Rigid vs. Semi-rigid diaphragm

Rigid diaphragms have infinite in-plane stiffness properties, and therefore they neither exhibit membrane deformation nor report the associated forces, whereas **semi-rigid diaphragms** simulate actual in-plane stiffness properties and behavior. For most reinforced-concrete slab systems, in which the slab is sufficiently thick and membrane deformation due to lateral loading is negligible, rigid diaphragms produce results nearly identical to those of semi-rigid diaphragms, while taking advantage of faster computation. Semi-rigid diaphragms should be modeled when significant in-plane deformation does occur, or when required by code.

Primary differences

- **Formulation** – The infinite in-plane stiffness components of a rigid diaphragm allows the stiffness matrix to condense, decreasing computational time.
- **Eccentricity** – For rigid diaphragms, the accidental eccentricity associated with auto seismic loading is concentrated and applied at the center of mass, whereas for semi-rigid diaphragms, accidental eccentricity is applied to every node for auto seismic loads. If no diaphragm is assigned eccentricity will not be applied to any node. For auto wind load cases and rigid diaphragm , loading is applied at geometric centroid, in case of semi-rigid diaphragm auto wind loads are distributed in 10 nodes, so that the summation of these forces with respect to centroid will be equivalent to lateral and torsional wind cases.
- **Reporting forces** – In-plane chord, shear, and collector forces are only reported when using semi-rigid diaphragms.

See Also

- Diaphragm forces using Section Cuts article
- Accidental eccentricity design article
- Center of rigidity of a semi-rigid diaphragm article