36－5　Buckling Strength of Steel Columns with Induced Deformation at Increasingly Higher Temperatures

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An experimental and analytical study was conducted to evaluate the effects of induced deformation caused by the thermal elongation of connected heated steel beams on the buckling strength of steel columns.Two sets of buckling tests were performed using steel columns(SN490B JIS grade)with a rectangular cross-section(a)one at a constant high temperature and(b)the other at increas-ingly higher temperatures under a constant axial load.The first experimental study indicated that the reduction of the maximum axial load Pmax due to induced deformation can be up to 15%at room temperature,but at above400℃,the column failure axial load is only slightly lower than that without inducing the deformation.The second experimental study indicated that the reduction in the column failure temperature Tcr due to induced deformation can be from 10℃ to 50℃,depend-ing on the axial force ratio.The results of these tests were simulated by a one-dimensional finite-element procedure developed by the authors,and it was shown that numerical analysis can be used to provide accurate predictions of the buckling characteristics of columns with an induced deformation at high temperatures when an appropriate mechanical model and data of steel materials at high temperature are used.

(Designing Structures for Fire Conference,　2003.10)