

عنوان مقاله:

Performance of Batten Columns in Steel Buildings During the Bam Earthquake of ۲۶ December ۲۰۰۳

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خلاصه مقاله:

In recent decades, the seismic behavior of steel and steel reinforced concrete buildings has been, in many cases, unsatisfactory. In fact, after the ۱۹۸۹ Loma Prieta, ۱۹۹۴ Northridge and the ۱۹۹۵ Kobe earthquakes, several engineered steel structures suffered heavy damage or collapsed due to failures in their structural components or welded parts. In some countries, non-engineered buildings using reinforced concrete or steel columns and beams (particularly shopping centers and schools) were responsible for the majority of casualties because of lack of safety procedures against the effects of horizontal seismic forces. In Bam, many residential, commercial and governmental buildings were steel structures. Use of built up columns with batten plates is very common in different regions of Iran. The design of the batten columns is guided by the INBC, which is limited to the calculation of the axial capacity of these column under gravity loads. In order that the shear deformations do not reduce the axial capacity of the batten columns, some recommendations are also provided by the INBC. Taking to account the INBC recommendations the column is expected to buckle along the axis parallel to batten plates in which the buckling load is not influenced by the shear deformation. In this paper, the behavior and failure modes of steel buildings during the Bam earthquake are briefly presented. The different failure modes of batten columns observed in damaged buildings are discussed and compared with those that are expected to happen when a batten column is designed according to code provisions. An initial evaluation of damage patterns from the Bam earthquake revealed failure modes in columns, such as global buckling about the axis perpendicular to batten plates (hollow axis), local buckling, batten plate failure, and lateral torsional buckling. This demonstrates that the seismic performance of batten columns is unsafe and their use must be avoided in regions characterized by high seismic risk, at least until their behavior under dynamic loads is better understood. Finally, it is necessary to update the INBC, introducing specific seismic requirements taking into account the importance of inelastic structural response to large earthquakes and criteria based on "performance-based design" and "capacity design" principles.

کلمات کلیدی:

Bam earthquake, Steel Building, Batten Column, Batten Plate, Shear Softening, Khorjini Connection

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