3.5 Computer analysis of rigid frames

Although the approximate methods described earlier have served structural engineers well for decades, they have now been superseded by computer analysis packages. Computer analysis is more accurate, and better able to analyse complex structures. A typical model of the rigid frame consists of an assembly of beam-type elements to represent both the beams and columns of the frame. The columns are assigned their principal inertia and sectional areas. The beams are assigned with their horizontal axis inertia and their sectional areas are also assigned to make them effectively rigid. Torsional stiffnesses and shear deformations of the columns and beams are neglected.

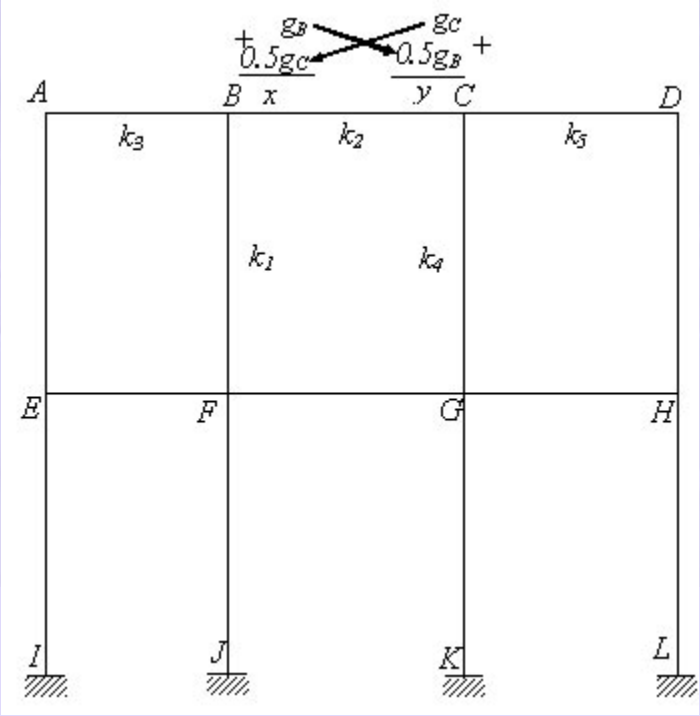

Fig.3.13 Typical frame

Some analysis programs include the option of considering the slab to be rigid in plane, and some have the option of including P-Delta effects. If a rigid slab option is not available, the effect can be simulated by interconnecting all vertical elements by a horizontal frame at each floor, adding fictitious beams where necessary, assuming the beams to be effectively rigid axially and in flexure in the horizontal plane.

Modern design offices are generally equipped with a wide variety of structural analysis software programs, invariably based on the stiffness matrix method. These Finite Element Analysis packages such as MSC/NASTRAN, SAP - 90, STAAD etc., give more accurate results compared with approximate methods, but they involve significant computational effort and therefore cost. They are generally preferred for complex structures. The importance of approximate hand methods for the analysis of forces and deflections in multi-storeyed frames can not be ignored; they have served the Structural Engineer well for many decades and are still useful for preliminary analysis and checking.