approach. Hollow core slab series are formed by several elements which share the same concrete geometry and have different reinforcement. The optimization carried out is constrained, due to the fact that several geometrical and mechanical constrains have been identified. Heuristic algorithms have been used in order to solve this optimization problem. Specifically the Simulated Annealing algorithm has been used to solve the mono-objective and multi-objective optimization problem.

Besides, geometrical and mechanical models to reproduce hollow core behaviour have been performed by the author to use heuristic algorithms and obtain optimal solutions along its life cycle.

From the optimization results new hollow core optimal designs have found out, obtaining important economical savings (15-17% lower than current commercial design). Finally, a new hollow design based on three different parts has been performed to be used in practice. Several useful design rules for the hollow core slab manufacture from an optimal approach have been provided

Key words: Hollow core slab, structures optimization, multi-objective optimization, heuristic optimization, concrete structures, precast concrete.