

Dynamic Test for Stability of Columns in Sway Mode

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Abstract : Testing of columns in sway mode is performed in order to determine the maximal allowable load limited by plastic deformations or their end connections and a critical load limited by columns stability. Motivation to determine accurate value of critical force is caused by its using as follow: - critical load is maximal allowable load for given column configuration and can be used as criterion of perfection; - it is used in calculation prescribed by standards for design of structural elements under combined action of compression and bending; - it is used for verification of theoretical analysis of stability at various end conditions of columns. In the present work a new non-destructive method for determination of columns critical buckling load in sway mode is proposed. The method allows performing measurements during the tests under loads that exceeds the columns critical load without losing its stability. The possibility of such loading is achieved by structure of the loading system. The system is performed as frame with rigid girder, one of the columns is the tested column and the other is additional two-hinged strut. Loading of the frame is carried out by the flexible traction element attached to the girder. The load applied on the tested column can achieve values that exceed the critical load by choice of parameters of the traction element and the additional strut. The system lateral stiffness and the column critical load are obtained by the dynamic method. The experiment planning and the comparison between the experimental and theoretical values were performed based on the developed dependency of lateral stiffness of the system on vertical load, taking into account semi-rigid connections of the column's ends. The agreement between the obtained results was established. The method can be used for testing of real full-size columns in industrial conditions.

Keywords : buckling, columns, dynamic method, end-fixity factor, sway mode

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