1. Introduction

1.1 Roof truss structures

Roof trusses are the very special structures that are adopted when a span of 10m and above is required. Preferring roof trusses makes the construction economic as the building of concrete sections to support the slab for such a long span becomes uneconomic in all respects. Roof trusses are the structural systems that comprise of tension and compression steel members being joined to one another in a form by means of welded and bolted connections. Normally compression members are called struts and columns, and tension members are called tie members. Normally such structures become inefficient under sustained loading. Using tensegrity the same structure can be constructed such that an economy could be achieved through cost, strength and also the dead load could be reduced as a whole. Also the aesthetics could be achieved which are bit tough with conventional constructing method.

1.2 Active Tensegrity

Tensegrity is a new principle (50 years old) based on the use of isolated components in compression inside a net of continuous tension members, in such a way that the compressed members (usually bars or struts) do not touch each other and the pre-stressed tensional members (usually cables or tendons) delineate the system spatially and in a self-equilibrated state.

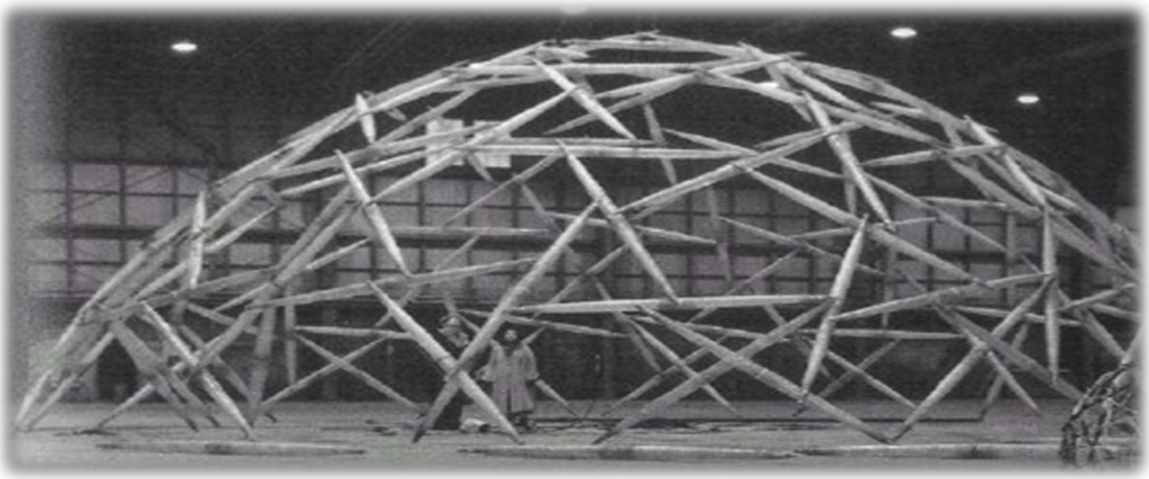

Fig.1.2.1 Geodesic dome structure by Snelson

Tensegrity structures are 3-D trusses where members are assigned specific functions. Some members remain in tension while others are always in compression. Usually for compressive members, solid sections or bars are used; and string or cable type elements are used as the tensile members. Generally bar &string configurations will not be in equilibrium. Hence, if constructed they will collapse to a different shape. Only bar string configurations which are pre-stressed and in a stable equilibrium will be called **Tensegrity structures**. If well designed, the application of forces to a Tensegrity structure will deform it into a slightly different shape in a way that supports the applied forces. A Tensegrity structure is as shown in fig.1.

Tensegrity technique results with structures that are self stabilised and vibrating such that the load coming over the structure is going to be distributed throughout the structure by the tension and compression thus the structure gets self stabilised. Also if the structure gets subjected to any impact loads the vibrating mechanism of the structure distributes the loads to the supports safely without causing any major harm to the structure.

Tensegrity is easily recognizable in the systems of the human body. The muscular skeletal system is a tensegrity of bones and muscles. The muscles provide continuous pull, and the bones provide discontinuous push. Another common example of tensegrity is in a children's balloon. When examined as a system the rubber skin can be seen as continuously pulling while the discontinuous air molecules are discontinuous. Pushing against the inside of a balloon keeping it inflated. All external forces are immediately distributed over the entire system hence the balloon is quite strong despite of its thin membrane.

1.3 Pre Engineered Building

PEB (Pre Engineered Building) is an optimistic building technique where in preference is given for providing economical sections according to the moments in the members. This optimistic technique came to be known in the 1960s.

Pre Engineering building technique is very popularly known for optimising the material in the construction. This is done by pre analysing the structure and preferring the larger sections at the regions of larger bending moment and preferring

smaller sections at the regions of smaller bending moments such that the sections preferred are adequate to resist the bending moments.

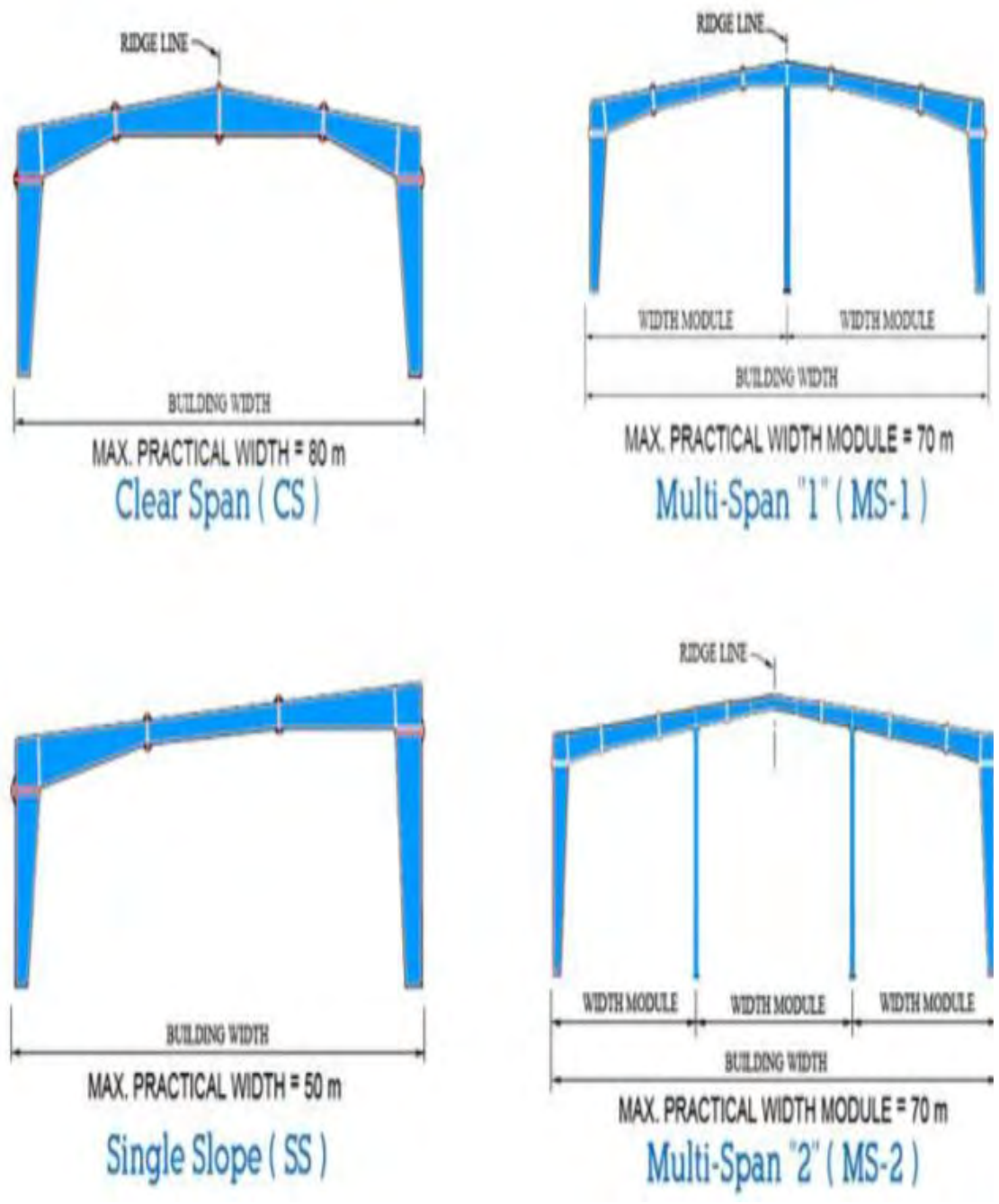

Fig.1.3.1 Pre Engineered building types

Fig.1.3.2 PEB structure in industrial building

Numerous software over the decades have made the way of analysing the structures easy and comfortable. Especially this usage of the software's has made Pre engineering building structures more economical and optimistic. This technique is a fast process of building especially the steel structures and thus achieving the economy in the construction. Also this method provides an advent for pre fabricating the materials in the industries and then transporting it the site and assembling them in the supervision of the engineers. Today Pre engineering building technique is widely followed for construction of the large steel structures and would remain in existence still for a couple of decades. A Pre Engineered building structure is as shown in fig.2.