Accepted Manuscript

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PII: S2352-0124(17)30024-3
DOI: doi: 10.1016/j.istruc.2017.04.005
Reference: ISTRUC 188

To appear in: *Structures*

Received date: 25 May 2016
Revised date: 10 November 2016
Accepted date: 21 April 2017

Please cite this article as: Jingsi Huo, Jinqing Zhang, Yanzhi Liu, Feng Fu , Dynamic Behaviour and Catenary Action of Axially-restrained Steel Beam Under Impact Loading. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Istruc(2017), doi: 10.1016/j.istruc.2017.04.005

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Dynamic Behaviour and Catenary Action of Axially-restrained Steel Beam Under Impact Loading

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Abstract: In this paper, the dynamic behaviour and catenary action of axially restrained steel beam under impact loadings is examined through a combination of experimental and numerical investigations. It describes and discusses the results of six impact tests on the axially restrained welded H-beams by means of the drop hammer test machine. The main behavioural patterns and the key response characteristics including the development of impact force, deformation and strain, as well as failure modes are examined, with emphasis on the effect of impact energy and the width to thickness ratio of beam flange. Finite element models are also developed and validated against the available testing results. It is demonstrated that the detailed FE model can capture the response of the welded H-beams under impact loadings. Moreover, the mechanism of catenary action was identified based on the development of the internal force in the welded H-beams.

Keywords: restrained steel beam; impact test; finite element simulation; catenary action

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