Abstract

In the last years there has been an increasing interest in high-strength concrete, these kind of concrete presents large advantages in front of conventional ones due its greater compressive strength and also other aspects such as durability and deformability. Any way, it has to be taken into account that the high strength concrete has some conceptual differences in comparison with normal-strength concrete.

Traditionally the shear strength of a beam has been studied by the truss analogy, taking into account or not the concrete contribution as a part of the shear strength of the same beam without shear reinforcement. In the last few years a new theory has been developed, this theory is based on equilibrium, deformation compatibility and constitutive equations of material response, *the modified compression field theory*, which is the base of many codes as the AASHTO specifications.

The Spanish code EHE bases its design specifications in equations developed from experimental research. Its experimental studies were conducted on members with concrete strength mostly below 40MPa. Using such equations to extrapolate may be unsafe in some cases. A characteristic of high-strength concrete is that it fractures suddenly and forms a failure surface that is typically smooth. This contrasts with the rough surface typical of lower strength concretes, with internal cracking following along the interface between stone and mortar, so that the contribution of shear-friction mechanism is being reduced. Moreover it has to be taken into account that the tension strength is not increased in the same way as the compression strength does.

The object of this paper is to evaluate the efficiency of the EHE code for shear design of prestressed concrete beams with and without shear reinforcement, from studding several experimental results, and to suggest any modifications that could improve the predictions of this code.

Results obtained from 118 experiments of prestressed concrete beams under shear failure are compared with the predictions of the Spanish code EHE, the European Eurocode-2 and the American AASHTO and ACI 318. It is also included the considerations of the Spanish EFHE code.

In addition to that, a neural network model is used to model with accuracy the behavior of beams under shear stress. The results of this neural network are compared with the predictions of the previous named codes to notice witch parameters should be adjusted on the EHE.

The principal conclusion of this paper is that for low longitudinal reinforcement and low prestress load, the EHE brings a good correlation with the empirical results, but the higher longitudinal reinforcement and the higher prestress force the more conservative results are given by the EHE, as much for beams with shear reinforcement as for beams without shear reinforcement. On the other hand, the AASHTO code, based on the Modified Field Compression Theory, brings the best correlations with the influence of the different parameters that affect the shear strength of a prestressed concrete beam in comparison of the EC-2 and the equation 11-9 of the ACI 318.