Abstract

Response of tall building diagrid structure to intermediate and mega floor fire has been studied in this thesis. The analysis was performed for a 36-story building with steel diagrid structure. Four fire scenarios were developed: two for lower floors (i.e. floor 3 & 4) and two for upper floors (i.e. floor 33 & 34). Standard fir curve i.e. ISO-834 was used for this study. The results show that the failure mechanism is different for intermediate and mega floor fire scenario on lower floors in a tall building. In case of intermediate floor fire, failure was initiated due to the buckling of diagrid at the base while in mega floor fire, failure was initiated due to plastic hinge formation in the floor beam. In case of fire on upper floors in the building, failure was indicated by large deflections in the slab.

Development of deflections, axial forces and bending moments were also analyzed. Results show that the largest compressive stresses develop in the fire floor. The floors adjacent to the fire floor experience highest tensile forces. Theses tensile forces reduce as we move to the floors away from the fire floor. The diagrid lateral displacement depends on the relative stiffness of floor beams and diagrid section. The lateral displacement of diagrid, inwards and outwards, is higher in case of mega floor fire.