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Buckling load and effective length of web tapered built-up columns in pre-engineered steel buildings

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Stability design requirements of structure and its elements emphasize to consider $P-\Delta$ and $P-\delta$ effects in structural analysis or use second order analysis. It is imperative for frames with web tapered built up columns, to assess for buckling load, P_{cr} . This paper presents two methods for calculation of buckling load, P_{cr} , for columns with web-tapered I-sections with both ends pinned and with one end fixed (base) while other free (top) having symmetric taper on both sides of vertical axis. This has been extended to columns with taper only on one side. These methods, namely buckling load factor method and effective length factor method, offer simple and direct equations. Equations are derived by analyzing results columns with various tapered columns and verified by SAP2000. Buckling load factors, R_{ppin} and R_{pfix} are used for ratio of buckling load of tapered column to Euler buckling load of prismatic column with section properties at base respectively. R_i term is used for ratio of moment of inertia at top to moment of inertia at base. It is shown that buckling load factor is independent of height. Equation for relation between buckling load factors for fixed base case and pinned end case is also derived.

Biography

Ramesh Meghrajani is a Research Scholar at VNIT, Nagpur, India. He is CEO of Neo Infrservices Pvt. Ltd., a structural consultancy organization in field of PEB buildings.

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