Ramberg-Osgood and Manson-Coffin Relation for Shear Studs In Fatigue

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Summary

Welded shear studs in composite bridges are subjected to statical as well as fatigue loading. To proof the fatigue resistance, the so-called Wöhler curves (S-N curves) have been established. The slip displacements in these bridges between concrete slab and steel girder however show that, the loading on the studs is more displacement than force controlled. Results on displacement-controlled fatigue push-out tests on shear studs are presented to describe the correlation between slip and bearable load cycles with the Manson-Coffin equation and the correlation between shear forces and slip with the Ramberg-Osgood equation. Both relations are combined to obtain an assessment of internal forces as well as displacements for the verification of the fatigue resistance.

Keywords: Composite constructions, Manson-Coffin relation, Ramberg-Osgood equation, verification of fatigue resistance, headed shear studs, displacement controlled tests, dynamic loading, slip controlled push out tests.

1. Introduction

Welded shear studs often form appropriate solutions to transfer shear forces between building elements in steel and concrete.

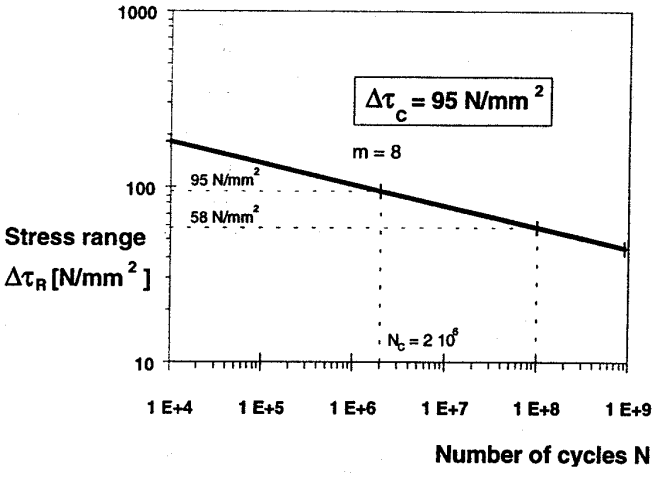

Fig.1 *Fatigue strength curve for fatigue stress range* $\Delta\tau_R$ [3]

The studs are used for example to connect concrete bridge decks with steel girders in composite bridges in steel and concrete. These studs are subjected to static - but also to dynamic forces, which requires verification of the fatigue resistance.

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