



Risk Assessment for Interaction Effect of Adjacent High-Speed Railway Bridges and Highways

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Abstract

In China, massive high-speed railway construction had been implemented in recent ten years. Due to the restriction of various factors, high-speed railway routes are usually located in existing transport corridors, which results in newly-built high-speed railway bridge (HSRB) being adjacent to and parallel to the existing highway. However, interaction between adjacent high-speed railway bridges and highway and its effects to the safety of bridge structure and the driving safety of high-speed trains and vehicles is not yet clarified. In this paper, risk assessment for interaction effect of adjacent and parallel high-speed railway bridge and highway is introduced. Firstly, risk factors due to the closely arranged high-speed railway bridge and highway, which may affect the safety of bridge structures, high speed trains and vehicles, are discerned. On this basis, general framework of assessment process is established. Subsequently, through a case study, effects and consequences of each risk factor are investigated by means of theoretical analysis, numerical simulation and field measurement. Analysis results show that the immediate vicinity of high-speed railway bridge and highway challenge the safety of bridge structure and the operation of railway and highway. Furthermore, risk evaluation and assessment of each risk factor are addressed through risk matrix method considering probability of occurrence and consequence comprehensively. In the end, a variety of risk mitigation measures are suggested.

Keywords: risk assessment; Interaction Effect, high-speed railway bridge; highway

1 Introduction

In China, since Beijing-Tianjin inter-city high-speed railway came into use in 2008, high-speed railway (HSR) operating length had reached 16000 kilometres until the end of 2014. For purpose of saving construction land and preventing excessive subgrade settlement, even in plain region, bridges, rather than roadbed, are widely used to laying ballastless track for HSR. Among the large-scale HSR construction in progress in China, railway route selection is always constrained by many factors, including urban planning, economization on land, attracting passenger, environmental

protection, etc. Therefore, HSR routes are usually located in existing transport corridors, which results in newly-built high-speed railway bridge (HSRB) being adjacent to and parallel to the existing highway. Also, this condition will become common in densely populated and economically developed regions in a future time. However, interaction between adjacent HSRB and highway and its effects to the safety of bridge structure and driving safety of high-speed trains and vehicles are not yet clarified

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