Lateral Buckling Capacity for H-shaped Beams Considering Restraint Effects on Non-Structural Members

Yuki YOSHINO

Assistant Professor yoshinoy@sendai-nct.ac.jp

Affiliated Societies
Architectural Institute of Japan
Japanese Society of Steel Construction

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Research Topics

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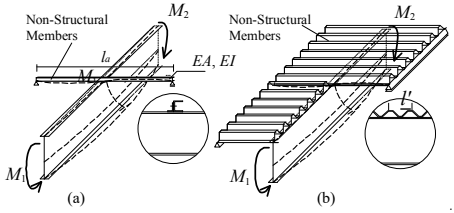
Research Seeds

Steel structures usually use H-shaped sections as structural members. H-shaped beams are connected by lateral braces in most cases, which is effective to prevent lateral buckling of the beams. Currently, Japanese design code only considers ideal cases in which a lateral brace is connected to a compressive flange or both flanges, by which lateral buckling is effectively prevented because it is initiated by flexural buckling of a flange under compression. However, considering that lateral braces are usually connected to the upper flanges of H-shaped beams in moment-resisting frames, the upper flange at a bracing point can also be subject to tensile force, whereas the other (bottom) flange with no restriction is subject to compression under a combination of dead loads and lateral seismic loads. As a result, a beam can undergo lateral buckling deformation initiated by flexural buckling of the bottom flange.

Figure.1 Lateral Buckle for H-Shaped Beams.



Non-structural members such as roof purlin and folded-roof plates are not considered as lateral braces. They might not possess sufficient rigidity or strength to restrain lateral buckling deformation of H-shaped beams. Even so, non-structural members are expected to be effective to increase the buckling load of structural members to some degree.

When non-structural members are jointed to a beam, their connections are usually multiple but single and closely spaced, comparing with a lateral brace (structural member) supporting a beam. These closely-spaced multiple braces along a beam are conveniently defined as “continuous braces.” Non-structural members, such as folded-roof plates, do not possess stiffness as large as a slab to restrain a beam from lateral buckling deformation. Some further evaluation is attempted to describe contribution of continuous braces.

This research examines the effectiveness of non-structural members as a lateral braces on the lateral buckling strength of H-shaped beams in a broader range of conditions in bracing stiffness and loading conditions.

Related Technology