Modelling effect of supporting frame on vibration serviceability of floors

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Abstract

Whether it is analytical or mathematical, modelling is a key and powerful tool for structural engineers to predict the performance of civil structures prior to their construction. A model, by its nature, is a simplified representation of the complex real-life structure. The more accurately the model represents the real-life structure, the more precise the performance could be obtained. Based on the purpose of the modelling process, different guidelines suggest different techniques to idealize structures. In the case of estimating vibration serviceability level of floor structures, current-state-of-the-art design guidelines provide a list of standard modelling assumptions. One of those is about modelling the boundary conditions of the floor, where only one level of columns above and below the floor are modelled with the assumption of rigid support regardless of the floor level being modelled (i.e. top or bottom floors in a multistorey building are modelled in the same way). This paper presents a pilot study to investigate the effects of modelling the full support frame of the building, including foundations, on the dynamic properties of floor structures. Different Finite Element (FE) models of the same suspended floor structure are used to present the methodology. It can be concluded that modelling columns and piles supporting the floor could change significantly the prediction of dynamic properties of the floor FE model under investigation. Consequently, the vibration serviceability level of the floor, introduced in terms of Response Factors, can change as well.