OFFICE STRUCTURE PLANNING WITH VARIOUS COLUMN ELEMENT SHAPES

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ABSTRACT

Rapid population growth demands the construction of efficient, safe, and aesthetically pleasing multi-story buildings to overcome land constraints. This study aims to analyze and compare the strength and stability of office building structures with variations in column cross-sectional shapes, including square, circular, hexagonal, and octagonal. Building design analysis was performed using conventional calculation methods with the assistance of Microsoft Excel and numerical analysis methods with SAP2000 software to obtain accurate comparison results. The materials used were concrete with a strength of f'c 25 MPa, main reinforcement fy 400 MPa, and stirrup reinforcement fyt 240 MPa. Verification of the comparison of the planning results on the various column element shapes at the inter-level deflection showed that in the x and y directions, square columns were smaller than other columns. Based on the deflection, it is known that P-Delta has a typical value that is the same for each shape. The values of internal forces in axial force, x and y direction moments, and x and y direction shear forces are obtained at the highest values in the cross-sectional shape with a difference in value between square, circle, hexagon, and octagon in column K1; circle 3.57 kN (P), square 5.54 kNm (Mx), square 5.50 kNm (My), circle 0.30 kN (Vx), and circle 0.98 kN (Vy). Meanwhile, in column K2; square 1.16 kN (P), square 17.38 kNm (Mx), square 1.16 kNm (My), circle and octagon 0.06 kN (Vx), and square 0.07 kN (Vy). For the column cross-section capacity in column K1, the largest capacity value is found in the square shape and the smallest in the hexagonal shape, with a difference of 366.85 kNm, and in column K2, the difference is 393.68 kNm.

***Keywords**: Internal Forces, Building, Columns, SAP2000*