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Reliability Assessment of Shear in Shortlink Beam

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Abstract

This paper presents the results of research in reliability of short seismic links in shear based on experiments. Four types of short links were analyzed, each having the same cross section and the same length, but with different number of web stiffeners. The main purpose of the stiffeners is to preserve buckling of the seismic link web, i.e. to achieve plastification of the cross section by shear. The design model of shear resistance according to Euro code **8** is applicable only to short links without web stiffeners. By adding the web stiffeners nonlinear inelastic behavior of short seismic links differs depending on the number of stiffeners, so that the calculation model of shear resistance according to Euro code **8** for short seismic link with stiffeners must be corrected. This fact is considered by introducing the correction factors that were determined from the laboratory tests conducted on **16** specimens. On the base of experiments in the second part of this paper the reliability of short seismic link is performed by forming limit state equations. These equations are formed by using the stochastic model, i.e. by describing the statistical nature of basic variables calculating the reliability index as an operational value of failure probability. The reliability level was determined by using the probabilistic analysis based on the first order reliability method (FORM) which resulted with the conclusion that the short seismic links with two and three couples of web stiffeners designed according to requirements of Euro code **8** have enough reliability for the reliability class RC**2** and the mean recurrence interval (MRI) of 50

Keywords: Reliability method, Link beam , shear, Eccentrically Braced Frames

1 Introduction

The topic of research in this paper concerns the most ductile elements of the eccentrically braced steel frames called seismic links. It is well known that seismic links are usually designed to remain in elastic region during ordinary loading but withstand nonlinear inelastic deformation during seismic event, having capability to dissipate seismic energy (Fig. 1) (Mazzolani and Piluso 1996; 1997; Mastrandrea and Piluso 2009).

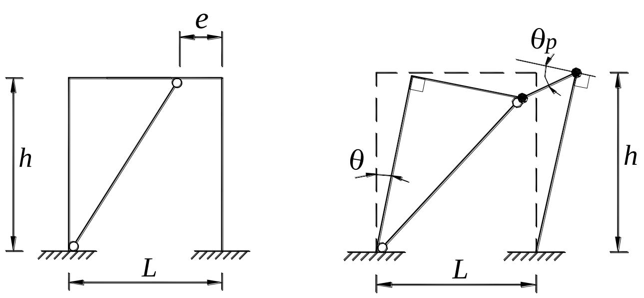

Fig. 1 **A simple eccentrically braced frame and its collapse mechanism**

The seismic link should be designed in a way that it may bear great inelastic deformations without losing resistance, i. e. that most of the seismic energy is possible to dissipate within it. To achieve the required plastic rotation local instabilities (such as flange or web buckling) should be delayed. The web local buckling

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