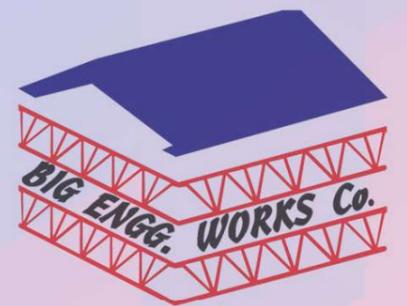


SPACE FRAME SYSTEMS



شركة بيغ للأعمال الهندسية
BIG Engineering Works Co.

Space Frames are a common feature in modern building construction; they are often found in large roof spans in modernist commercial and industrial buildings.

In structural engineering, a **space frame** or **space structure** is a truss-like, lightweight rigid structure constructed from interlocking struts in a geometric pattern. Space frames can be used to span large areas with few interior supports.

Like the truss, a space frame is strong because of the inherent rigidity of the triangle; flexing loads (bending moments) are transmitted as tension and compression loads along the length of each strut.

Steel space frames provide great freedom of expression and composition as well as the possibility to evenly distribute loads along each rod and external constraints. With these features, steel space frames can be used to achieve also complex geometries with a structural weight lower than any other solution.

The inner highly hyper-static system provides an increased resistance to damages caused by fire, explosions, shocks and earthquakes. Space frames are modular and made of highly industrialized elements designed with a remarkable dimensional accuracy and precise surface finish.

Space frames are typically designed using a rigidity matrix. The special characteristic of the stiffness matrix in an architectural space frame is the independence of the angular factors. If the joints are sufficiently rigid, the angular deflections can be neglected, simplifying the calculations.

The simplest form of space frame is a horizontal slab of interlocking square pyramid and tetrahedra built from aluminium or tubular steel struts. In many ways this looks like the horizontal jib of a tower crane repeated many times to make it wider. A stronger form is composed of interlocking tetrahedra in which all the struts have unit length.

More technically this is referred to as an isotropic vector matrix or in a single unit width an octet truss. More complex variations change the lengths of the struts to curve the overall structure or may incorporate other geometrical shapes.

Space Frame Systems - Curvature Classification

- Space plane covers. These spatial structures are composed of planar substructures. Their behavior is similar to that of a plate in which the deflections in the plane are channeled through the horizontal bars and the shear forces are supported by the diagonals.
- Barrel vaults. This type of vault has a cross section of a simple arch. Usually this type of space frame does not need to use tetrahedral modules or pyramids as a part of its backing.
- Spherical domes and other compound curves usually require the use of tetrahedral modules or pyramids and additional support from a skin.



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