4.2 Thin shell

A thin shell is defined as a shell with a thickness which is small compared to its other dimensions and in which deformations are not large compared to thickness. A primary difference between a shell structure and a plate structure is that, in the unstressed state, the shell structure has curvature as opposed to the plate's structure which is flat. Membrane action in a shell is primarily caused by in-plane forces (plane stress), but there may be secondary forces resulting from flexural deformations. Where a flat plate acts similar to a beam with bending and shear stresses, shells are analogous to a cable which resists loads through tensile stresses. The ideal thin shell must be capable of developing both tension and compression.[

Types

The most popular types of thin-shell structures are:

Concrete shell structures, often cast as a monolithic dome or stressed ribbon bridge or saddle roof Lattice shell structures, also called grid shell structures, often in the form of a geodesic dome or a hyperboloid structure Membrane structures, which include fabric structures and other tensile structures, cable domes, and pneumatic structures.