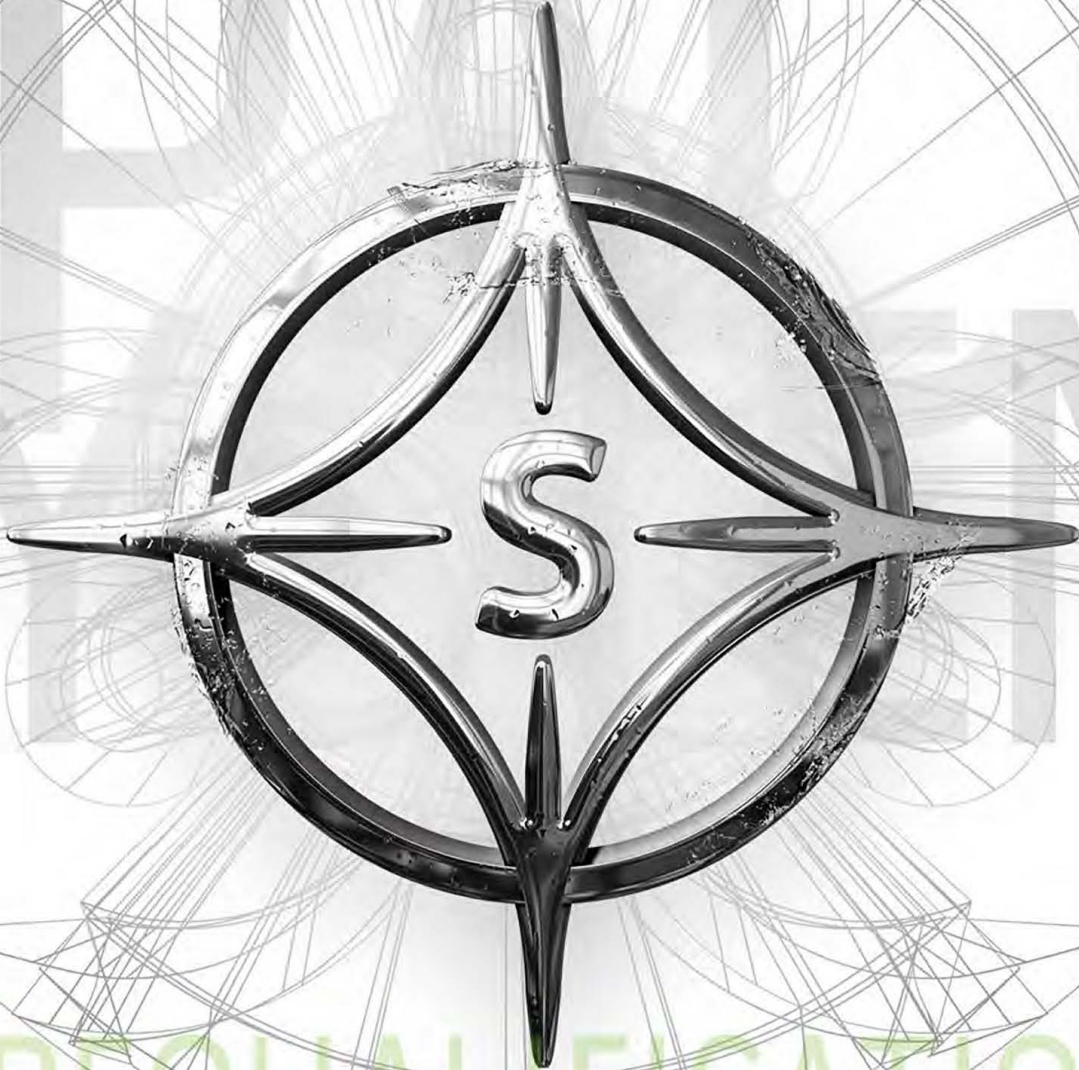




UZAY SİSTEM
INDUSTRIAL SPACE FRAMES

S U P E R I O R C A G E S T R U C T U R E S



PREQUALIFICATION
DOCUMENT



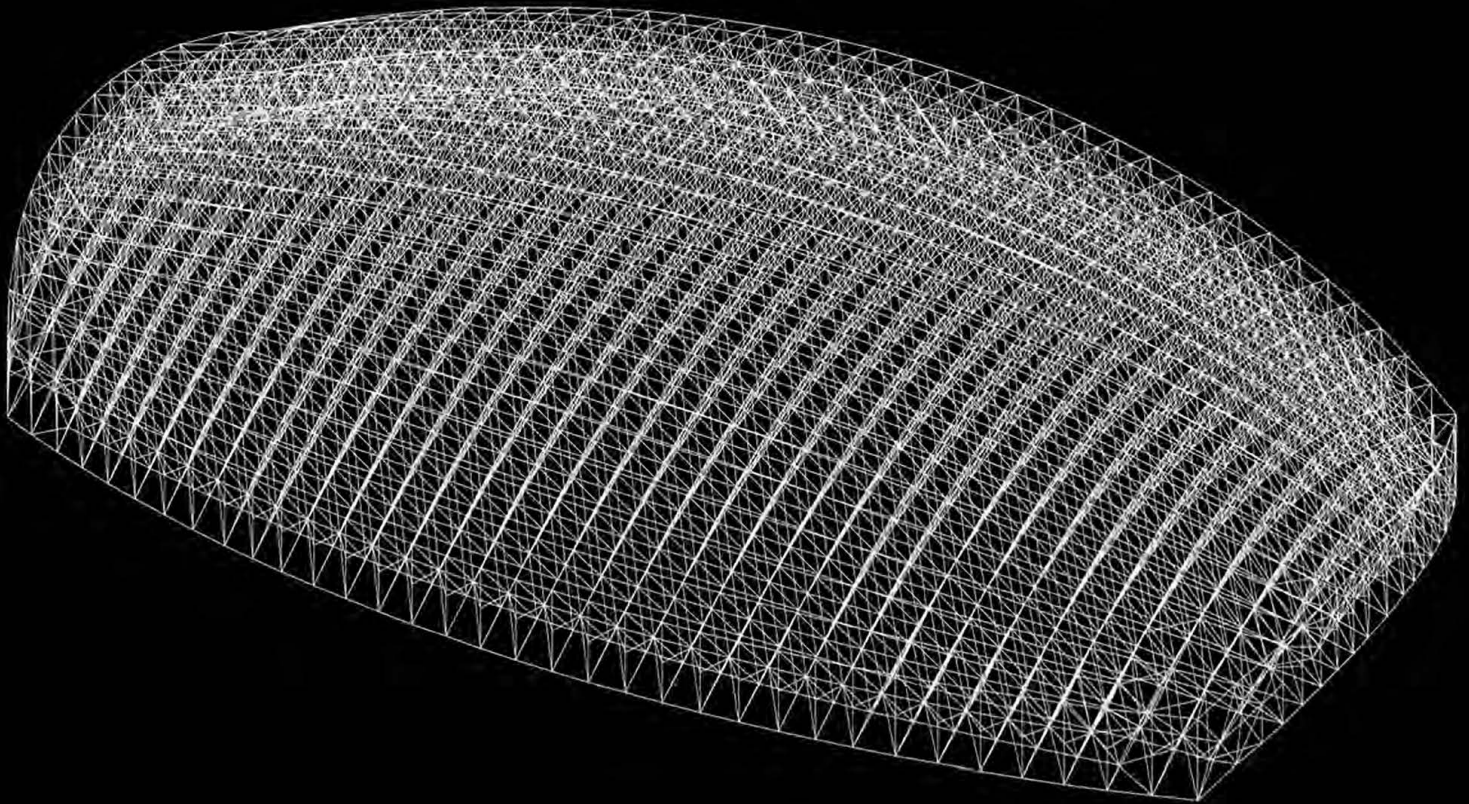
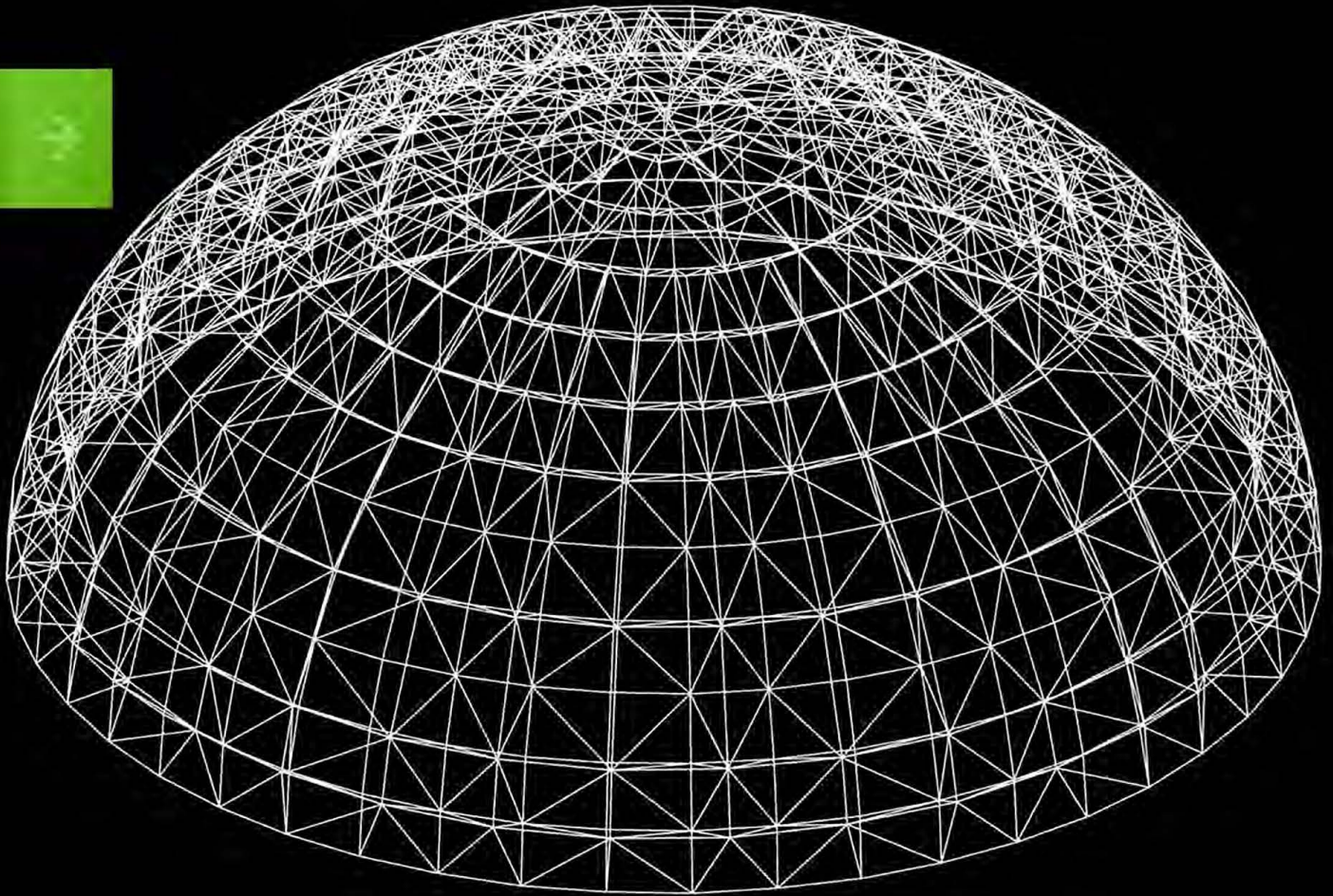
PREQUALIFICATION DOCUMENT

www.uzaysystem.com

UZAY SİSTEM
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S U P E R I O R C A G E S T R U C T U R E S





Company Profile

UZAY SISTEM Machinery, Industry and Trading Co. Ltd. is one of them major companies of TURKEY, established in Istanbul, 1986 providing turn - key projects from design to construction.

Although space frame systems are our speciality, we provide not only steel structures but a complete package of construction including but not limited to rainwater drainage system, cladding, siding, glazing, aluminium/glass curtain walls. Its fabrication works are being carried out within our factory with total area of 12.000 m².

Unique structures of UZAY SISTEM are composed of pipe/tubular steel frames, nodes (spheres), bolts, nuts and pins which are produced by our own machinery. The space frame systems can be given variety of forms such as flat plate, vault, dome, pyramid etc. and also can be used in various tower and bridge constructions.

Coordinating with architects and clients, our engineers make visions come true, merging function and aesthetic.

To reconcile vision and creative ideas with the laws of constructional physics; conceptual and technical know-how and experience are required. These are the qualifications that UZAY SISTEM has and we take advantage from them throughout all the construction process; from conception to assembly.

A team of experienced professionals - engineers, craftsmen and mechanics – decide what is technically feasible and safe.





Foundation and Fields Of Activity


UZAY SİSTEM Machinery, Industry and Trading Co. Ltd. was established in 1986 and until 1989 continued our activities in small workshops located in several parts of Istanbul. Growing strong and extending our fields of activities, we became a pioneer company specialising on space frame and steel construction.

Modifying the modulation of the space frame system we are able to create the most economical solutions according to architectural design yet still being able to give various forms to the system (such as arc, dome, vault, pyramid etc.). Aside from space frame we are able to implement various frame applications such as towers and bridges.

During design stage; with our advanced technical knowledge, working experience, state-of-the-art computer aided design possibilities and our expert engineers and architects we are able to prepare projects that comply with the required regulations and codes in a very short amount of time.

Our features that differs us from our competitors are; making structural analysis and design as per the required codes and specifications considering snow loads, temperature changes, seismic loads, wind loads on vertical and horizontal directions and all types of dead and live loads acting on the structural system.





Since our manufacturing is prefabricated, it is very easy to break down the system into segments and change the place of the structure. By using wheeled landing, without any help of a crane, whole the space frame structure can be assembled in the air.

On the other hand since the time required for the manufacturing and assembly is relatively short, it does not create additional constructional.

UZAY SISTEM has been doing various projects in different countries for years creating aesthetic, structurally safe and liveable places.

Always developing its technical capabilities and keeping up with the latest technologies on construction, pre-tensioned space frame systems are being used by our company where required.

To emphasise our structural safety; after the major Kocaeli earthquake in 1999, various structural systems (over 50) constructed by us that did not suffer any damage are the evidence of our quality.

Finally, I would like to thank to everyone who has worked very hard for the mission that our company has targeted and reached to develop through ISO 9001 system.





Space Frame Structures Are Our Speciality

The frames are composed of steel pipes, conics, bolts and nuts. They are connected with spheres (nodes) via bolts. Nodes are produced by CNC machines in order to avoid any production faults.

The frame members take only axial loads. The compression forces are transferred to the nodes by nuts and tension forces are transferred by bolts. The structural analysis of the system is carried out by the software called FRAMECAD, which is specialised on solving the space frame systems using "matrix theory of structures" for analysis.

Every single member of the system is designed by our engineers in coordination with architects and all the manufacturing is carried out in our factory and assembly by our well-trained technicians.

UZAY SİSTEM provides the space frame systems which are economical, aesthetic and fast-manufactured and assembled with its advanced technical knowledge and experience aided by state of the art technological possibilities such as software and hardware.





Advantages of the Space Frame System

- Fast design, manufacturing and assembly
- Fast application and low cost
- Contemporary design on project basis
- Variable modulation and height
- Functional utilisation possibilities
- Ease of application integrated with the illumination and ventilation systems
- Free design
- Aesthetic appearance
- High resistance against corrosion
- Different applications with all kinds of cladding materials
- Possibility to choose different colours from R.A.L. catalogue
- Decorative interior and exterior environments
- Ease of storage and transportation of system components
- Quick and easy assemblage at site either on the ground or in the air
- Space frame system is three dimensional and very rigid. Therefore, large spans can be arranged in lower heights

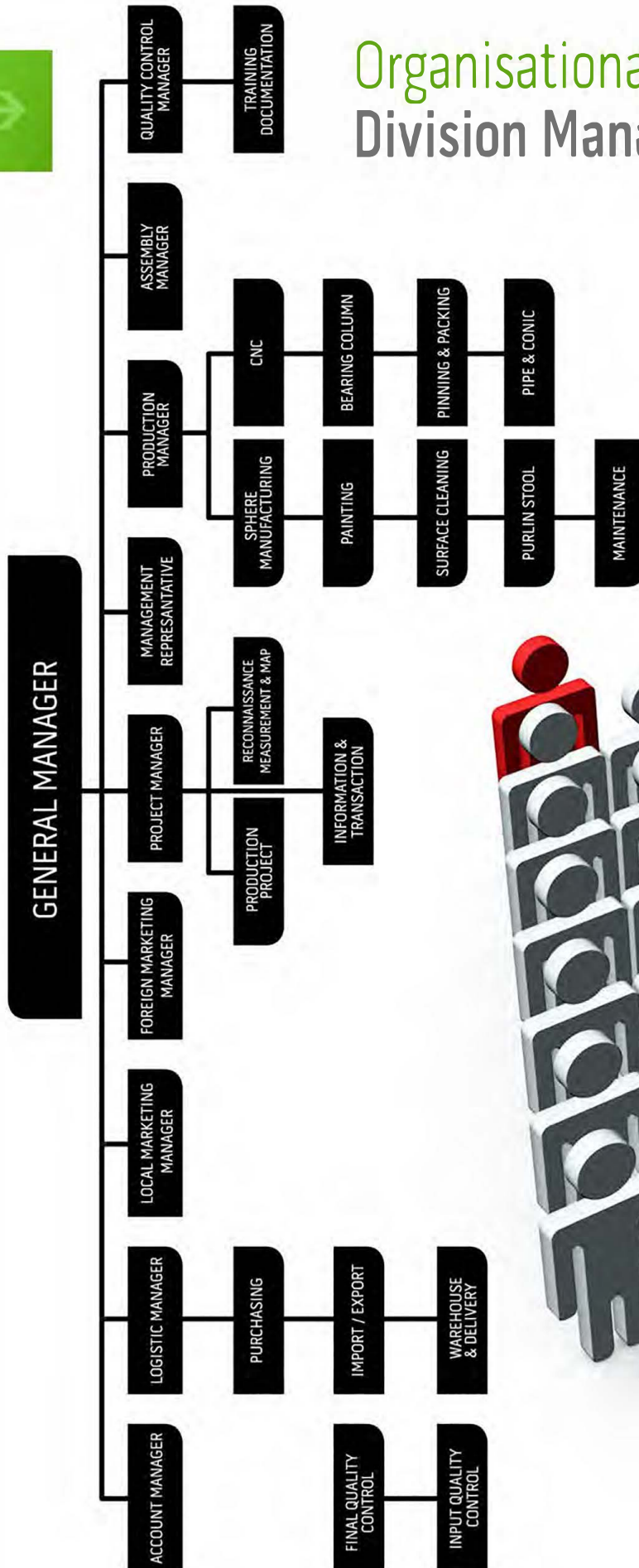
We provide you with;

- an engineering department for constructional and technical issues
- our own manufacturing sites
- our own assembly department
- comprehensive service for delivered and assembled structures for years





Organisational Structure and Division Managers





Division Managers

General Manager

He takes all the strategic decisions for UZAY SISTEM and he contributes the other Division Managers for making decisions related to the company.

Management Representative

He is responsible for making and application of the necessary arrangements and organisations in order to provide continuance of ISO 9001 Quality Assurance System.

Quality Control (QC) Manager

His main function is to obtain technical and quality conditions of the products, which are produced as per the customer request, in accordance with Quality Assurance System.

Manufacturing Manager

His main responsibility is to manage the activities related to manufacturing, planning the job flow of the units supporting the production and obtain the coordination of all divisions related to manufacturing.

Local Marketing Manager

He is responsible for searching new customers, preparing offers as per customer request, handing over the offer to the project department after being awarded and follow up all the phases until the project is completed.

Foreign Marketing Manager

He is responsible for searching new customers, preparing offers as per customer request, handing over the offer to the project department after being awarded and follow up all the phases until the project is completed. Informing the general manager when importing/exporting is required.

Project Manager

He is responsible for preparation of technical drawings, cost analysis, preparation of the application projects and shop drawings after the offer is confirmed.

Logistics Manager

He is responsible for taking verbal offers from various companies and to maintain that importing procedures are being carried out properly.

Erection Manager

He is responsible for the application of UZAY SISTEM's projects as per the conditions defined in the contract, procedures and instructions.



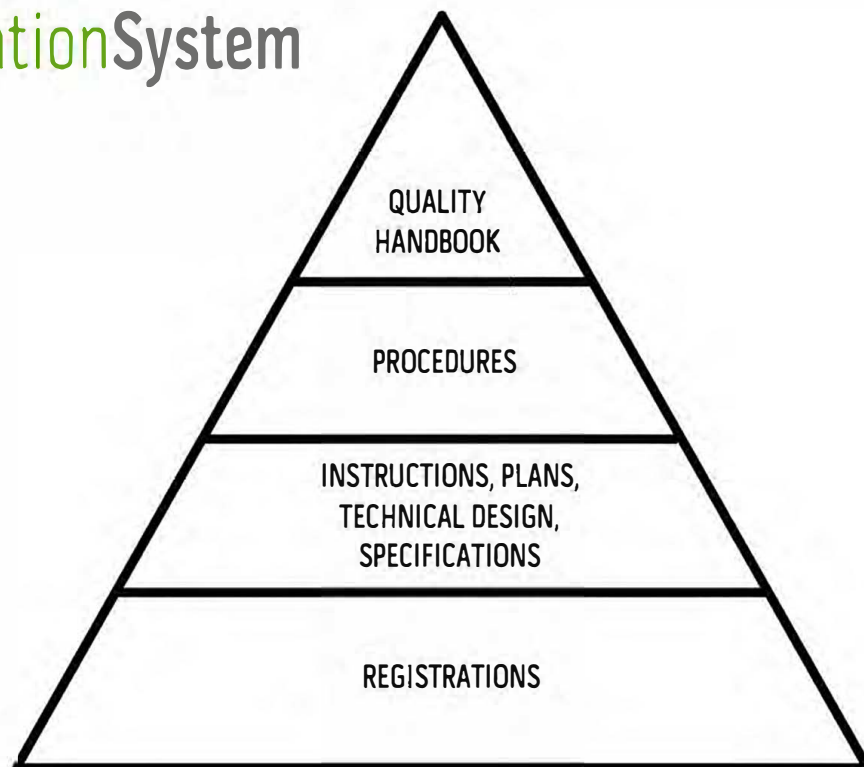
Quality System

Quality Planning

All production, erection and control activities, processing and verifying steps, control methods and applications of UZAY SISTEM is determined by Quality Plans that include responsibilities and reference documents.

On the other hand Quality System Procedures and Instructions also include the productions that are made for UZAY SISTEM's customers.

Documentation System



1. CONTRACT CONTROL

Prior to giving any offer; customer needs and requests have to be defined, realisation of the conditions has to be checked and full satisfaction of the customer should be aimed.

2. DESIGN CONTROL

While controlling and confirming of design works; it has to be considered that the work is as per customer's needs and requests; safe, economic erection conditions.



Quality Assurance Policy

General Manager, division managers and personnel have to understand the need for Quality Assurance Policy and to maintain it. The management and personnel have to uphold the quality principles and objectives in the beginning of every project.

Each department has its own job to do and gets on within the framework of the overall planned company environment, which is increasingly driven by upper management. Quality requirements shall be considered prior to construction or manufacturing. Quality planning and quality plans are considered and set up prior to contract award.

Quality controls are completed by reviews being done at various phases of manufacturing and construction processes. We use control points where the quality can be compared, data is collected, measurements and accurate predictions are made. Our company has manuals and procedures and Quality Programs that all the staff participates.

Quality is stated as our main objective, which is known to our total workforce. Quality matters appear as the first item on our agendas.

Our aim:

- Our main aim is to meet the customers' expectations, perfectly and in time, by using our resources in more productive way, with our continuously improving quality.
- Therefore; our company's main working policy is to design, produce and construct structures and spaces respectful to human life and environments and obtaining full customer satisfaction.
- In order to reach our target the philosophy of UZAY SİSTEM is to use knowledge, experience and state-of-the-art technology at every stage.
- In this context, our main responsibility is to provide scheduled training and to obtain an comfortable (focused on success and productivity) environment for our staff who are our most important resource.

15. HANDLING, STORAGE, PACKING, PRESERVATION

Necessary storage and stockyards are determined and all the precautions are taken for storing, packing and preservation of all raw materials, materials, semi-materials and products. Necessary methods are determined for handling of products, transportation and erection in order to not to make any damage to products.

16. CHECKING OF QUALITY RECORDS

The procedure on required forms, lists, protocols and reports of quality system are prepared and distributed and kept as per the determined procedures.

17. INTERNAL QUALITY AUDIT

Internal Quality Audit is done by QC Manager and Management Representative.

18. TRAINING

UZAY SİSTEM arranged the required resources for staff training with the purpose of obtaining effective and continuous Quality Management System.

19. SERVICE

UZAY SİSTEM has determined the methods, responsibilities and records to be kept regarding the services that shall be given to the customer after delivering of the Space Frame Structure.

20. STATISTICAL TECHNIQUES

For the control of process sufficiency, determining and confirming the product specifications, necessary statistical techniques are designated and are put into practice

Quality Certificates





10.3. FINAL INSPECTION AND TESTS

Before delivery; final checks are carried out by responsible QC staff as per the process quality plans and results are recorded.

It is not permitted to pack and deliver the products, before process and final inspections and tests, completion of registration and receiving positive check results; as per the quality plans.

11. CONTROL OF INSPECTION , MEASURING AND TESTING EQUIPMENT

In order to maintain the systematic continuity of activities related periodic checks and calibrations of inspection, measurement, test tools and equipment, used to determine whether the products are as per the determined conditions not; required methods, responsibilities and rules are determined.

The calibration of UZAY SİSTEM's inspection and test equipment are being carried out by national and international laboratories and companies.

12. INSPECTION AND TESTING STATUS

In the end of inspection and tests, products are labelled by their inspection and testing status (pass/fail) or they are grouped accordingly.

13. CHECKS OF UNSUITABLE PRODUCTS

Methods are determined and precautions are taken in order to prevent unsuitable products from being used and delivered or being mixed with suitable products.

14. CORRECTIVE AND REPRESSIVE ACTIONS

With purpose of determining, correcting, disposing of the reasons; of all kinds of existing or potential unsuitability, methods are improved and responsibilities are determined in order to start and take corrective and repressive actions.

Corrective and Repressive Actions:

- Customer complaints
- Internal studies
- Unsuitable products and error analysis
- Supplier Evaluation
- Input Quality Control
- Process Control
- Final Inspection and Tests

14.1. CUSTOMER COMPLAINTS

Customer complaints regarding UZAY SİSTEM's structural systems, defining the complaint and taking corrective measures to satisfy the customer, are very important in order to maintain the quality and improvement. Therefore methods are determined to maintain this.



9. PROCESS CONTROL

In UZAY SISTEM all the processes are defined and kept under control for structurally safe Space Frame Systems which are designed and produced in accordance with the latest codes and specifications to meet the customers' requests and needs.

The main processes are as follows:

- Sphere processing
- Pipe and cone processing
- Support and Column manufacturing
- Purlin and purlin support production
- Assembly
- Maintenance and repair

Production types, operation order and procedure, technical documents to be used, responsibilities, start-up/production controls and acceptance procedures are determined and procedures are formed.

Besides; activities and methods are determined regarding the maintenance, repair and regular checks of materials, equipment, auxiliary plants and units, which are used in manufacturing, to make sure that they are being used in sufficient and appropriate conditions.

10. INSPECTION AND TESTING

Testing and controlling operations are carried out in order to verify that the products manufactured by UZAY SISTEM and their assembly operations are according to the determined conditions. All the methods responsibilities are determined regarding the above mentioned operations.

10.1. INPUT INSPECTION AND TESTS

After confirmation of the warehouse responsible, QC Manager makes the entrance control of the procured raw materials. No material can be used or processed without entrance control and confirmation.

10.2. INSPECTION AND TESTS DURING PROCESS

In all the fabrication and erection processes; and in operations determined according to process quality plan inspections, tests and controls are carried out and the results are recorded by the division responsible staff.

During the processes it is not permitted to pass through another process before making inspection and testing of products according to Process Quality plans and without receiving positive check results.

Inspections and tests that are being carried out at process stage in UZAY SISTEM are as follows:

- Sphere process
- Support and Column manufacturing process
- Pipe and cone process
- Purlin and purlin support production process
- Assembly process



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3.DOCUMENT AND DATA CONTROL

Methods and responsibilities related to verification, preparation, inspection, approval, reproduction, distribution, making updates where necessary of all the documents in the quality management system are determined.

Also methods related to keeping the documents such as standards, codes, laws, technical drawings -which are prepared by official or private institutions aside from UZAY SİSTEM, being used in the activities in the quality system, being taken as reference- are up to date.

4. PROVIDING QUALITY

Purchased raw material, materials and services become the part of the product affecting its quality directly. With this thought, necessary conditions are determined and procedures are formed to make sure that all the procurement operations are planned and controlled.

5. PURCHASING

For varying product and services, different purchasing methods and responsibilities are determined. All the registrations and documents of purchasing operations are kept up-to-date and in full.

6.SELECTING AND EVALUATING THE SUPPLIER

Performances of the companies or persons providing materials and services used directly at production are evaluated according to determined criteria. Results of the Evaluation are discussed at Management Quality System Control Meetings.

7. CONTROL OF CUSTOMER SUPPLIED PRODUCT

Responsibilities about; confirming of the area provided by the customer complies with quality and safety conditions of the space frame system, inspection of its suitability, and reporting to the customer in case of unsuitability are determined for the project that shall be carried out by UZAY SİSTEM.

8.PRODUCT IDENTIFICATION AND TRACEABILITY

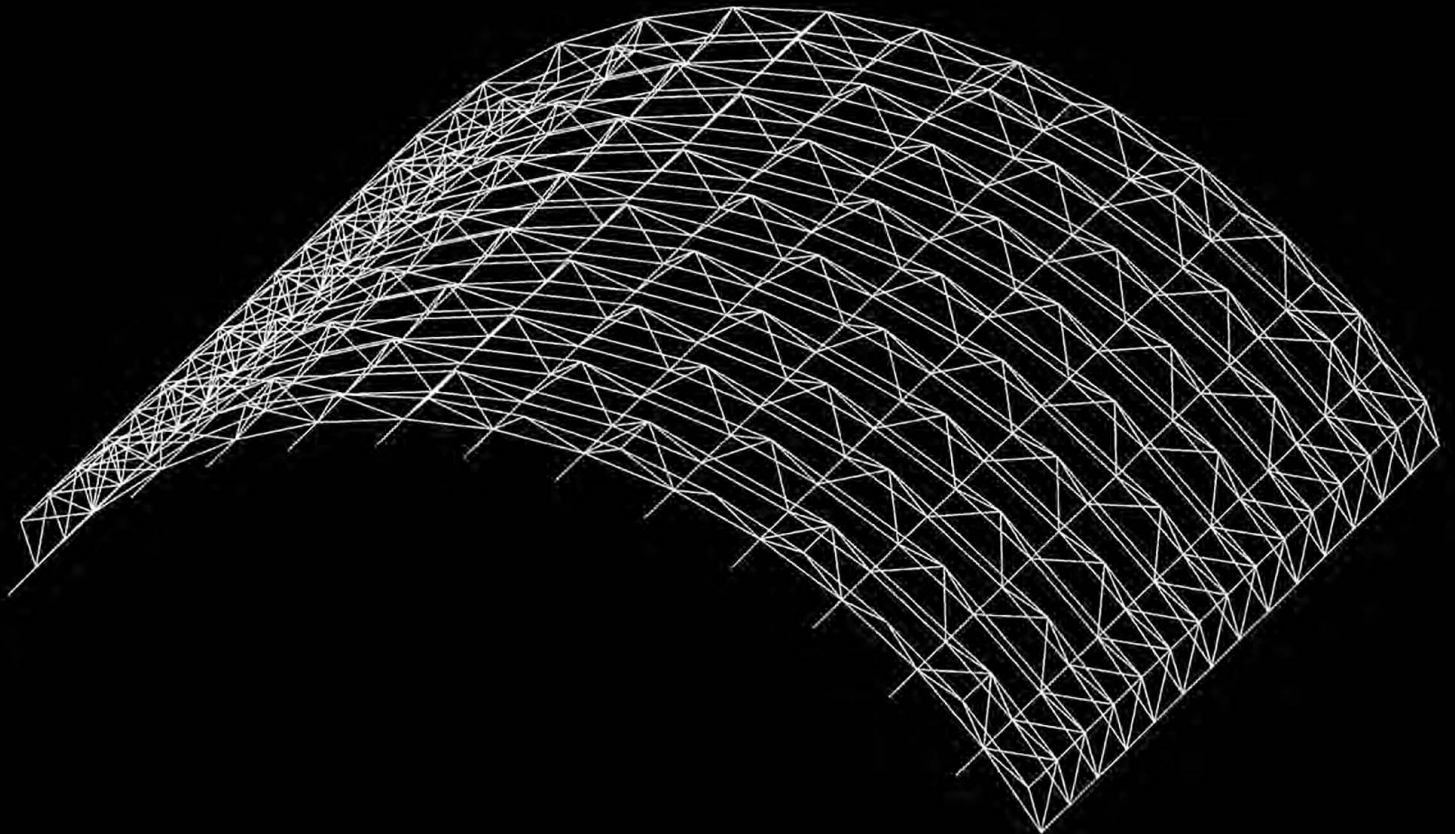
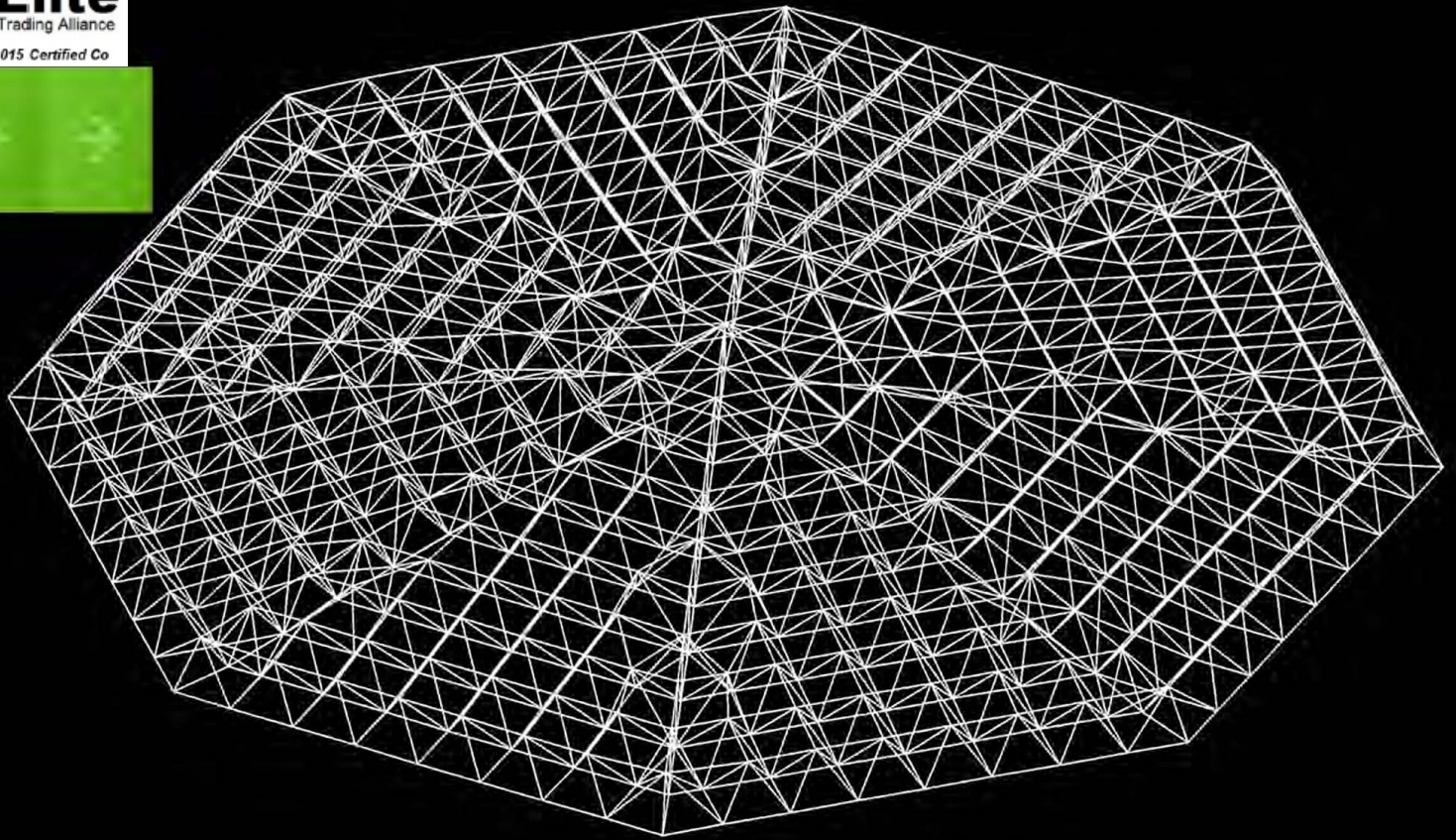
Necessary numbering and labelling systems and methods are formed in order to define the products at every step and to keep them traceable after delivery to the customer with the methods that are suitable for the products procured at UZAY SİSTEM.

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Assembly

Horizontal members and members with a little inclination are assembled their holes facing down. While the members are being fastened to the nodes, attention should be given not to damage the bolt threads. Bolts are screwed into the spheres by rotating the nuts. Assembly can be made on the ground or in the air, on scaffolds.

Protection Against Corrosion

Uzay Sistem members, as a first step, are cleaned from rust and oil stains utilizing special paints.

Next, innerface of the pipes are painted with a furnace paint as coating and outerface is painted

By powder polyester furnace paint. Than the pipes are furnaceed.

Nuts and some accessories are covered by hot dipping galvanizing process and then centrifuged in order to achieve appropriate cover thickness. Since by hot dipping galvanization

Even the tiniest holes are filled, a protection for about 20 years is achieved. This protection duration can be increased by applying additional cover.

Galvanization of purlins, columns etc, can not sometimes be realized by hot dipping method. In this cases spray galvanization is applied instead of hot dipping process wet paint, meeting the requirements is used instead of powdered paint.

Powdered Paint

After galvanizing the members, spheres and bolts, they are painted by high quality plastic powdered paint.

In the cover process, polyester powder containing carboxyl is sprayed to the galvanized pipes without adding any additives. This powdered paint is hardened in a furnace at 200°C. At the End of this process, a 80 microns thick, smooth and shiny film layer paint is obtained. The color of the paint can be selected from RAL catalogue. All colors at various tones can be provided. Nuts are covered like the other elements, but since nuts undergo high stresses, before the powdered paint application and after galvanization, they are first immersed in hot astra

(like hot phosphating) and then painted. Electrostatic powdered paint is resistant to impacts and hence it has a longer lifetime than The ordinary paints. This paint, is also resistant to temperatures between -35°C and to ultraviolet radiation. Besides it's enduring to the wearing effects and no bubbles, imperfections.

And stains form on it.

Pieces that are not powdered paint can be painted by wet paint, mutually agreeing with the client. Wet paint will be applied to have 30-40 microns dry film thickness. It can be applied in just one layer or more than one layers

Bolts are covered by 20 micron electron galvanize.

Spheres are covered by 20 micron electron galvanize.

As columns and belts ST 37-2 quality steel as described in DIN 17100 is utilized.



TECHNICAL SPECIFICATION FOR THE PRODUCTION OF PREFABRICATED "UZAY SİSTEM" SPACE FRAME SYSTEM

Prefabricated members of Uzay Sistem are manufactured in the factory in a way to make the assembly quick and easy on site. The system is made up node elements which are spheres and Members which are pipes.

1-Nodes:

Nodes which are elements that the members are connected are spherical shaped and they are shaped either on a lathe or by hot wrought iron technique. Maximum 18 bolts holes can be drilled on the surface of the spheres when necessary. The pipes are screwed to the nodes through the bolt holes. The nodes manufactured at temperatures specified in DIN 17200.

The node elements utilized at the supports are produced using ST 52 (FYIELD =353 Mpa)
Or ST 60 (Fyield =333Mpa) quality steel.

2- Members:

Members are pipes at the ends of which two conic shaped pieces are welded.

These conic Pieces are welded. These conic pieces are for transferring the compressive or tensile forces to the pipes. The pipes and the conics are either ST 33 (fyield = 186 Mpa), ST 37 (fyield=235 Mpa) or ST 52. Material quality is convenient with the norms set by DIN 17100 standards. DIN 4100 and DIN 4115 standards are followed in the welding process of conics to the pipes.

On the drawings and on the materials used, symbols giving information about the materials are written. (i.e. ST 33_1, ST 60, 3X3,65X2484)

3- Bolts, Nuts and Pins:

Bolts are inserted in the conics and the bolt heads can rotate freely. In between the conic and the node, there is a hexagonal nut. The nut must have a pin hole on their faces and they are pinned to the bolts through the pin hole on the shank of the bolt. This way the nut is turned to screw the bolt to the node. Bolts are ISO threaded bolts in accordance with DIN 13 and they meet the standards of DIN 267. The mechanical properties of the bolts, nuts and the pins are illustrated below

Material Class	BOLTS			NUTS			PINS		
	5.6	8.8	10.9	9s	Mn	28	6.8	8.8	12.9
Maximum Tensile Stress (kg/mm ²)	30	64	90	32			48	64	90
Minimum Ultimate Strength (kg/mm ²)	50	80	100	50			60	80	120
Minimum Ultimate Strain (%)	20	12	9	9			8	10	4

Bolts are marked in order to indicate their properties.



Space Frame

In architecture and 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.

Overview

The simplest form of space frame is a horizontal slab of interlocking square pyramids 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 stonger 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 octed truss.

More complex variations change the lengths of the struts the curve the overall structure or may incorporate other geometrical shapes.

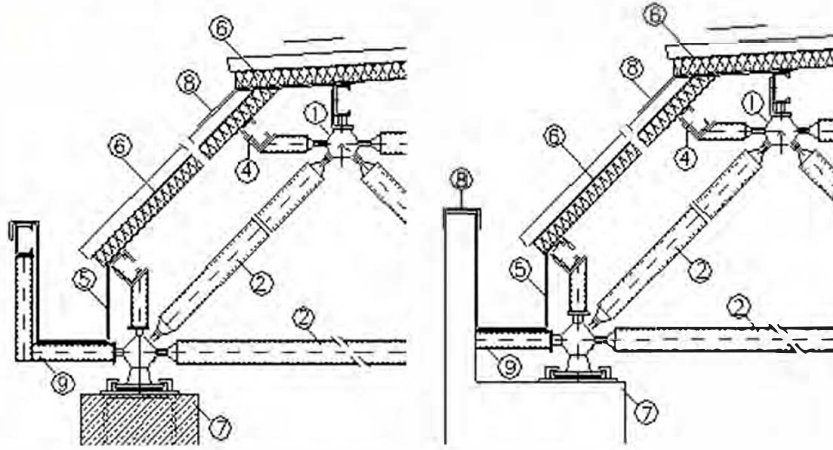
History

Space frames were independently developed by Alexander Graham Bell around 1900 and Buckminster Fuller in the 1950s. Bell's interest was primarily in using them to make rigid frames For nautical and aeronautical engineering. Few of his designs were realised. Buckminster Fuller's Focus was architectural structures; his work had greater influence





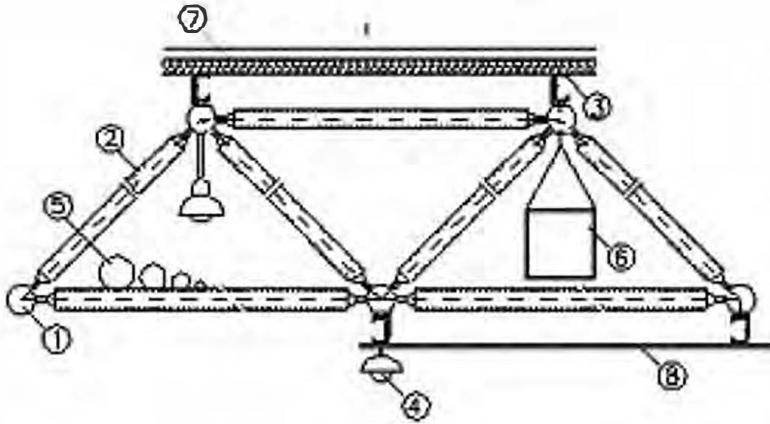
3.GUTTER AND CLADDING DETAILS



3.GUTTER AND CLADDING

1. Space Frame Node
2. Frame Member
3. Purlin
4. Bolt
5. Gutter
6. Cladding
7. R/C Column
8. Aluminium fittings
9. Gutter support
10. Teflon

4.ILLUMINATION AND VENTILATION DETAILS

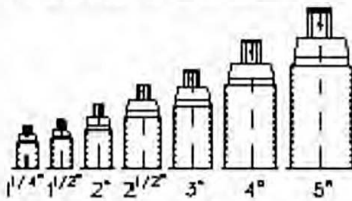


4.ILLUMINATION AND VENTILATION

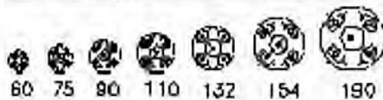
1. Space Frame Node
2. Frame Member
3. Purlin
4. Illumination
5. Installations
6. Ventilation
7. Polyurethane filled cladding
8. Aluminium suspended ceiling

SPACE SYSTEM ROD TYPES

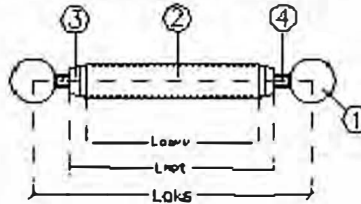
UZAY SİSTEM ÇUBUK TIPLERİ



UZAY SİSTEM KURE TIPLERİ



PRODUCTION NORMS



İMALAT İÇİN KULLANILAN NORMATLAR

1. Uzay sistem kuresi
2. Uzay sistem çubuğu
3. Konik
4. Somun

SPACE FRAME SPHERE TYPES

1. Space Frame Node
2. Frame Member
3. Cone
4. Nut



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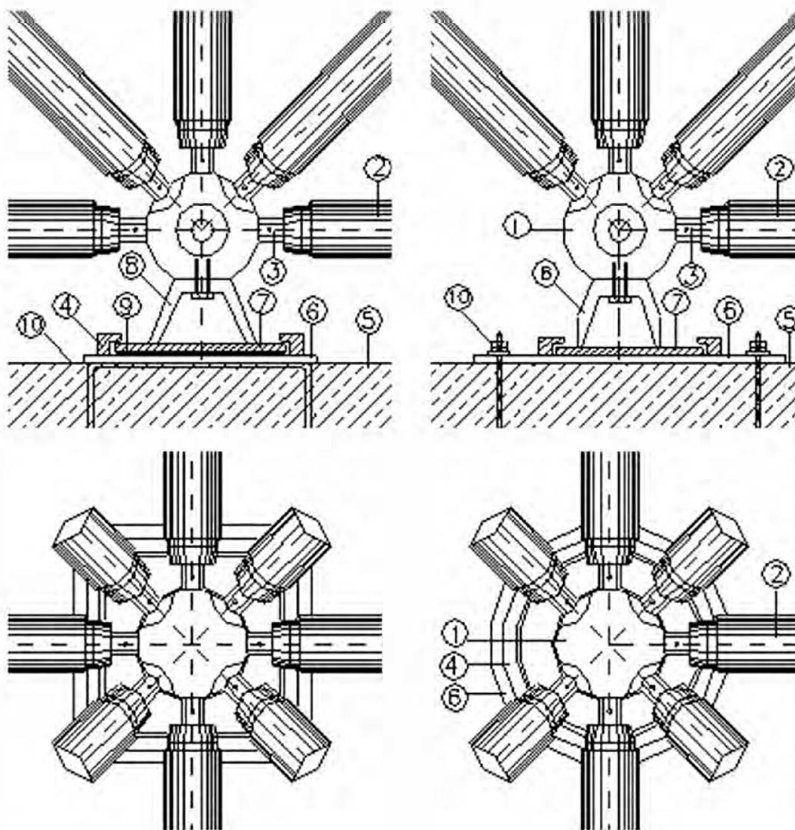
2. SUPPORTS AND COLUMNS

a. Supports

These are the members, with statically predefined degrees-of-freedom, that transfer the loads coming from space frame system to load bearing vertical members. (i.e. columns)

b. Columns

These are the main load bearing and vertical members of the structural system.



SUPPORT DETAILS

- | | |
|---------------------|--------------------|
| 1. Space Frame node | 6. Anchorage Plate |
| 2. Frame Member | 7. Support Plate |
| 3. Nut | 8. Cone |
| 4. Support Retainer | 9. Teflon |
| 5. R/C Column | 10. Anchor Bolt |





Samples of Division Works

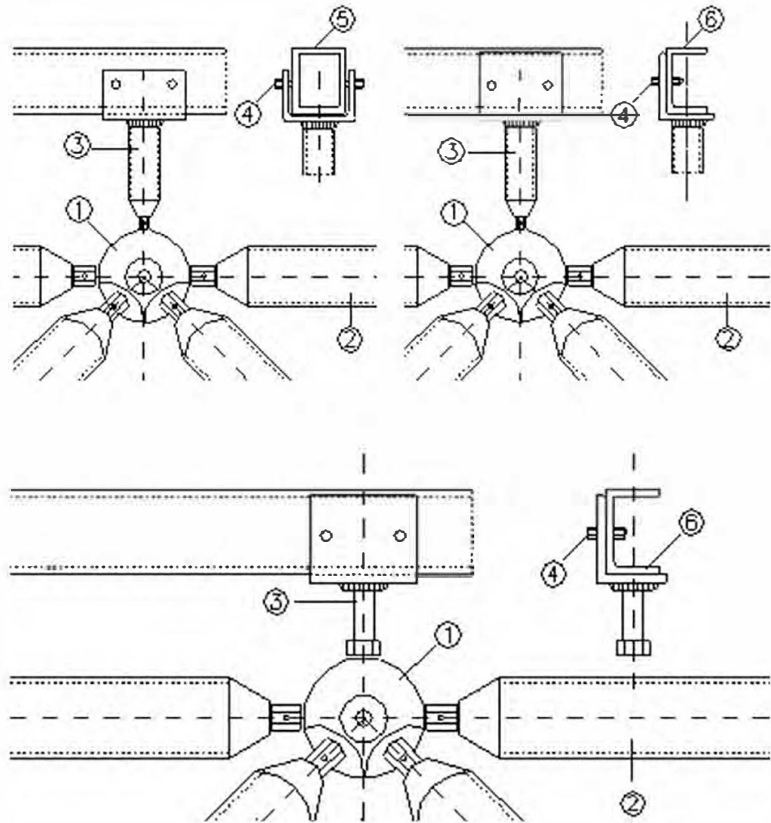
1. PURLINS AND PURLIN SUPPORTS

a. Purlins

These are the system components that transfer the loads from cladding to the main load bearing system via purlin supports.

b. Purlin supports

These are the system components that connect the purlins and gutters to load bearing system and transfer the loads to it.



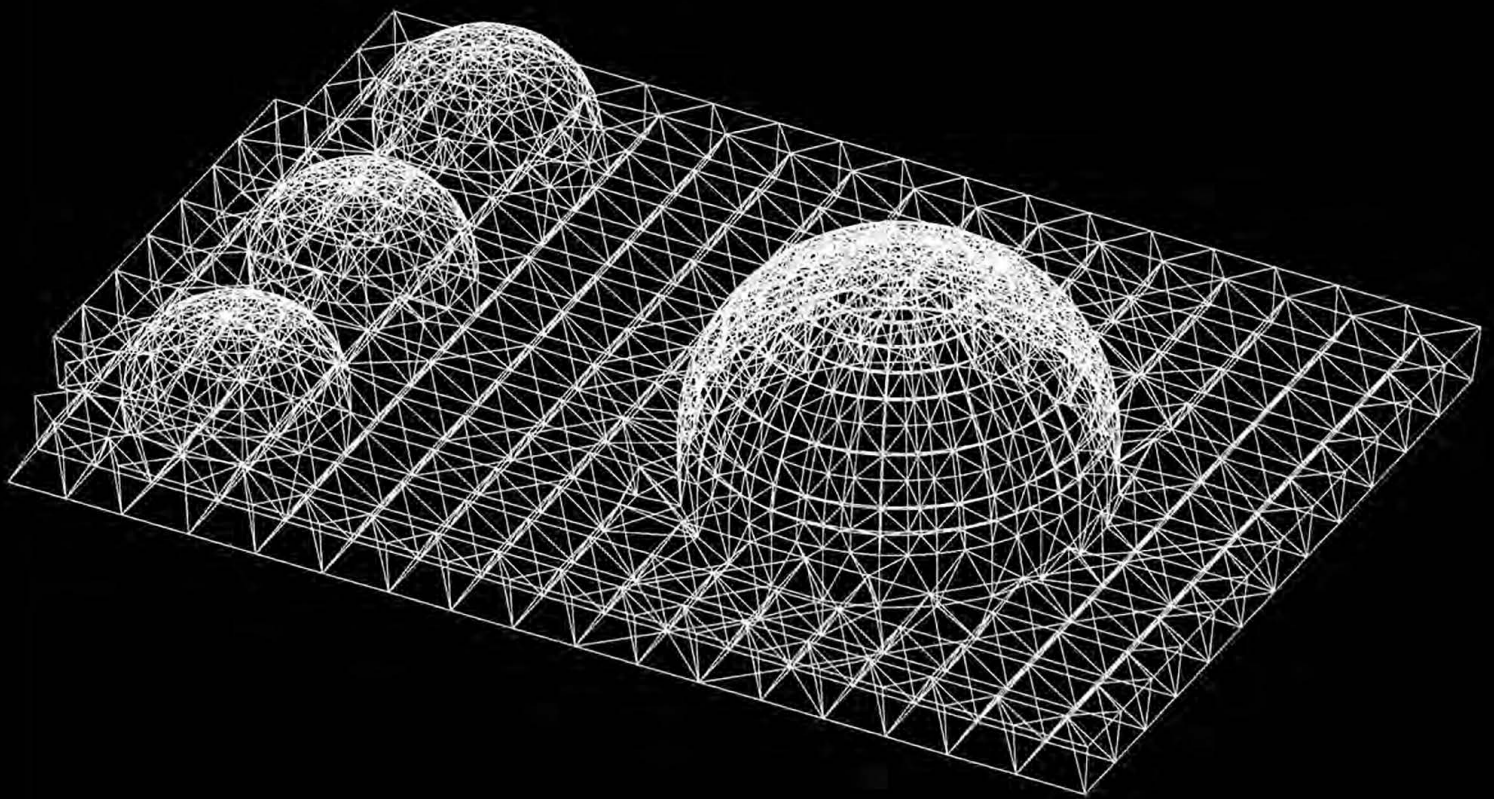
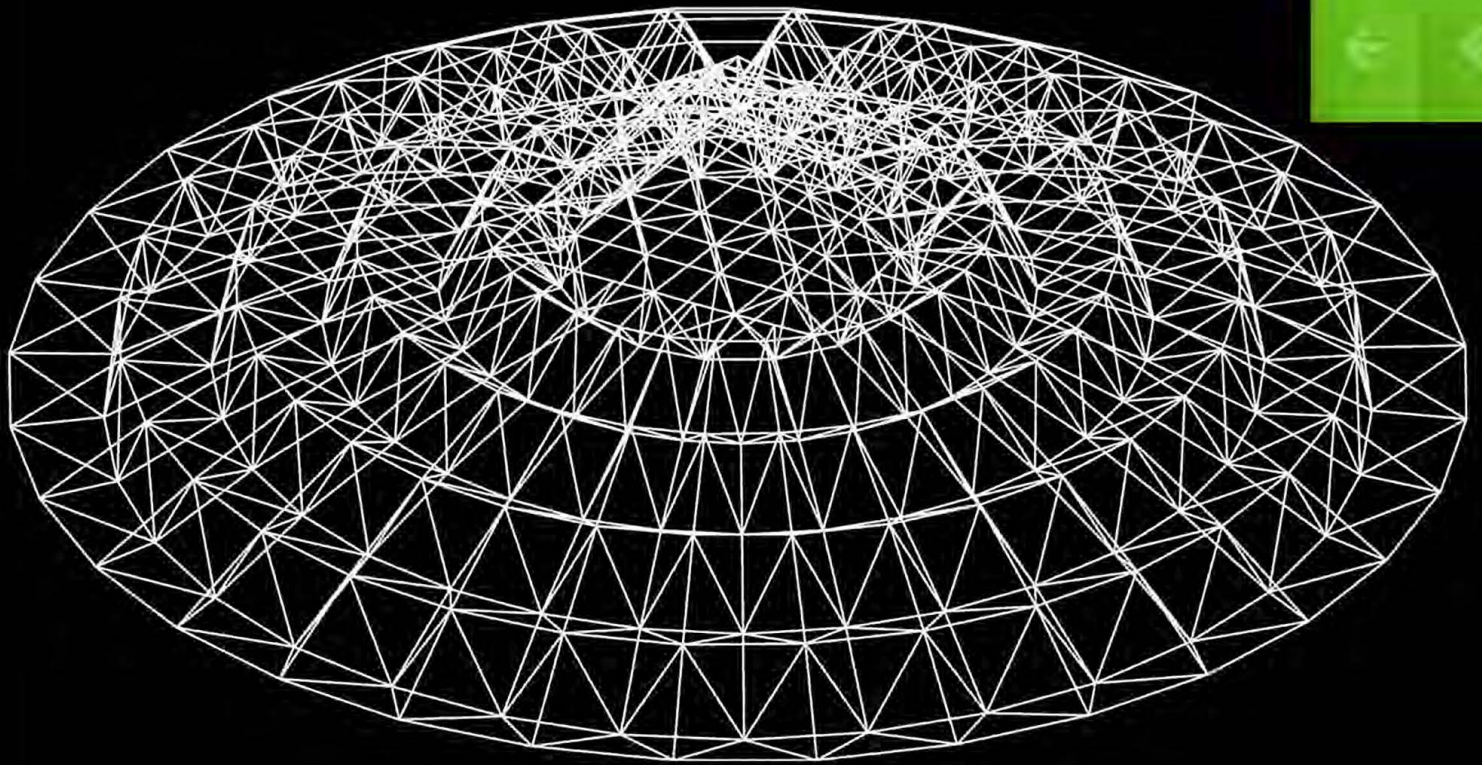
PURLIN DETAILS

1. Space frame node
2. Frame Member
3. Purlin Stool
4. Bolt
5. Purlin (Tube Section)
6. Purlin (U Section)

SUPERIOR CAGE STRUCTURES



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