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1. Most downloaded

The effective length of columns in multi-storey frames

Abstract

Codes of practice rely on the effective length method to assess the stability of multi-storey frames. The effective length method involves isolating a critical column within a frame and evaluating the rotational and translational stiffness of its end restraints, so that the critical buckling load may be obtained.

The non-contradictory complementary information (NCCI) document SN008a (Oppe et al., 2005) to BS EN 1993-1 (BSI, 2005) provides erroneous results in certain situations because it omits the contribution made to the rotational stiffness of the end restraints by columns above and below, and to the translational stiffness of end restraints by other columns in the same storey.

Two improvements to the method are proposed in this paper. First, the axial load in adjoining columns is incorporated into the calculation of the effective length. Second, a modification to the effective length ratio is proposed that allows the buckling load of adjacent columns to be considered. The improvements are shown to be effective and consistently provide results within 2% of that computed by structural analysis software, as opposed to the up to 80% discrepancies seen using the NCCI (Oppe et al., 2005).

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2. Recent Article

Assessing the in-plane seismic performance of rammed earth walls by using horizontal loading tests

Abstract

Rammed earth (RE) construction is attracting renewed interest throughout the world thanks to its sustainable characteristics: very low embodied energy, advantageous living comfort due to substantial thermal inertia, good natural moisture buffering and an attractive appearance. This is why several studies have recently been conducted to investigate RE. However, there have not yet been sufficient studies on the seismic performance of RE buildings. This paper presents an experimental study on the static nonlinear pushover method and its application to the seismic performance of RE structures. Several walls with different height/length ratios were built and tested to obtain nonlinear shear force–displacement curves. By transposing these shear force-displacement curves to an acceleration–displacement system and using the standard spectra presented in Eurocode 8, the performance points were determined, making it possible to assess the seismic performance of the walls studied in different conditions (seismicity zones and soil types).

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3. Most cited

FRP-confined concrete in circular sections: Review and assessment of stress-strain models

Abstract

An important application of FRP composites is as a confining material for concrete, in both the seismic retrofit of existing reinforced concrete columns and in the construction of concrete-filled FRP tubes as earthquake-resistant columns in new construction. Reliable design of these structural members necessitates clear understanding and accurate modeling of the stress-strain behavior of FRP-confined concrete. To that end, a great number of studies have been conducted in the past two decades, which has led to the development of a large number of models to predict the stress-strain behavior of FRP-confined concrete under axial compression. This paper presents a comprehensive review of 88 models developed to predict the axial stress-strain behavior of FRP-confined concrete in circular sections. Each of the reviewed models and their theoretical bases are summarized and the models are classified into two broad categories, namely design-oriented and analysis-oriented models. This review summarizes the current published literature until the end of 2011, and presents a unified

framework for future reference. To provide a comprehensive assessment of the performances of the reviewed models, a large and reliable test database containing the test results of 730 FRP-confined concrete cylinders tested under monotonic axial compression is first established. The performance of each existing stress-strain model is then assessed using this database, and the results of this assessment are presented through selected statistical indicators. In the final part of the paper, a critical discussion is presented on the important factors that influenced the overall performances of the models. A close examination of results of the model assessment has led to a number of important conclusions on the strengths and weaknesses of the existing stress-strain models, which are clearly summarized. Based on these observations, a number of recommendations regarding future research directions are also outlined.

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4. Open Access Article

مقاله زیر به صورت کامل قابل دریافت و در صورت تمایل قابل ترجمه می باشد.

Fragility assessment of a RC structure under tsunami actions via nonlinear static and dynamic analyses

Abstract

Current guidelines for design and assessment of buildings under tsunami actions do not explicitly state how to apply tsunami loads to buildings and which analysis methods to use in order to assess the structural response to the tsunami loads. In this paper, a reinforced concrete (RC) moment-resisting frame, which is designed as a tsunami evacuation building, is selected as a case study and subjected to simulated 2011 Tohoku tsunami waves. To assess tsunami impact on the model building, different nonlinear static analyses, i.e. constant-height pushover (CHPO) and variable-height pushover (VHPO), are compared with nonlinear dynamic analysis. The results of VHPO provide a good prediction of engineering demand parameters and collapse fragility curves obtained from the dynamic analysis under a wide range of tsunami loading. On the other hand, CHPO tends to overestimate interstorey drift ratio (IDR) and underestimate column shear by about 5–20%. It provides a larger fragility, i.e. about 10% in median value, for global failure and a smaller fragility for local shear failure. On the basis of these results, it is recommended that VHPO be used in future fragility analysis of buildings subjected to tsunami. However, pushover methods might not be adequate in cases where the tsunami inundation force time-histories are characterised by a “double-peak”, which subjects the structure to a two-cycle load. Finally, it is found that tsunami peak force is better correlated to IDR than flow velocity and inundation depth for the considered structure. This

suggests that the peak force would be a more efficient intensity measure than the other two in the development of tsunami fragility curves.

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