

CHECK TENT STRUCTURE, IN TERMS OF ARCHITECTURAL AND STRUCTURAL DESIGN

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Mg. Anahita Ghorbani
Islamic Azad University of Damghan, *Architecture*
Technology, Iran
anahitaghorbani1368@gmail.com

Mg. Majid Shahroudi
Islamic Azad University, *Geography and Urban*
Planning, Islamshahr Branch, Iran

Mg. Mohammadyar Kermani
Islamic Azad University,
Public Administration (Correction of Organizational
Structure and Improvement Methods),
Central Tehran Branch, Iran

Hossein Jafari Asl
Tabriz University, *Architectural expert "Design and*
renovation of worn out texture",
Jahad, Iran

Resumen: Cerca de varias décadas las estructuras de tensión o sistemas de membrana debido a sus características únicas se tienen en cuenta en la industria de la construcción. Hoy en día, con los avances en la tecnología, las estructuras de membrana se han transformado completamente, aunque los materiales mejorados, el rendimiento mejorado de recubrimiento de membrana es métodos de planificación, pero el factor principal es la eficiencia de las estructuras de compensaciones. En este trabajo, las estructuras de membrana de tracción desde el punto de estructuras de discusión en las estructuras de membrana (tejido), el análisis ha sido investigado. Estas construcciones pueden utilizarse como cubierta para edificios, parques infantiles, jardines, terrazas, estacionamientos, etc., iluminación creativa como espacio urbano deseado e indicadores que aparecen. Los materiales utilizados en este tipo de estructuras (generalmente tela), tanto estéticamente como funcionalmente con todos los materiales convencionales utilizados en la industria de la construcción son diferentes. Las estructuras de tracción para sus propiedades físicas y geometría así como otras estructuras son únicas y podrían ser estructuras permanentes, temporales o móviles ser utilizados. Estas estructuras no sólo son ligeras, sino también hermosas, semi-transparentes, y tienen una larga vida y son principalmente económicos.

Palabra clave: Estructuras, membrana, tiendas de campaña, mástil, cable, estiramiento

Abstract: Close to several decades tensile structures or membrane systems because of its unique features is taken into consideration in the construction industry. Today, with advances in technology, membrane structures have been completely transformed, though improved materials, enhanced performance of membrane coating is planning methods but the main factor is the efficiency of the structures of tradeoffs. In this paper, tensile membrane structures from the point of discussion structures in the membrane structures (fabric), the analysis has been worked investigation. These constructs can be used as a cover for buildings, playgrounds, gardens, terraces, parking lots, etc., creative lighting as an urban space desired and indicators appear.

Materials used in this type of structures (generally fabric), both aesthetically and functionally with all conventional materials used in the construction industry are different. Tensile structures for their physical properties and geometry as well as other structures are unique and could be permanent structures, temporary or moveable be used. These structures are not only lightweight, but also beautiful, semi-transparent, and has a long life and are mostly economic.

Keywords: Structures, membrane, tents, mast, cable, stretching

1. INTRODUCTION

Because the membrane can be such a beam column buckling resistance against bending and the like, these systems are very light. In fact, members of the tents to withstand the pressure that they often are weighted against the overall membrane. While the structures of compressed air through a membrane under tensile stress affected the internal Air Pressure, tent structure by rigid members such as pressure parts, bracing rope and kept arches. Cable systems also rely tensile stress, although thin wires and bars along the lines of focus, but the tent structure tensile stress over a wide area distributed.

2. RESEARCH METHODOLOGY

Methods of collecting information for research and for studies and field research library strives to most updated samples for the most up to date information and resources and even samples are used.

3. HISTORY

Despite the instability of the membrane, a very long time human creativity and ingenuity has managed ways and means to use the membrane in structural applications find, for example, nomads of Iran, Native America tribe of Arabs for thousands of tents used are lighter weight structural systems and efficient use of materials is limited to the benefits of this system. Nearly 2,000 years ago, it was decided that the ancient Roman amphitheater with a movable roof of the tent, using the same technology as the ship sails, be covered. The larger tent structures used to cover exhibitions such as circuses. But in fact used by the emergence of serious architectural work of Frei Otto and others in the wake of the Second World War began. He was always looking architecture that consumes minimal materials. He used to be a soap bubble model in an integrated approach, using the structures clad architecture is aptly encouraged intensive use of this type of construction developed. In nature, trees, webbed feet frog and bat Tent structures are all similar. Non-construction tent structure includes rocking chairs, fishing nets, kites, sails, gliders and loungers is. (Mohammad A.S ; Seyed Mostafa .2014), (Mohammad Mujahidin,2015)



Figure 1. The tent structure (Mahmoud et al 2013)

3.1. Tent structures

Tents: (a shell extension integrated thin by means of a column or arc pressure is maintained.) Tent different kind of structures, cables, curved double where the distance between the cable dropped to zero and level one in the tent were continuous shell, shell carries the load or part of it. Small tents made entirely of cloth. Usually by rigs (columns) or kept arches (Mahmoud et al 2013).

3.2. Examples of tensile behavior

- round fire
- Umbrella (with reverse its action also reverses the wind stress, however, the membrane is stretched in both cases)
- Eskimo boats (made of sealskin) (Mahmoud et al 2013).



Figure 2. Pre-tensioned membrane, an umbrella (Mohammad Mujahidin,2015)

3.3. Tents

The main motivation for the use of tents is the appropriate use of lightweight membranes. Nomadic tents and circus when properly maintained by the tensile elements can, cover large spans, Temporary tents are very intertwined, and only when they are

acceptable as a permanent roof (Mahmoud *et al* 2013).
Tent structures with nomadic tents difference:

- Consultants are great.
- Consultants are permanent.
- It is expected that not to spill down.
- Must not have wrinkles.
- Has a complex geometry.

Should have great sway in the wind-resistant materials are used in them can not only be designed backgrounds and practical experience (Mahmoud *et al*, 2013).

4. THE ADVANTAGES AND LIMITATIONS OF MEMBRANE STRUCTURES, AND COMPARISON WITH OTHER SIMILAR STRUCTURES

Performance membrane structures do not have any stiffness and hardness, so it should form their internal Prestressing to rely on. As a general rule, the beams with a span of more than 15 meters to prevent large openings can be made to strengthen the fabric by weaving or cable. Lack of tension in the membrane for structural stability is very dangerous if not maintained regularly led to the collapse of the structure (Mahmoud *et al*, 2013).

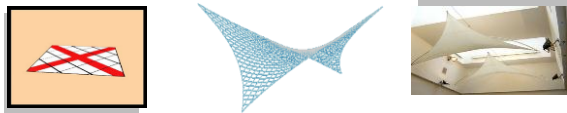


Figure 3. Form a high saddle by at least 2 points and 2 points down there



Figure 4. Saddle form an arch support across the membrane by structures placed in a stretched position (Mahmoud *et al* 2013)

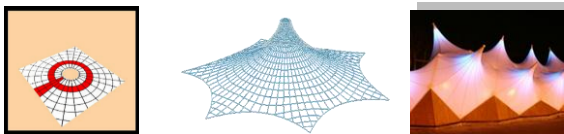


Figure 5. Form by dragging a point where the membrane comes out of the screen (Mahmoud *et al* 2013)

5. ARCHITECTURE AND CONVENIENT OPERATION

Tent structures widely used as temporary structures for exhibitions, markets and drawings are. However, for permanent structures such as air terminals, museums and laboratories should be used. These structures are often not used for more than one floor buildings, because they cannot form a normal class. Waterproofing membranes clad hard, so more places with temperate climate Shvnd.bh used for light weight, tent structures are an excellent choice for earthquake-prone areas. Significantly tents in areas where strong winds are a regular phenomenon, are inappropriate (Mohammad A.S + Seyed Mostafa, .2014).

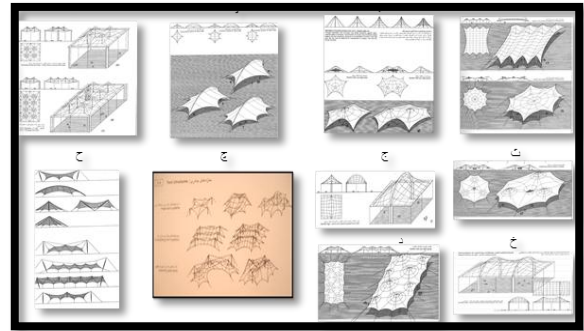


Figure 6. Tent structures

5.1. Building

Tents commonly used for temporary structures are considered, because the fabrics have low resistance to sunlight and quickly disappears. Recent advances, the use of shells (FRP in high doses) and coverage of the least erosion in the sun (eg, Teflon) has increased. The useful life of more than 20 years of hip shell 'which made them suitable for use in permanent structures (Mahmoud *et al*, 2013).

5.2. Connectors

According to the structures, connection type is selected and in corrosive environments and in other cases from stainless galvanized metal is used (Mahmoud *et al* 2013).

5.3. Abutments

Put simply, they are kept by the central pillars, but in practice may be due to non-structural or undesired use of other methods. Arc or more composite structures to provide support for vertical pressure may be applied on them. Cables can be daisy-chained along with columns for holding ridge tents at several points used (Mahmoud *et al* 2013).

5.4. Textiles

Fabrics used in membrane structures to be as follows. (Mahmoud *et al*, 2013)

- High density polyethylene HDPE
- PVC-coated polyester
- Glass fibers coated with PTFE

Cutting and sewing the fabric and fittings

- Preparation of cutting fabric and cutting fabric
- Sewing textile and related fittings and installation of fabric
- Installation and fabrics often "takes place at the same time.
- supply and installation of fittings using bolts, chains and cables
- Install and tune up the fabric (Mahmoud *et al* 2013)

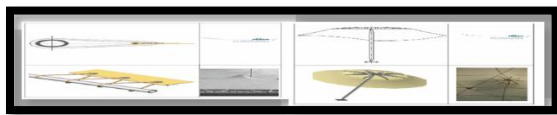


Figure 7. Sewing textile and related fittings (Mahmoud *et al* 2013)

5.5. Connectors Details

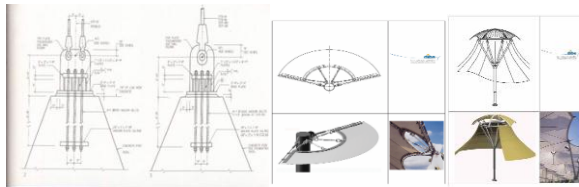


Figure 8. Connections (Mahmoud *et al* 2013)

5.6. Implementation details and fittings

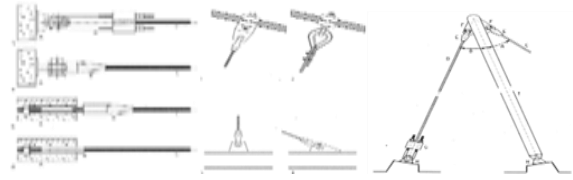


Figure 9. Connecting cables to the mast and anchor cable (Mahmoud *et al* 2013)



Figure 10. The cable is attached to the mast and fabrics (Mahmoud *et al* 2013)

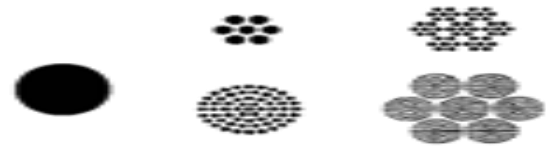


Figure 11. Cable geometry (Mahmoud *et al* 2013)

5.7. The development of membrane structures

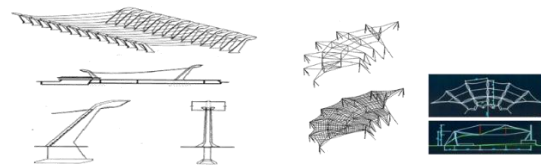


Figure 11. Structural development

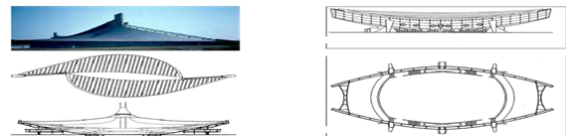


Figure 11 and 12. The process of structural development (Mahmoud *et al* 2013)

5.8. Loading membrane structures

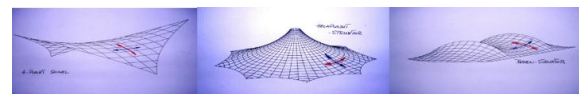


Figure 13. Structure loading (Mahmoud *et al* 2013)

Wind power
 Red = to wind suction
 The force of the weight of snow
 Blue = to wind pressure and snow load

6. EXAMPLES OF APPLICATION OF MEMBRANE STRUCTURES PARKING

- pergolas and canopies for outdoor
- Public spaces (cultural, commercial, recreational, etc.)
- Ventilation window glass and body building
- Coverage yards
- temporary exhibition spaces
- Domestic (ceilings, and partitions.)
- Areas with large span roofs of stadiums and sport facilities such as hangars, multipurpose halls and.

7. TENT STRUCTURES

Horst Berger, one of the engineers involved in the design of a large number of tent structure recently wrote: "Despite the great progress of construction materials and technology in recent years, a serious lack of understanding of the design and conduct Tent structures in most architecture. Temporary nature and vulnerability of the words shell and tents to obscure the fact that such structures safer and more reliable than many of the traditional system, they are combined. Because they are in operation and a lightweight waterproof shell to provide an integrated flexible.

7.1. Design methodology

Use soap bubbles networking curved and models are very appropriate for understanding the initial tents. They can be used to determine the form of the curve rope under tensile stress evenly across the membrane by pages that are used. However, more sustainable models for the study of architectural forms during the design process will be required. To search for other forms stockings nylon tent is often the first choice. Metal plates made with rotating joints, such as shells, tent structures can be seen in the form of classical chemistry become classical. To test the model in detail and with a good measure of the true scale models may be required. The critical issue is like the wind, the wind tunnel model may be required. While the shape of tents may be designated, in an easy and friendly using the above model is complete, Analysis

and evolution of certain structural requirements of the early preliminary design (Mohammad A.S † Seyed Mostafa .2014).

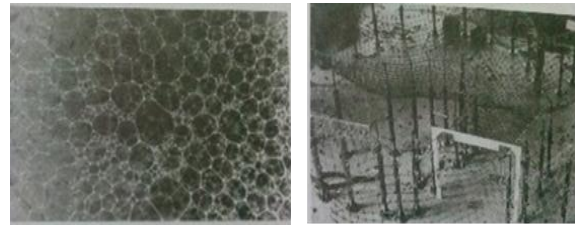


Figure 14. Rope and soap bubbles curve (Mohammad A.S † Seyed Mostafa .2014)

7.2. Development model

Tent structures by adding a tent or a rigid structure adjacent develop. They can easily be tangential or fall together, however, if two tents are fully connected, the forces will be changed every two tents. Therefore, such a connection will be possible but unusual development. This can be a common point, along a common line or in a common area occurs (Mohammad A.S † Seyed Mostafa .2014).

7.3. Build and run

Construction: fabric or homogeneous (with equal strength in all directions) or heterogeneous (one axis stronger than the rest). With regard to the materials chosen for their shape, levels of development or non-development will be created. This sequence requires the transportation and construction, because at one time in cutting special and unusual shapes should be well connected (Mohammad A.S † Seyed Mostafa .2014).

7.3.1. Construction sequence

Because of differences in size, shape and type of tent structures cannot be defined any construction sequence. Construction at the site can be divided into three categories or a combination of these three categories. Smaller networks already cut at the factory and delivered to the panel in place, And at ground level and then on the installation position are drawn up. If a tent is very large for this method, the panels can be installed partially in sections on the ground and then taken up. More Tent structures for ultimate stability on the Prestressing. Although, when the structure was built in detail, such stability is still not balanced. During construction, clad membranes quite vulnerable even to light winds (Mohammad A.S † Seyed Mostafa .2014).

7.3.2. Aesthetic features:

Beautiful tent of curvature of the reciprocating pages and edges, translucent tissue and the use of vivid colors and subtle. The ability to cover long spans, tent structures can significantly beyond the human scale. Small models of tent structures often referred to as the canopy at the entrance of the shop, where unique brand identity to create a low cost, are used. Texture and strong role model in the beauty of its cable networks, cable networks, a sense of curvature in the fabric of the tent increases (Mohammad A.S † Seyed Mostafa .2014).



Figure 15. The large-scale tent structure compared to the human scale (Mohammad A.S † Seyed Mostafa .2014)

7.4. Offers design templates

In many architectural designs due to the similarity of issues between buildings of different and diverse experiences over time in relation to subscribe to this thread has been done can be together and optimizing these experiences, patterns indicated that the course of design speed data, facilitate and prevent a repetition of the many errors in that direction. The main attention in these models, more focused aspects of functional and structural and what the form is less certain and the art of being linked, but rather focused on efficiency and coordination and interconnected aspects of functional and structural dimension is. Based on the results of the study sample interior can be obtained covering the hip can be more suitable for covering temporary yard monuments considered in these cases only the ones that are easy on the feet and picking are required. As I studied the style of these structures are generally two categories. As I studied the style of these structures are generally two categories. One tent tents that form and with the help of a rig in the middle of their yard have been kept higher. And peripheral edges to rely sometimes on the edges of the roof are connected. The second type tents without having to anchor the mast Only Curtain connection. The geometry of these coatings was evaluated in a limited sample, Can be developed with regard to their ability to match their yard various geometric structure is used. In the above table, we tried the diversity of geometric patterns to form an image to be displayed.

8. CONCLUSION

Membrane structures (tents) can withstand loads under tension, these structures are not only lightweight and efficient use of limited material benefits of the system. But elegant, semi-transparent and also has a long life and are mostly economic. These structures can be used as cover for buildings, playgrounds, gardens, terraces, parking and with creative lighting as an urban space seem favorable indicators.

9. REFERENCES

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