

Repair, Strengthening and Upgrading of Steel Bridges in The Netherlands

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Abstract

After World War II, many steel bridges were designed and built in The Netherlands. Many of these bridges are now of a substantial age and were designed for static and fatigue loading less severe than eventually present during their lifetime. Many of these bridges now show (fatigue) damage. Depending on the nature of the damage, these bridges can either be replaced, or a reinforcing substructure can be added, or the visible damage can be repaired and the bridge can be locally strengthened. In many cases, it has to be shown that the bridge is fit for purpose for future use, meaning that upgrading may be necessary. These bridges are now being reassessed and any possible conservatism in these assessments needs to be excluded to avoid unnecessary strengthening. The paper gives practical examples of repair, strengthening and upgrading techniques for steel bridges.

Keywords: steel; bridges; assessment; repair; strengthening; upgrading; fatigue; codes; standards.

1 Introduction

From the fifties to the eighties of the 20th century many steel bridges were designed and built in The Netherlands. Railways had to be reinstalled after World War II and the highway road network was developed. Many of the bridges built in that era are now of a substantial age. Modern bridges are designed differently than shortly after World War II [1]. At that time, traffic loads were moderate and also traffic intensity was much lower than nowadays. So these bridges were designed for static and fatigue loading less severe than eventually present during their lifetime, in some cases leading to (fatigue) damage. For that reason, these bridges are being reassessed. When reassessing existing bridges usually an inspection

is carried out to see if damage has occurred. Damage of course needs to be repaired, often in such a way that the structure is also strengthened and the bridge is fit for purpose again for the years to come.

Section 2 further elaborates on the aspects inducing reassessment of existing bridges. In section 3 calculation aspects are treated briefly. Section 4 gives examples of repair, strengthening and upgrading of existing steel road bridges while section 5 does so for steel railway bridges. The conclusions are presented in section 6.

2 Aspects inducing reassessment

Reassessment of existing steel bridges is necessary if visible damage is present or due to new heavier