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SPACE FRAME STRUCTURE SYSTEM: A REVIEW

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Abstract

In recent decades the building industry has begun to grow. The human race is still seeking to use the maximum structural space. Modern systems are required in order to achieve a broad clear economic period. Nowadays, the interest in space frame systems is growing. A 3D structural structure is a space frame that incorporates well-organized linear axial components to achieve a coherent distribution of power. The key goal of these schemes is to cover a broad coverage and make the layout friendly. The space frames are also light and can be taken to the site quickly. The goal of this paper is to implement the comprehensive definition of these systems' spatial frame systems and implementations. In addition, a literature analysis discusses the study of different parameters influencing the structural behavior of the space frames system.

Keywords: *3D structure, Lightweight, long span structures, Space frame systems.*

I.INTRODUCTION

There has been raising world-wide interest in the construction of space frame systems. The key goal in architecture and design is to have the big unblocked area fitted with all the necessary facilities and defense. Since the spaceframe makes the correct decision to satisfy these specifications for the implementation of modern design techniques and materials and methods. Many scientists have put forth their ideas, approaches and experimental findings for improving the framework of spatial structures[1]. Due to their aesthetic appearance and ability to cover a wide area without any intermediate blockage, the device is becoming essential.

The structure of a Space Frame (Figure 1) can be described as a rigid and lightweight structure like a truss. It is formed by a geometrical pattern from the interlocking struts. Efficiently, the space frames may be used to occupy wide areas with little internal assistance. The intrinsic rigidity of the triangle and the bending loads distributed as stress and compression loads over each strut is due to a robustness of the spatial system. Space frames are usually assembled with

a matrix of rigidity. The special feature of the rigidity matrix is the independence of the angular variables in the architectural frame. The angular deflections can be overlooked, simplifying equations, if the joint is sufficiently stable[2]. A horizontal plate of square pyramids and tetrahedrons, made of Aluminium and tube stainless steel, is the simplest shape of the room frame. This looks many times like the horizontal jib of a turret replicated to make it longer. A stronger type is made up of interlocking tetrahedra with unit lengths of which all struts.

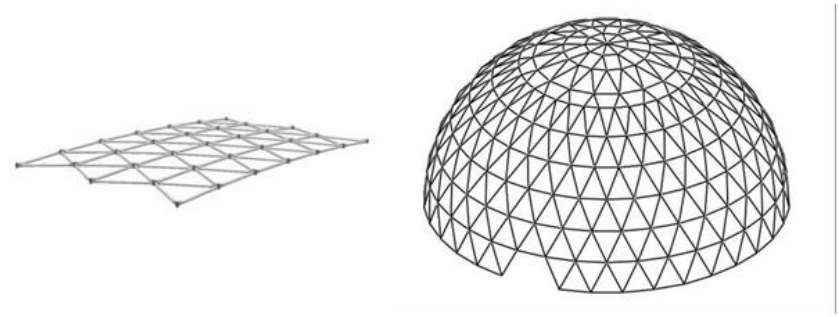

Fig.1: Space frame structure[3]

This is more technically known as an isotropic vector matrix or a byte truss in one single unit width. Differences in complexity alter the length of the streams to curve the structure or other geometric forms. Space frames are a standard characteristic in contemporary constructions; often in modernist commercial and industrial buildings they are used in large sections of a roof. The lightweight of a space frame structure is one of the most important advantages. The principal factor is that material is spatially dispersed in a manner that the load transfer process is predominantly axial voltage or compression. Accordingly, any material is used in its entirety in any given element. Moreover, most space frames have now been made of steel or Aluminium, reducing their self-weight significantly. This is particularly important for long-range roofs, which have contributed too many noteworthy implementation examples. Spatial frame units are typically manufactured in bulk in the factory so that an industrialized structure infrastructure is completely exploited. Space frames may be made from basic, often regular size and shape prefabricated units. These units can be brought comfortably and assembled efficiently on site by semi-skilled practice. Space frames will then be produced at a reduced cost.

Despite its lightness, a space structure is also sufficiently rigid. This is because of its three-dimensional existence and the complete presence of the constituent elements. Space frames have a flexibility in shape and form, and can create different flat space grids, tapestries or even free form modules by using a regular module. Architects admire the elegance of vision and the remarkable simplicity of space frame lines. The structural members remain subjected to a pattern that is very evident in the architectural expression. The need for clarity in terms of both visual effects and the potential to satisfy variable spatial demands often requires the most advantageous approach to spatial frames[4]. There is an increasing stability and rigidity in the layout of space structures and the markets will quickly catch up. It is an outstanding choice with its aesthetics and architecture viewpoints. In addition to the above points, we will discuss

some other specifications and benefits of a Spatial Frame Structure in a sequence in the next report.

A. Space Frame Structure Implementations

1. Structures of commerce and industry
2. Auditory spaces
3. Lightning
4. Canopies
5. Great stands
6. Halls of Show
7. Stadiums in athletics

B. Space Frame Layout Curvature Classification

1. **Capacity of the space plane:** such space structures consist of planar substructures. Its action is identical to that of a plate where the floor extends across the horizontal bars and the diagonal protects the shear forces.
2. **Vaults of a barrel:** This kind of vaults has a simple arch cross section. Normally, tetrahedral modules or pyramids do not need to be used as part of this kind of spatial frame.

Tetrahedral modules or pyramids and additional support from the skin are typically required for spherical domes and other compound curves.
This is more technically known as an isotropic vector matrix or a byte truss in one single unit width. Differences in complexity alter the length of the streams to curve the structure or other geometric forms. Space frames are a standard characteristic in contemporary constructions; often in modernist commercial and industrial buildings they are used in large sections of a roof[5].
The designs of the space frames are light in weight and can be shaped into different forms that offer the structure a good aesthetic look.

II.DISCUSSION AND CONCLUSION

The researchers concluded that spatial systems are best suited to long-term structures and are useful for stretching vast regions without mid-impedance. The loads are moved equally to ensure these systems are:-

Rigidity and power gain.

i. The designs of the space frames are light in weight and can be shaped into different forms that offer the structure a good aesthetic look.

ii. For thorough analysis and design of spatial structure, various Finite Element applications such as STADDPro, SAP 2000, ANSYS, ABAQUS are useful.
iii. Different methods, like composed spatial systems, over-reinforced top chord members, are used to use strong parts improving structural performance.
iv. The composite roof is more effective than a non-composite roof, to minimize compression forces in the top chord.
v. Members. - Members. The buckling loss of top chord members was also avoided by reducing the compression powers. The composite structure of space improves structural performance.

III.REFERENCES

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