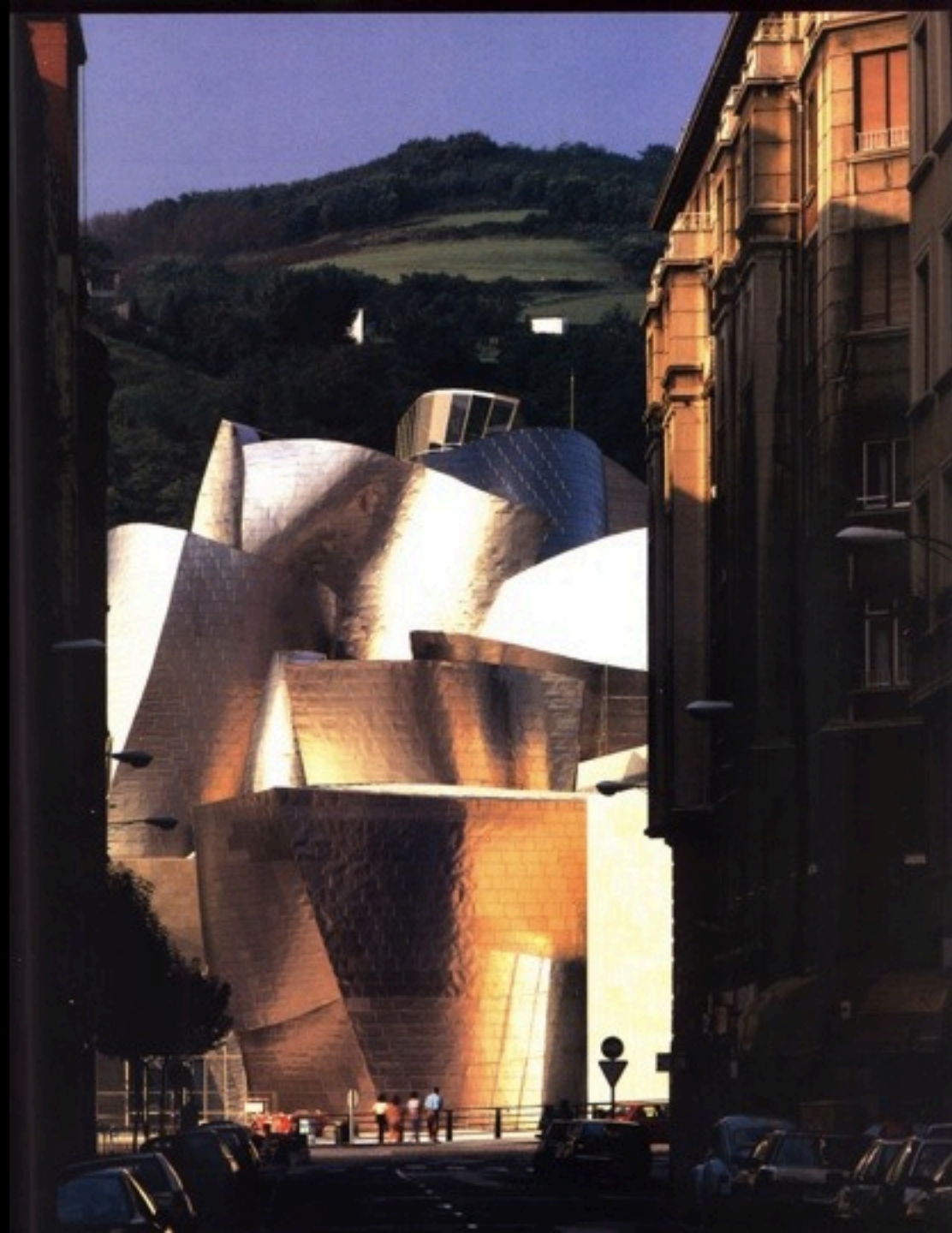
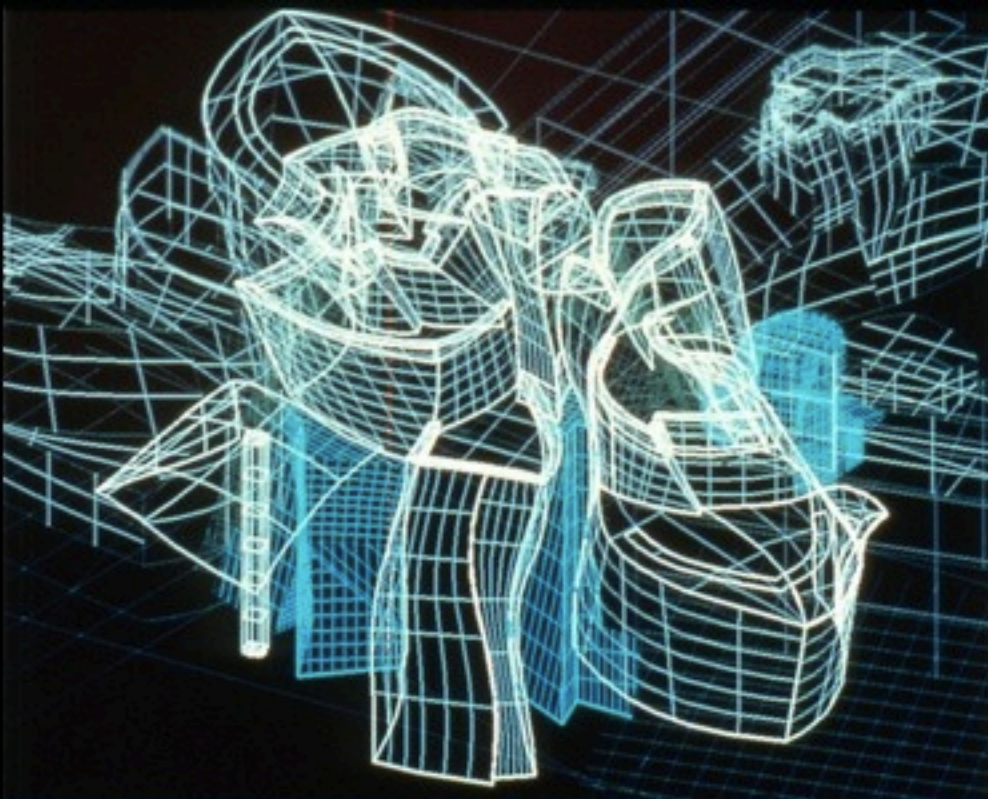


Bilbao



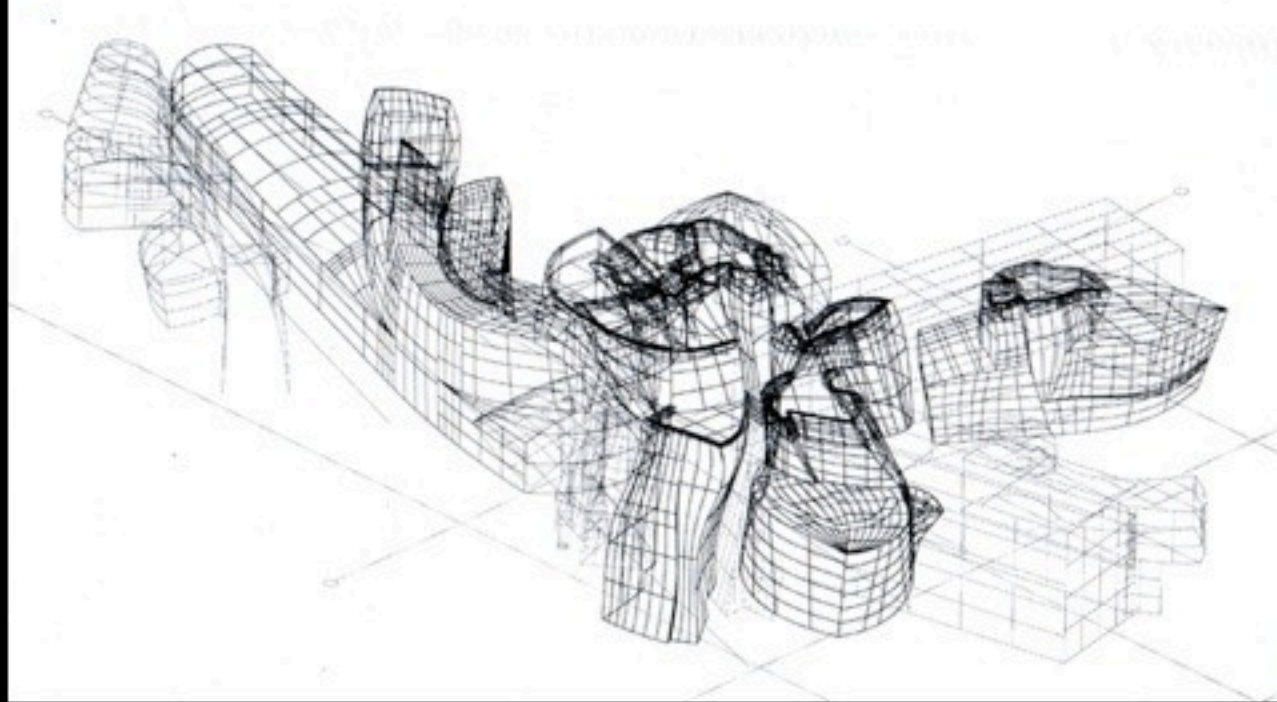




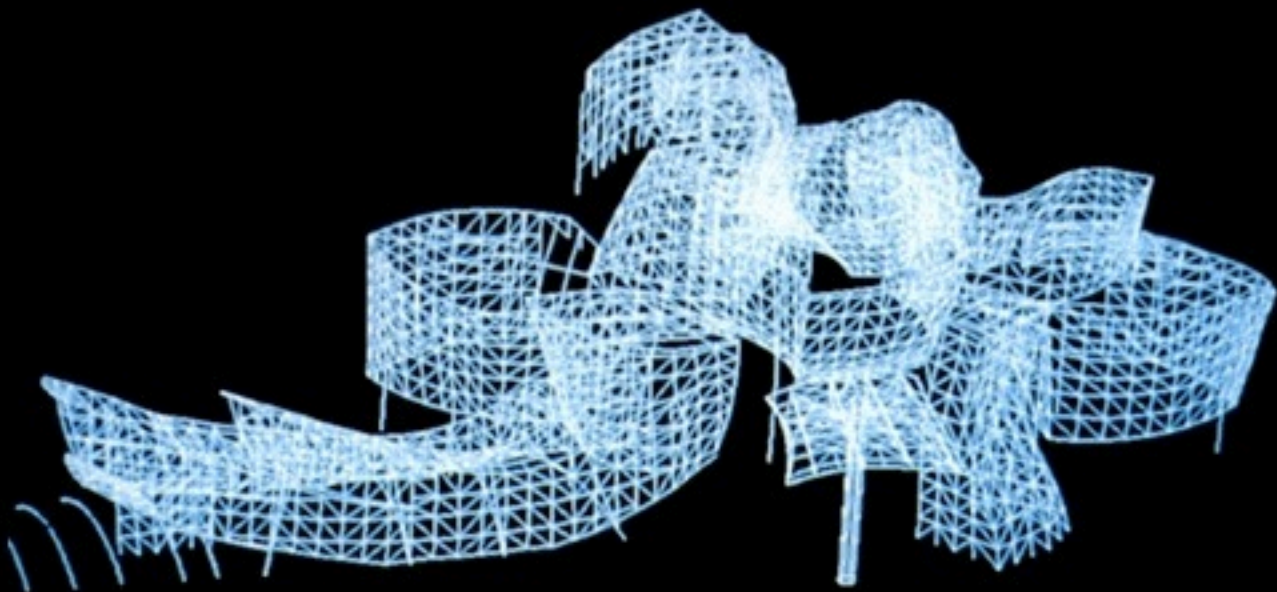
**Catia:
Master Geometry Surface Model**



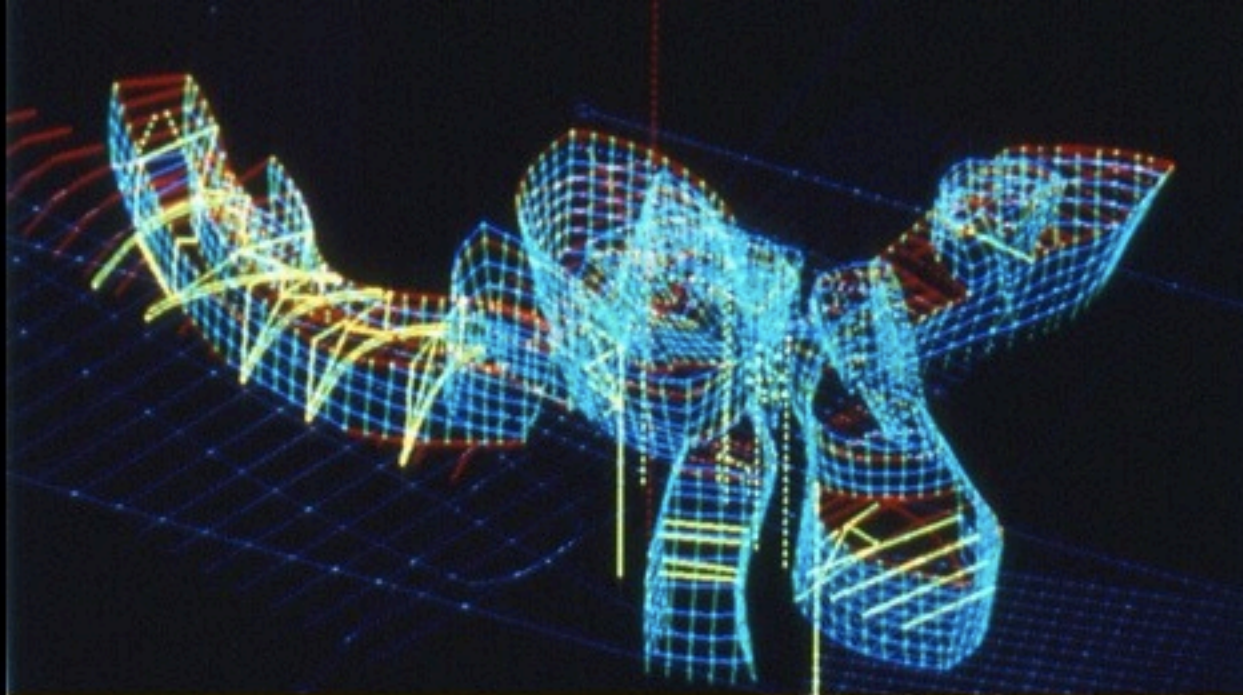
**Construction:
Face of cladding (titanium)
=
Master Geometry Surface Model**



Catia:
Master Geometry
Surface Model



Catia:
Structural Wireframe
Model

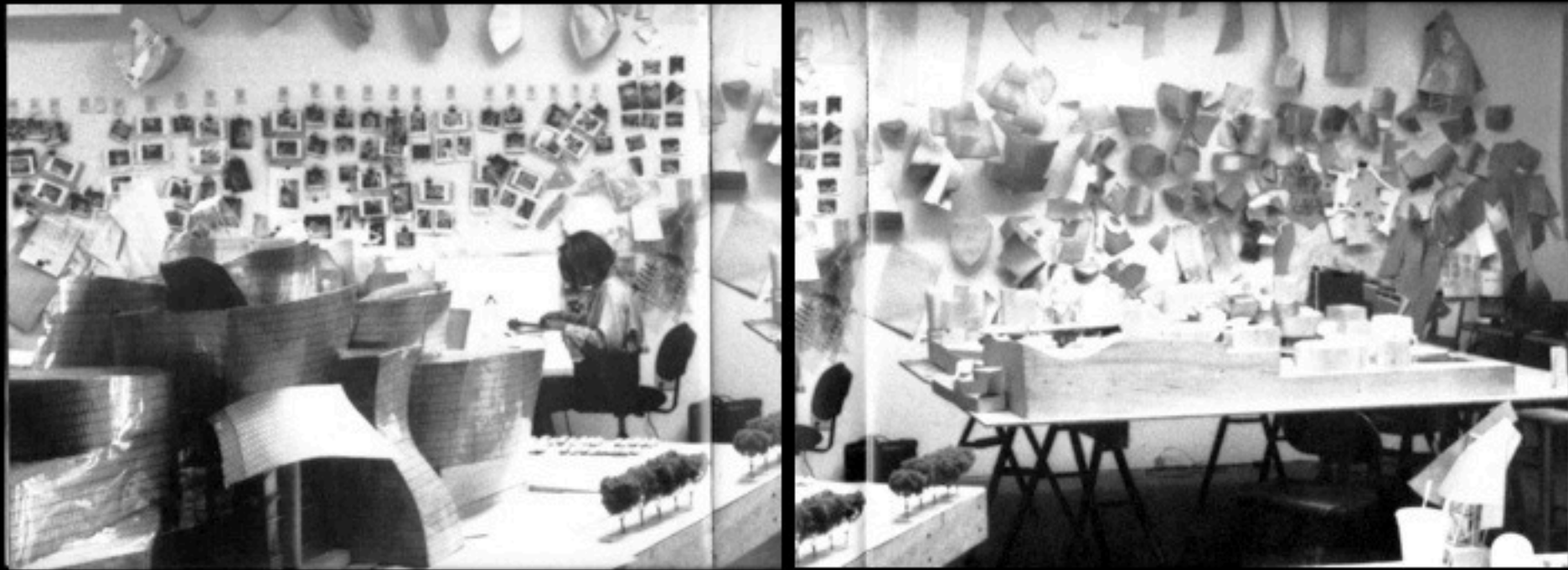


**Catia:
Structural Wireframe**

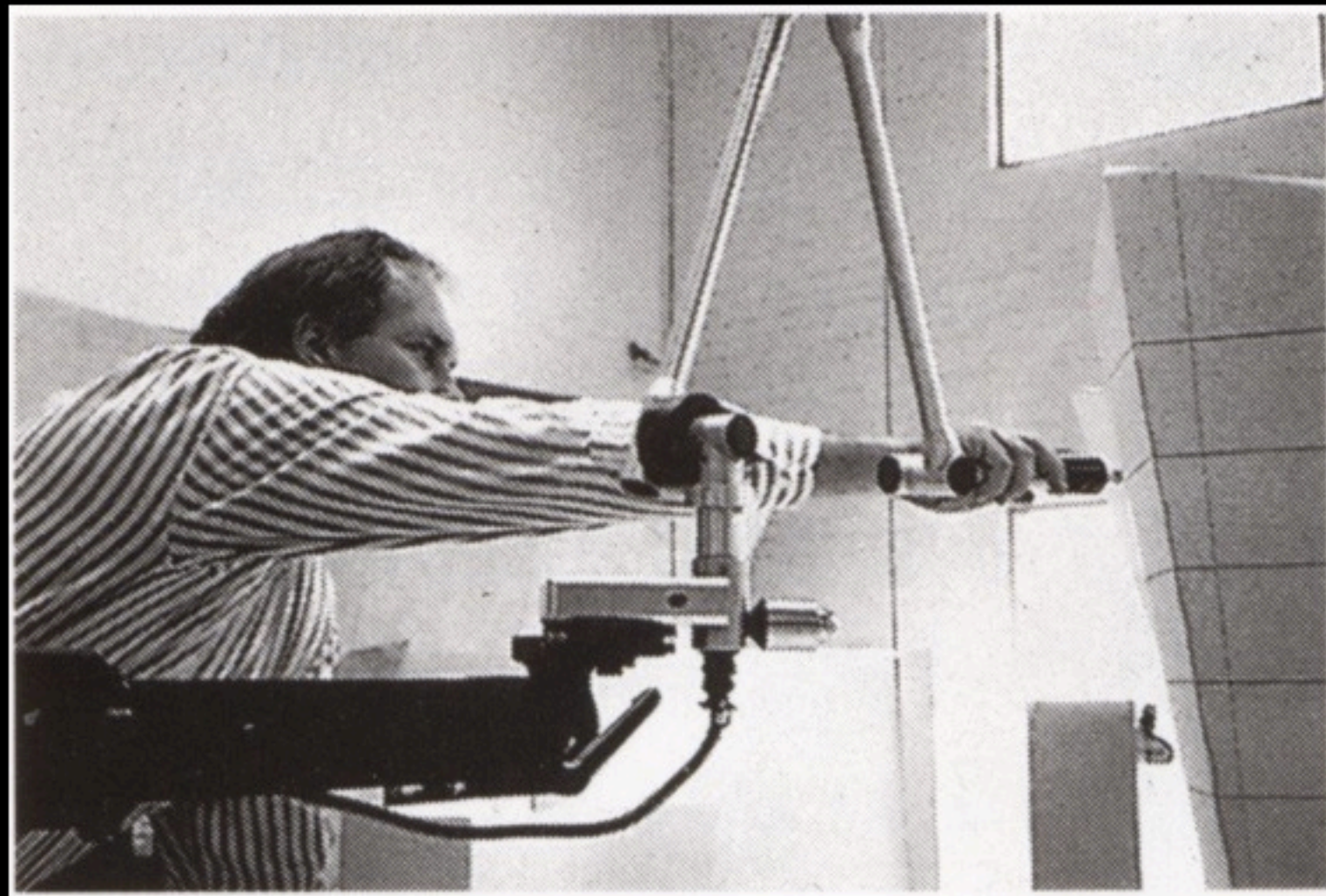


**Construction:
Steel Frame &
Masonry Back-Up
System**

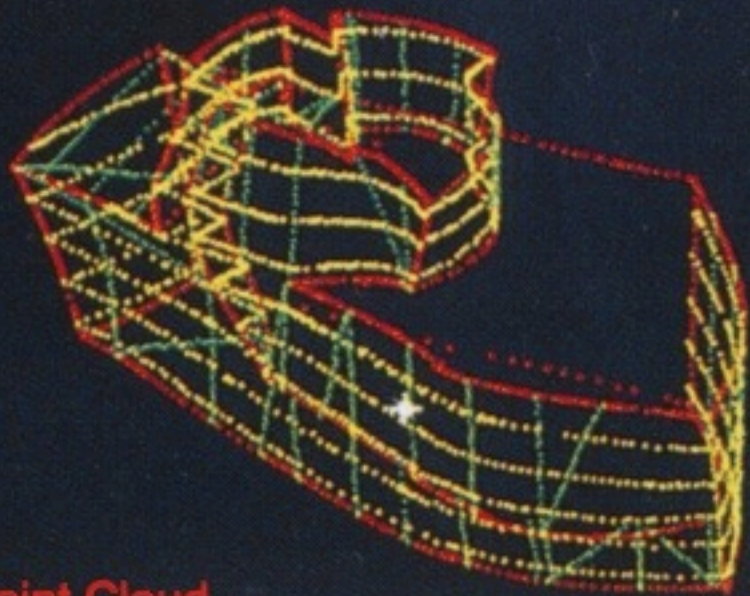
Panorámica desde Oficinas del Consorcio Guggenheim Bilbao.



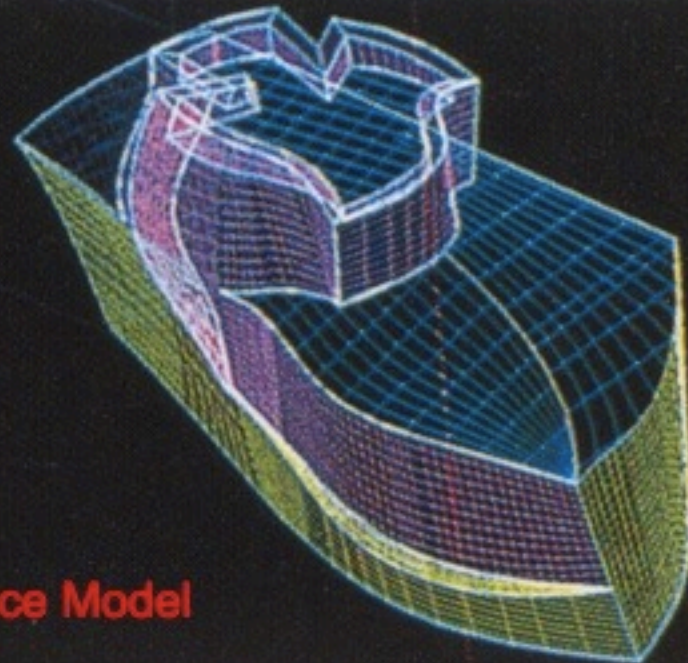
Design Models: Documenting the Evolution of the Design Process



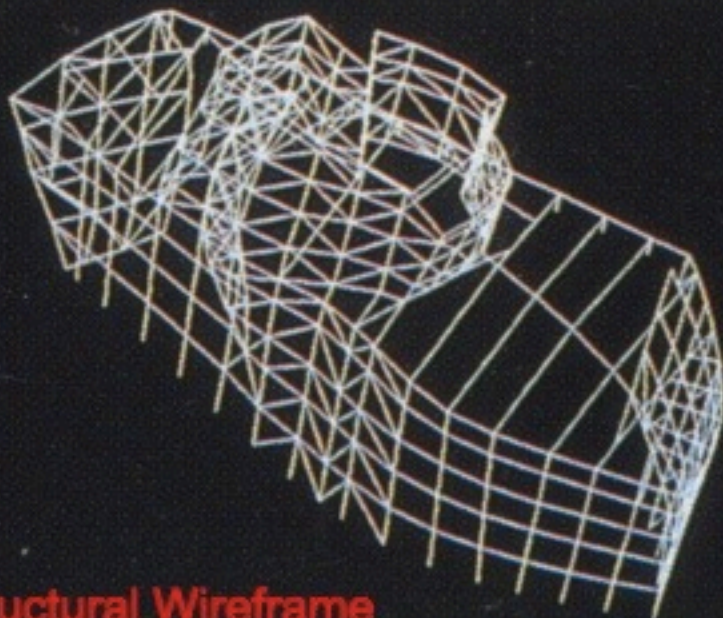
Digitizing the Physical Model



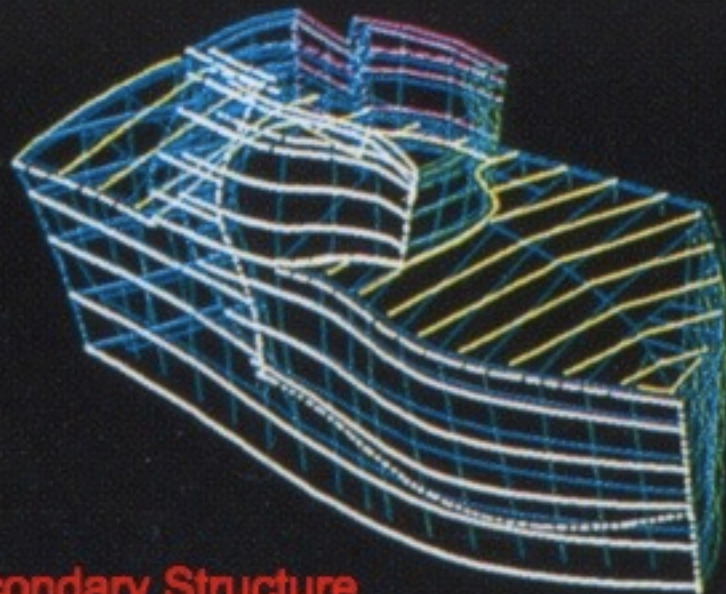
Point Cloud



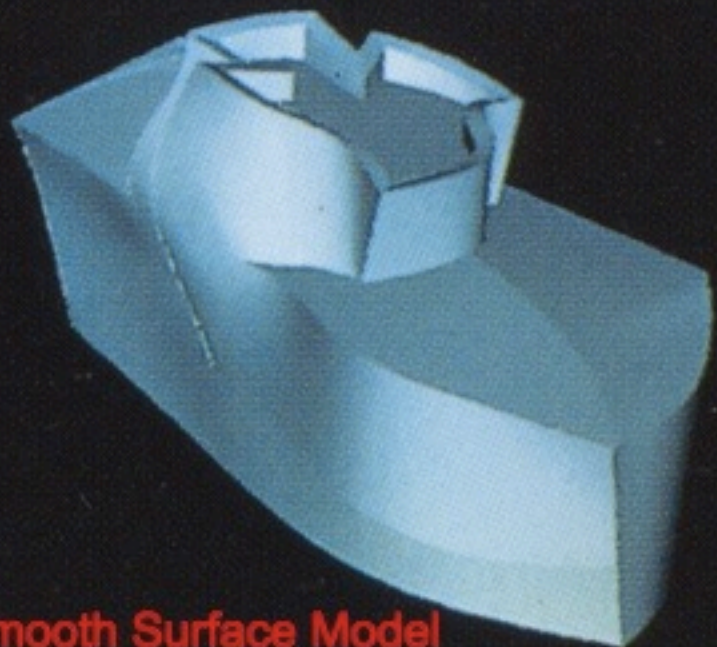
Surface Model



Structural Wireframe



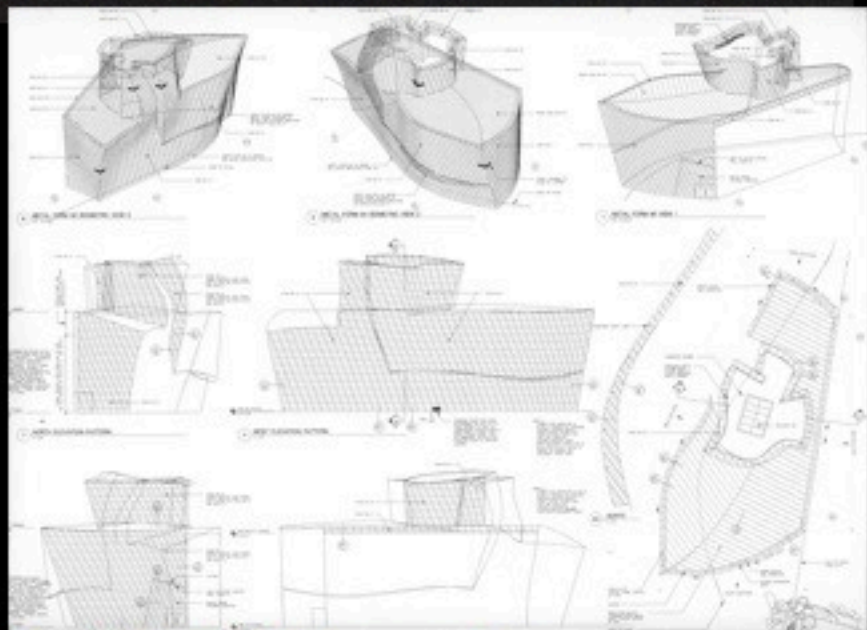
Secondary Structure



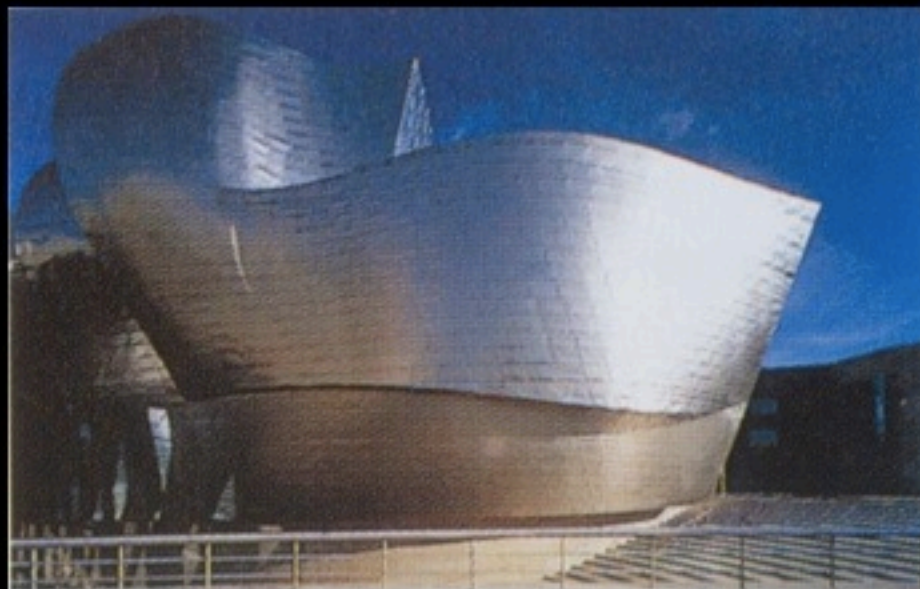
Smooth Surface Model



Verification Model



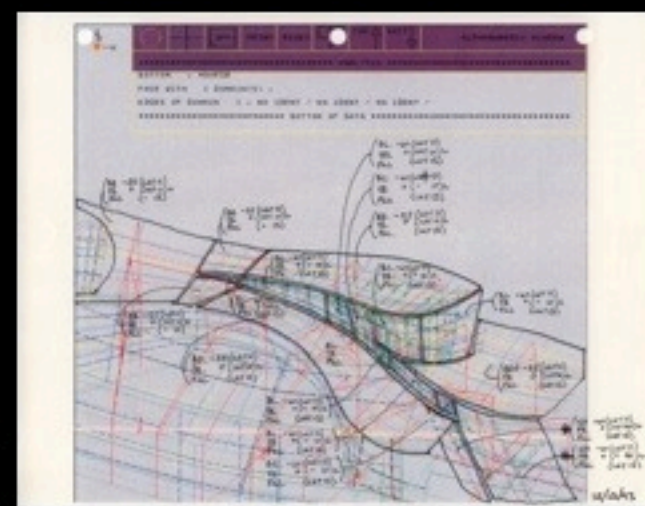
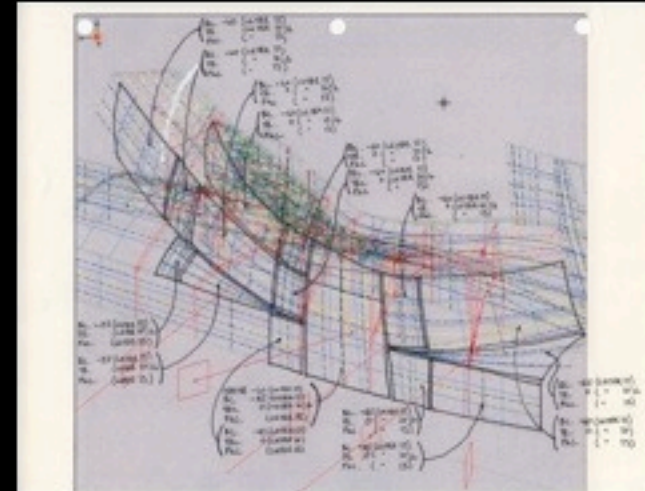
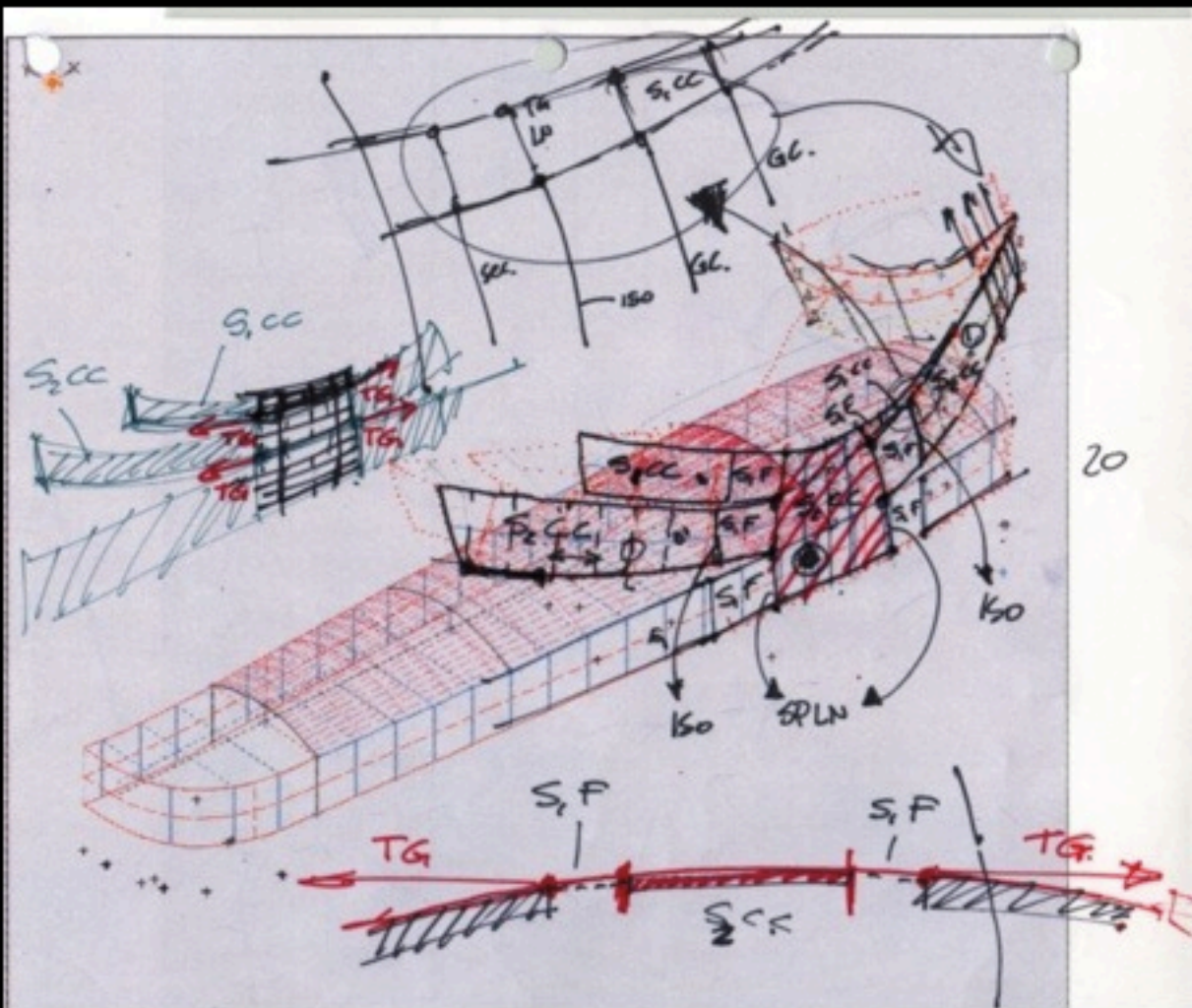
Construction Documents



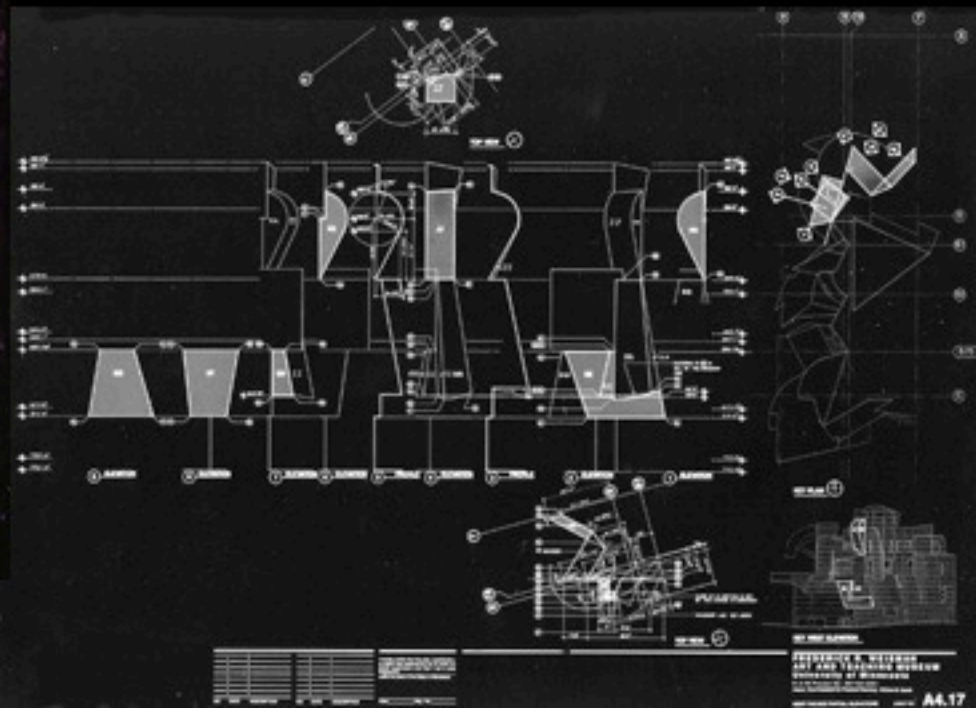
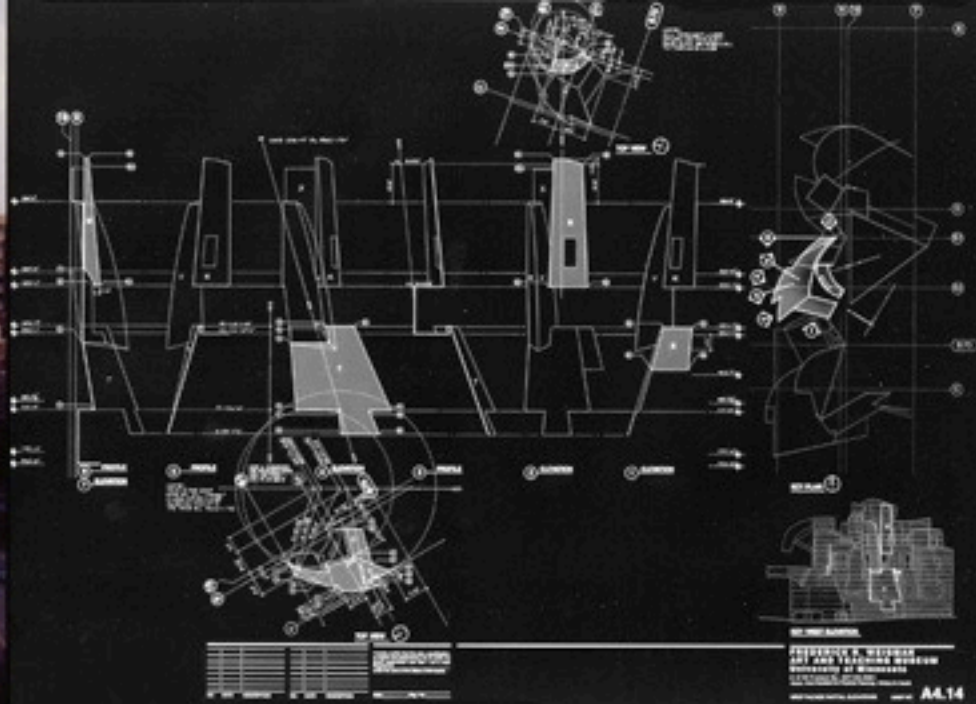
Nemo Built



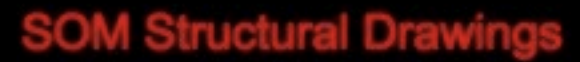
Module

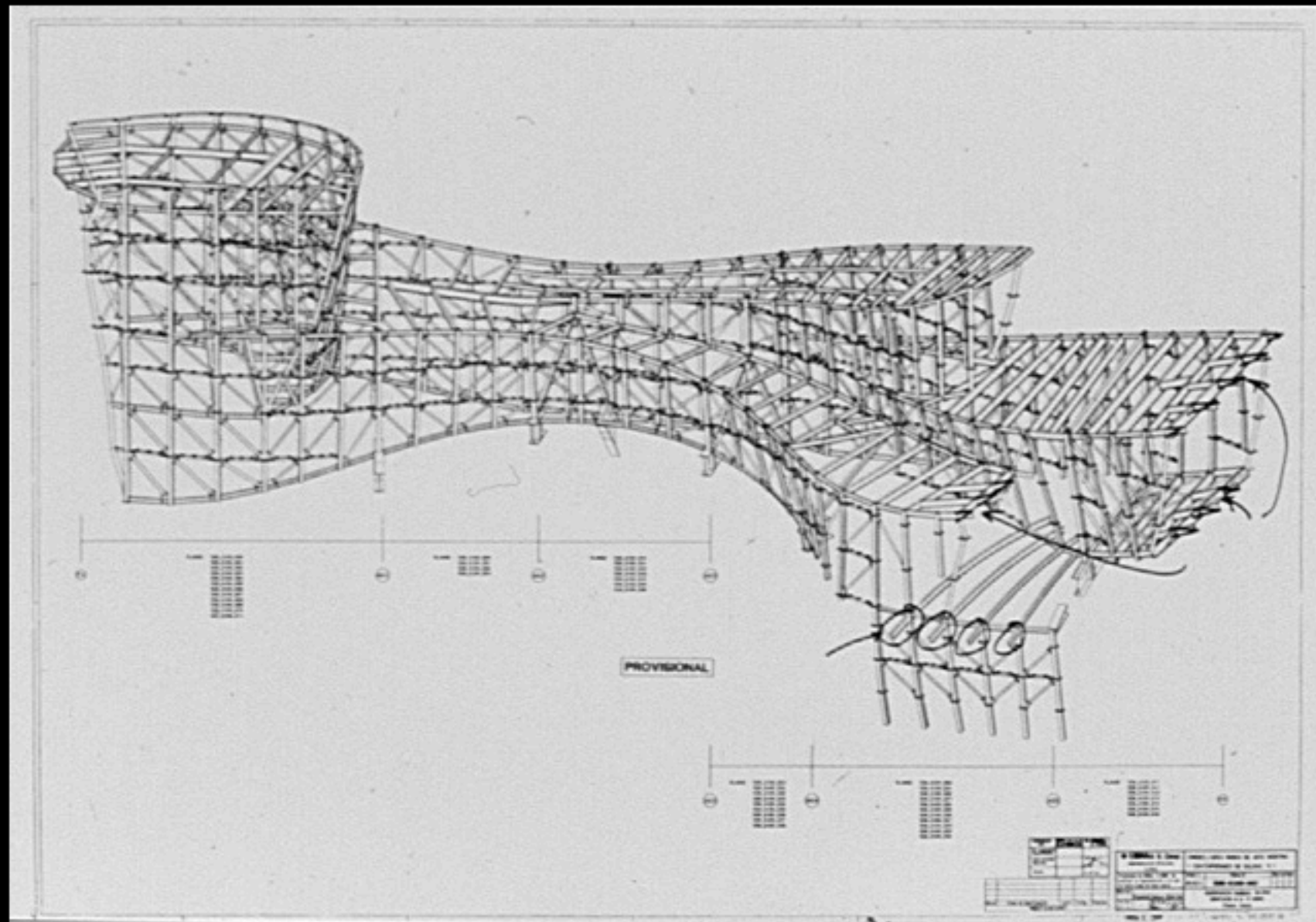


Catia Screen Dumps:
Surface Geometry Rationalization

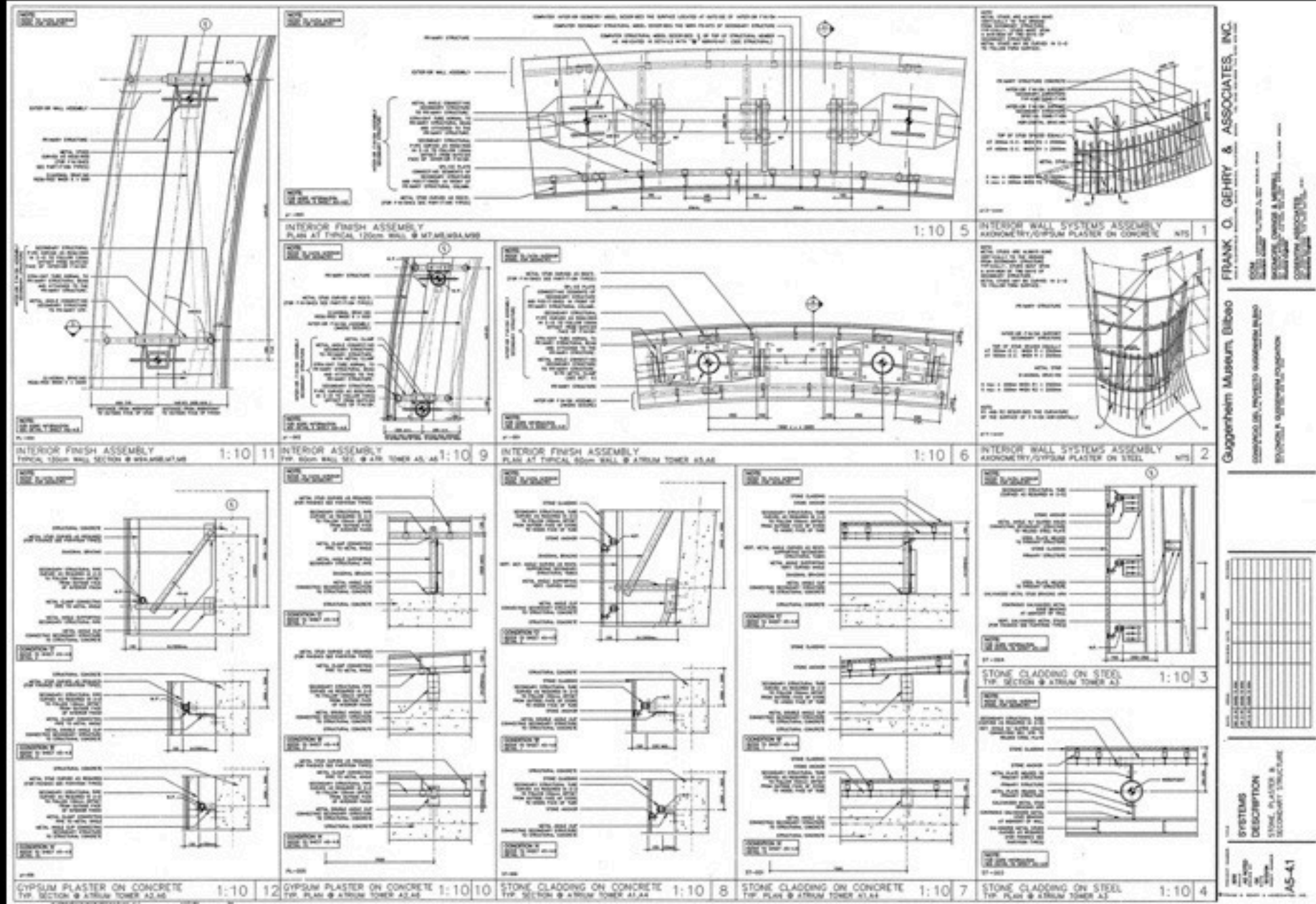


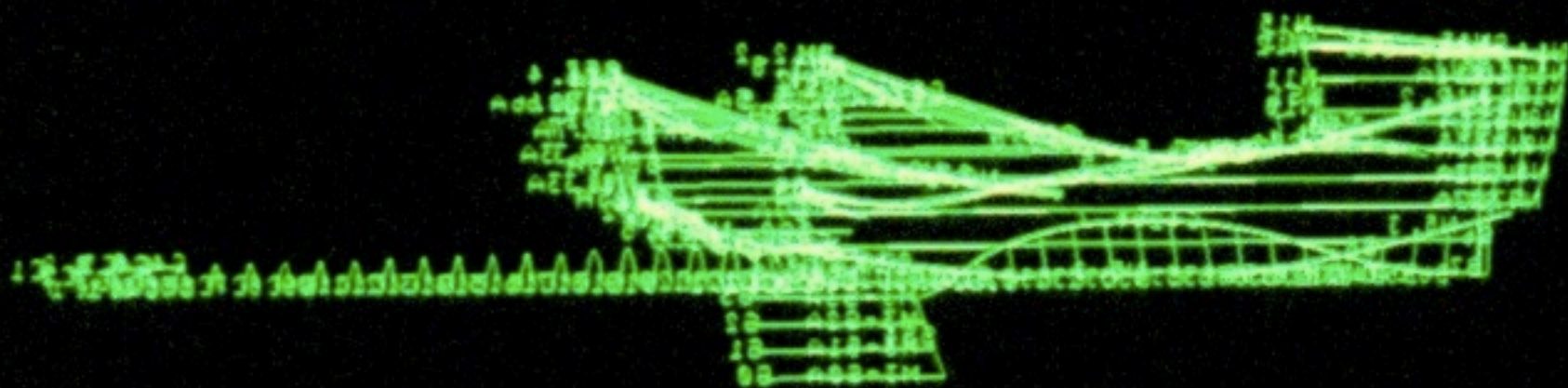
**Weisman Art Museum:
Descriptive Geometry Drawings**





T-1000 Shop Drawing





T-1000 Secondary Structure



T-1000 & Boat Skin



Colocación de chapa galvanizada en "M-5: Boot"

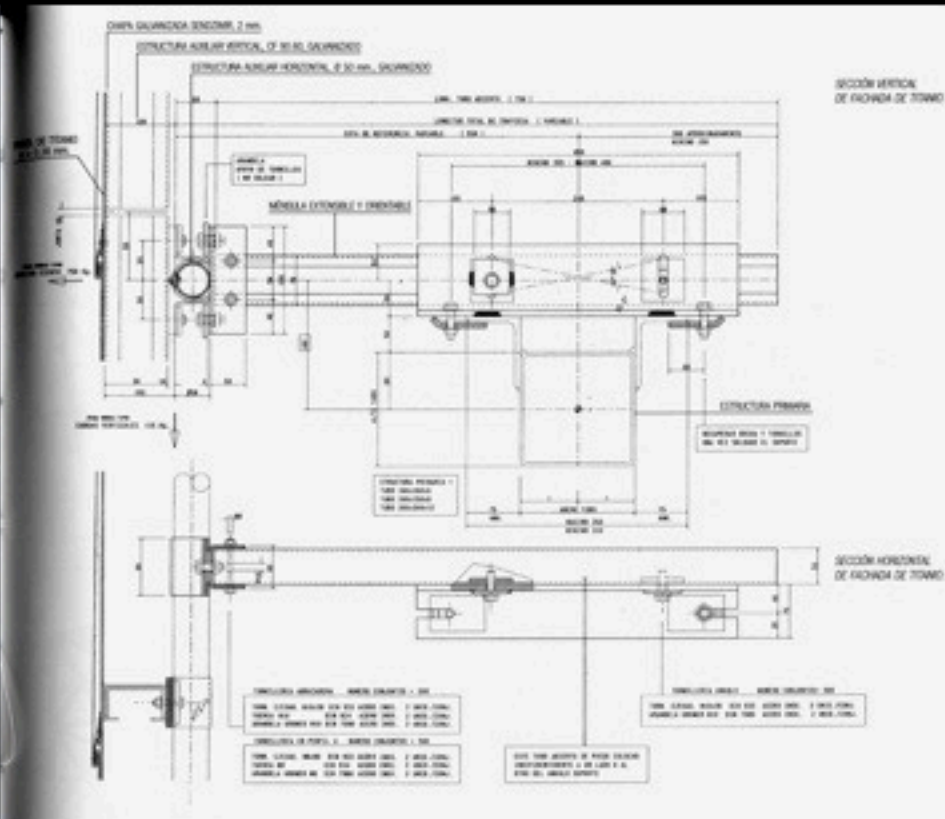
Successive Stages of Construction:

Primary Structure

Secondary Structure

Sheathing

M-Elements Enclosure Assembly System:
Primary Steel = Straight Sticks
Secondary Structure = Curved Pipes & Mtl Studs



Unistrut Adjustable Stand-off System





Montaje Envolverte de Chapa Galvanizada en el "M-3: Fish".



Vista Parcial de Obra.



Montaje Envolverte de Chapa Galvanizada en el "M-3: Fish".



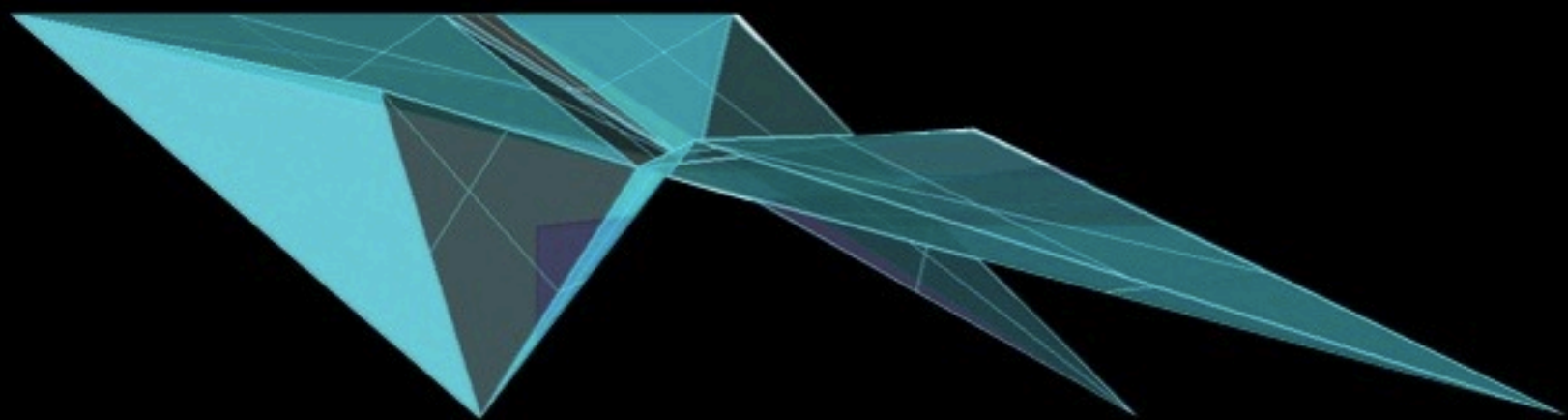
Envolverte de Chapa Galvanizada en el "M-3: T-1000".





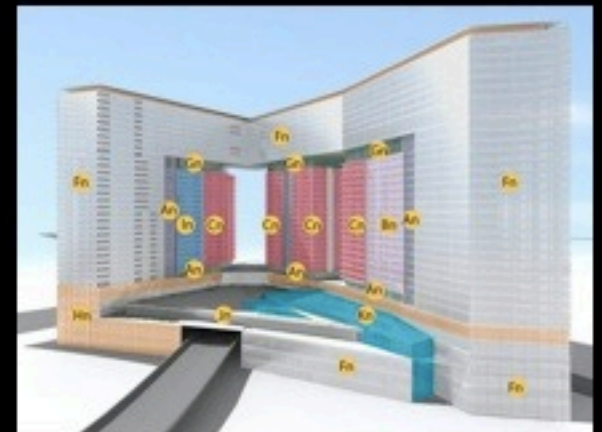
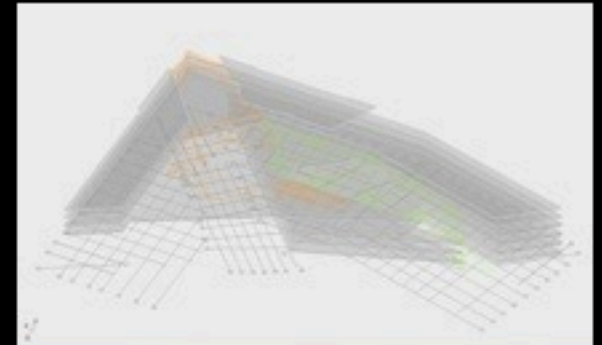


Dubai





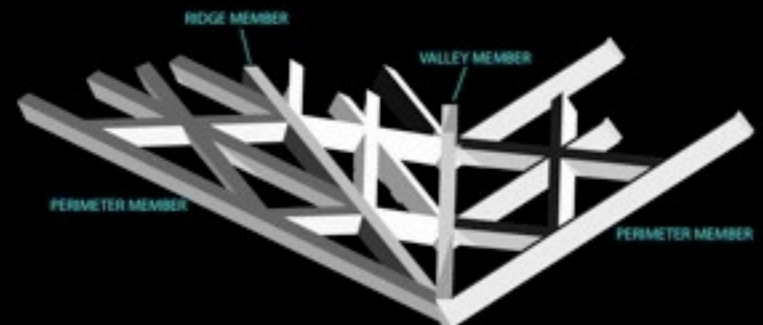
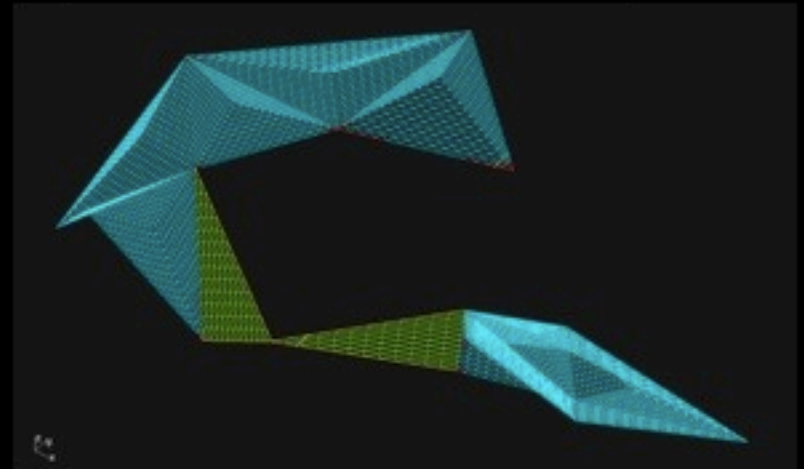
**One Zabeel: 2 Million Square Feet Mixed Use Development
Retail / Residential / Office / Hotel**

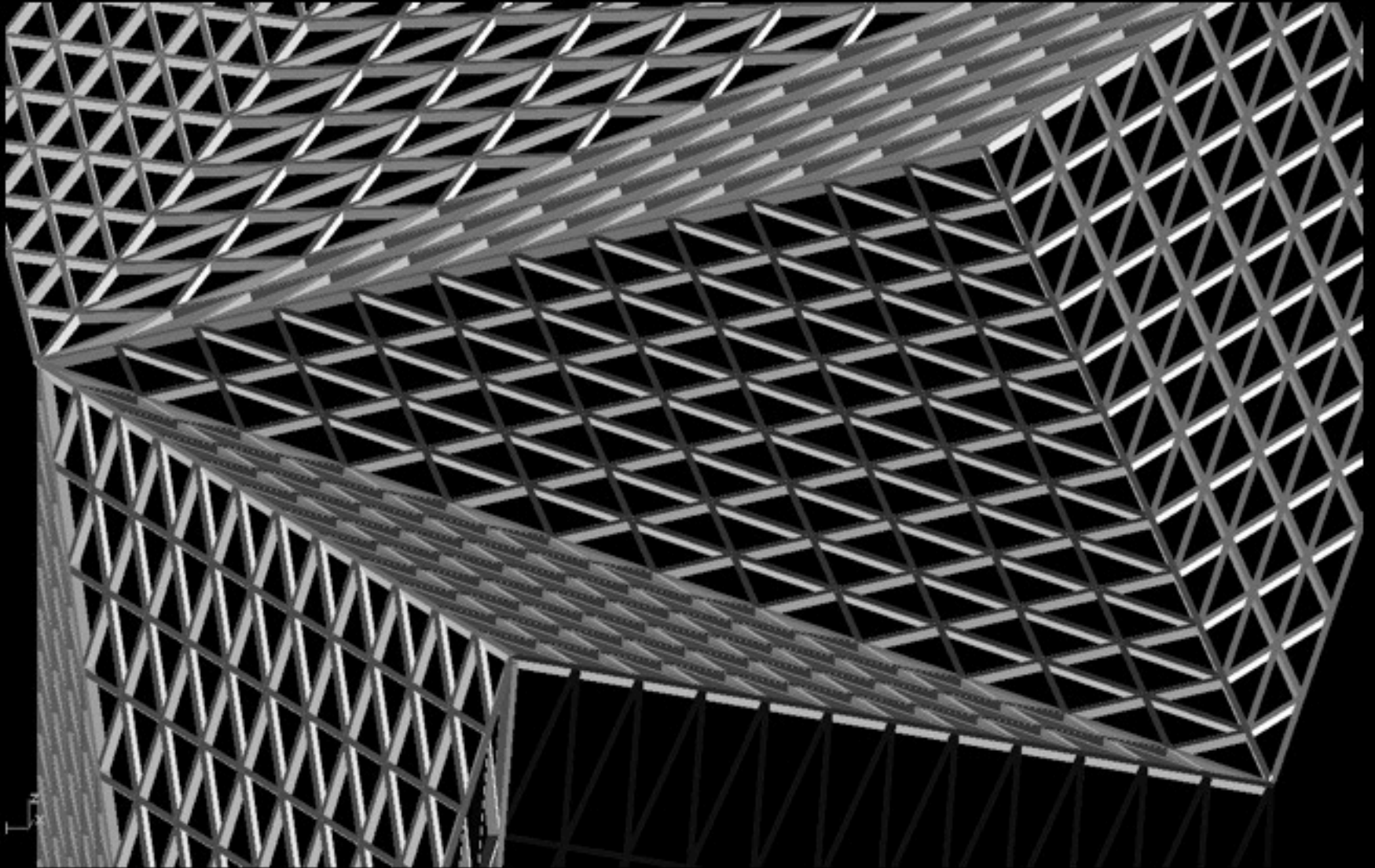


Atrium Skylight Enclosure Measuring 150ft x 900ft long (3 football fields)

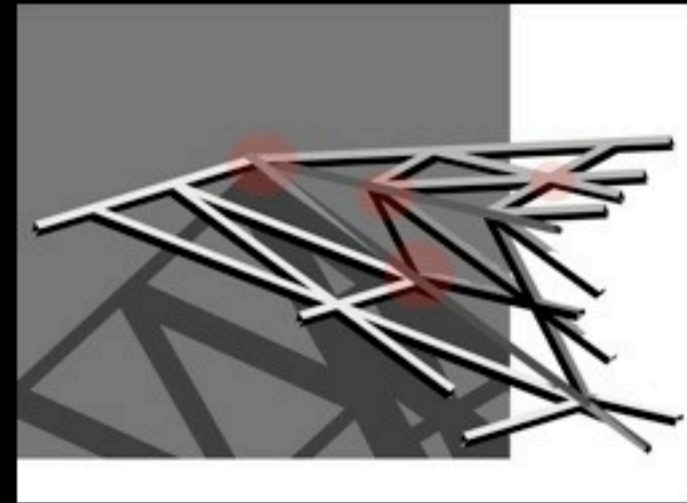
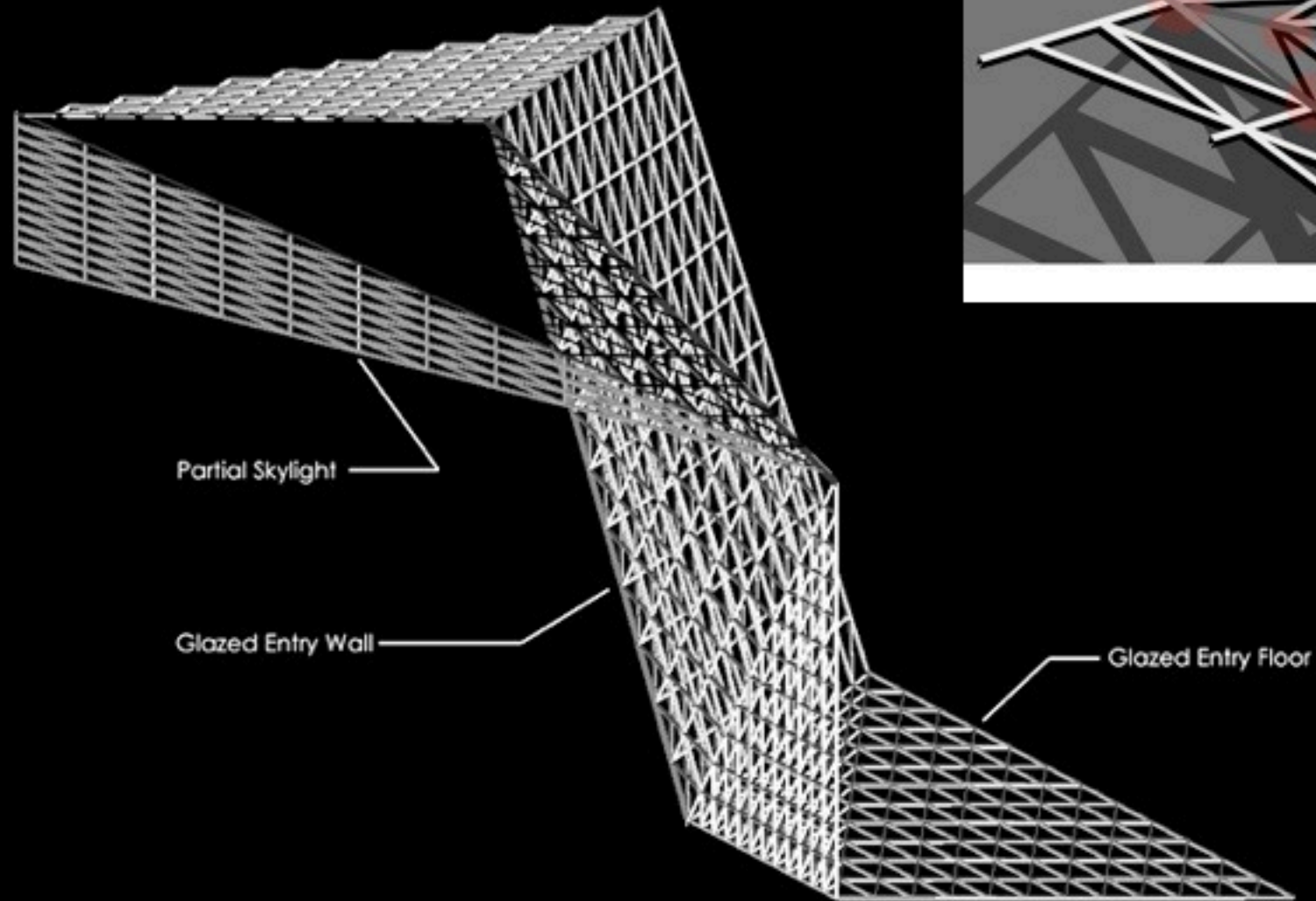
Driving Goals

1. **Transparency**
Maximize Visibility & Daylight
Eliminate Visual Clutter
2. **Geometry = Structure**
1:1 Correspondence Between
Form and Structure.
3. **Adaptable Structure**
Ability to Adapt to Various
Programmatic, Environmental &
Site Conditions

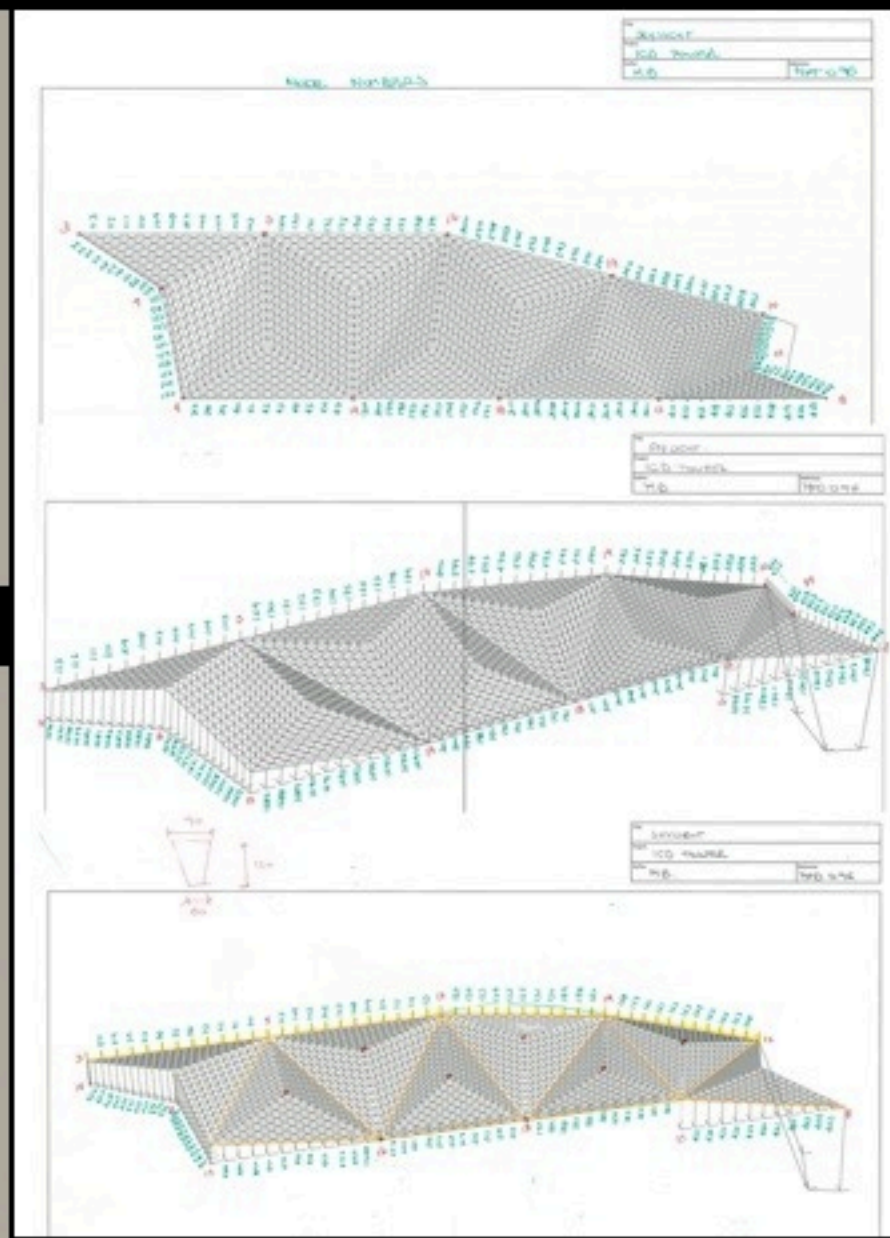
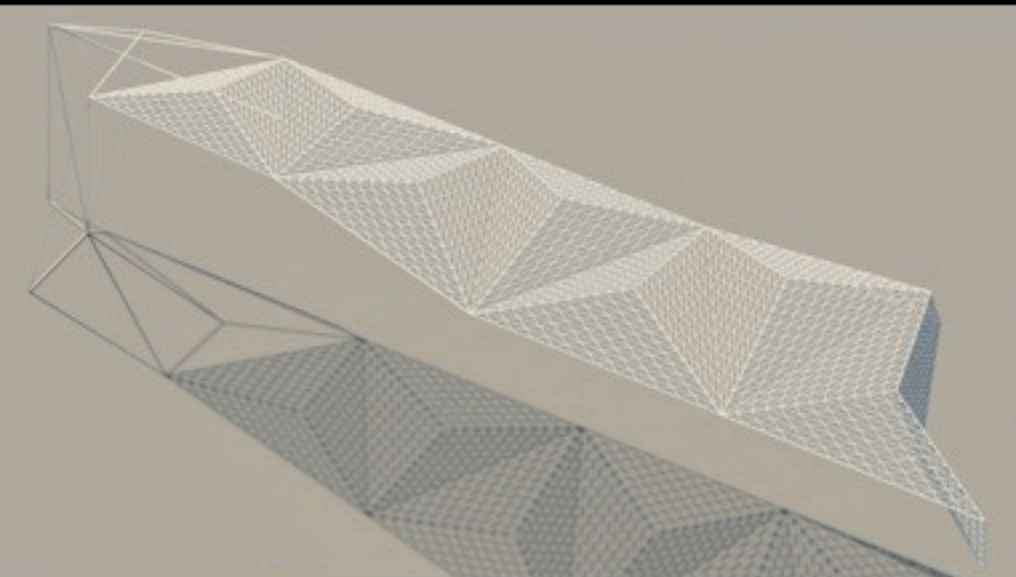
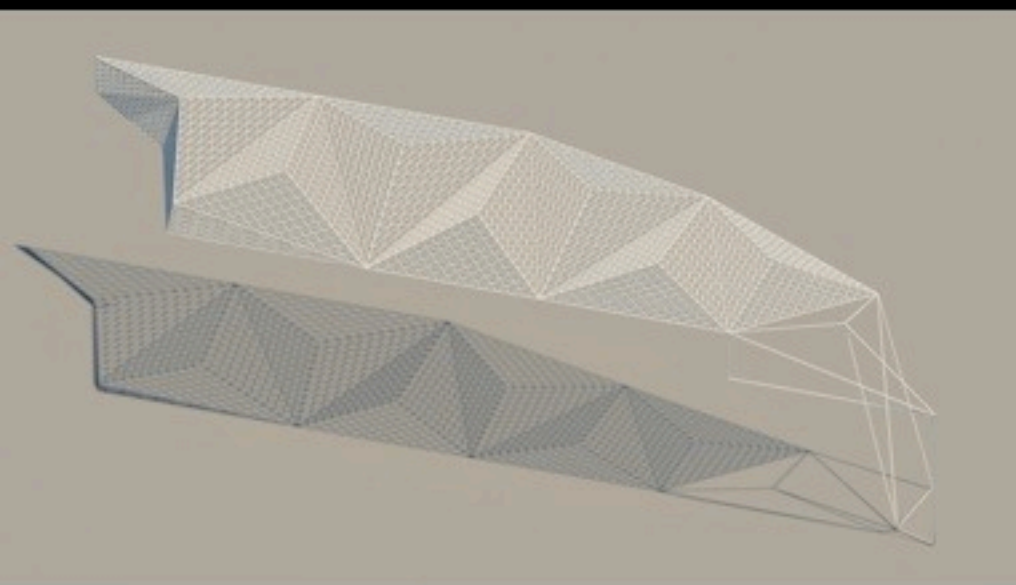




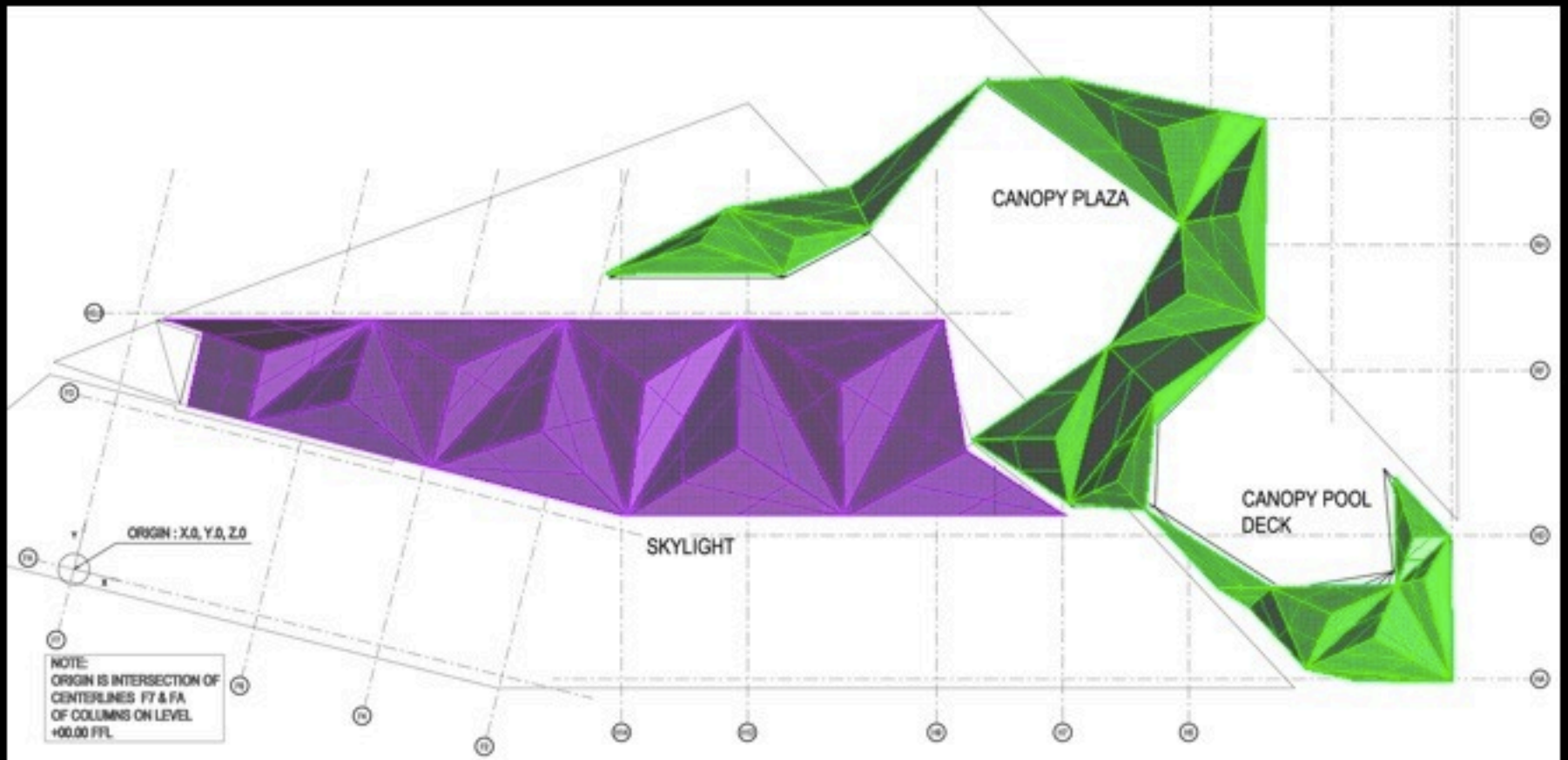
Pleating = Structure



Pleating Enabled a Logic that could mediate between Floors, Sidewalls & Skylights

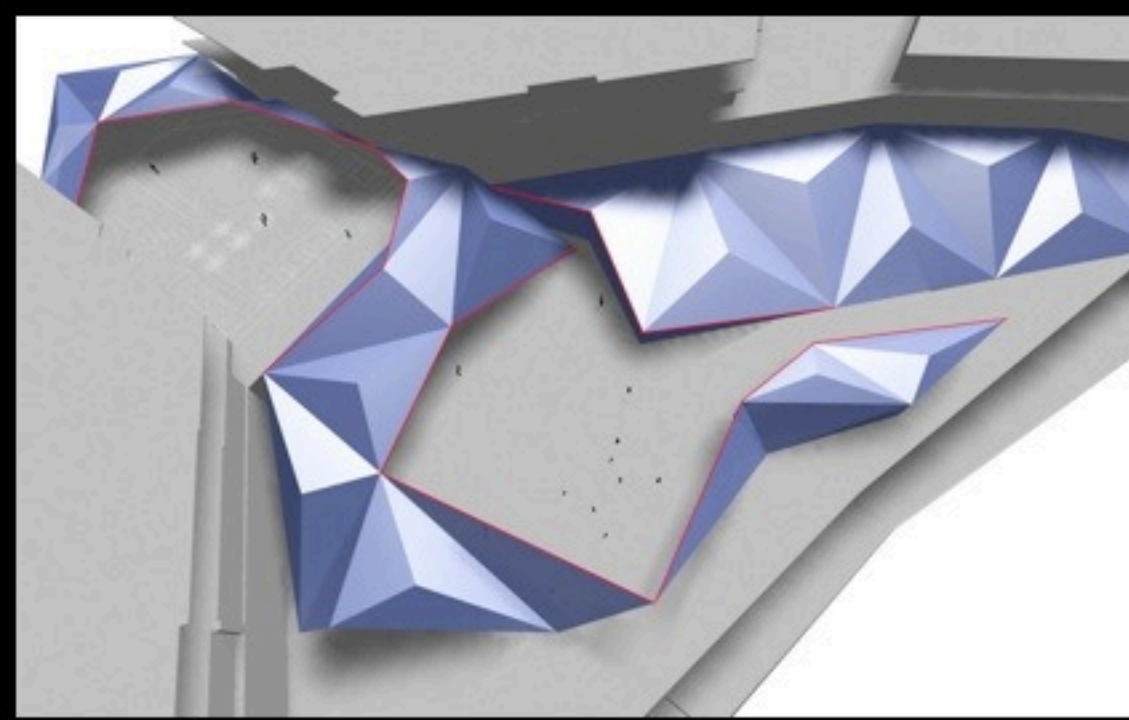
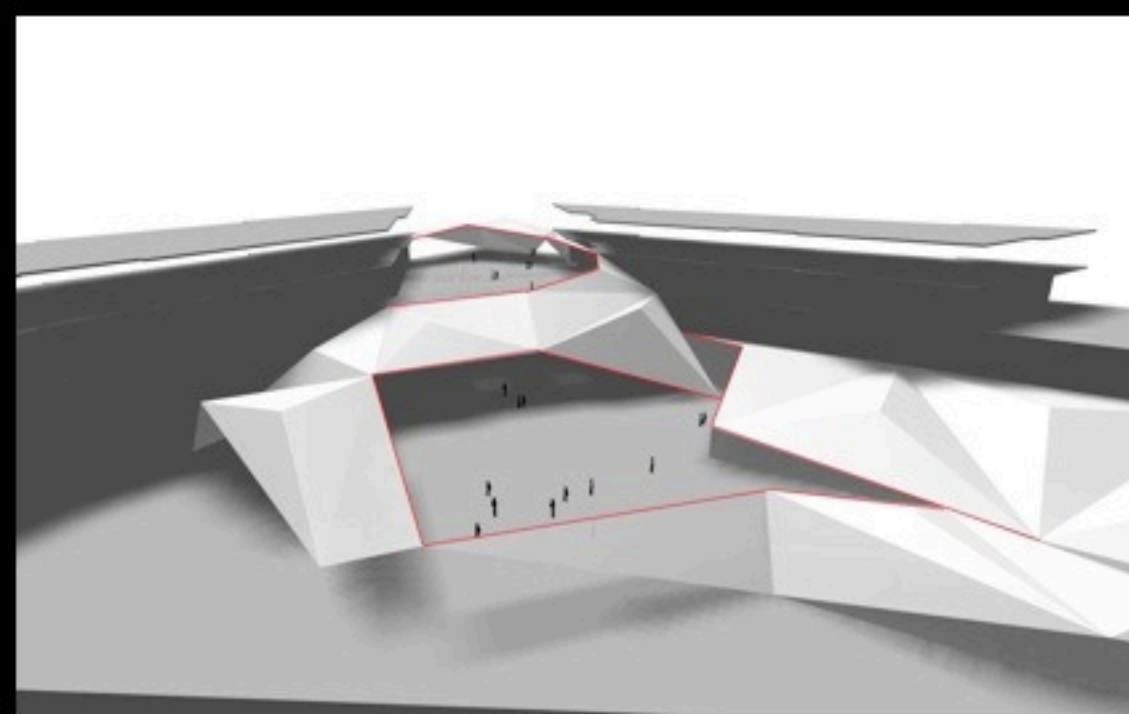


Skylight Enclosure Wireframe Model & Structural Finite Analysis Models



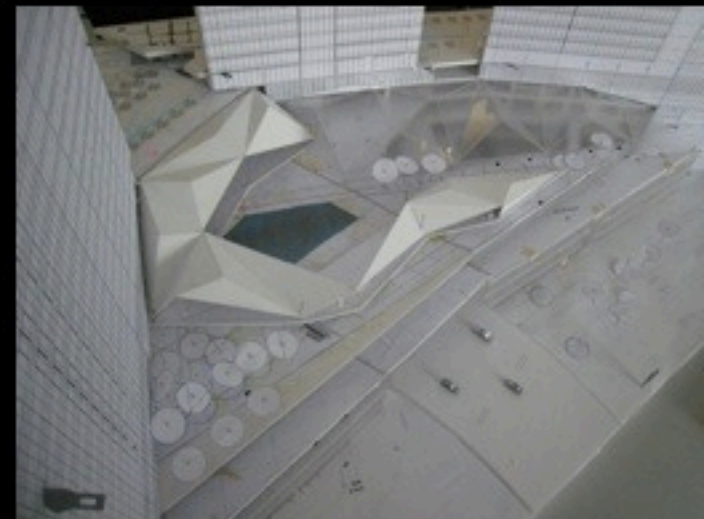
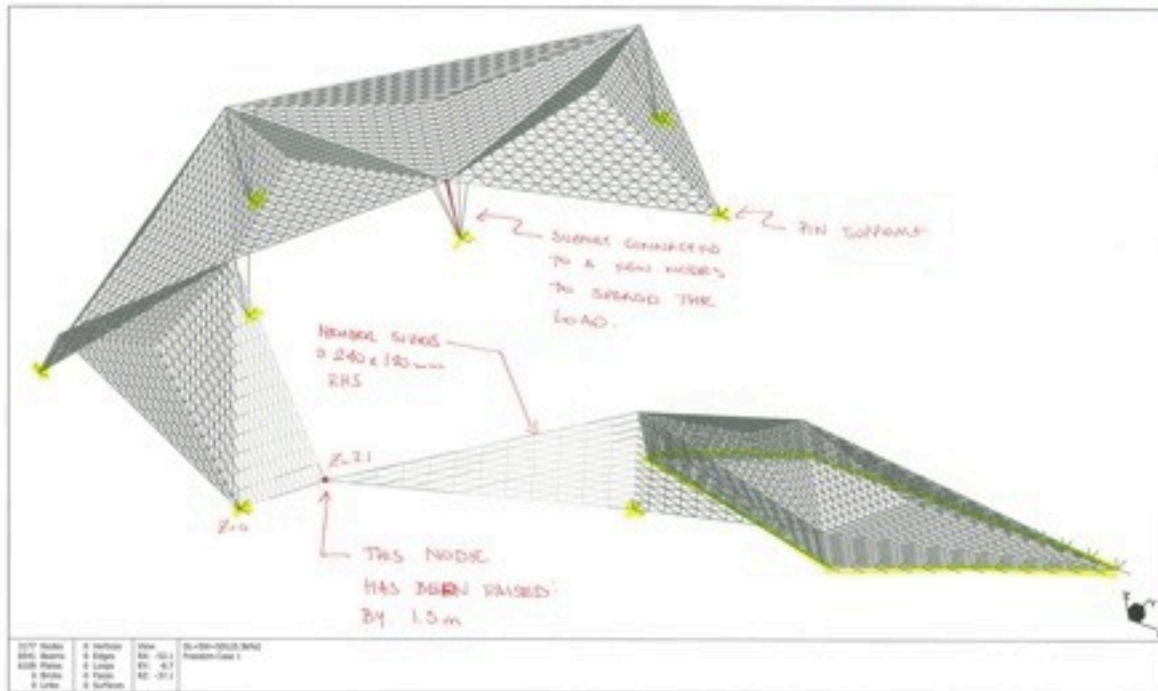
Adaptability

The shell system that satisfied the principles of transparency and the equivalence between geometry & structure also satisfied the principle of adaptability. There were several programmatic, structural and environmental conditions that the project was required to negotiate. The shell structural system enabled the form to modify and adapt to accommodate the various conditions.



**System Expands to accommodate
Adjacent Program Uses**

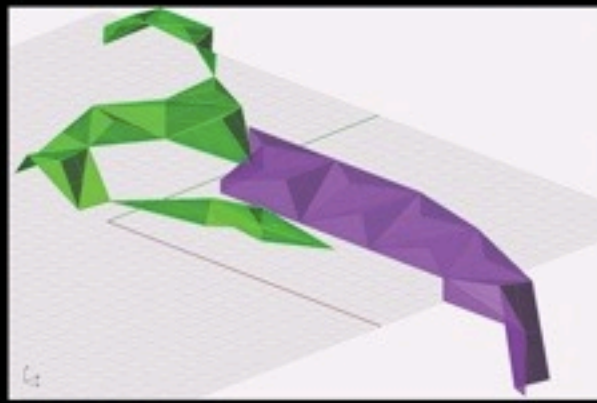
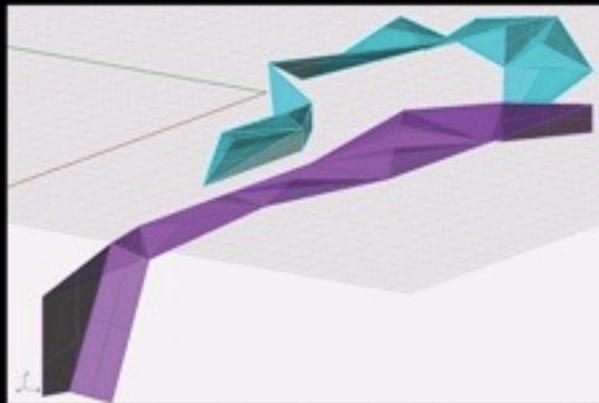
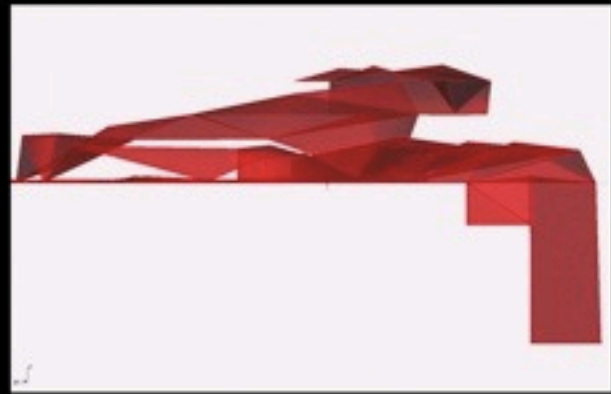
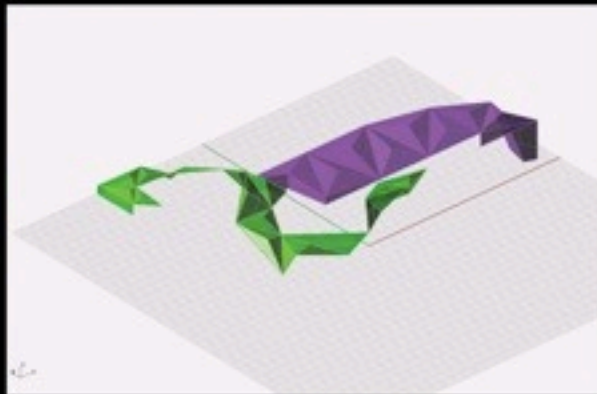
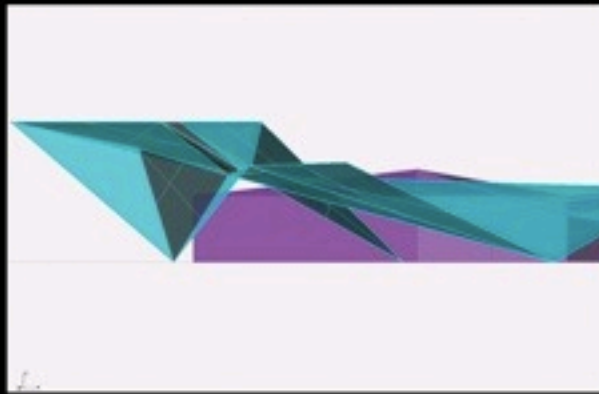
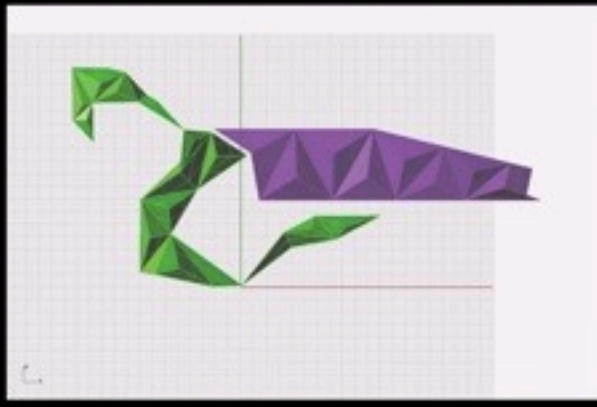
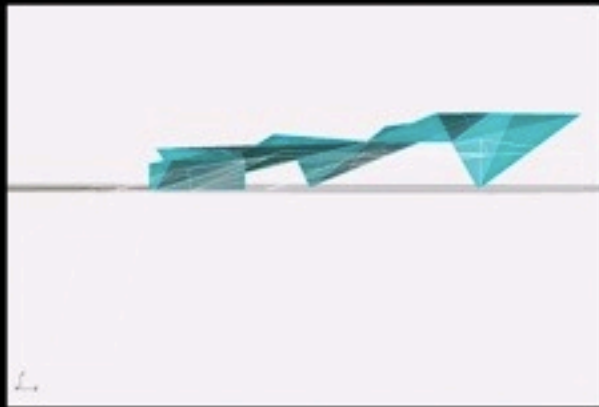
PRISM CANOPY	
100 TOWER	
MB	ME009C



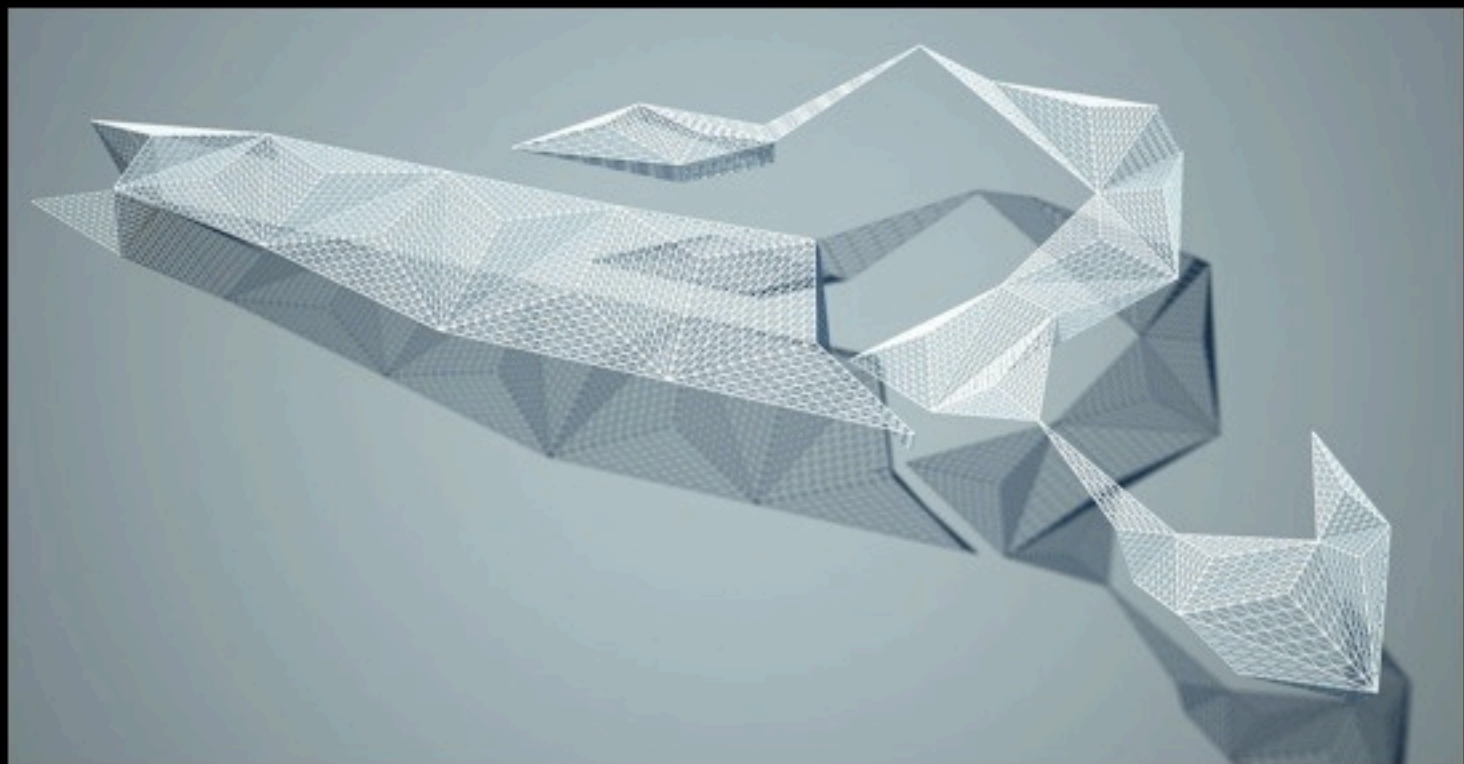
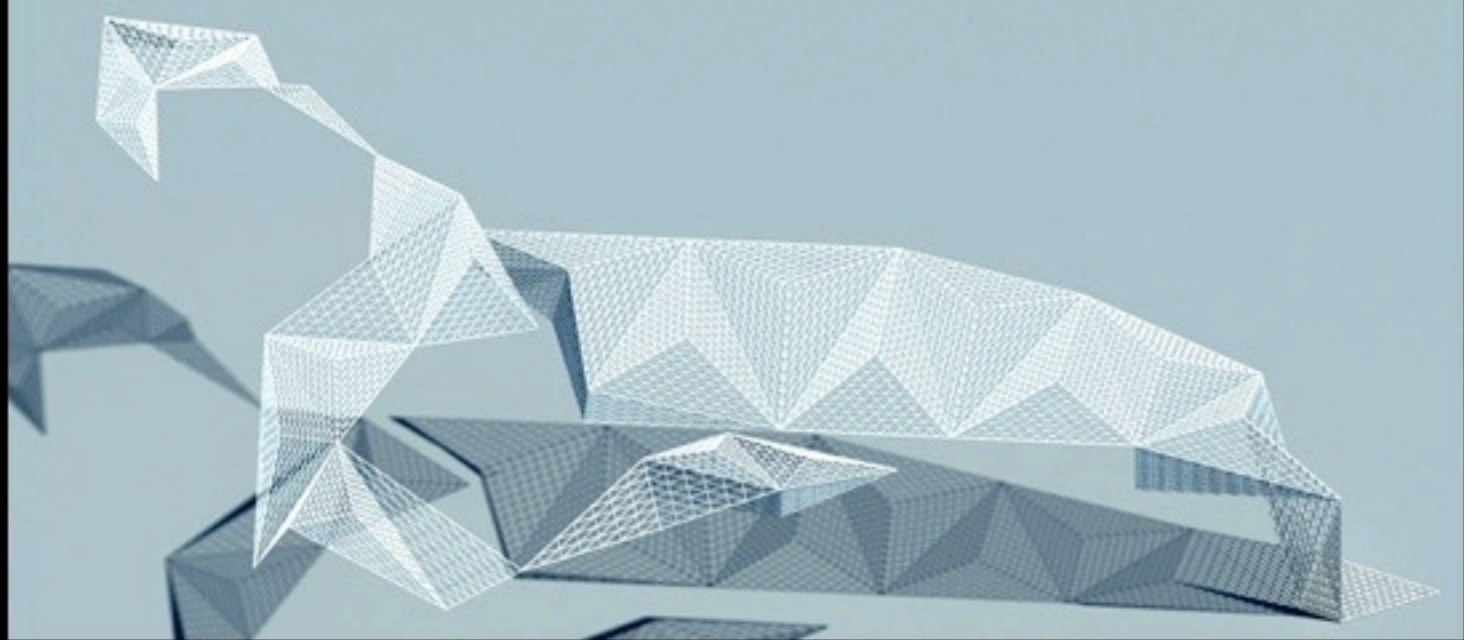
Structural Analysis & Prototype Models

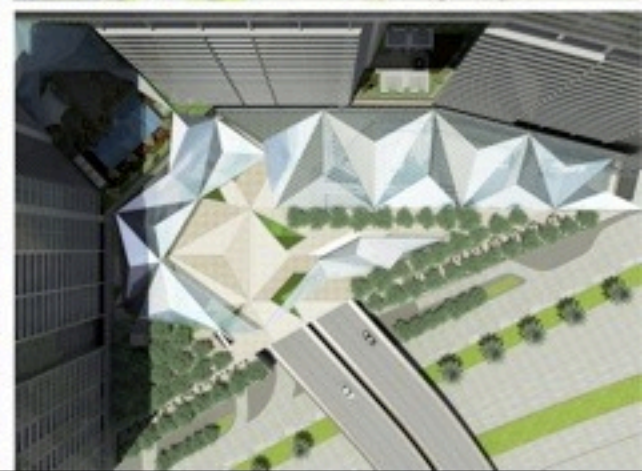
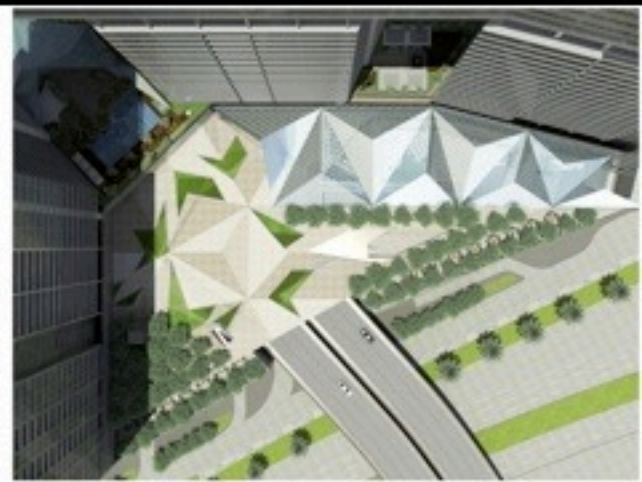
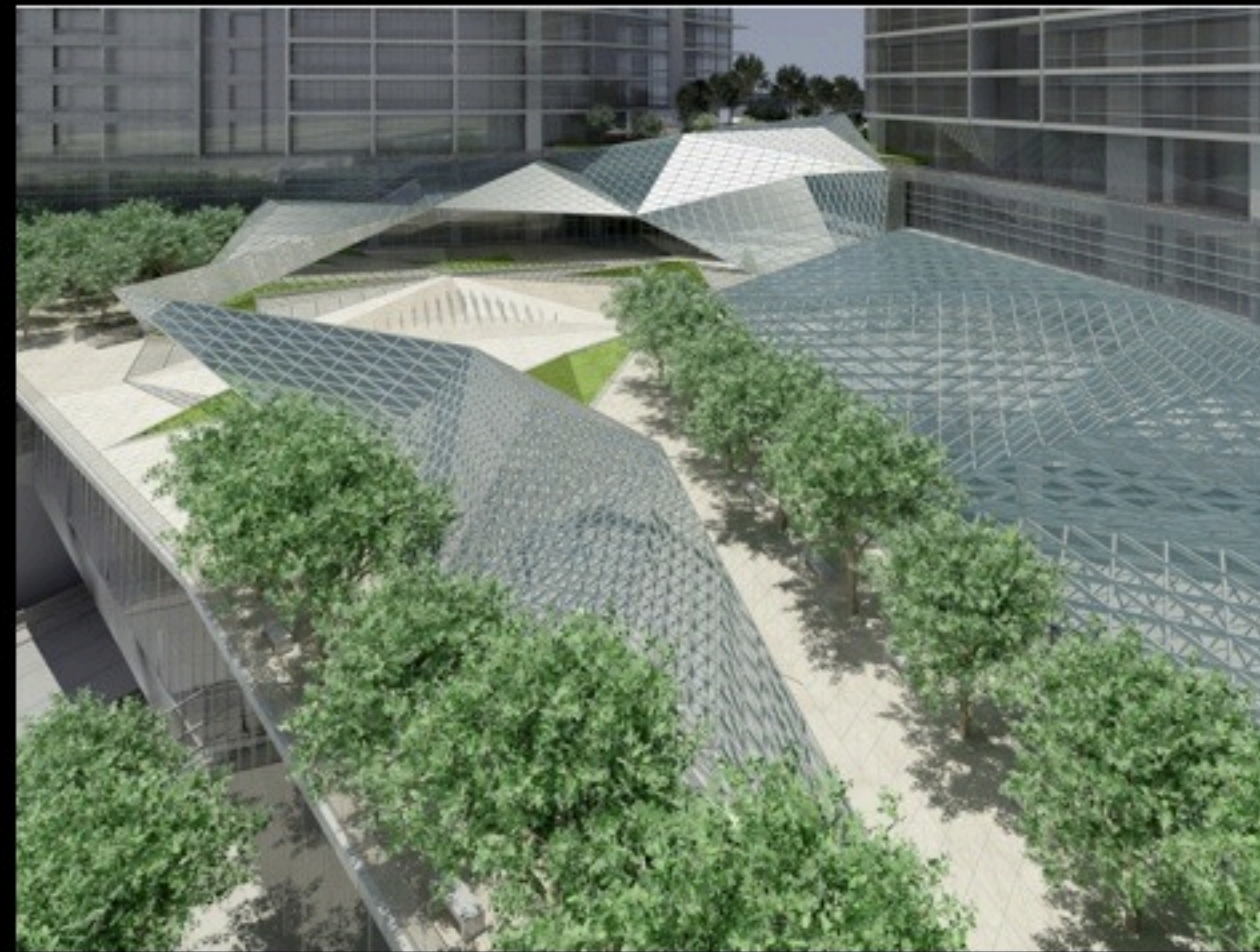


Wind Tunnel Testing & Modification



Iterative Development of Enclosure Geometry

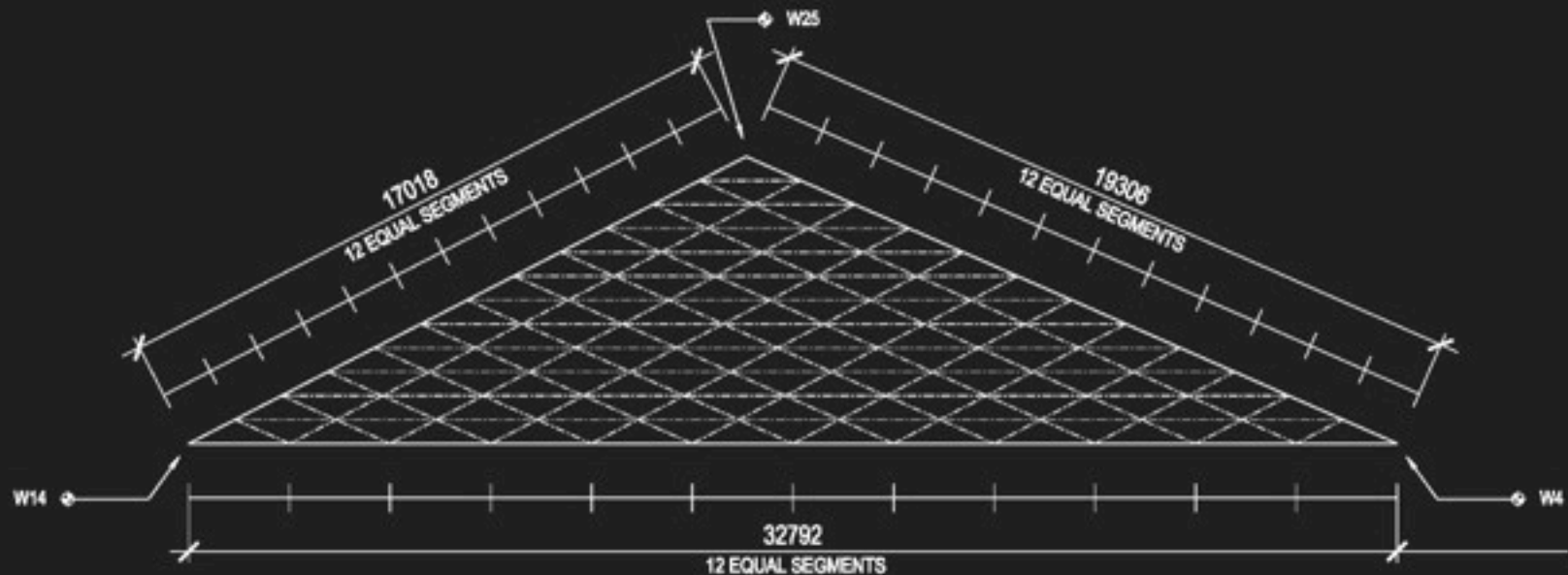


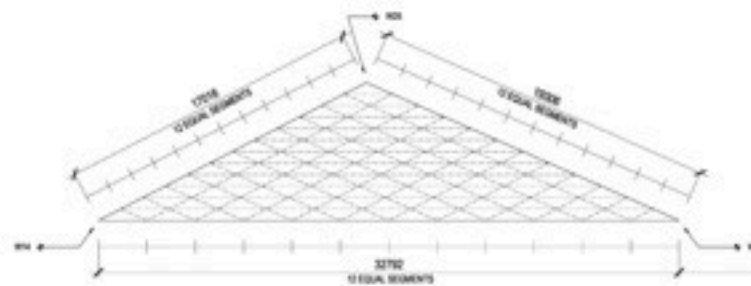


Final Geometry:
One Continuous Net No Differentiation Between Members; Girders, Beams, Columns

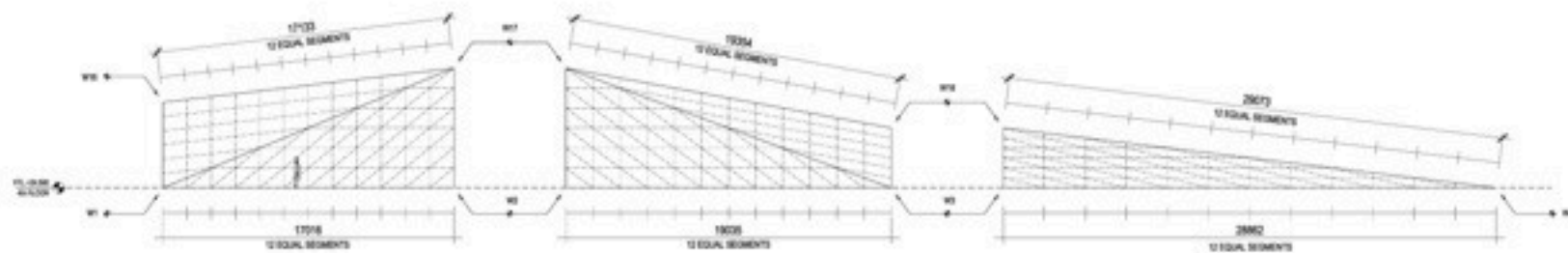
System Rules

The rules for the system were based on a series of triangular faces with the leg of each triangle divided into twelve equal segments. This established a consistency between faces that were modulated to accommodate the various conditions.





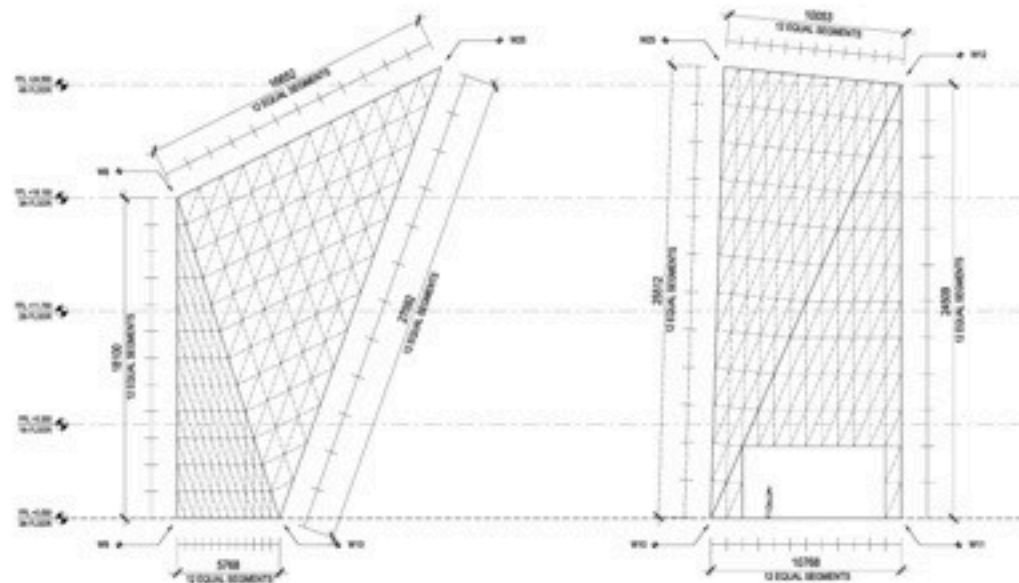
1 TYPICAL TRIANGLE GEOMETRY D1
1:10



2 TYPICAL TRIANGLE GEOMETRY A 5.6
1:10

3 TYPICAL TRIANGLE GEOMETRY 3.4
1:10

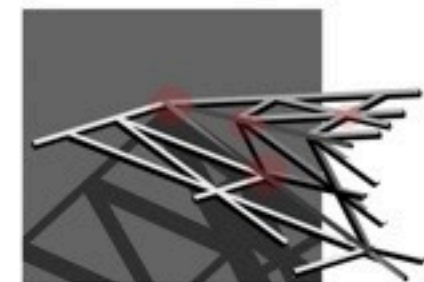
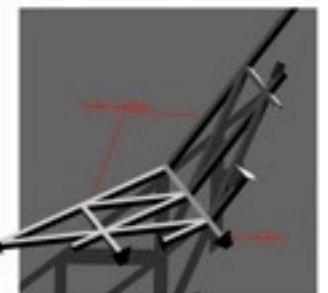
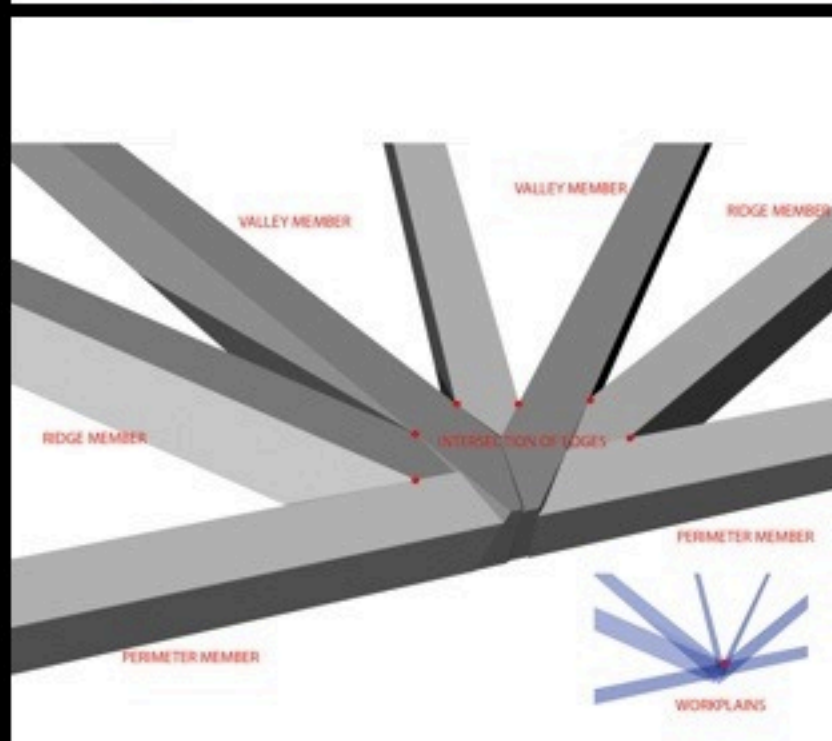
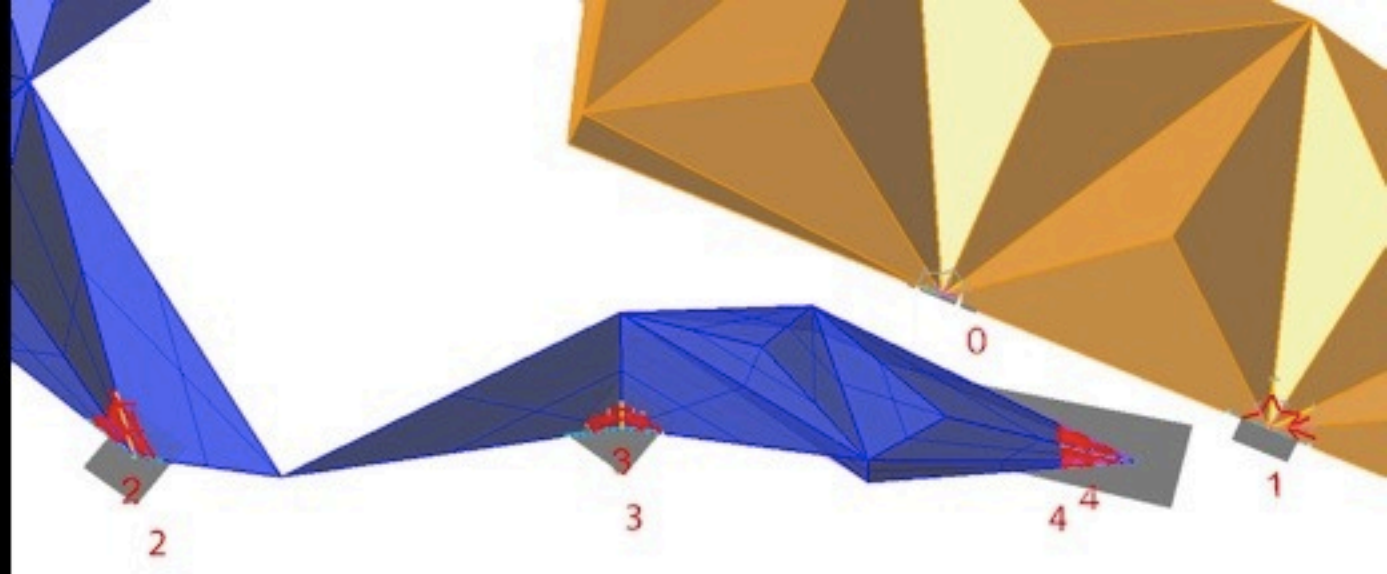
4 TYPICAL TRIANGLE GEOMETRY B4
1:10



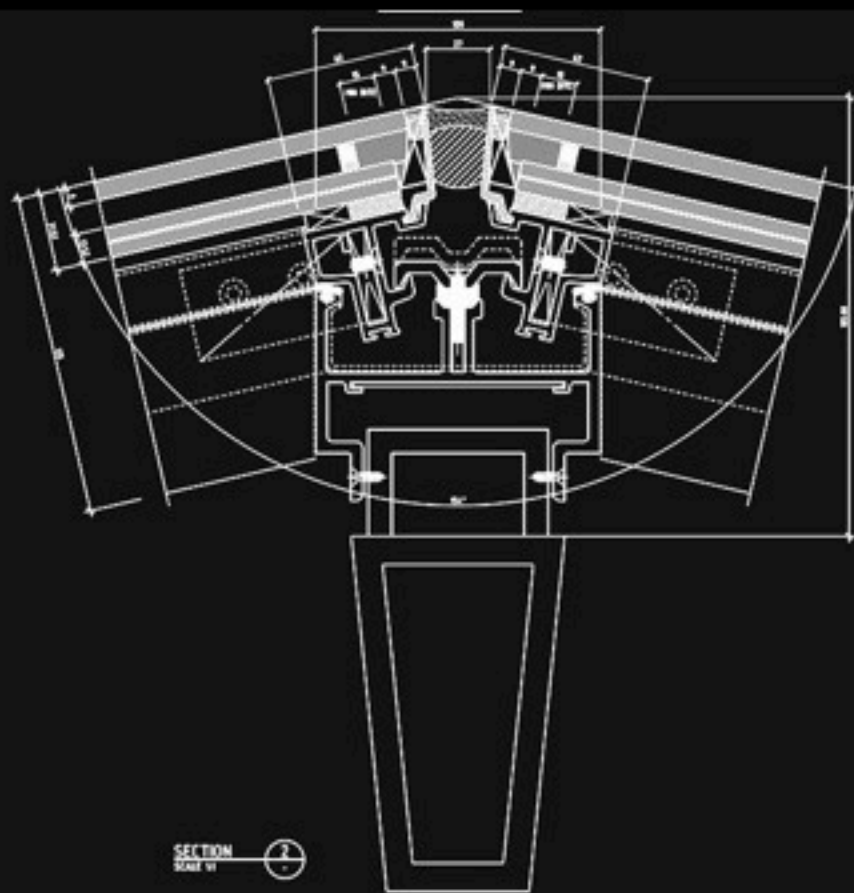
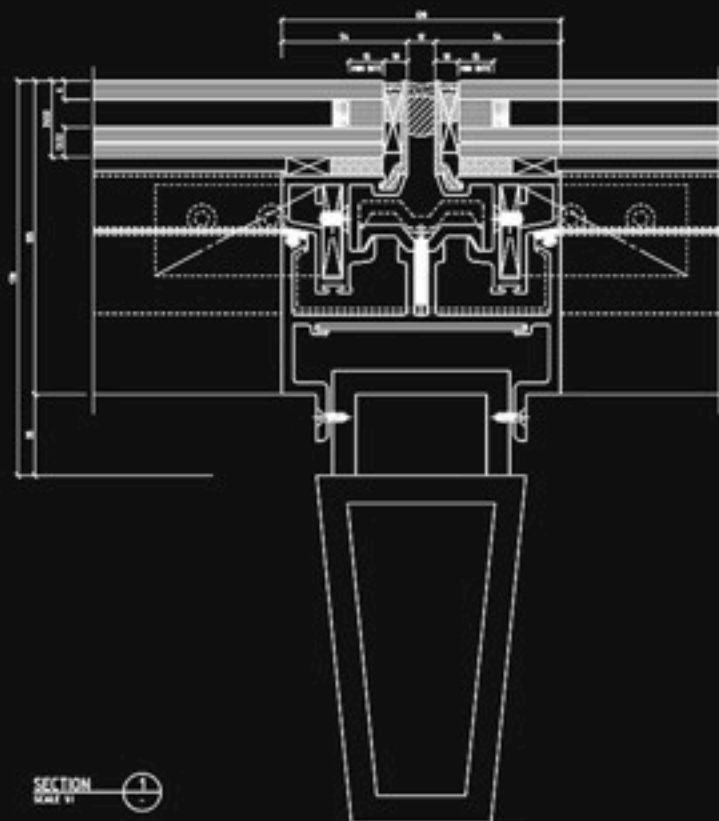
5 TYPICAL TRIANGLE GEOMETRY K2
1:10

6 TYPICAL TRIANGLE GEOMETRY K1
1:10





Nodal Conditions

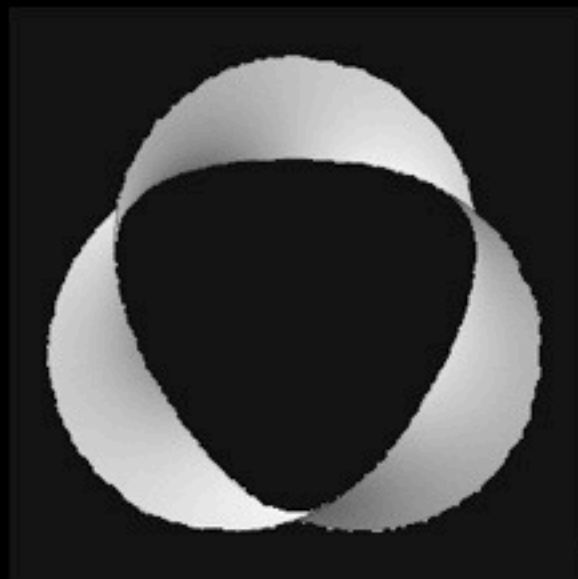


Primary Structure Member Size = 150mm = 6in
 Total Enclosure Depth = 320mm = 12.5in

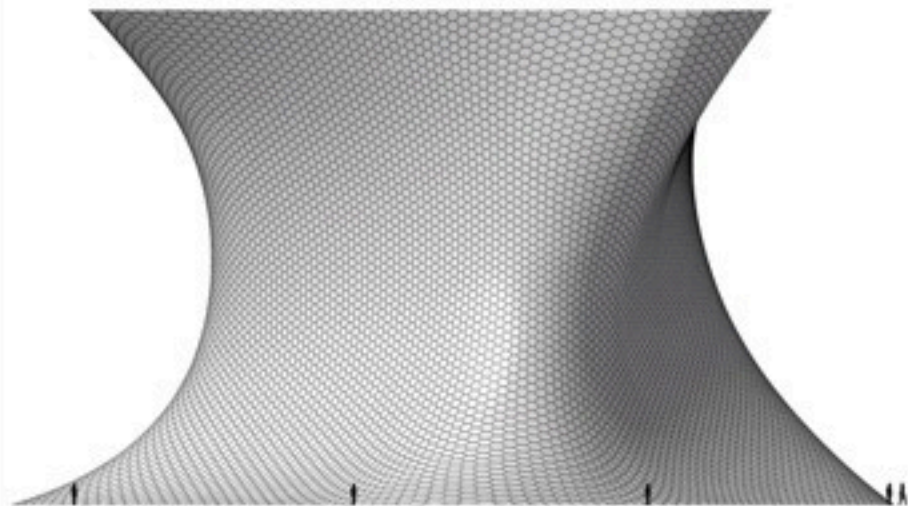


Robert Stephens
Middle East Director Meinhardt
Founded Inhabit Group

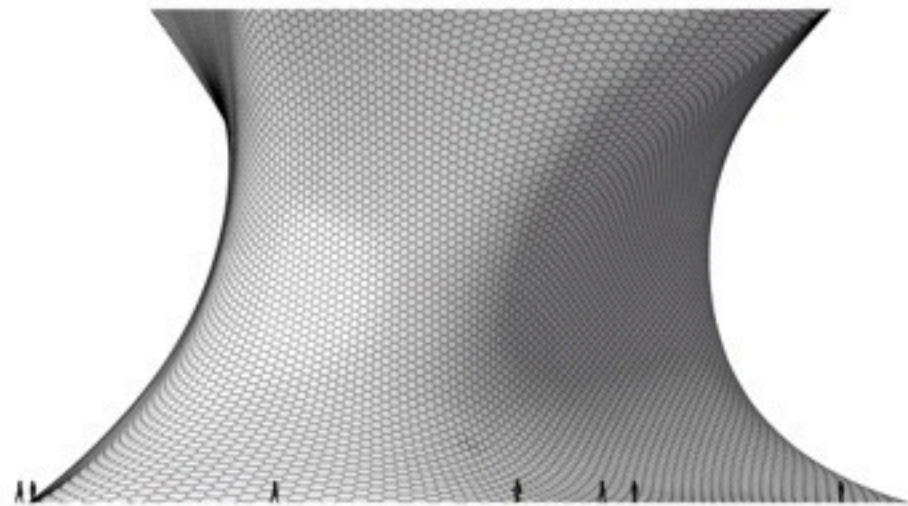
Soumaya Museo



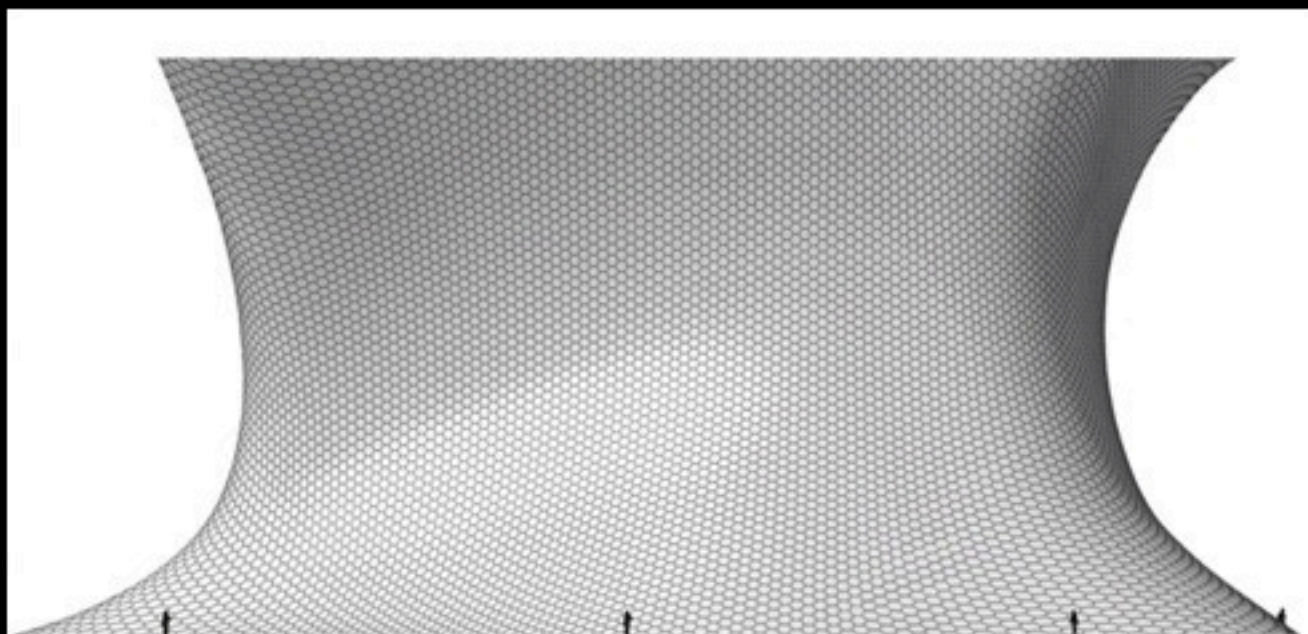




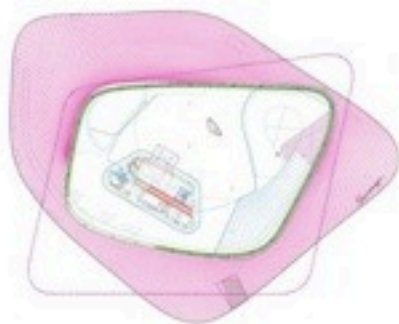
East

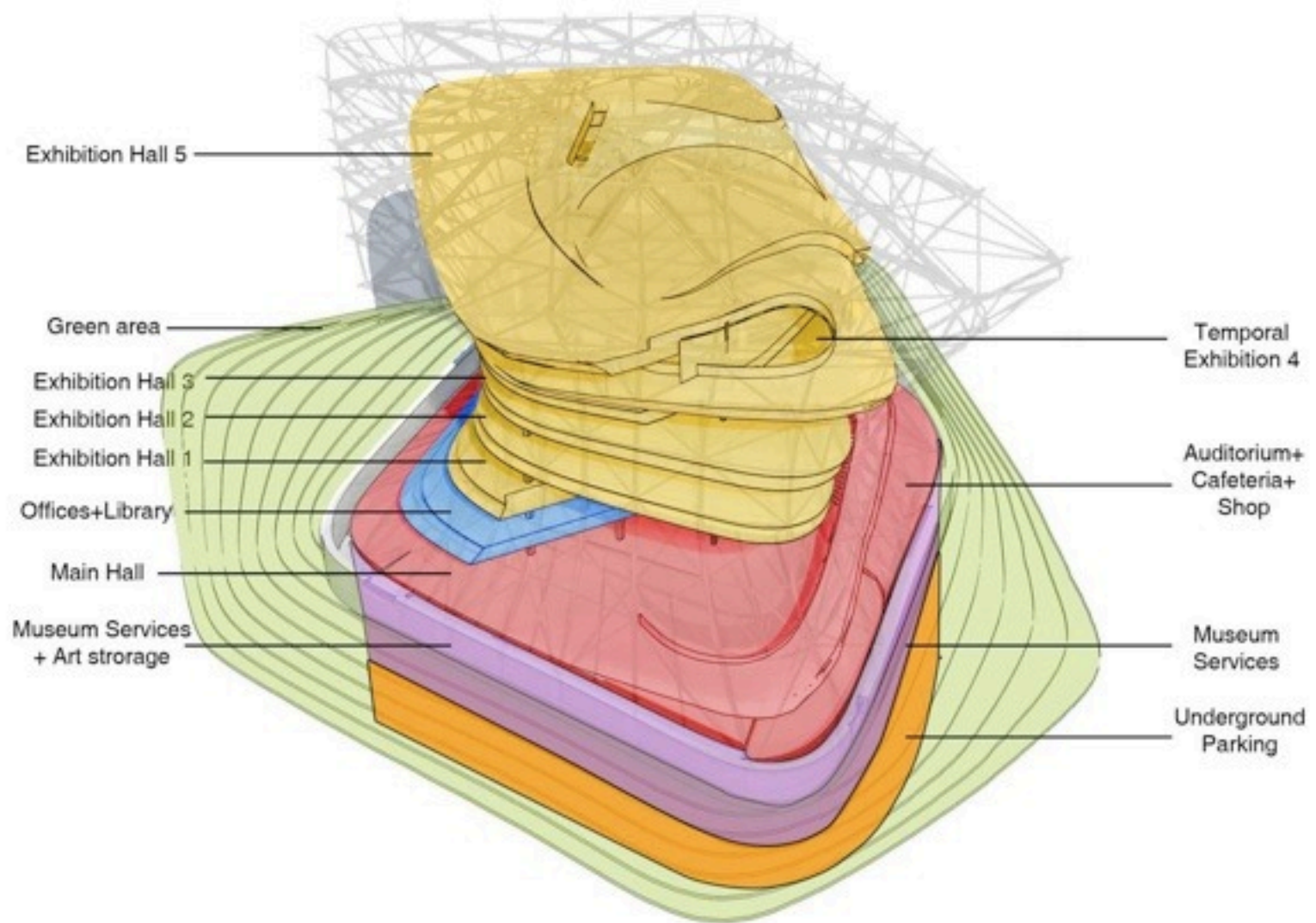


West



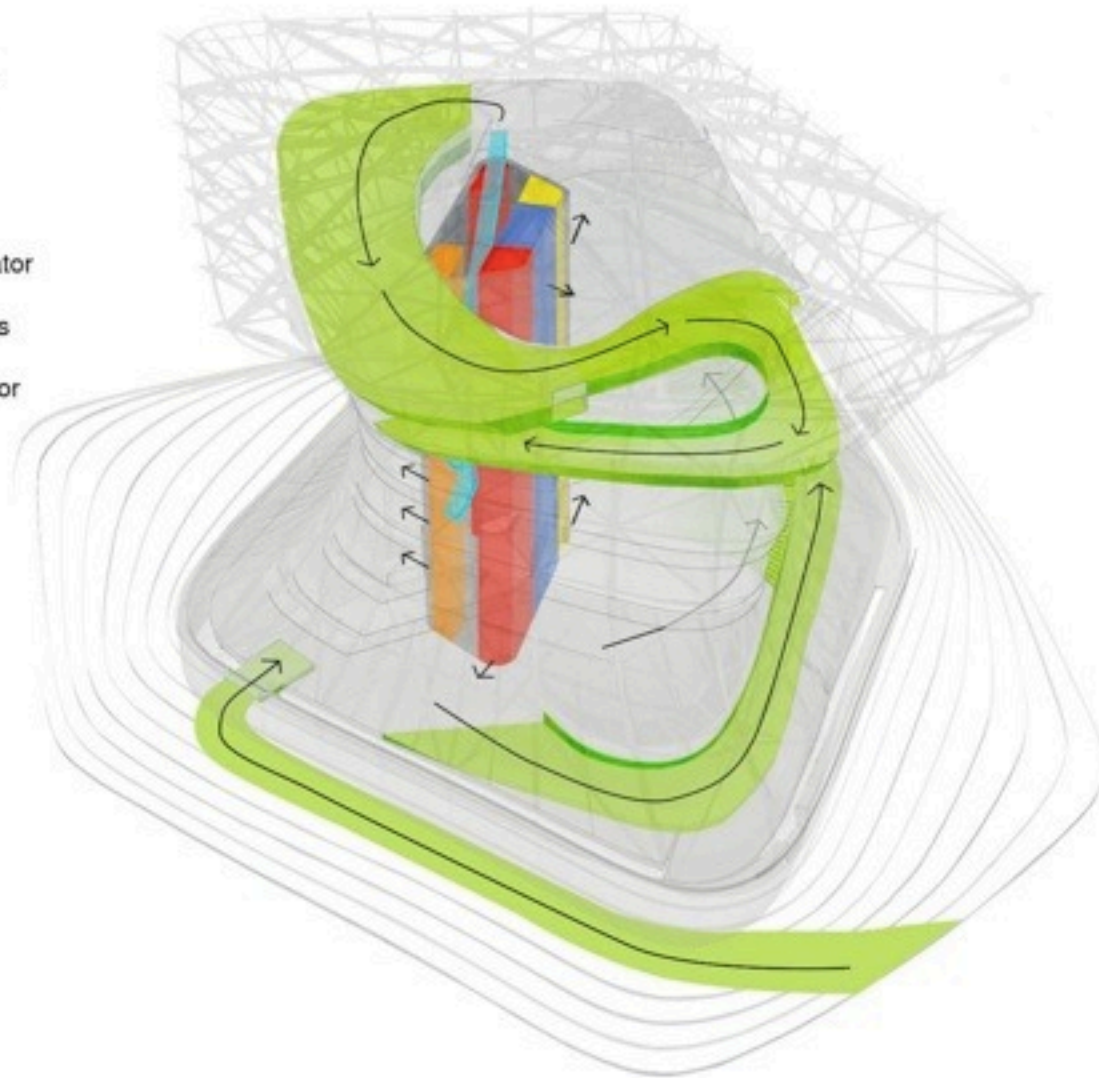
North



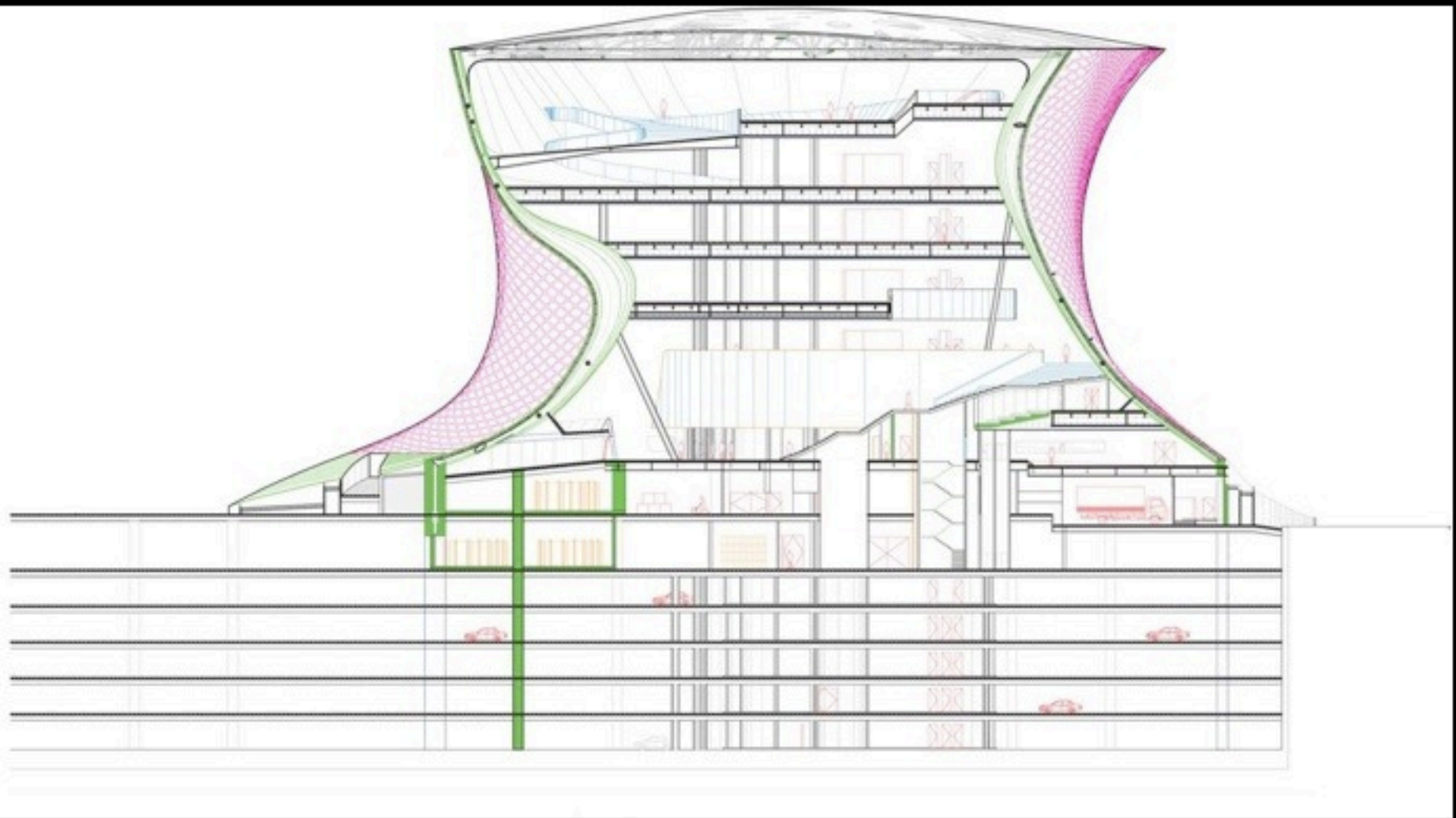


Program Organization

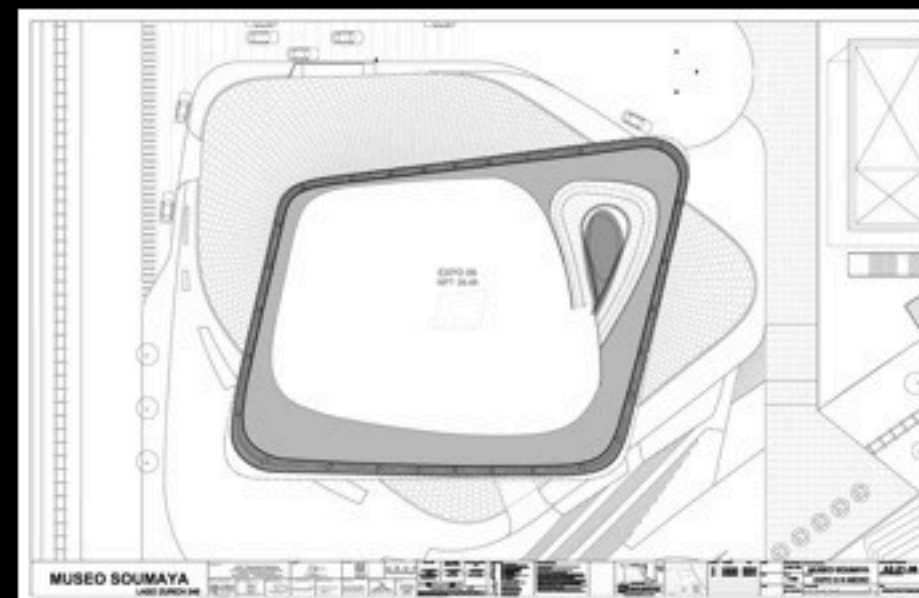
- User's circulation
- User's elevator
- Emergency exit
- Employees' elevator
- Electric escalators
- Art Freight elevator

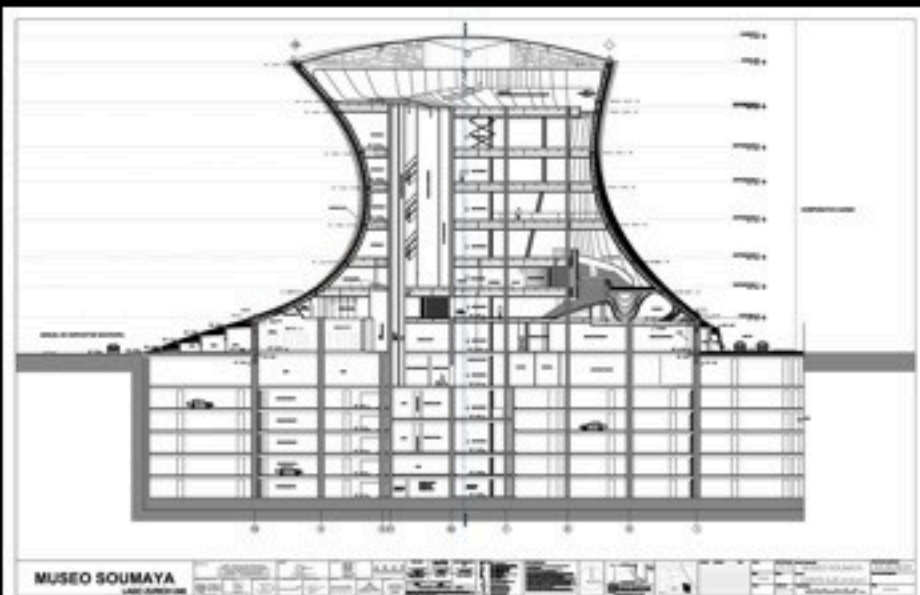
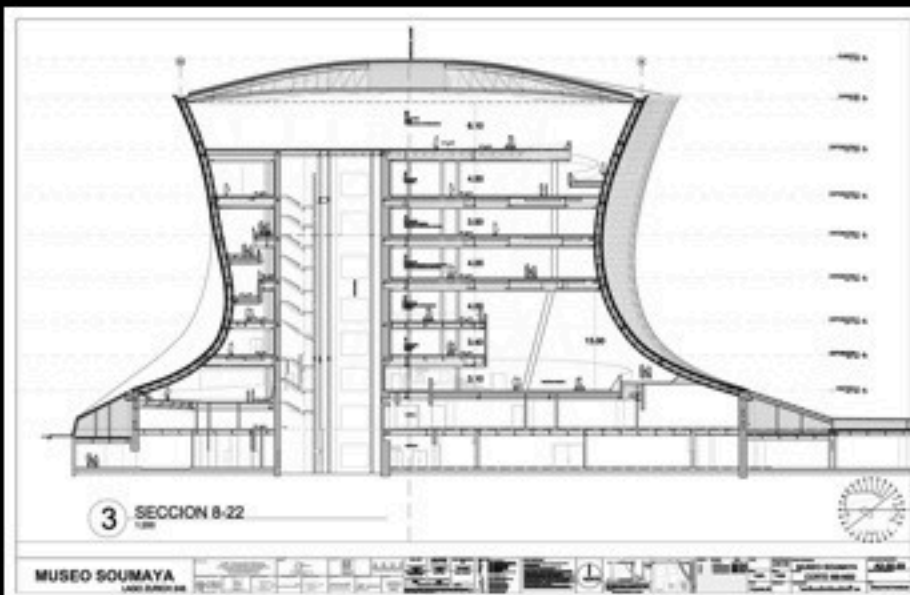
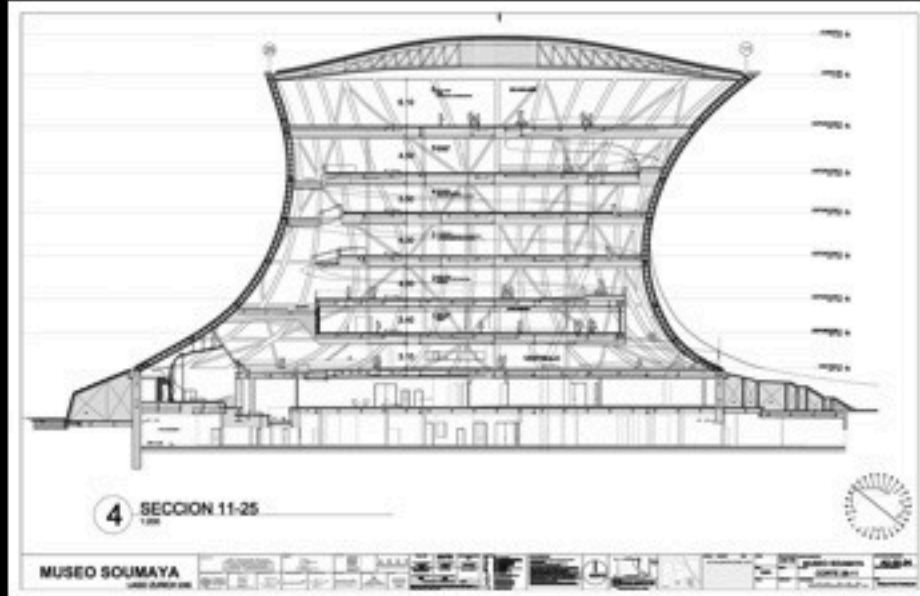
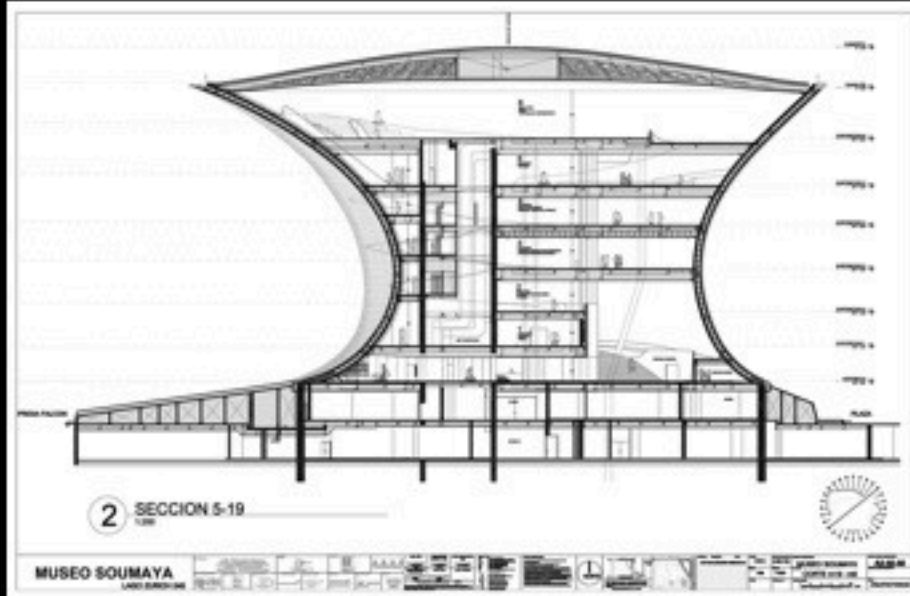


Circulation Pathways



Building Section E/W











Primary Structural Frame:
52cm dia Steel Pipe



**Offshore Oil Platforms:
Carlos Slim Subsidiary**





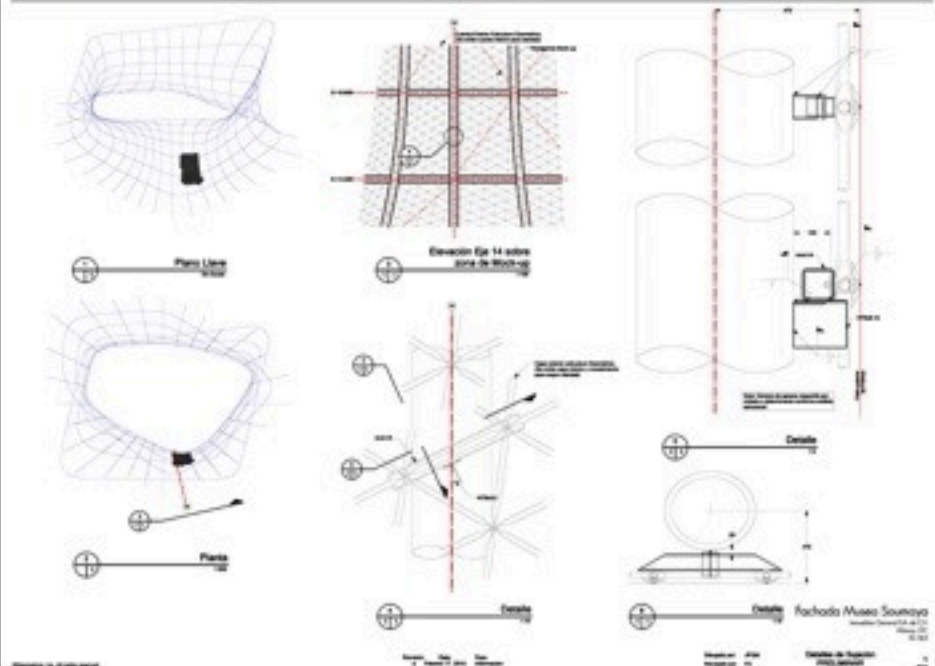
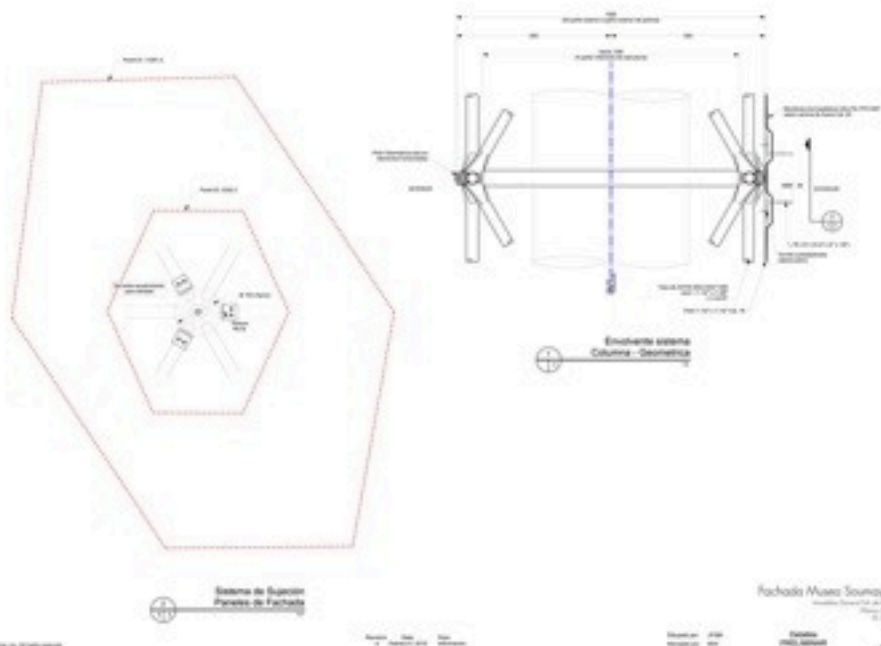
Base Pipe Column



Column Connections



Pipe Steel Connections



Secondary Structural Drawings:
Geometrica





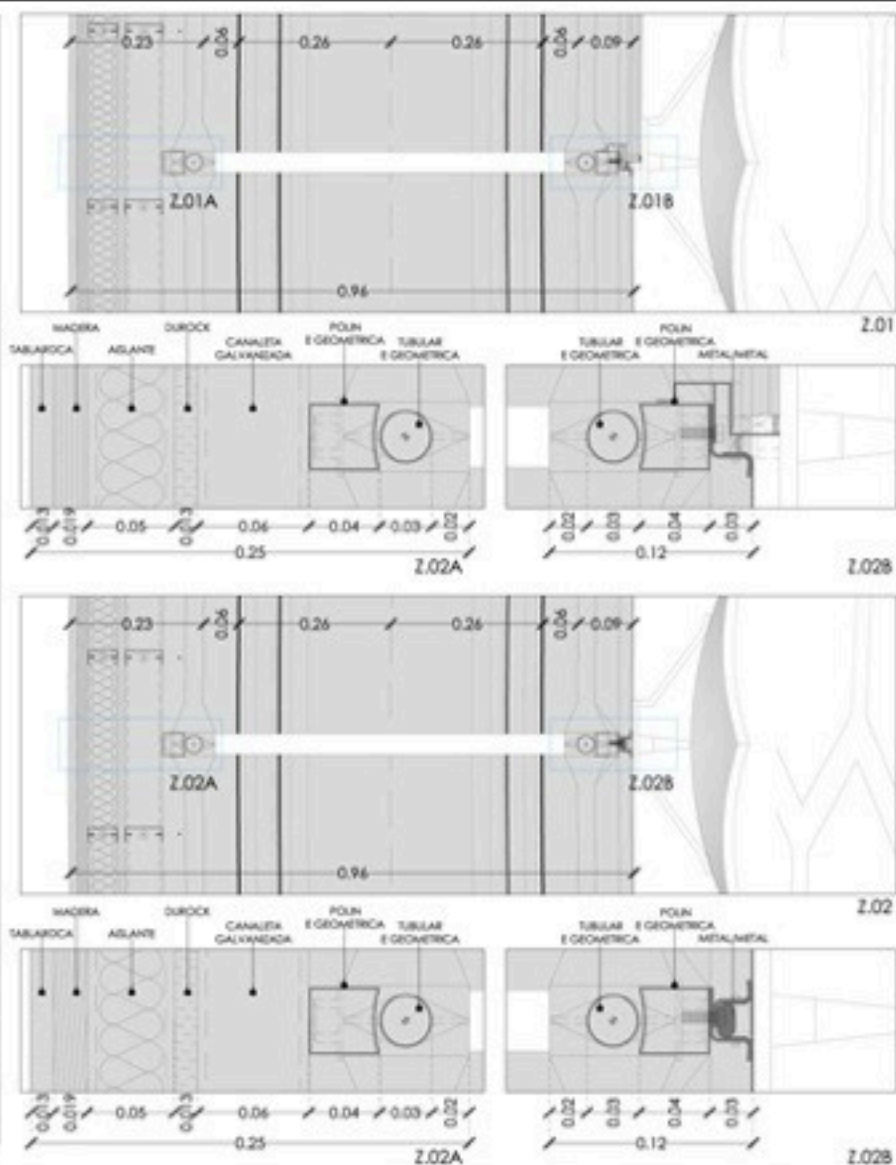
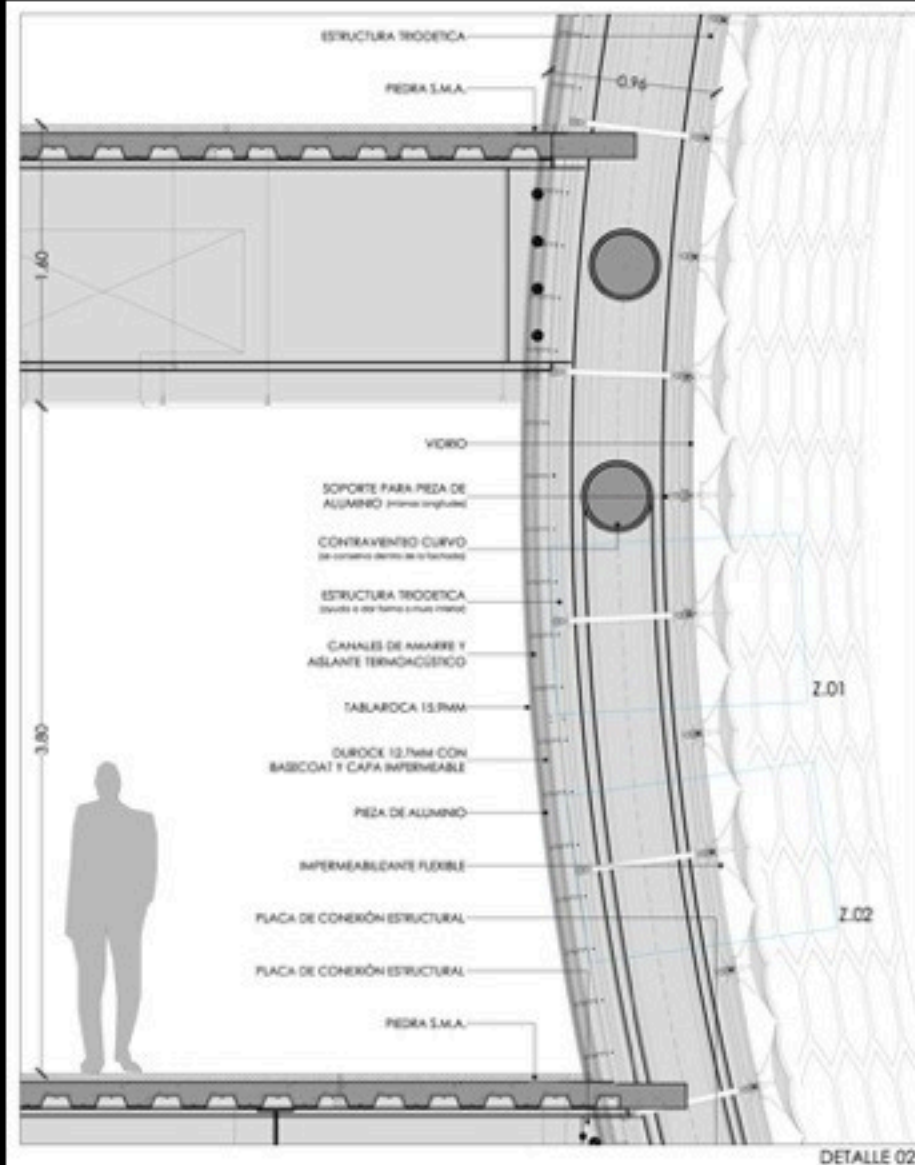


Secondary Structure Assembly

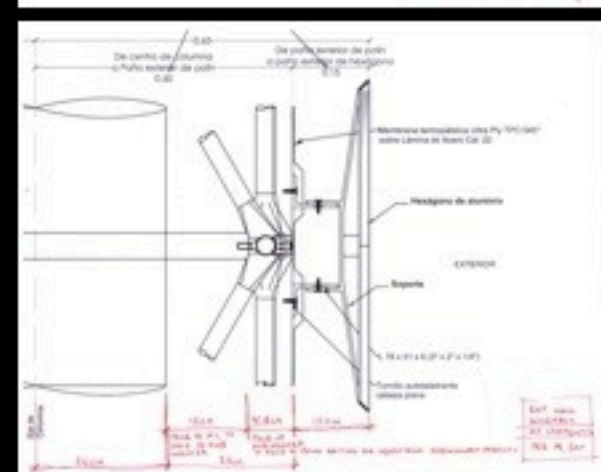
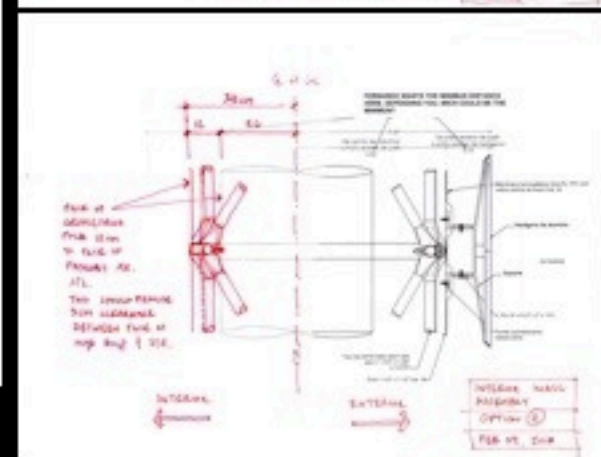
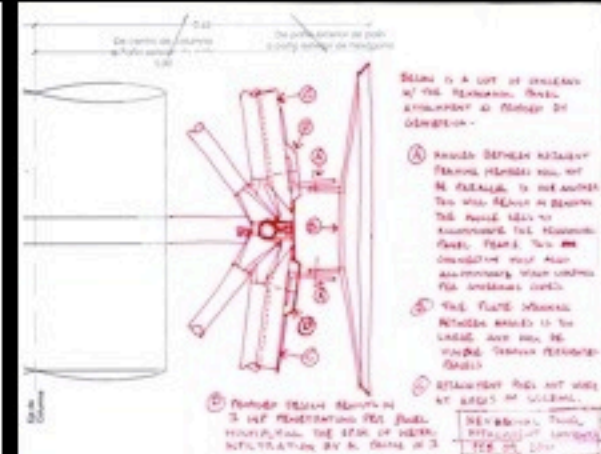
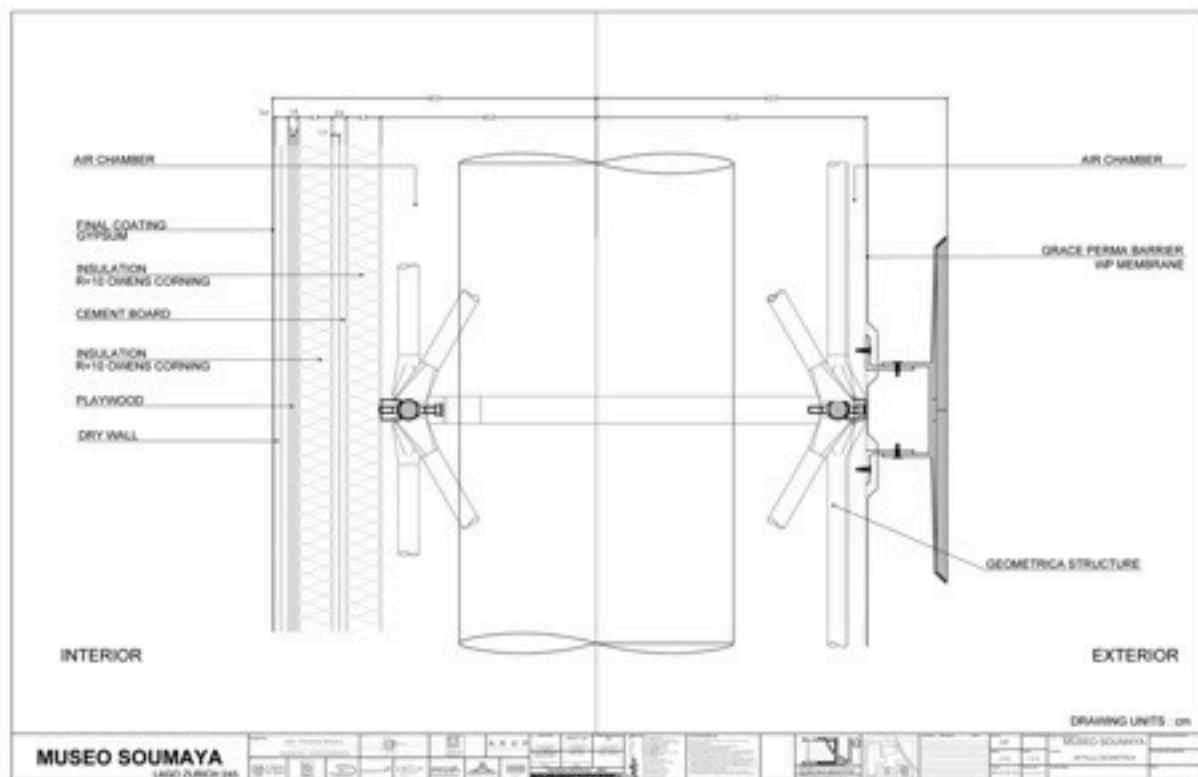


Secondary Structure Installation

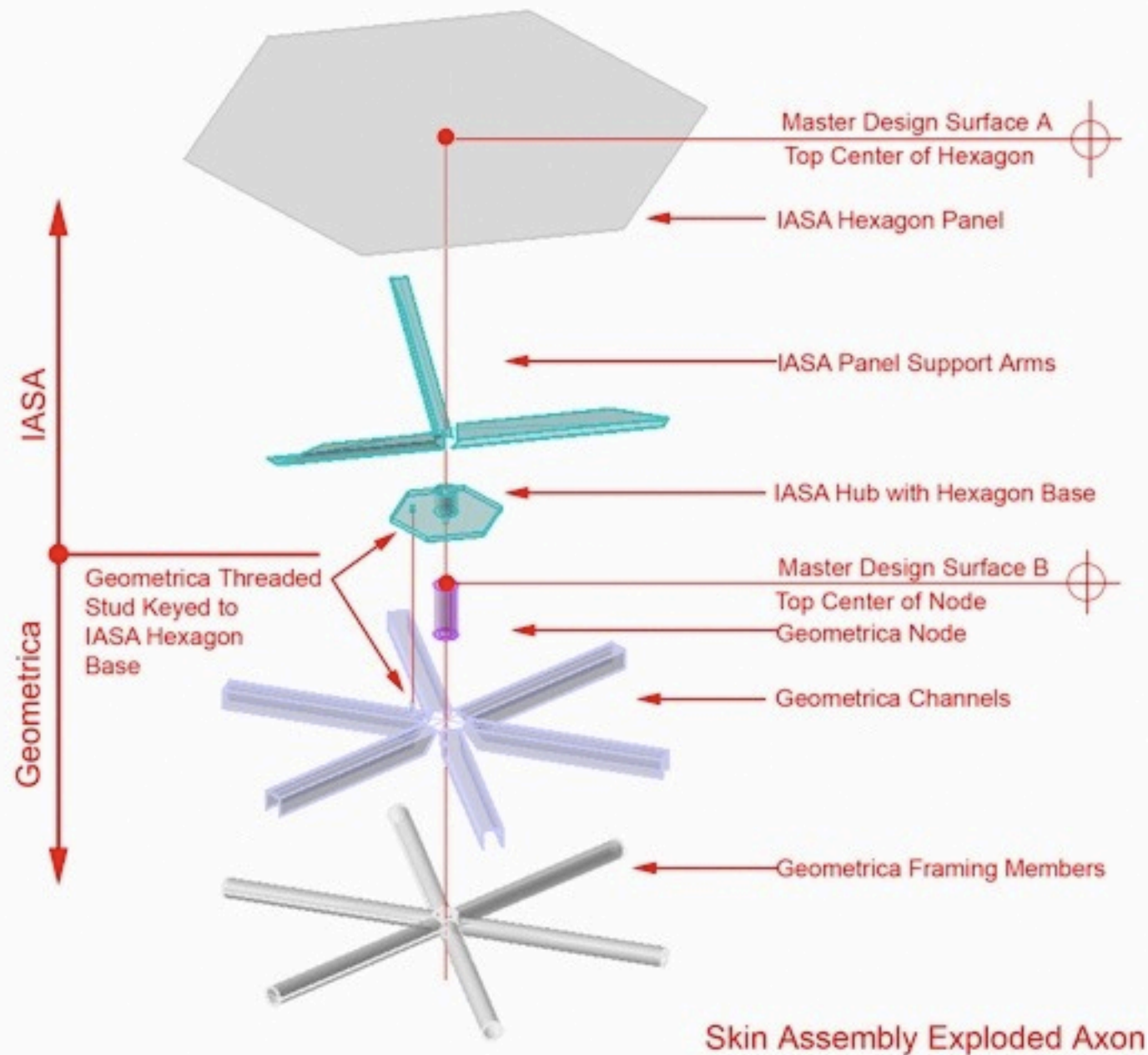




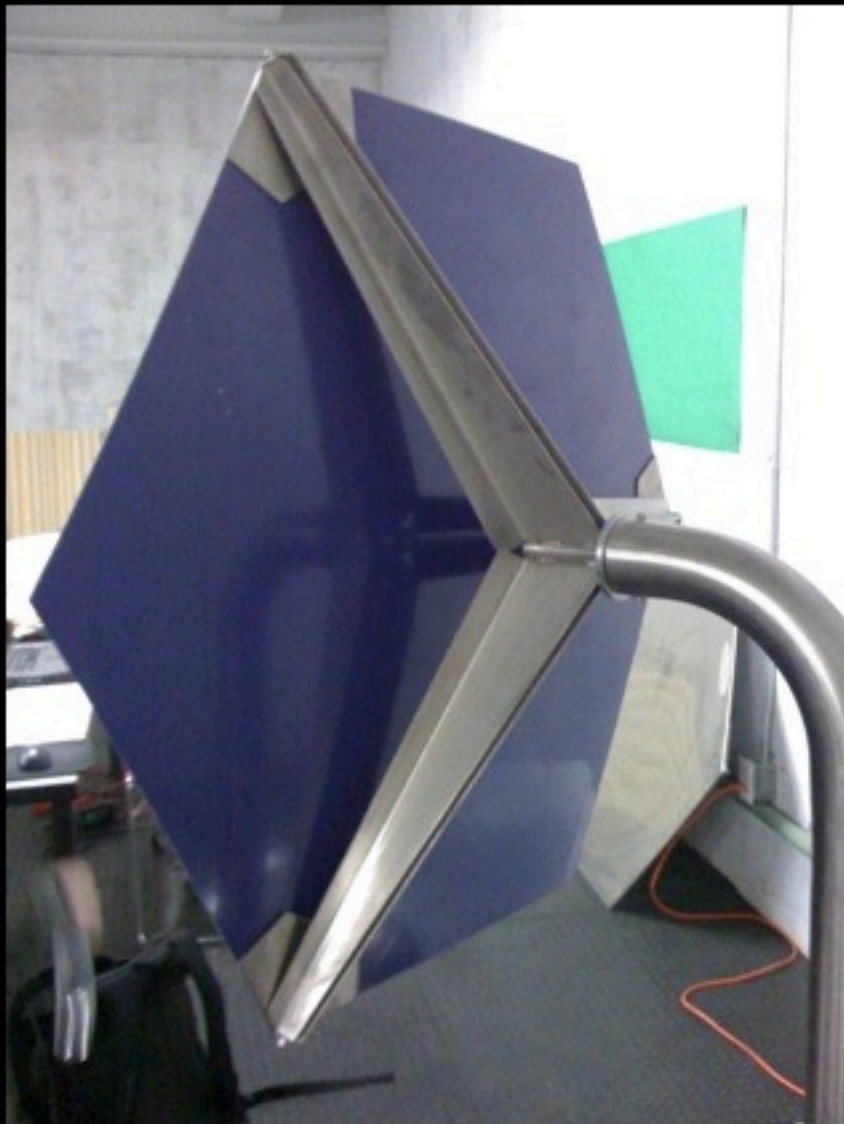
Enclosure Assembly



Enclosure Assembly Development

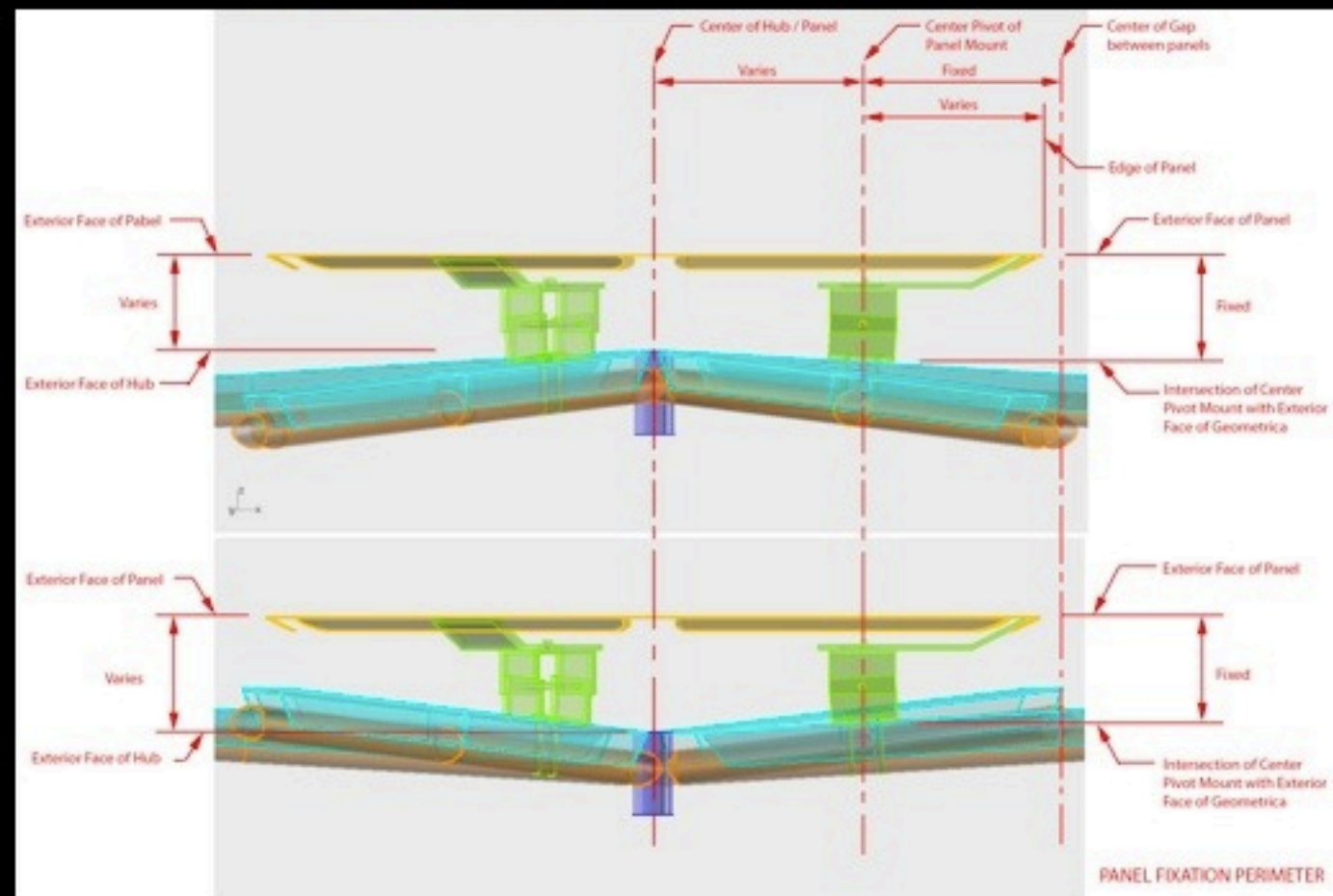
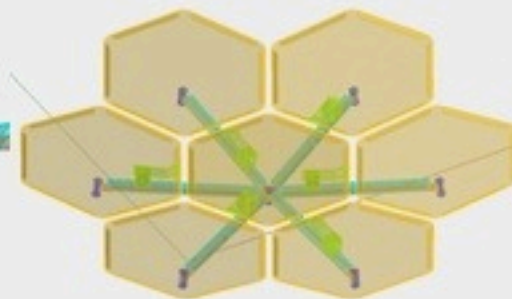
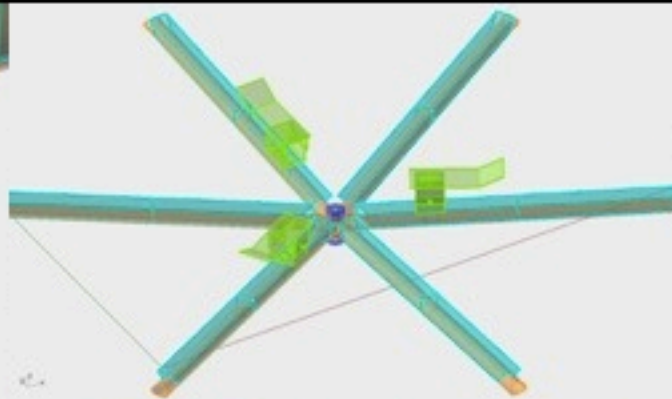
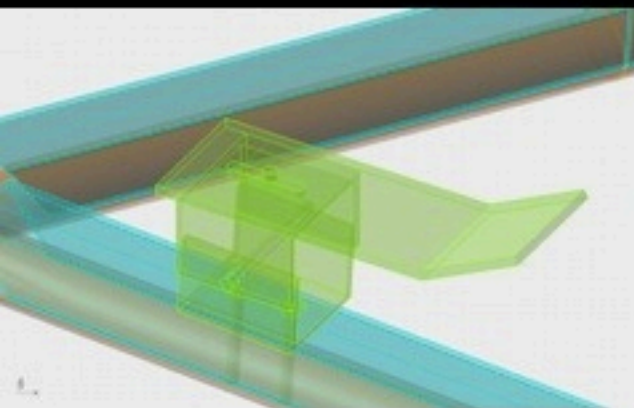


**Building Skin
Components
Separated
by Fabricator**





Panel Mock-ups



Panel Mounting System



Panel Mock-up



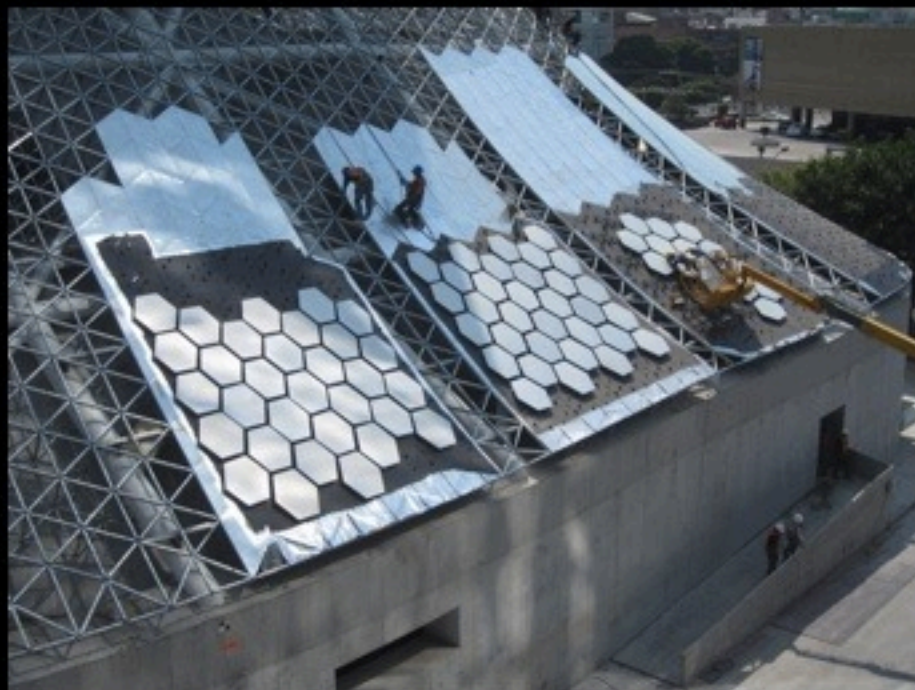
IASA: Aluminum Fabricator for Telemex Communications (Carlos Slim Company)



Prototypes

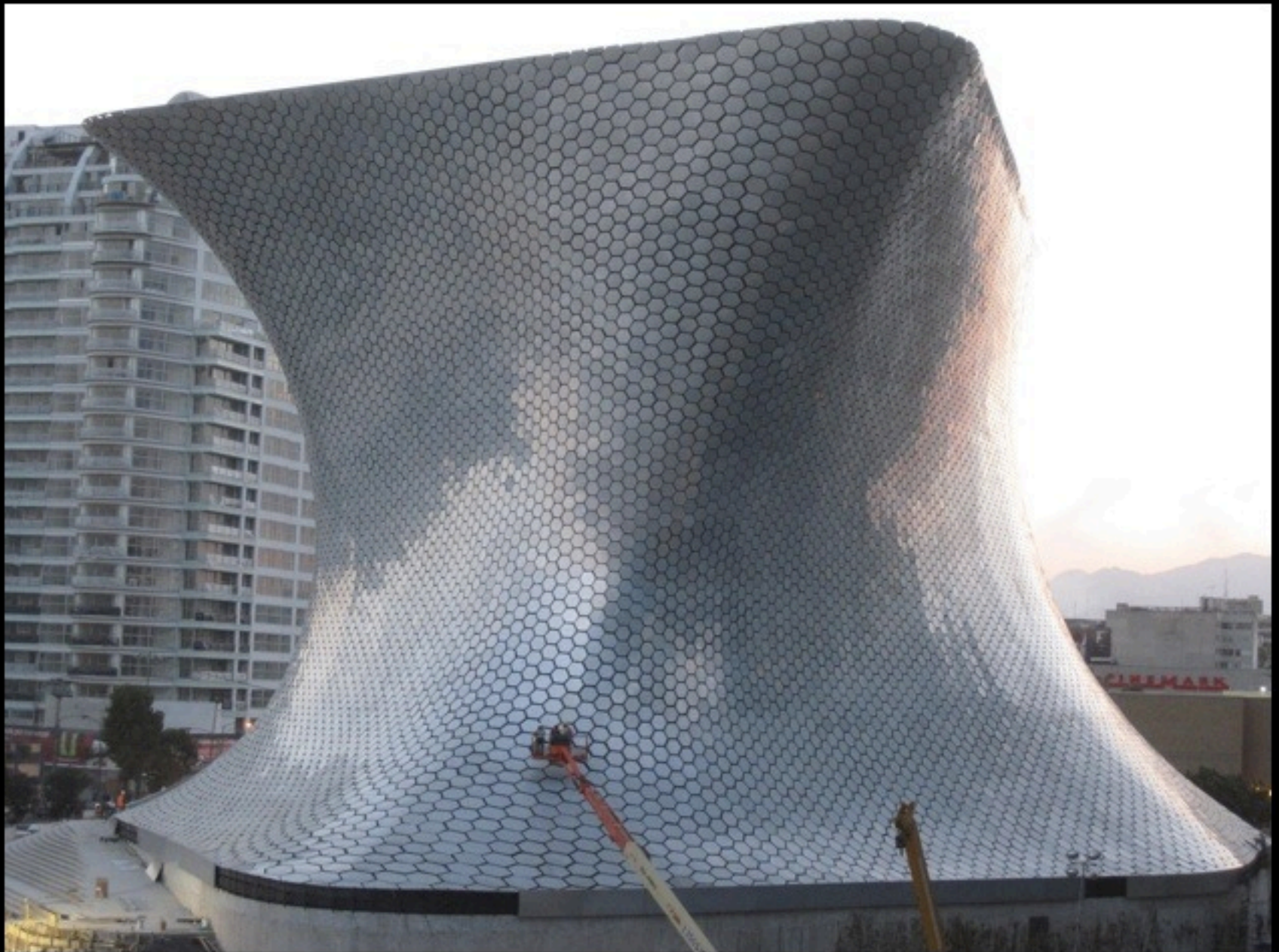


Panel Installation

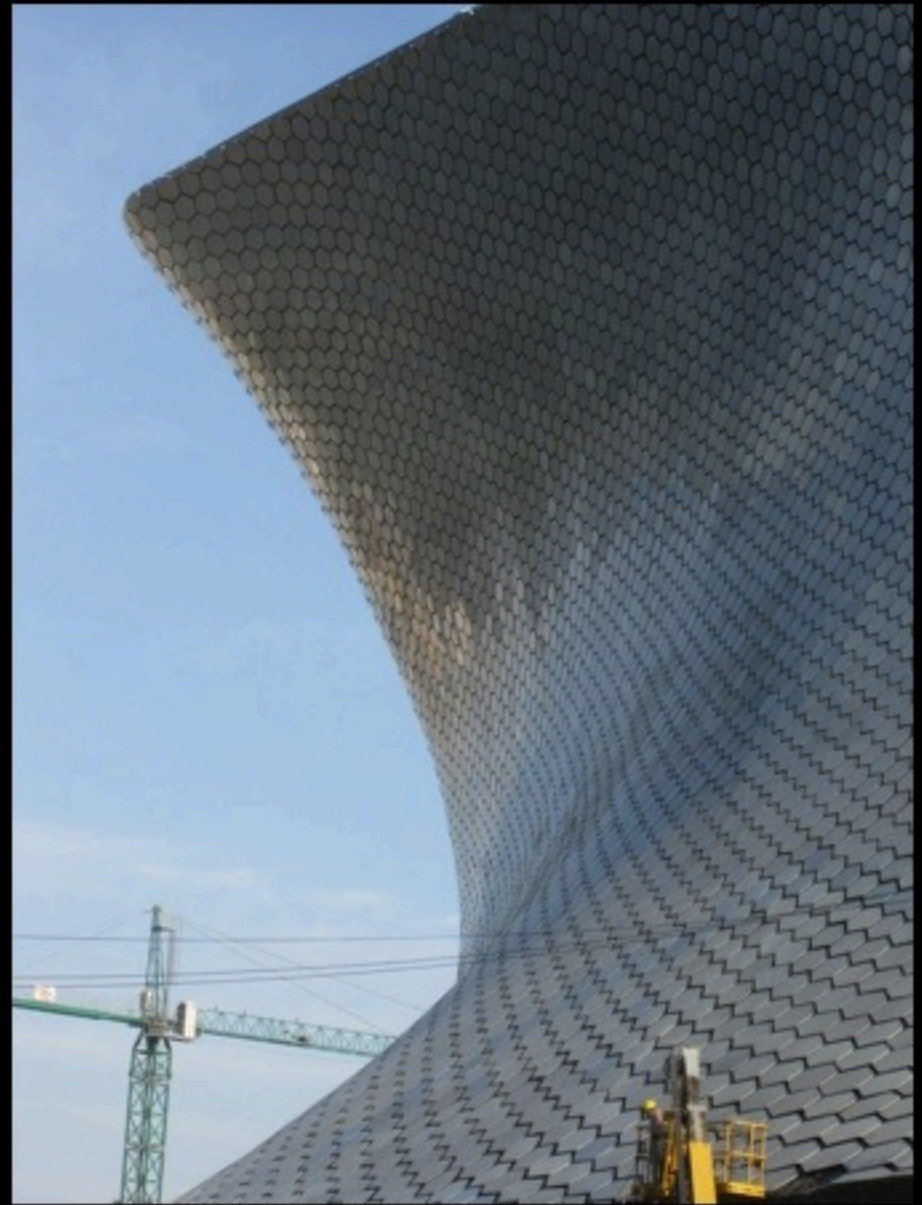
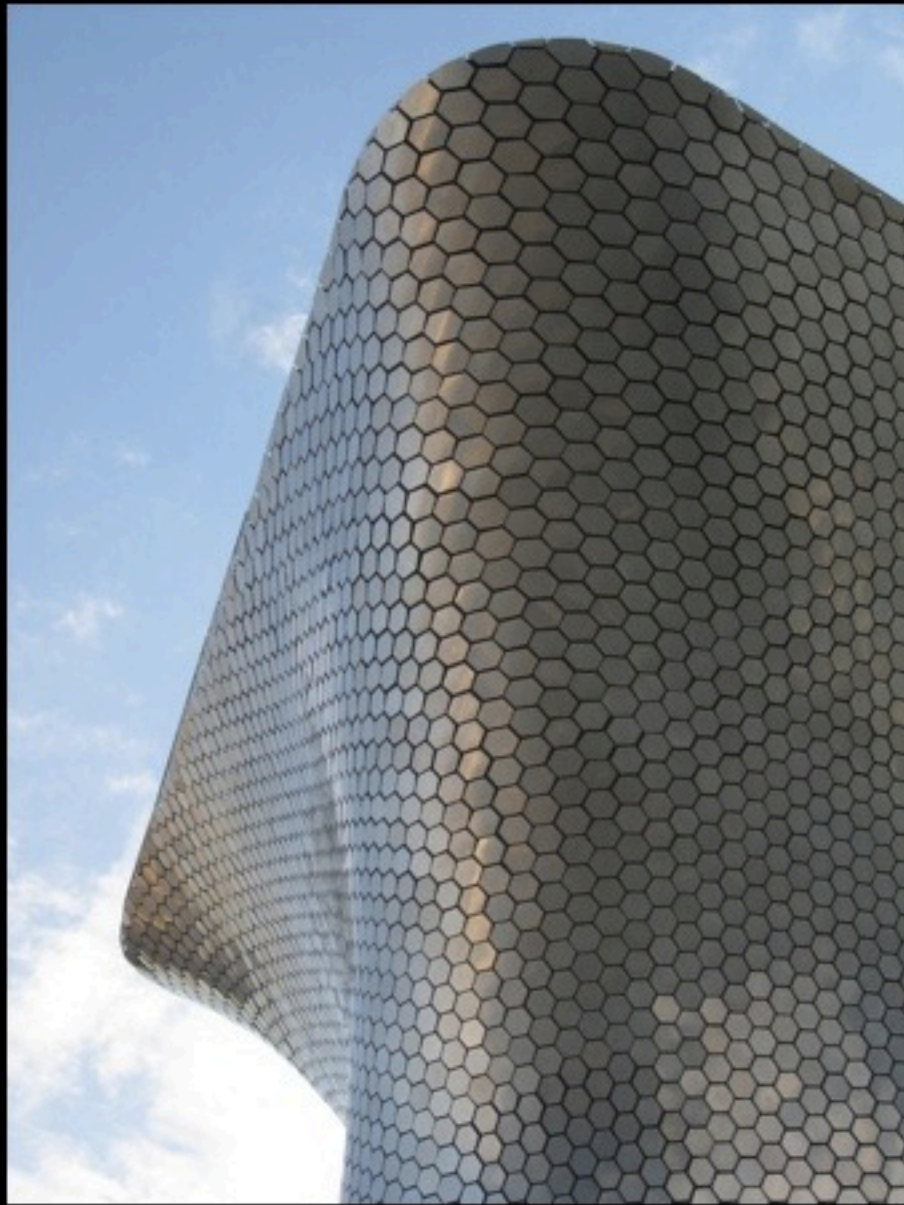


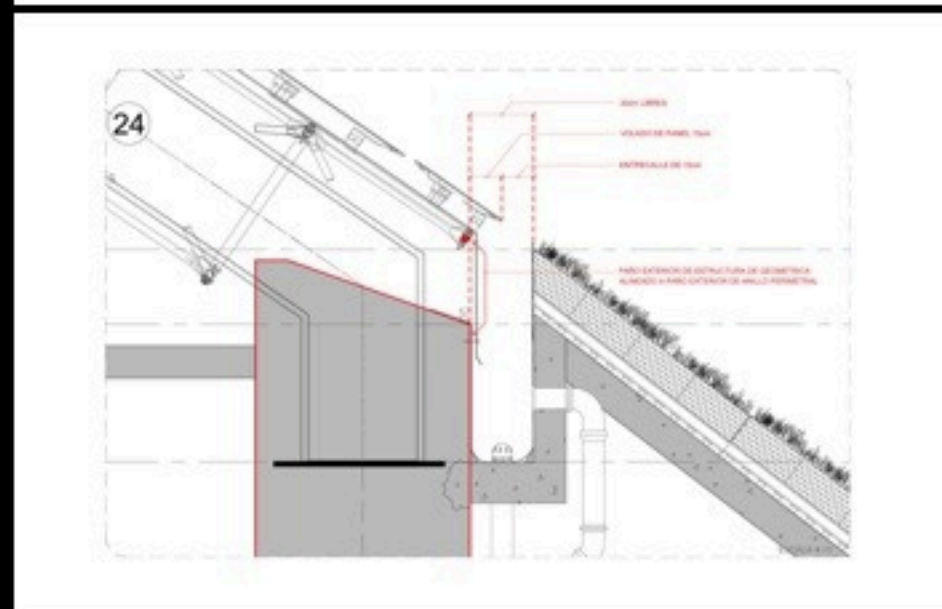
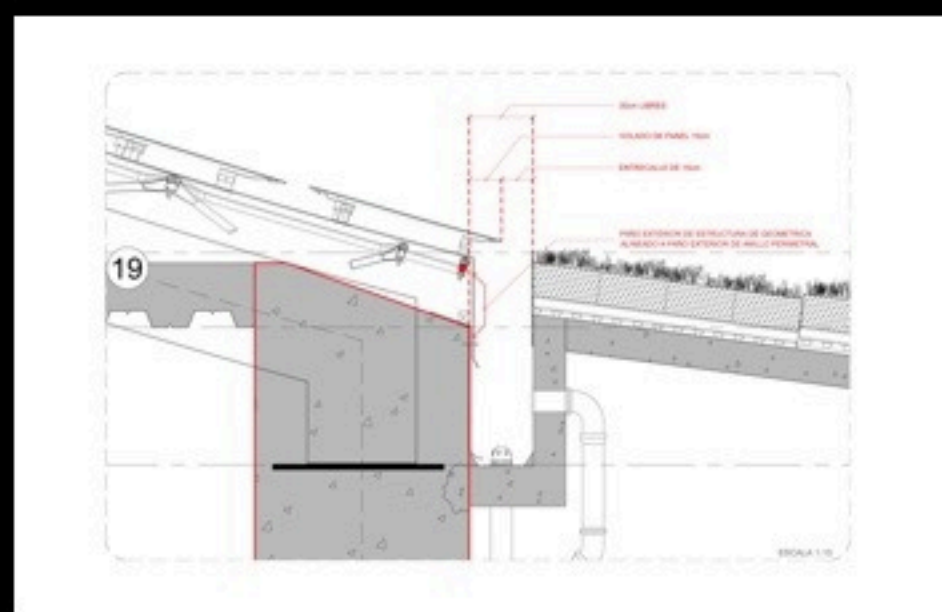
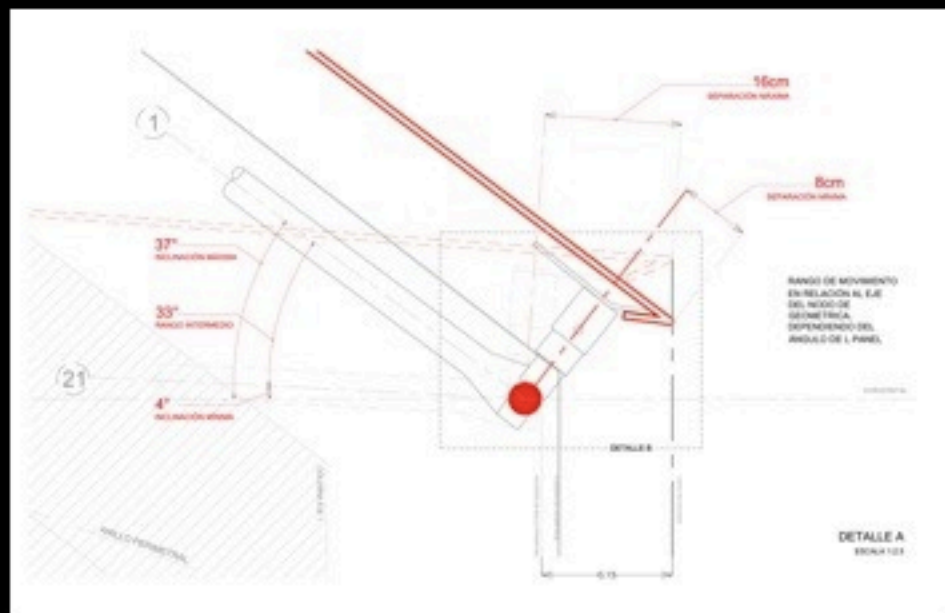


Building Skin Installation

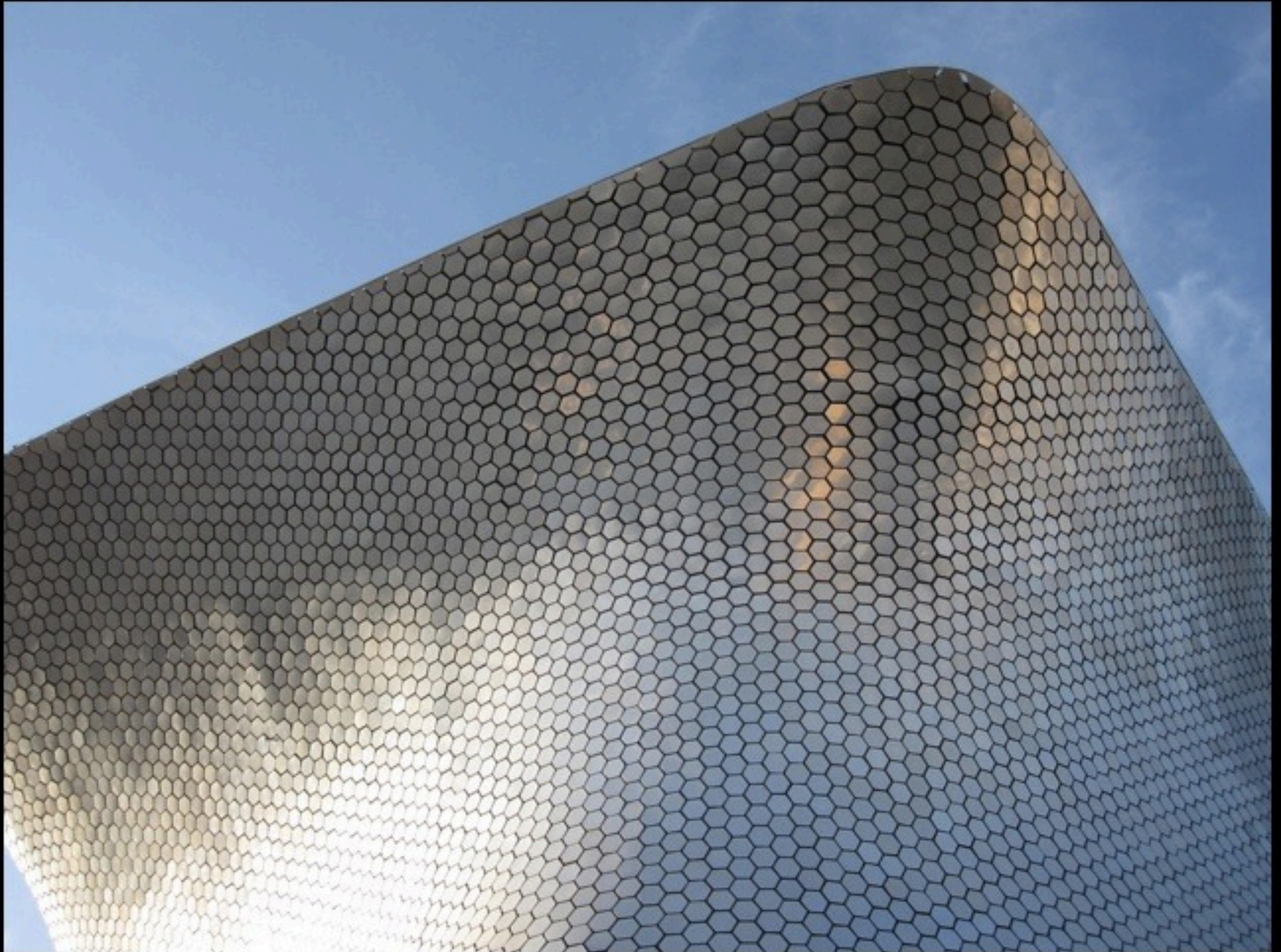


Soumaya Completed





Cladding Rules: Base Termination



Cladding Top Termination: No Coping



