

The Application of Concrete Dowels in large Structures

Ingbert MANGERIG

Professor
University of the German
Armed Forces Munich,
Munich, Germany
Ingbert.Mangerig@unibw.de

Ingbert Mangerig, born 1950, received his PhD 1986 from the Ruhr.-Univ. Bochum. Since 1997 he is professor for steel, timber and composite structures at the University of the German Armed Forces.



Robert WAGNER

Civil Engineer
University of the German
Armed Forces Munich,
Munich, Germany
Robert.Wagner@unibw.de

Robert Wagner, born 1978, received his civil engineering degree from the Technische Universität Kaiserslautern in 2006. Since 2007 he is working as a research assistant at the University of the German Armed Forces.



Summary

The concrete dowel is used as a shear connector in the field of composite construction. It generally consists of a welded steel girder or a halved I-type steel girder with slots in the web. The shear connection between the concrete and the steel is established by the steel web which is embedded in the concrete slab. With its high load carrying capacity and ductility and an excellent resistance against fatigue the technique of concrete dowels enables composite construction with large dimensions. Within the presented project new continuous cuts for the steel web were tested. These cutting lines allow a production of two steel girders with only one continuous oxygen-cut. The main item was to investigate the influence of the boundary conditions to the load bearing behaviour of the concrete dowel. The combination of experimental tests and FE simulations allowed an enhancement of the current verification procedure for concrete dowels. The modified design guidance enables the application of concrete dowels in t-beam cross sections and it covers the influence of different distances between the steel girders, too

Keywords: composite construction, composite girder, concrete dowel, shear connector, headed stud, fatigue behaviour

1. Introduction

1.1 General

In composite construction a perfect usage of steel and concrete according to their specific material characteristics is possible. The arrangement and the design of the shear connectors influence the load bearing capacity of a composite system strongly. The concrete dowel is the result of several research activities in the area of composite construction. The composite is established by the

perforated steel web of an I-type steel girder with a removed upper flange which is embedded in the concrete slab. Alternatively, a perforated steel plate is welded on a standard steel profile. The slots can be manufactured by oxygen-cutting or plasma-cutting. The next figure displays two different construction examples.

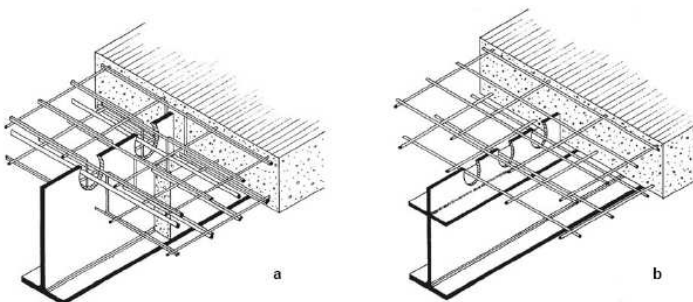


Fig. 1: Overview concrete dowels [4], [5]