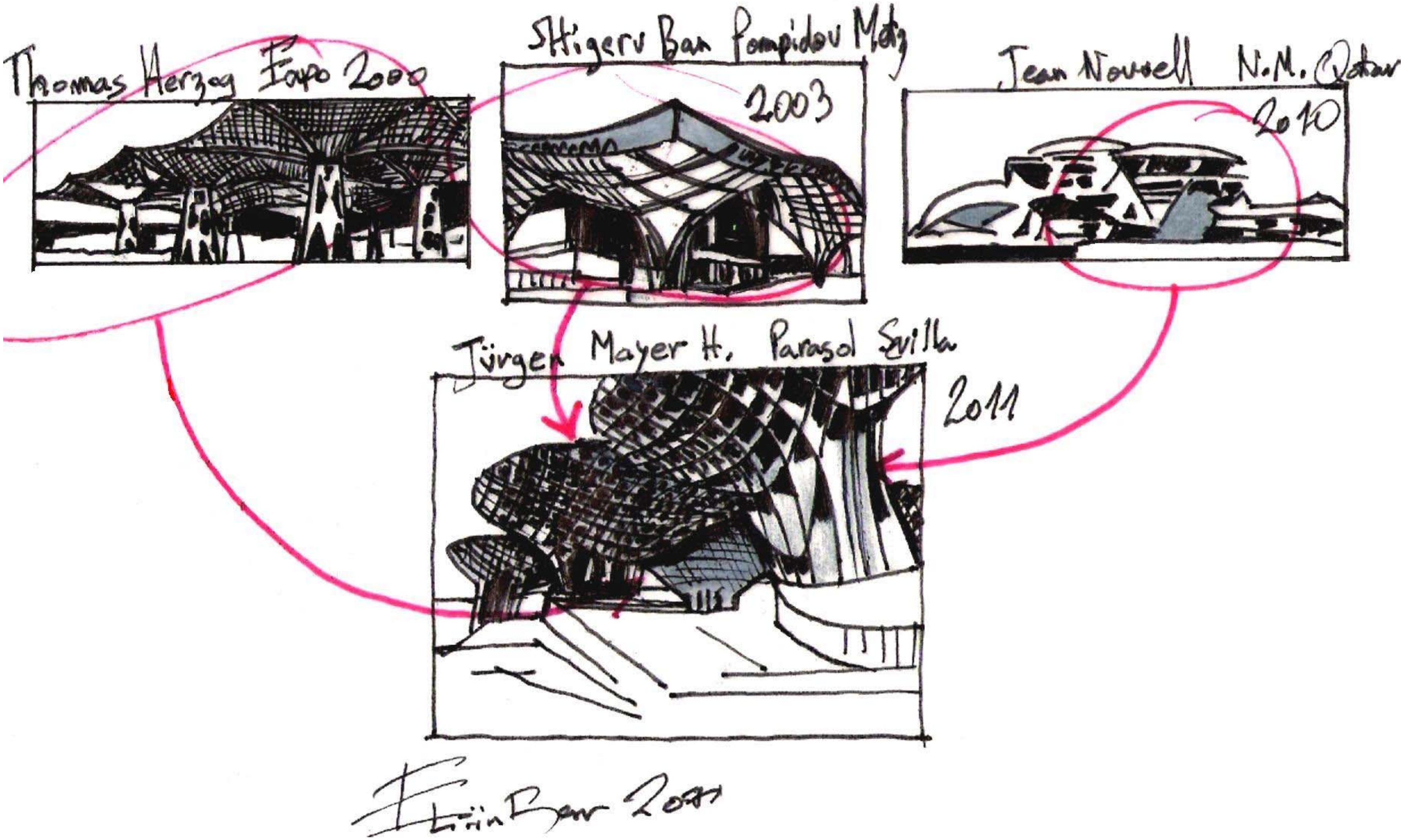
STUDI KASUS ARSITEKTUR PARAMETRIK

KULIAH 2

https://100architects.com/endorsed/metrosol-parasol/



http://www.loversiq.com/daut/as/f/c/conscious-inspiration-architect-someone-has-built-it-before-j-mayer-h-the-ultimate-e2-80-9cconscious-architect-e2-80-9d-1_inspiration-architecture_architecture_architectural-design-software-free-digit.jpg

Museo Soumaya

Nuevo Polanco, Mexico City, 2011 by Fernando Romero

http://www.fr-ee.org/media/00000000571.jpg

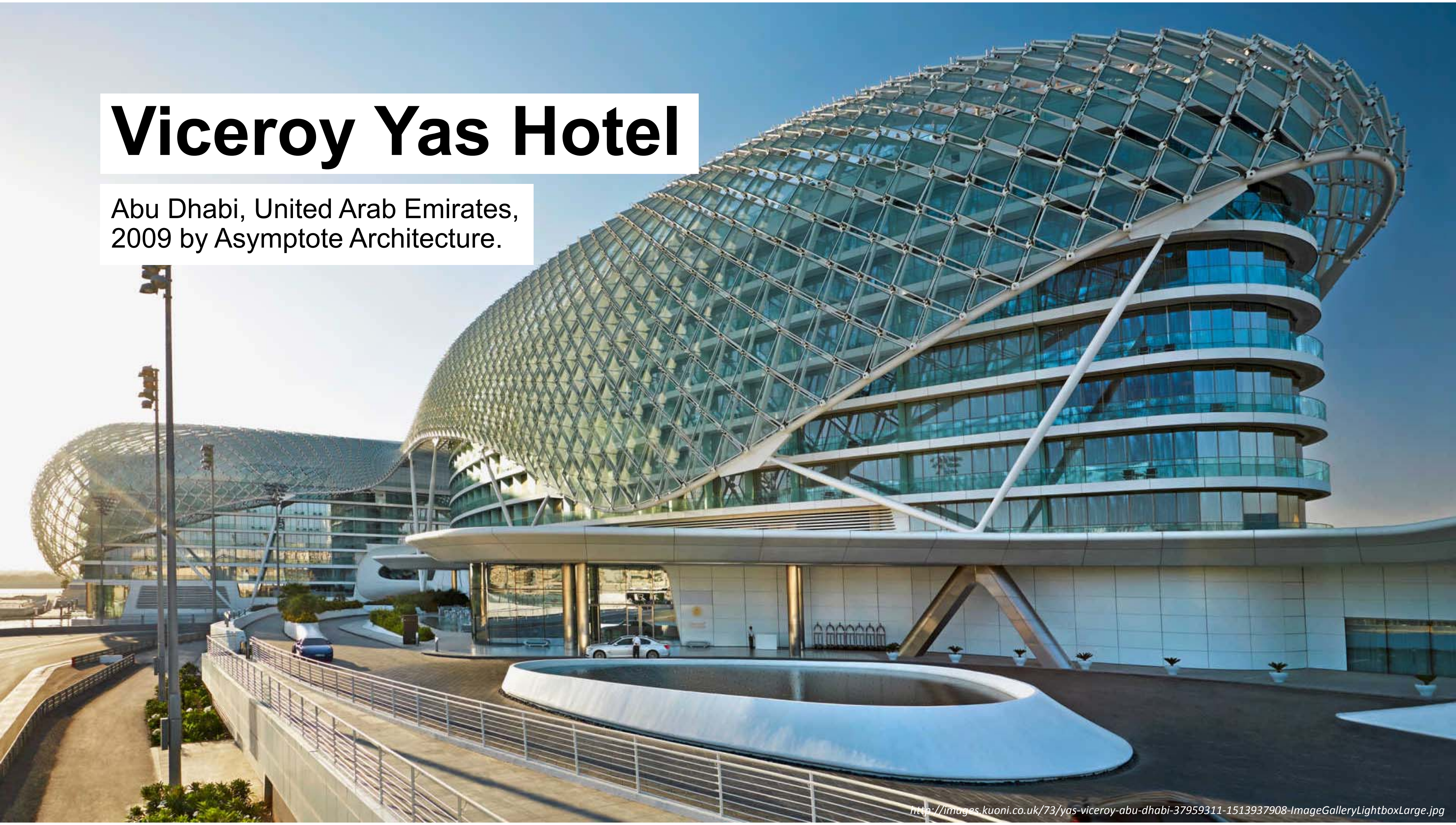
AAMI Park Stadium

Melbourne City, Victoria, Australia, 2010 by Cox Architects & Planners

http://aasarchitecture.com/wp-content/uploads/AAMI-Park-by-Cox-Architecture-03.jpg

Viceroy Yas Hotel

Abu Dhabi, United Arab Emirates,
2009 by Asymptote Architecture.



http://images.kuoni.co.uk/73/yas-viceroy-abu-dhabi-37959311-1513937908-ImageGalleryLightboxLarge.jpg

British Museum

London, 2000, Foster and Partners

http://travelinnate.com/wp-content/uploads/2016/02/British-Museum-6.jpg

South Australian Health and Medical Research Institute (SAHMRI)

Adelaide, Australia, 2013, by Woods Bagot

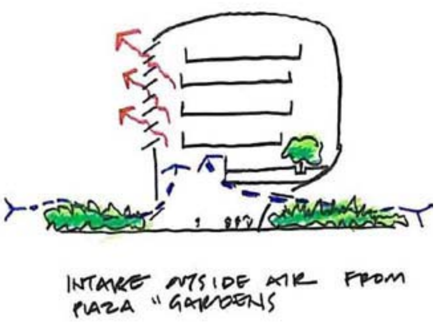
https://images.adsttc.com/media/images/529f/6460/e8e4/4e39/0200/0009/large_jpg/5_50_1399_N47_screenhd.jpg?1386177619

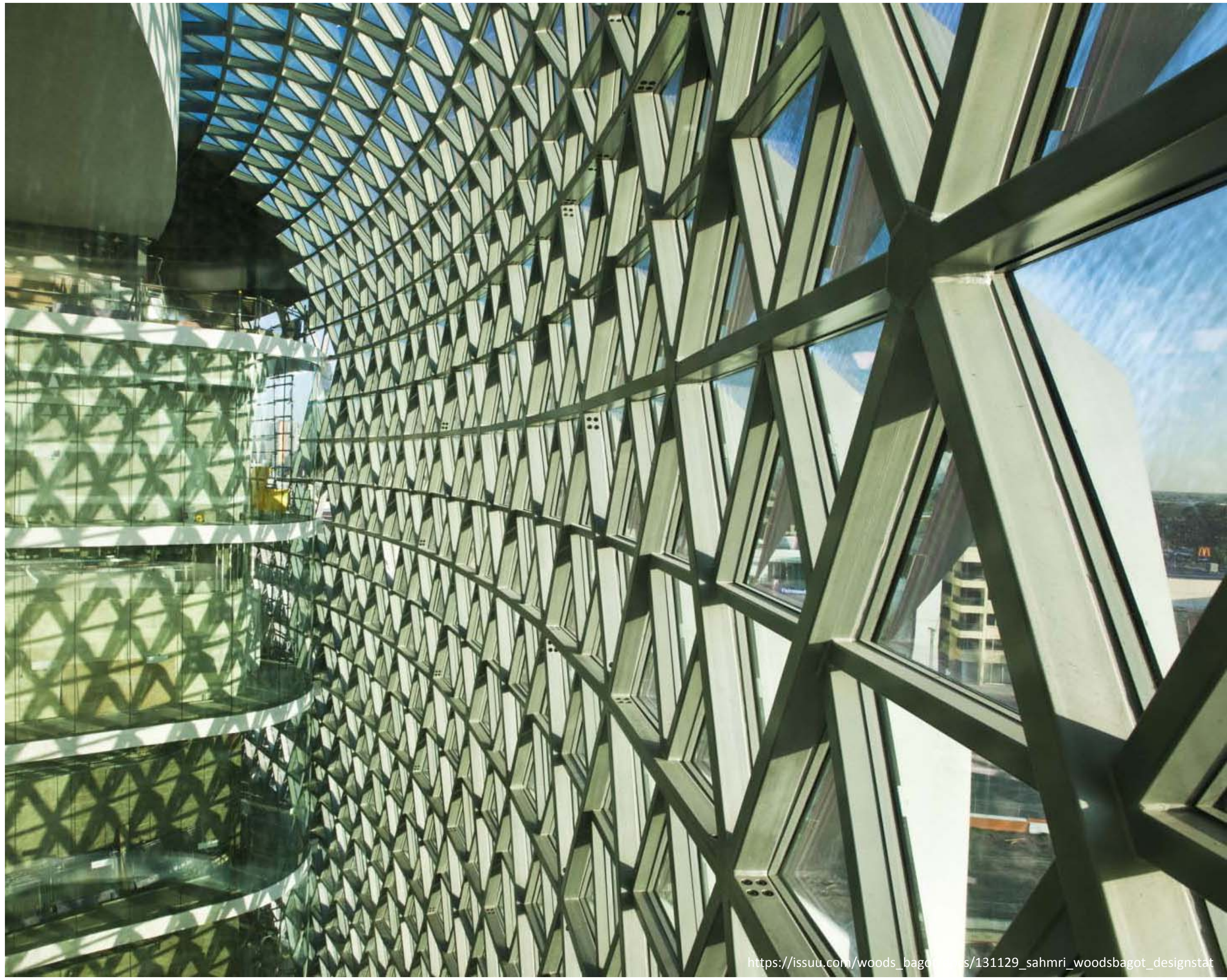
SAHMRI is the result of collaboration between the architect Woods Bagot and Aurecon, in the design of an Institute for Health and Research for the Government of South Australia.

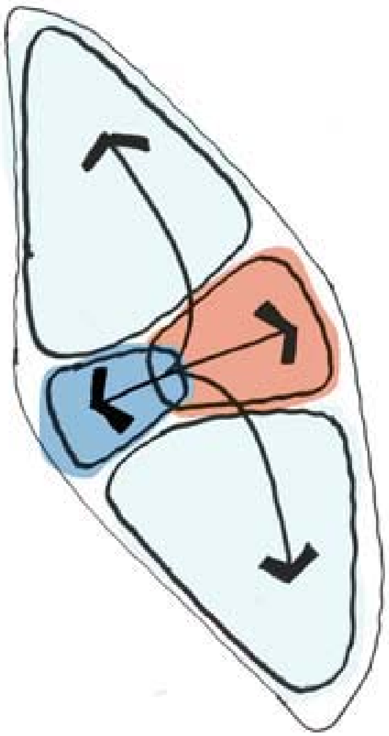
Baggot uses parametric modeling tools to integrate into the facade environmental, programmatic and procedural requirements.

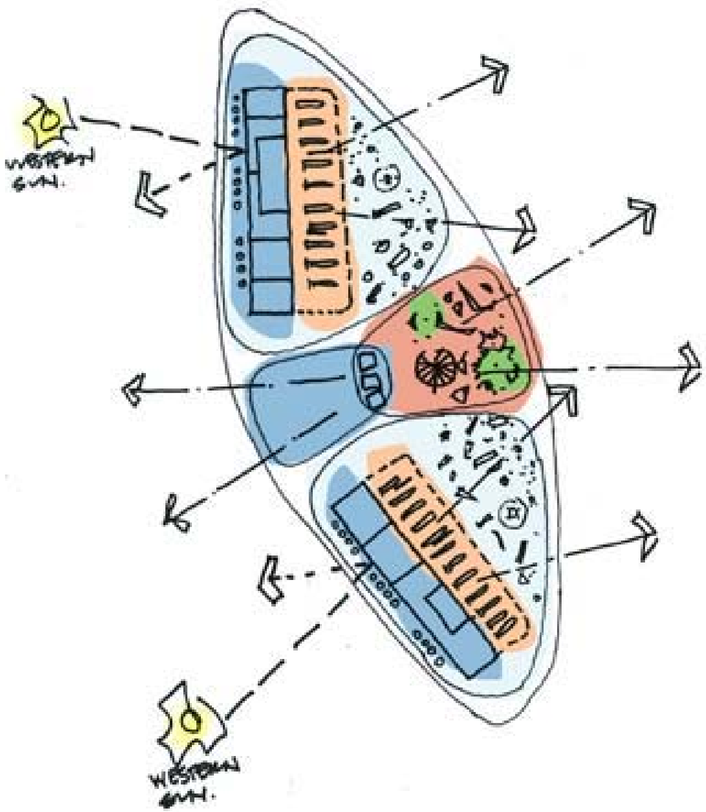
SAHMRI is a flexible, adaptable, healthy and sustainable facility, which has been rated **LEED Gold.**

LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world.

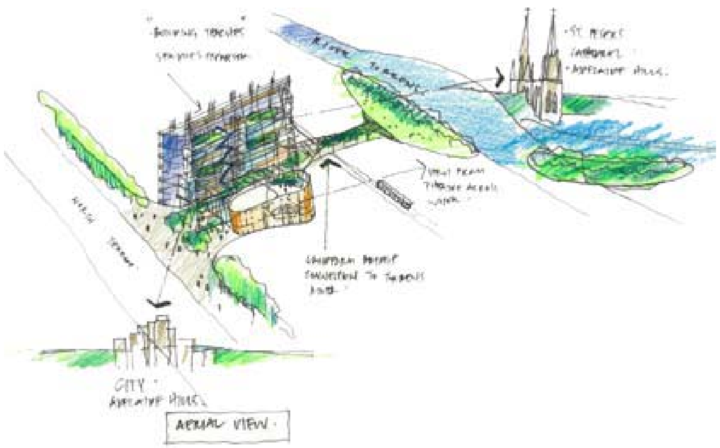


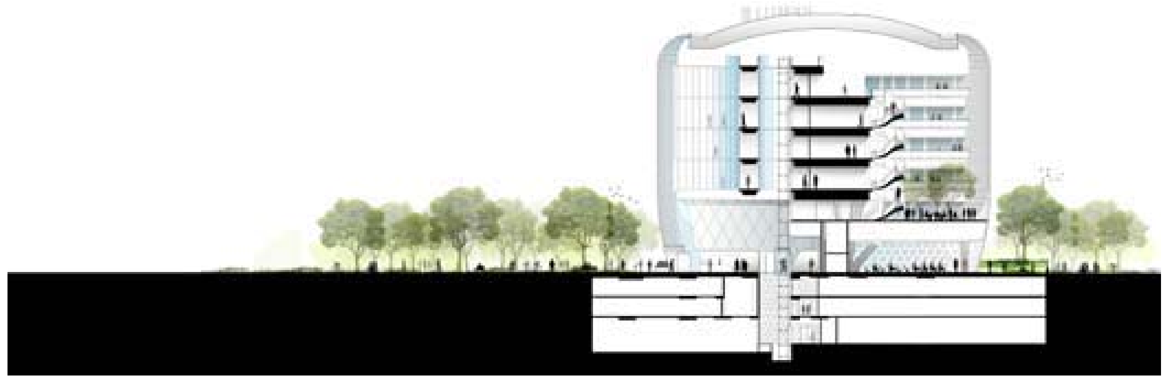


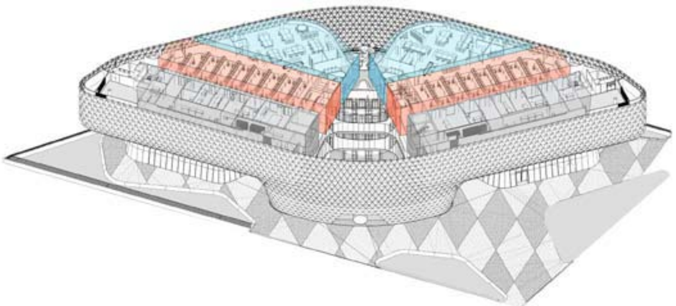




https://issuu.com/woods_bagot/docs/131129_sahmri_woodsbagot_designstat



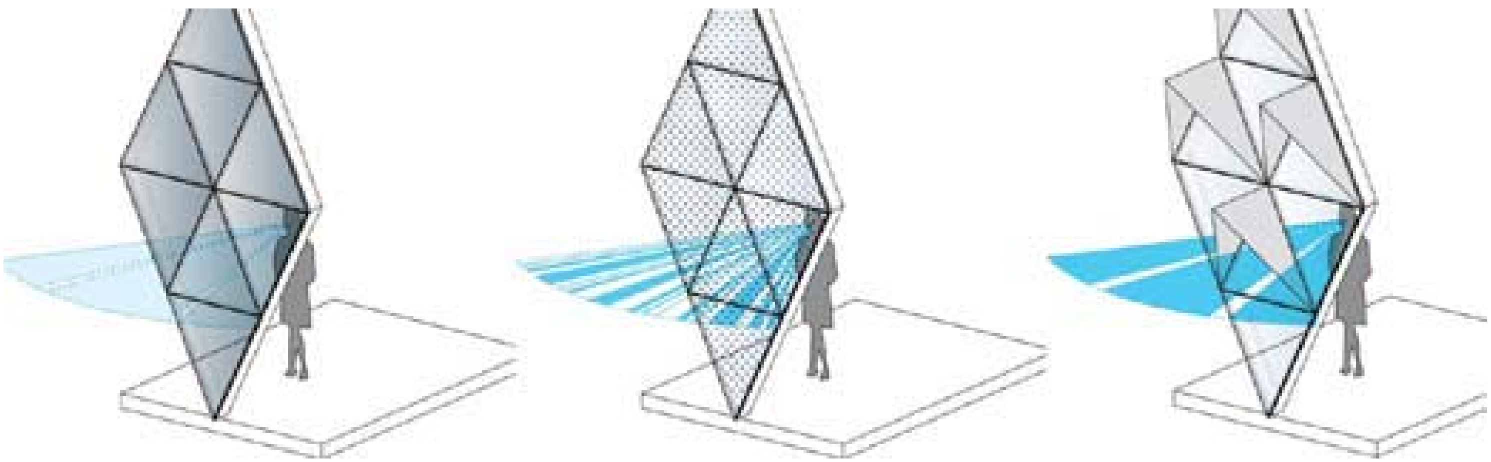




https://issuu.com/woods_bagot/docs/131129_sahmri_woodsbagot_designstat

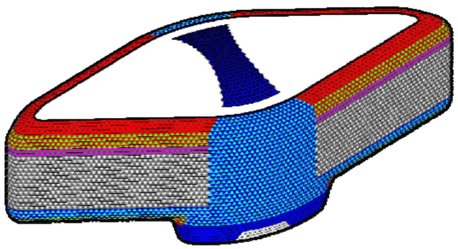
FACADE

The transparent façade covered with a triangular grid articulated skin adapts and responds to its environment, becoming a living organism that responds to the position of the sun.

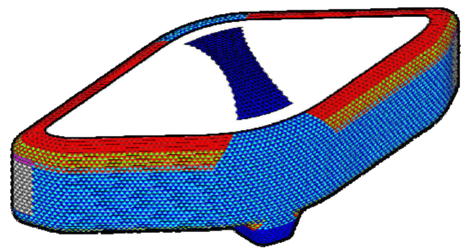


Responding to sunlight, heat load, glare and wind deflection, while maintaining views and daylight

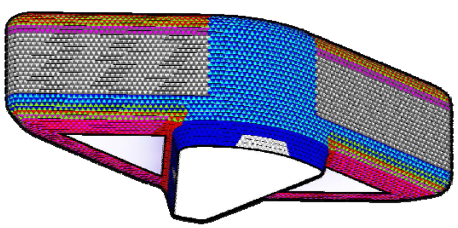
https://issuu.com/woods_bagot/docs/131129_sahmri_woodsbagot_designstat



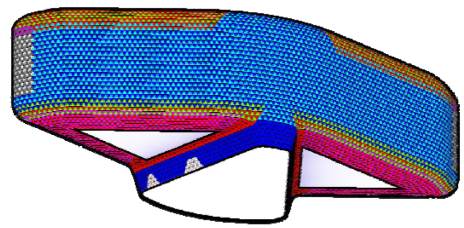
West Facade Aerial Axo



East Facade Aerial Axo



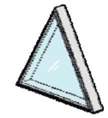
West Facade Underside Axo



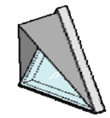
East Facade Underside Axo

	Material Type/ Area Totals	Type_01	Type_02	Type_03	Type_04	Type_05	Type_06	Type_07	Type_08	TOTAL
Counts	Bays	4547	2706	3098	1240	1026	1176	1344	120	15302
	Unique Sizes	994	134	467	178	162	4	4	24	1954
Areas	Glass	3059	1902	0	0	0	0	0	0	4961
	(flat) Metal	0	0	1947	0	0	0	0	0	1583
	(expanded) Metal	0	0	0	1125	0	0	0	0	1125
	(screen) Metal	0	1755	0	0	0	0	1335	0	3090
	(perforated) Metal	0	0	0	0	687	0	0	0	687
	Bird Mesh	0	0	0	0	x	855	977	0	1832

Zones	CD10, CD11, CD12, CD13	●	●						
	CD20, CD21						●	●	
	CD30, CD31, CD32					●		●	
	CD40, CD41	●		●	●	●			
	CD50, CD51			●	●				
	CD60		●	●					
	CD70			●		●			
	CD80	●							●
	CD90	●							



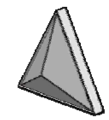
Type_01
- Glass



Type_02
-Glass
- Sun Shade

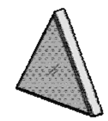
Glazed Panels

Type_03
- Metal



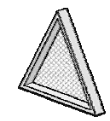
Type_04
- Expanded Metal

Solid Metal Panels



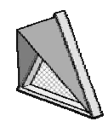
Type_05
- Metal

Perforated Metal Panels



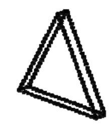
Type_06
- Birds Mesh

Open Panels



Type_07
- Birds Mesh
- Sun Shade

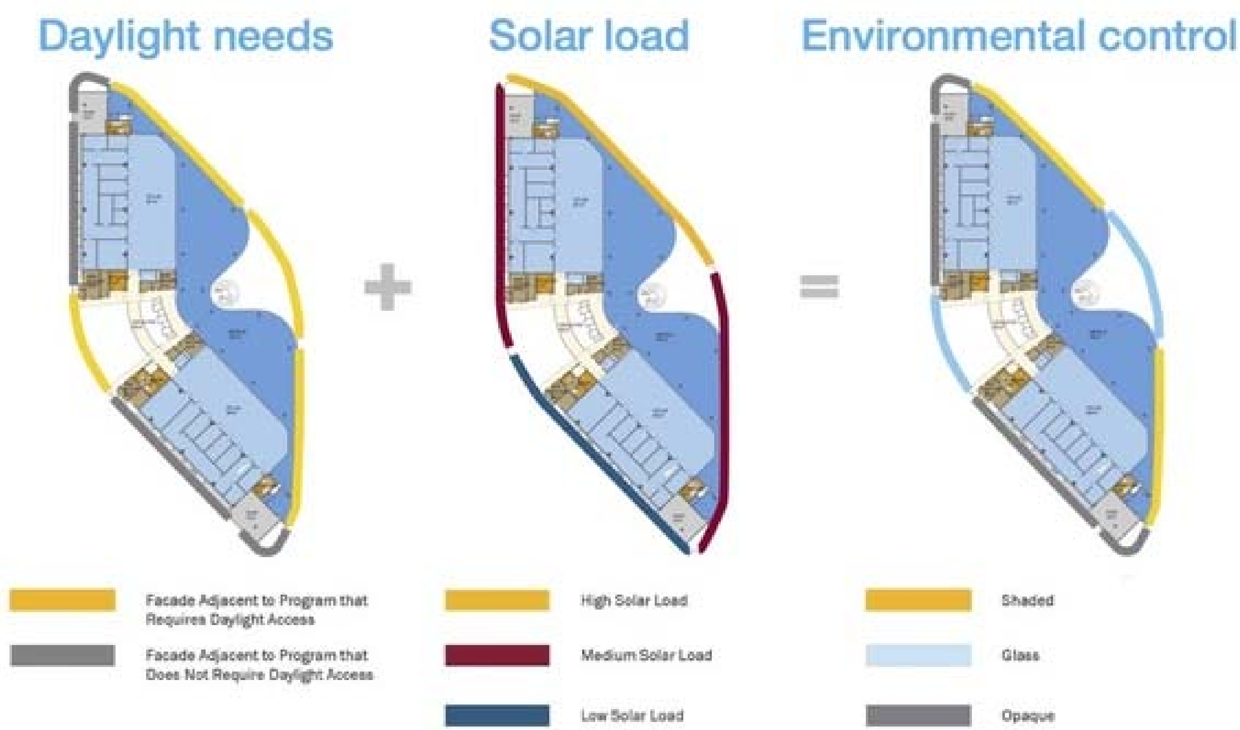
Open Panels



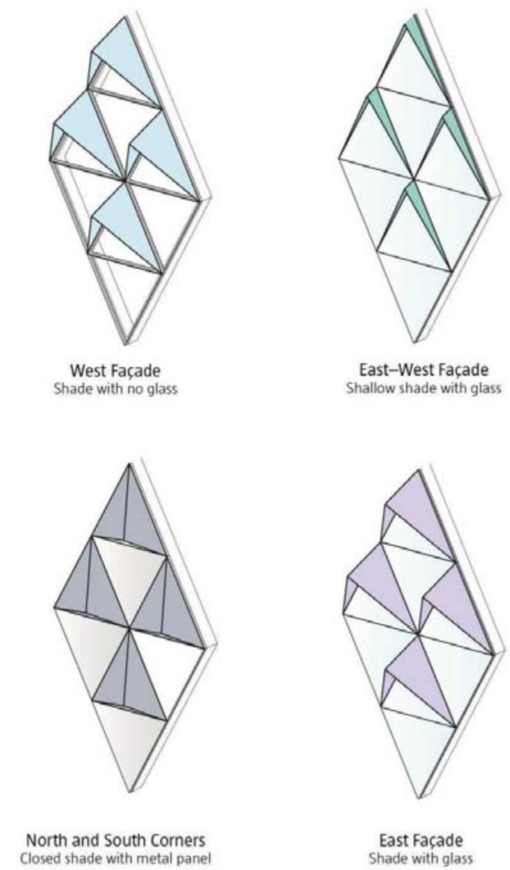
Type_08
- Removed

http://bubblemania.fr/wp-content/uploads/MEDICAL-SOUTH-AUSTRALIA-35.png

Environmental Analysis
Façade Requirements



Façade Shading

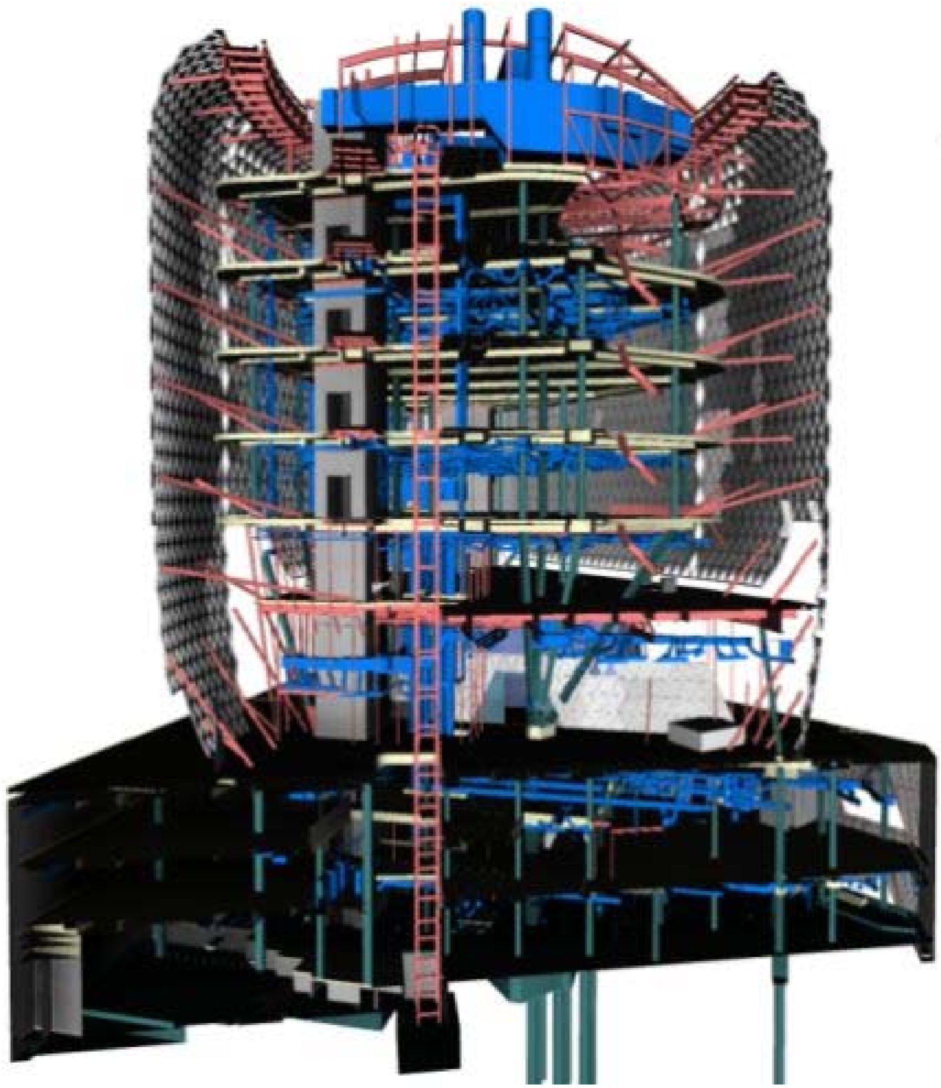


https://www.engsurveys.com.au/projects/sahmri.html

STRUCTURE

Euclidean theory of light covers that are usually used in modern stadiums. This technique allowed the use of an “active structural form” to the charge distribution, allowing the use of small rectangular hollow steel elements that allow free passage of natural light through large spaces of the building.

The 36 columns that would have been necessary to support the upper floors were reduced to 6 mainstays located plaza level, being reduced the weight of the steel structure must withstand approximately 250tn.

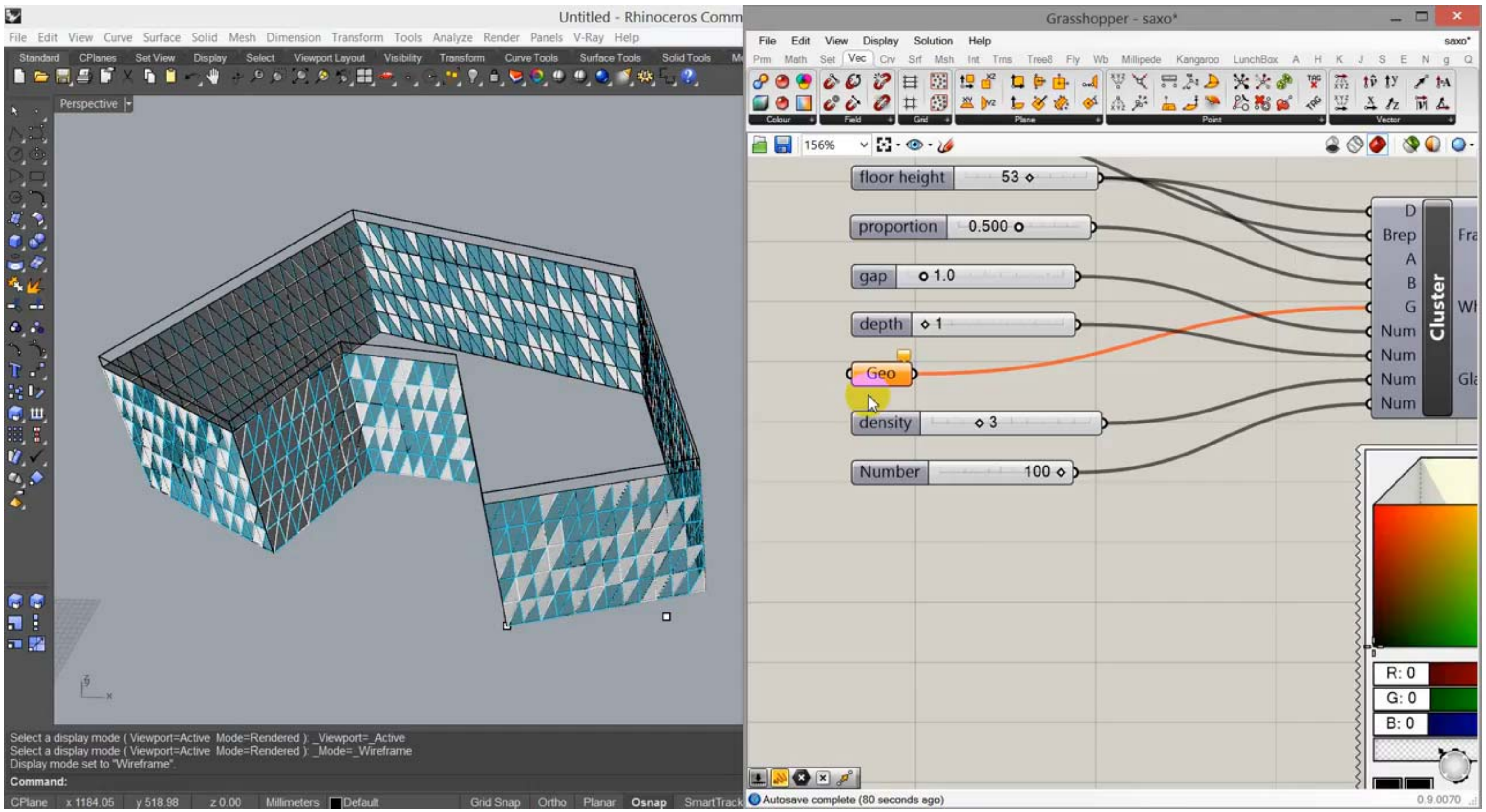



SAHMRI

https://www.engsurveys.com.au/projects/sahmri.html

https://i2.wp.com/assets.yellowtrace.com.au/wp-content/uploads/2015/01/SAHMRI-by-Woods-Bagot-Yellowtrace-011.jpg

Grasshopper triangular façade exercise



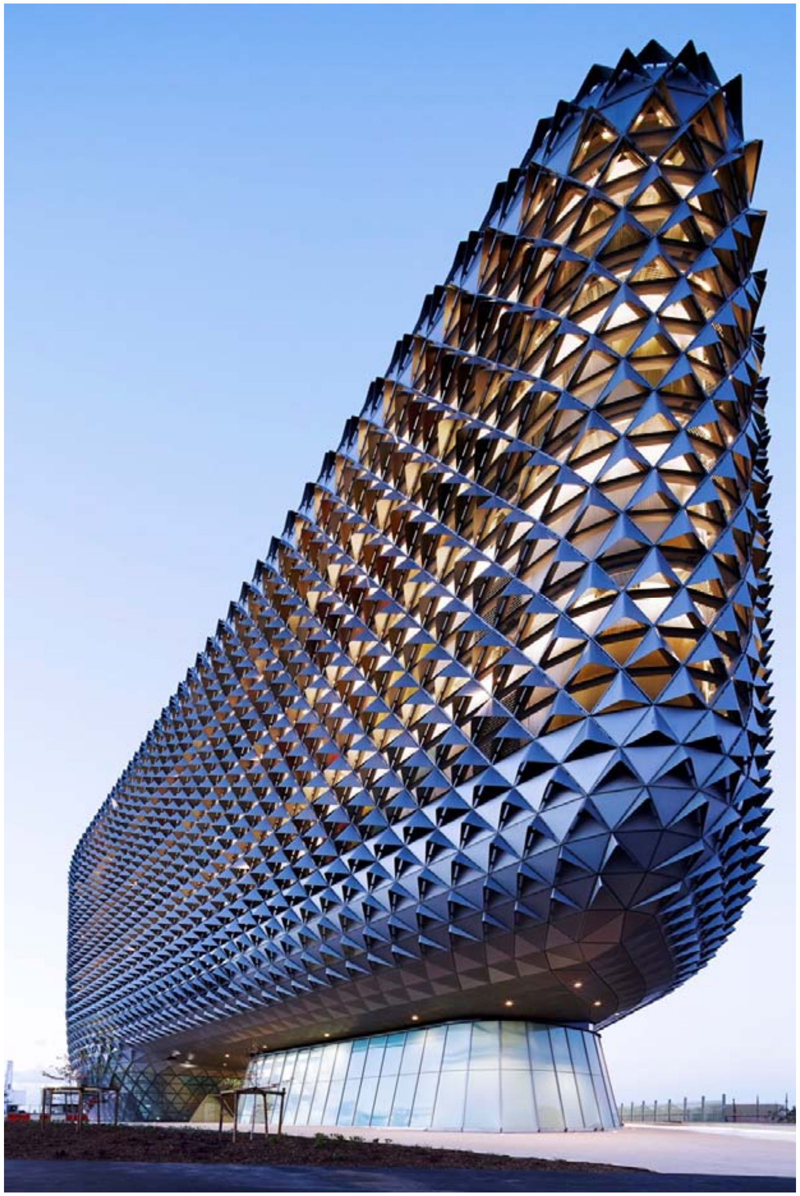
https://www.youtube.com/watch?v=V4BFlStlGWk

Grasshopper triangular façade exercise (on any surface)

https://www.youtube.com/watch?v=o4ufv13EZk4

SAHMRI construction and design overview

https://www.youtube.com/watch?time_continue=345&v=ZRjOpFwLjWk



http://bubblemania.fr/wp-content/uploads/MEDICAL-SOUTH-AUSTRALIA-08.jpg

The Hangzhou Tennis Center

Hangzhou, China, 2015 by NBBJ and China Construction Design International (CCDI)

http://www.xinhuanet.com/english/2016-09/22/135705706_14745305129261n.jpg

The Olympic Park occupies 400,000 square meters on the west bank of Qiantang River, whereas the building utilizes 220,000 square meters to accommodate 10,000 seats.

1. West Riverfront Plaza
2. Parking
3. South Entry Plaza
4. Tennis Practice Fields
5. East Riverfront Plaza
6. Parking
7. Cultural Center Plaza
8. Retail Boulevard
9. Rolling Landform Park
10. Gingko Bosque
11. Retail Connection Spine
12. Retail Connection Spine
13. Water Feature
14. East Entry Plaza
15. Extreme Sports Area
16. Community Playfields

https://www.arch2o.com/wp-content/uploads/2015/06/Arch2O-HangzhouTennisCenter-NBBJCCDI-12.jpg

Parametric Algorithm:

• **Geometry Design:** Parametrically defining and controlling the exterior geometry.

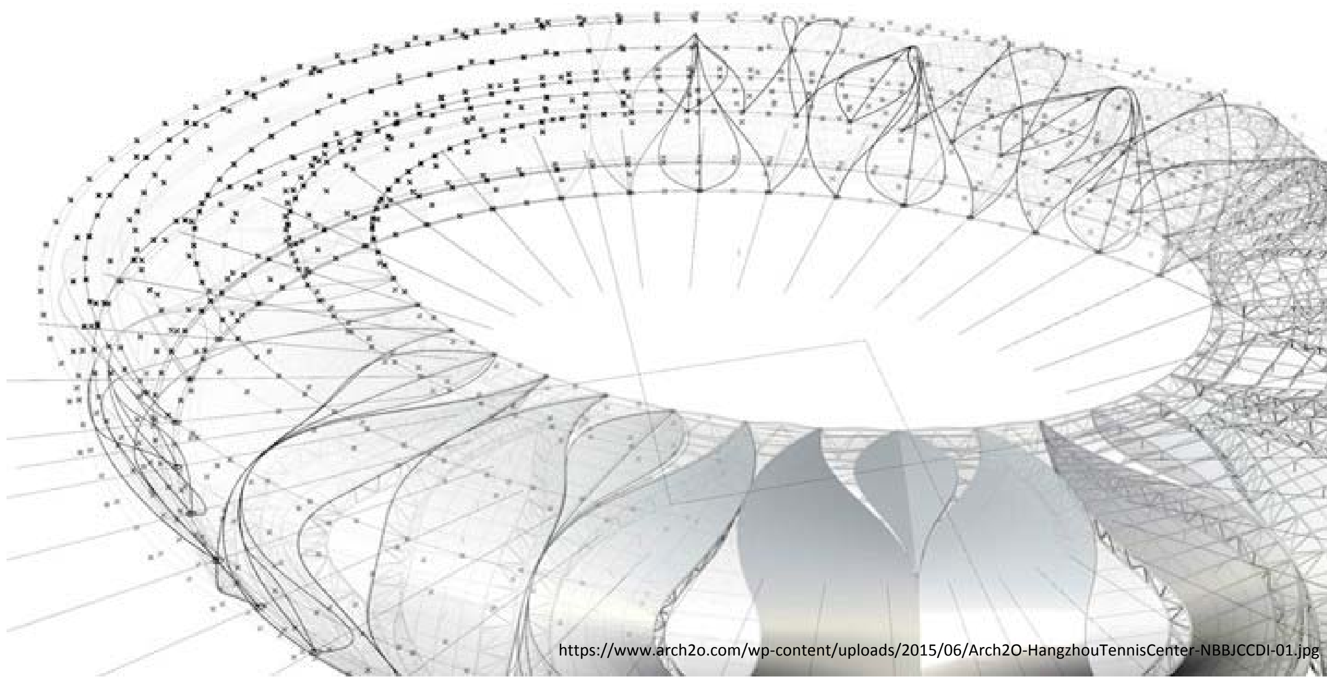
• **Form Variations:** Rapid refining of the building form and testing alternatives.

• **Structural Collaboration:** Systems for producing analysis-ready structural models.

• **Conceptual Simulation:** Integrating intuitive physics simulation for an intuitive understanding of complex structures.

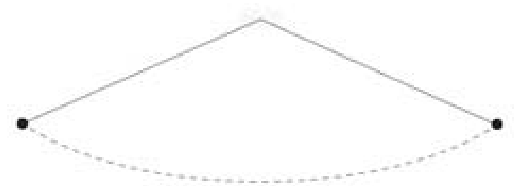
• **Surface Analysis and Cladding:** Surface property visualization and detailed parametric paneling systems.

Rhinoceros 3D + Grasshopper plug-in + Revit

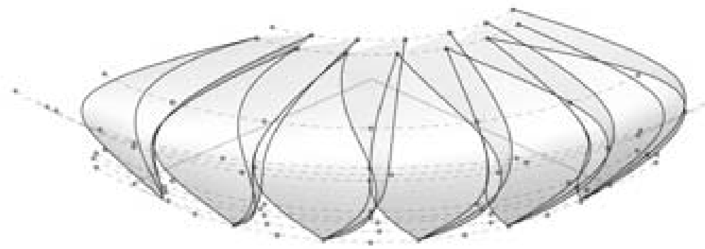


https://www.arch2o.com/wp-content/uploads/2015/06/Arch2O-HangzhouTennisCenter-NBBJCCDI-01.jpg

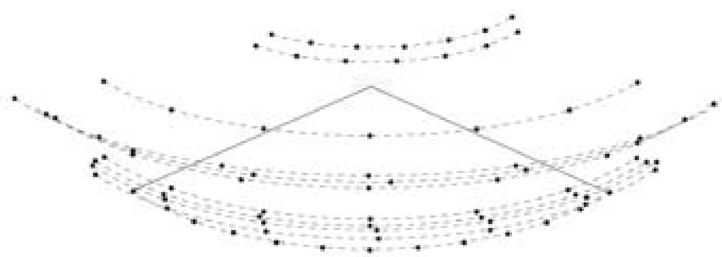
GEOMETRY DESIGN



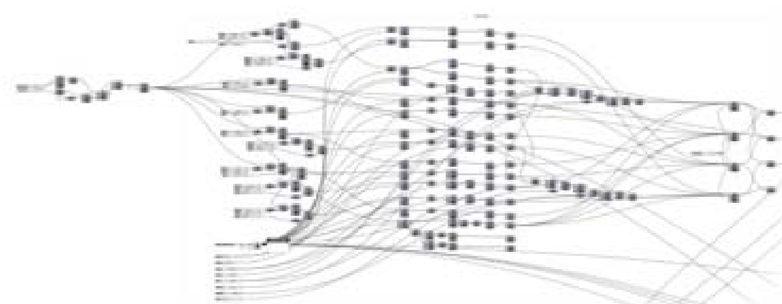
CIRCULAR ARC



CONTROL SURFACES

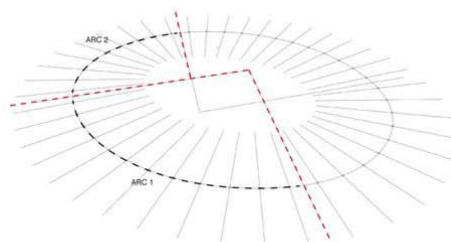


POINT CLOUD CONSTRAINTS

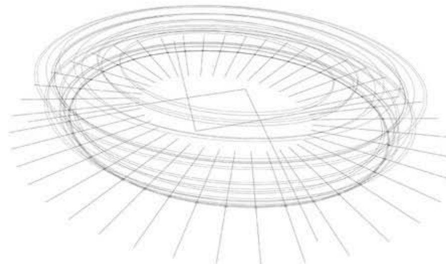


The algorithm for defining the geometry of the exterior shell.
A point cloud driven by circular arcs creates the control system for NURB control surfaces.

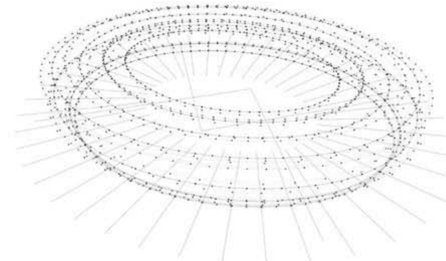
https://issuu.com/nmillerarch/docs/hz_tennis_issuu



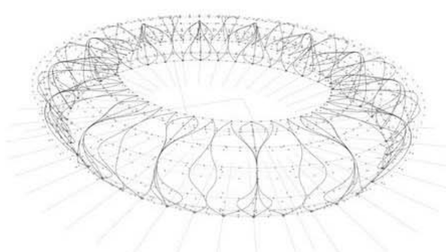
1. Circular arcs are established as the driving geometry for the bowl and the exterior steel petals.



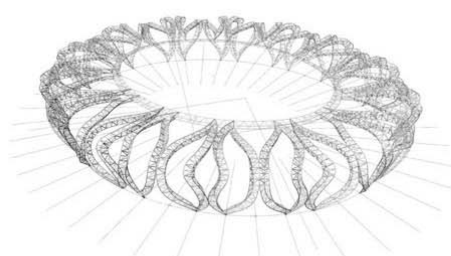
2. Arc geometry is transposed in 3D space to define the interior and exterior limits of the stadium shell.



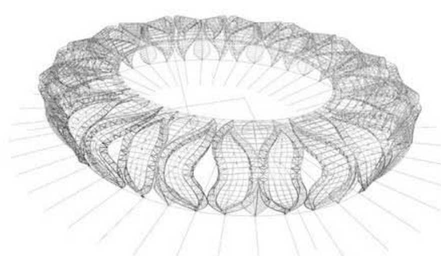
3. Arcs are divided into lists of control points.



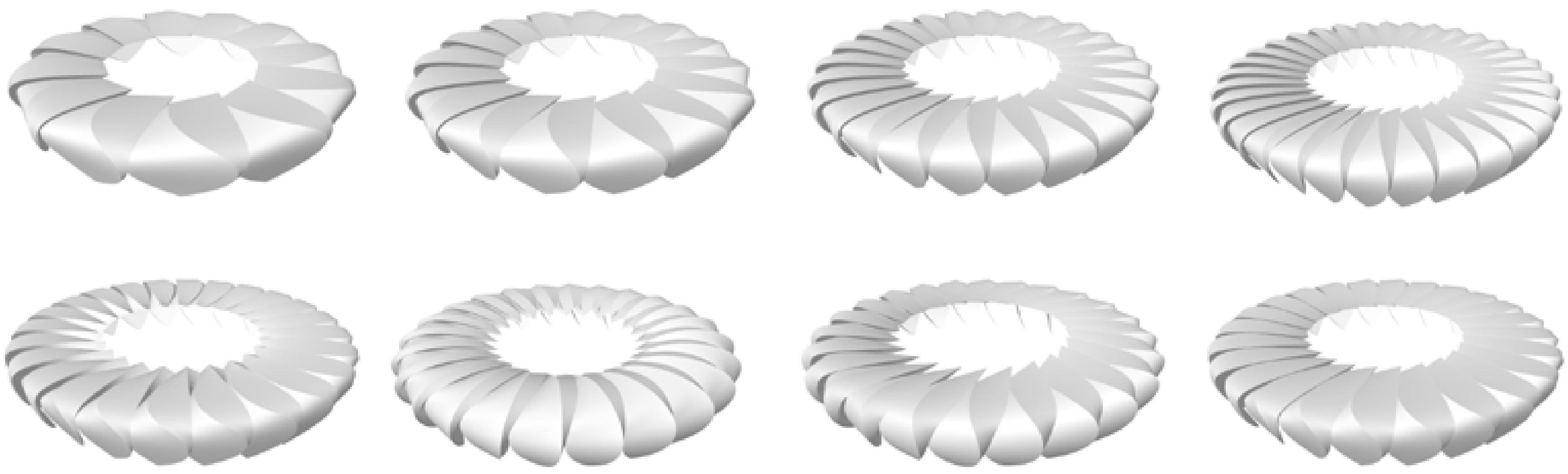
4. The list of points is organized to define B-Spline curves and surfaces.



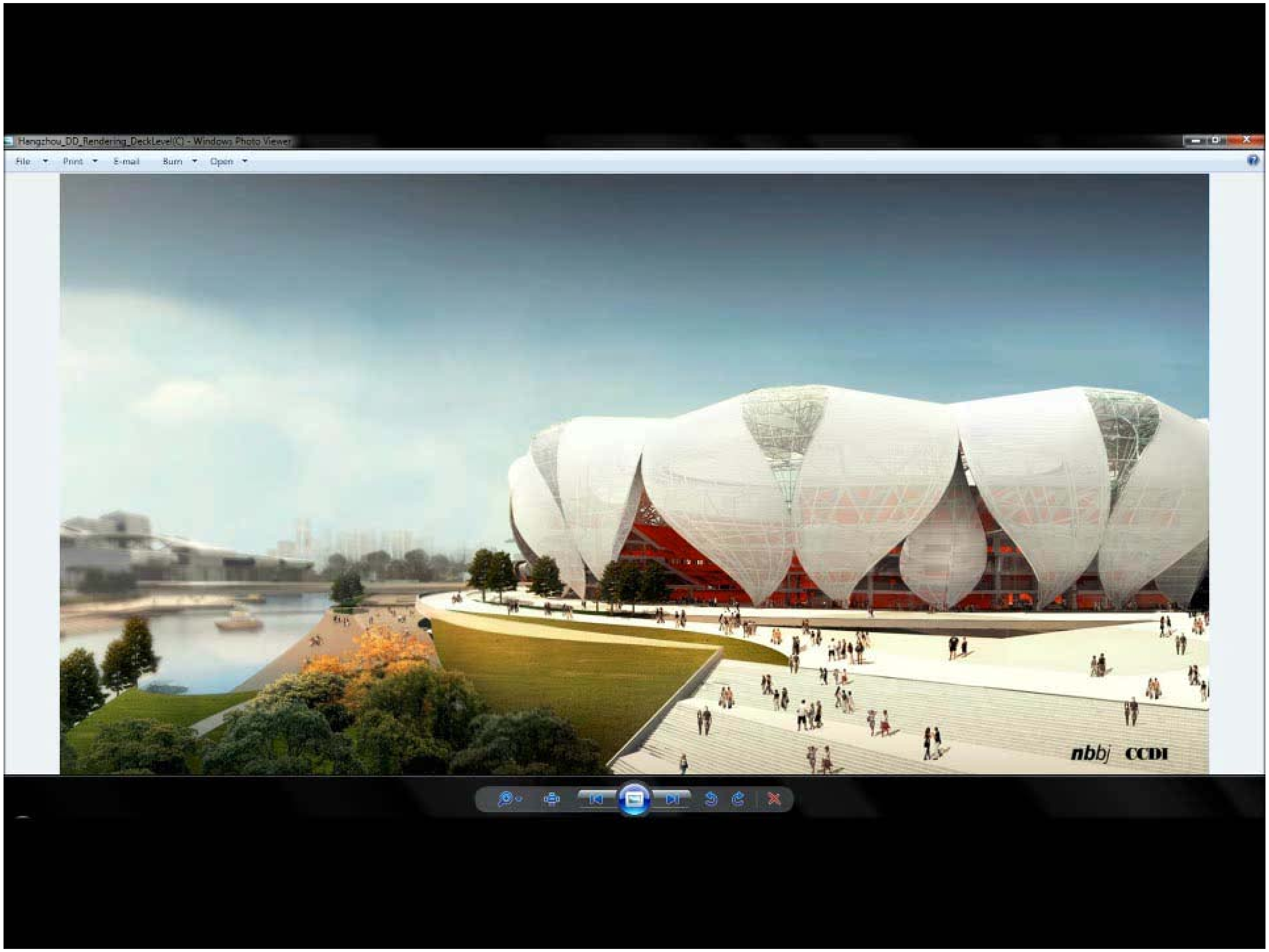
5. The B-spline geometry is subdivided to create primary truss geometry.



6. Secondary structural elements for lateral bracing and roof systems are linked to the primary truss system.



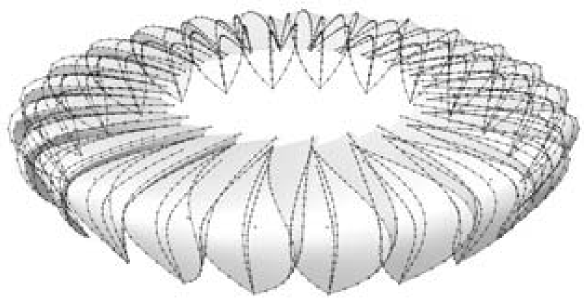
Variations on the exterior envelope.
The point cloud constraints were manipulated to create different geometric effects. The number of petal modules could also be increased or decreased.



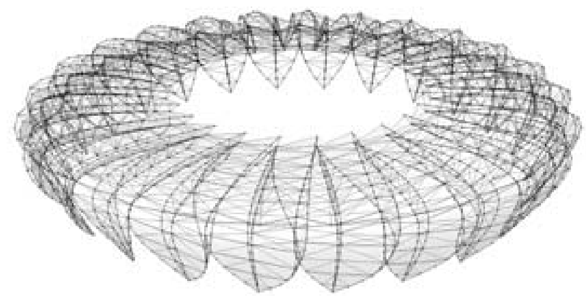
Grasshopper
geometric
practice

https://www.youtube.com/watch?v=ax_snVOIZ8A

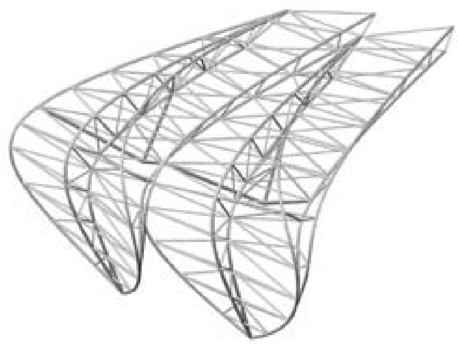
STRUCTURAL COLLABORATION



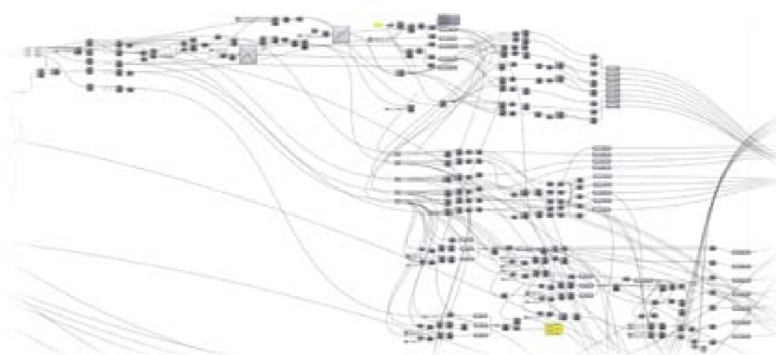
1. STRUCTURE NODES DEFINITION



2. TRUSS CENTERLINE DEFINITION



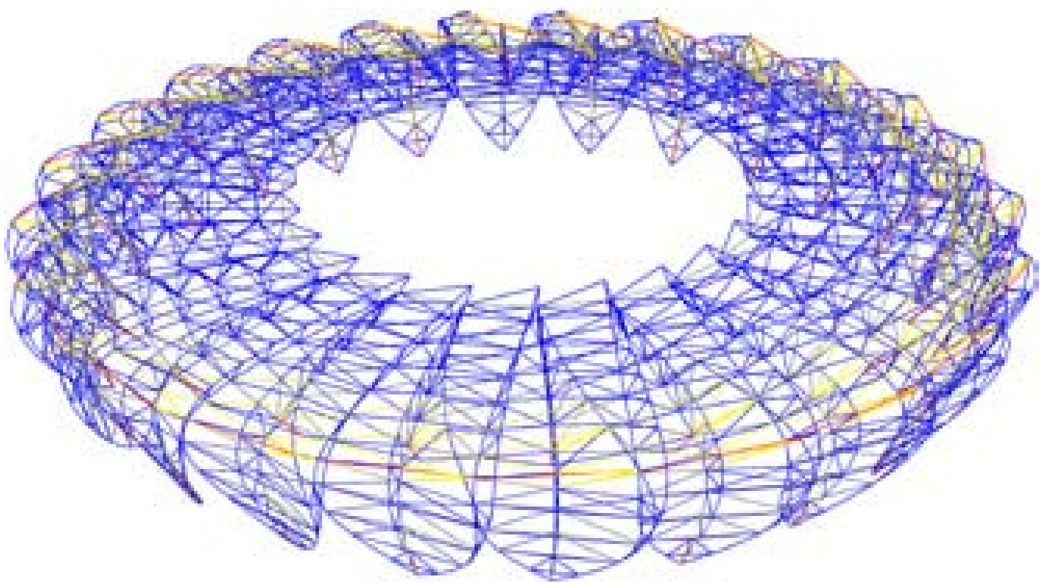
3. TRUSS MEMBER SIZE COORDINATION

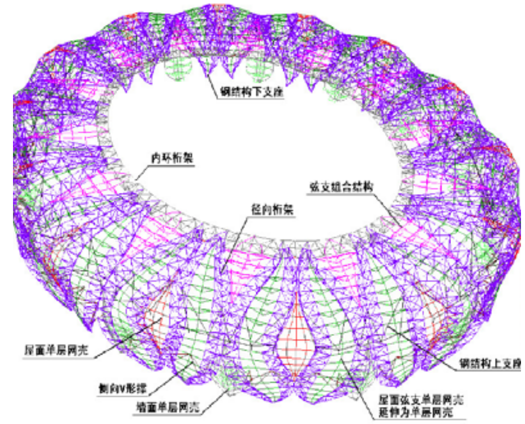


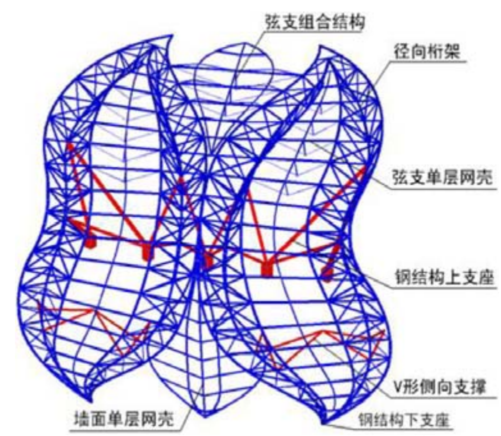
The parametric structural design model.
Centerline information was exported for structural analysis.

https://issuu.com/nmillerarch/docs/hz_tennis_issuu

CONCEPTUAL SIMULATION



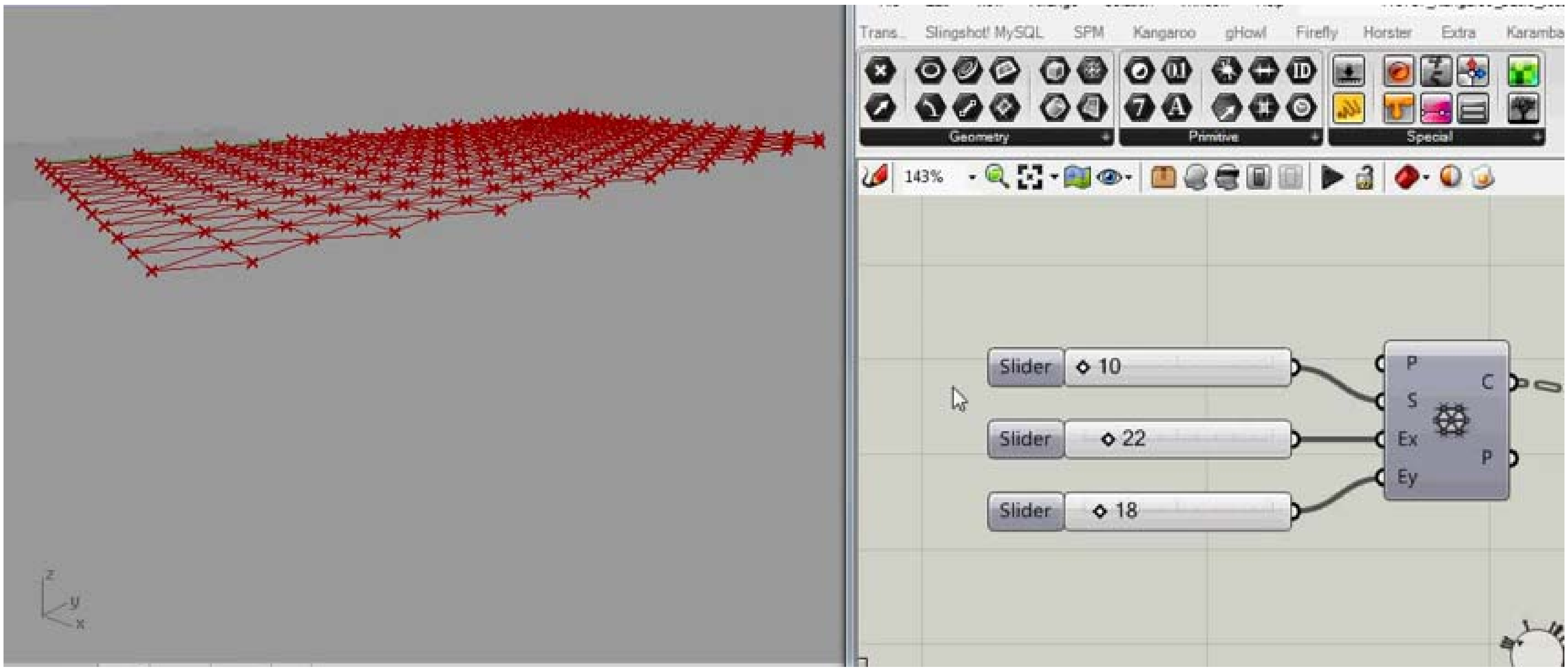




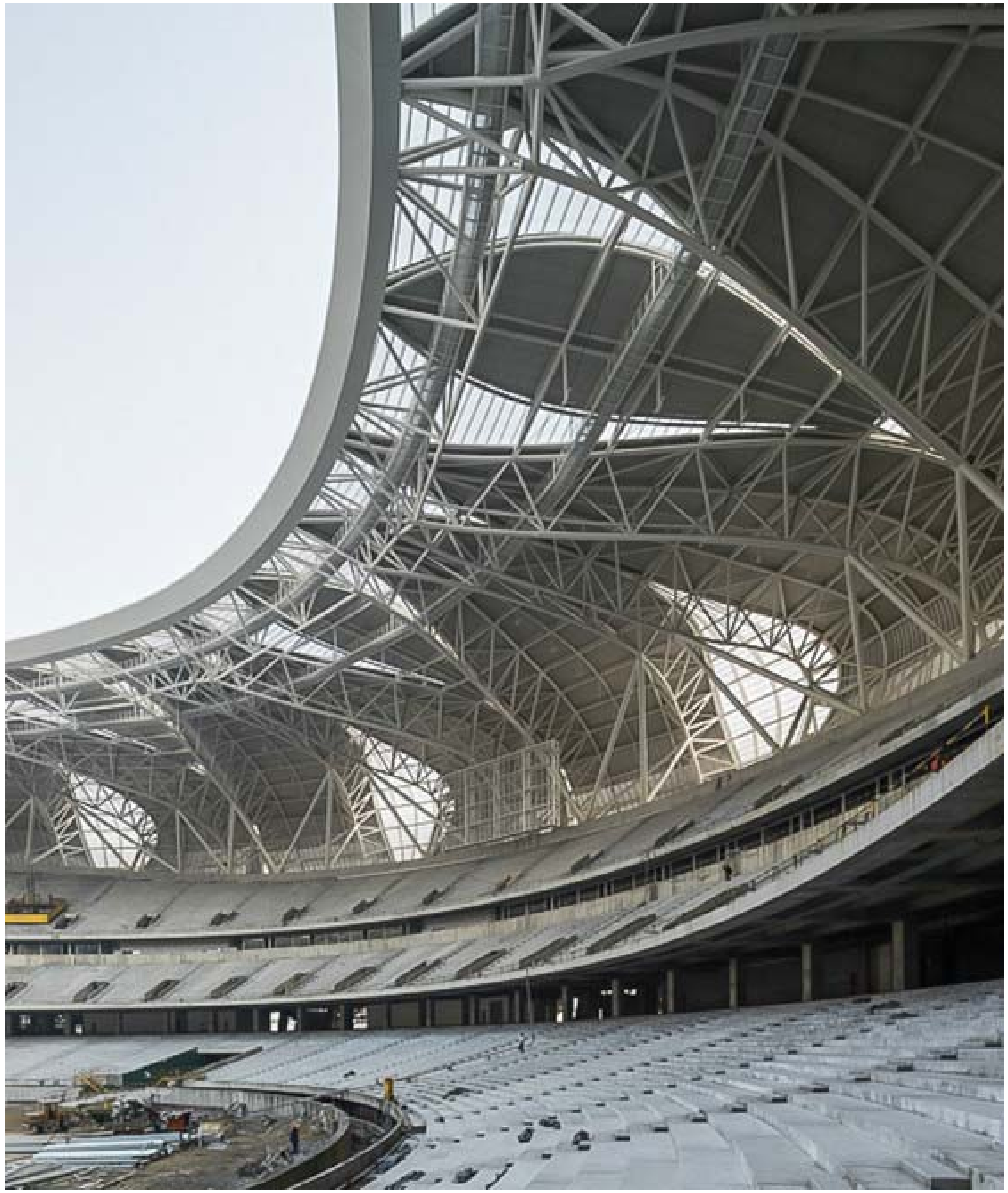
Using **the Kangaroo physics engine** to visualize **gravity loading** on the truss centerline model.

https://www.arch2o.com/wp-content/uploads/2015/06/Arch2O-HangzhouTennisCenter-NBBJCCDI-031.jpg
https://issuu.com/nmillerarch/docs/hz_tennis_issuu

Kangoroo Simulation example: on membrane



https://www.youtube.com/watch?v=d93gezuqwAY



http://www.arch2o.com/wp-content/uploads/2015/06/Arch2O-HangzhouTennisCenter-NBBJCCDI-14.jpg

Metropol Parasol

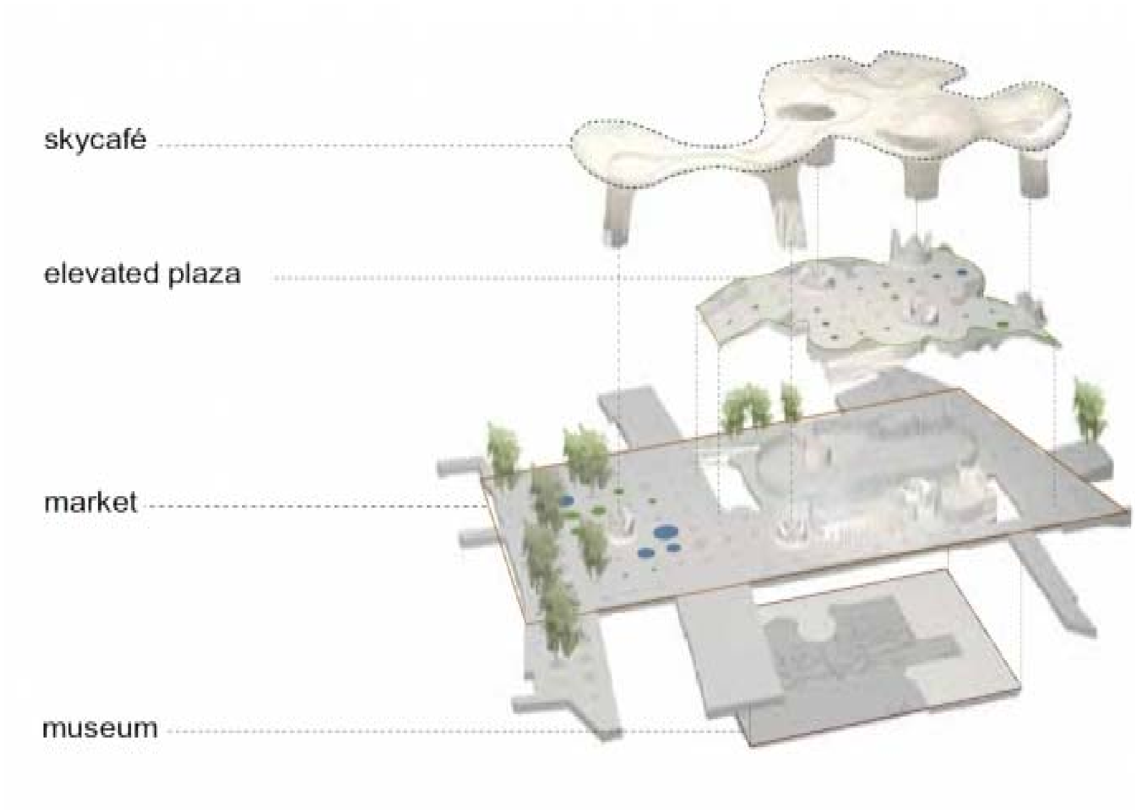
Seville, Spain, 2011 by Jürgen Mayer-Hermann.

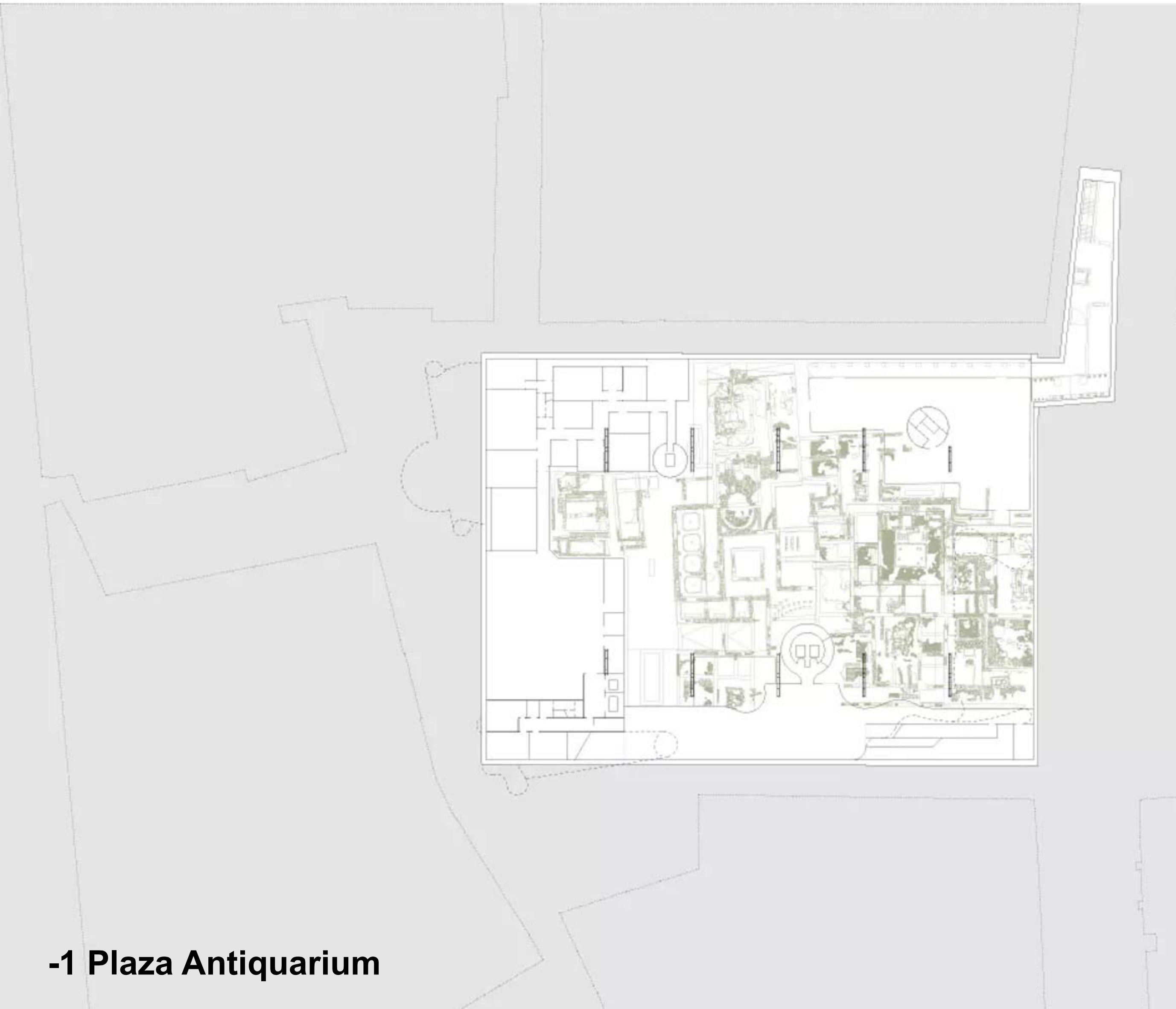
https://www.yatzer.com/Metropol-Parasol-The-World-s-Largest-Wooden-Structure-J-MAYER-H-Architects

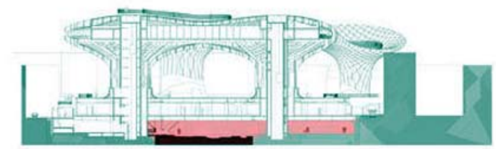
Project: Metropol Parasol
Redevelopment of Plaza de la Encarnacion, Seville, Spain

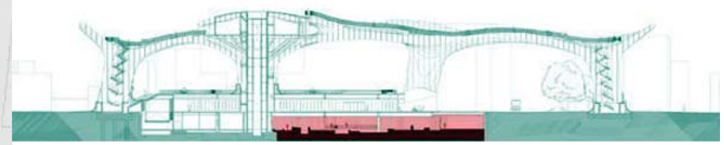
Function: archeological site, farmers market, elevated plaza, multiple bars and restaurants

Site area: 18,000 square meters
Building area: 5,000 square meters
Total floor Area: 12,670 square meters
Number of floors: 4
Height of the building: 28.50 meters



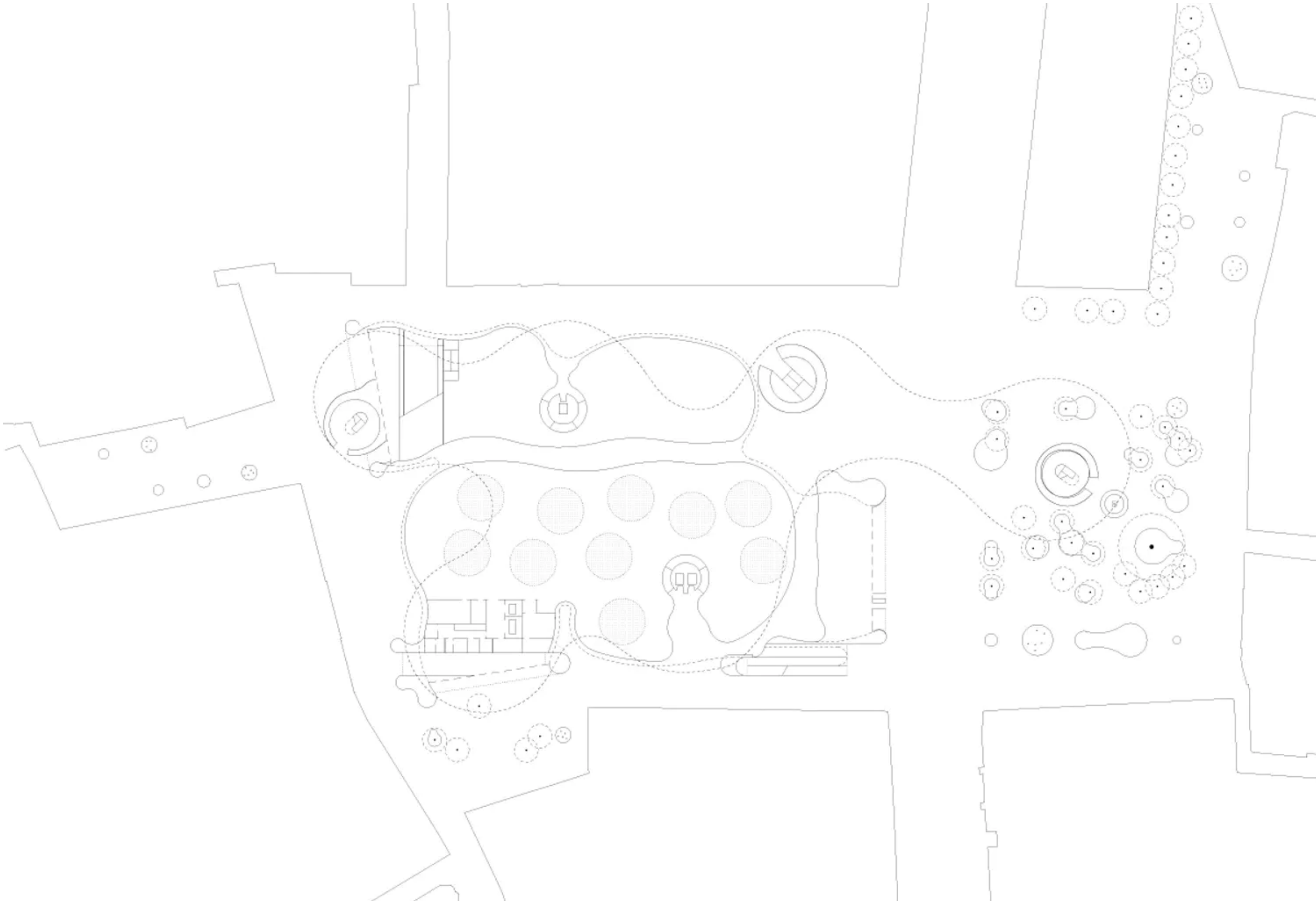






-1 Plaza Antiquarium

https://www.designboom.com/cms/images/jayme01/metropole/met11.jpg

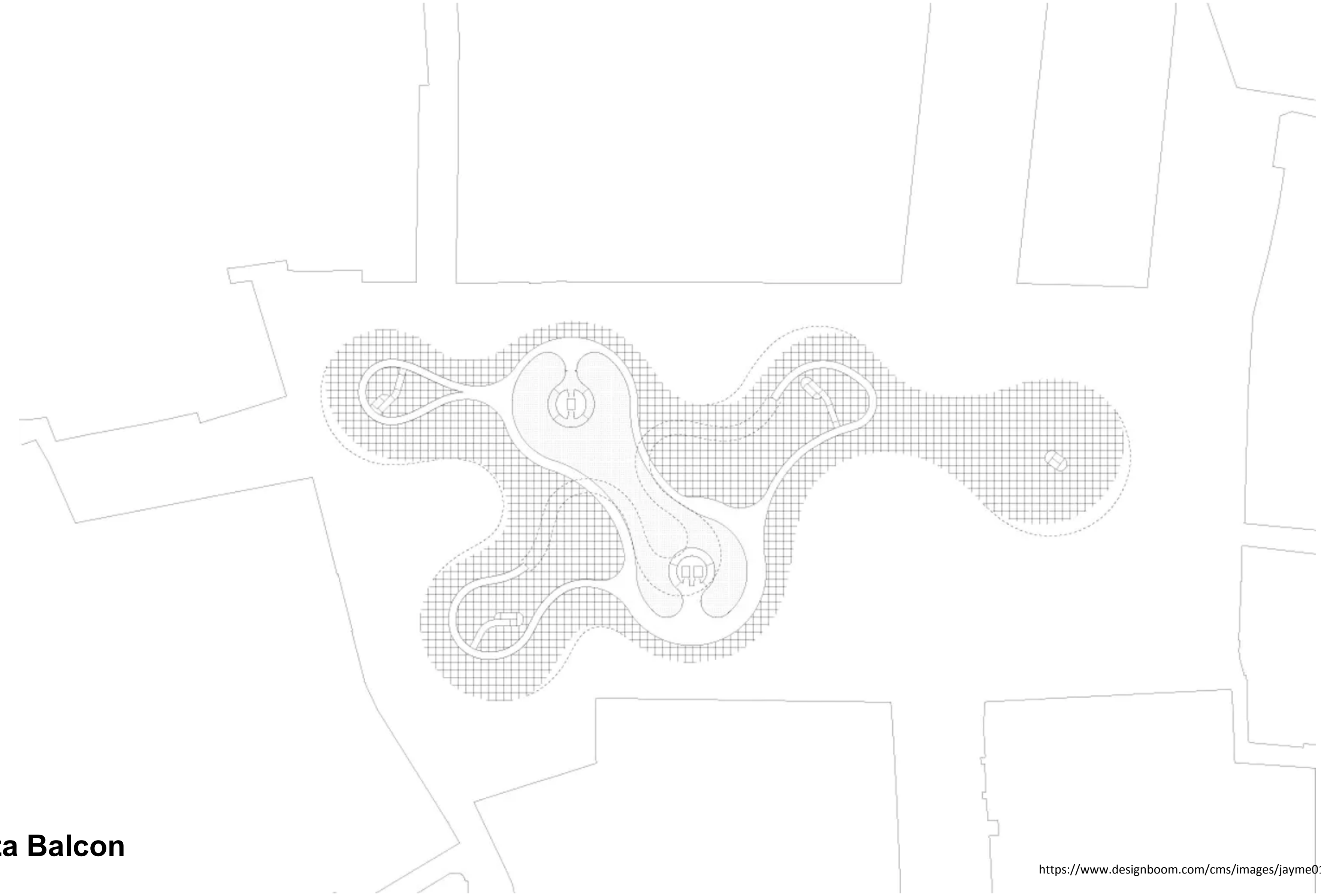


0 Plaza Abastos

https://www.designboom.com/cms/images/jayme01/metropole/met11.jpg

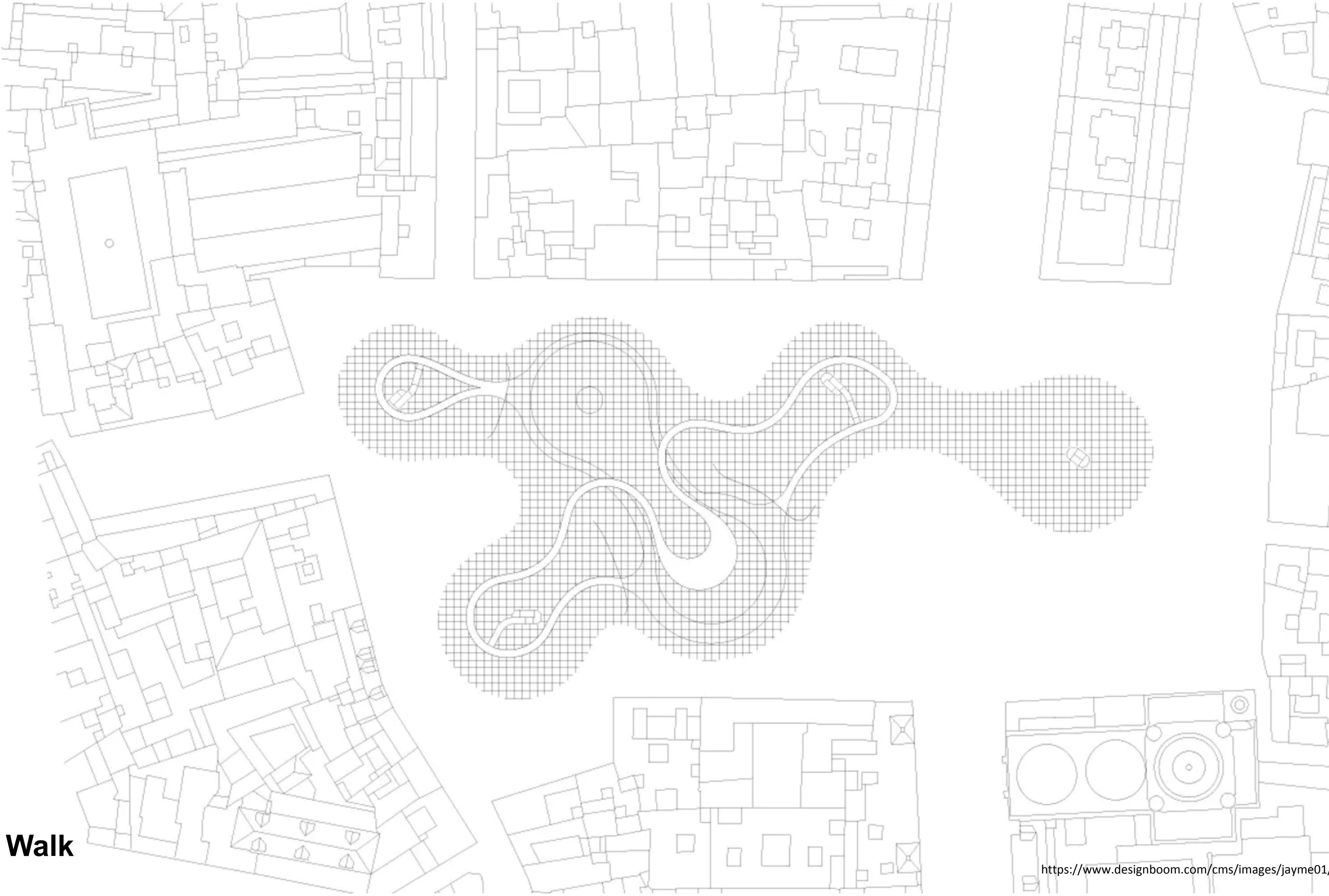
1 Plaza Elvada

https://www.designboom.com/cms/images/jayme01/metropole/met11.jpg



2 Plaza Balcon

https://www.designboom.com/cms/images/jayme01/metropole/met11.jpg



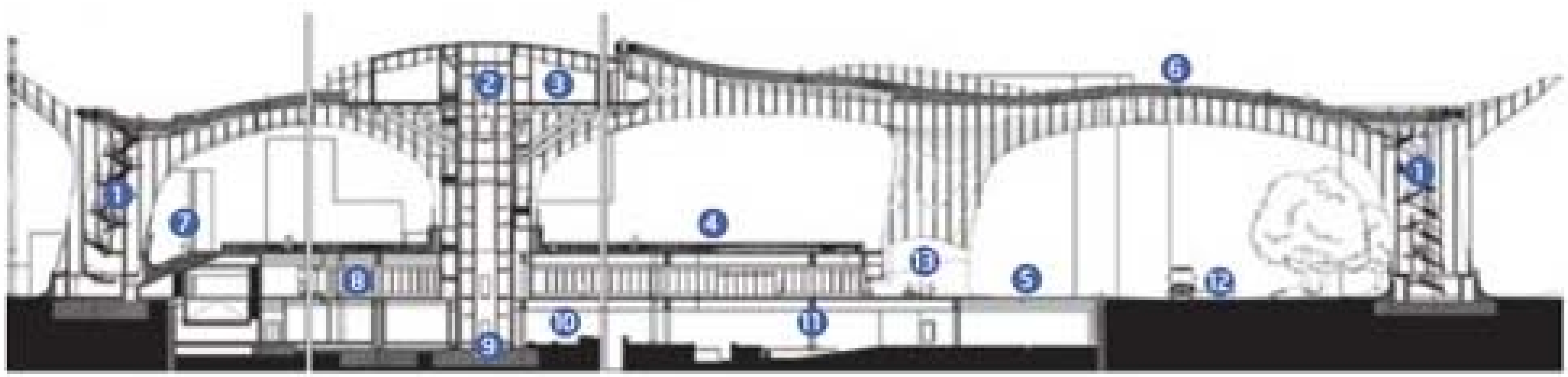
3 Sky Walk

https://www.designboom.com/cms/images/jayme01/metropole/met11.jpg

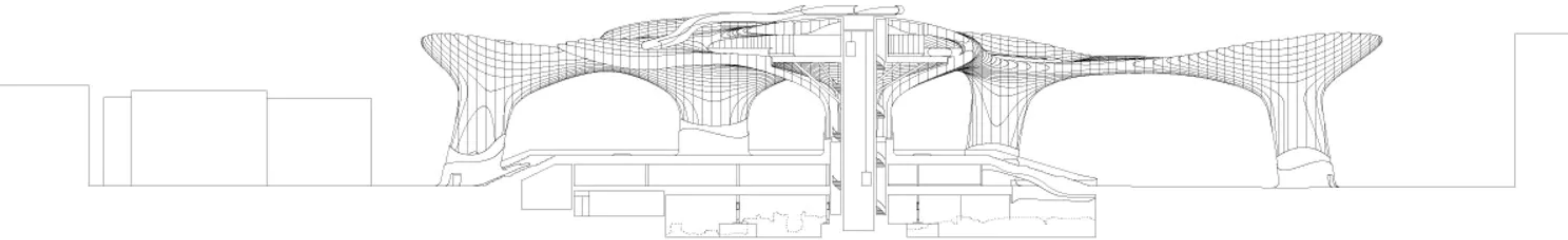
SECTION

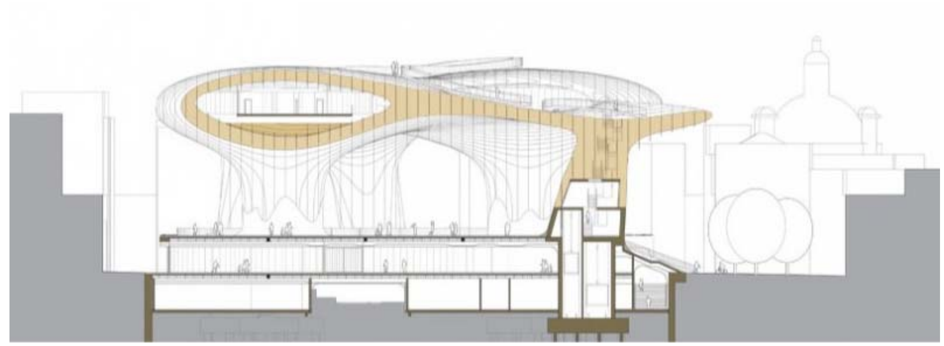
North-south sections across the site

1 Timber core with escape stairs
2 Hollow section steel struts support composite steel concrete deck off concrete core
3 Restaurant and viewing gallery levels
4 New plinth plaza level
5 Existing plaza level
6 Rooftop walkway
7 Stairs down to north side of plaza
8 New market below plinth
9 Concrete core with elevator and services
10 Museum of roman antiquities
11 Vierendeel trusses supported on trident columns below
12 East/west road across site
13 Fire protection at all trunk lower levels

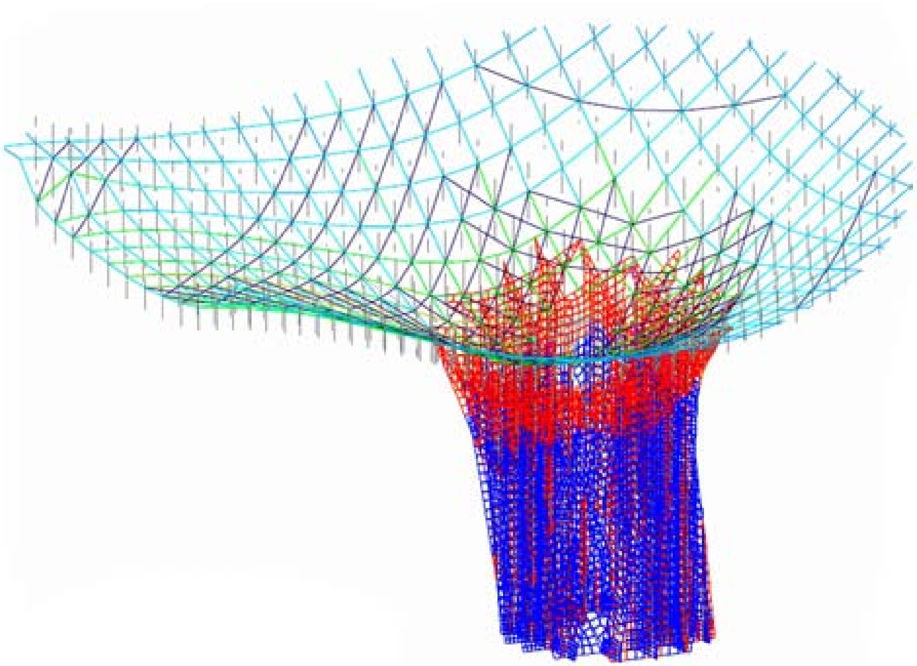


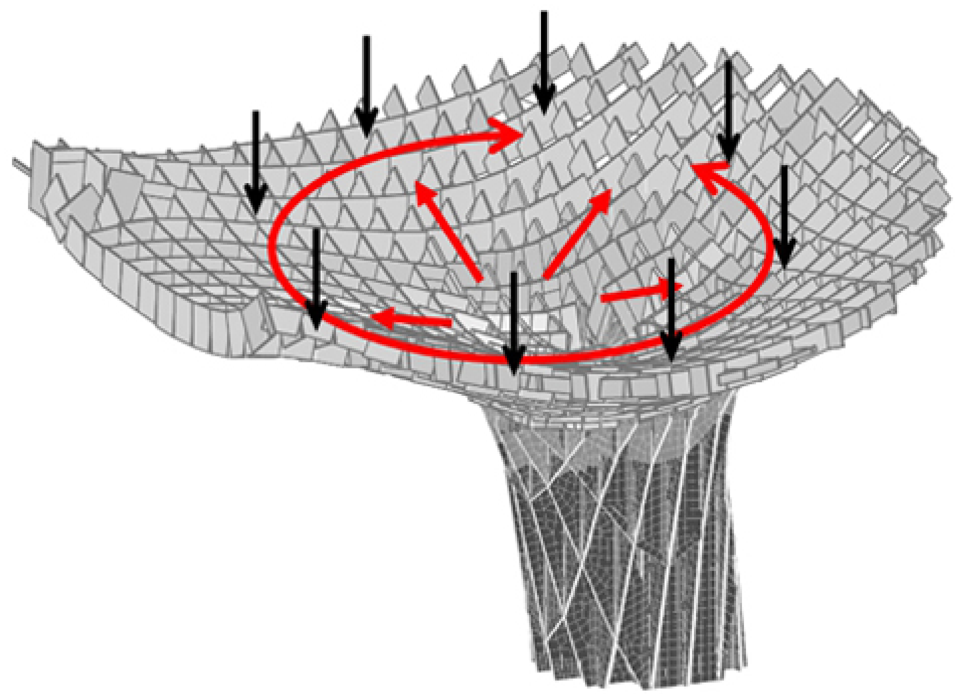
http://www.solaripedia.com/13/393/5659/metropol_parasol_north_south_section.html





Six fungal umbrellas air forming project structure have a dimension of 150 feet long, 75 wide and 28 high, from an orthogonal grid of 1.5 x 1.5 meters



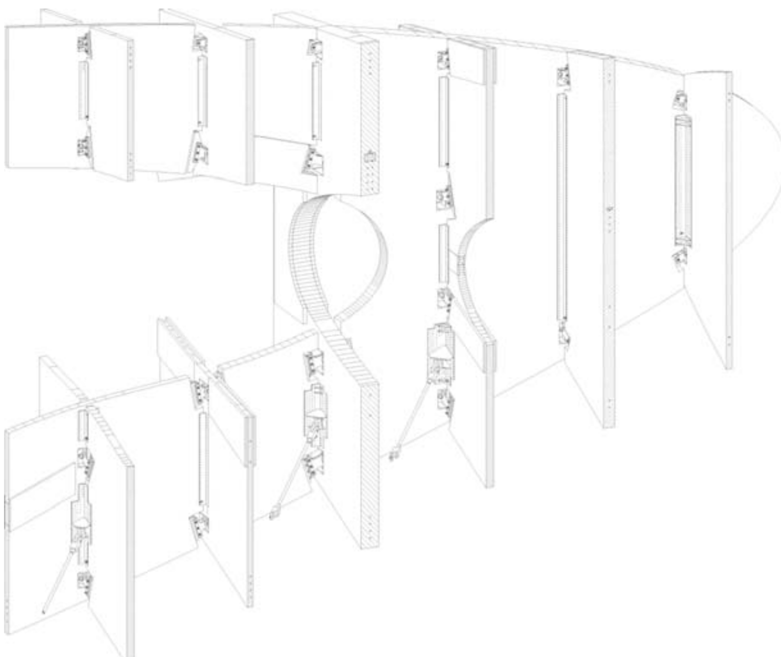


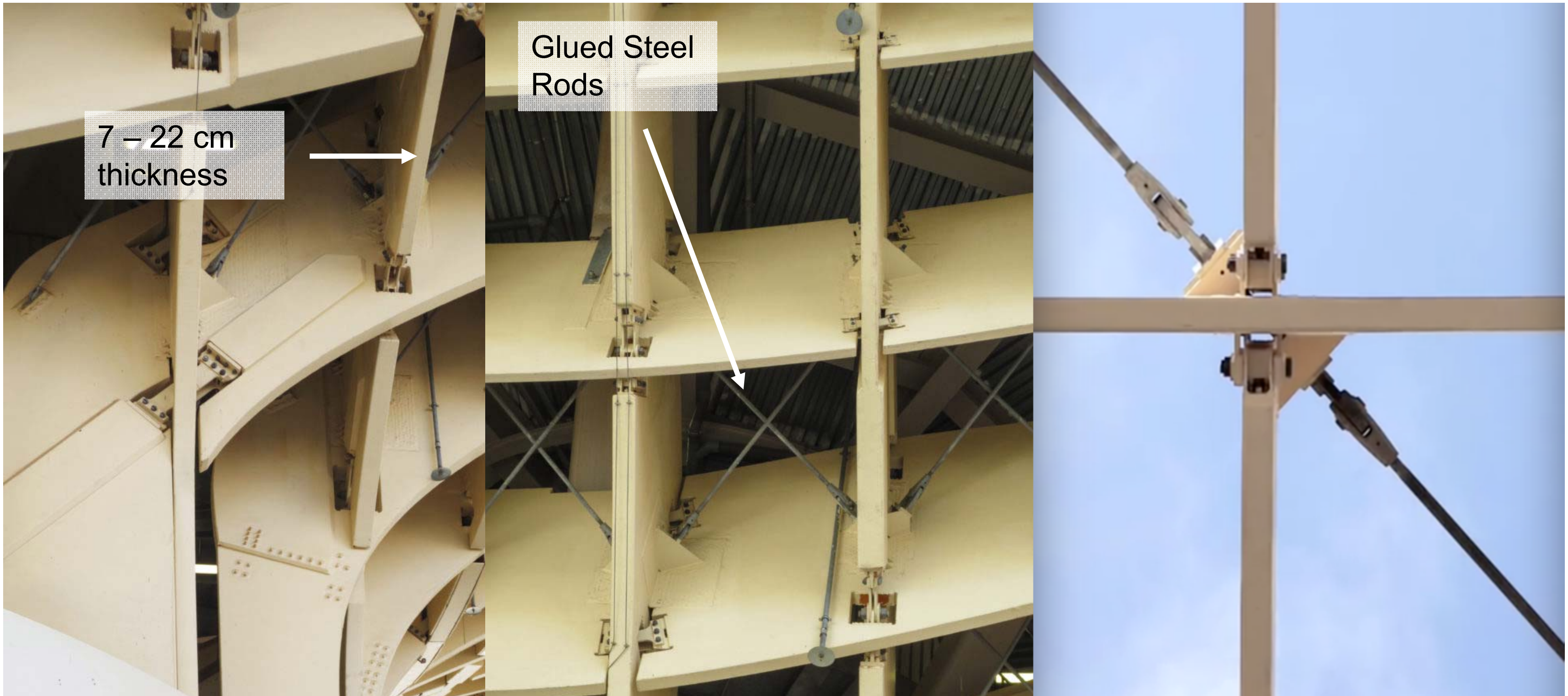
https://i.pinimg.com/236x/c8/47/05/c84705ce4fdfb8db4d4d47e138ff7fff--parasol.jpg

CONSTRUCTION & MATERIAL

Structure: concrete, timber and steel
Principal Exterior: timber and granite
Principal interior material: concrete, granite and steel
Designing period: 2004-2005
Construction period: 2005-2011
Building/Cost: 90 Million Euro

Structural System:
timber (birch) and steel, held together with high-performance polyurethane resin.





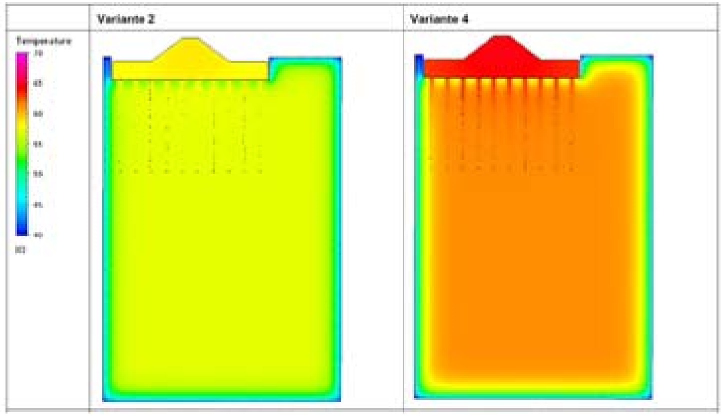
The wooden structure is orthogonal arrostrada by slashes that are below the walkways. The wooden structure Metropol Parasol has, therefore, the behavior of a laminar bidirectional network.

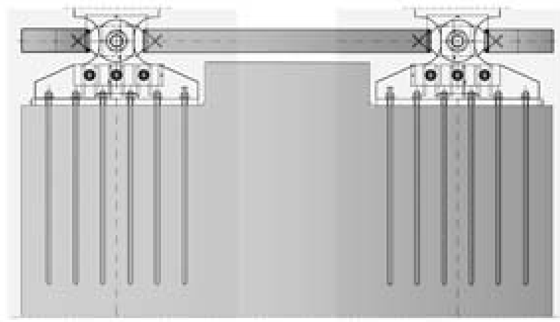
Micro-laminated Wood

As the wooden structure has no roof and should be protected from the elements, the architects have developed a new system capable of preserving the wood. It is a waterproof but vapor permeable polyurethane coating of 2 to 3 mm.

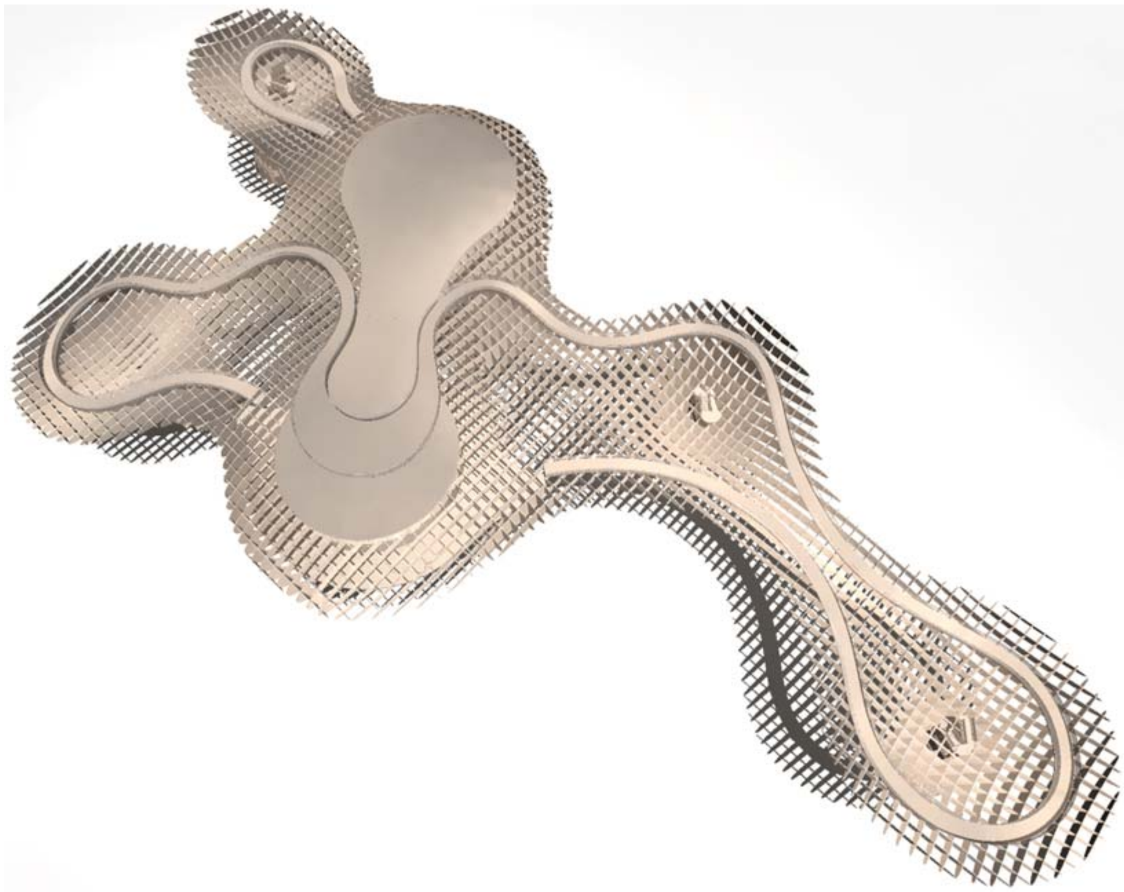
Steel

The joints at the intersections of the many pieces were made by glued steel bars, easy optimization for fast assembly on site.

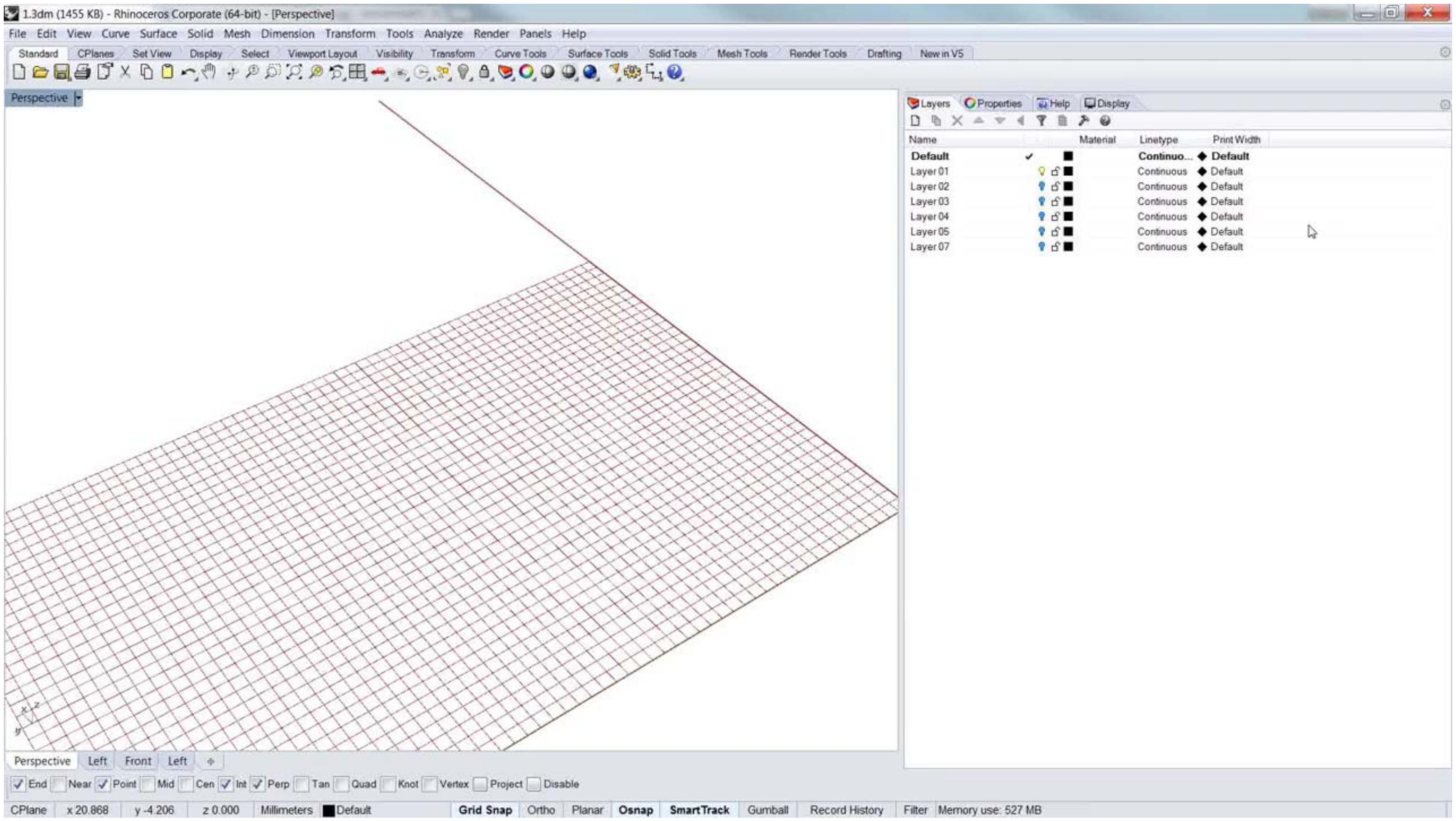

Variante 2
Variante 4
Temperature



DESIGN PROCESS

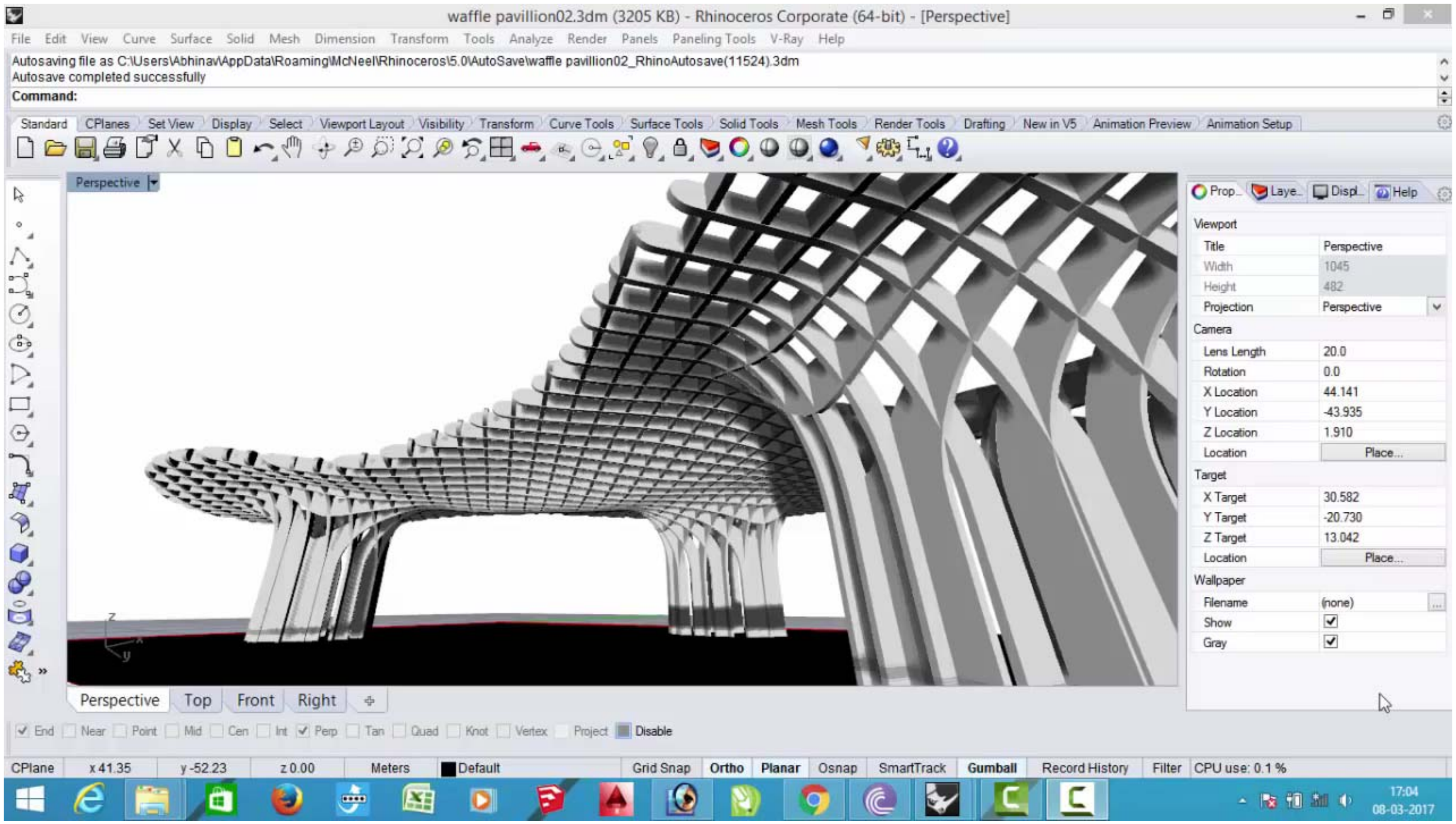


Waffle Structure Metropol Parasol geometric exercise (with Grasshopper)

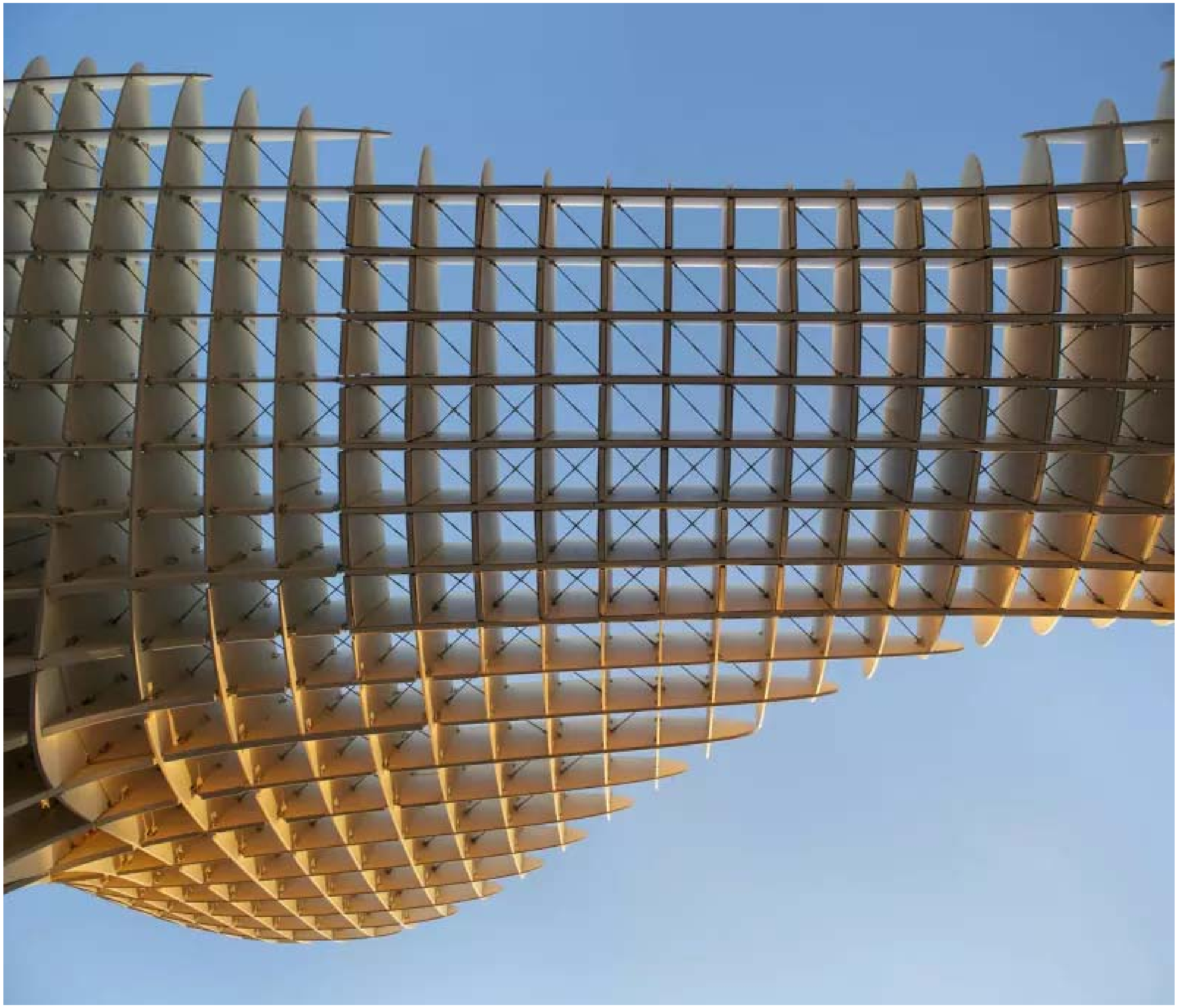


https://www.youtube.com/watch?v=apJaJ1TjNfQ

Waffle Structure Metropol Parasol geometric exercise (Rhino only)



https://www.youtube.com/watch?v=NbAt-SioOp4



TUGAS KELOMPOK

Bentuklah kelompok kecil untuk mata kuliah Desain Parametrik berisi 4 – 6 mahasiswa per kelompok

TUGAS KELOMPOK

Buatlah studi kasus analisa lanjutan pada bangunan ***Metropol Parasol***

1. *Analisa parameter (what, why)*
2. *Proses pengembangan desain (how)*
3. *Material bangunan (what, why)*
4. *Teknik konstruksi (how)*
5. *Fungsi arsitektural dan pengaruhnya terhadap lingkungan sekitar obyek*

Susunlah dalam bentuk PPT (gambar, sketsa analisis, video) untuk dipresentasikan pada pertemuan selanjutnya (Kuliah 3)