

Effect of Residual Stresses on the Overall Buckling Behavior of Welded Box-section Columns under Axial Compression Loading

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Abstract

Owing to progressively increased demands of high-strength steels (e.g. S460, S690 and S960) in steel construction, an experimental program was developed to study welded box-section steel columns under compression accounting for residual stress distribution. In this paper, a series of numerical analyses were performed to identify the effect of residual stress on the overall buckling loads of the welded box-section columns. At the end of the study, it was observed that residual stress distribution has little influence on the overall buckling loads of the welded box-section steel columns. It was also observed that dimensional properties and residual stress ratio α/β have a minor and a significant influence respectively on the overall stability coefficient of welded box-section steel columns.

Keywords: residual stress; welded box-section columns; buckling loads; axially compressed; stability behavior.

1 Introduction

Sectional residual stresses has a negative influence on the overall buckling behavior of steel columns under compression loading because of premature yielding and loss of stiffness [1]. An understanding of effect of residual stress is very important for

reliable design theories especially for high-strength steel structures (e.g. S460, S690 and S960) which have been increasingly applied in recent years.

A number of experimental tests have been carried out to investigate the residual stress distribution and magnitudes of welded box-sections. Wang [2] measured three welded box-sections made of