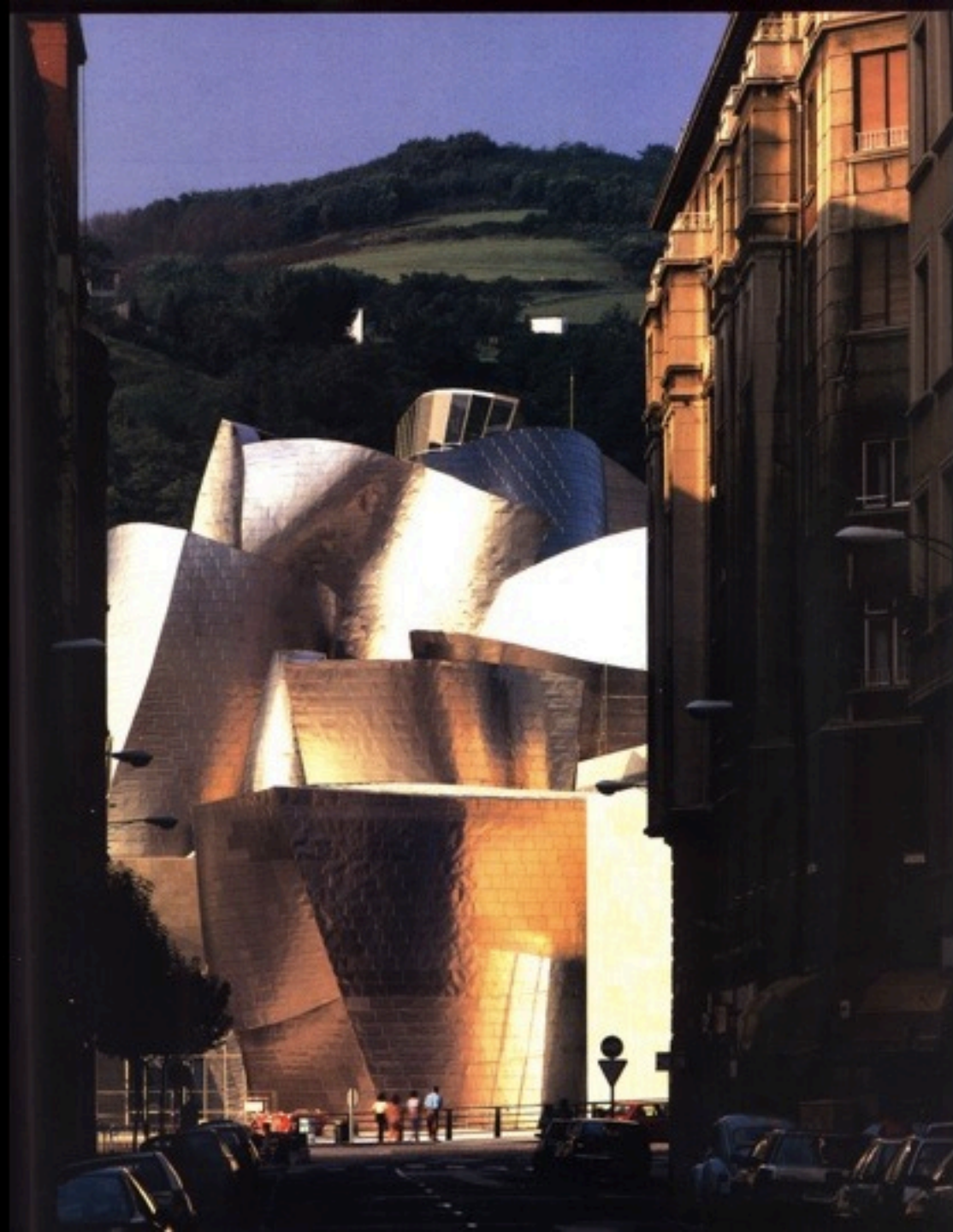
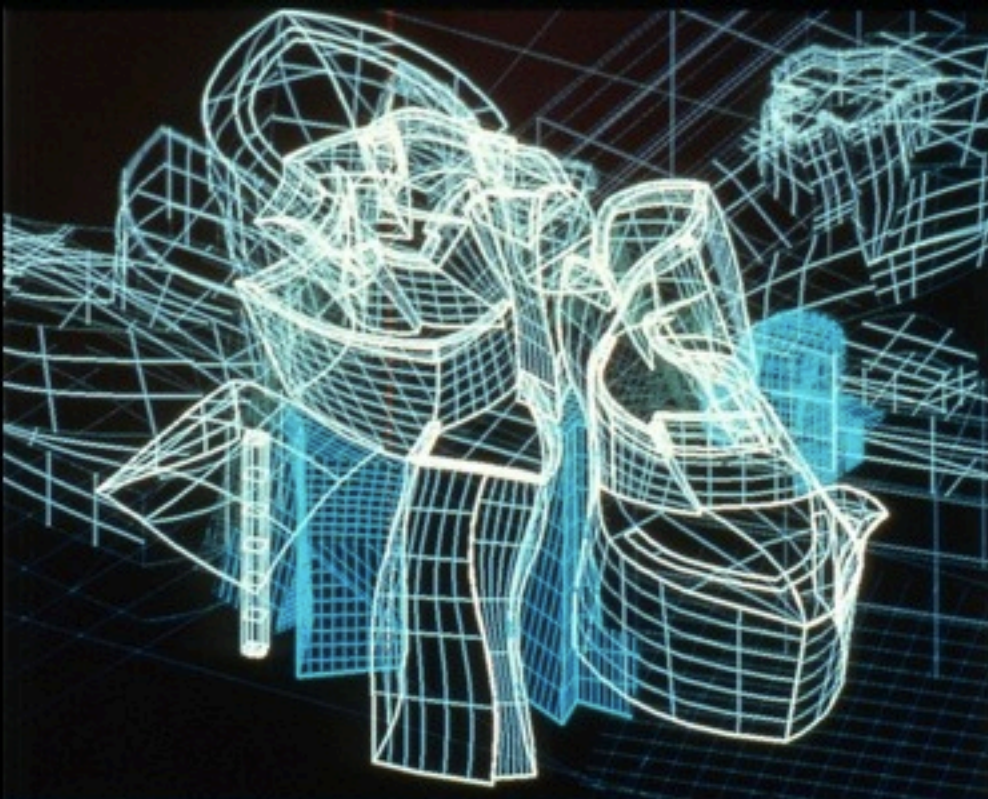


Bilbao



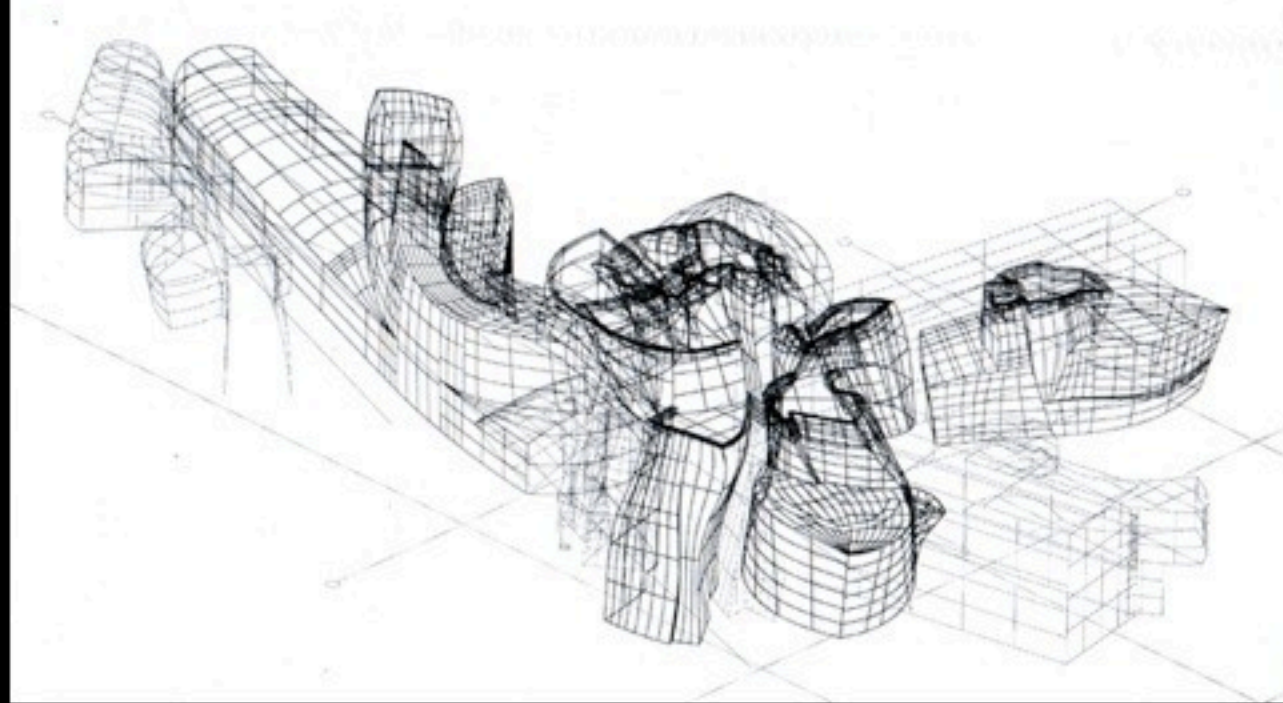




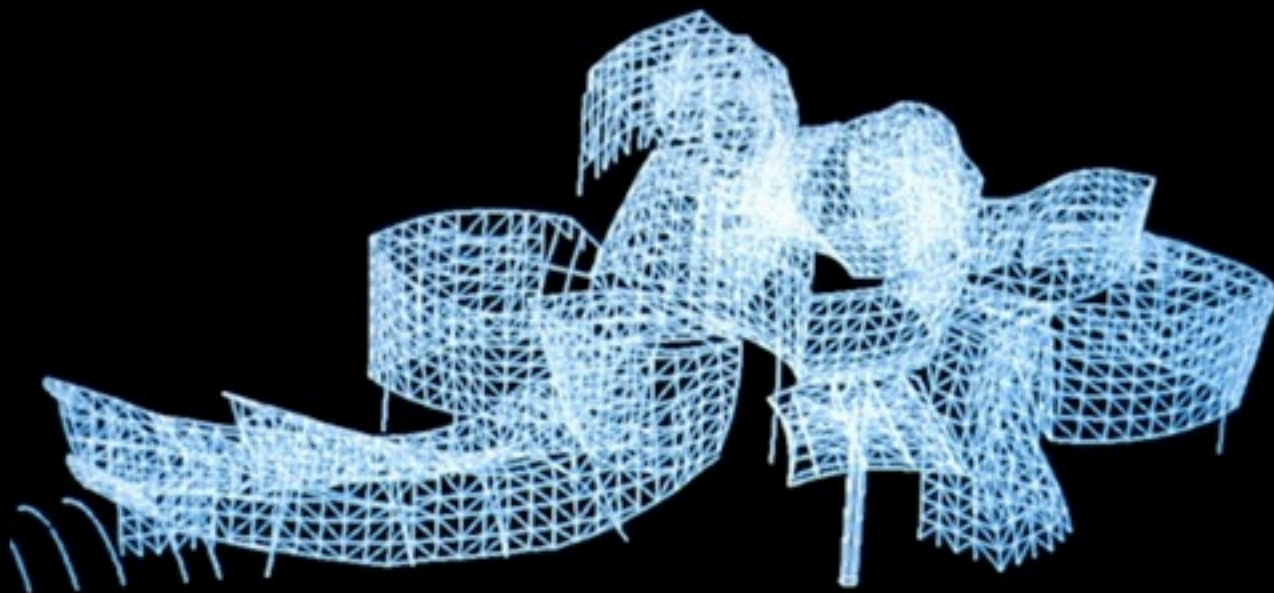
**Catia:
Master Geometry Surface Model**



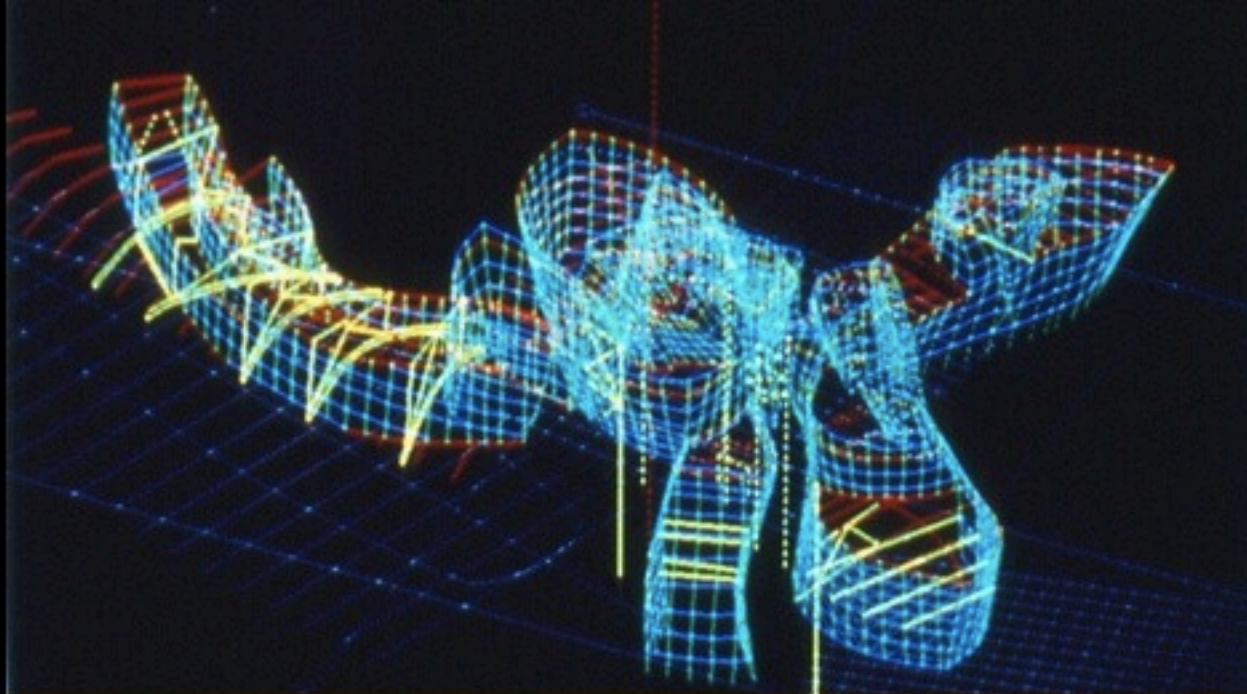
**Construction:
Face of cladding (titanium)
=
Master Geometry Surface Model**



**Catia:
Master Geometry
Surface Model**



**Catia:
Structural Wireframe
Model**



**Catia:
Structural Wireframe**

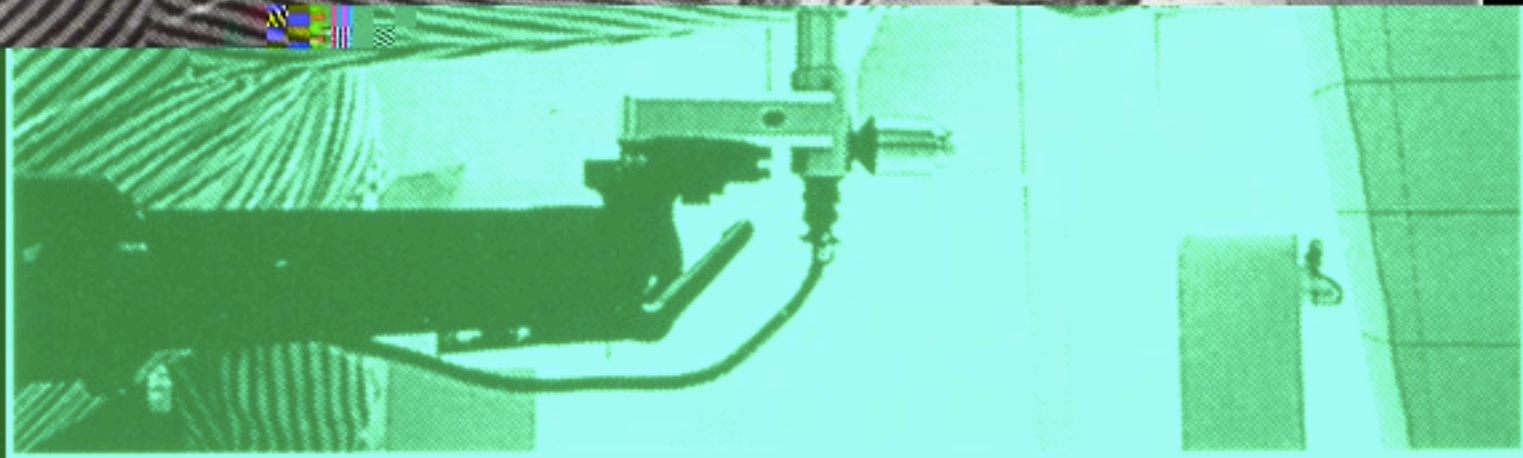


**Construction:
Steel Frame &
Masonry Back-Up
System**

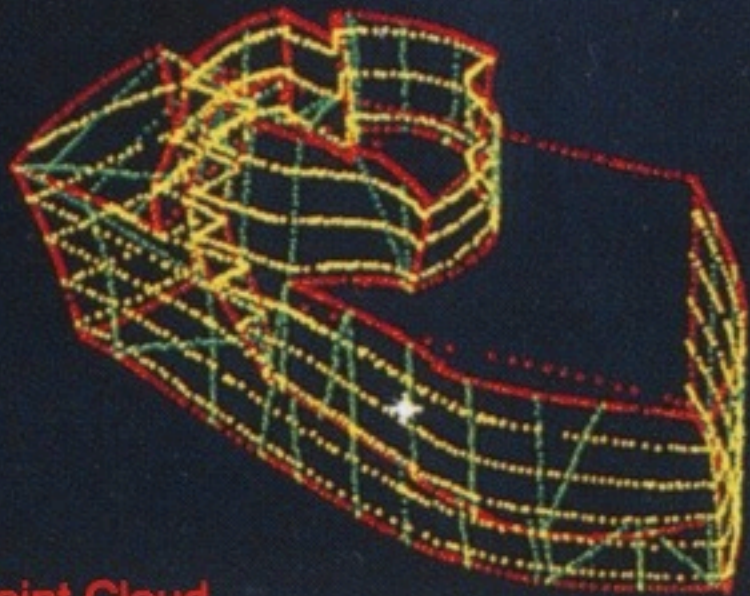
Panorámica desde Oficinas del Consorcio Guggenheim Bilbao.



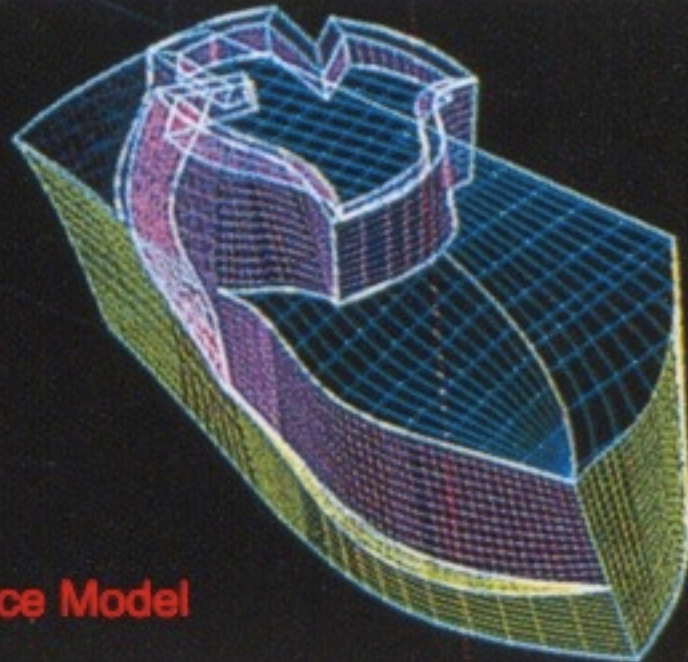
Design Models: Documenting the Evolution of the Design Process



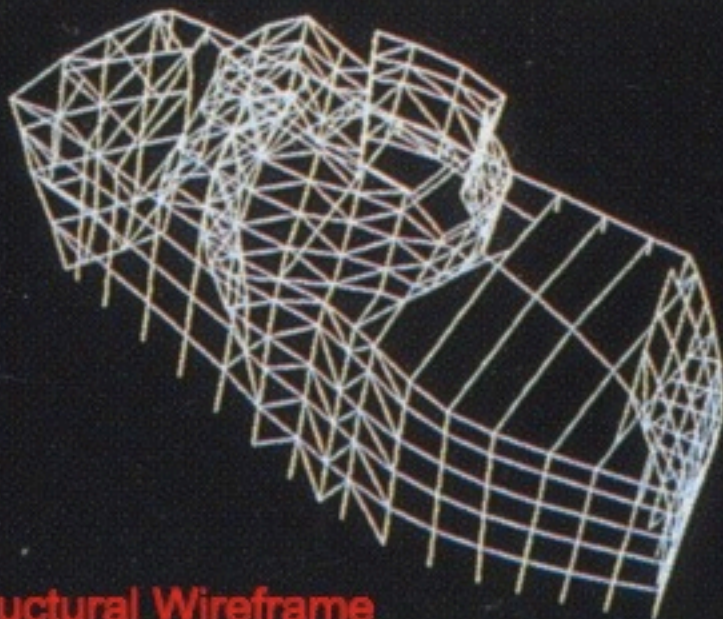
Digitizing the Physical Model



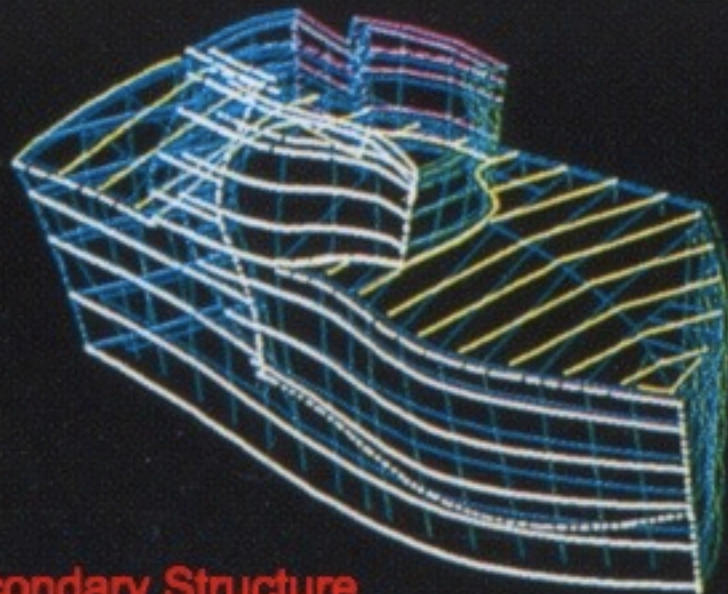
Point Cloud



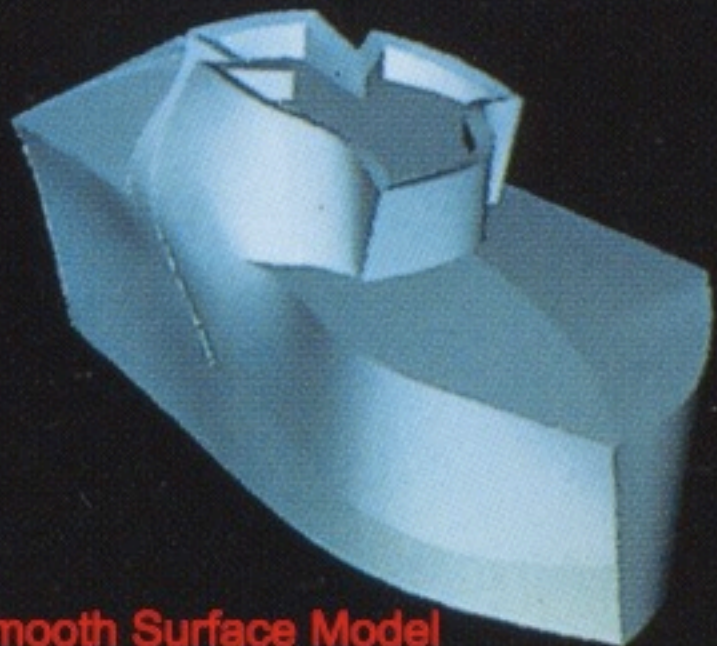
Surface Model



Structural Wireframe



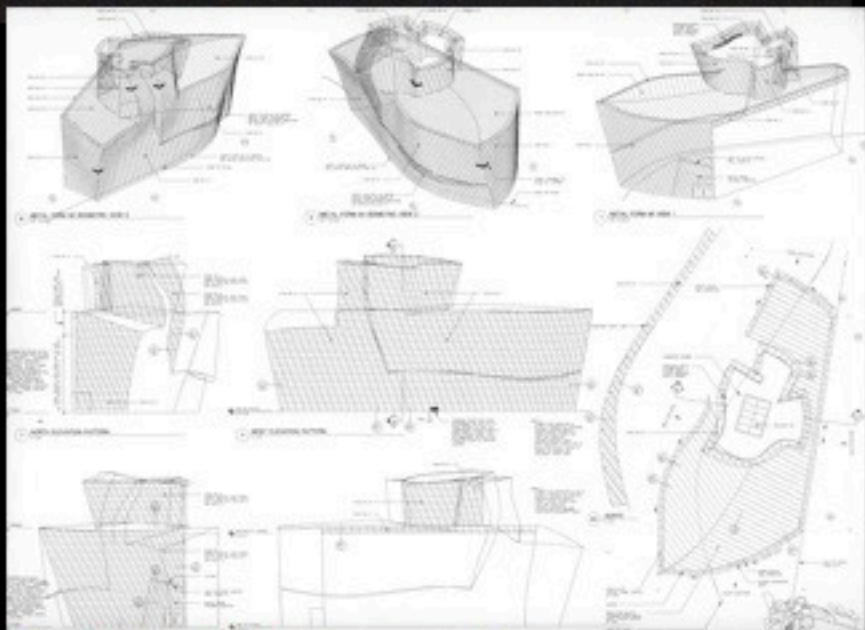
Secondary Structure



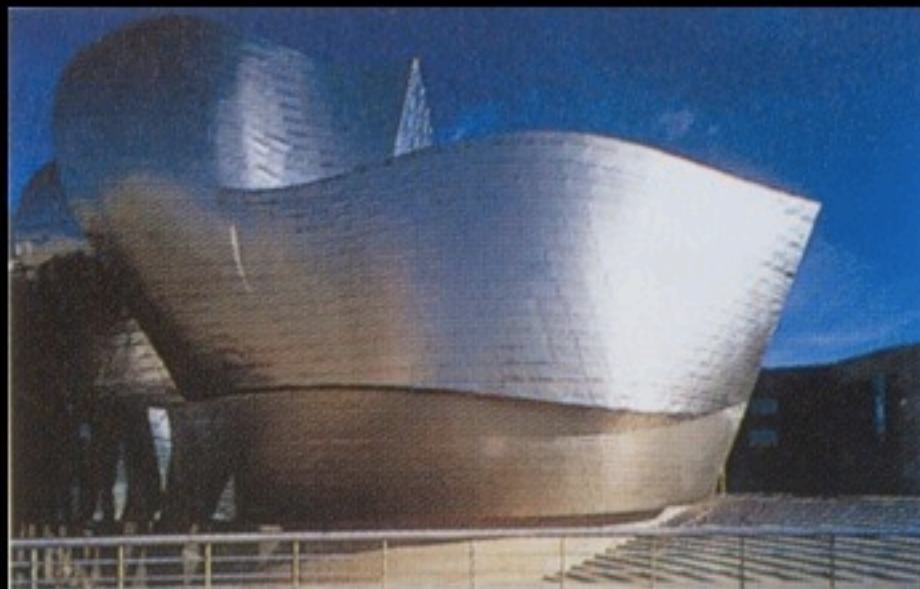
Smooth Surface Model



Verification Model



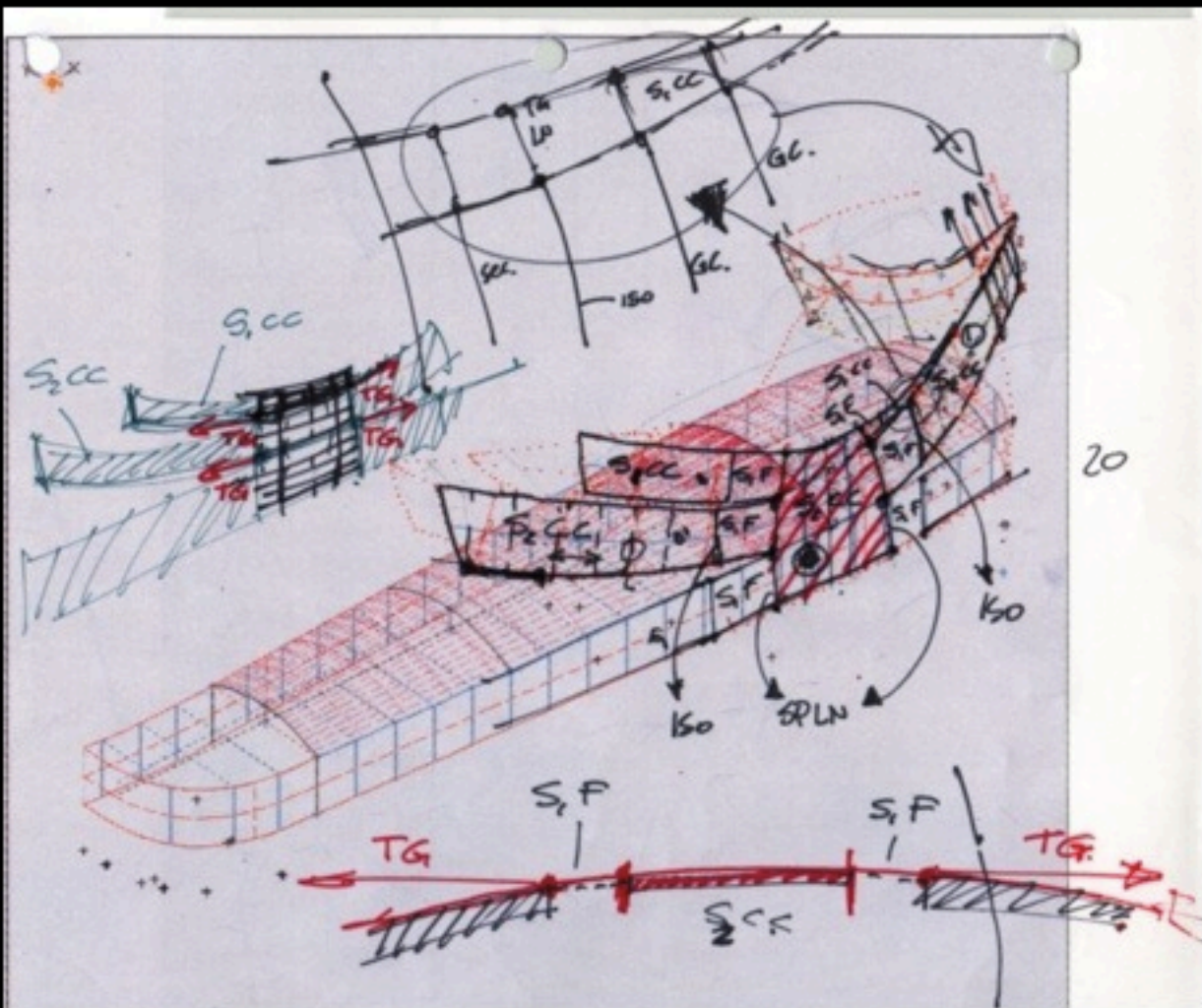
Construction Documents



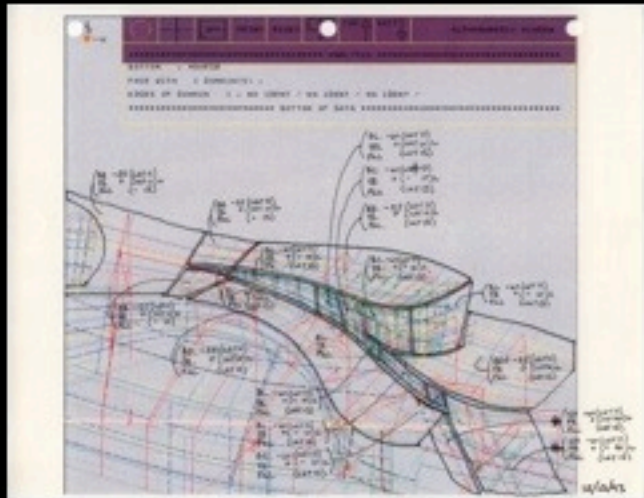
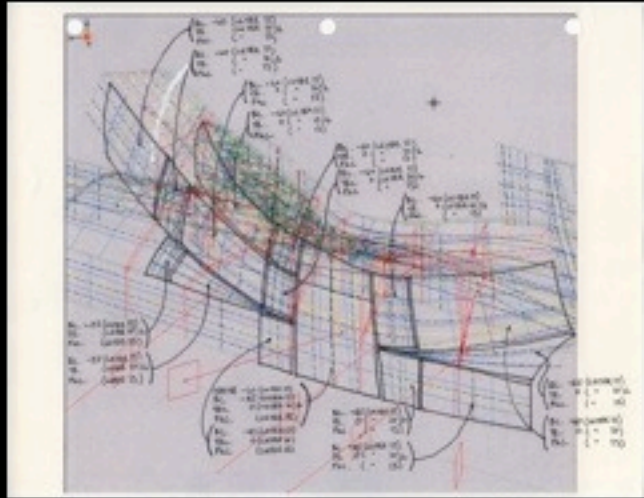
Nemo Built



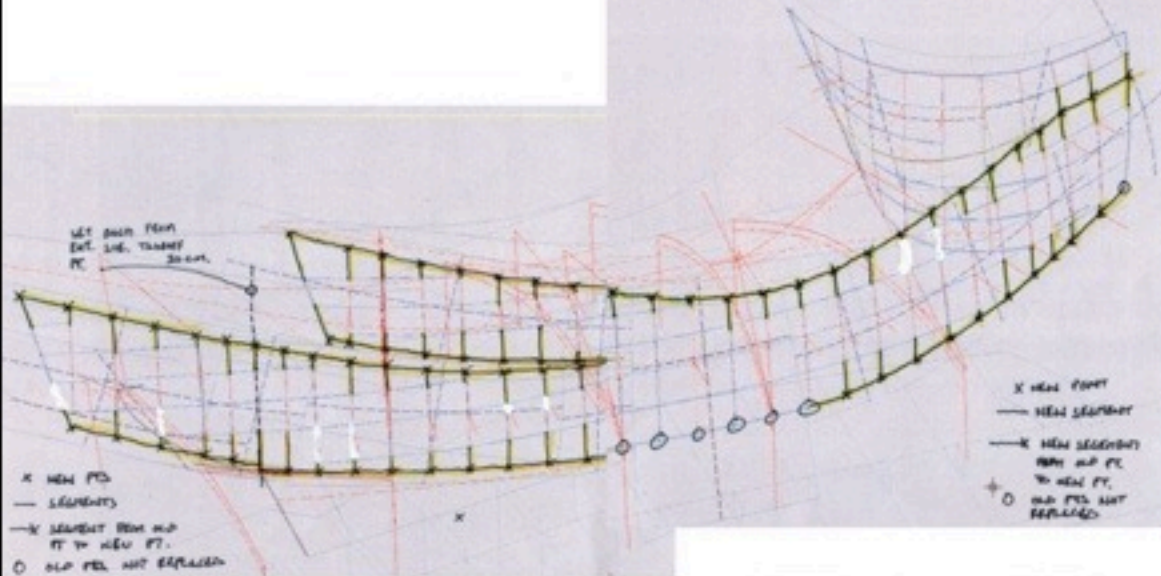
Module



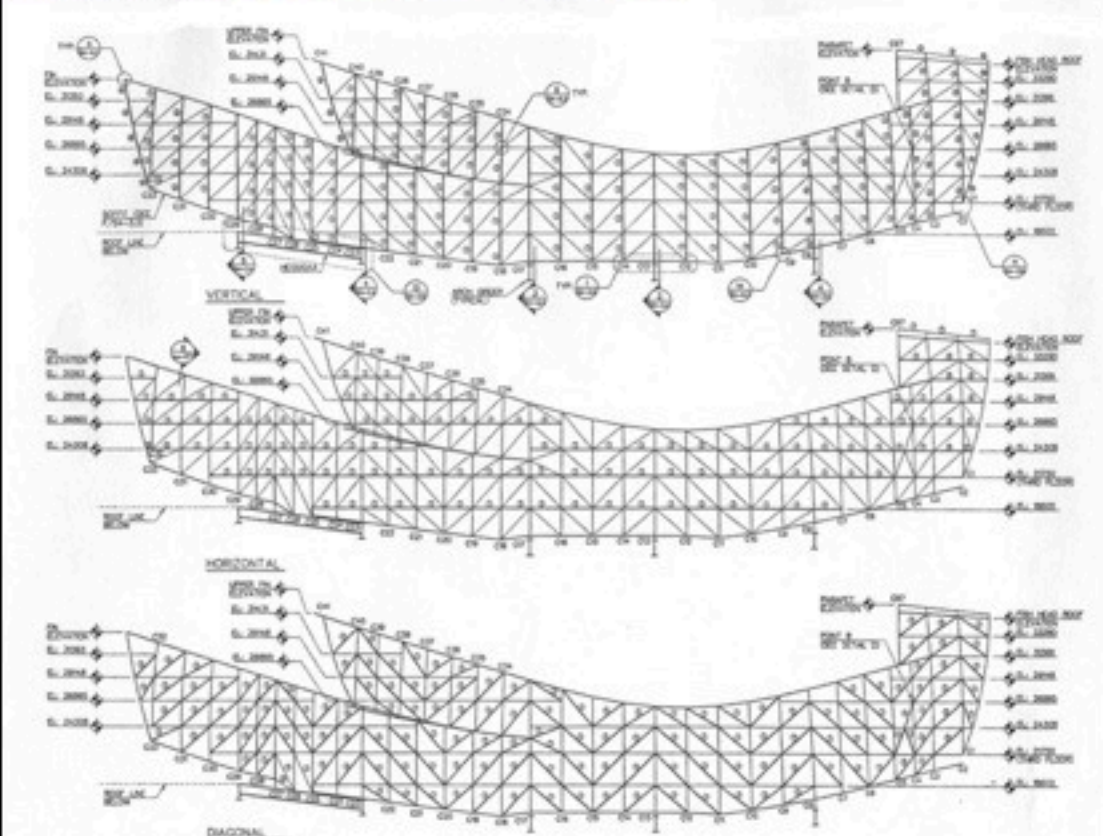
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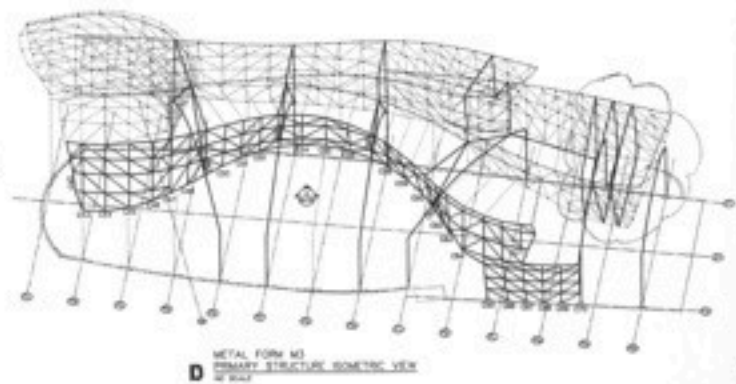
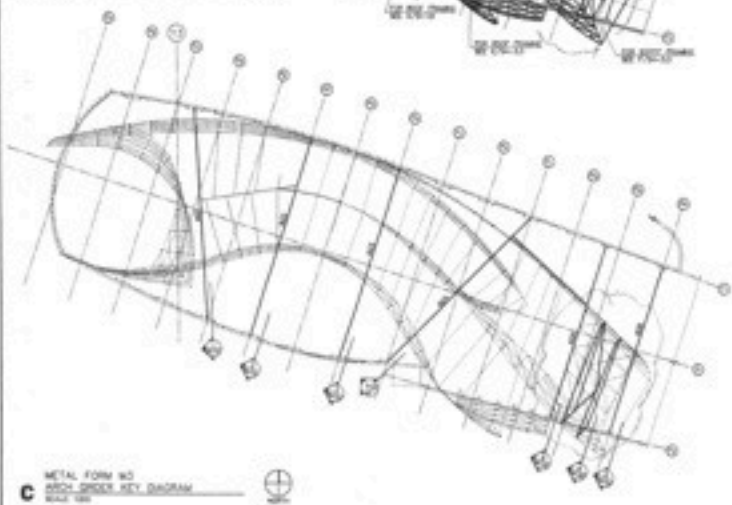
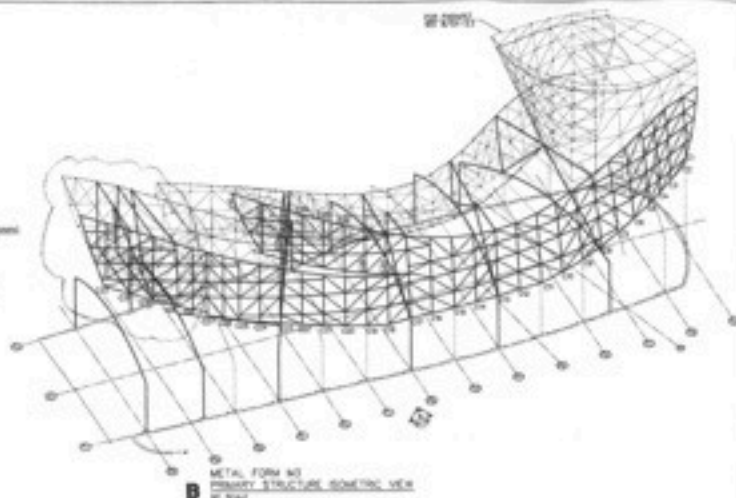
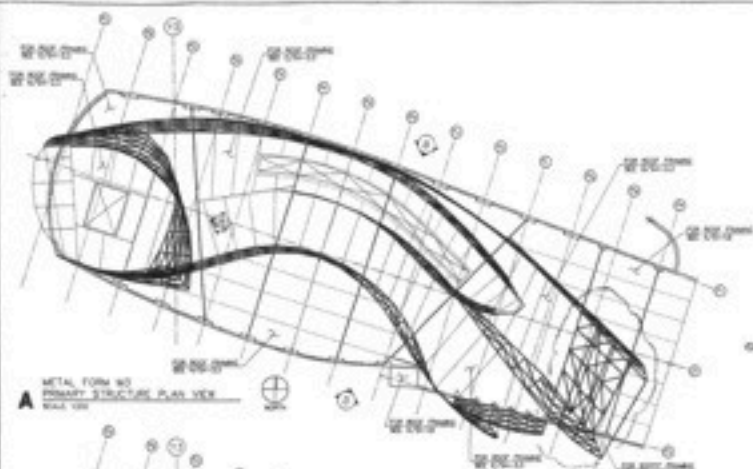
**Catia Screen Dumps:
Surface Geometry Rationalization**



Catia:
Structural Wireframe
Mapping 3M Intervals

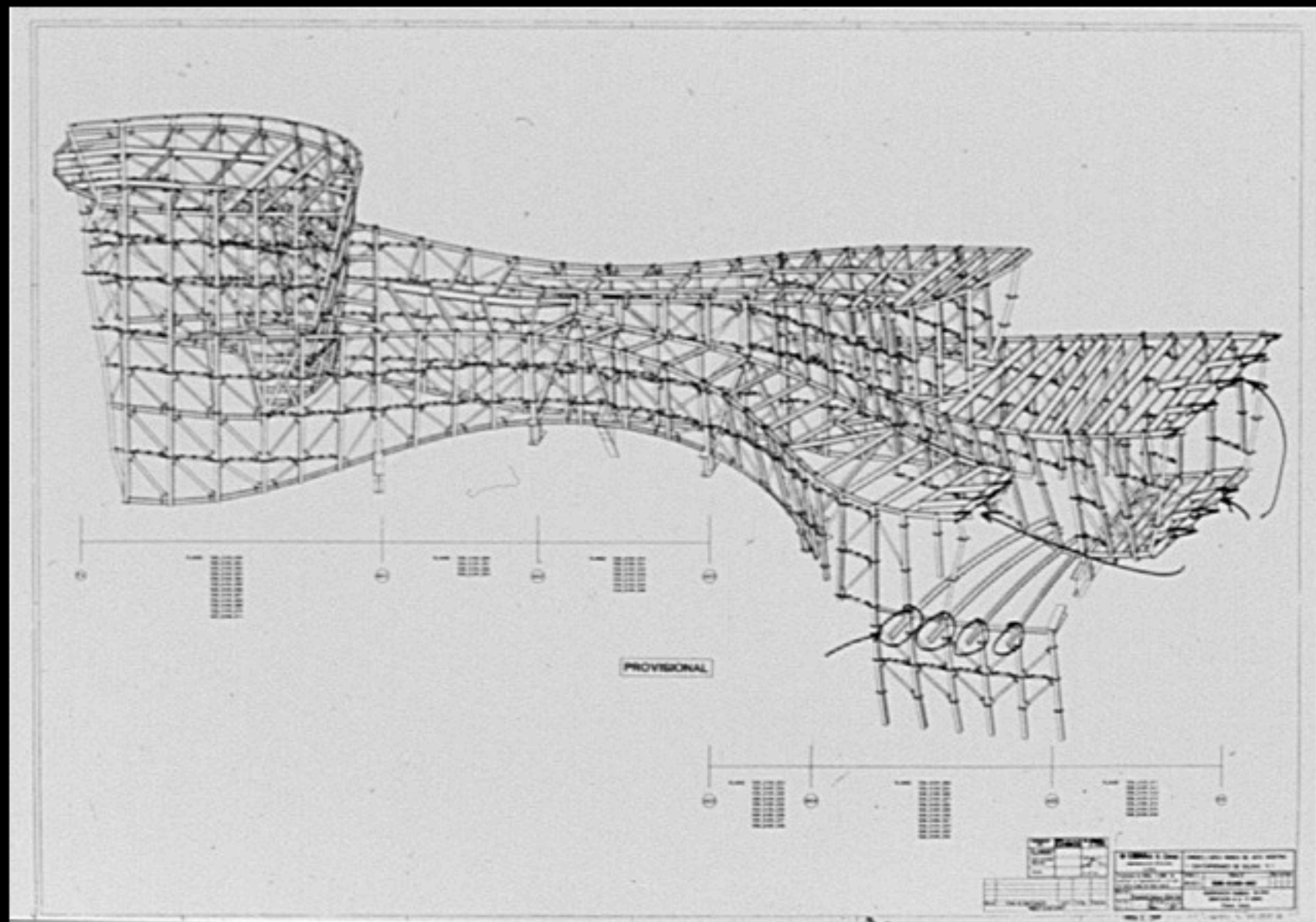


SOM Structural Drawings

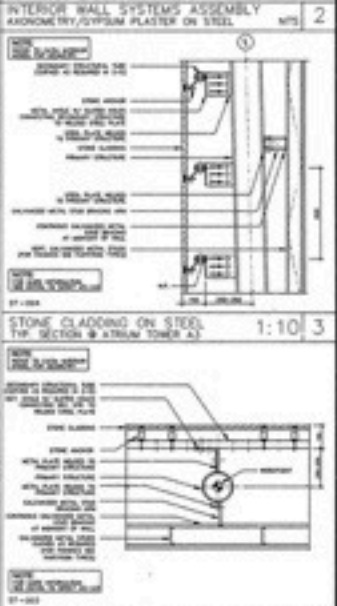
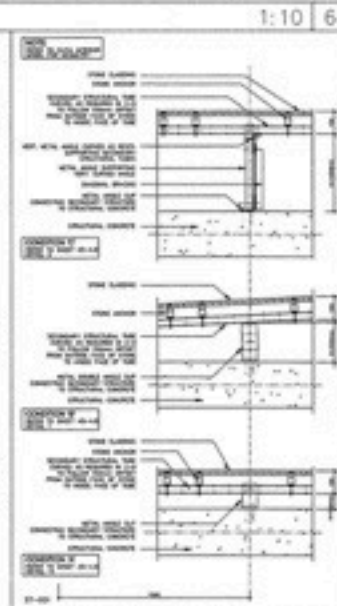
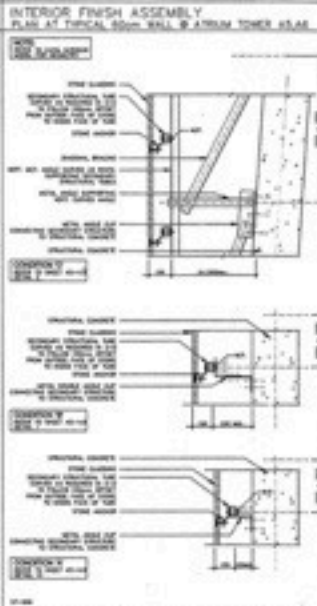
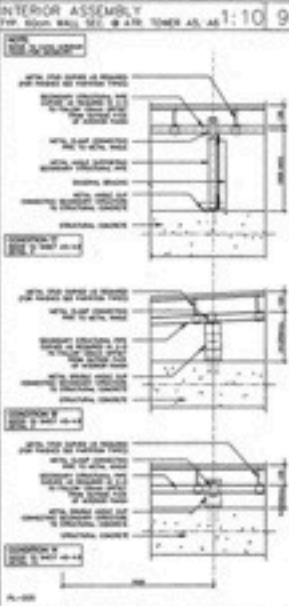
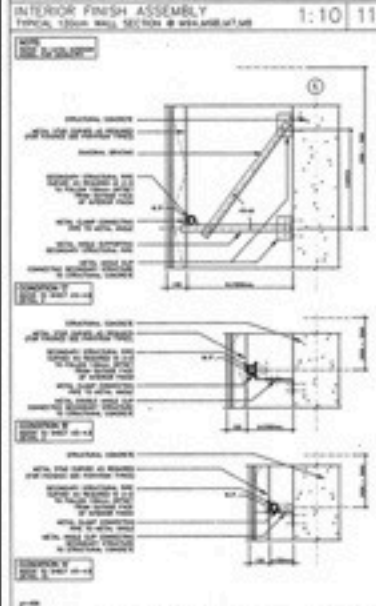
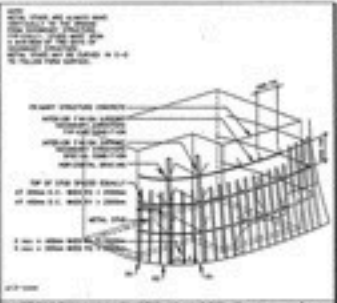
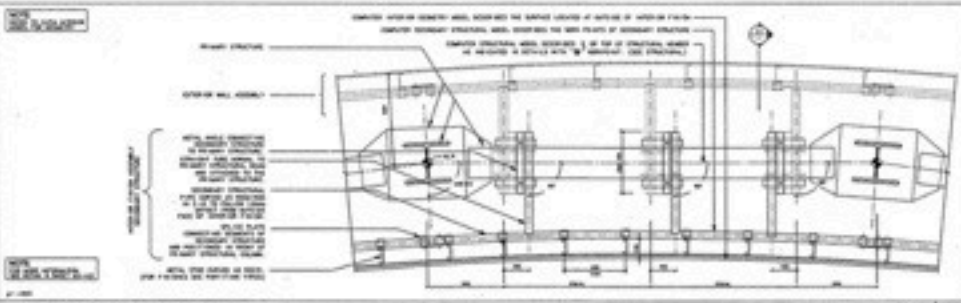
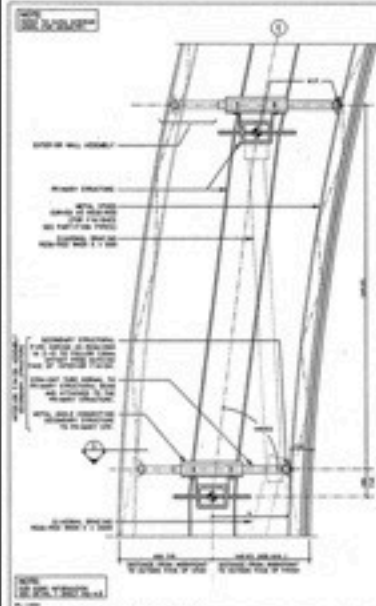


METAL FORM M3 WORK POINT COORDINATE SCHEDULE

LOWER ROOF - NORTH (10/26/22, A-B/10)		
WORK POINT	X COORDINATE	Y COORDINATE
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2	10.000	10.500
3	10.000	11.000
4	10.000	11.500
5	10.000	12.000
6	10.000	12.500
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332	10.000	175.500
333	10.000	176.000
334	10.000	



T-1000 Shop Drawing



GYPSUM PLASTER ON CONCRETE
TYP. SECTION @ ATRium TOWER AS.4E 1:10 12

GYPSUM PLASTER ON CONCRETE
TYP. SECTION @ ATRium TOWER AS.4E 1:10 10

STONE CLADDING ON CONCRETE
TYP. SECTION @ ATRium TOWER AS.4E 1:10 8

STONE CLADDING ON CONCRETE
TYP. SECTION @ ATRium TOWER AS.4E 1:10 7

STONE CLADDING ON STEEL
TYP. SECTION @ ATRium TOWER AS.4E 1:10 4

INTERIOR FINISH ASSEMBLY
PLAN AT TYPICAL 1200mm WALL @ MTR.4E/AS.4E 1:10 5

INTERIOR FINISH ASSEMBLY
TYPICAL 1200mm WALL SECTION @ ATRium TOWER AS.4E 1:10 11

INTERIOR FINISH ASSEMBLY
TYPICAL 1200mm WALL SECTION @ ATRium TOWER AS.4E 1:10 9

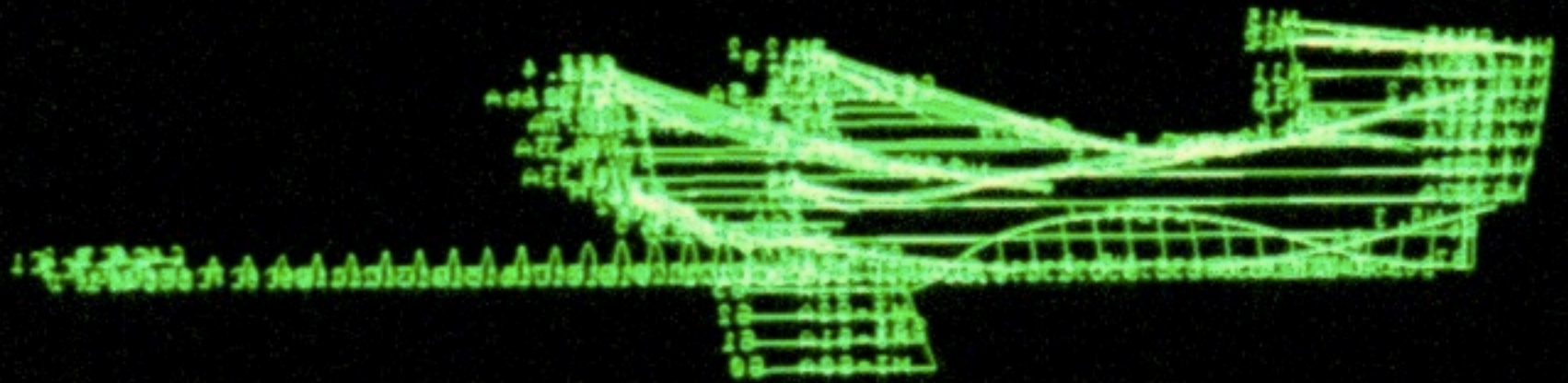
INTERIOR FINISH ASSEMBLY
PLAN AT TYPICAL 1200mm WALL @ ATRium TOWER AS.4E 1:10 6

INTERIOR WALL SYSTEMS ASSEMBLY
RANDOM/RY/TYPICAL PLASTER ON CONCRETE 1:10 1

INTERIOR WALL SYSTEMS ASSEMBLY
RANDOM/RY/TYPICAL PLASTER ON STEEL 1:10 2

STONE CLADDING ON STEEL
TYP. SECTION @ ATRium TOWER AS.4E 1:10 3

FRANK O. GERRY & ASSOCIATES, INC.
Guggenheim Museum Bilbao
SYSTEMS DESCRIPTION
STONE, PLASTER &
SECONDARY STRUCTURE
AS-41



T-1000 Secondary Structure



T-1000 & Boat Skin



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

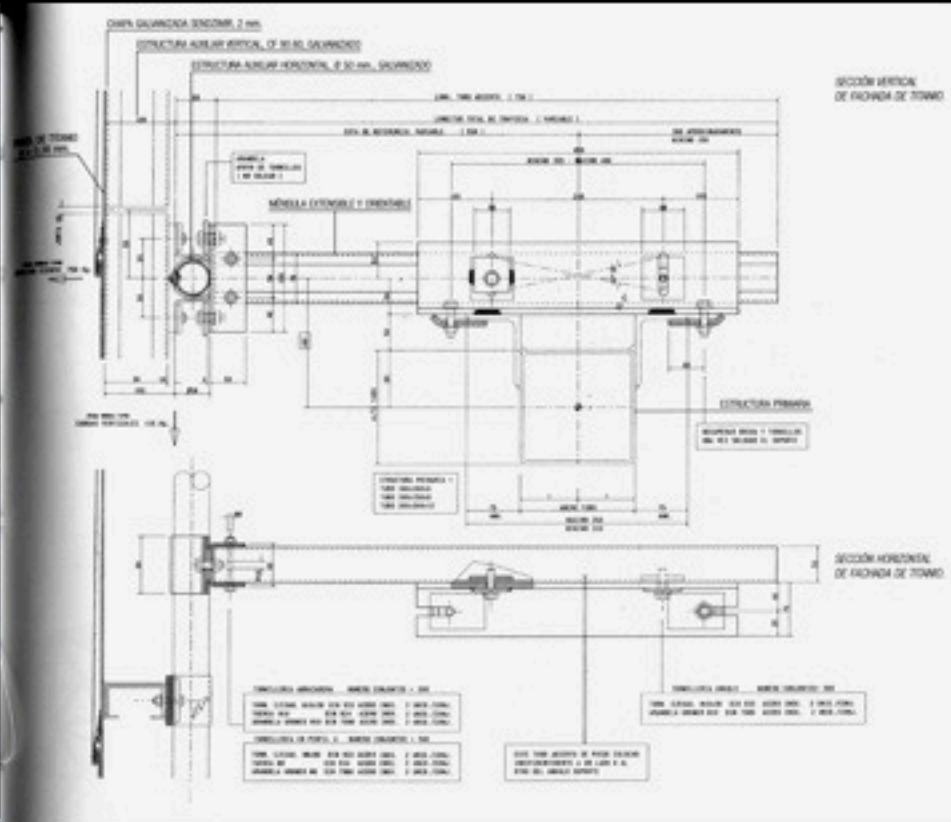
Successive Stages of Construction:

Primary Structure

Secondary Structure

Sheathing

**M-Elements Enclosure Assembly System:
 Primary Steel = Straight Sticks
 Secondary Structure = Curved Pipes & Mtg 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".



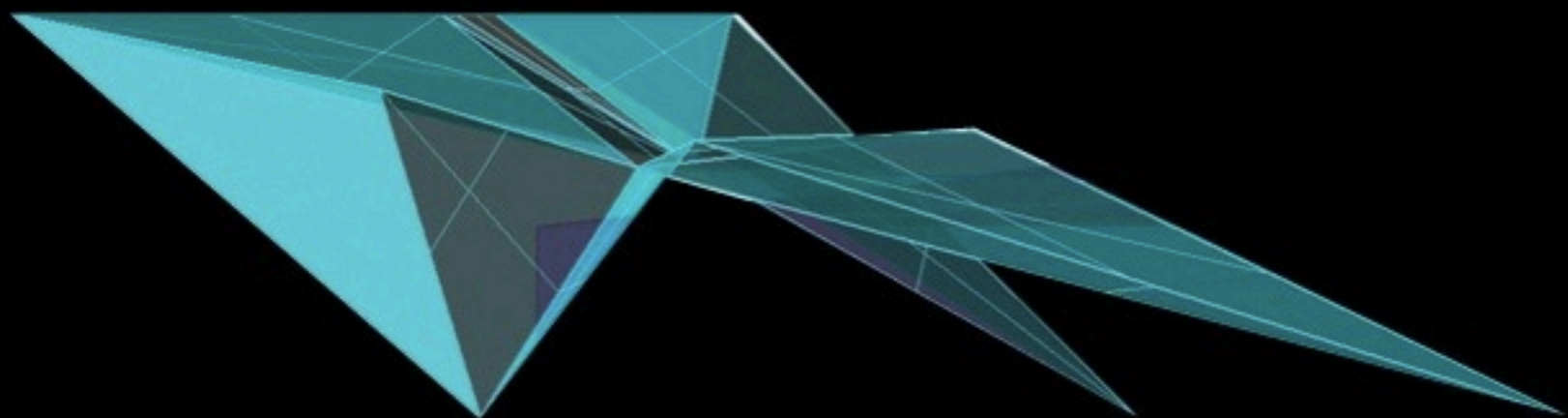
Envolverte de Chapa Galvanizada en el "M-3: T-1000".





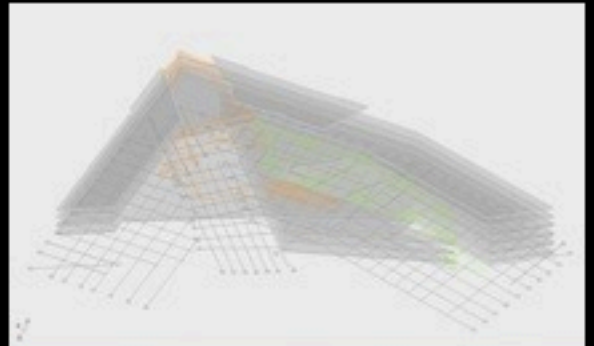


Dubai





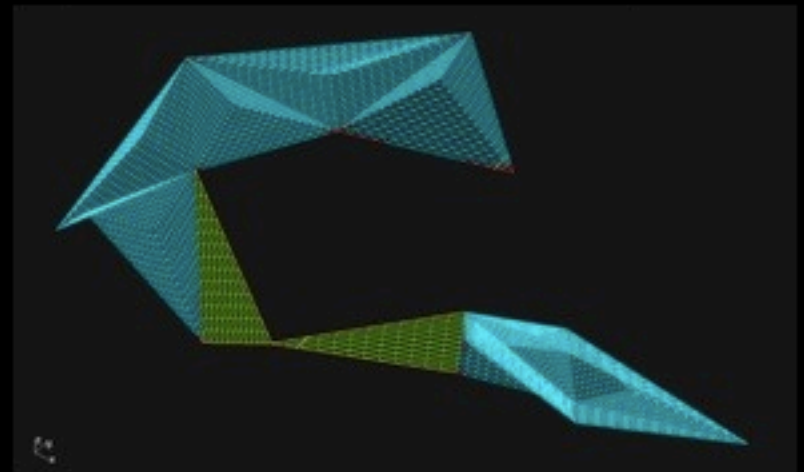
**One Zabeel: 2 Million Square Feet Mixed Use Development
Retail / Residential / Office / Hotel**

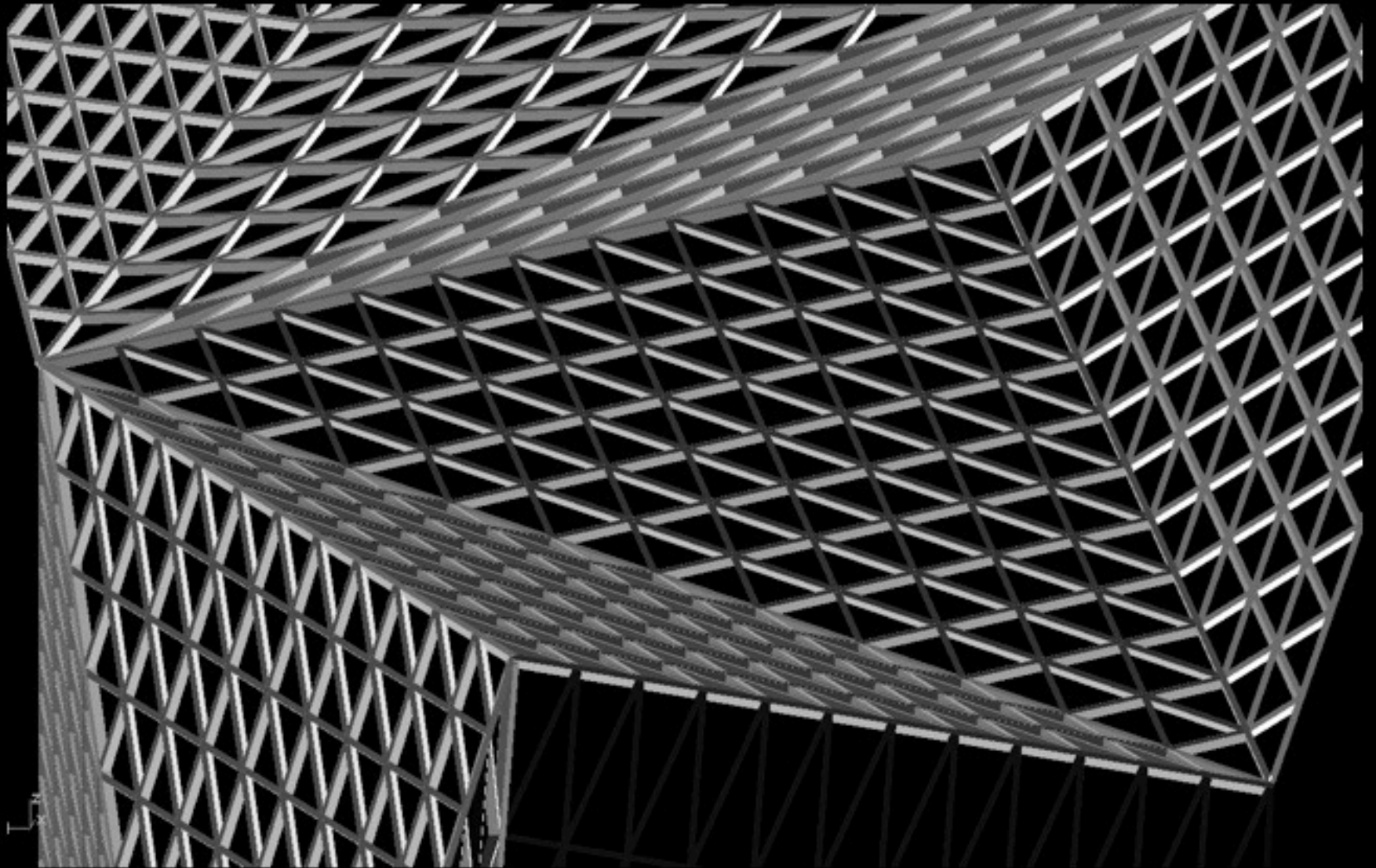


Atrium Skylight Enclosure Measuring 150ft x 900ft long (3 football fields)

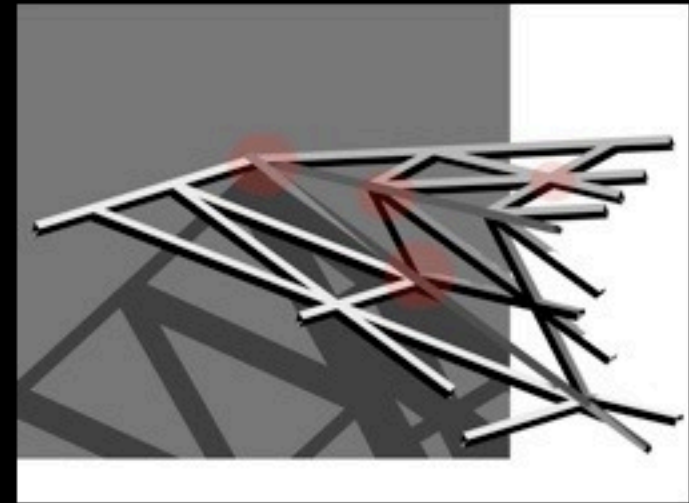
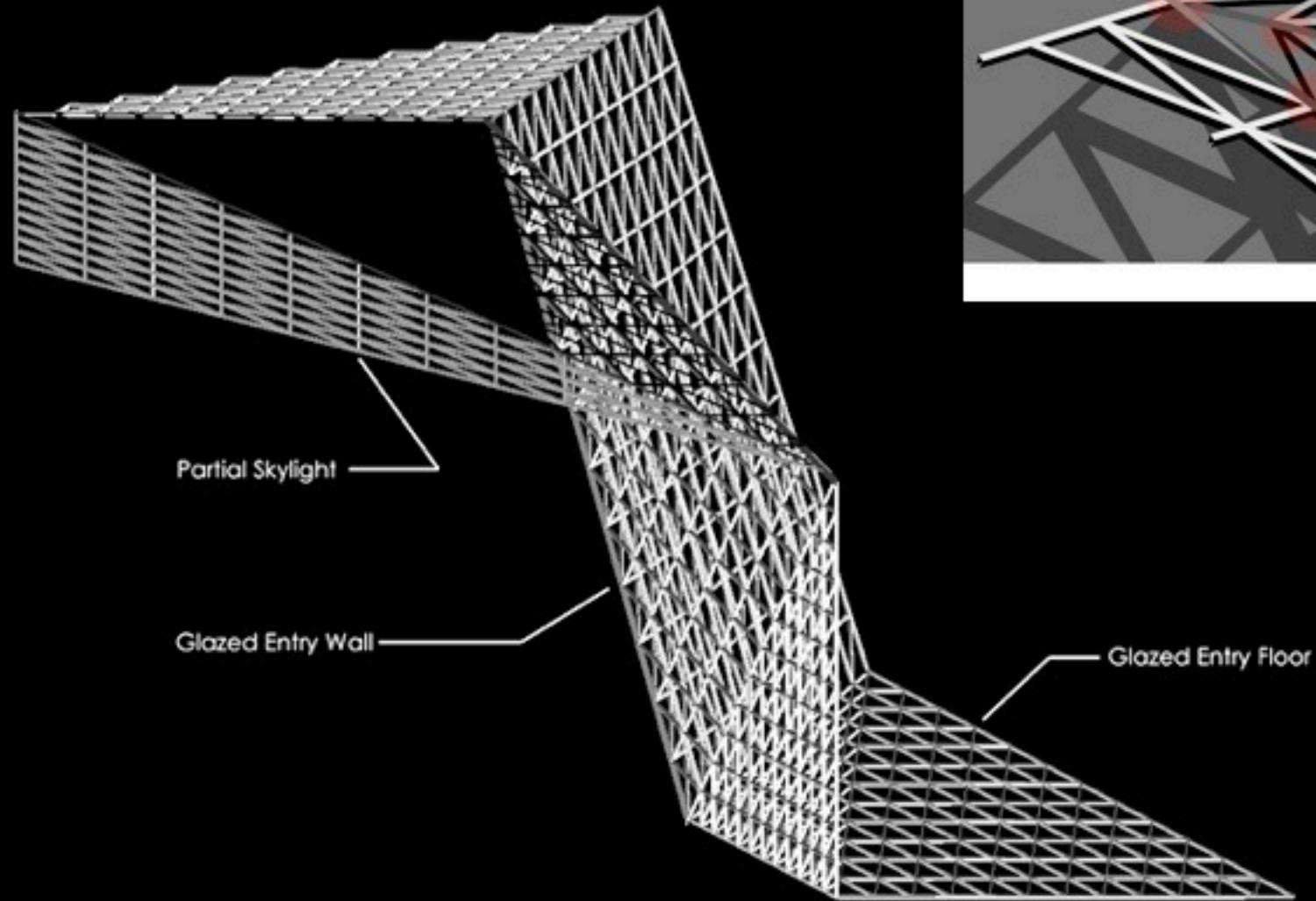
Driving Goals

- 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

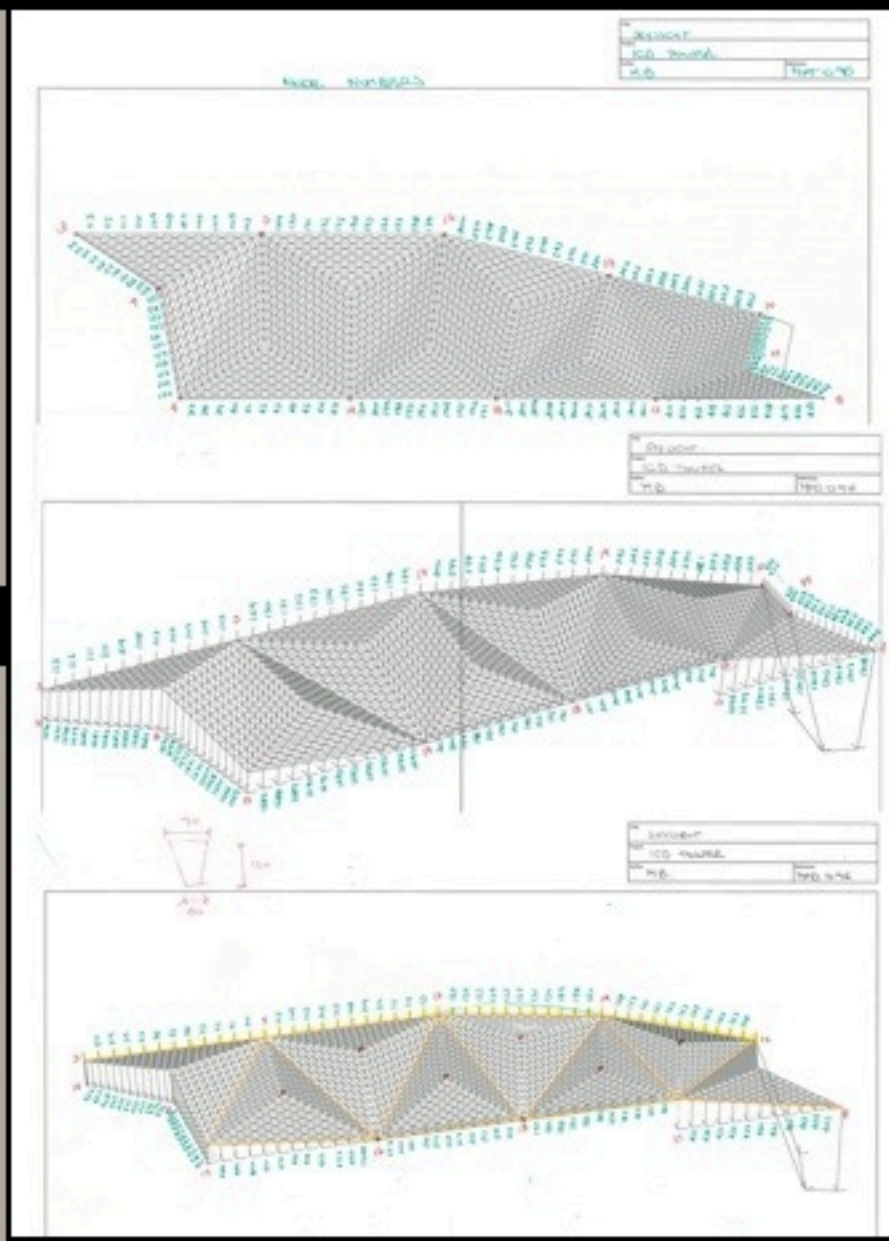
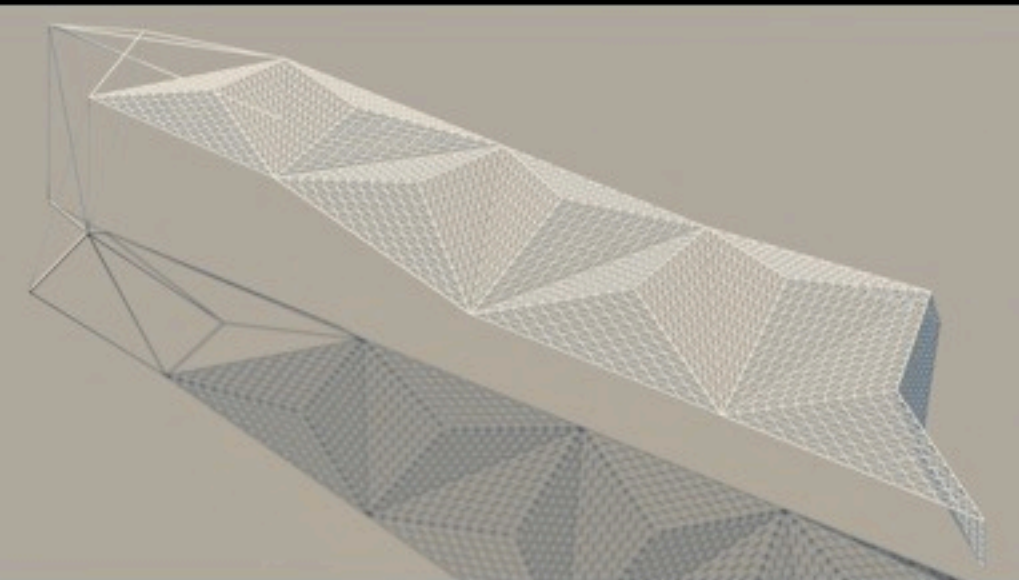
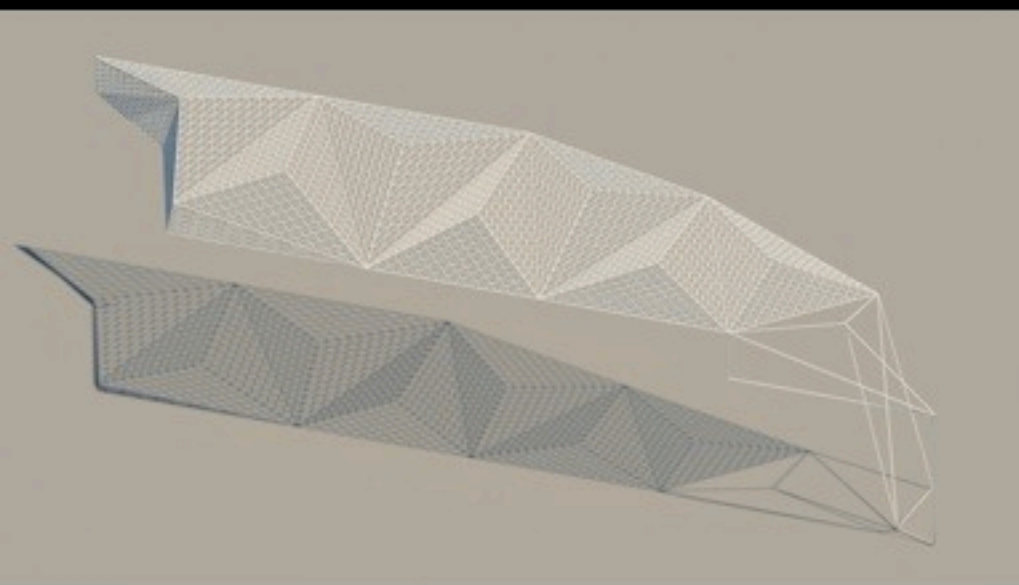




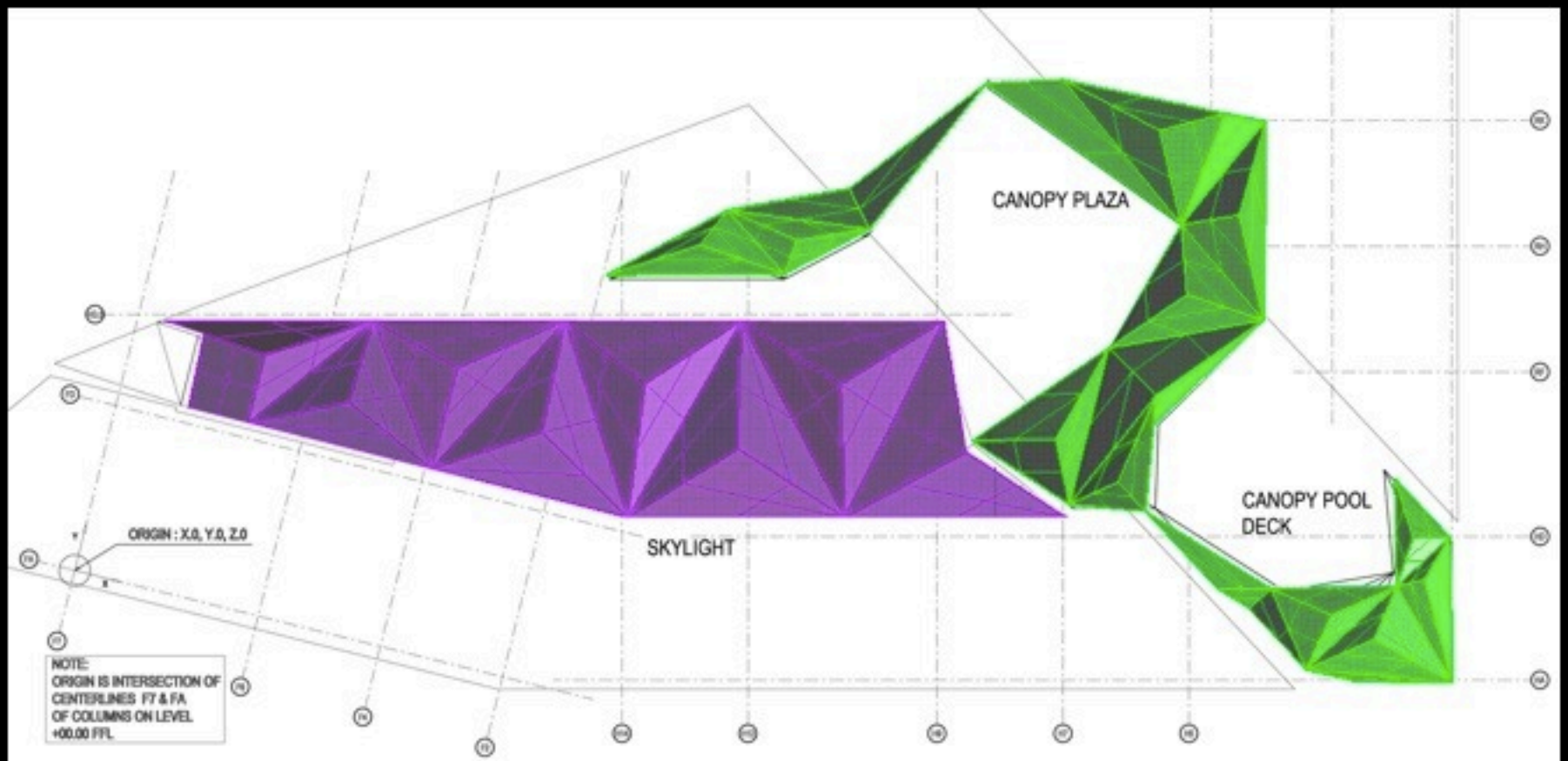
Pleating = Structure



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

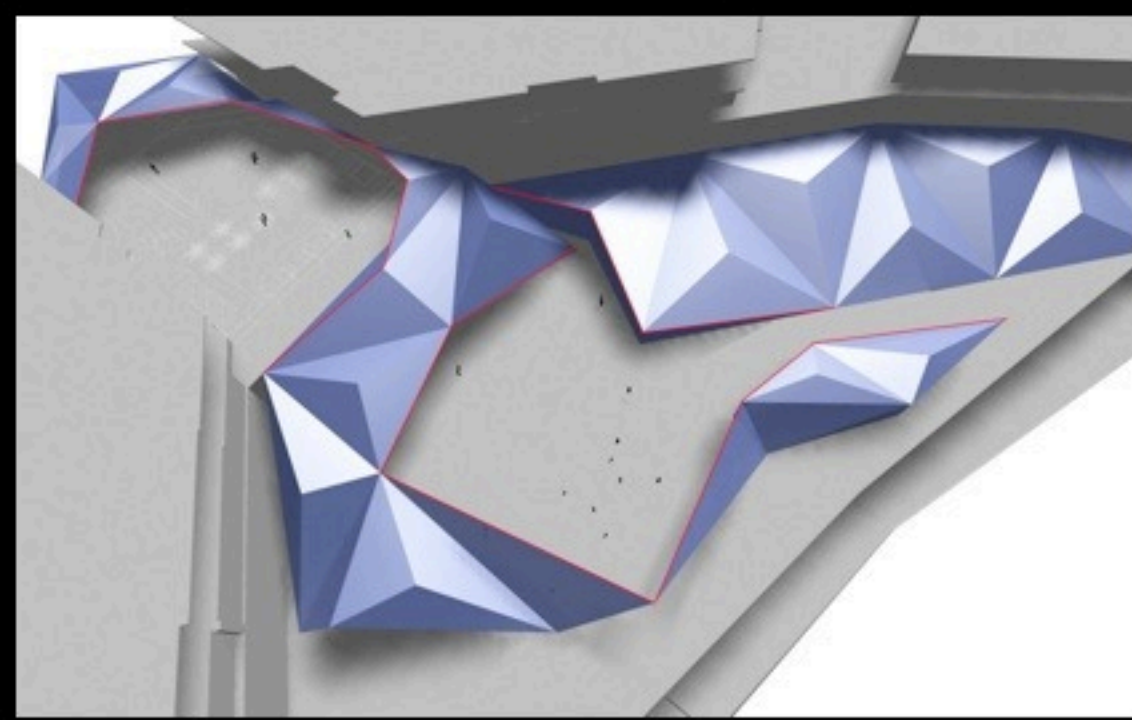
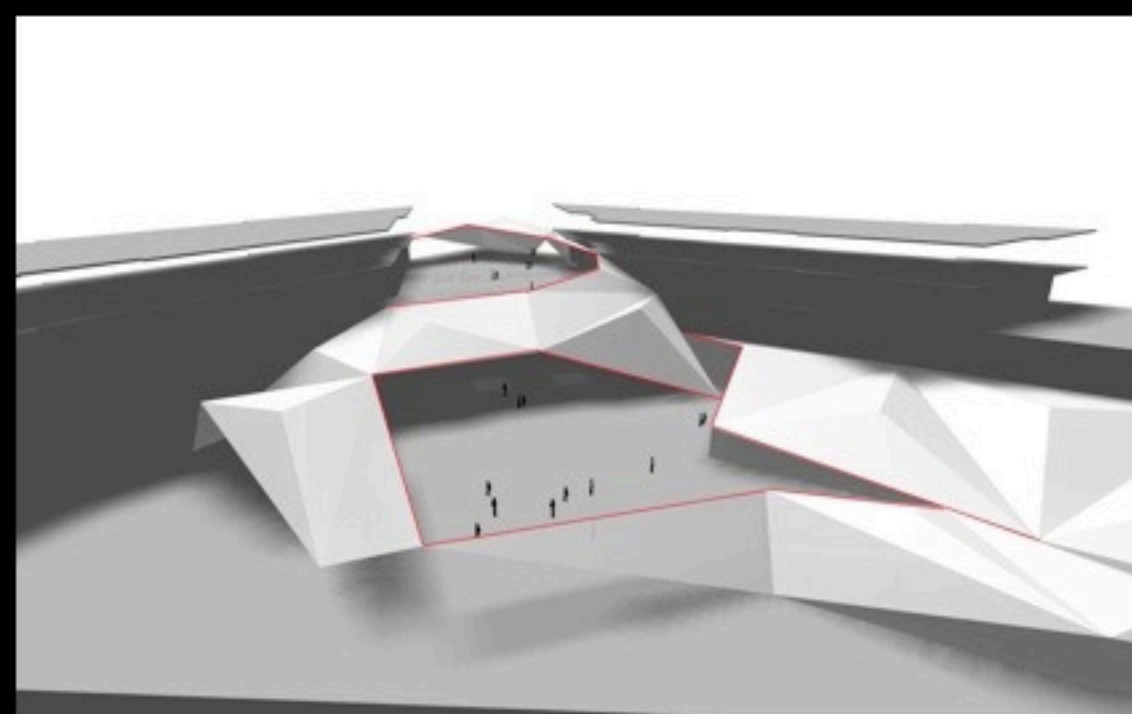


Skylight Enclosure Wireframe Model & Structural Finite Analysis Models



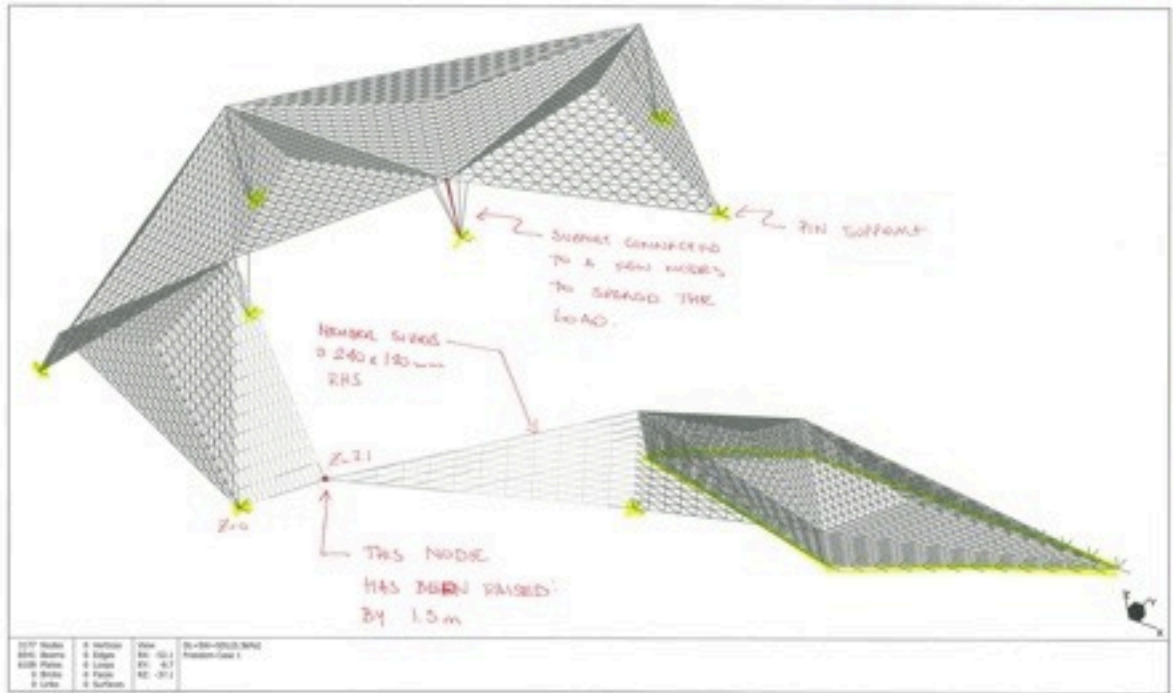
Adaptability

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.

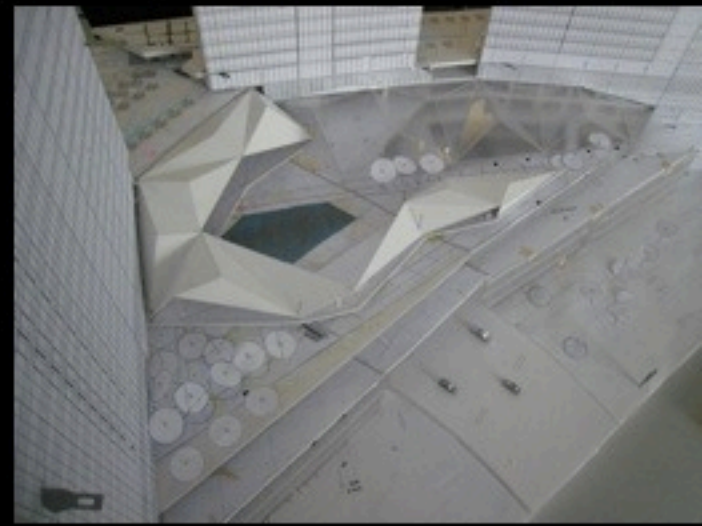


**System Expands to accommodate
Adjacent Program Uses**

PELUM CANOPY	
100 TOWER	
MD	MEB09C



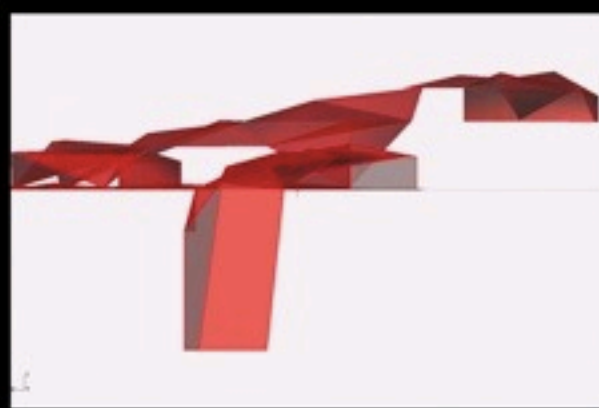
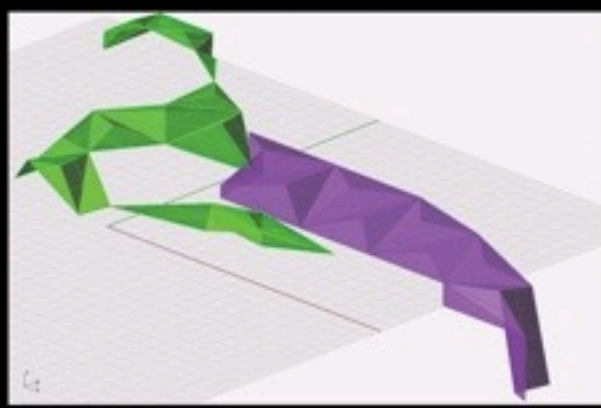
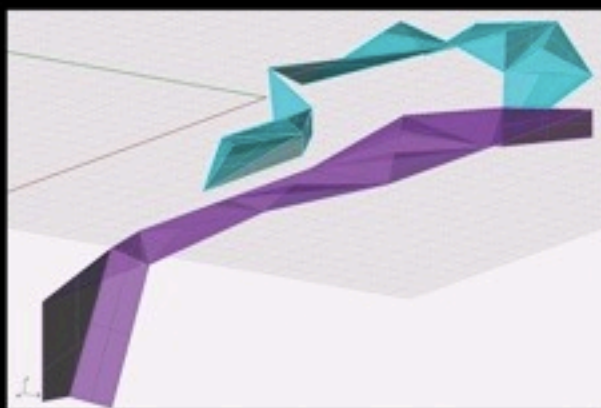
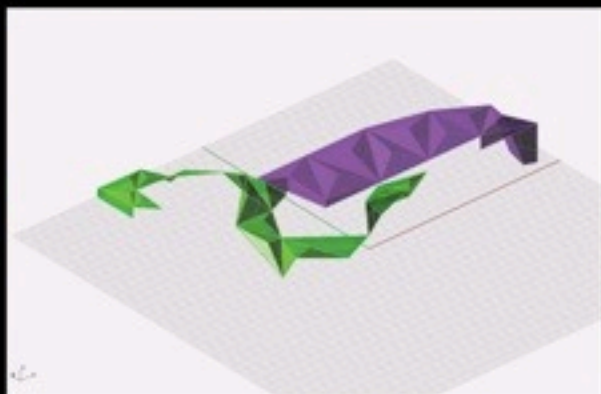
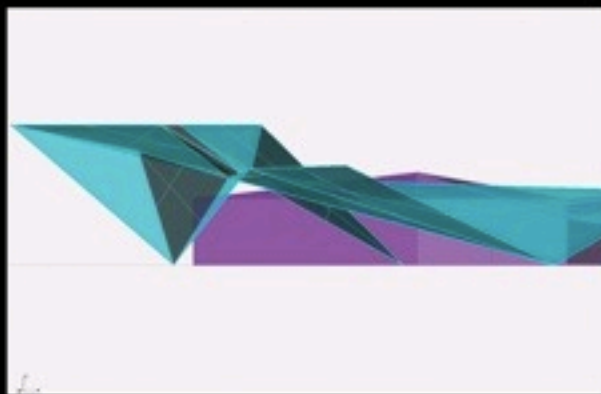
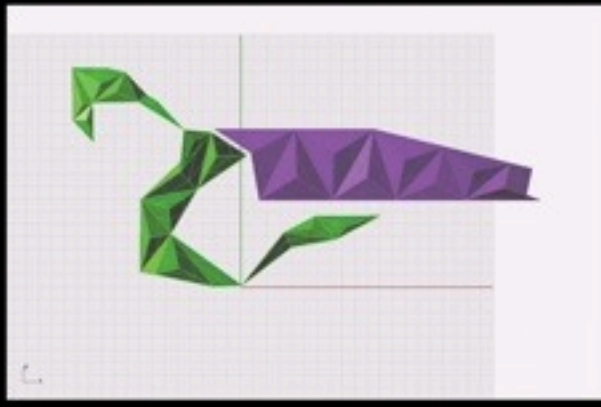
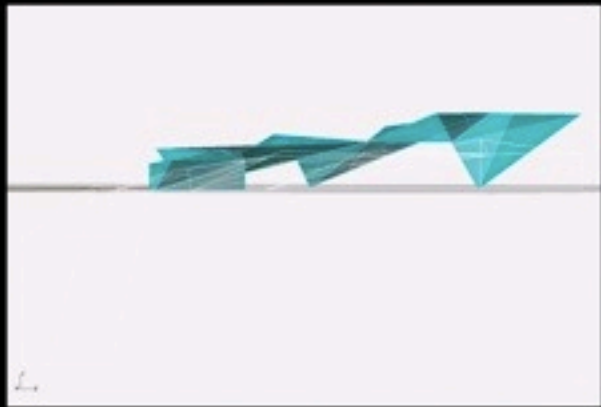
1000 Nodes	0 Surfaces	View	01-00-0000.MXD
8000 Beams	0 Edges	Ext. (0,1)	Problem (Case 1)
10000 Plates	0 Loads	Ext. 0,1	
0 Bricks	0 Plates	Ext. 0,1	
0 Pipes	0 Surfaces		



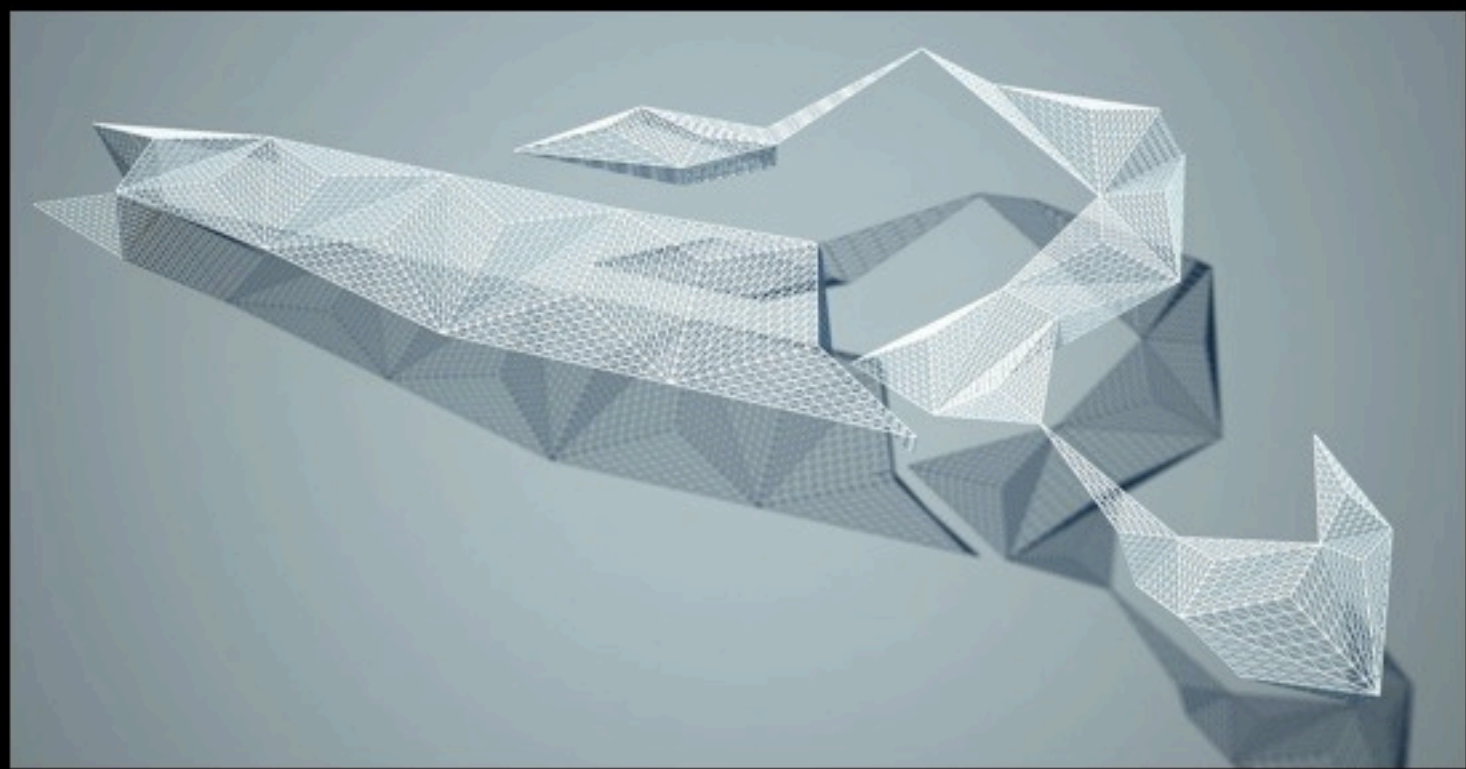
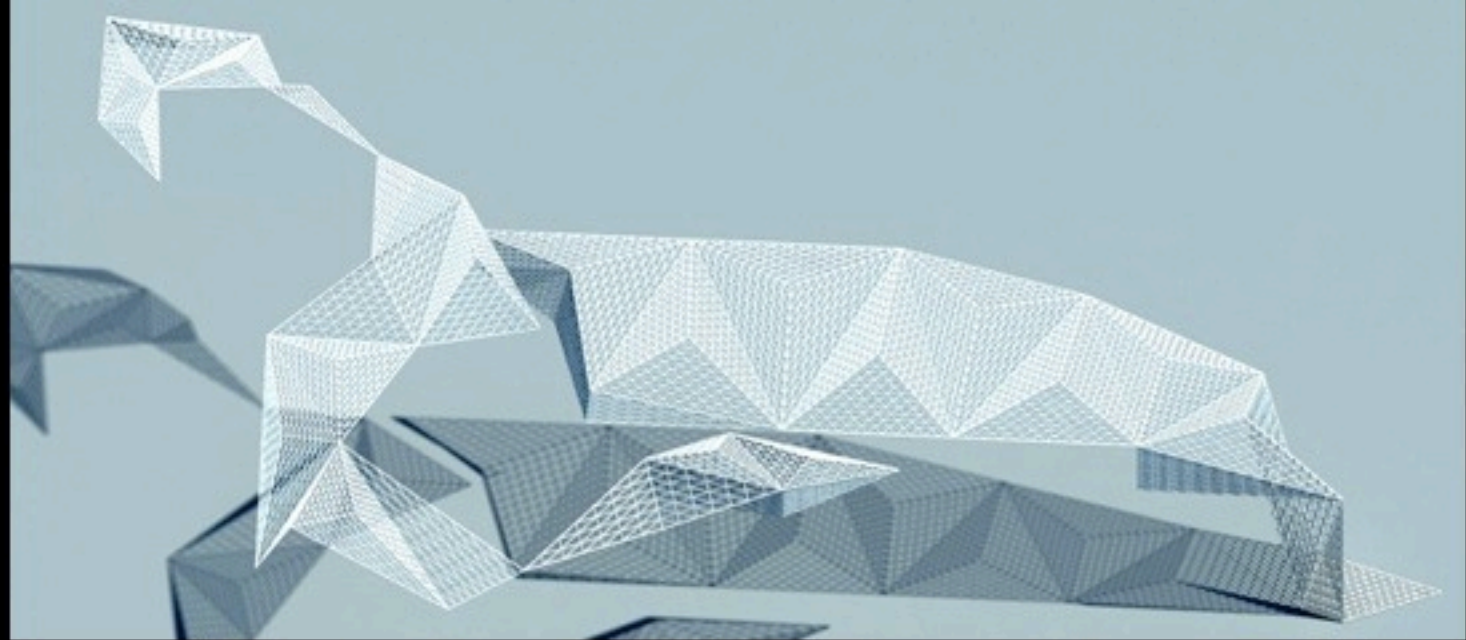
Structural Analysis & Prototype Models

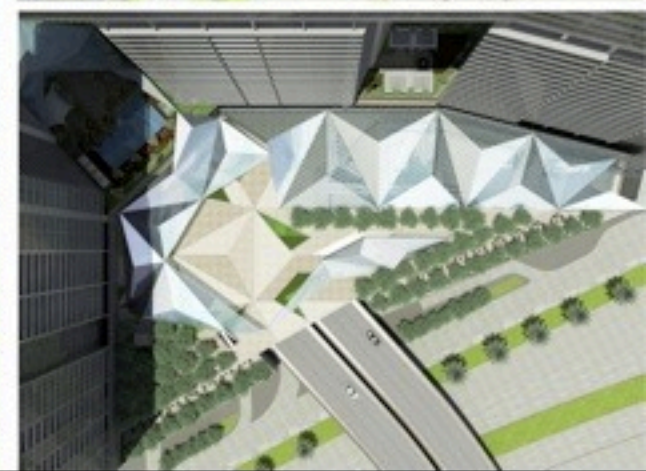
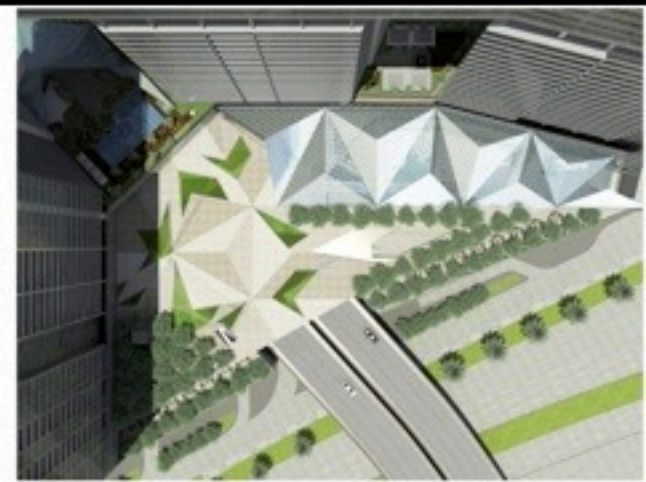
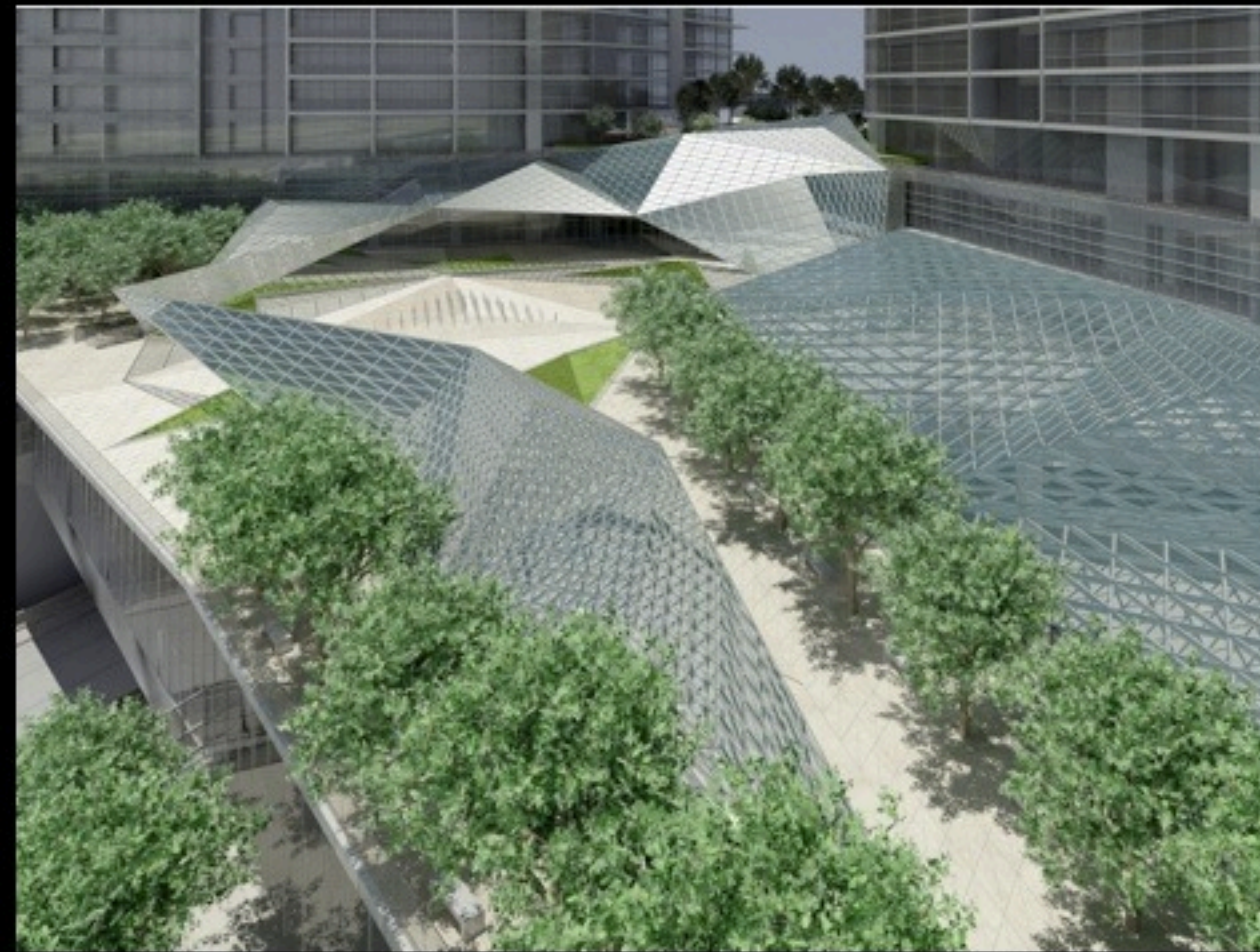


Wind Tunnel Testing & Modification



Iterative Development of Enclosure Geometry

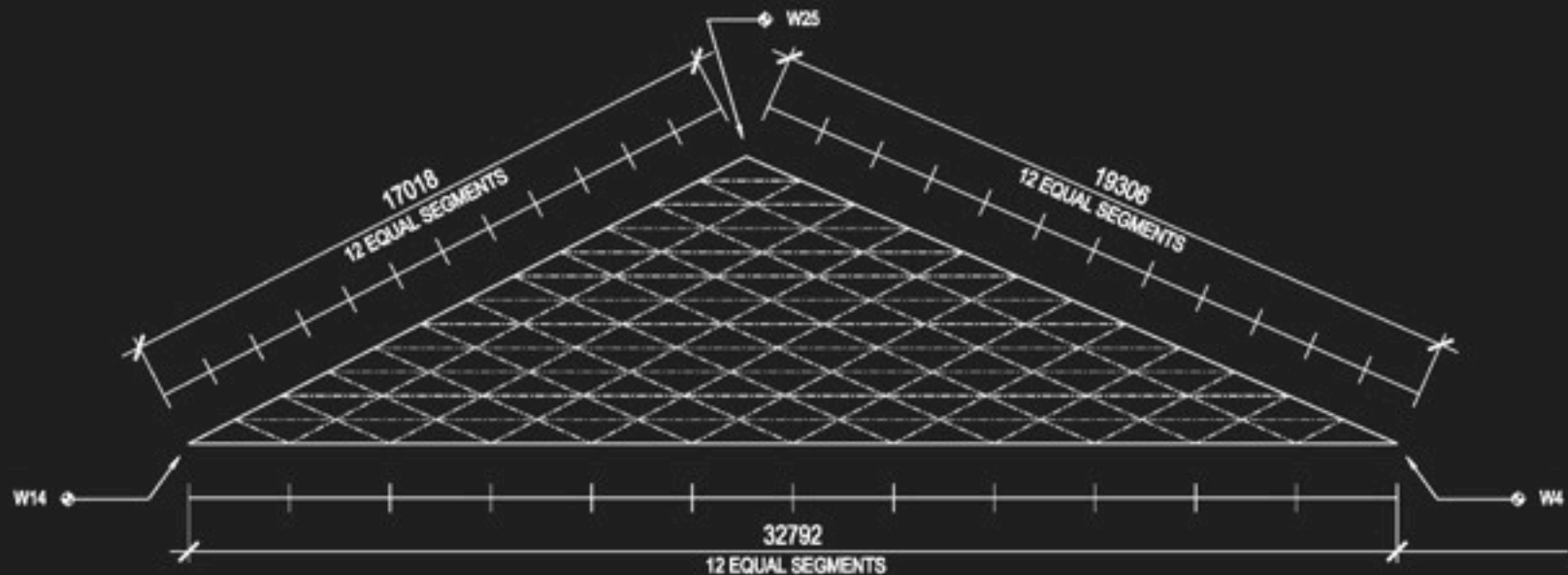


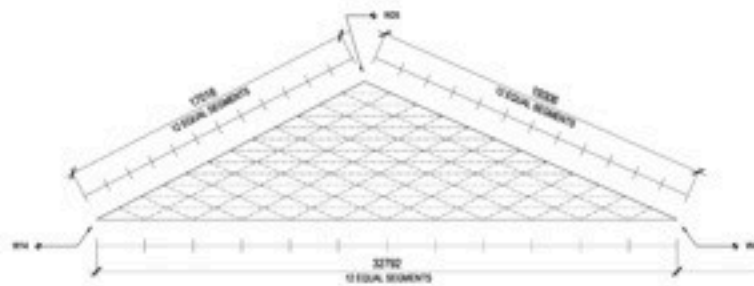


Final Geometry:
One Continuous Net No Differentiation Between Members; Girders, Beams, Columns

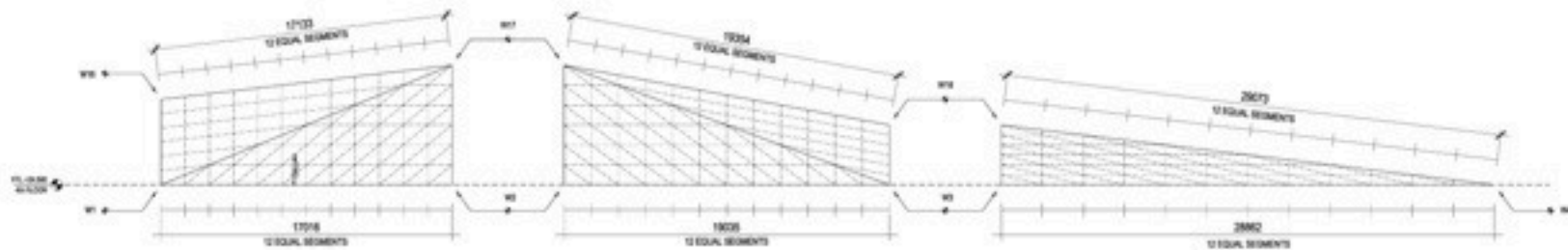
System Rules

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.





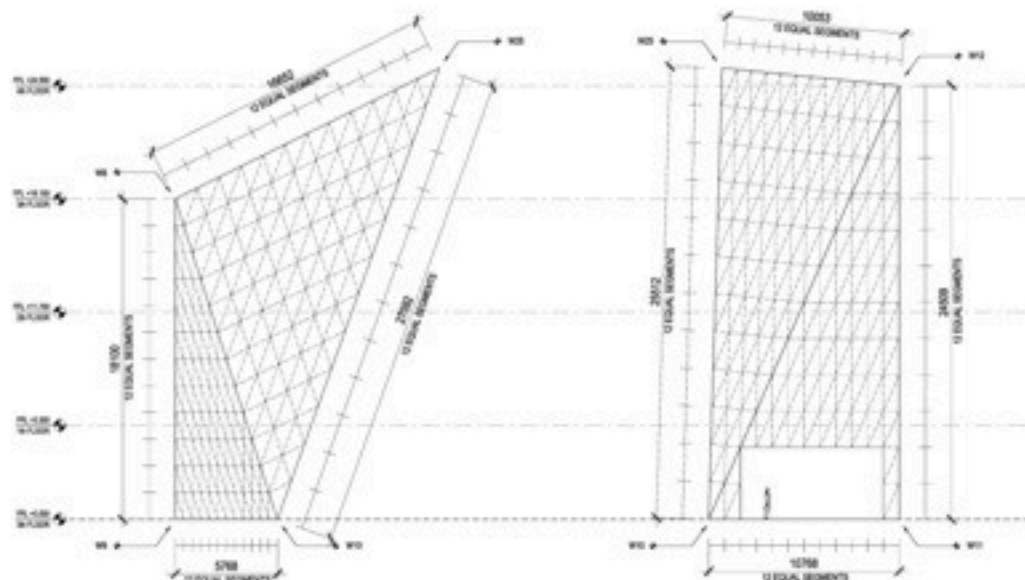
1 TYPICAL TRIANGLE GEOMETRY D1
1/8"



2 TYPICAL TRIANGLE GEOMETRY A.1
1/8"

3 TYPICAL TRIANGLE GEOMETRY A.2
1/8"

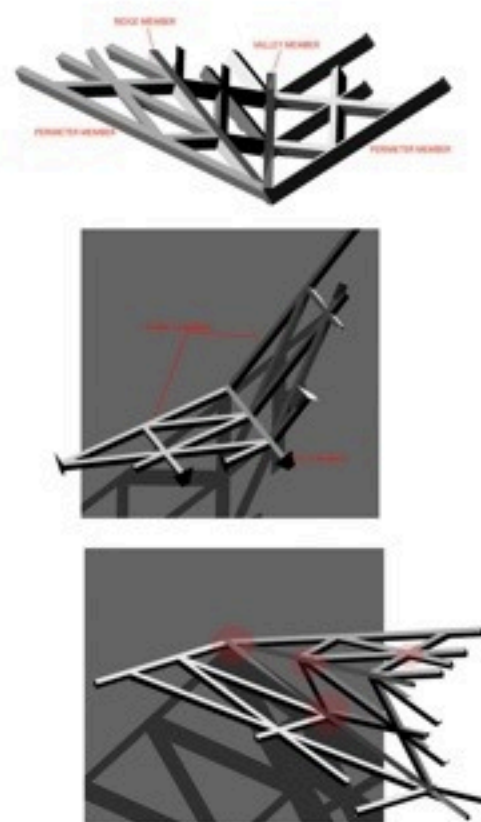
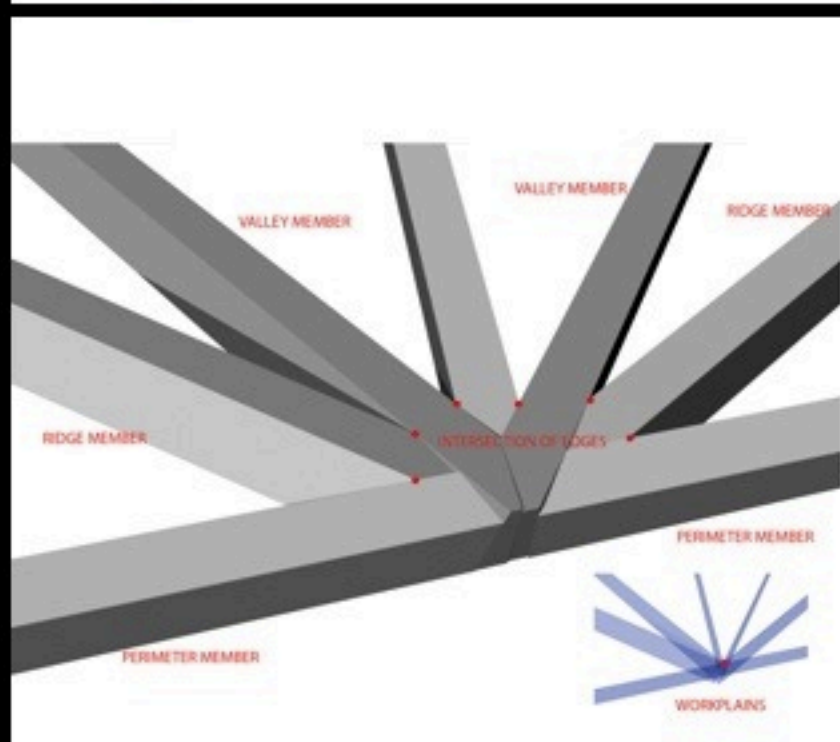
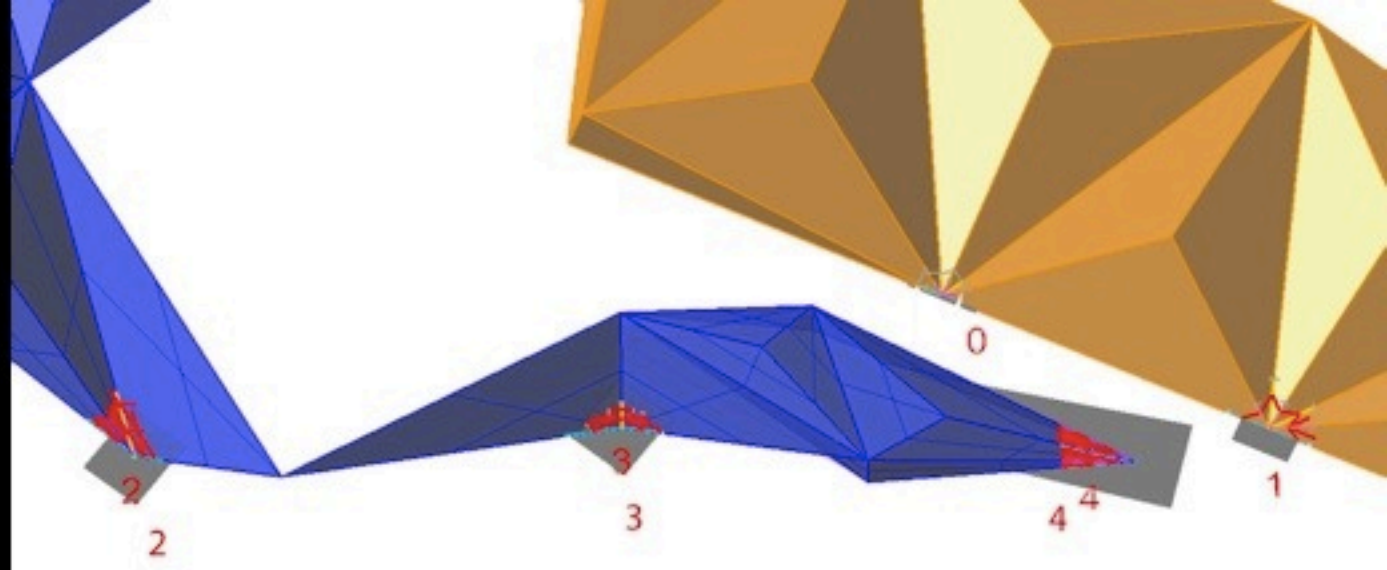
4 TYPICAL TRIANGLE GEOMETRY B.1
1/8"



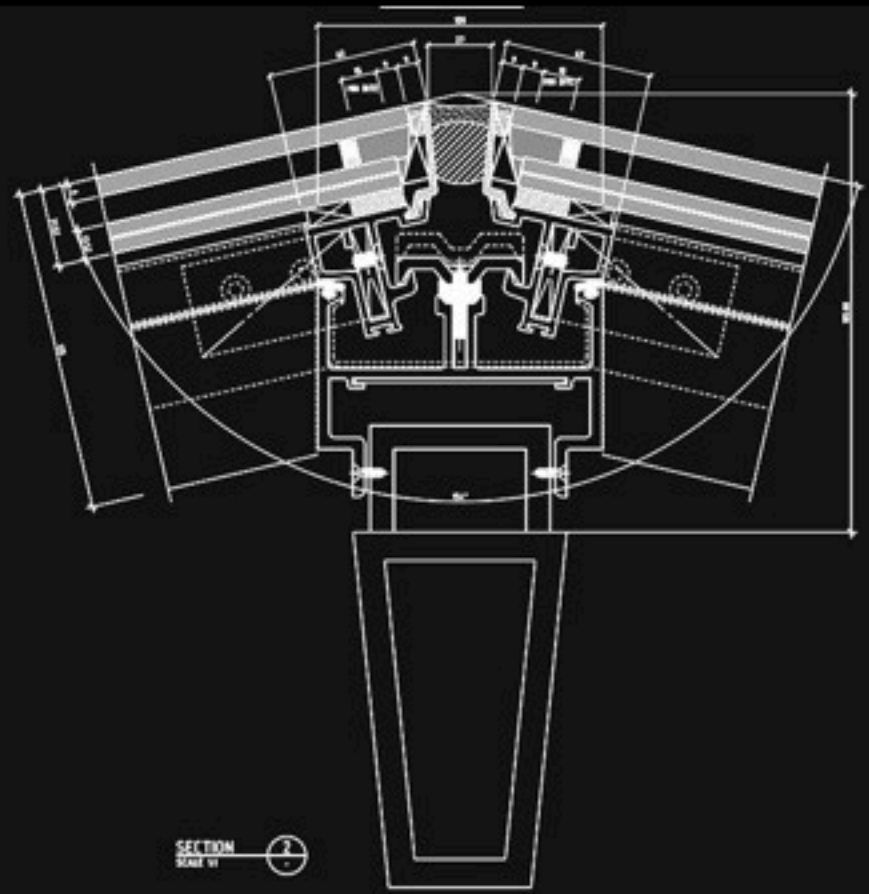
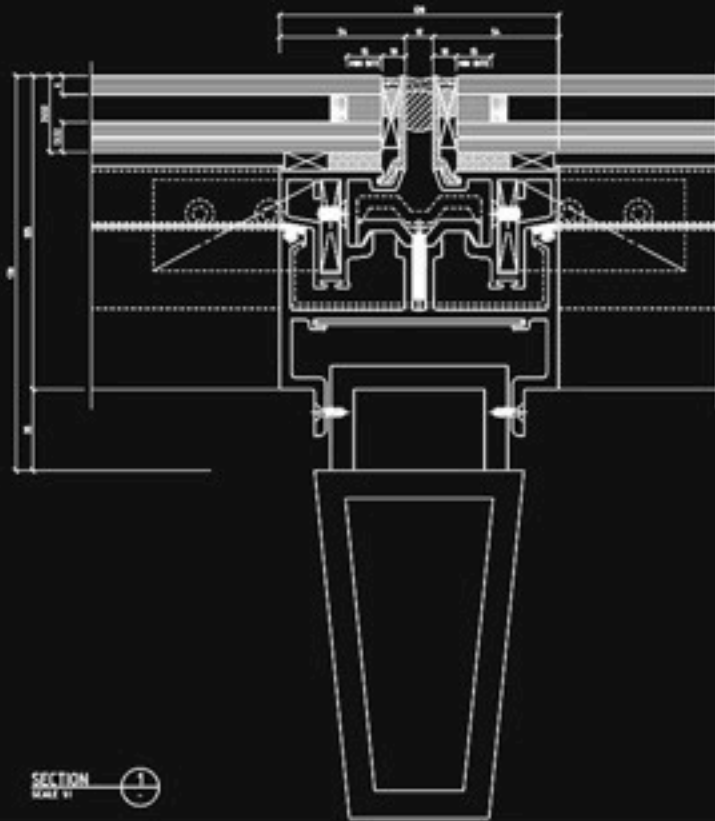
5 TYPICAL TRIANGLE GEOMETRY K1
1/8"

6 TYPICAL TRIANGLE GEOMETRY K2
1/8"





Nodal Conditions



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

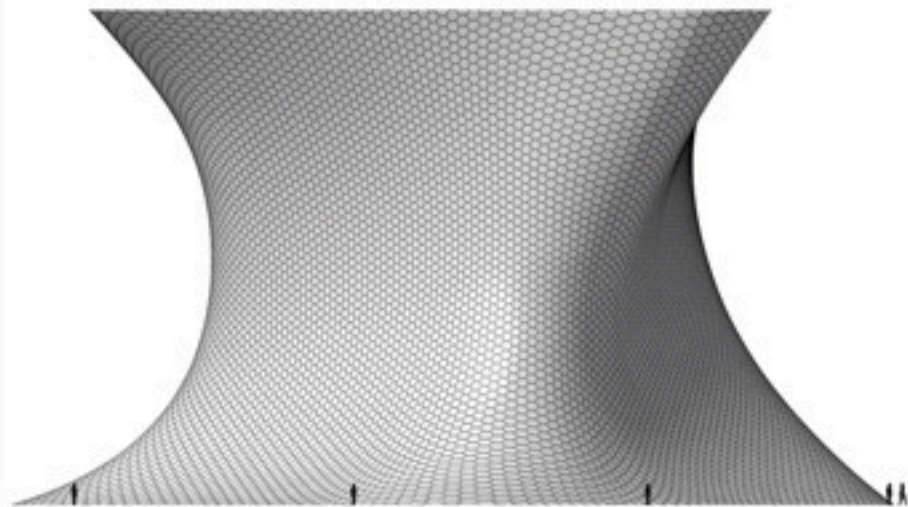


Robert Stephens
Middle East Director Meinhardt
Founded Inhabit Group

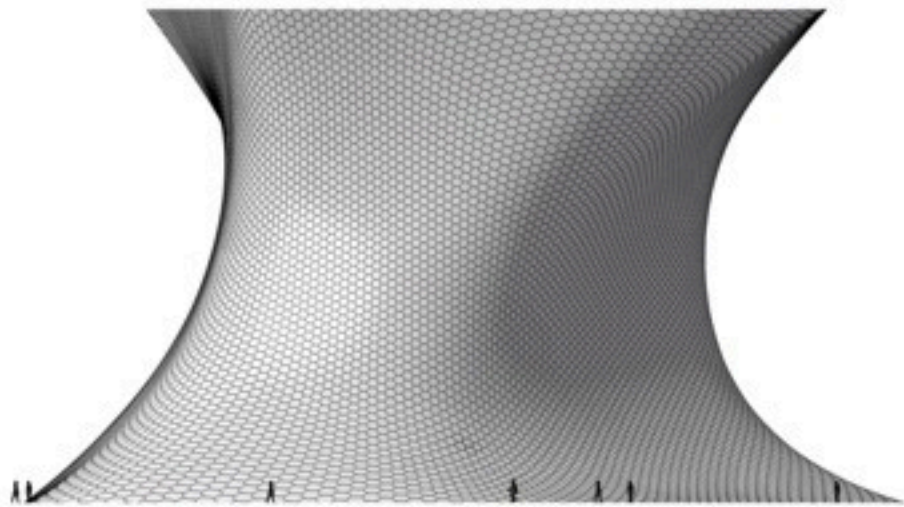
Soumaya Museo



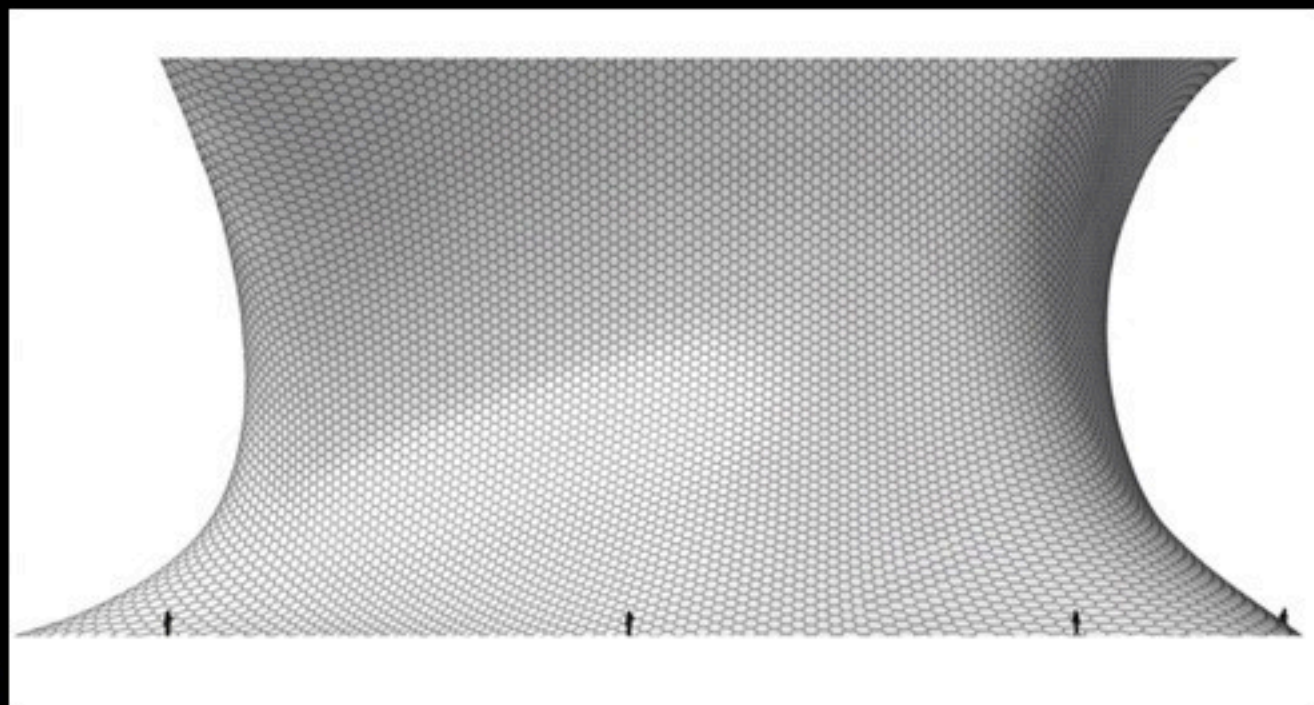




East

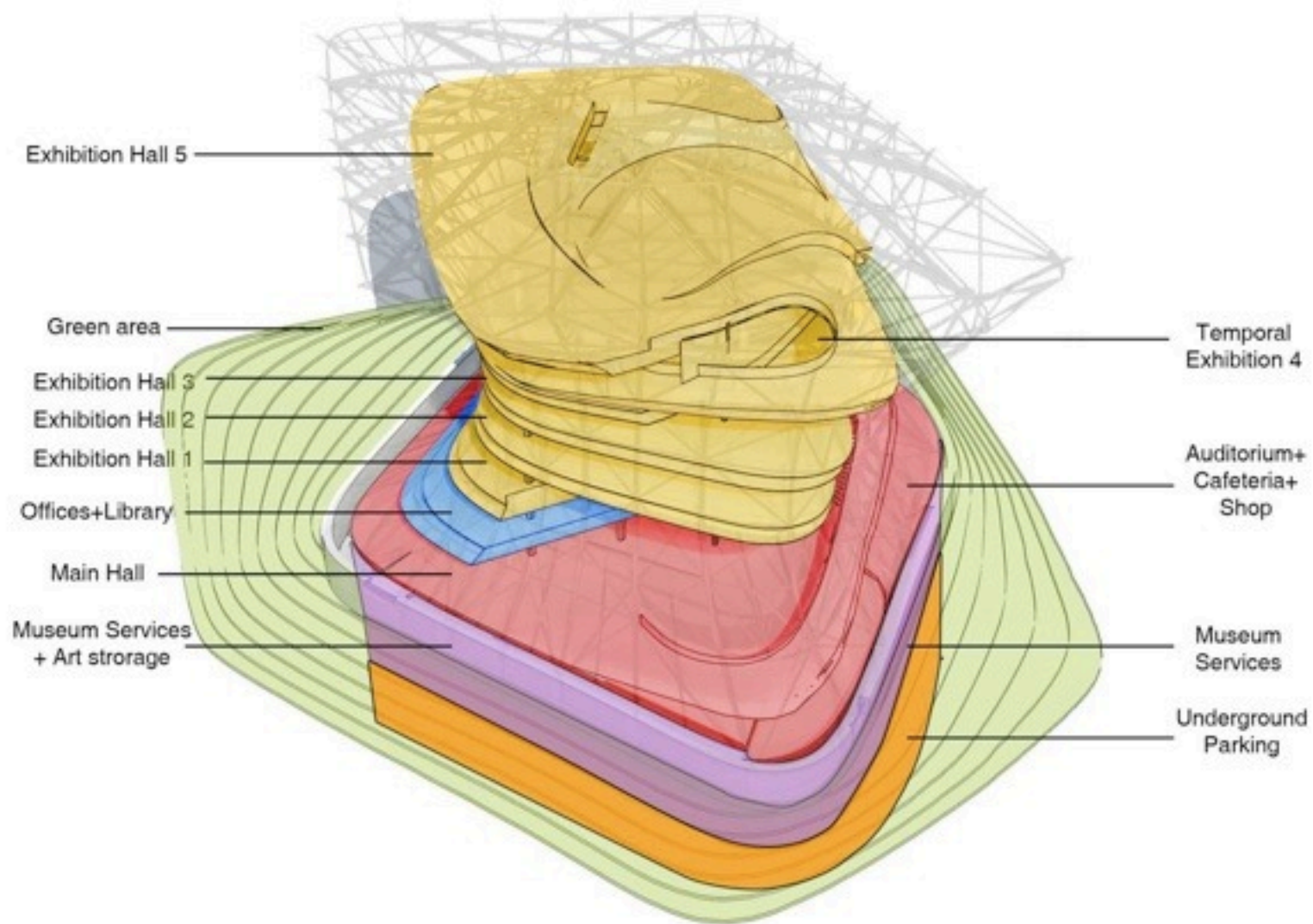


West



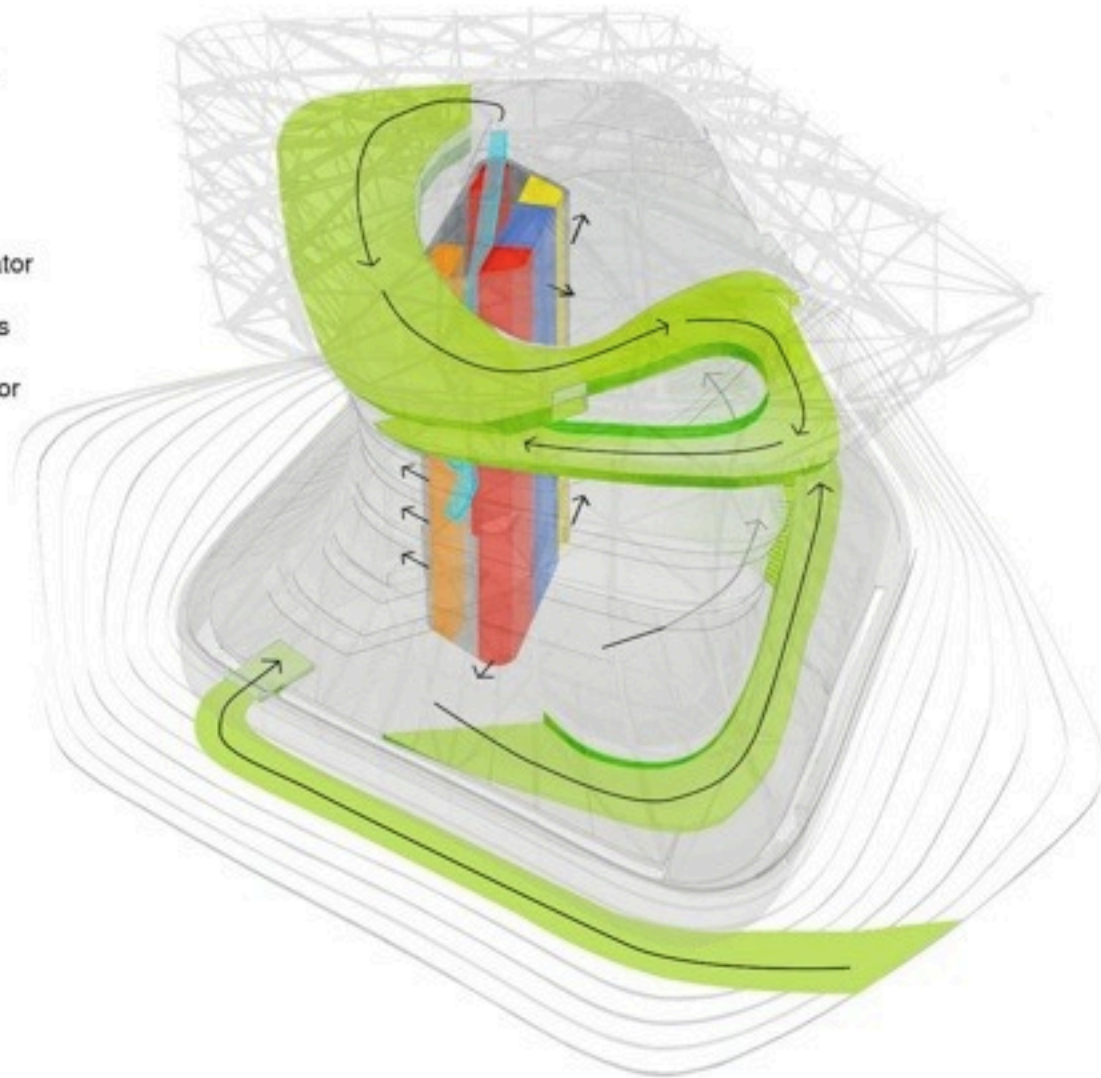
North



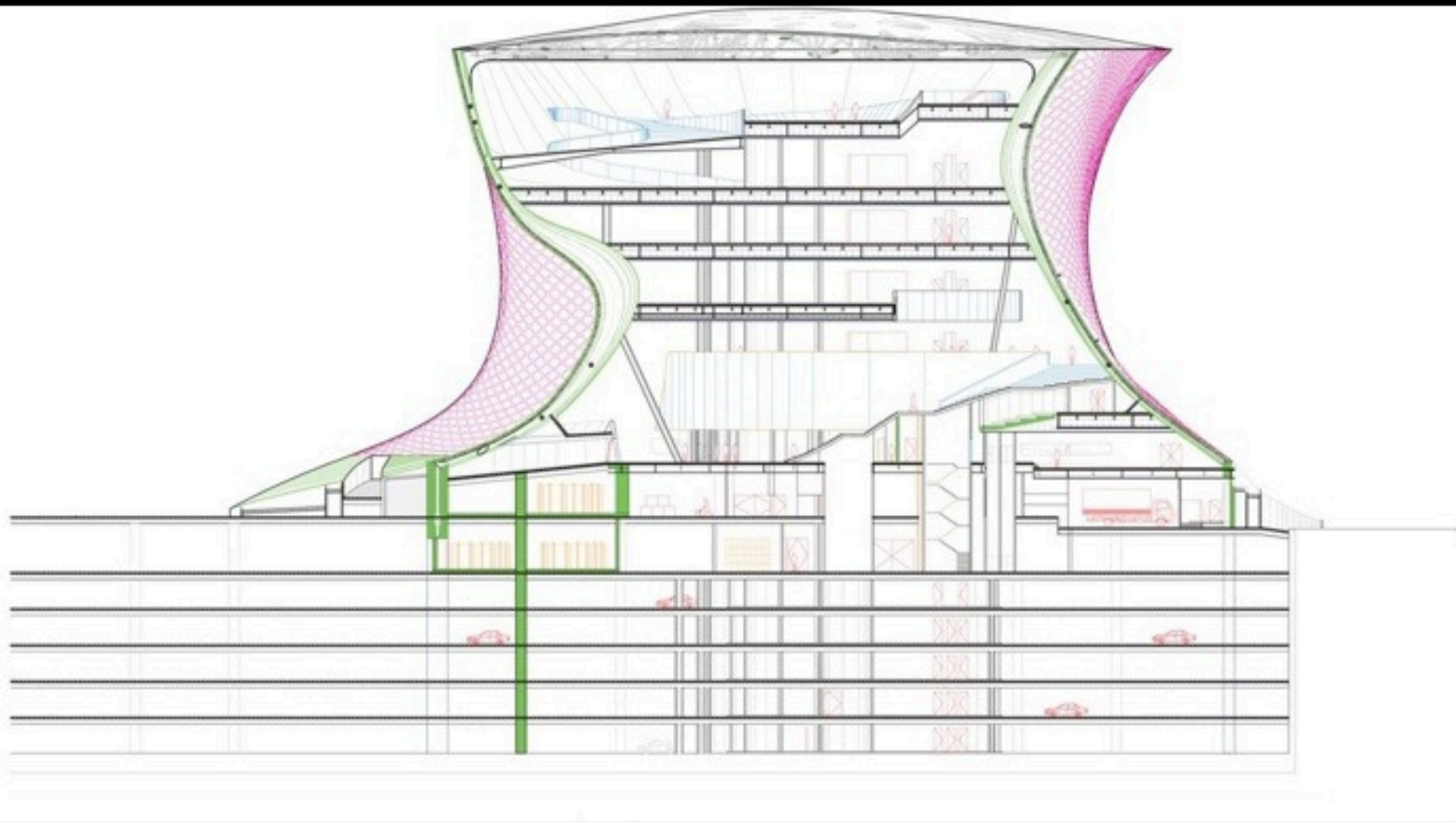


Program Organization

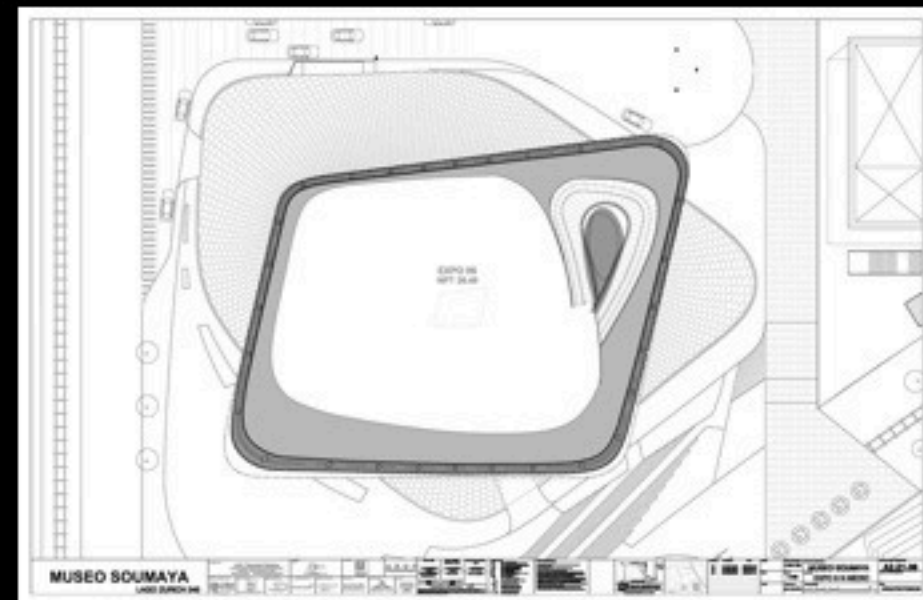
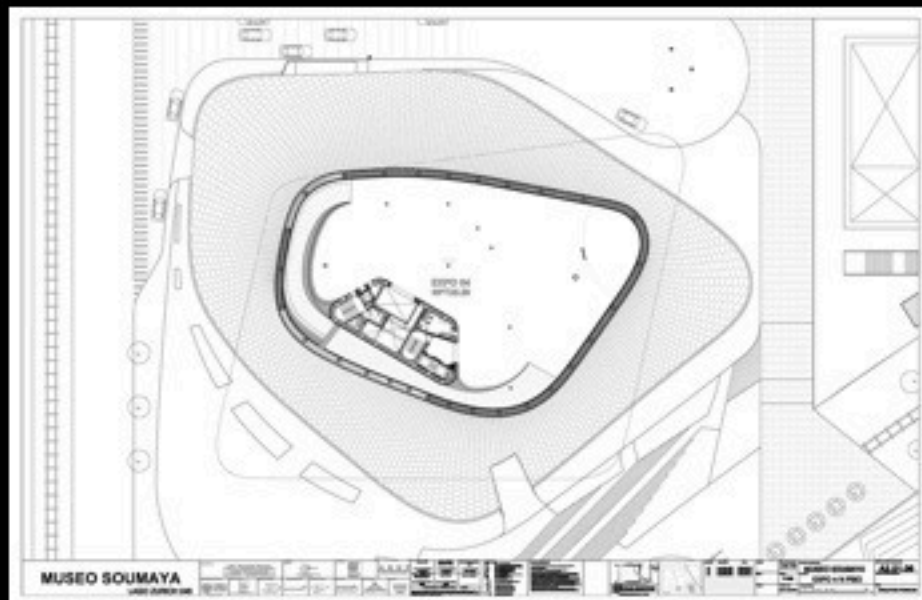
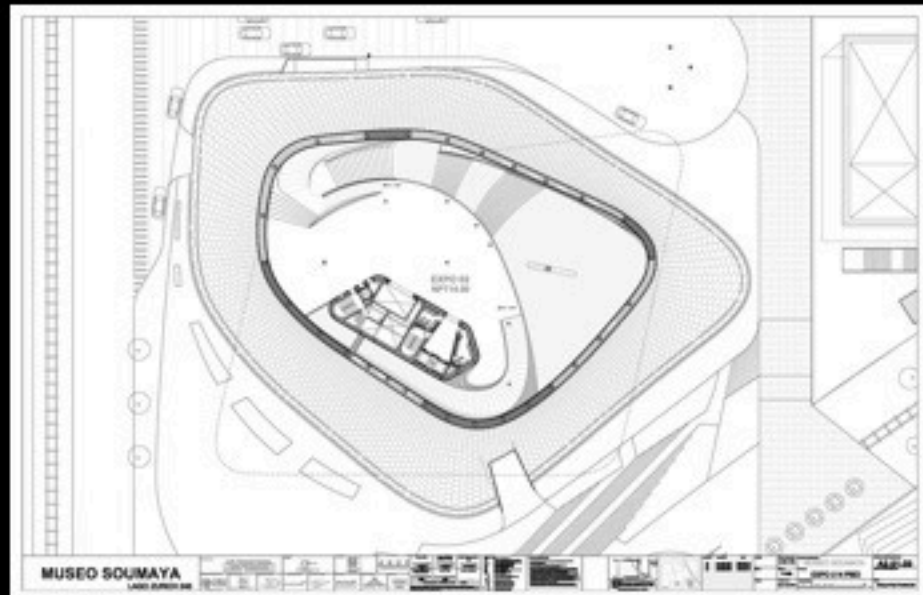
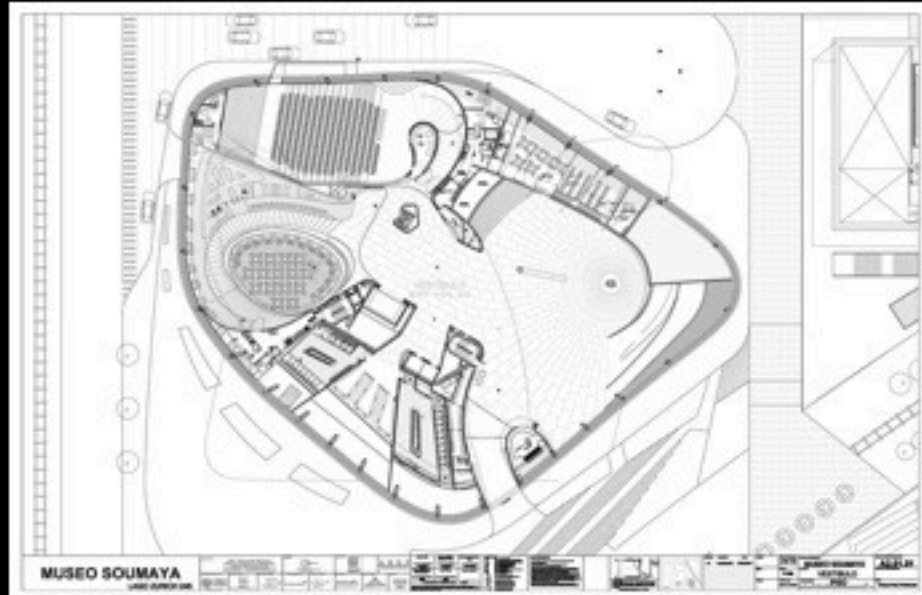
- User's circulation
- User's elevator
- Emergency exit
- Employees' elevator
- Electric escalators
- Art Freight elevator

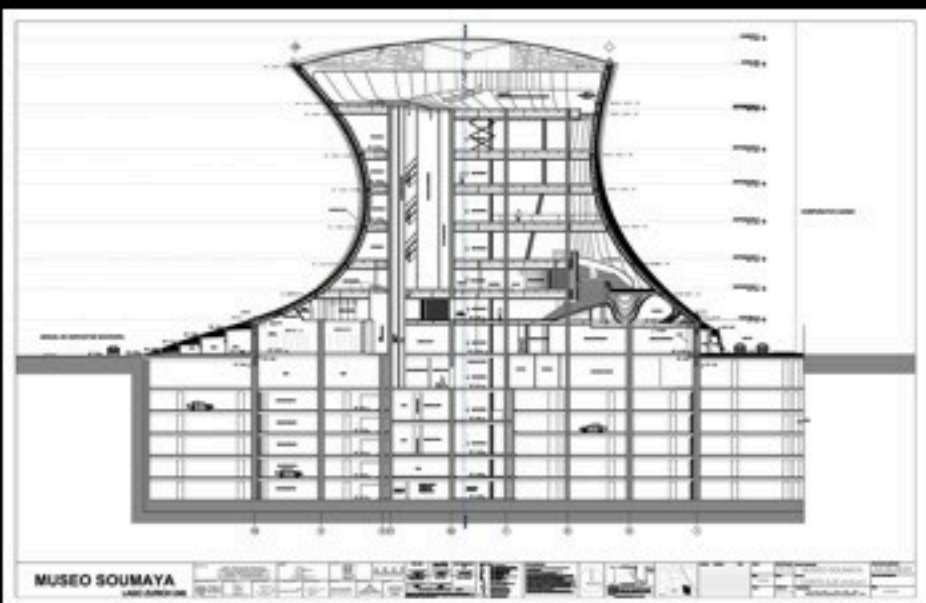
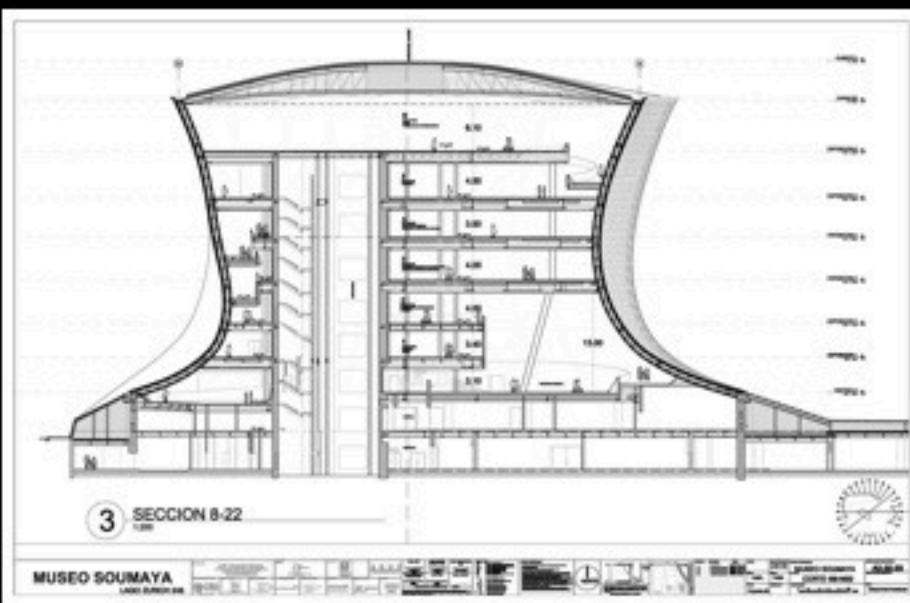
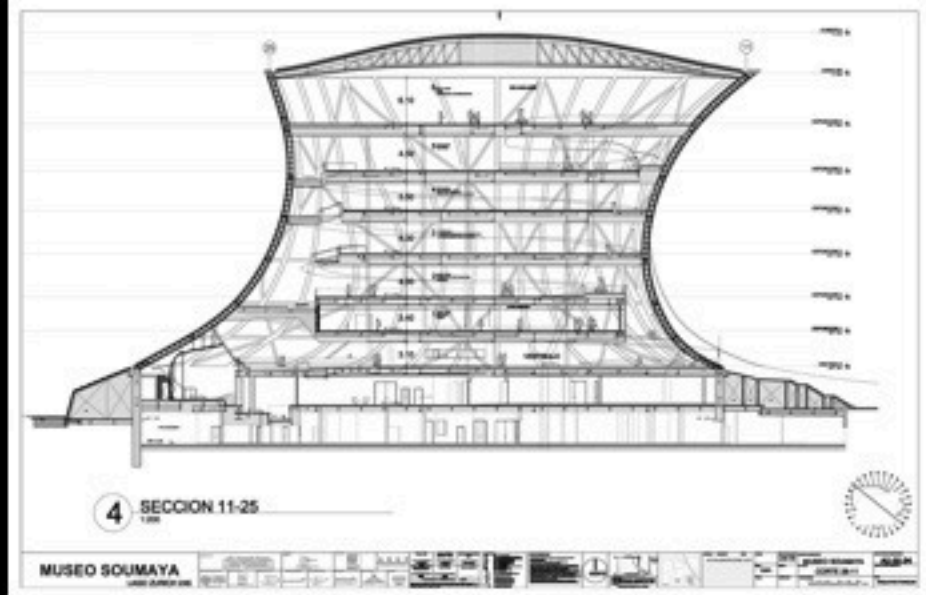
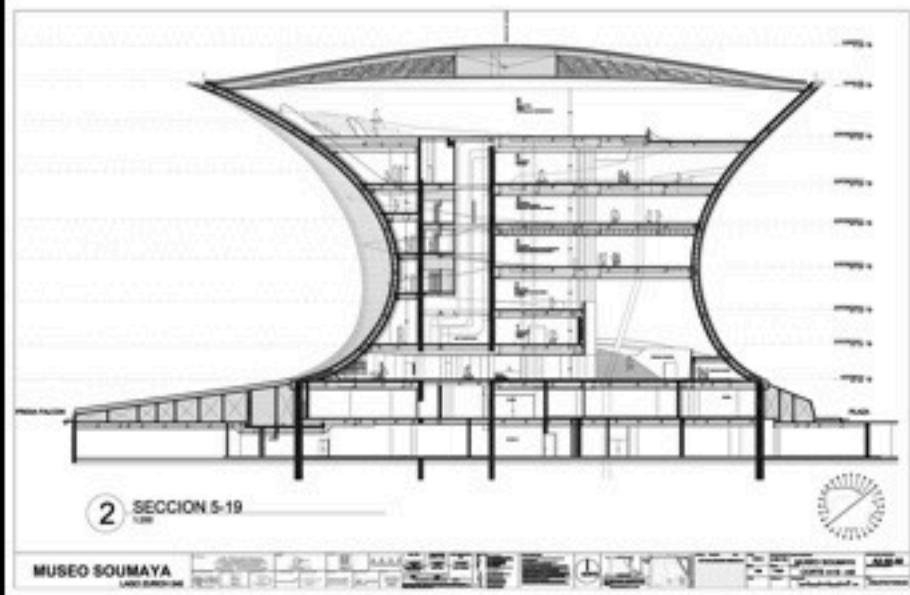


Circulation Pathways



Building Section E/W











**Primary Structural Frame:
52cm dia Steel Pipe**



**Offshore Oil Platforms:
Carlos Slim Subsidiary**





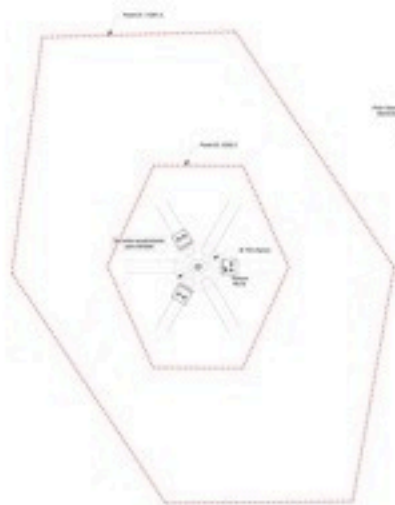
Base Pipe Column



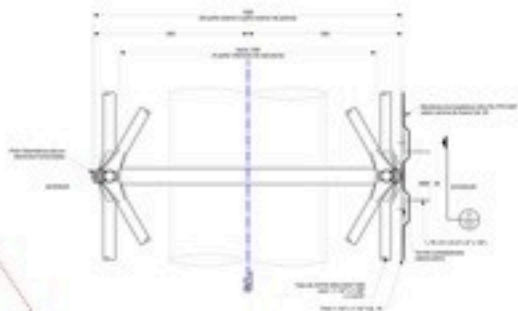
Column Connections



Pipe Steel Connections



Sistema de Soporte
Paramo de Fachada



Enchufe sistema
Columna Geometrica

Fachada Museo Soumaya

Arquitecto: Cesar Pelli

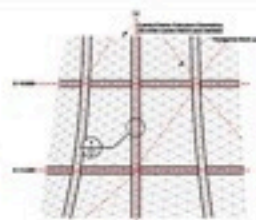
Arquitecto: Cesar Pelli

Arquitecto: Cesar Pelli

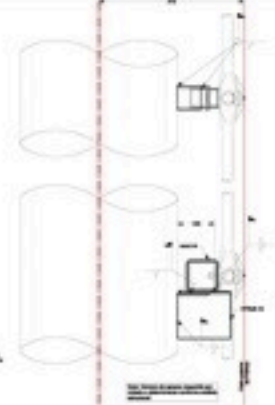
Arquitecto: Cesar Pelli



Planta Nivel



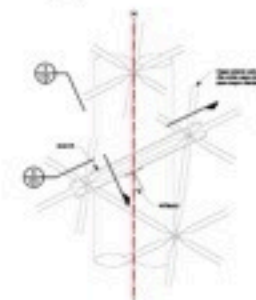
Elevación Eje 14 sobre
zona de Montaje



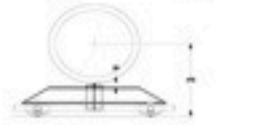
Detalle



Planta Nivel



Detalle



Detalle

Fachada Museo Soumaya

Arquitecto: Cesar Pelli

Arquitecto: Cesar Pelli

Arquitecto: Cesar Pelli

Arquitecto: Cesar Pelli

Secondary Structural Drawings:
Geometrica

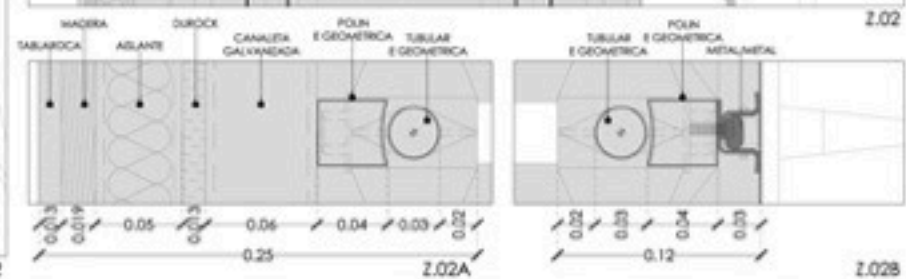
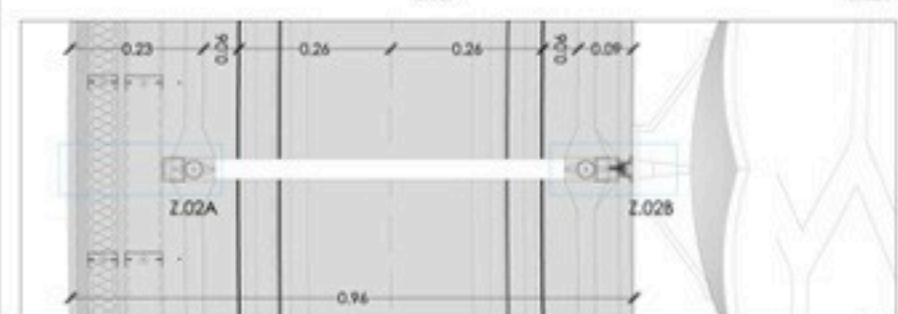
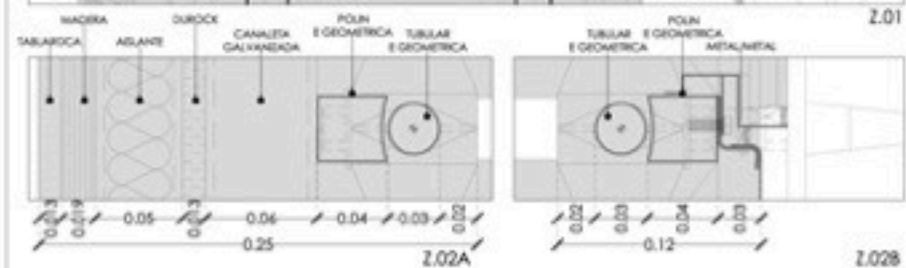
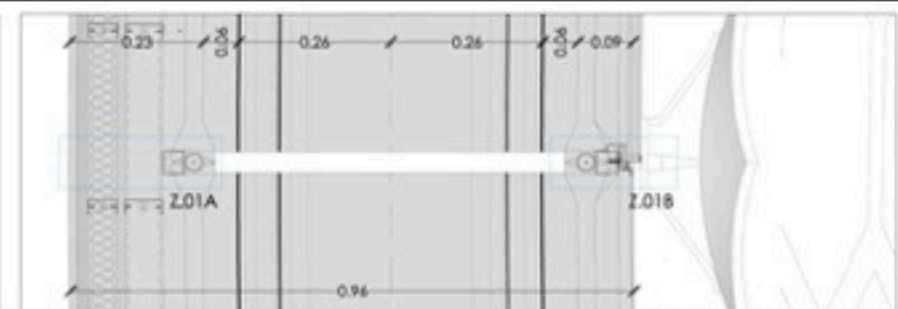
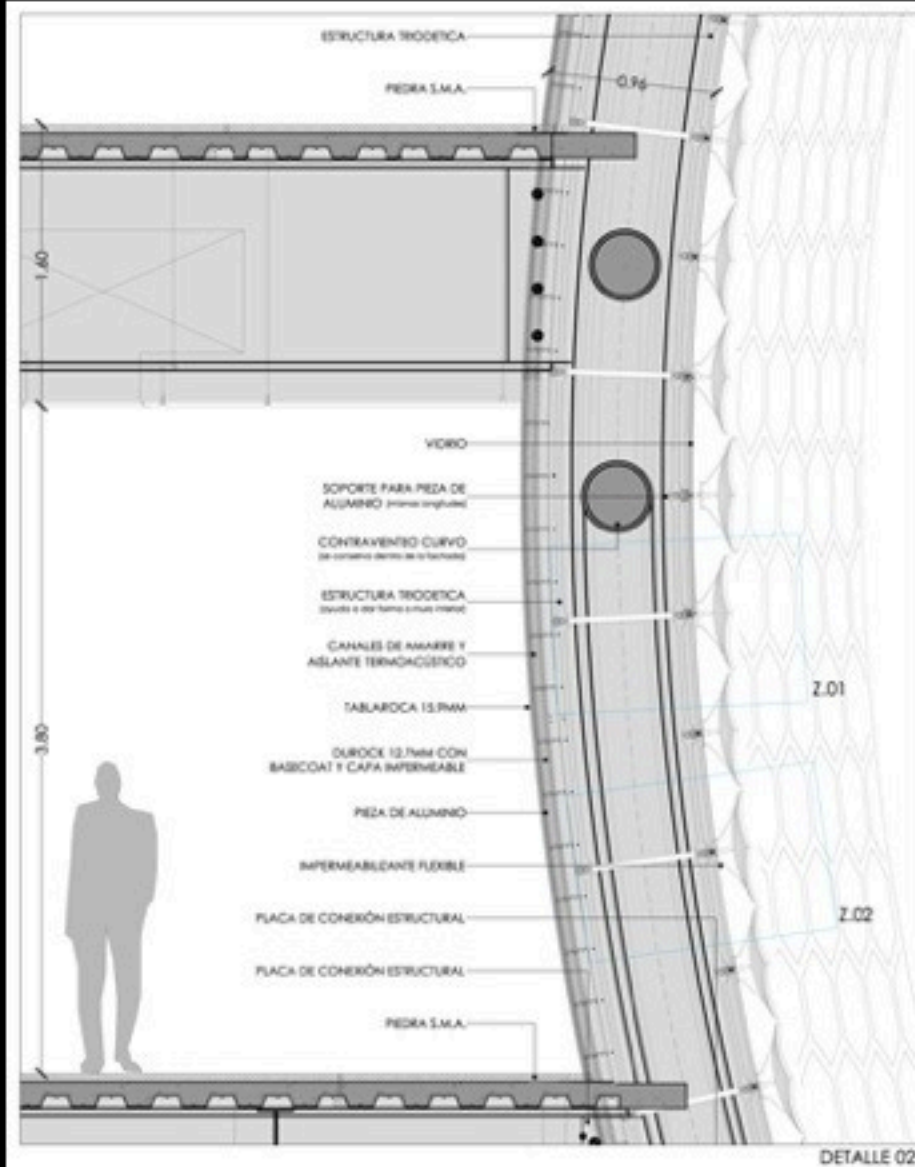




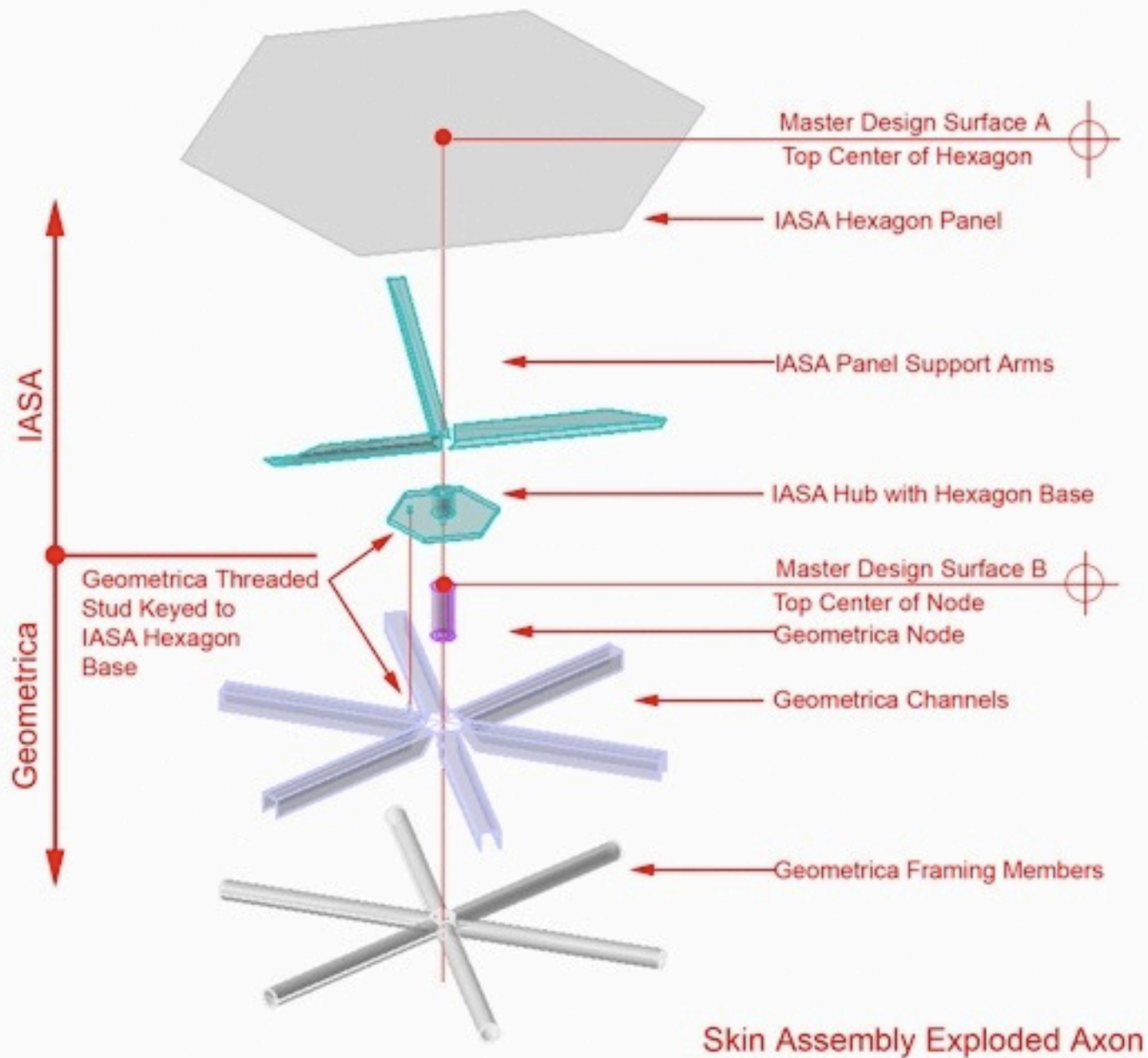


Secondary Structure Installation





Enclosure Assembly



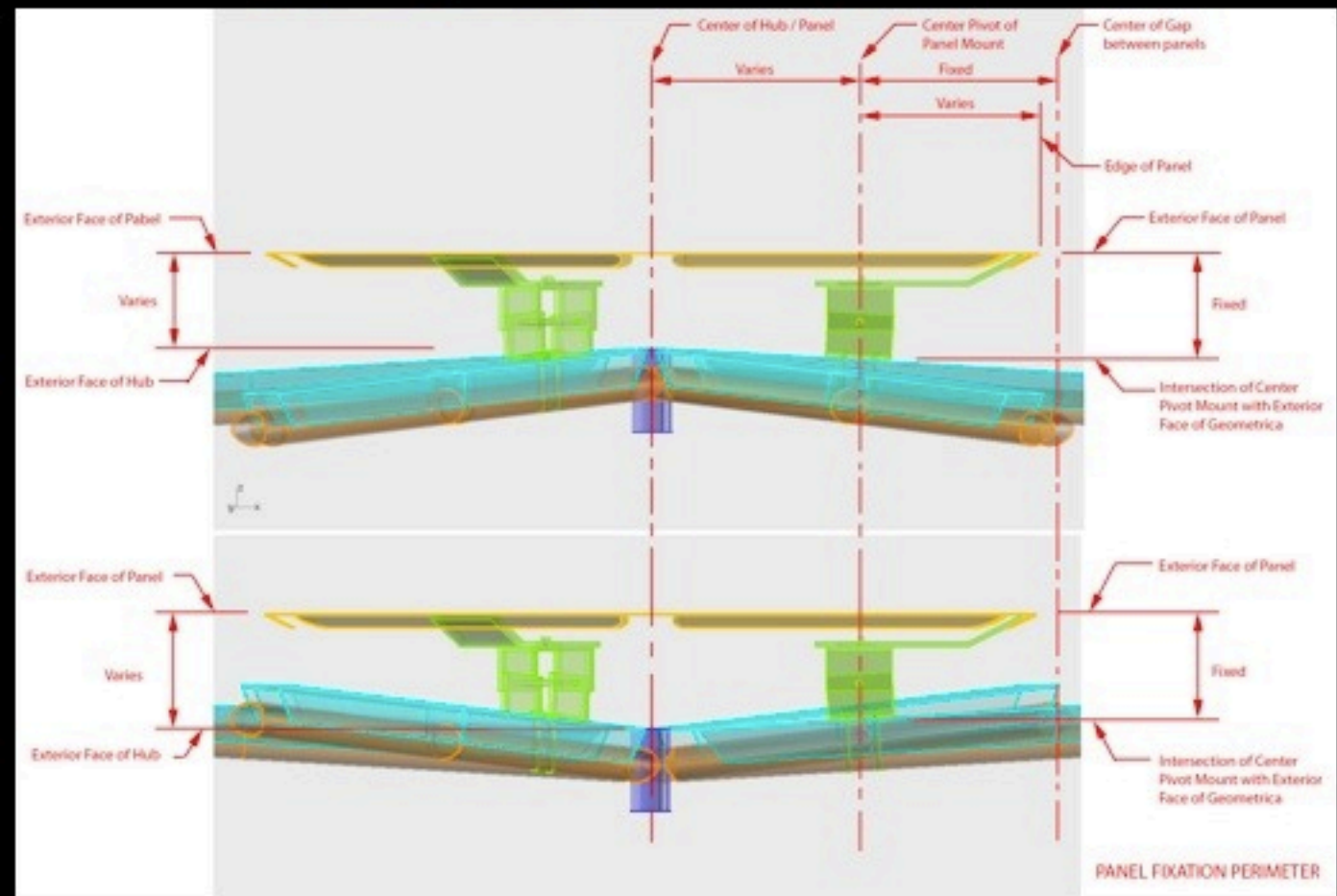
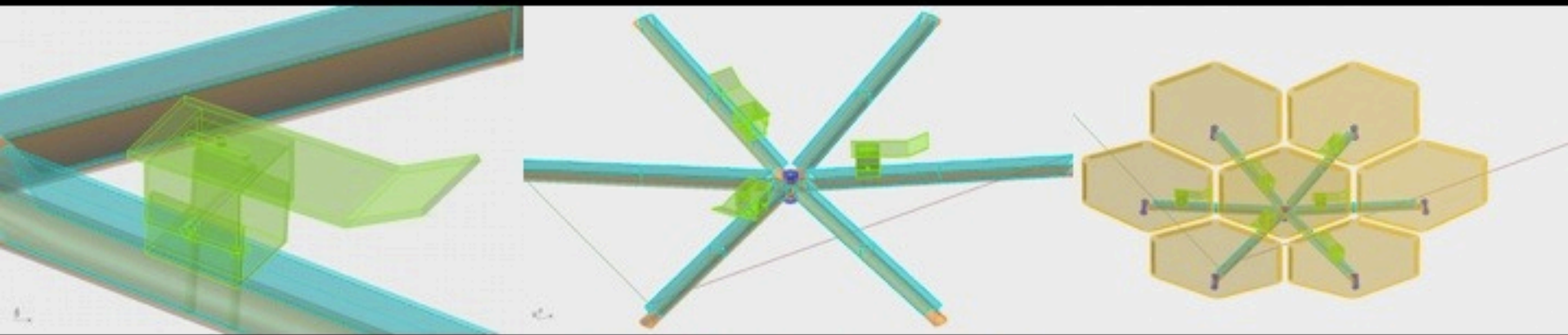
Skin Assembly Exploded Axon

**Building Skin
Components
Separated
by Fabricator**

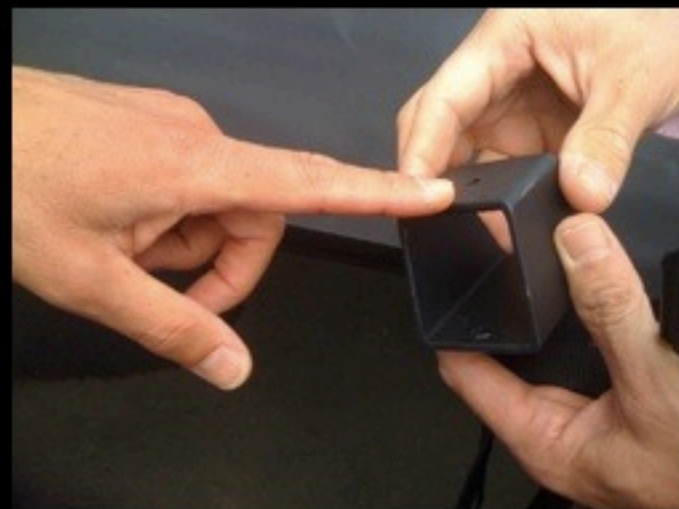




Panel Mock-ups



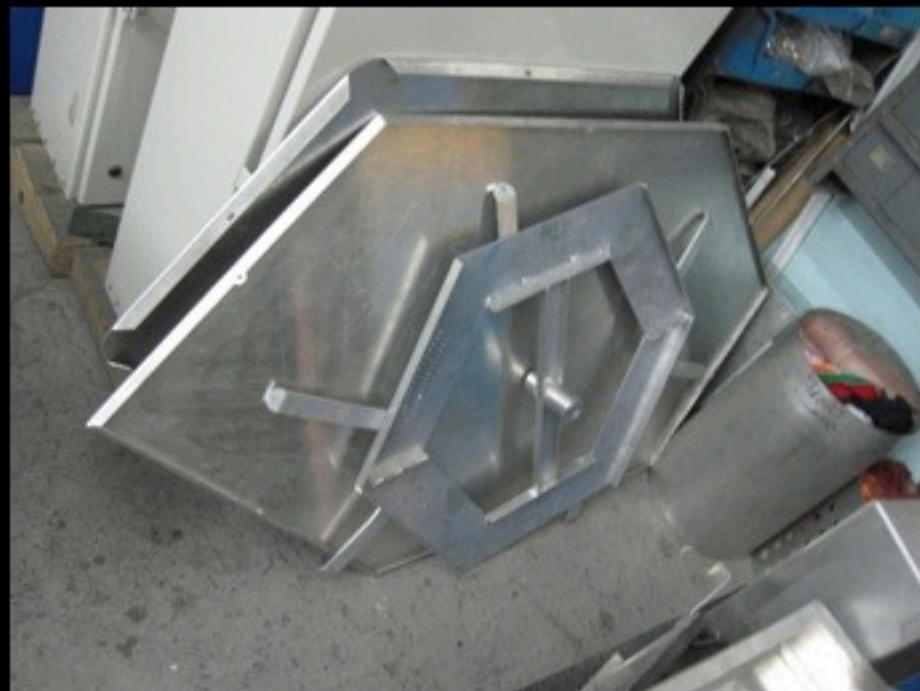
Panel Mounting System



Panel Mock-up



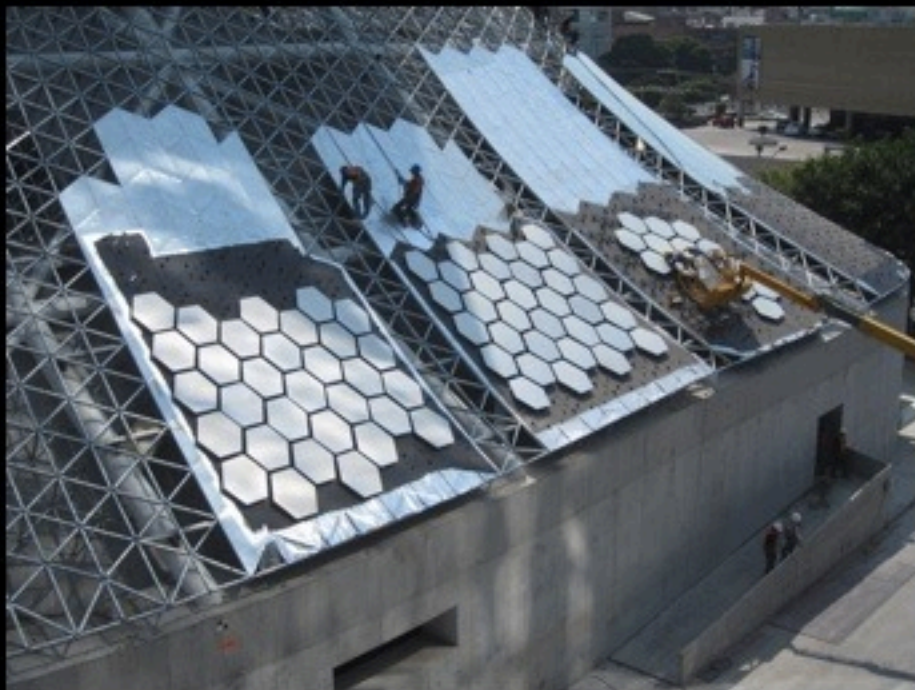
IASA: Aluminum Fabricator for Telemex Communications (Carlos Slim Company)



Prototypes

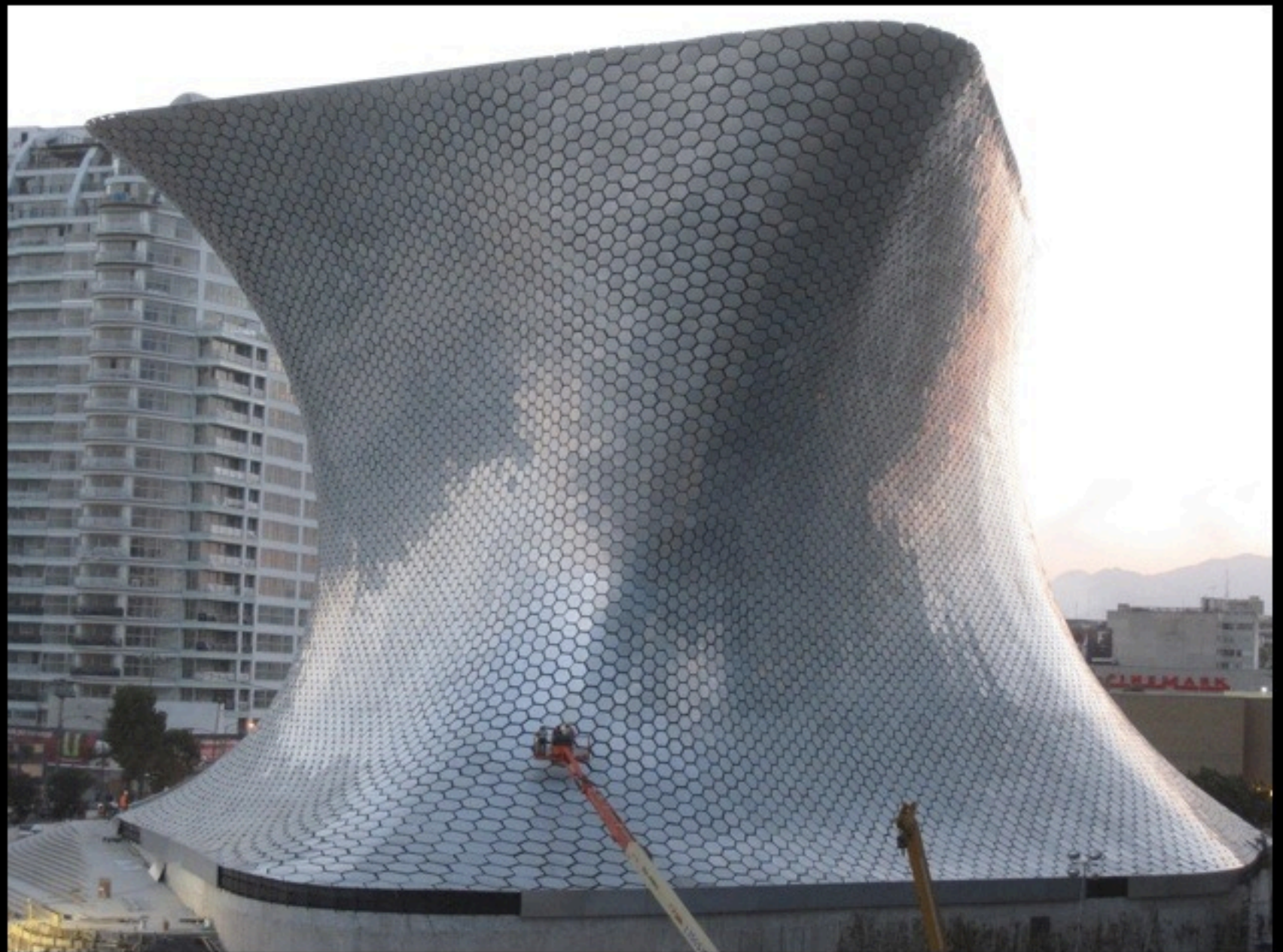


Panel Installation

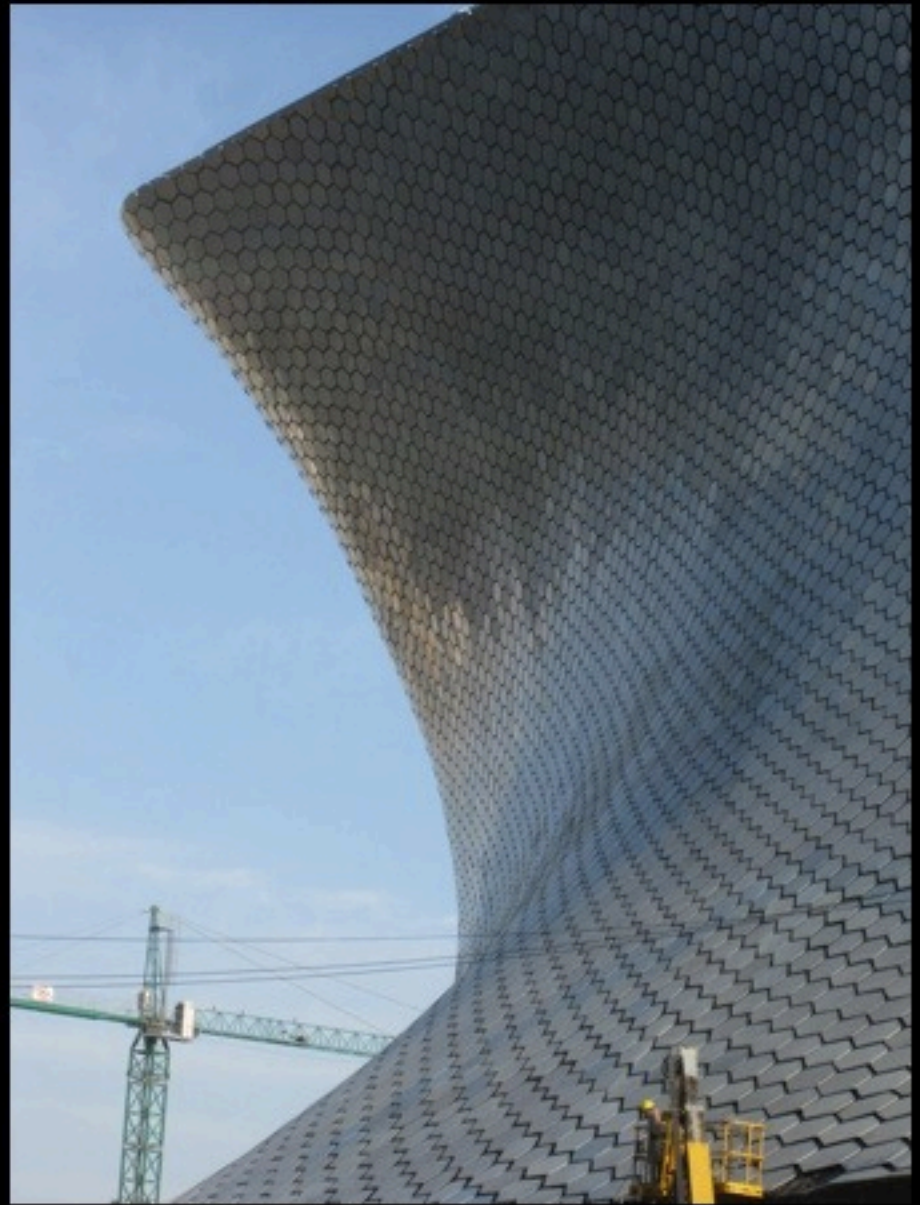
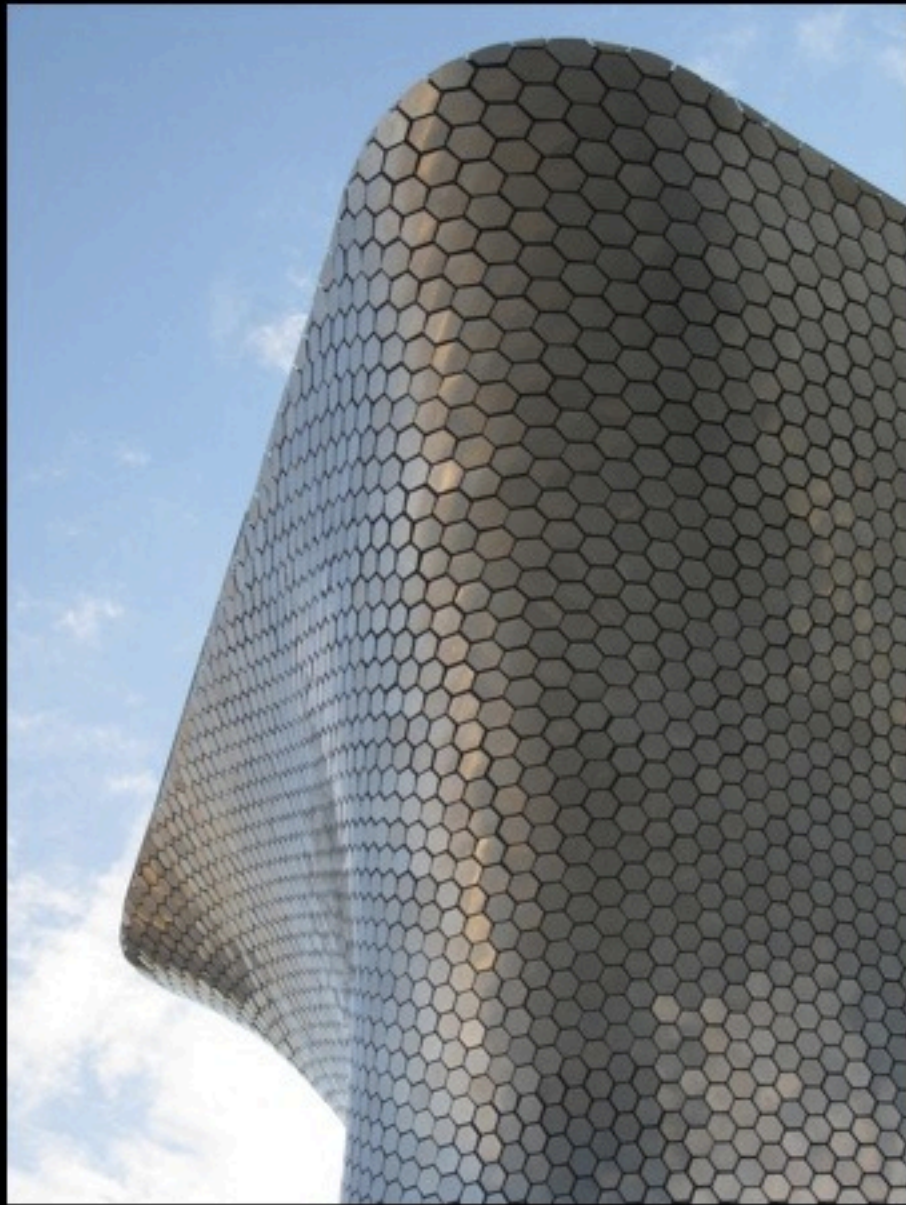


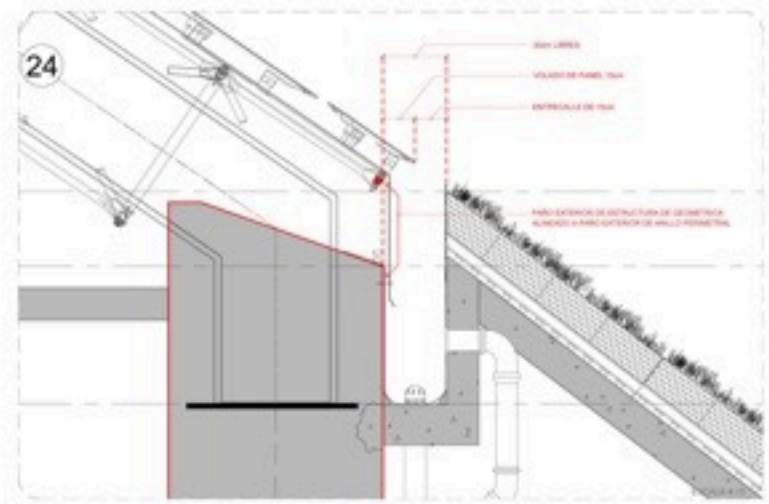
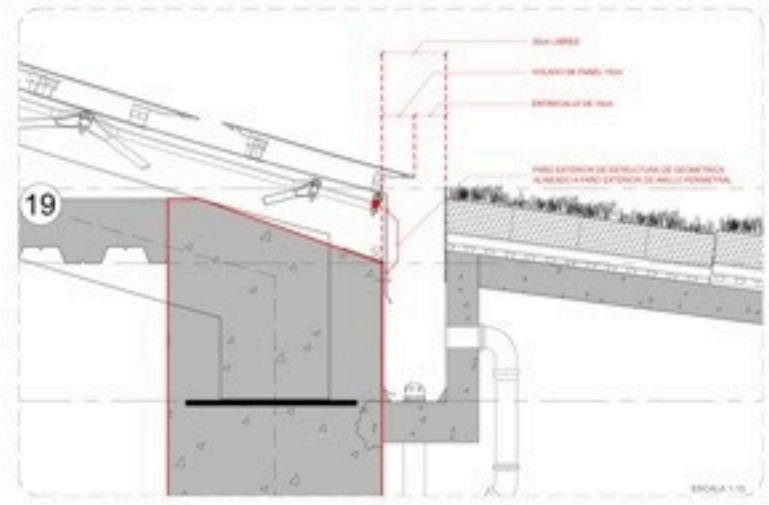
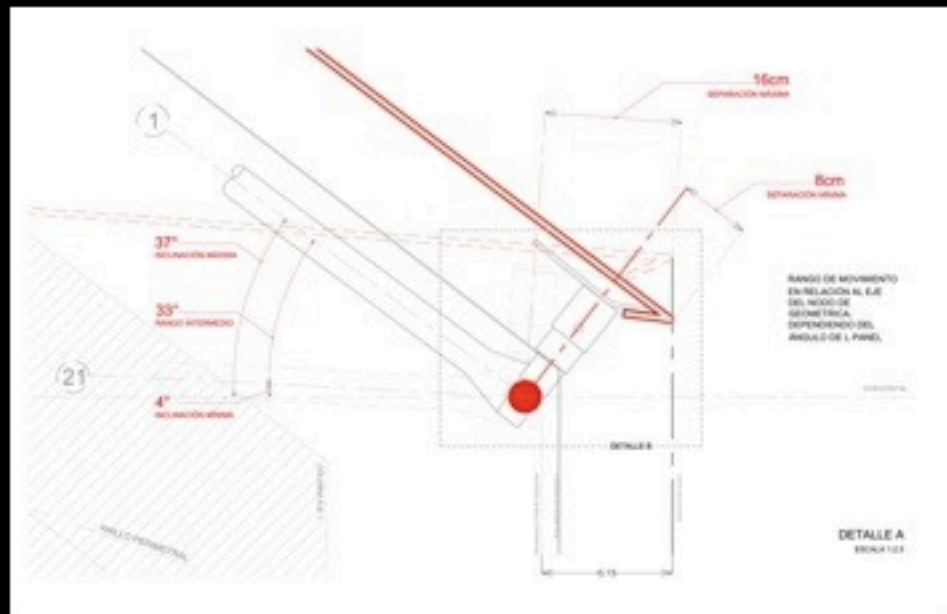


Building Skin Installation

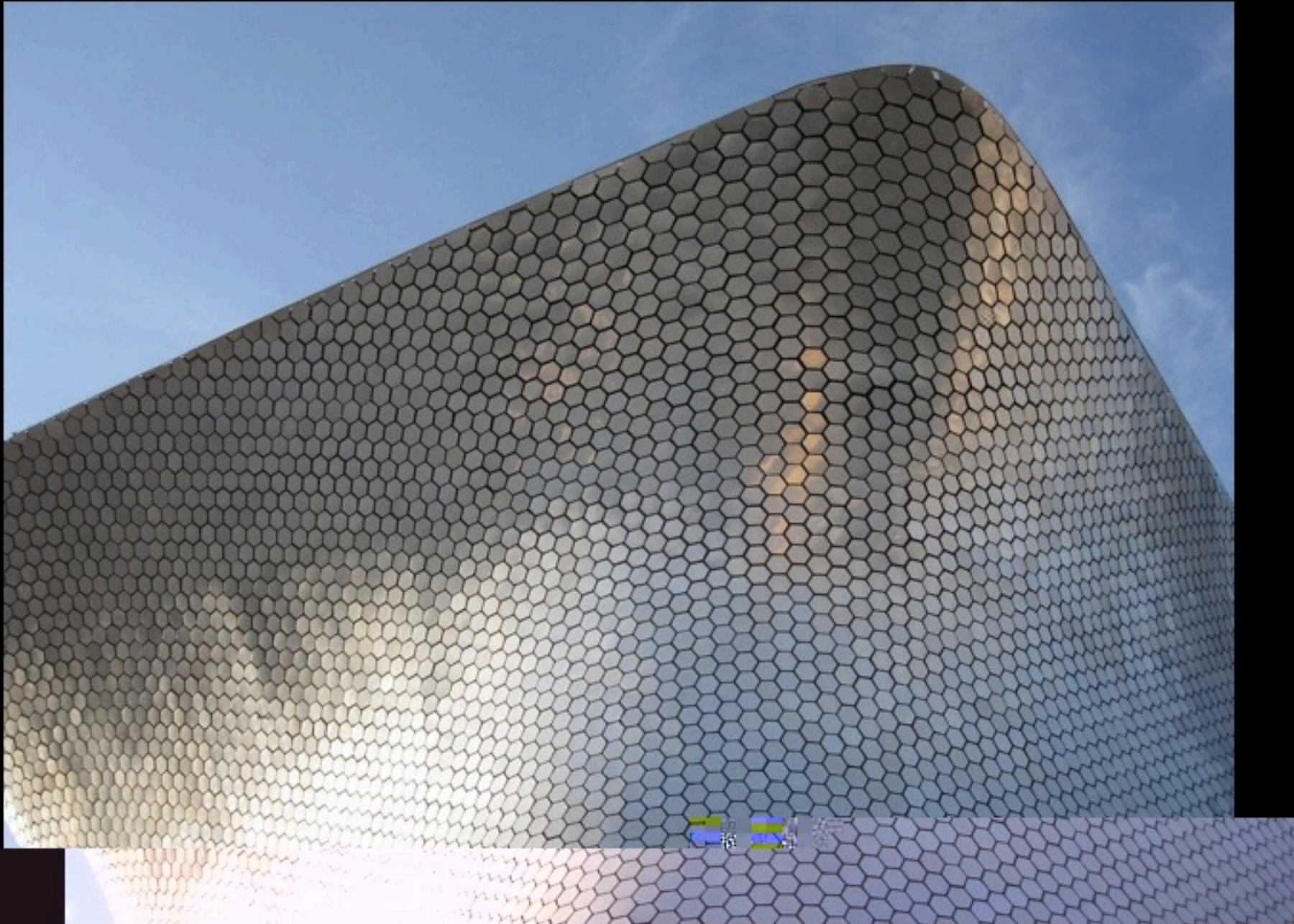


Soumaya Completed





Cladding Rules: Base Termination



Cladding Top Termination: No Coping



