Structural fire response of tall buildings with inclined and bi-linear perimeter columns

This paper considers the effect of perimeter column angle-of-inclination on the structural response of tall buildings subject to fire. The purpose of the study is to aid designers when doing structural fire assessments of tall buildings. Initially the consequences of column angle-of-inclination and its interaction with the floorplate are examined. It has been found that inclined and vertical columns have a similar structural fire response. However, bi-linear columns which have two angles-of-inclination have been found to behave differently compared to linear columns when exposed to fire. Bi-linear columns induce increased in-plane axial forces on the floor slab during both ambient and fire conditions. This affects the behaviour of the floor under fire conditions. As a result, bi-linear columns are subjected to combined axial forces and bending and the connections require higher compressive or tensile capacities to withstand these forces compared to columns that have only one angle-of-inclination. A parametric study was carried out for a range of bi-linear columns by varying the angle-of-inclination, column section, applied axial load, and length of the span of the floor.