Abstract

One-way ribbed slabs are, since decades ago, one of the most used floor system in Spain, especially those that combine the utilization of a precast element with a topping concrete poured in situ. The precast element used in this procedure is the so-called lattice joist. These elements were directly propped on the previous floor to support the blocks and subsequently the concrete of the topping is poured. This construction procedure was dangerous because of the falls of people or tools so, nowadays, it is obligatory to place a platform under the joist and the blocks, in order to reduce accidents. The advantages of using joists are, therefore, lost with this new procedure, so the possibility of using the working surface as a formwork has appeared. With this procedure, it is possible to shorten the period of construction.

This new type of floor cannot be calculated by the Spanish Code for one-way precast concrete floors (EFHE), because precast elements are not used anymore. Consequently, they must be designed and executed according to the General Code for concrete structures (EHE). But the application of the EHE to this type of floor presents some incompatibilities, especially in what refers to the shear resistance, since the steel truss does not fulfil the restrictions of the EHE.

The main objective of this thesis is to prove that this type of beam-block floor system satisfies the serviceability and safety requirements to be used as a structural system. We also want to prove that predictions made using EHE formulae were good even some restrictions were not fulfilled.

This thesis has been directed by Prof. Antonio Mari and it represents the continuation of a thesis previously carried out before by Gemma Viladomat, related to statically determinate elements. The present work deals with two spam slabs. Four beams of a total length of 10.05 m were tested. The beams had a \( \pi \) cross section of 15 cm width of each web and 30 cm total depth (25+5). For each beam, a test under service load level was performed, introducing distributed loads in three load cases. Deflections and crack openings were measured at this load level. Subsequently, the beams were subjected to two points load, symmetrically placed with respect to the central support, increasing it up to shear failure. Deflections, reactions and stresses at steel both in the longitudinal and transversal reinforcement were measured, by means of displacement transducers, load cells and strain gauges, respectively. All the tests were carried out in the Laboratory of Technology of Structures of the UPC.

The results obtained can be considered very satisfactory in general, because the structural response in terms of safety and serviceability of the beams was very similar to the expected behaviour, proving its technical aptitude. It was also proved that EHE (Art. 44*) formulae can be used to calculate a lower bound of shear resistance.