

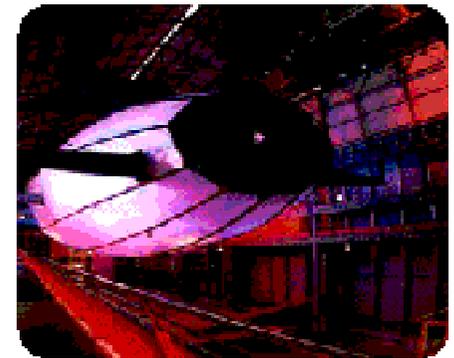
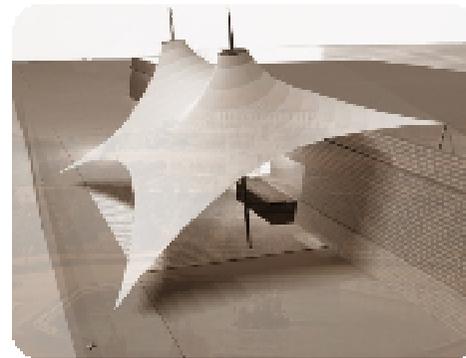
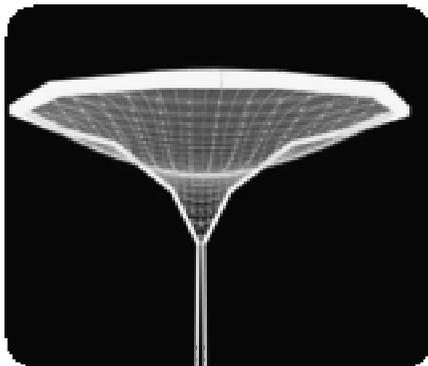


# MEMBRANE : DESIGN : TECHNOLOGY



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# ROBERT WEHDORN-ROITHMAYR

Since 2001 Partner of **Wehdorn**  Architekten

Since 2003 Vienna University of Technology

Directing Competence Industrial Software

Institute of Interdisciplinary Construction Process Management

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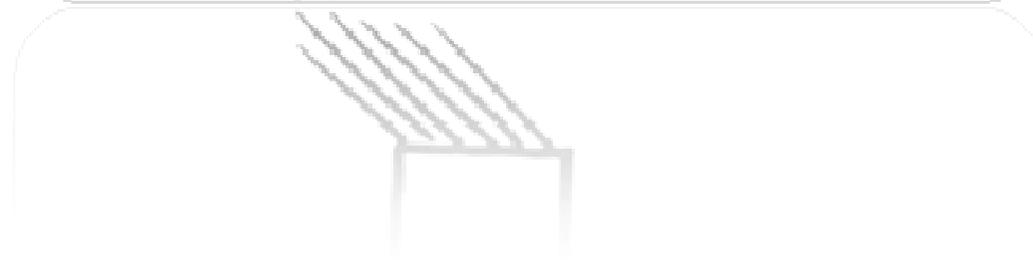
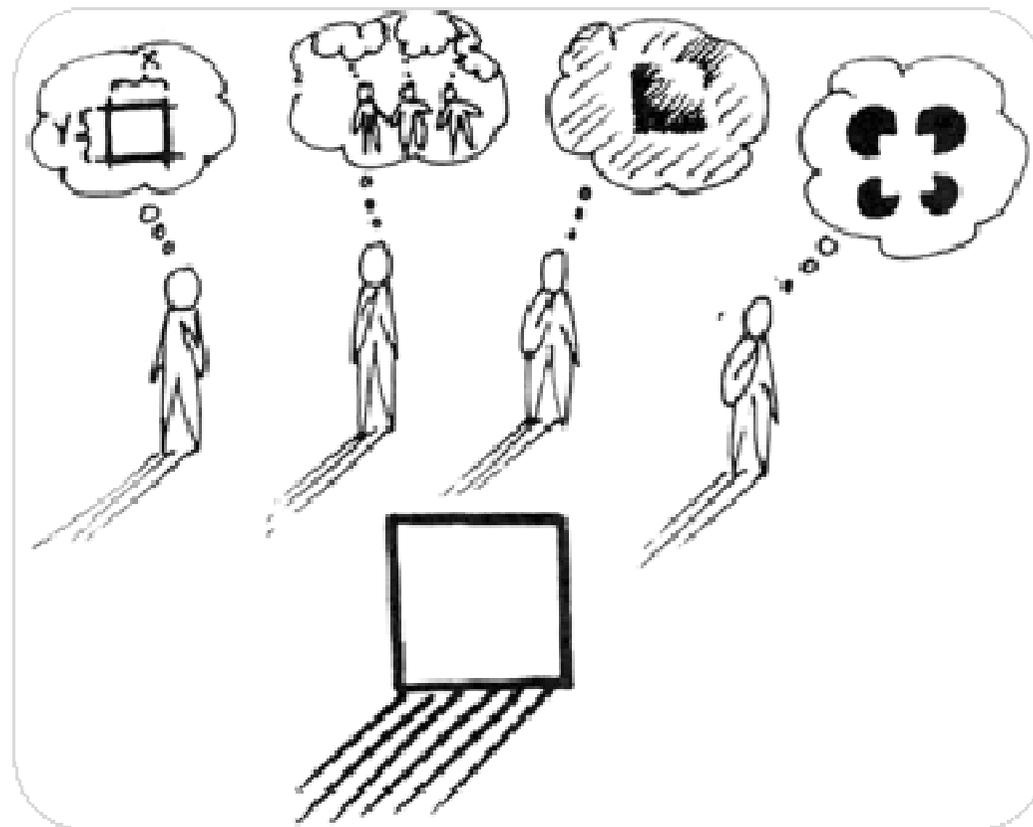
MEMBRANE : DESIGN  
THE SPECIALIZED TECHNOLOGY

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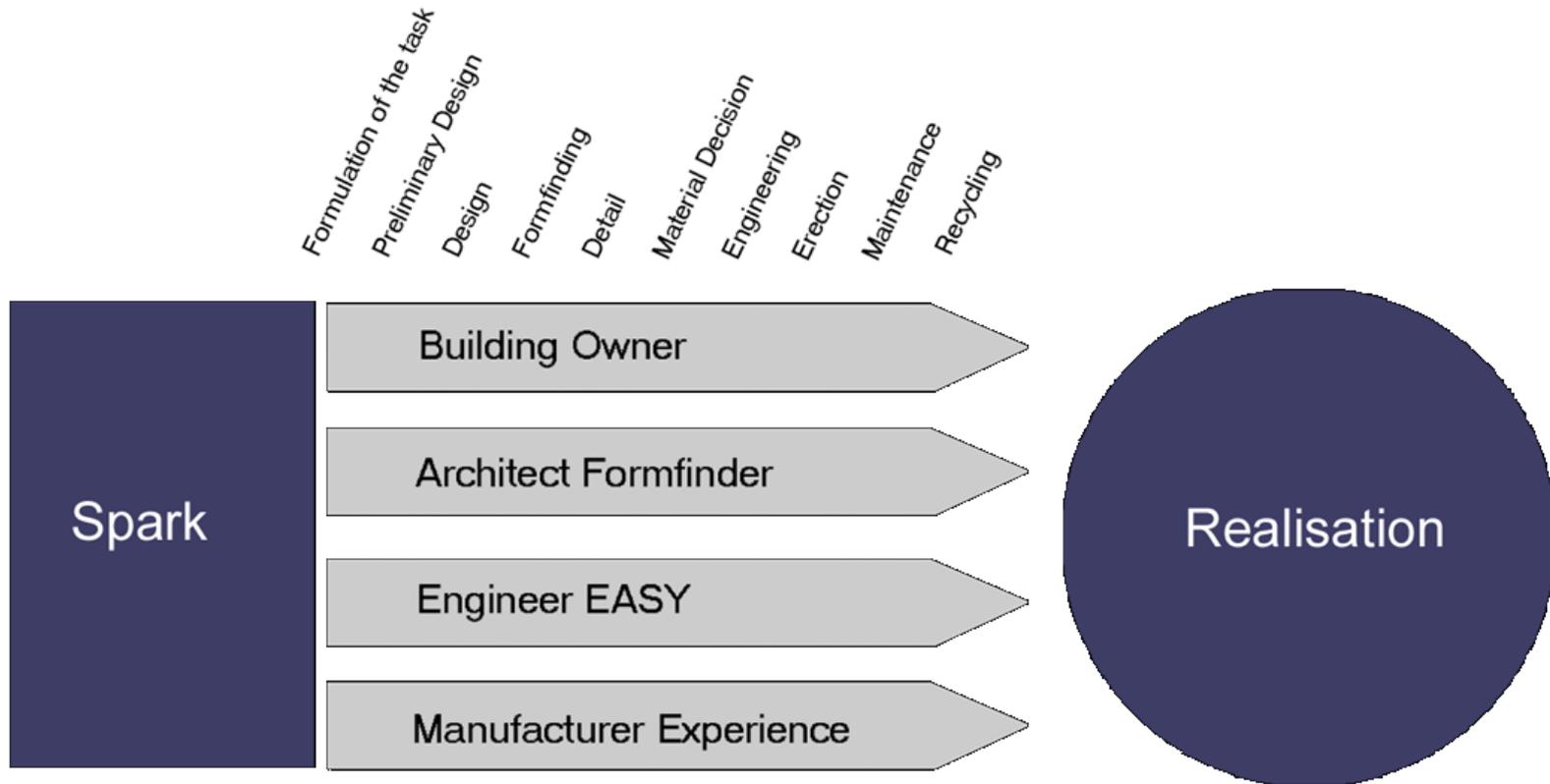
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# TEAMWORK AND 5 CHARACTERISTICS

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# formfinder



# formfinder

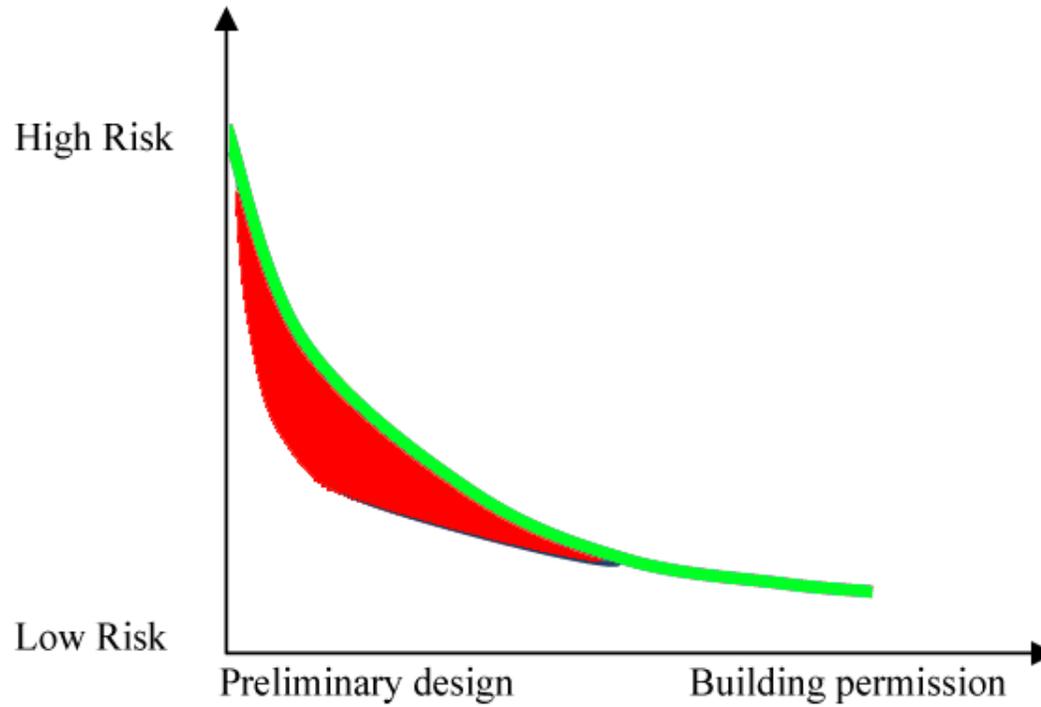
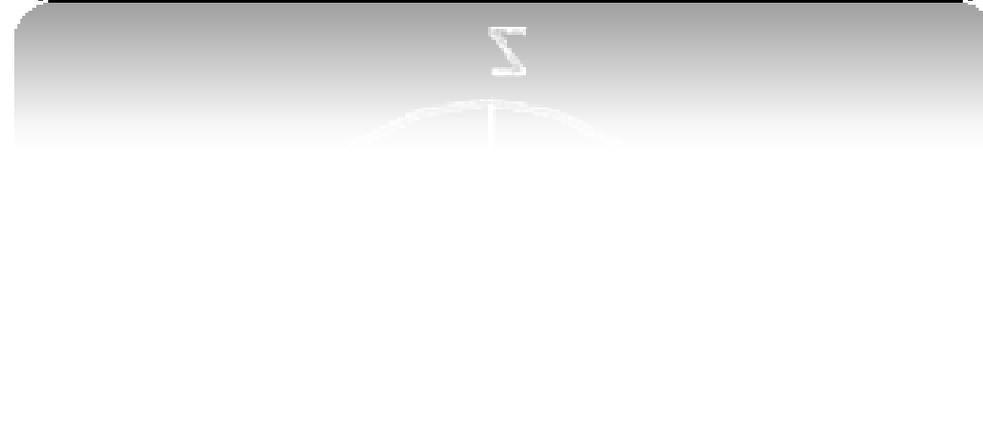
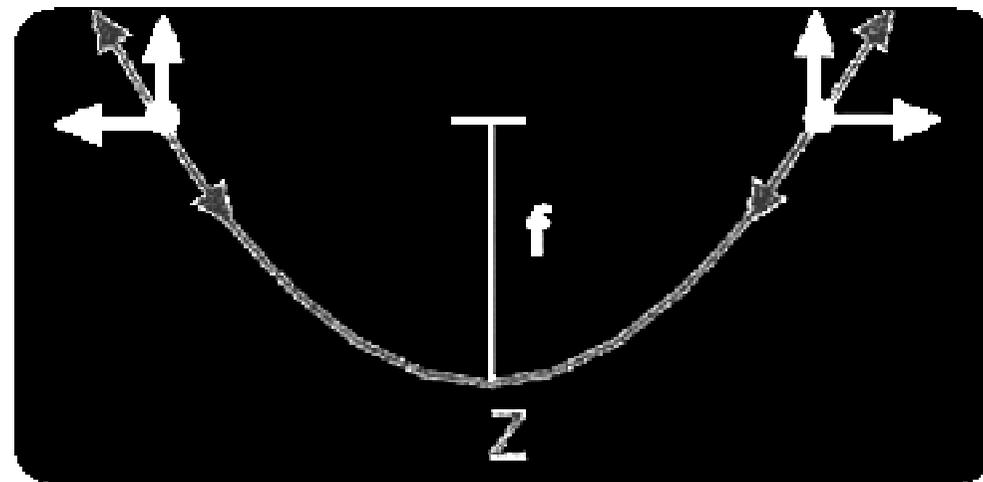


Figure: Level of risk compared with preliminary design up to stage of receiving building permission

## 5 CHARACTERISTICS

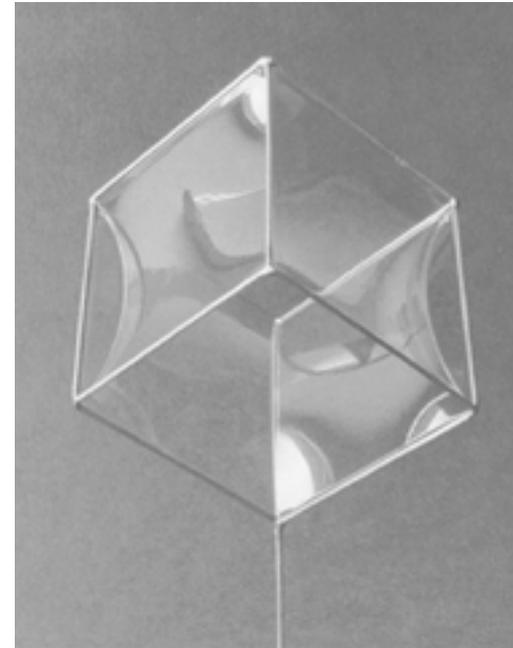
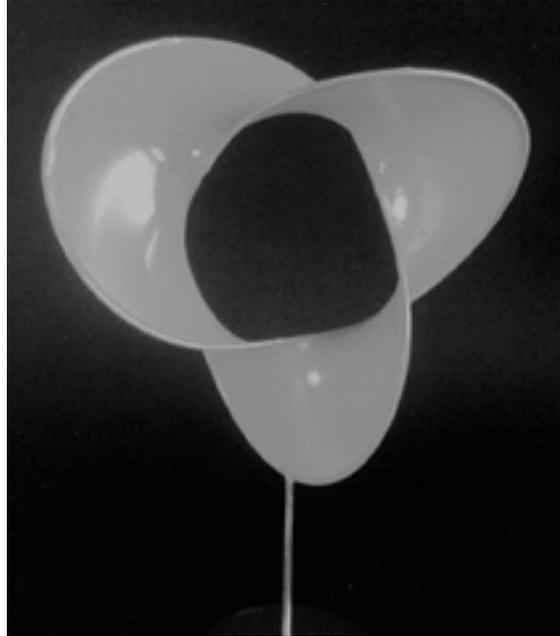
1. **Design with Forces** (Form-finding, Geometry)
2. **Geometry** (Typology, Dimension, Proportion)
3. **Element Catalogue** (Gestalt, Appearance)
4. **Building Physics** (Climate, Accoustics, Fire Protection)
5. **Manufacture** (Errection process, Maintenance)

# 1.) DESIGN WITH FORCES



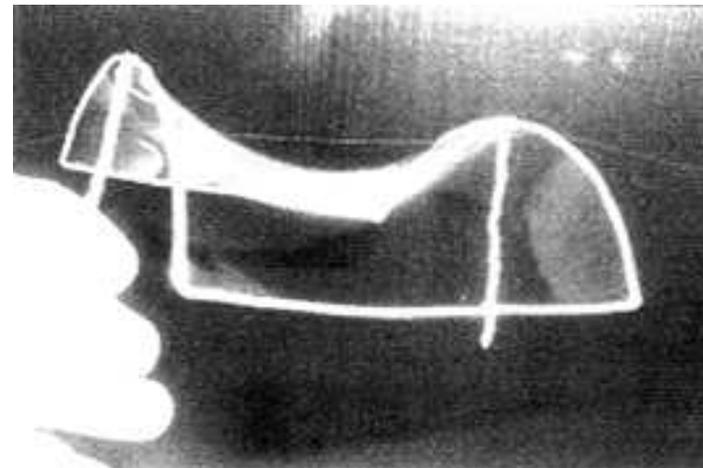
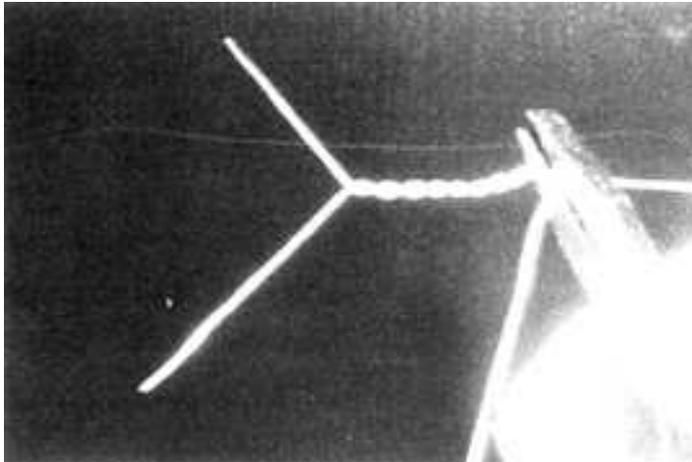
Catenary

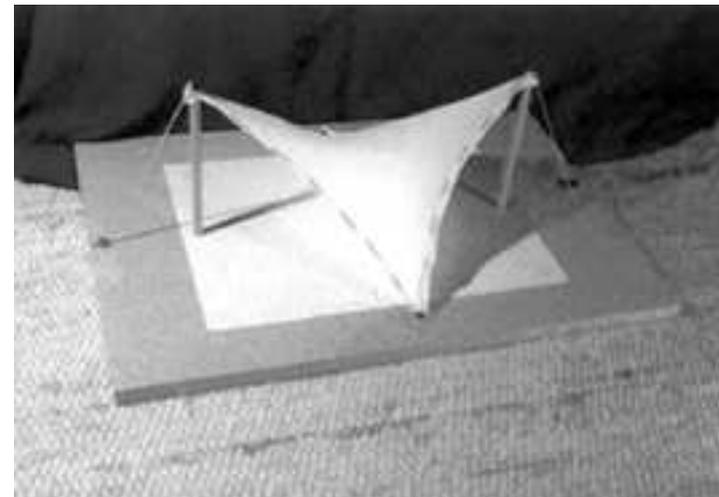
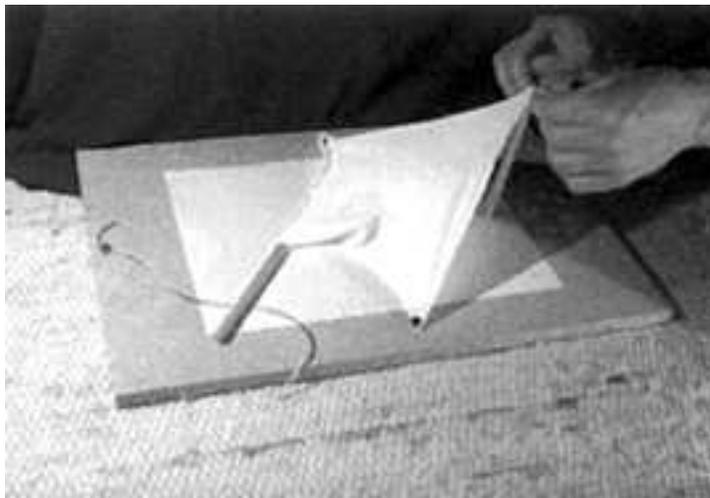
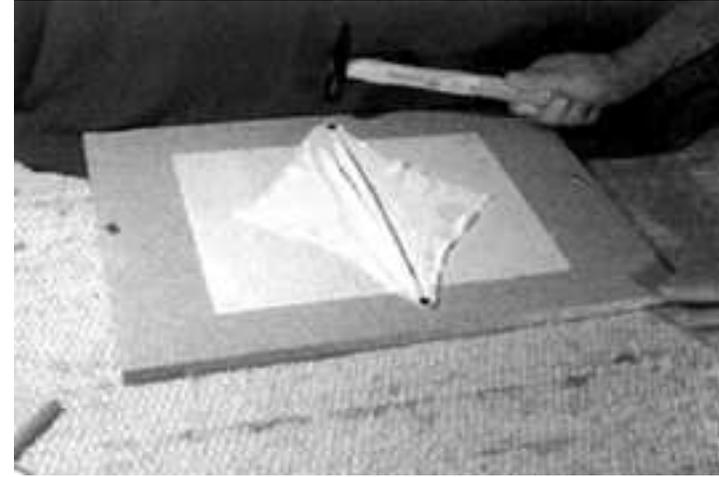
# Minimal Surface

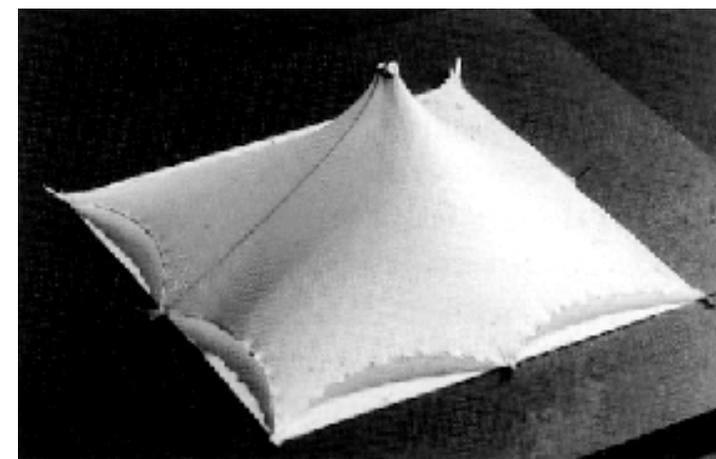
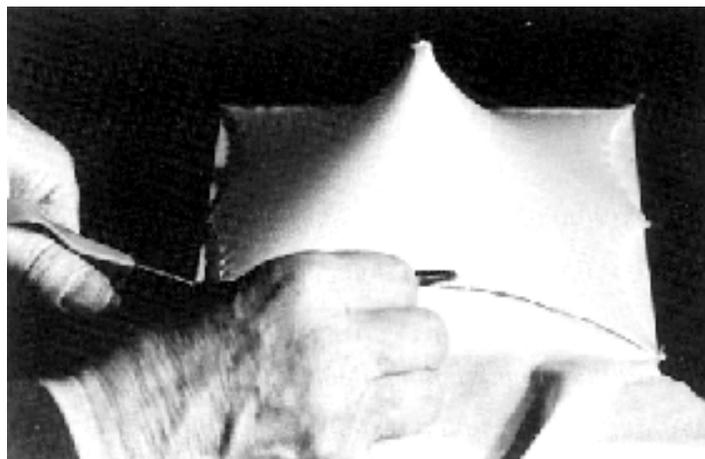
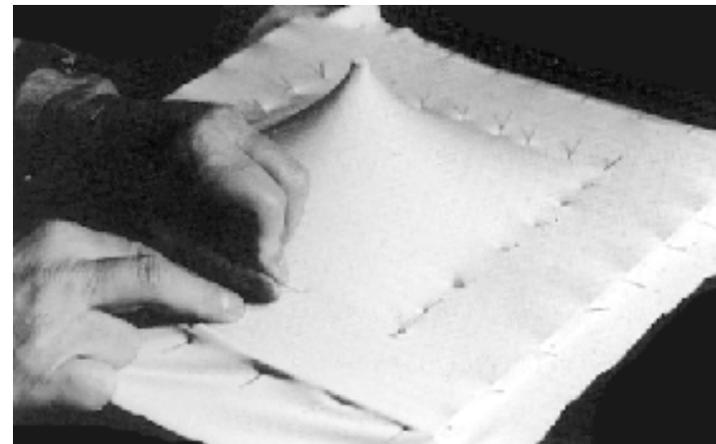
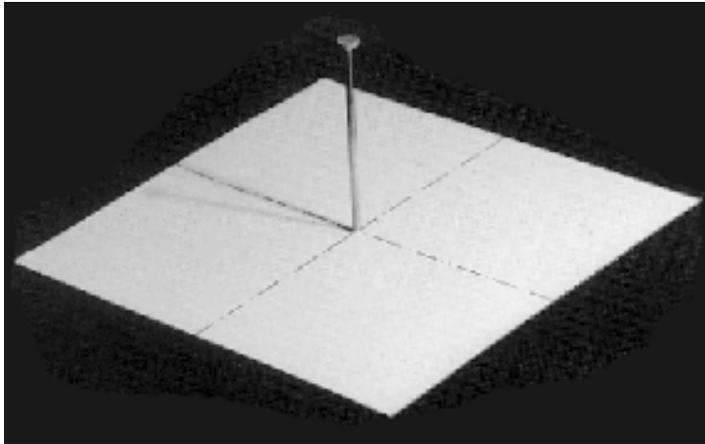


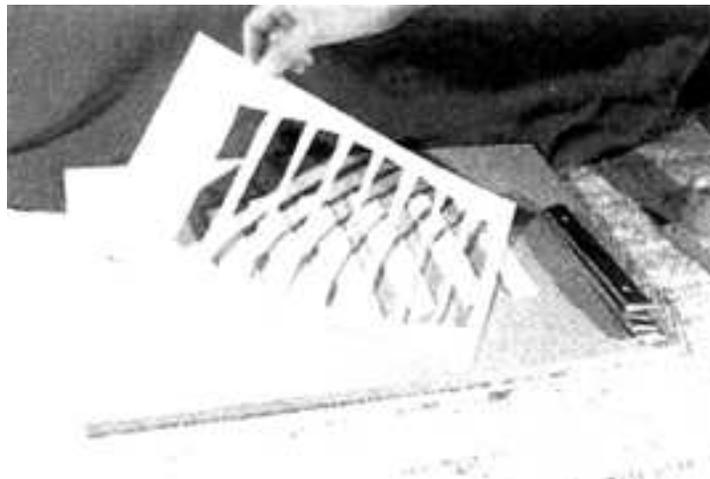
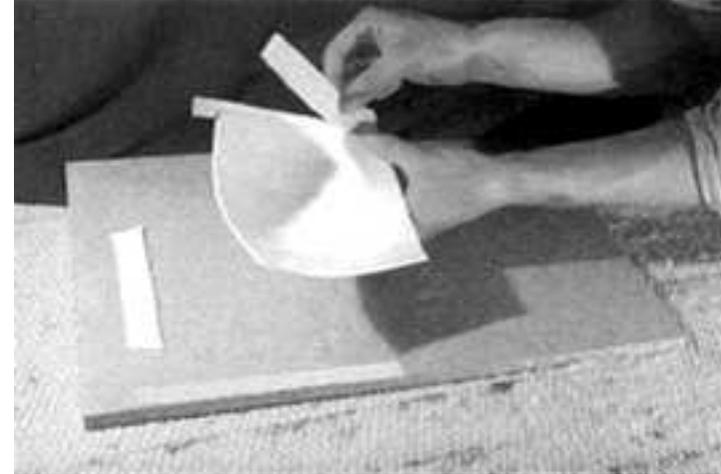
## Soap Film

Joseph Antonie Ferdinand Plateau (1801-1883)

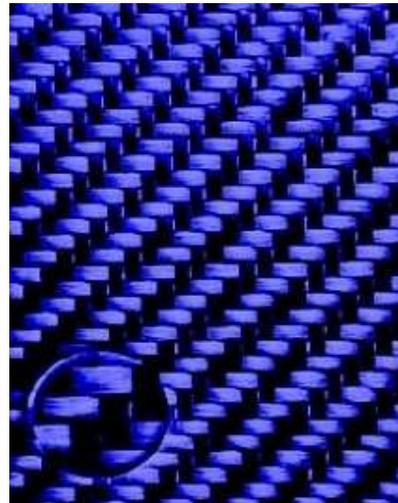
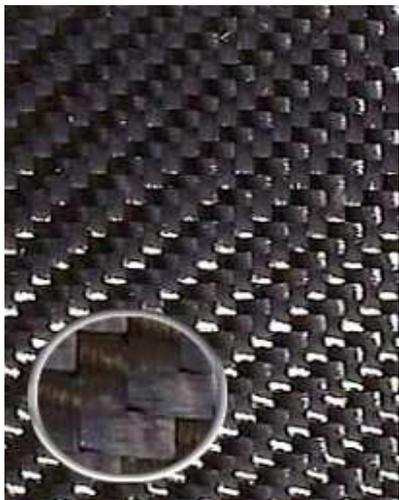
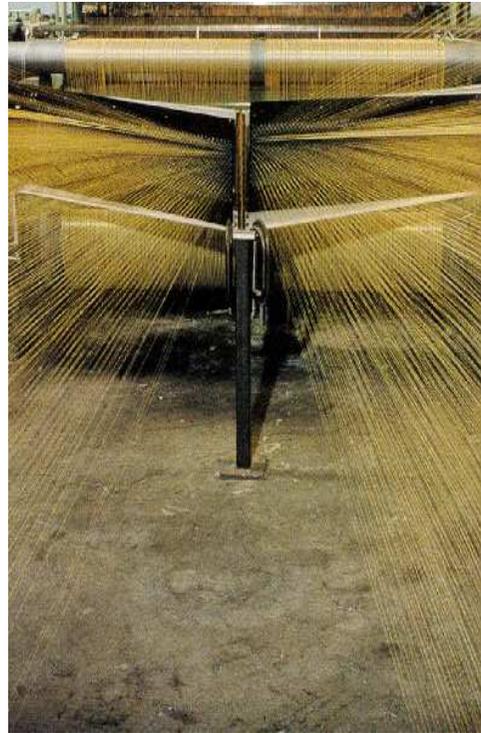






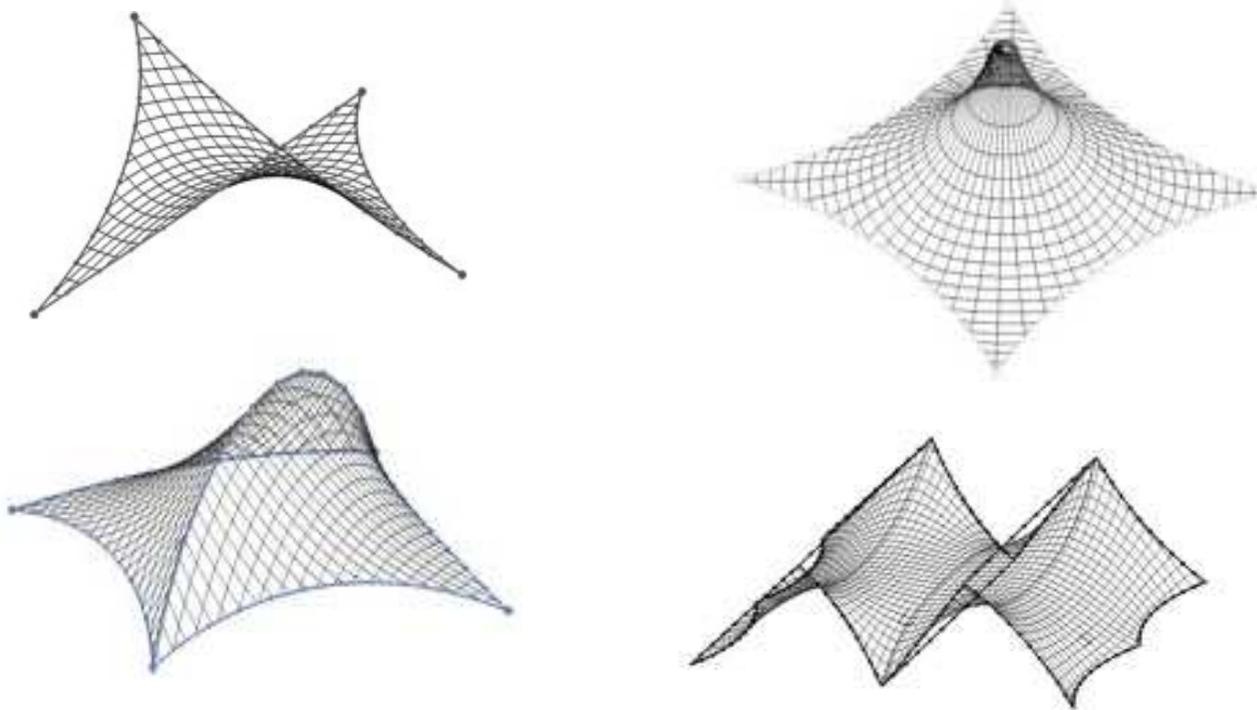


# Filament, Fibre, Fabric, Coating

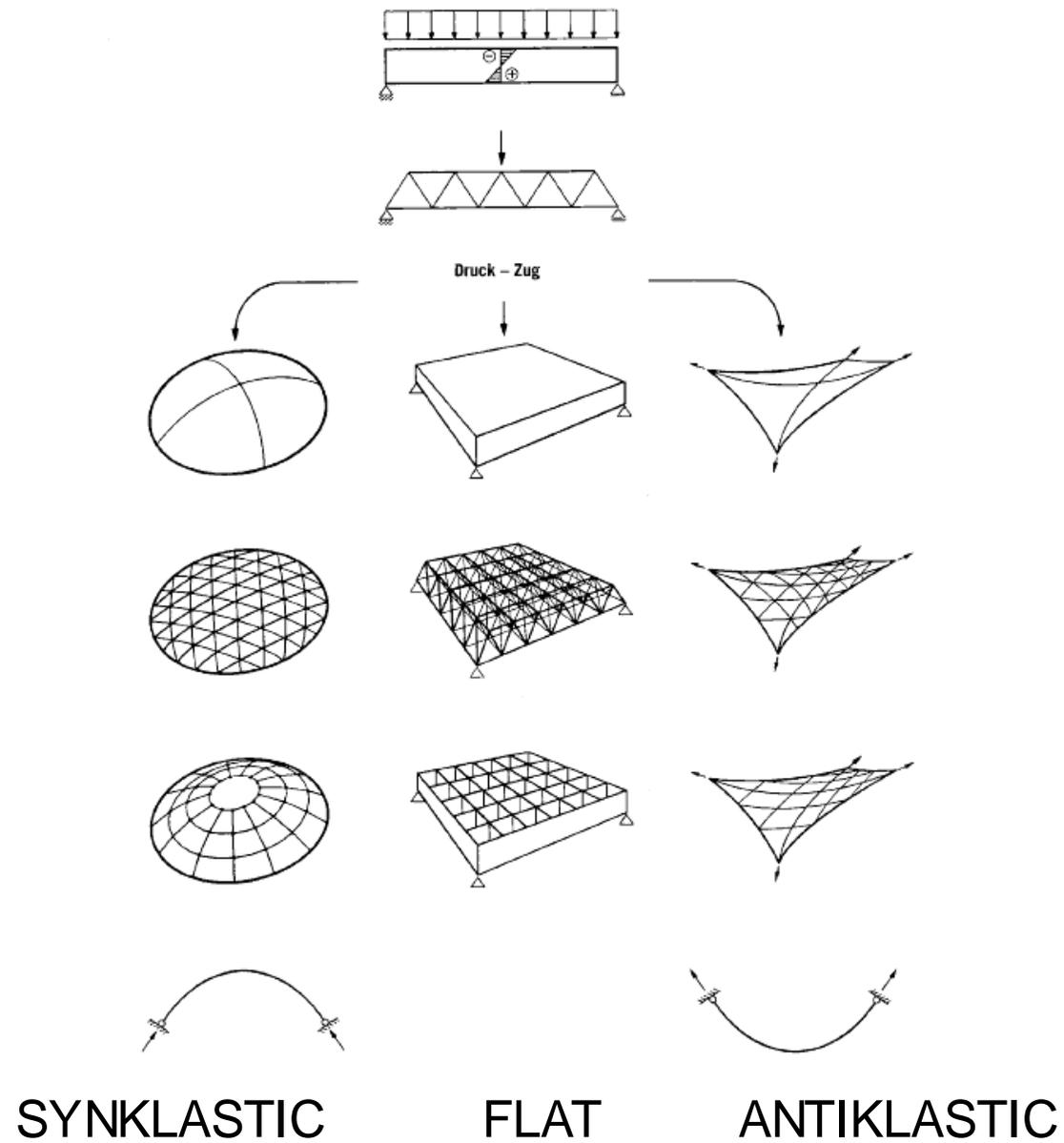


## 2.) GEOMETRY

## 2.) GEOMETRY



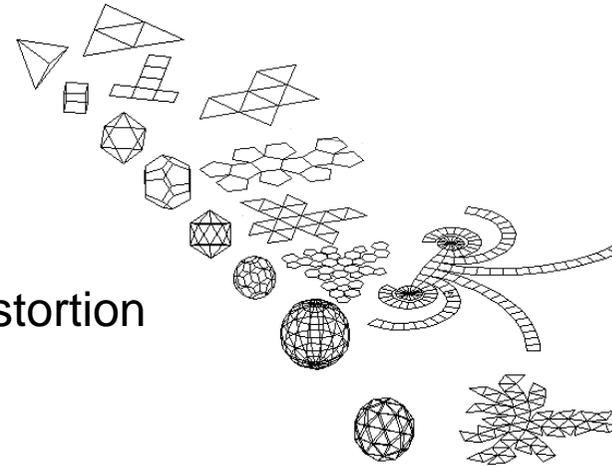
(1.) Design with Forces and (2.) GEOMETRY can not be separated



## 1. FLAT

Curvature = 0

unroll of surface possible without distortion



## 2. ANTIKLASTIC

Curvature  $k = -1$  (negative)

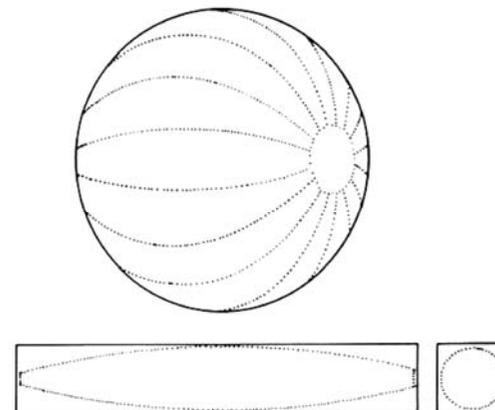
(distortion on unroll of surface)

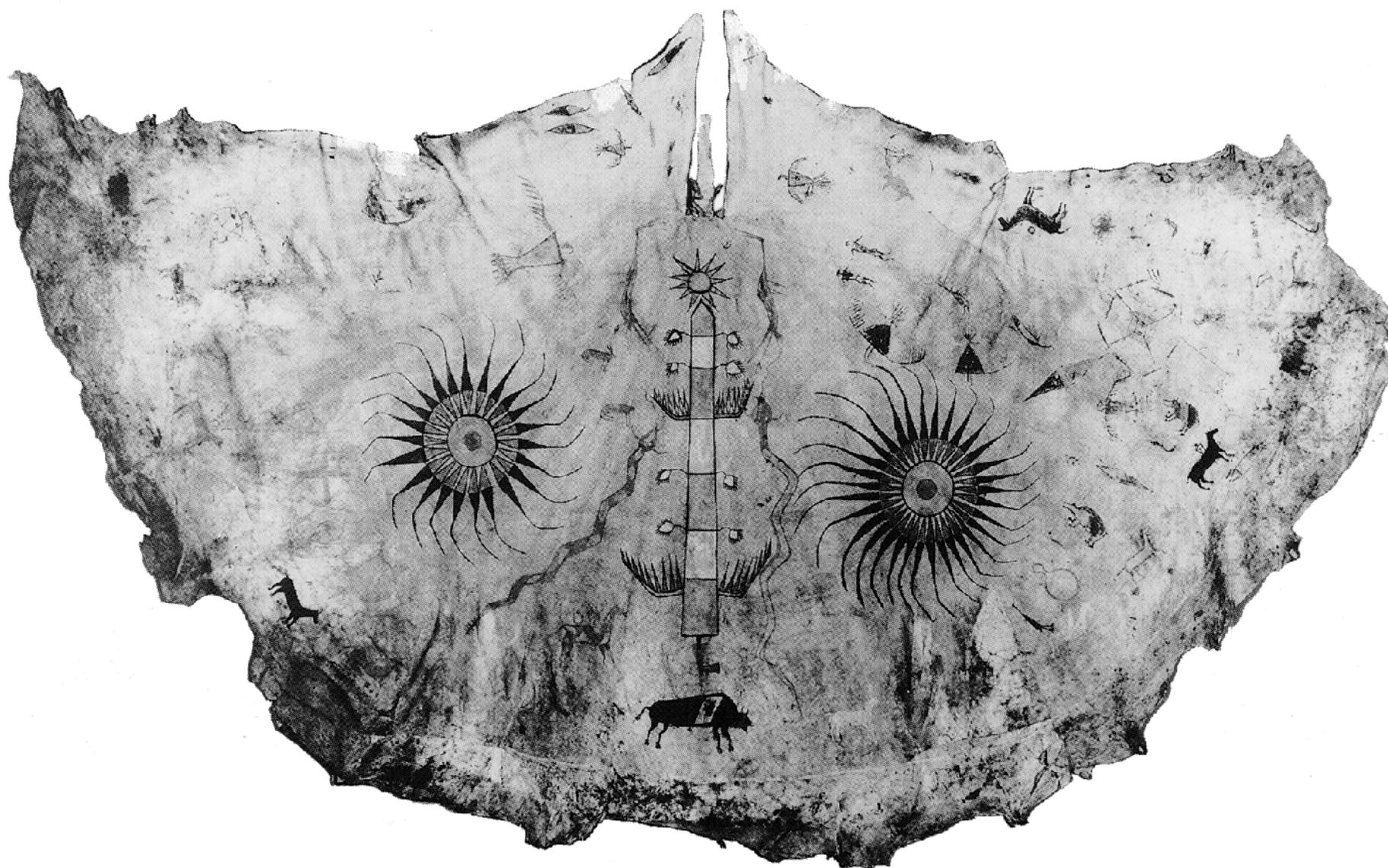


## 3. SYNKLASTIC (Air supported)

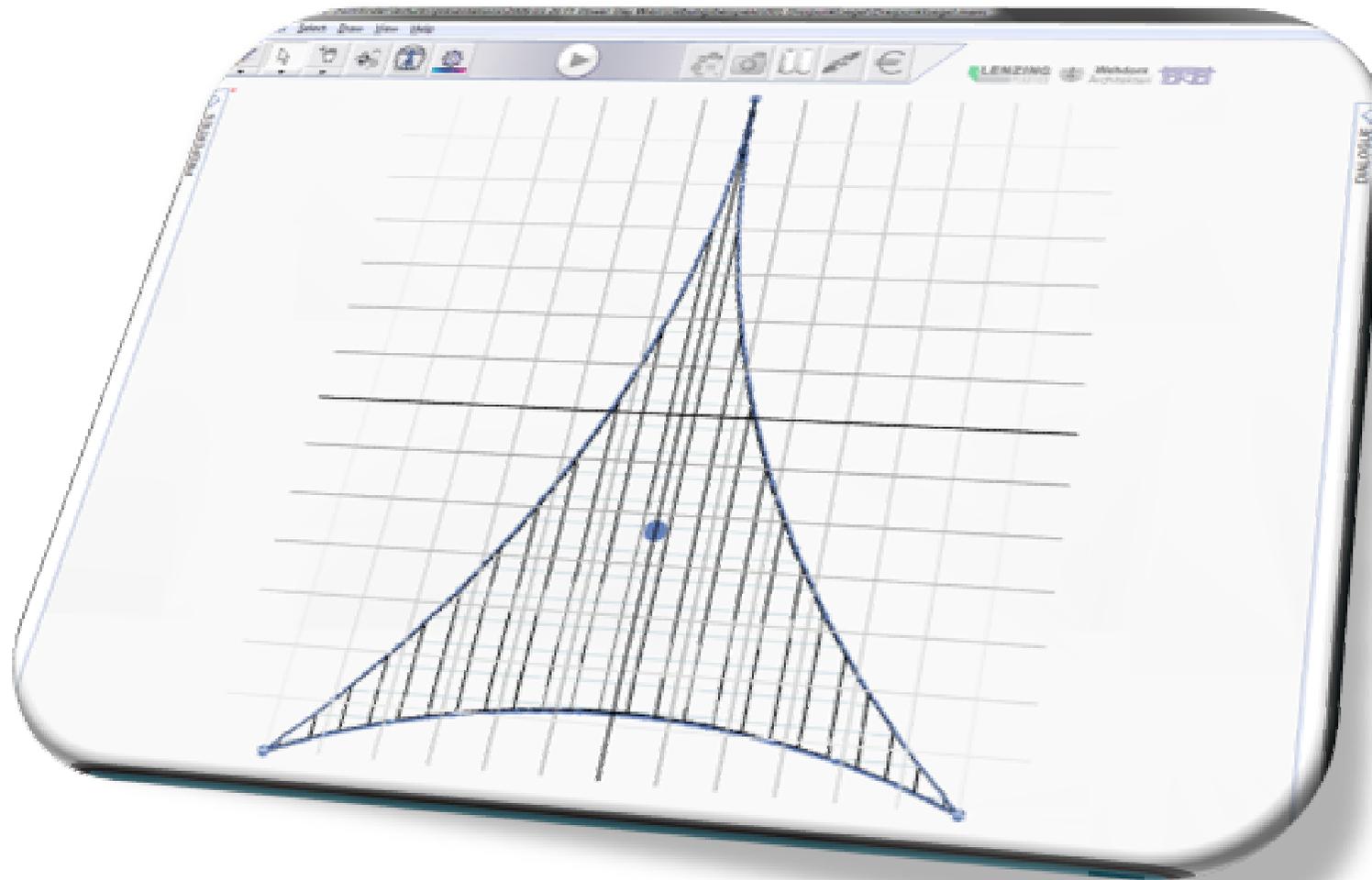
Curvature  $k = +1$

(distortion on unroll of surface)

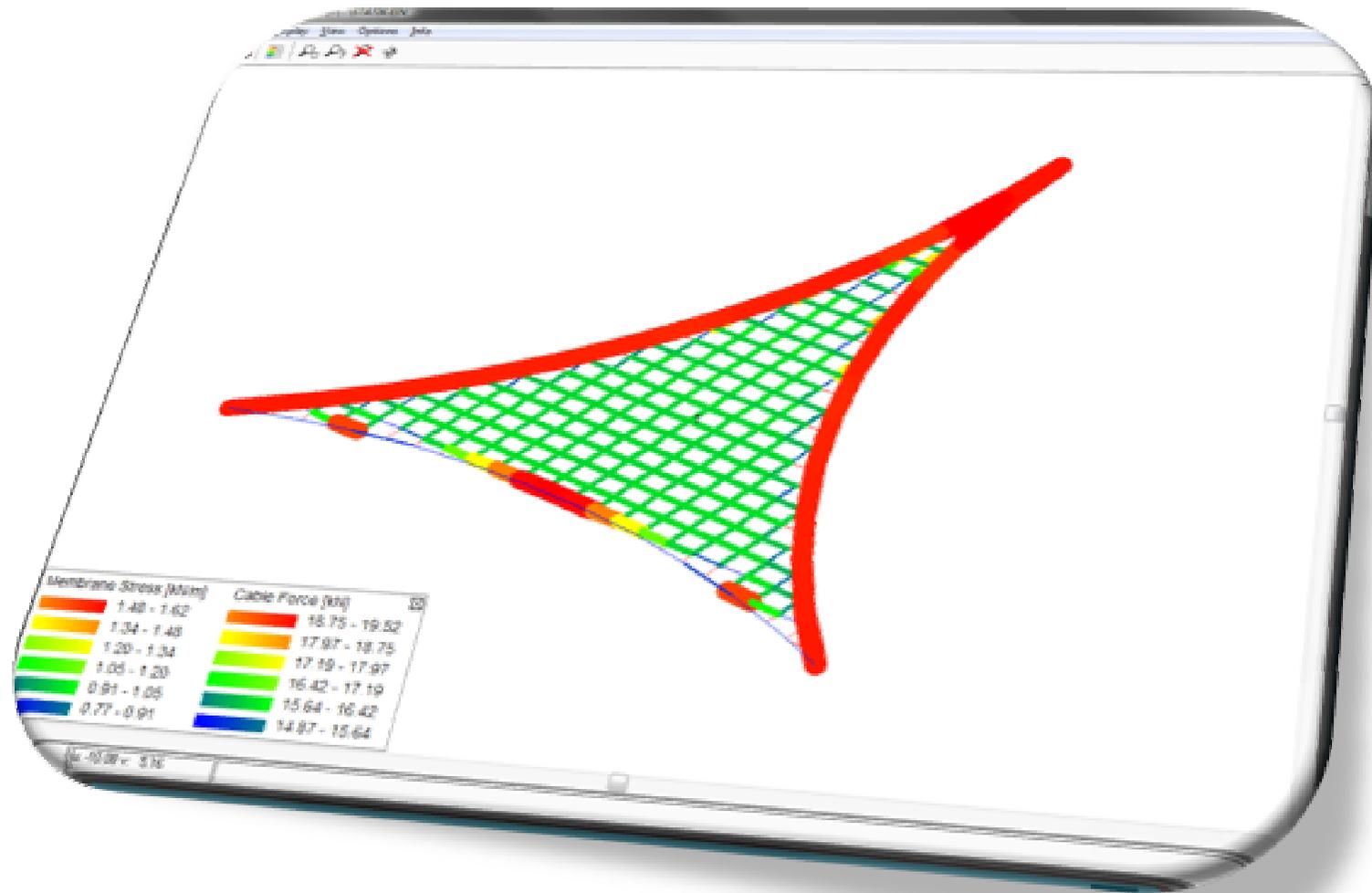




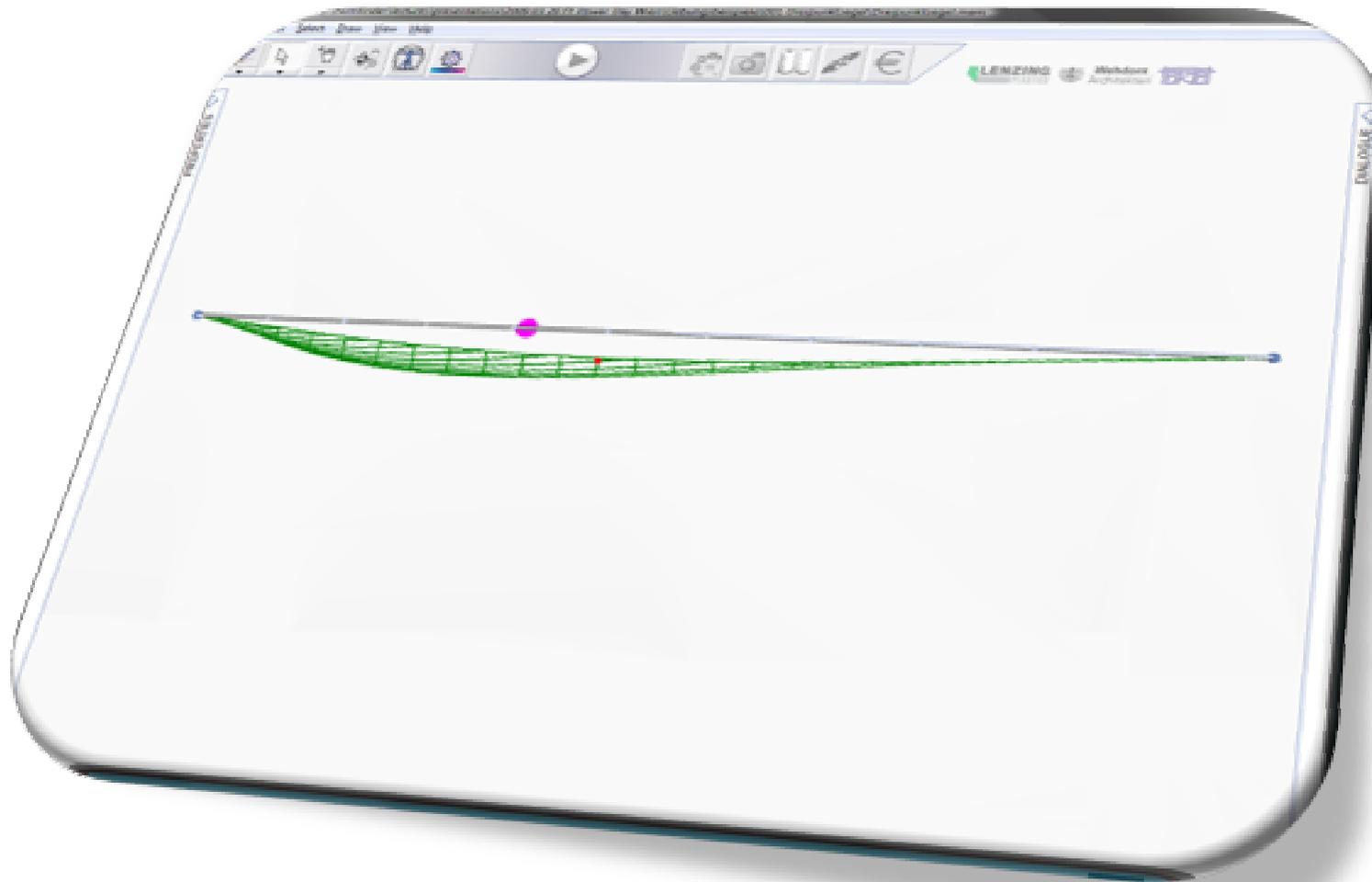




Edge 15 Meter



**SELF WEIGHT: Cable Force 20 kN**



**SELF WEIGHT:  $\text{Sag} > 50 \text{ cm}$**

THEREFORE  
DESIGN WITH FORCES  
and  
GEOMETRY

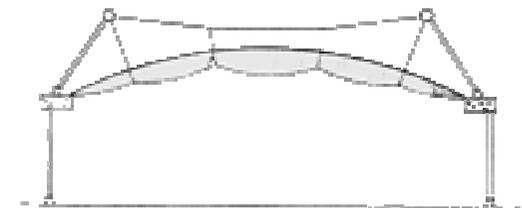
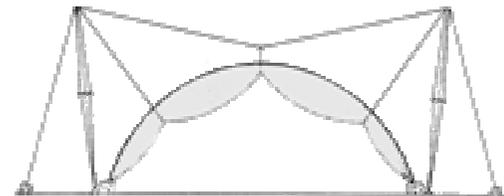
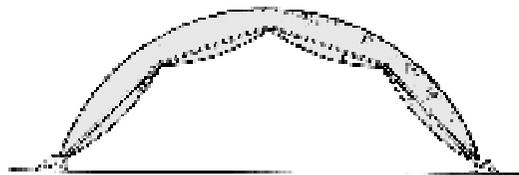
SYNKLASTIC

Curvature  $k = +1$  (Positive)



Krümmung  $k= +1$

SYNKLASTIC  
 $k = +1$





Air cushion



# STABILISATION ON GEOMETRY

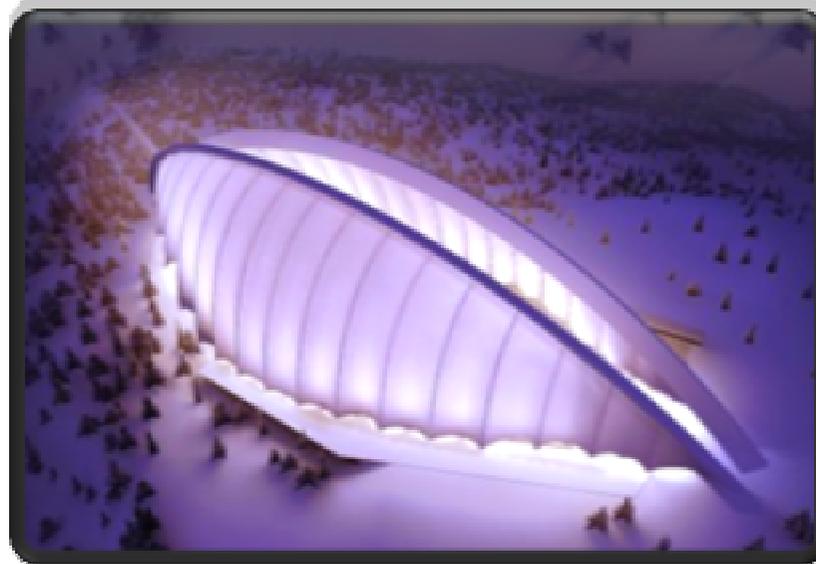
ANTICLASTIC  
Curvature  $k = -1$  (Negative)



1:1 to 1:4



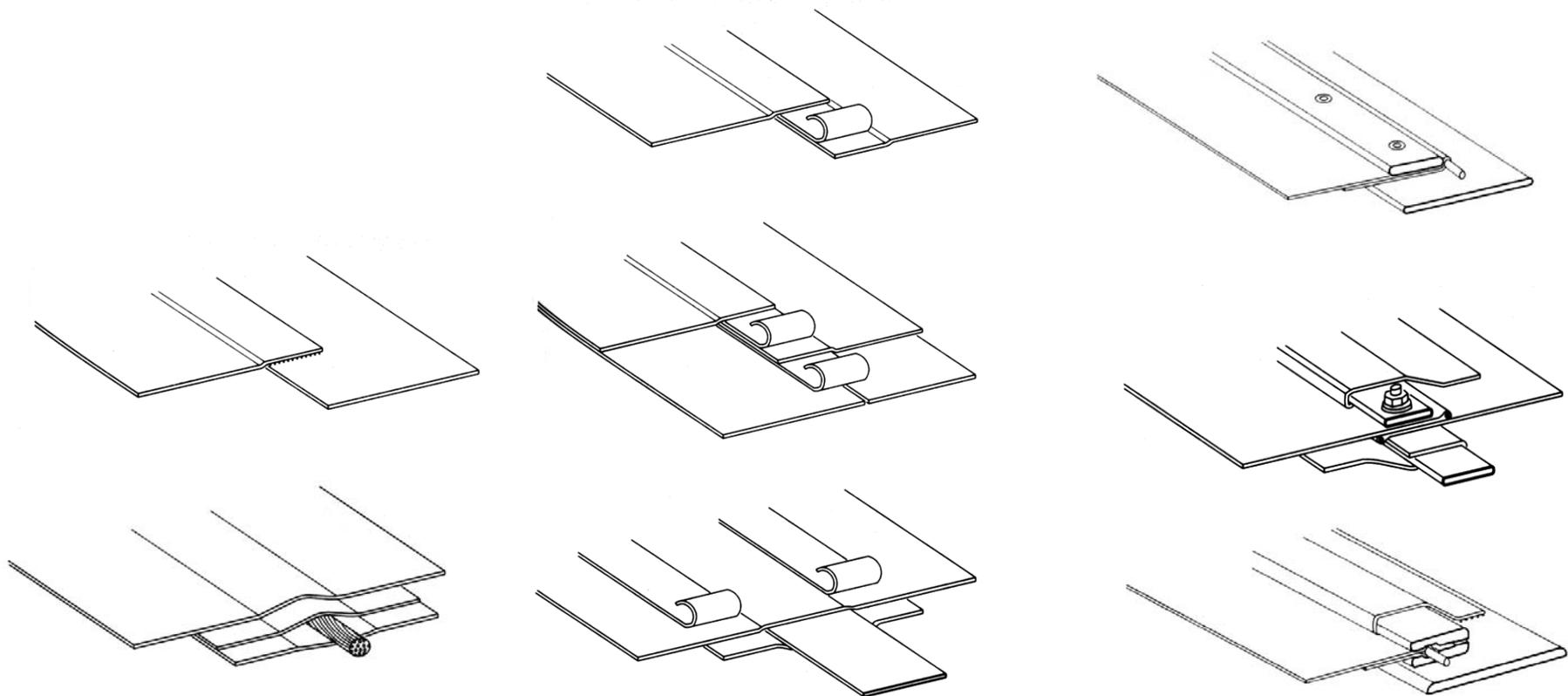




## 3.) ELEMENT CATALOGUE

Due to high number of different geometries only few details are re-used.

# ELEMENT: MEMBRANE CONNECTION



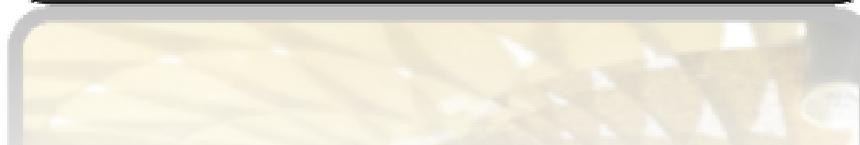


Arrangement of the surface

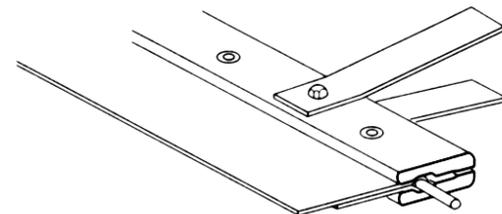
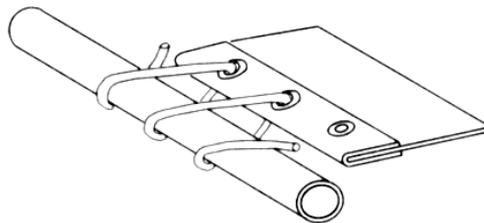
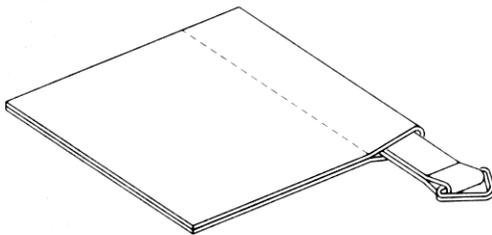
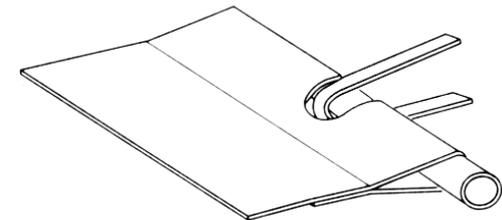
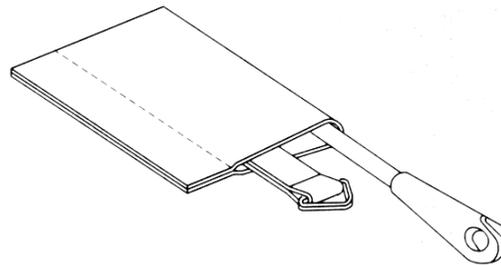
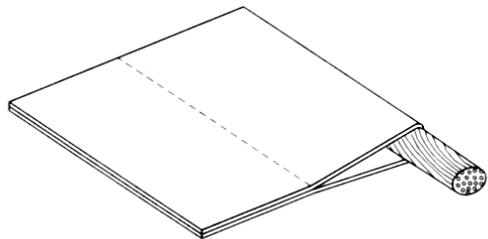


Readability of the surface

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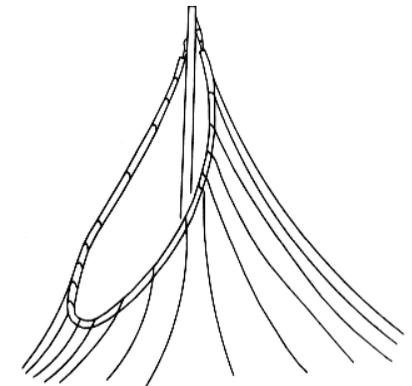
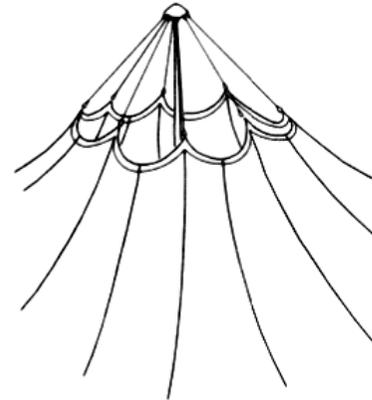
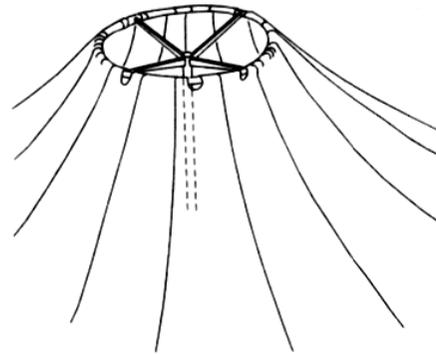
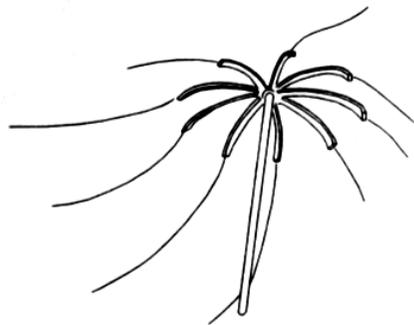
# ELEMENT: EDGE CONNECTION

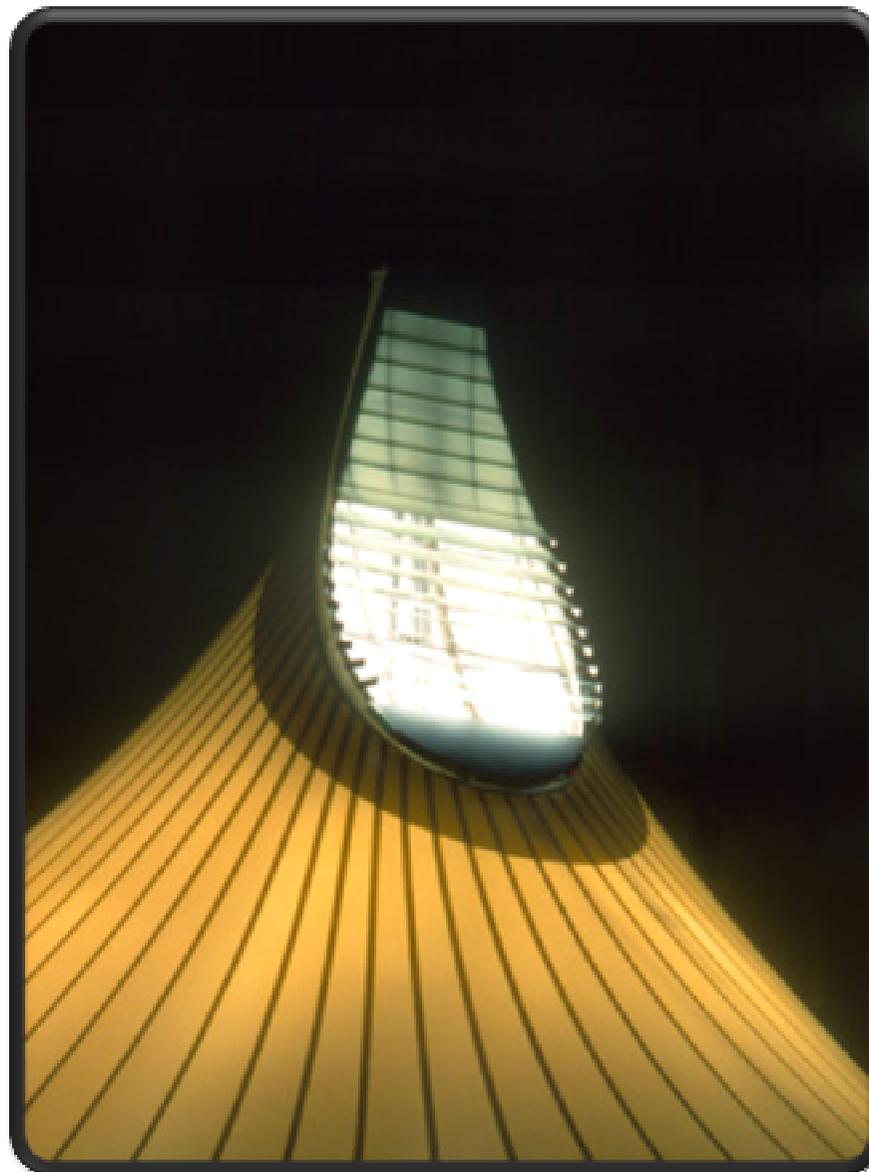




Edge-Cable

# ELEMENT: HIGH POINT

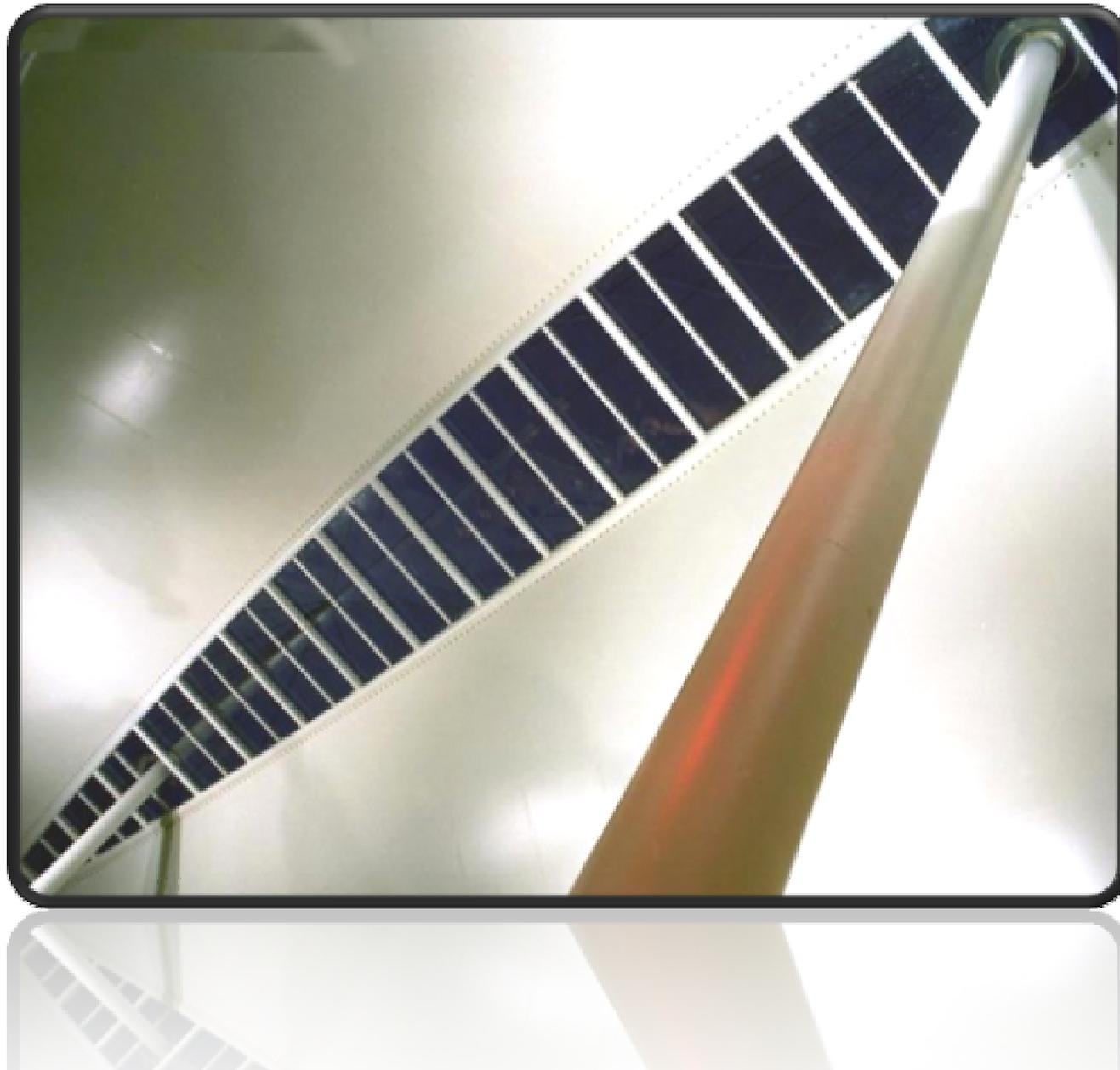




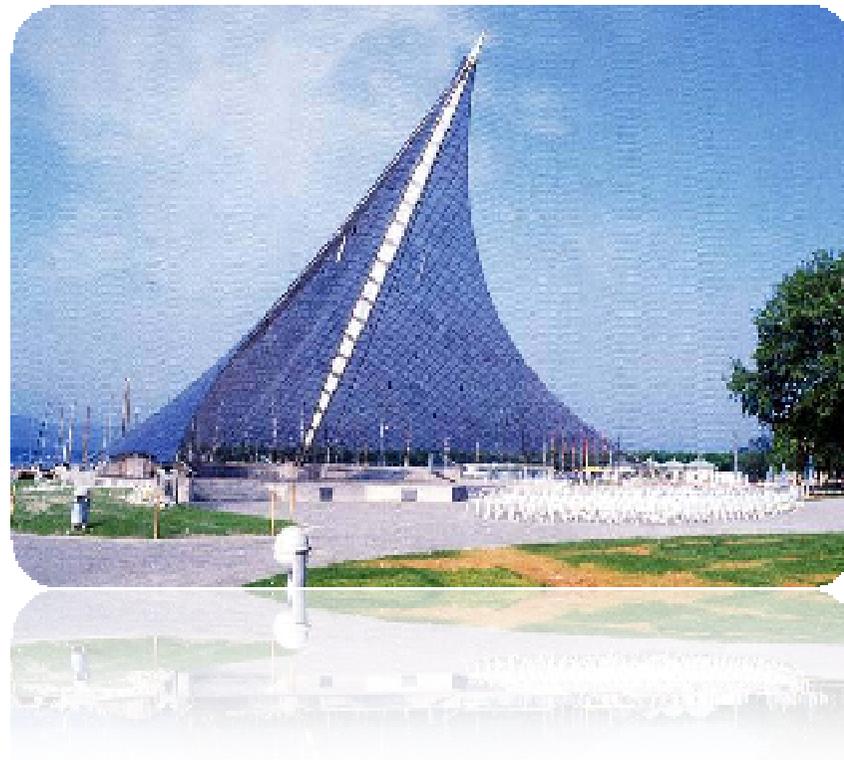
Loop

# ELEMENT: MAST



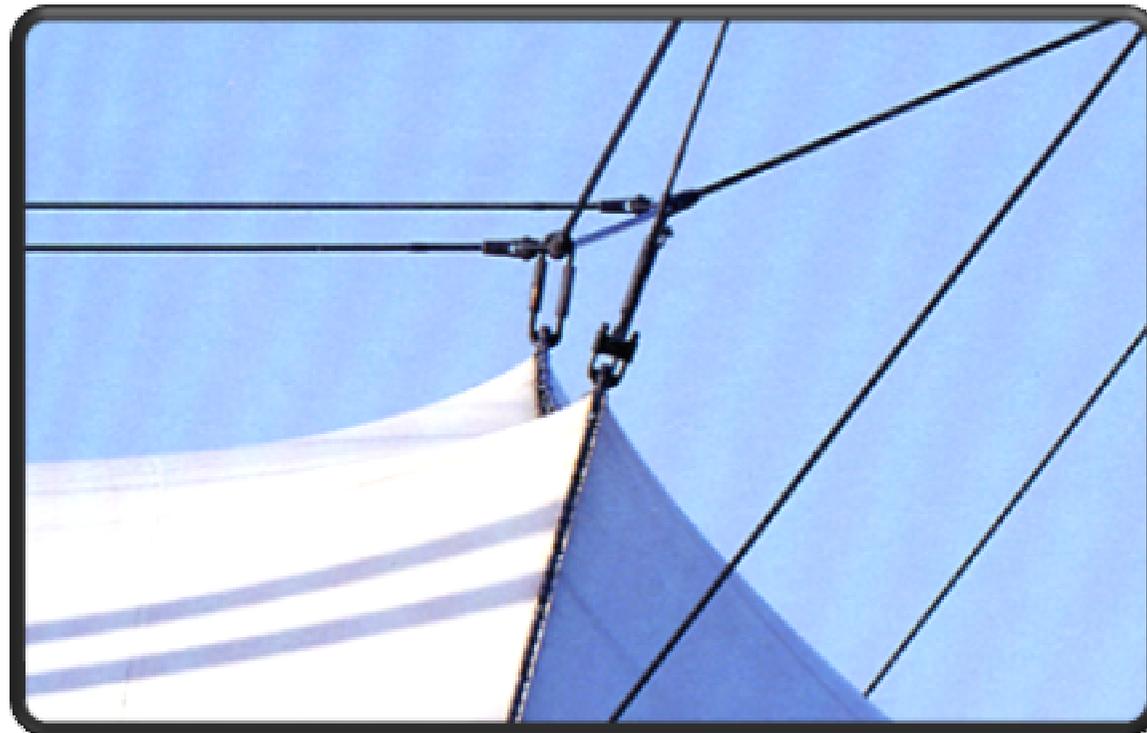


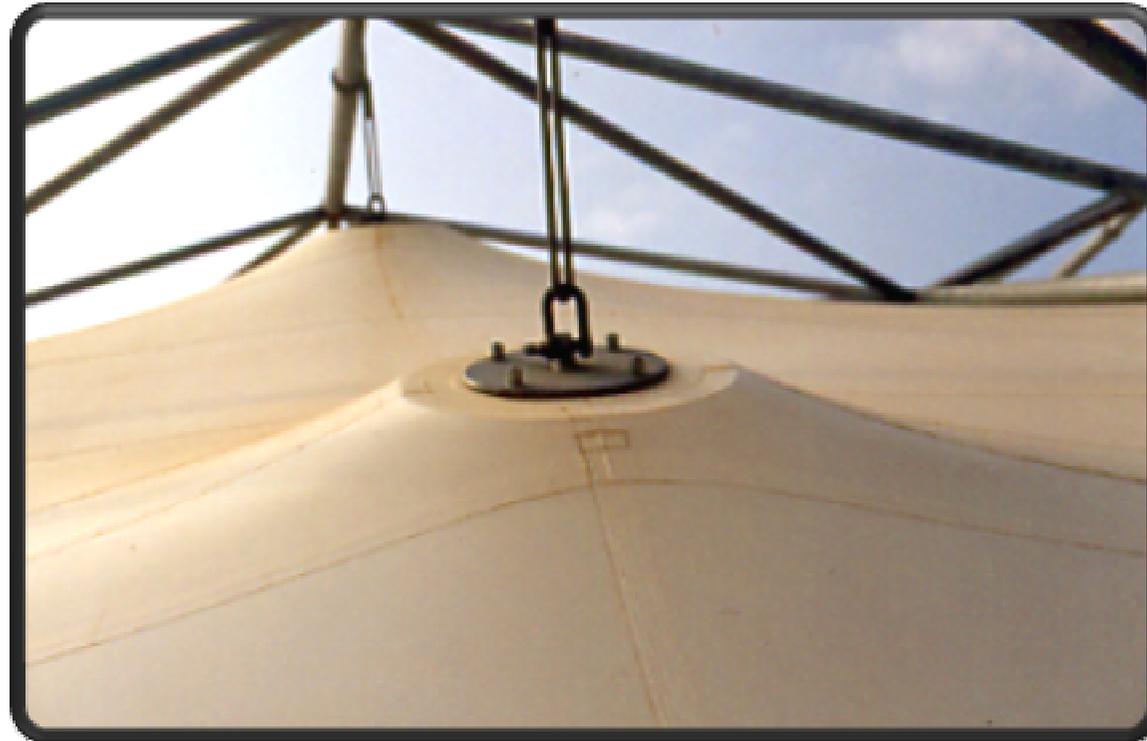


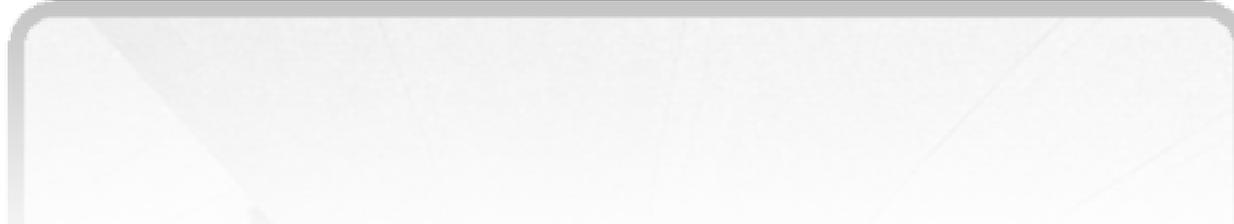
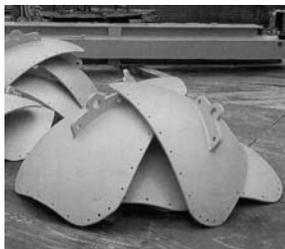


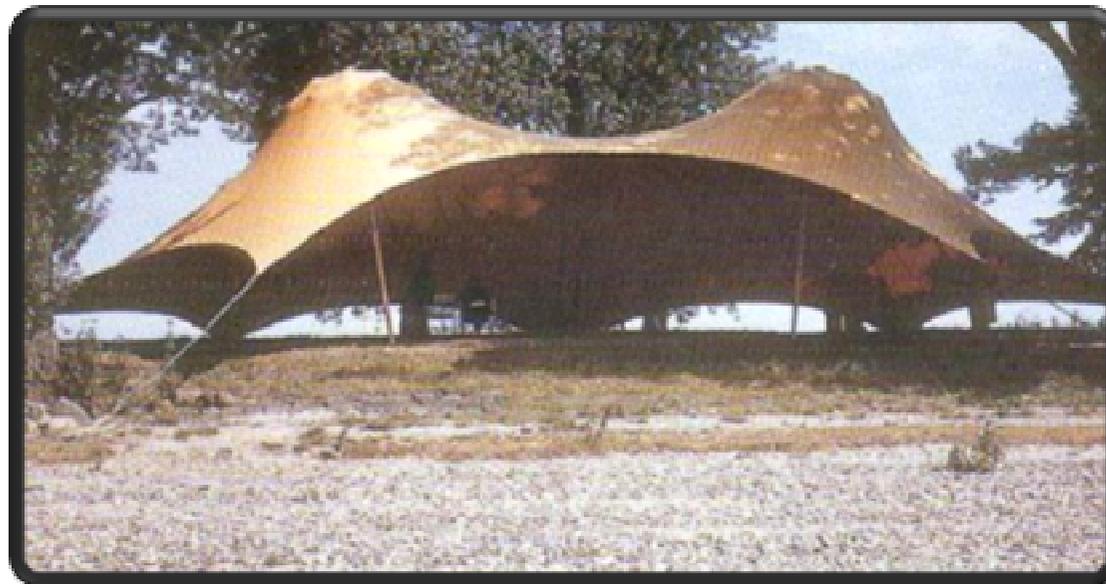


ELEMENT: CABLE, POINT, HUMP

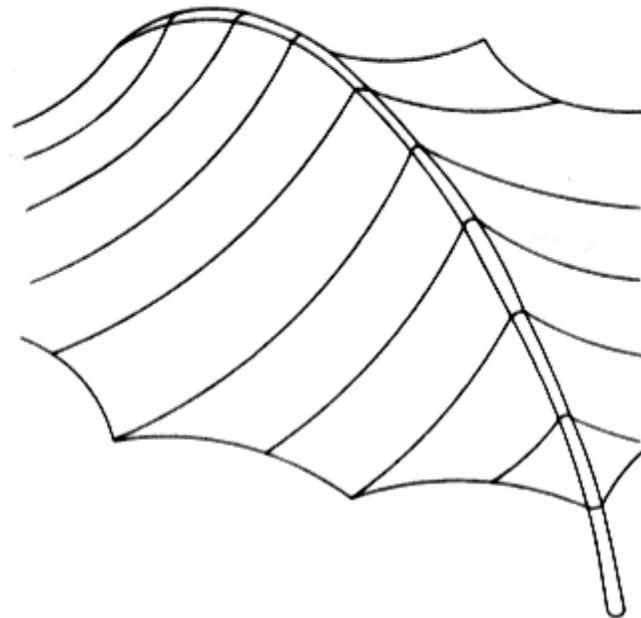








# ELEMENT: ARCH

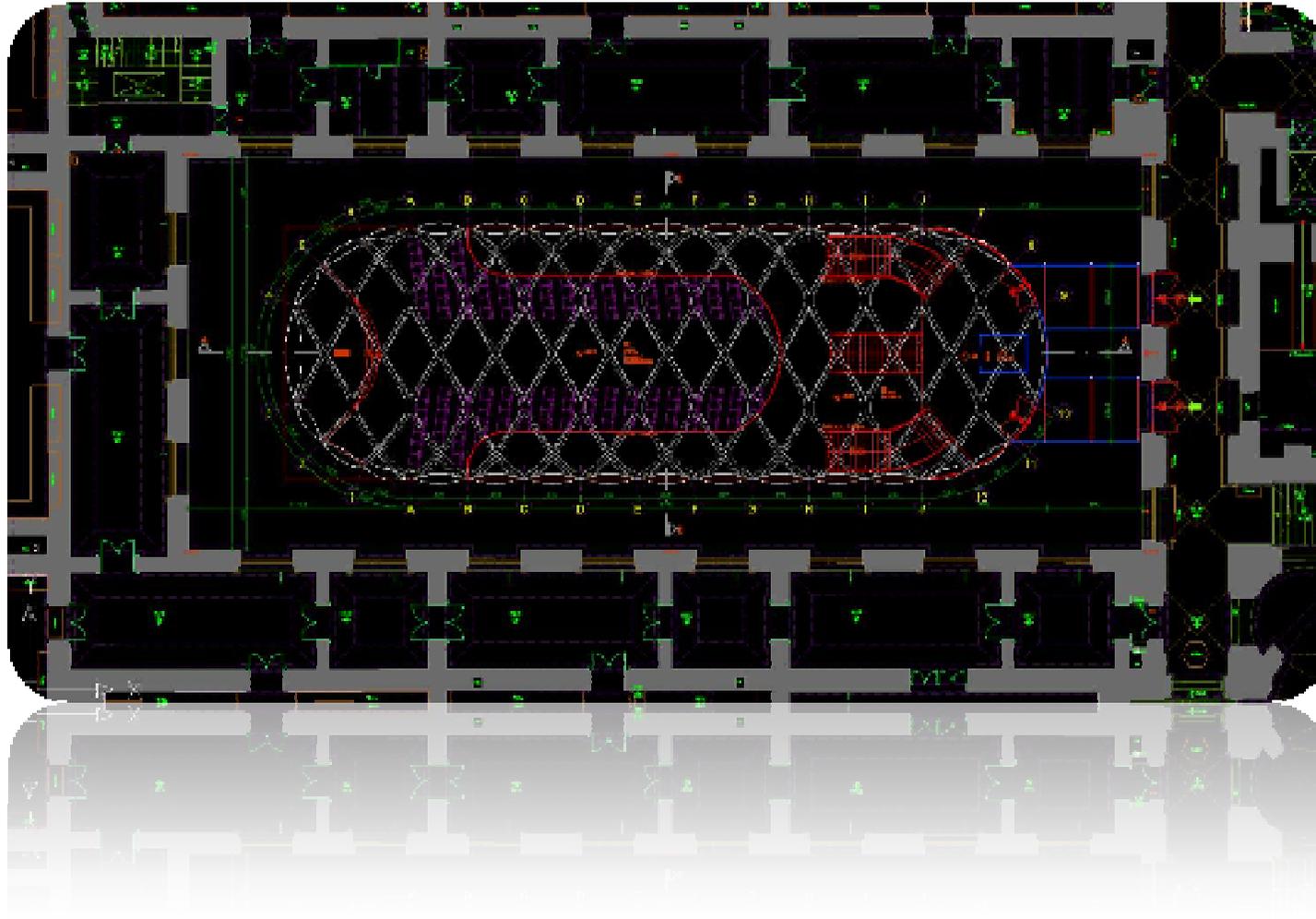


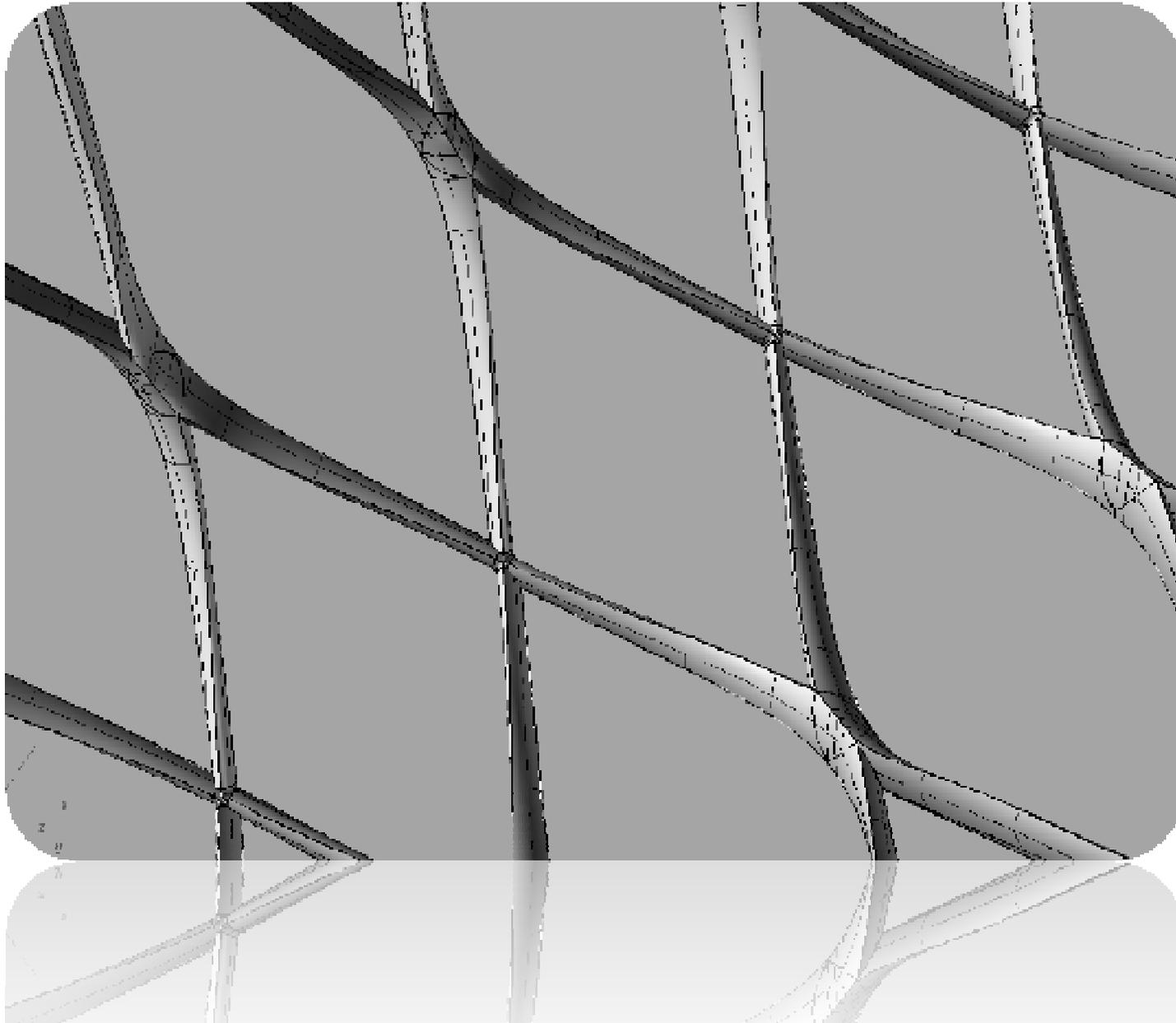


## 4) BUILDING PHYSICS

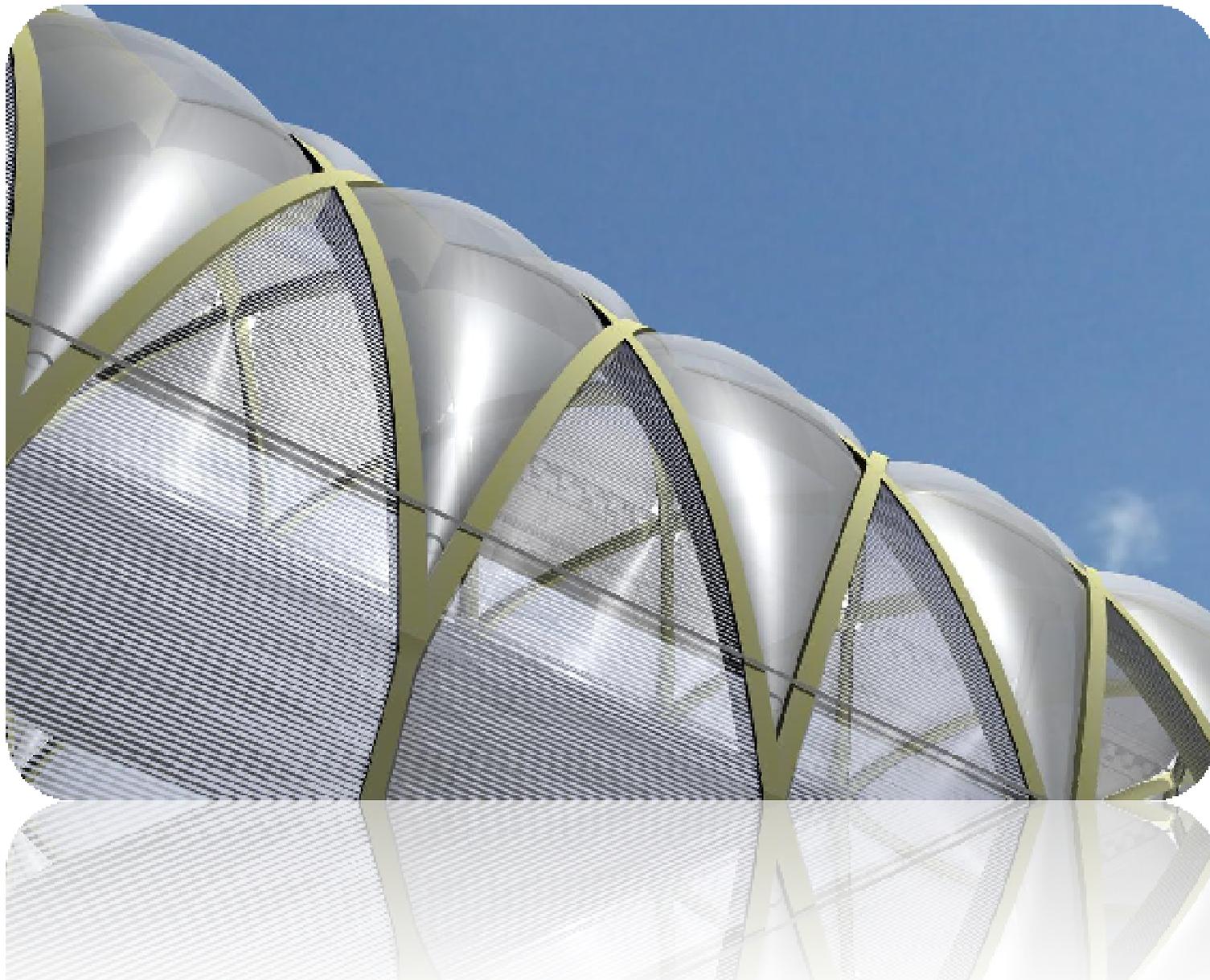


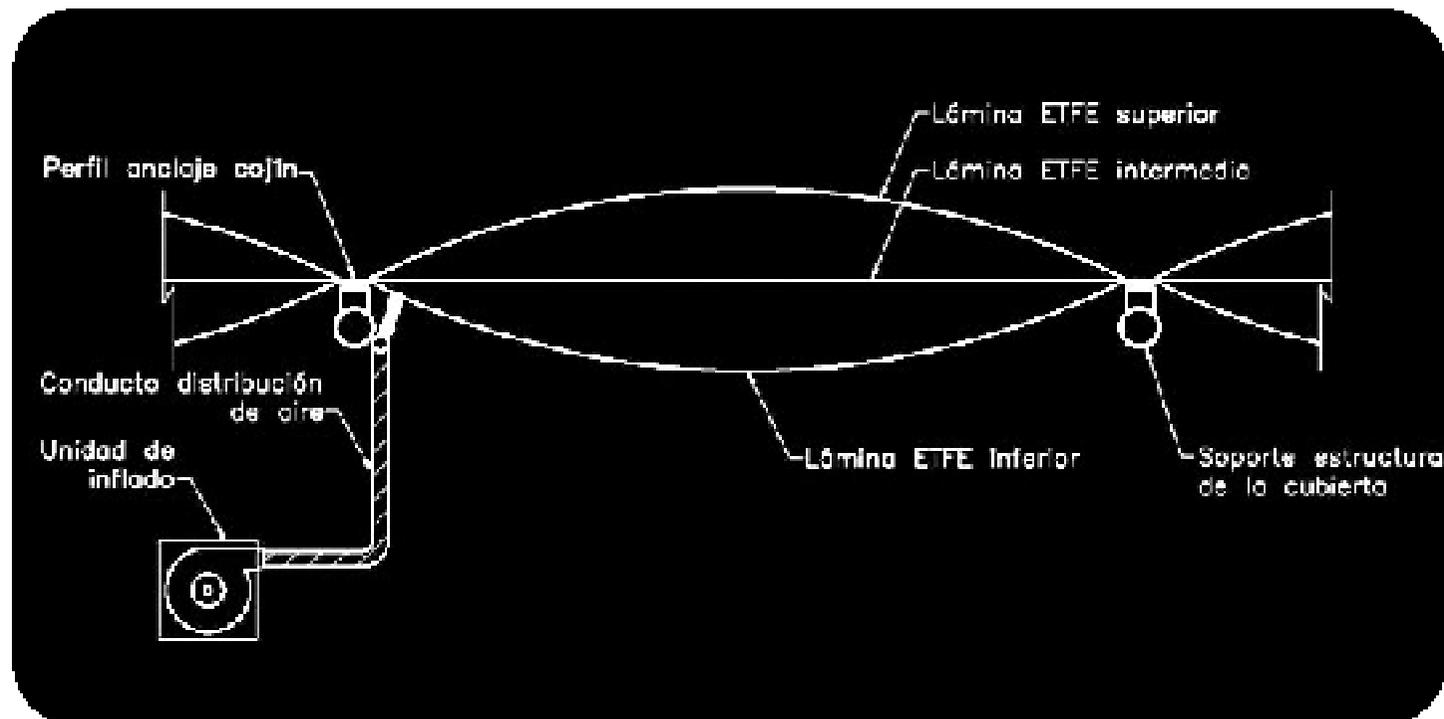
Naturhistorisches Museum Wien

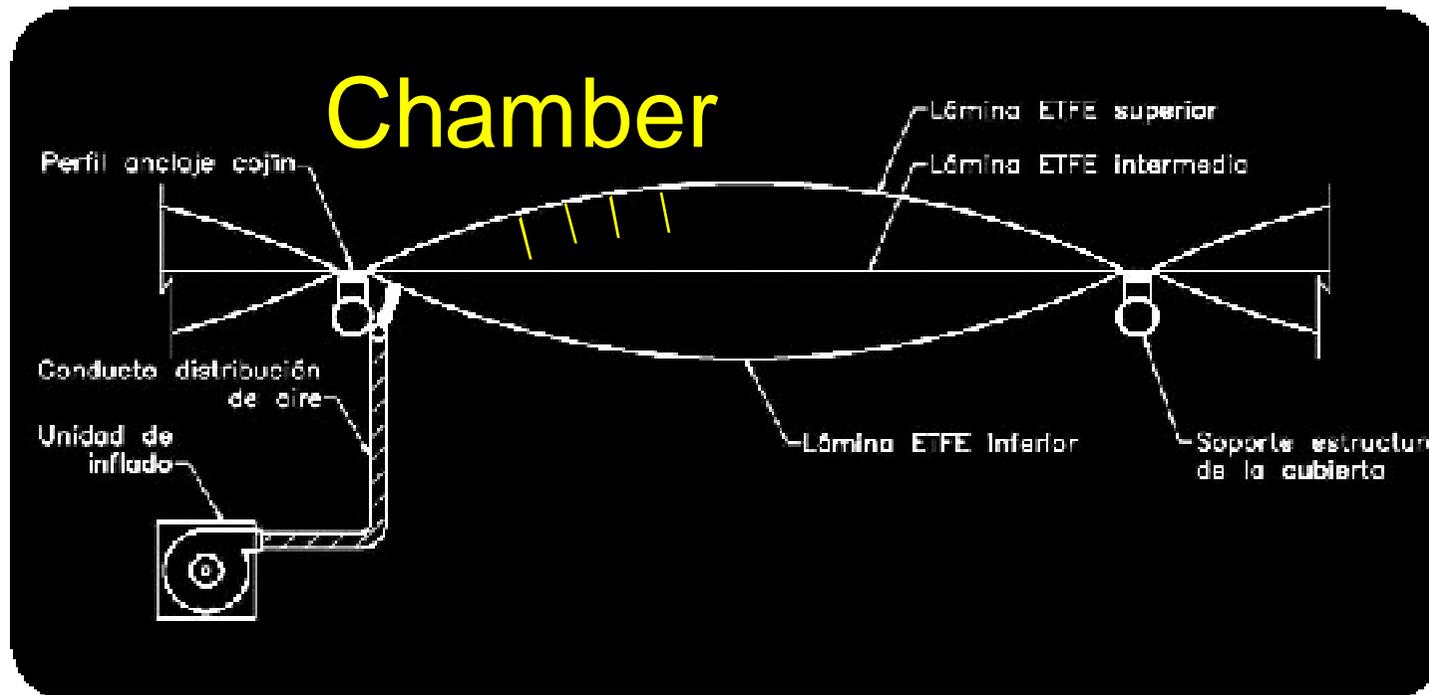














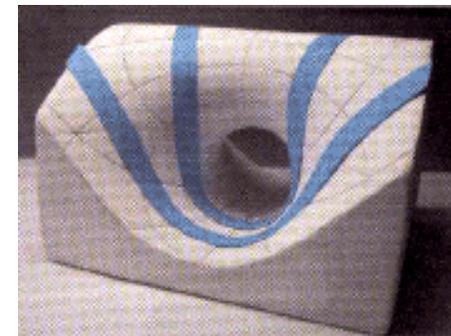
formfinder

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## 5) MANUFACTURE

Manufacture technology (limitations) effect  
the design scope

# Geodesic Lines

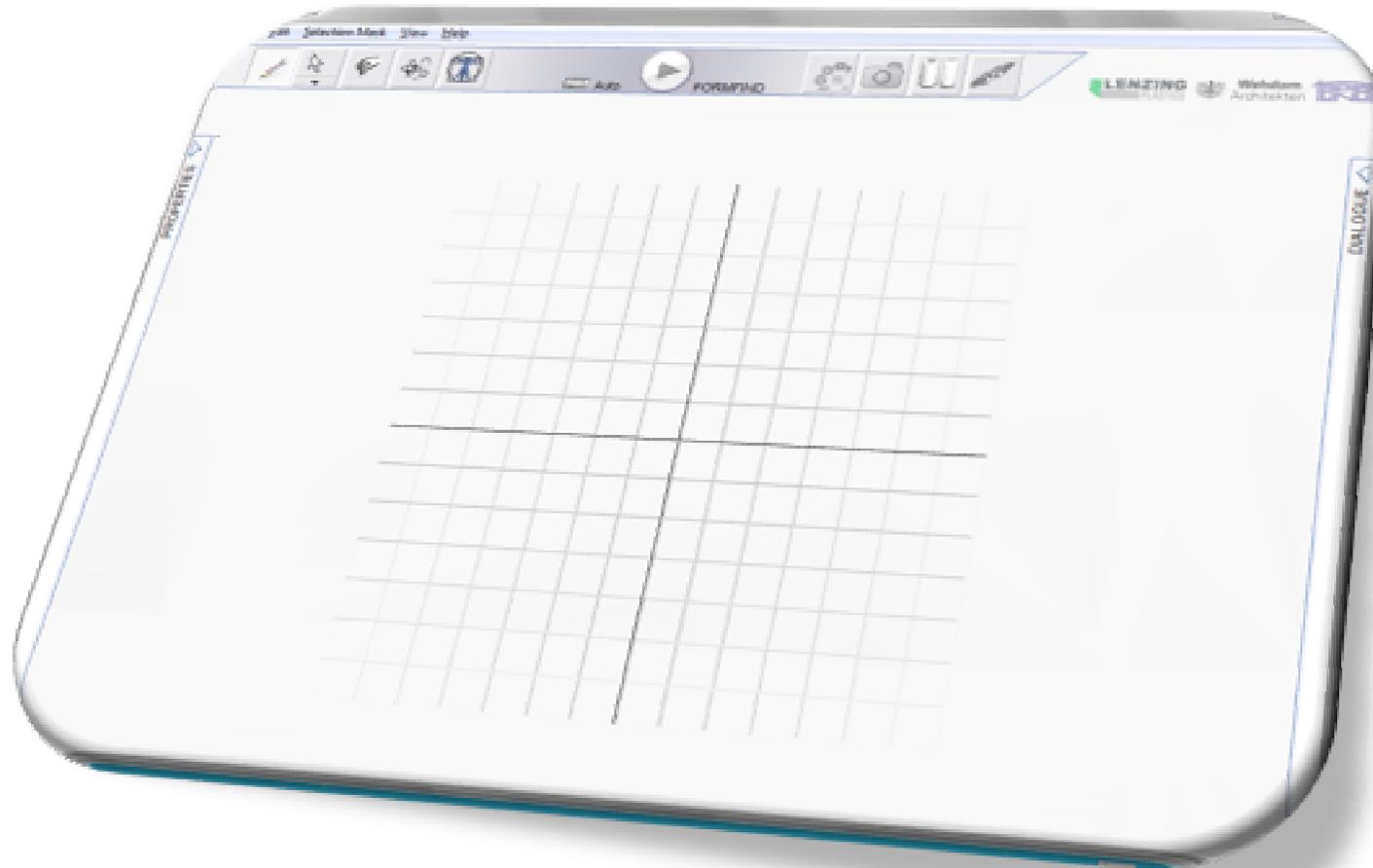


**formfinder**



**FORMFINDER**

# formfinder



**formfinder**

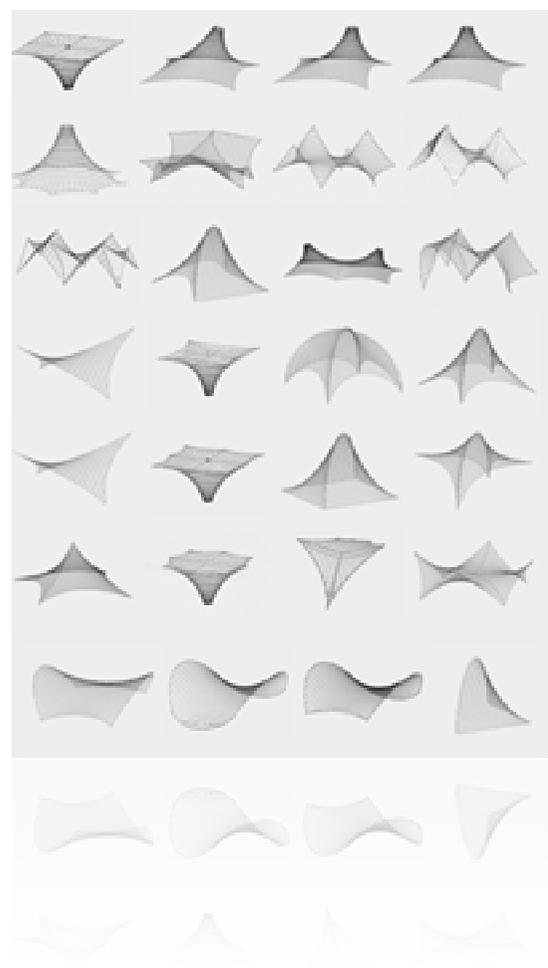
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**DIALOGUE PANEL**

# formfinder

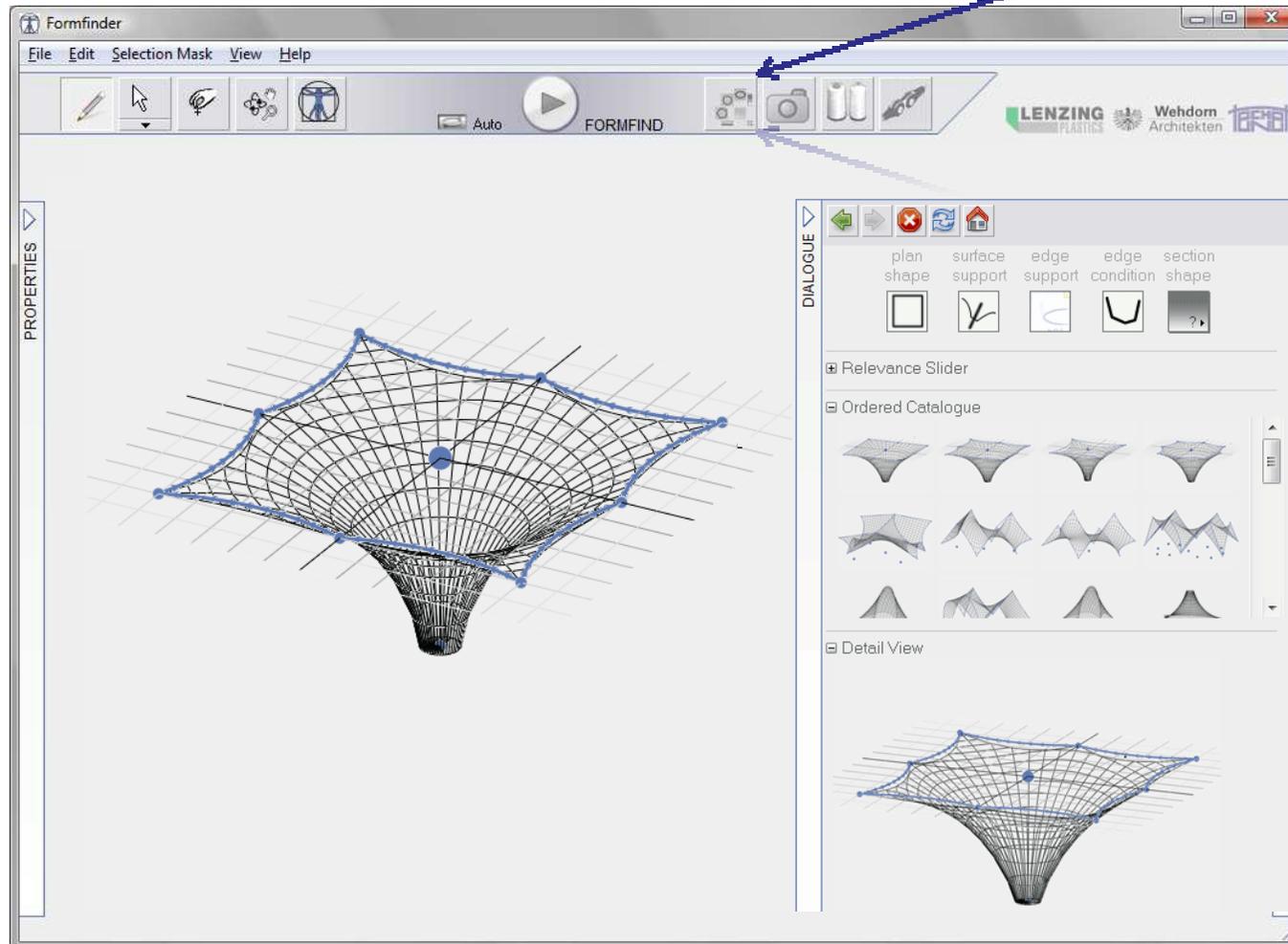
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## DATA CLASSIFICATION



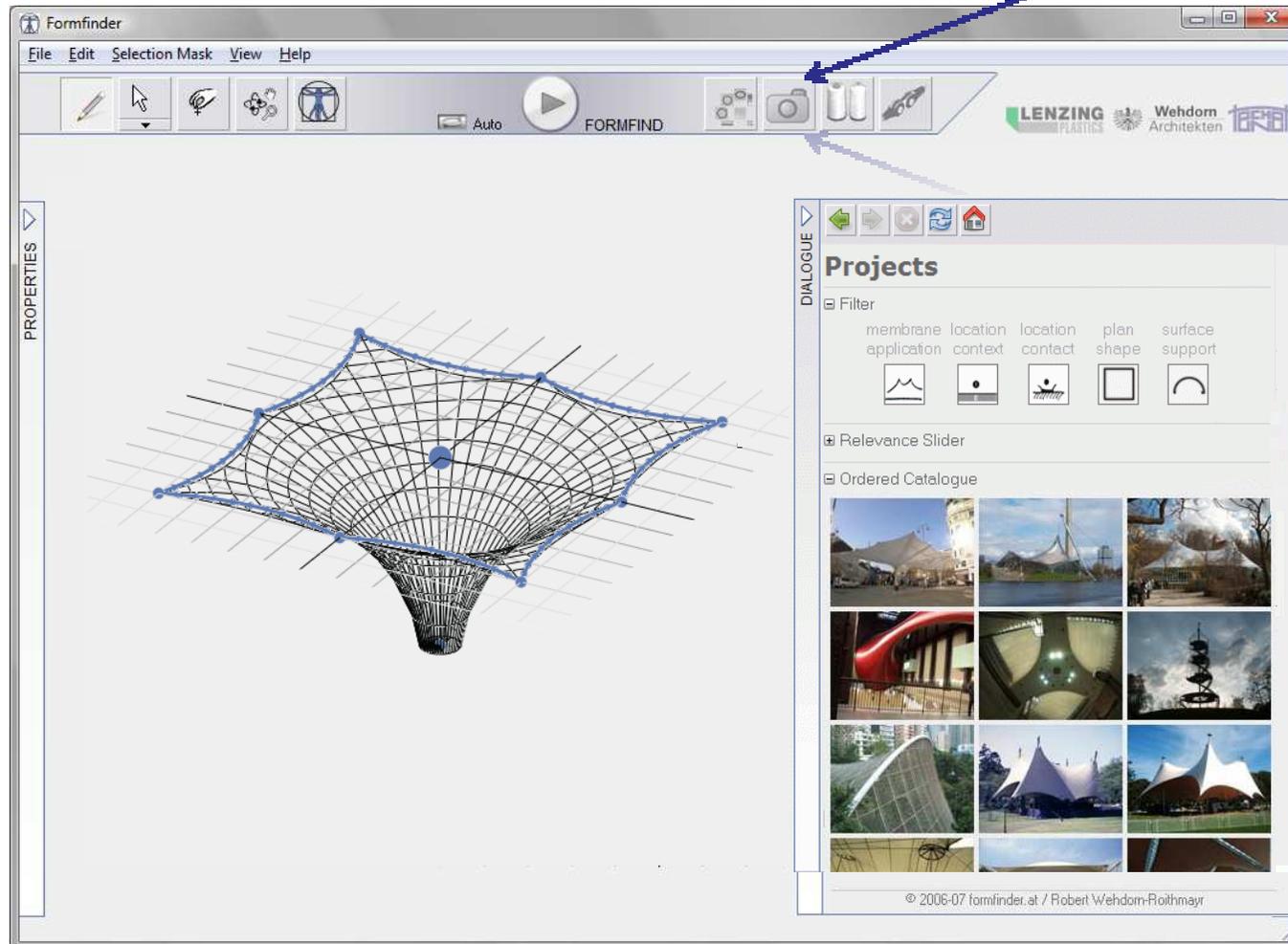
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## 1. TYPOLOGY



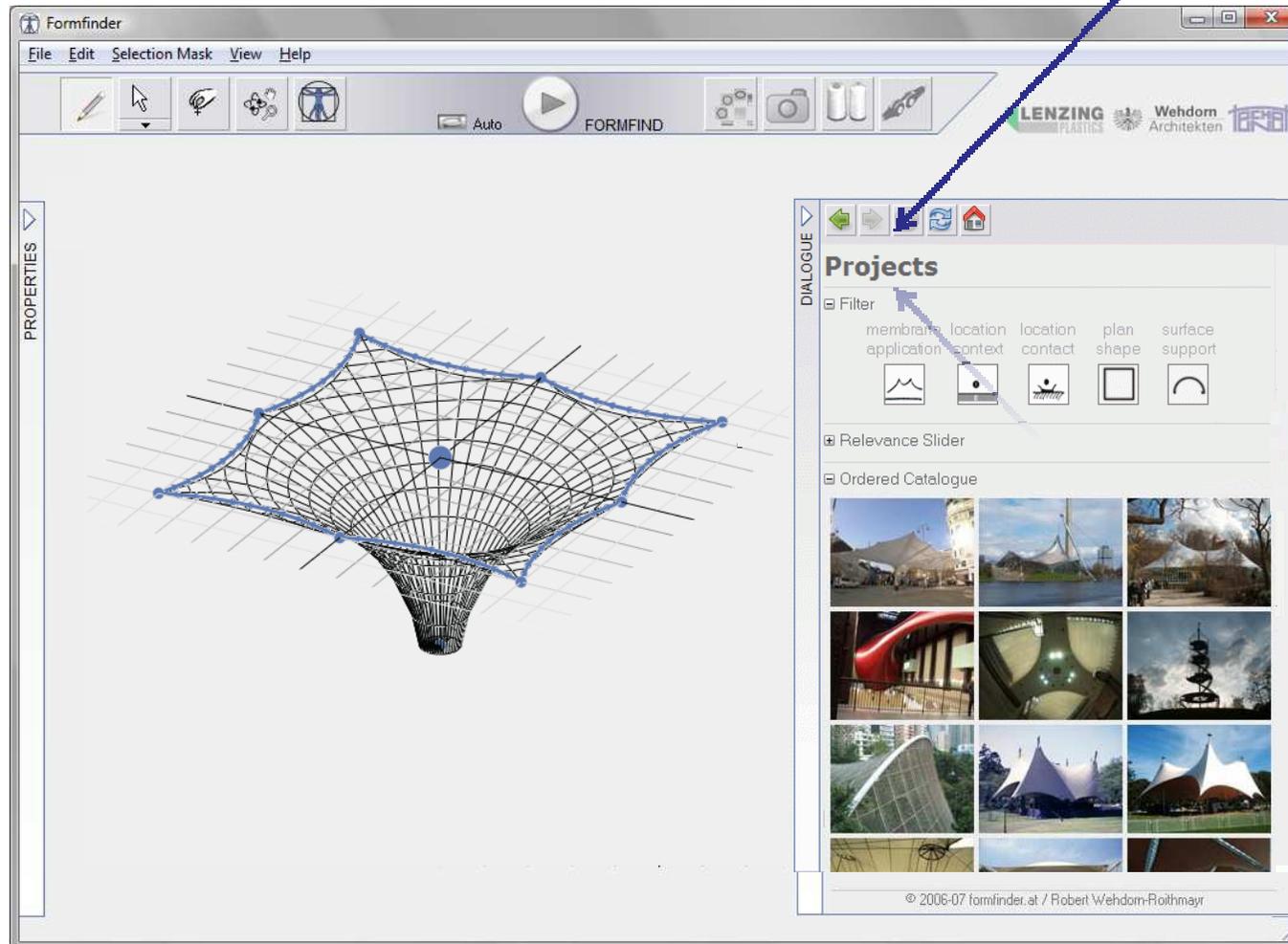
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## 2. PROJECTS



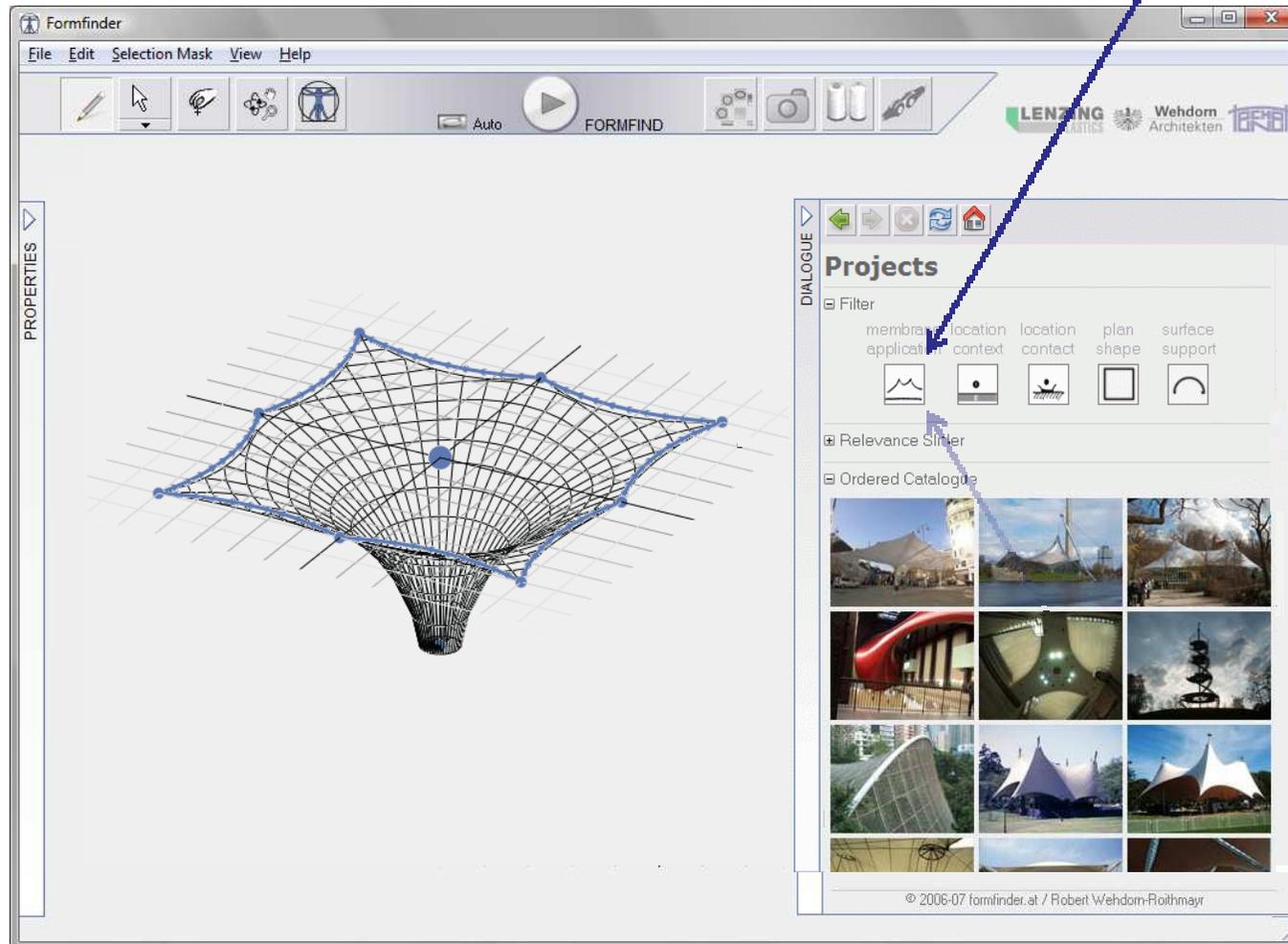
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## 2. PROJECTS

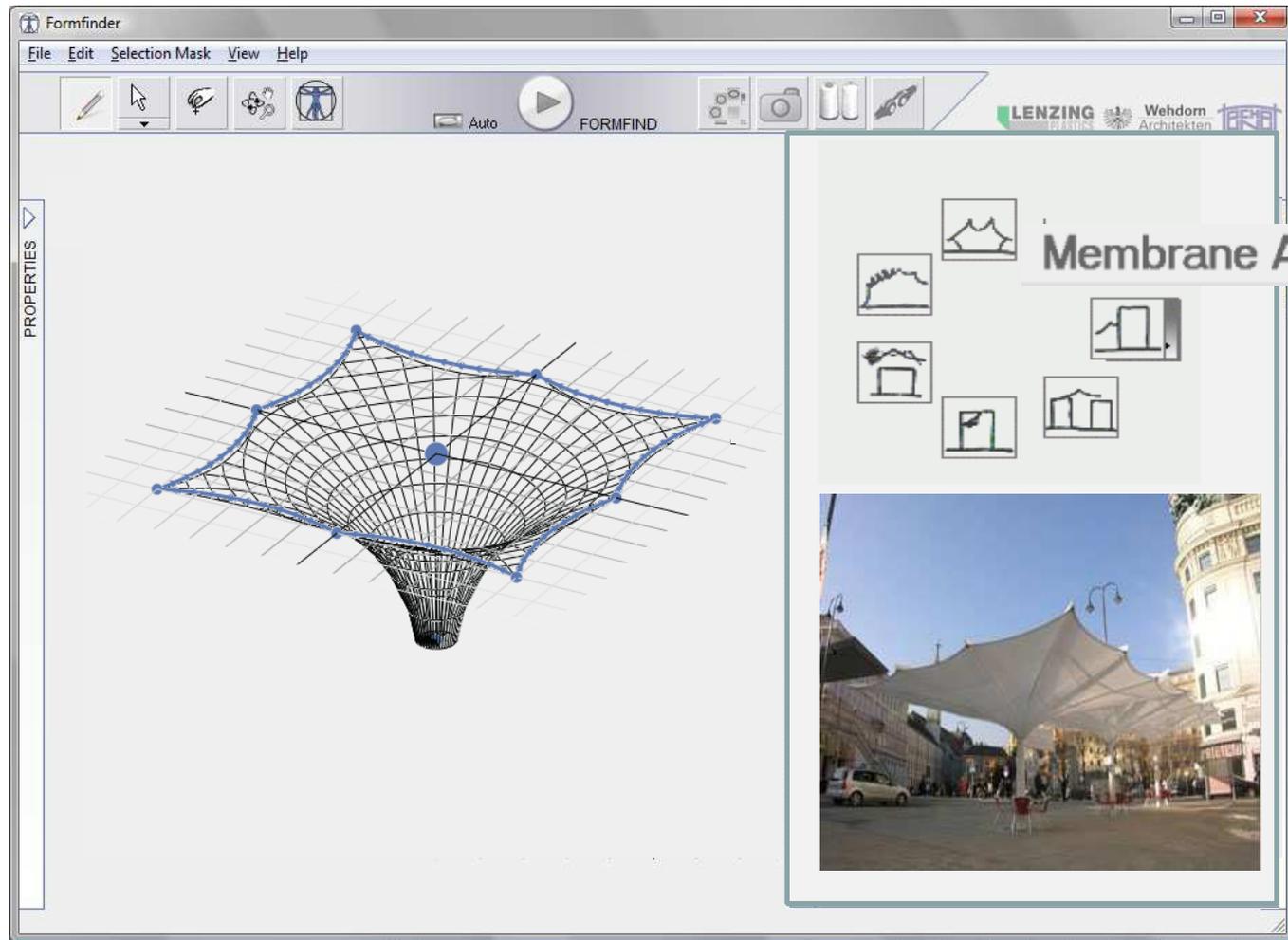


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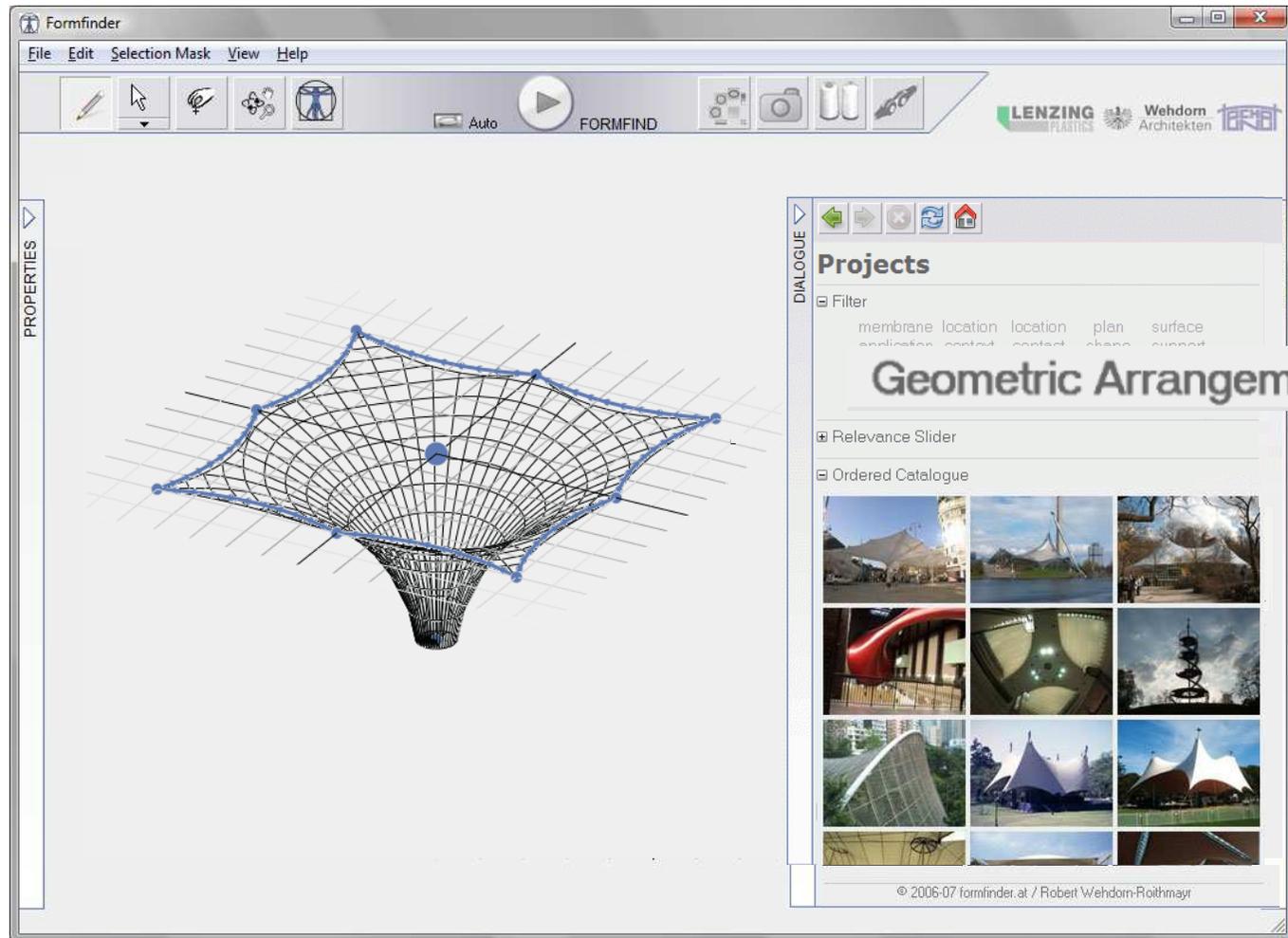
## 2. PROJECTS



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# formfinder



formfinder

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PALMA AQUARIUM

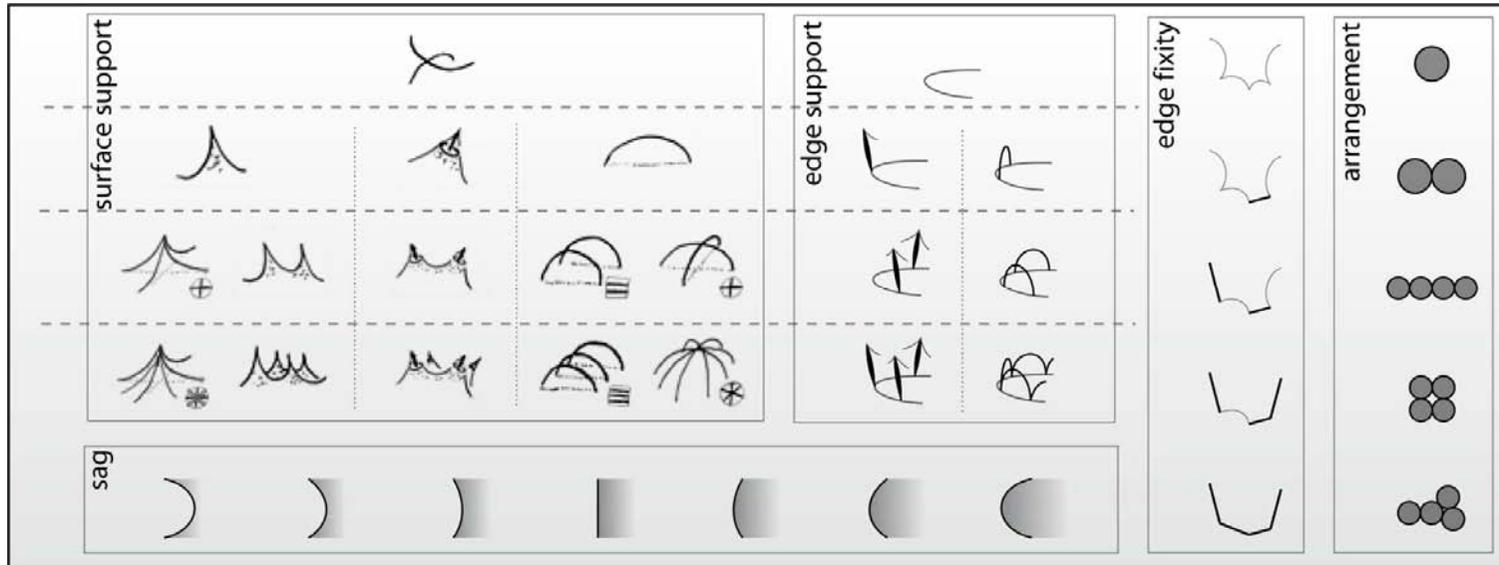
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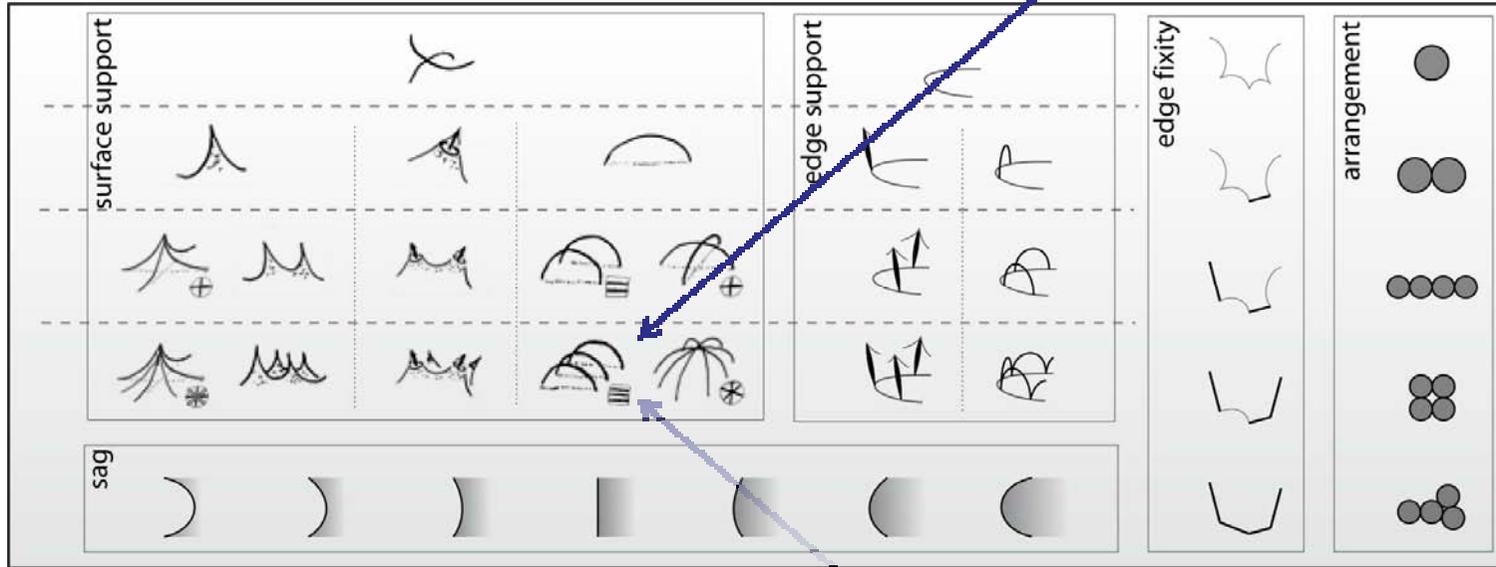


# formfinder

## Geometric Arrangement



# formfinder



# formfinder



surface support			
edge support			
edge fixity			
sag			
arrangement			

# formfinder



surface support							
edge support							
sag							
	edge fixity						
	arrangement						



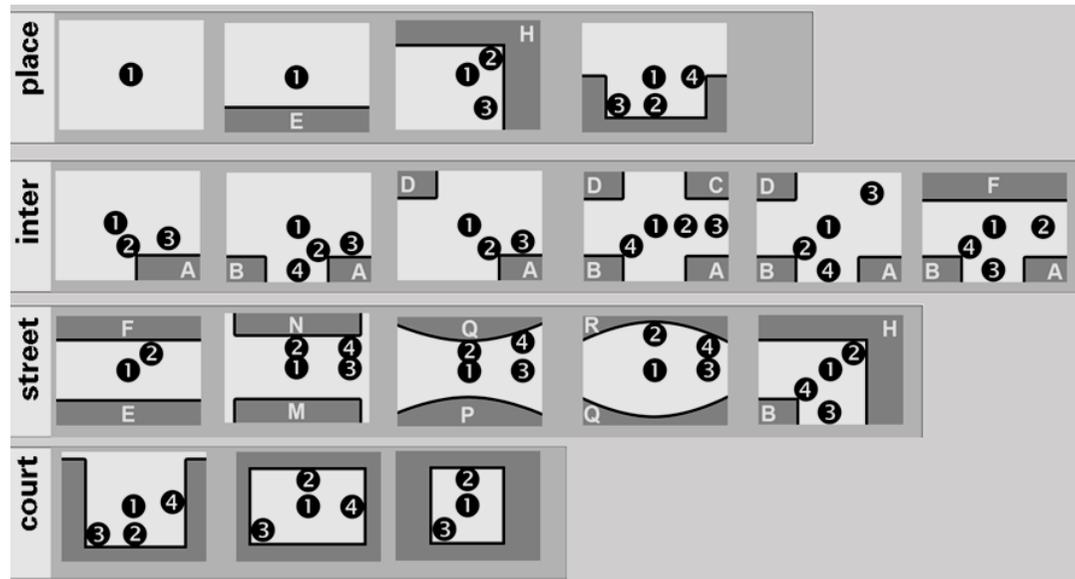
# formfinder



surface support			
edge support			
sag			
edge fixity			
arrangement			

# formfinder

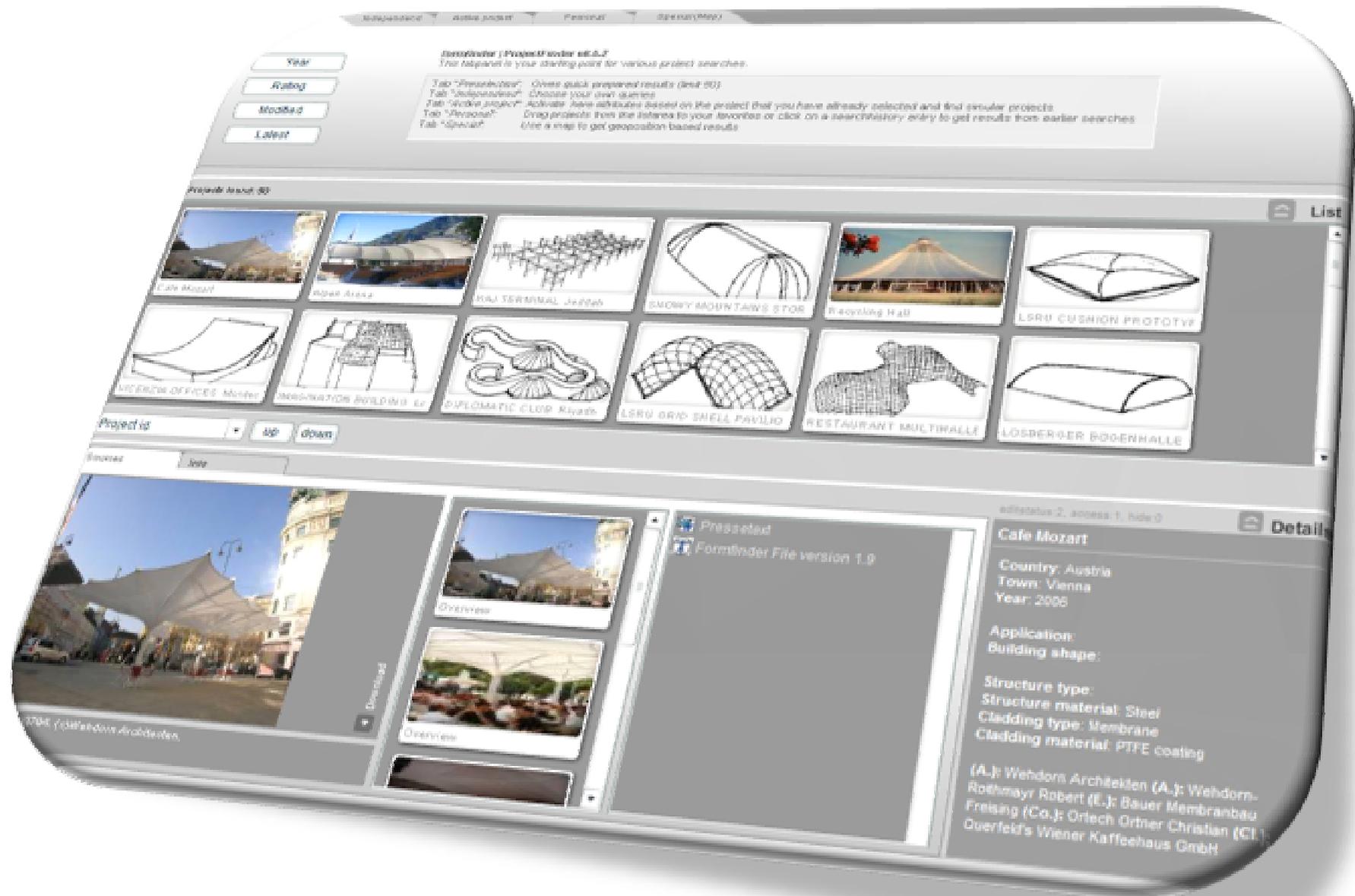
## Location Context



## Structural Element Contact



# formfinder

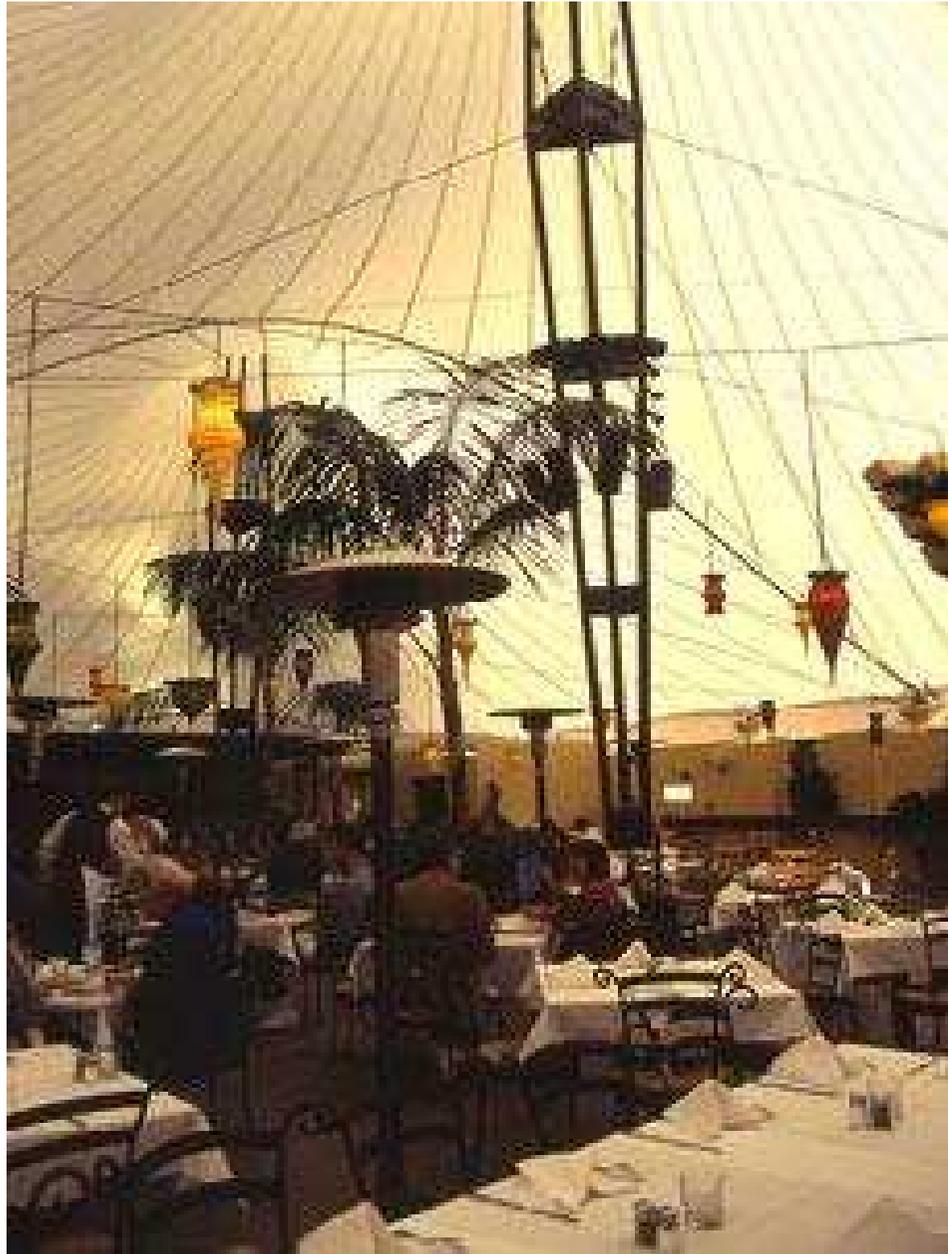


formfinder

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# formfinder



# formfinder



formfinder

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Thank you very much for your attention!

