



Analysis on the minimum shear strength of reinforced concrete elements without transverse reinforcement

David FERNÁNDEZ-MONTES

Professor
Technical University
Madrid, Spain
dfernandez@intemac.es

David Fernández-Montes, born 1977, received his PhD from the Faculty of Civil Engineering at the Technical University of Madrid (UPM). He is an Engineer at the Department of Structures at INTEMAC. His research interests include shear strength of concrete structures.



Enrique GONZÁLEZ-VALLE

Professor
Technical University
Madrid, Spain
egonzalez@yahoo.es

Enrique González-Valle, born 1941, received his PhD from the Faculty of Civil Engineering at the Technical University of Madrid (UPM). He is an Adviser at INTEMAC. His research interests include shear at the interface between concrete cast at different times.



Elena DÍAZ-HEREDIA

Professor
Technical University
Madrid, Spain
ediaz@intemac.es

Elena Díaz-Heredia, born 1976, received his PhD from the Faculty of Civil Engineering at the Technical University of Madrid (UPM). She is an Engineer at the Department of Structures at INTEMAC. Her research interests include shear strengthening.



Jorge LEY

Professor
Technical University
Madrid, Spain
jley@intemac.es

Jorge Ley-Urzaiz, born 1962, received his PhD from the Faculty of Civil Engineering at the Technical University of Madrid (UPM). He is the Director of the INTEMAC Laboratory. His research interests include NDT for forensic engineering.



Summary

The design value for the shear resistance in Eurocode 2 (EC-2) would have one important disadvantage if a minimum was not fixed for reinforced concrete members without transverse reinforcement. That was, in cases without compressive axial force, the shear capacity would be 0 when the longitudinal reinforcement ratio was 0, although these cases would not be possible if the minimum amount of reinforcement indicated in the codes is considered. When the Spanish Code (EHE-08) was edited, the basic formula adopted was the same as the formula defined in EC-2 but the minimum formula was modified. So, the EHE-08 and the EC-2 equations to assess minimum shear strength are inconsistent with one another and in both cases provide a poor fit to experimental findings. This paper summarizes the most important conclusions of an investigation conducted in the Faculty of Civil Engineering at the UPM and incorporates a new proposal.

Keywords: shear; minimum longitudinal reinforcement ratio; high performance concrete; structural analysis.

1. Introduction

At the beginning of the past decade, on the occasion of changes in the European sectional design procedures for shear, there were some shortcomings with regard to the use of the basic equation defined for the shear strength of a reinforced concrete element without shear reinforcement [1], $V_{Rd,c}$. In particular, it was wished to have a value for $V_{Rd,c}$ defined as the minimum shear resistance