



# Svijet ovješnih fasada

Nebojša Buljan, RI ISA d.o.o, Permasteelisa Group



# Sydney Opera House

.....  
SYDNEY  
AUSTRALIA

Glavni element u više  
pogleda

daje izgled i boju zgrade

omogućava prozirnost, u  
oba smjera

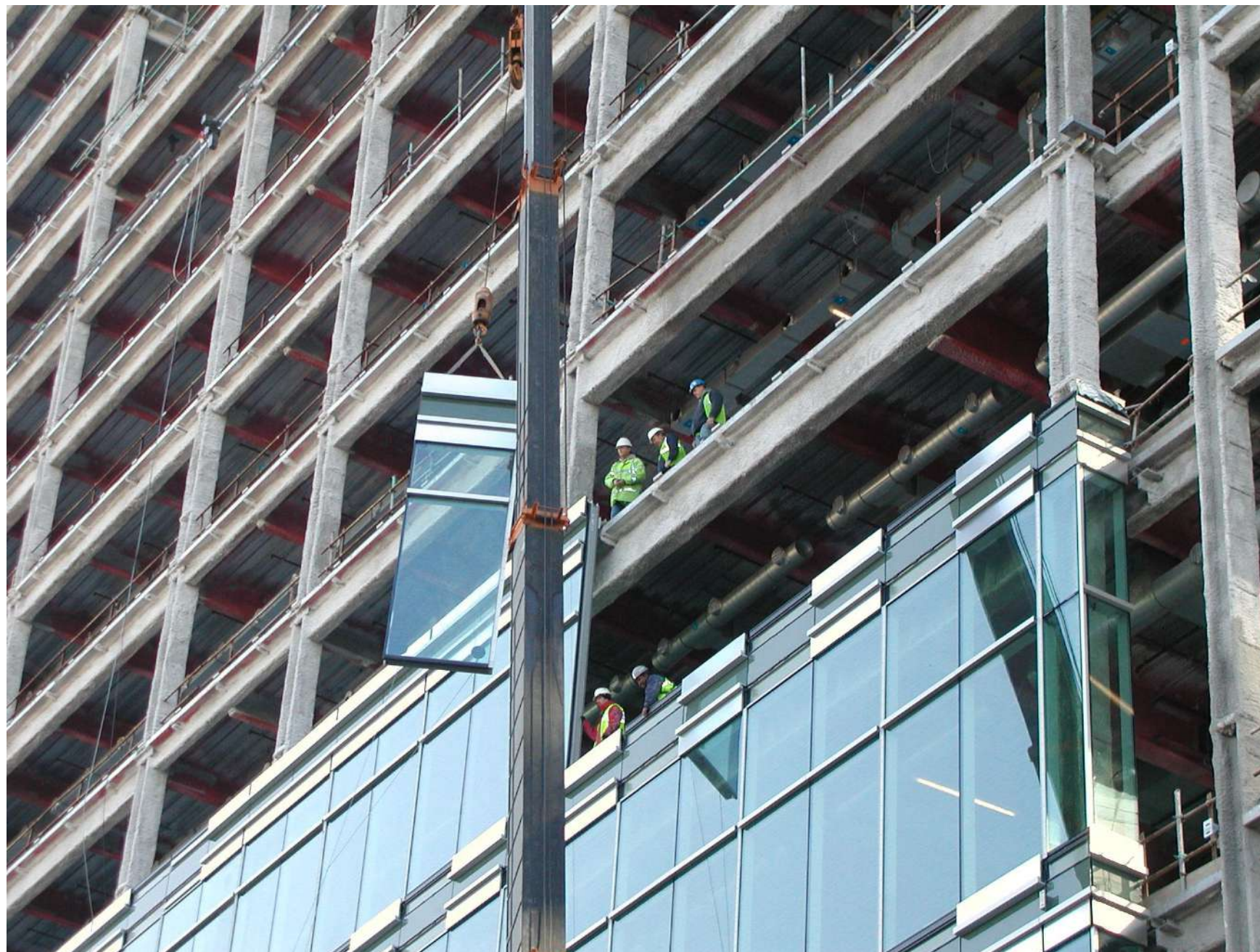
fizikalna svojstva: akustička,  
energetska

prenosi opterećenja (vjetar)  
na glavnu konstrukciju

štiti korisnike od  
atmosferskih prilika

razdvaja unutrašnjost zgrade  
od okoliša

pruža zaštitu od pada



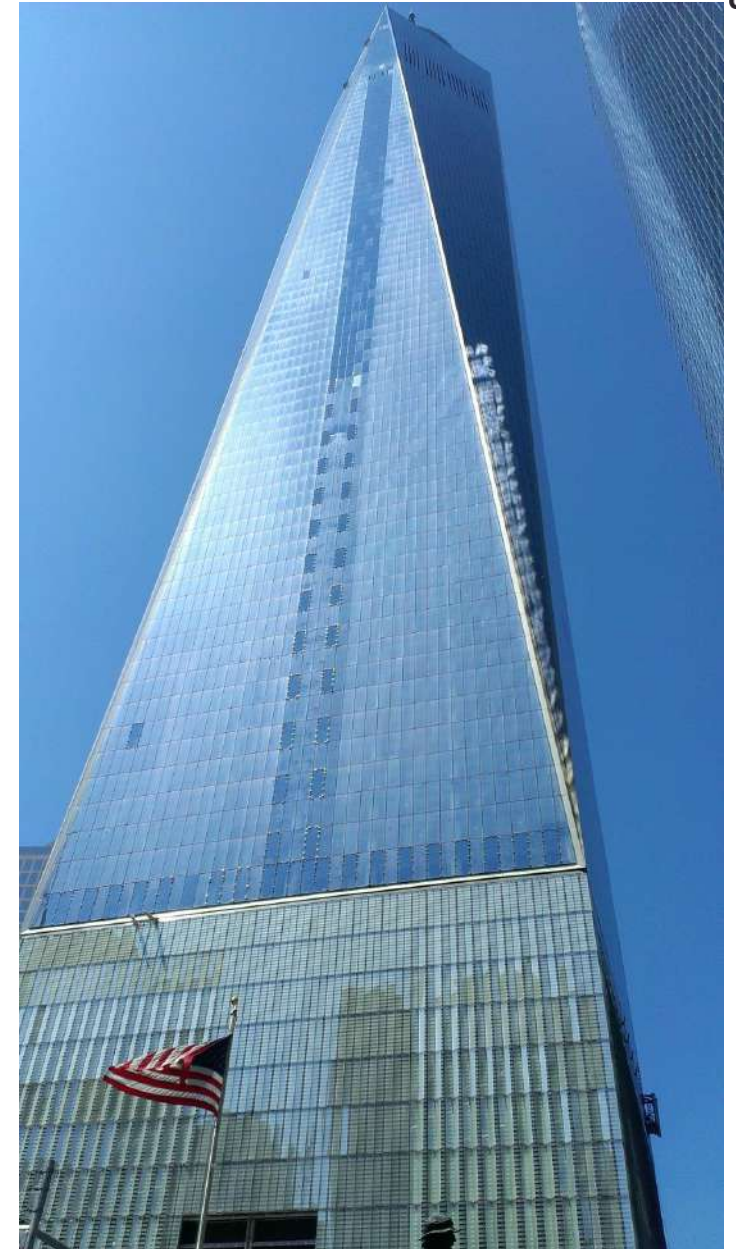




# 1 World Trade Center Podium

.....  
NEW YORK, NY  
USA

# Svijet ovješnih fasada





# The Shard

.....

LONDON

UK



**PERMASTEELISA  
GROUP**



# The Shard Winter Garden

.....

LONDON  
UK



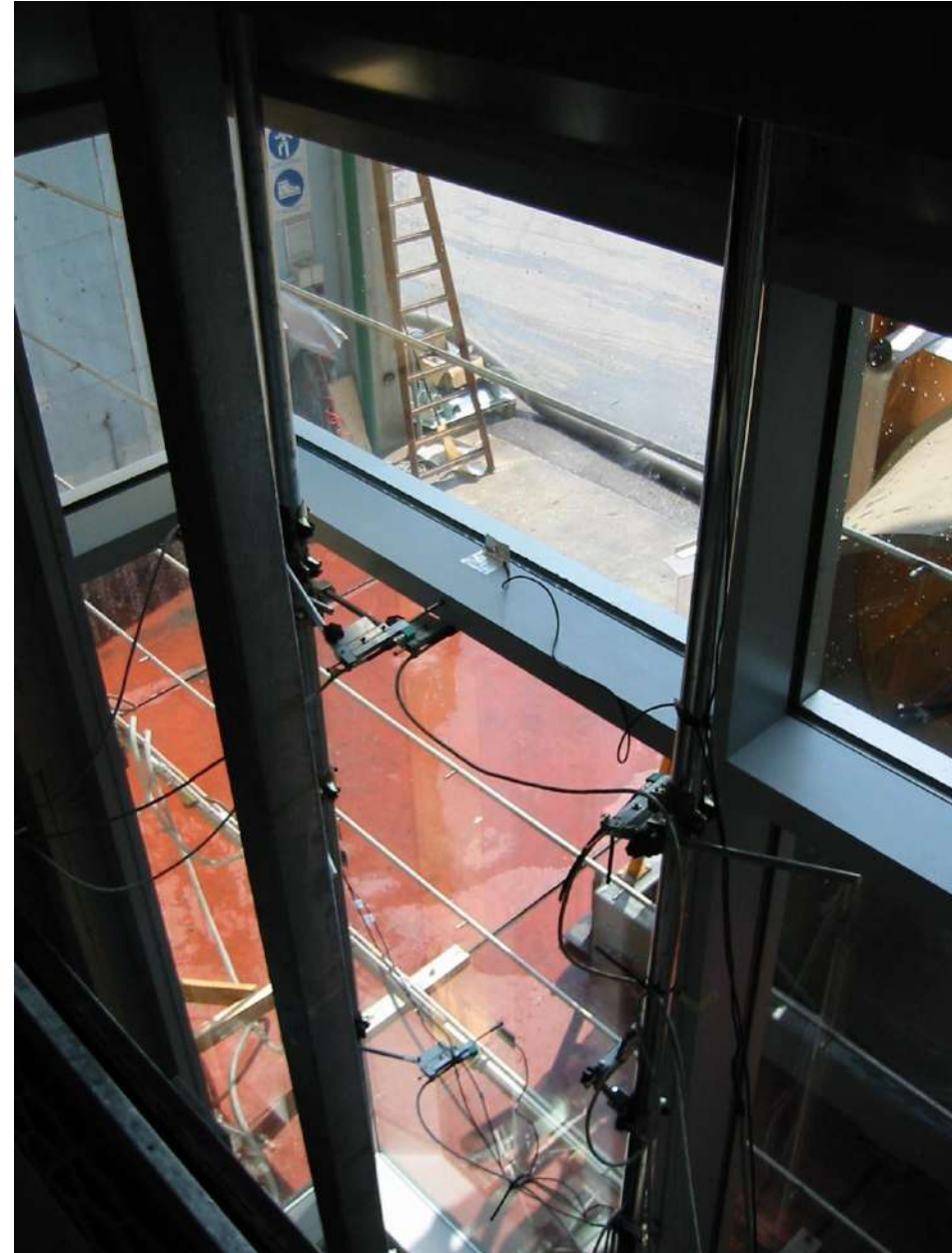


VMU  
Vizualni uzorak  
The Shard

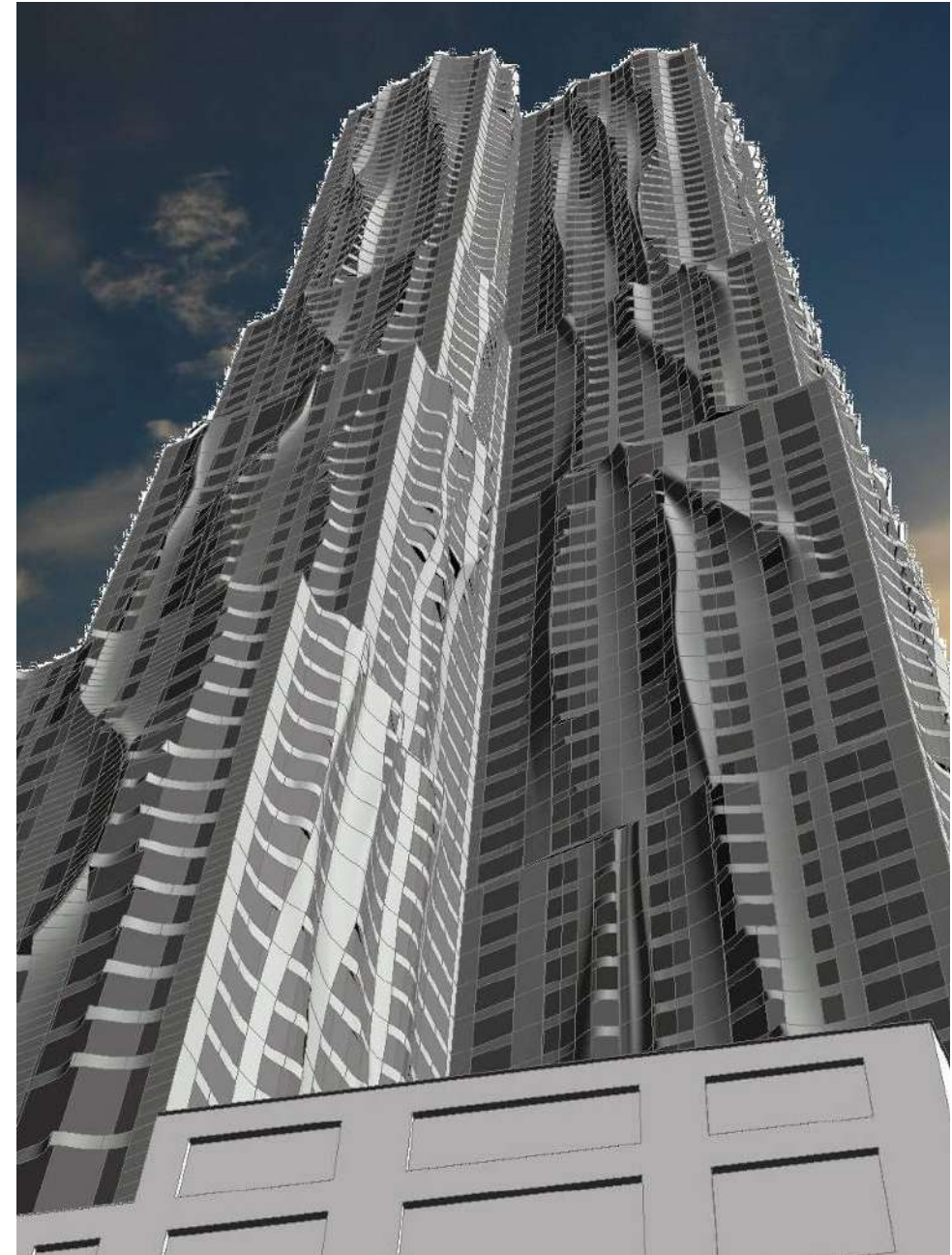


PMU

Laboratorijsko ispitivanje



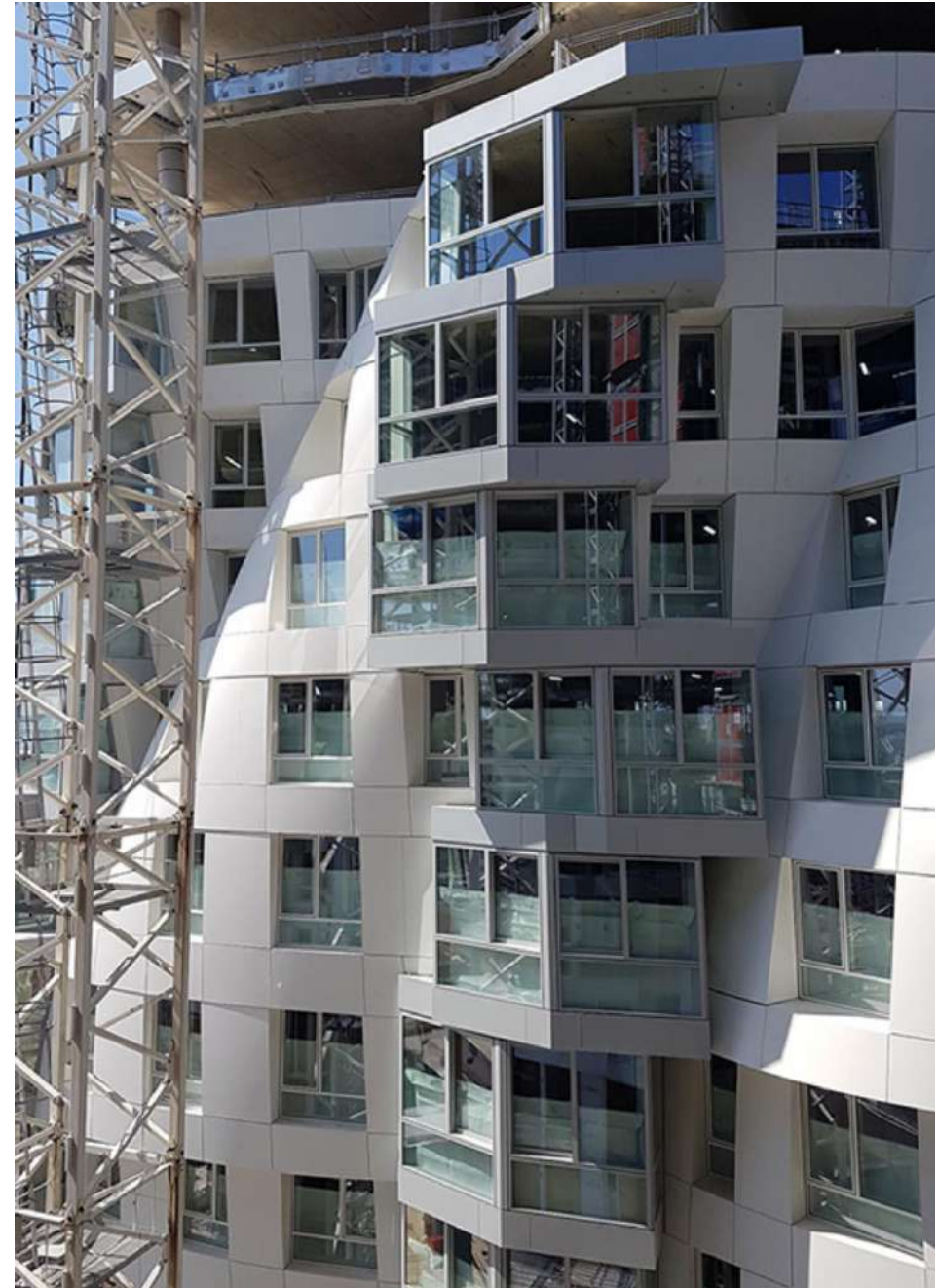
Beekman tower, NY  
Gehry & Partners





Battersea Power Station -  
Phase 3A, Prospect Place  
London (UK)



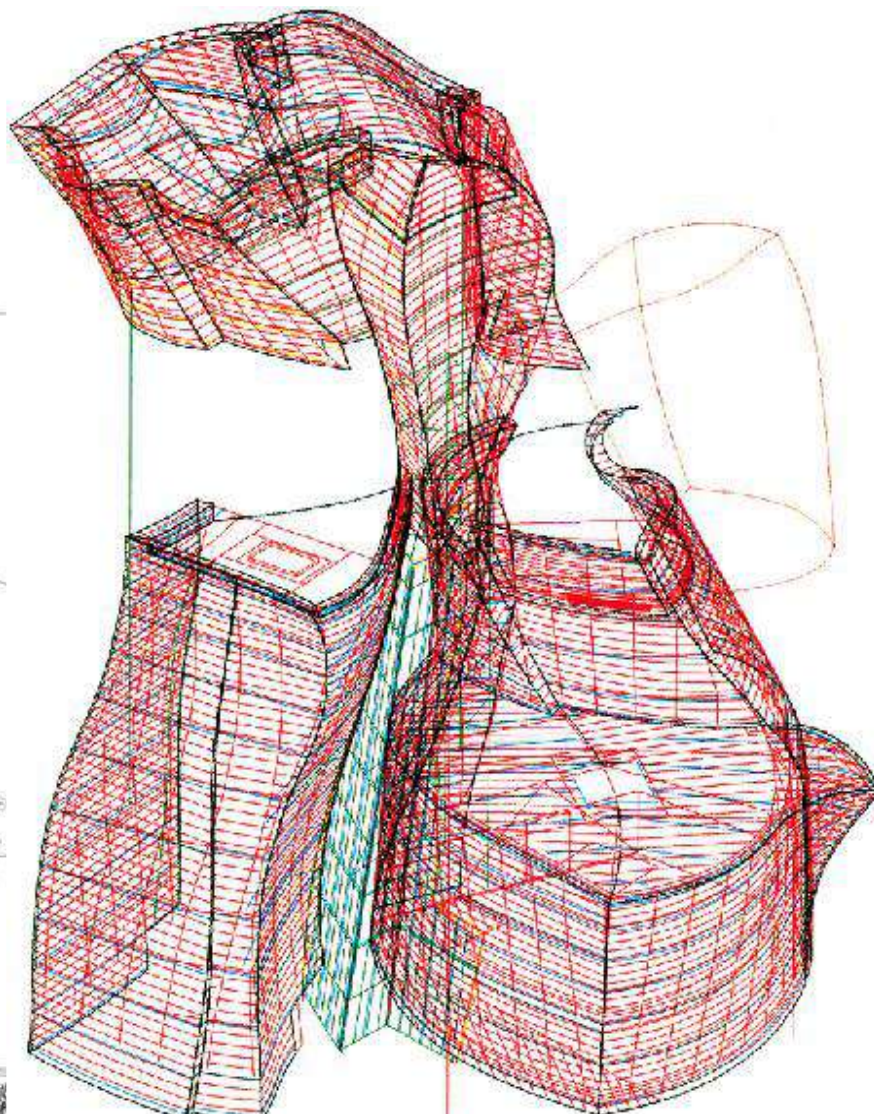
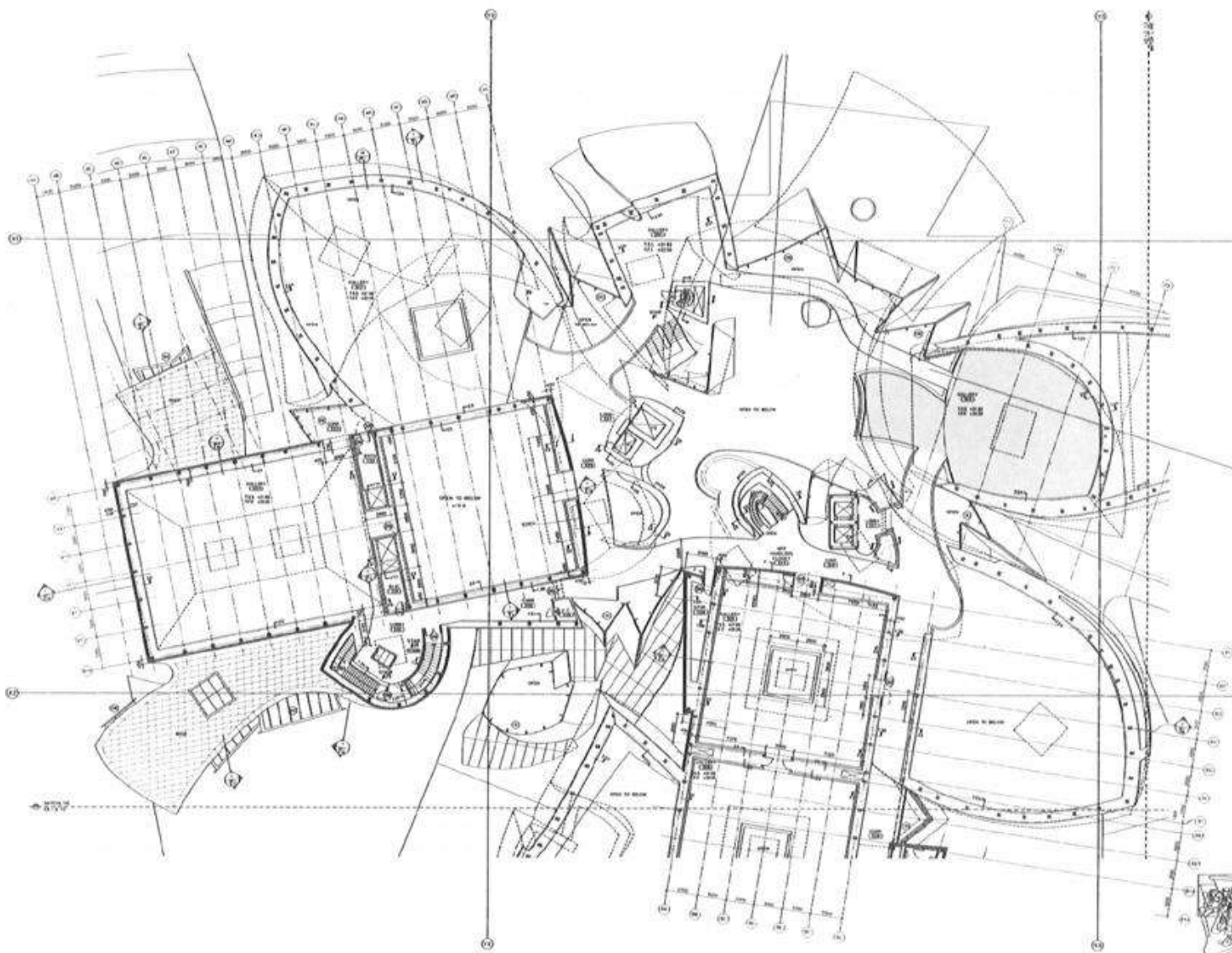


## Guggenheim Museum – Bilbao (Spain)

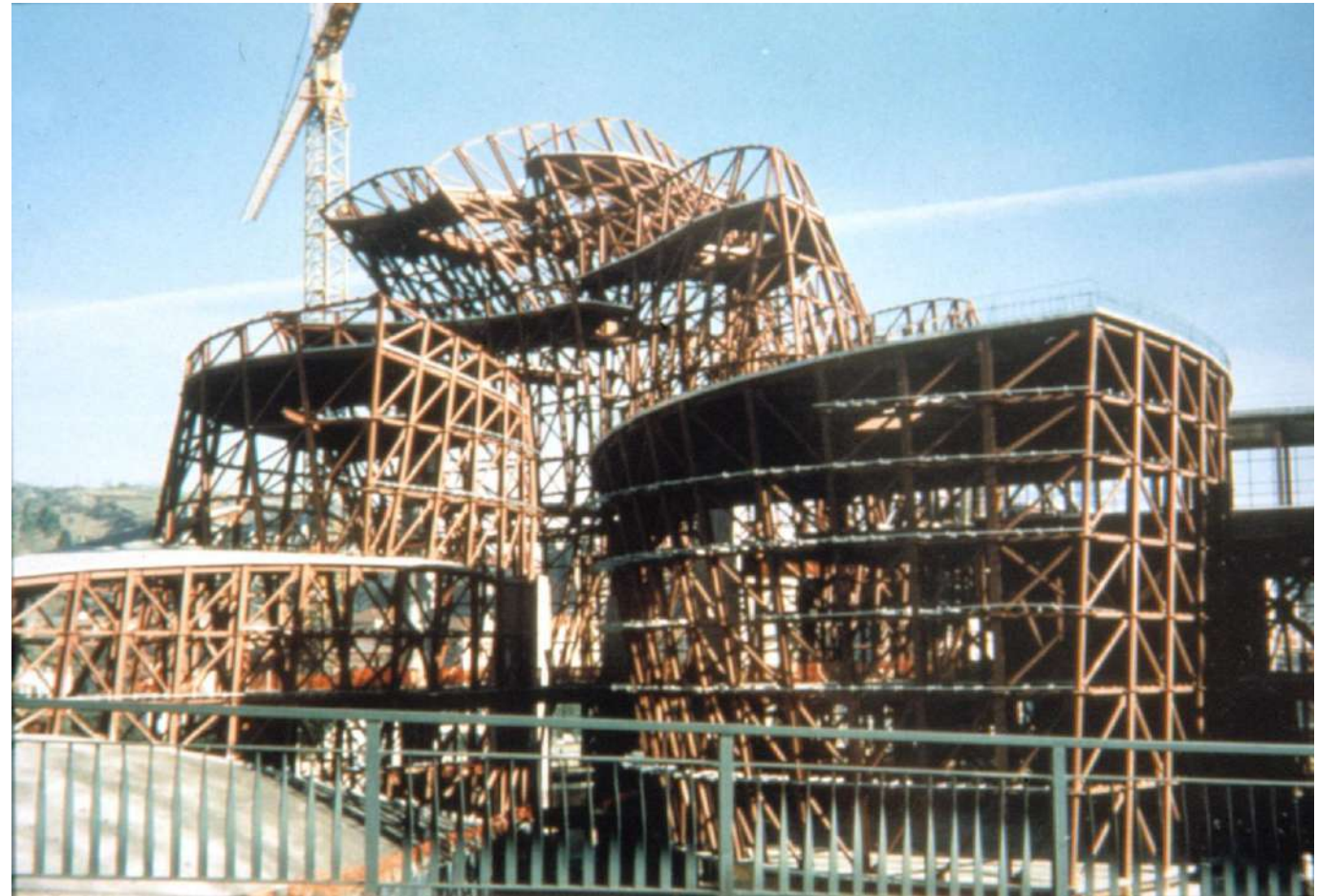


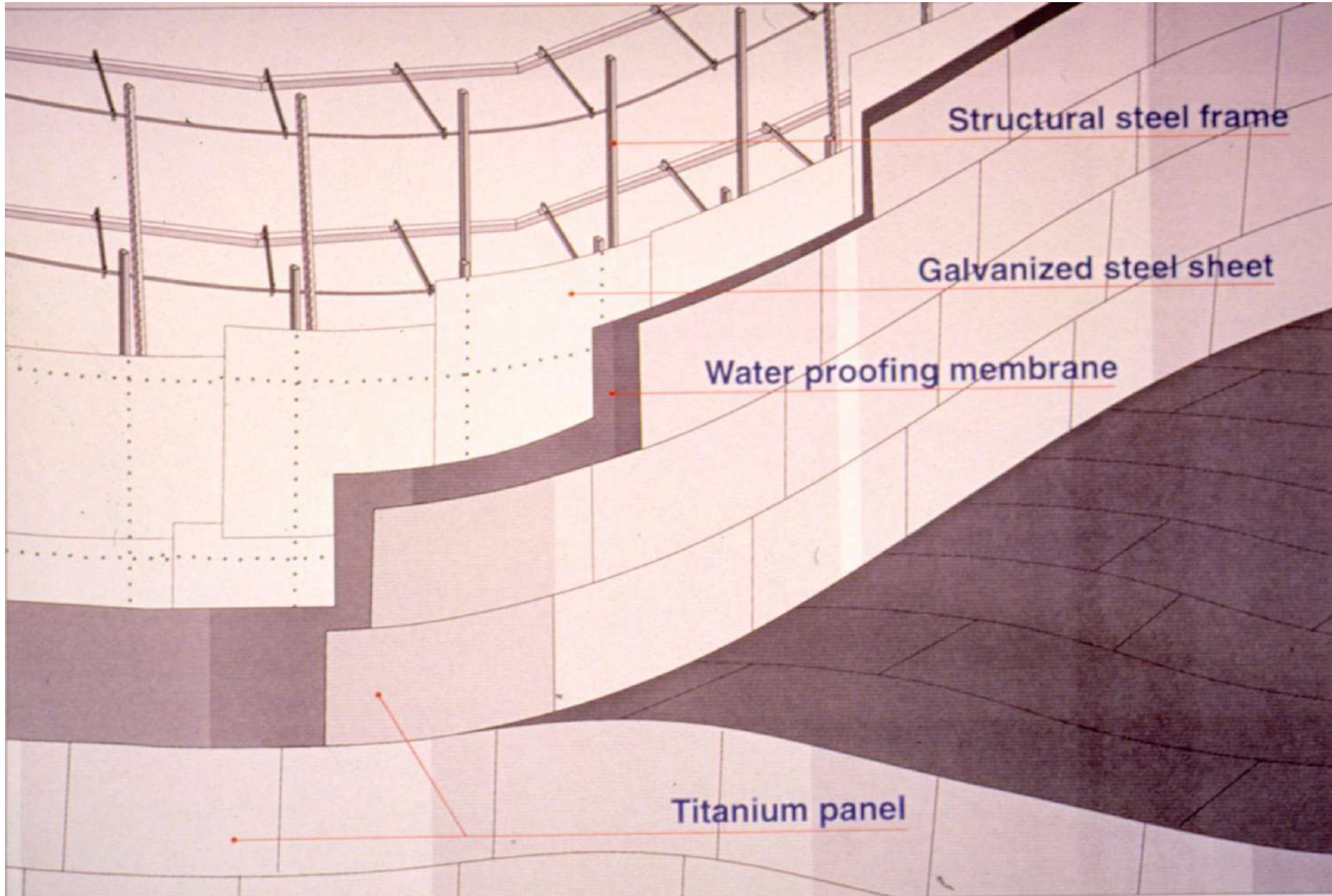
**Architect:** Frank O. Gehry  
& Associates

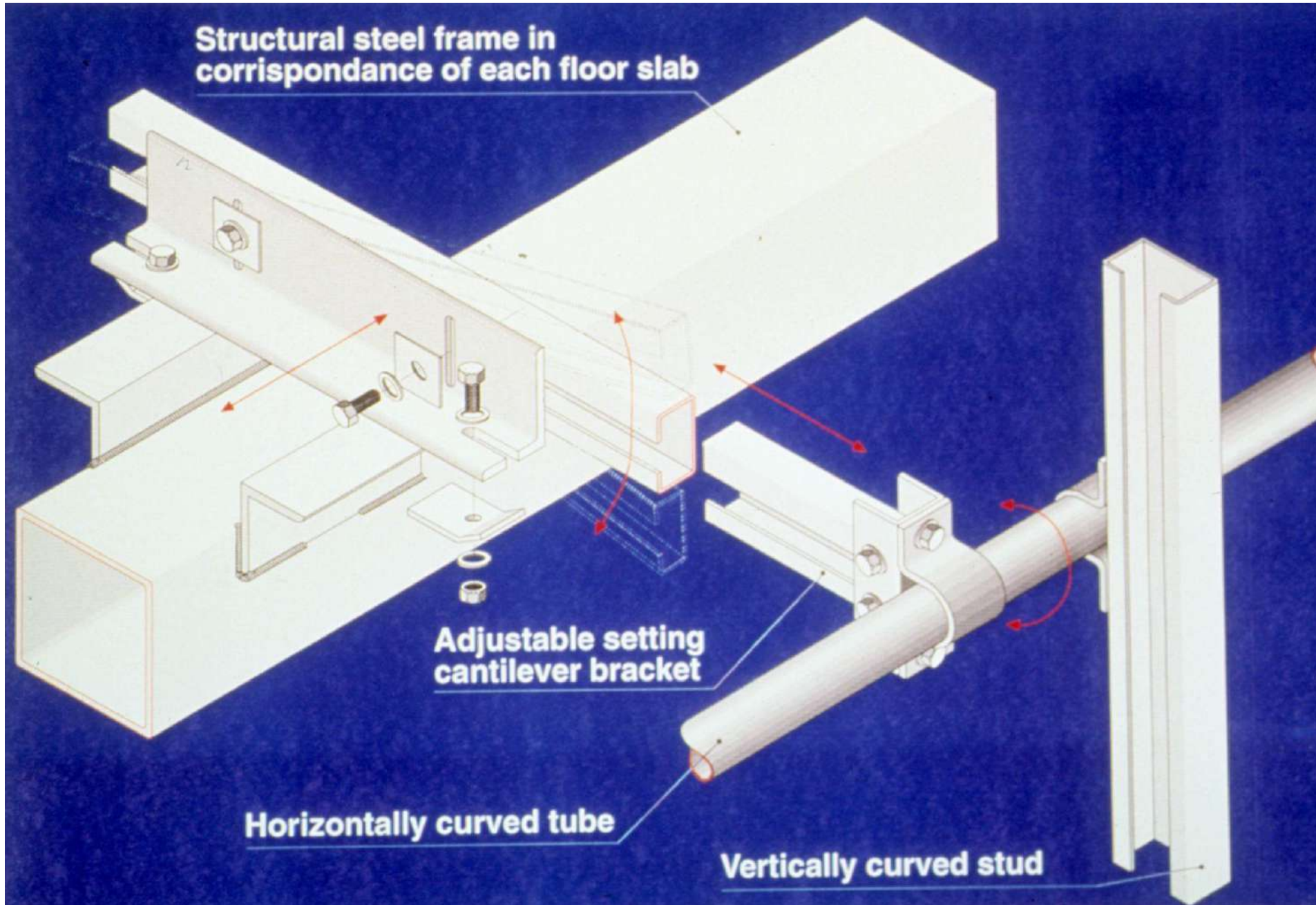
36.000 m<sup>2</sup> obloge od titana

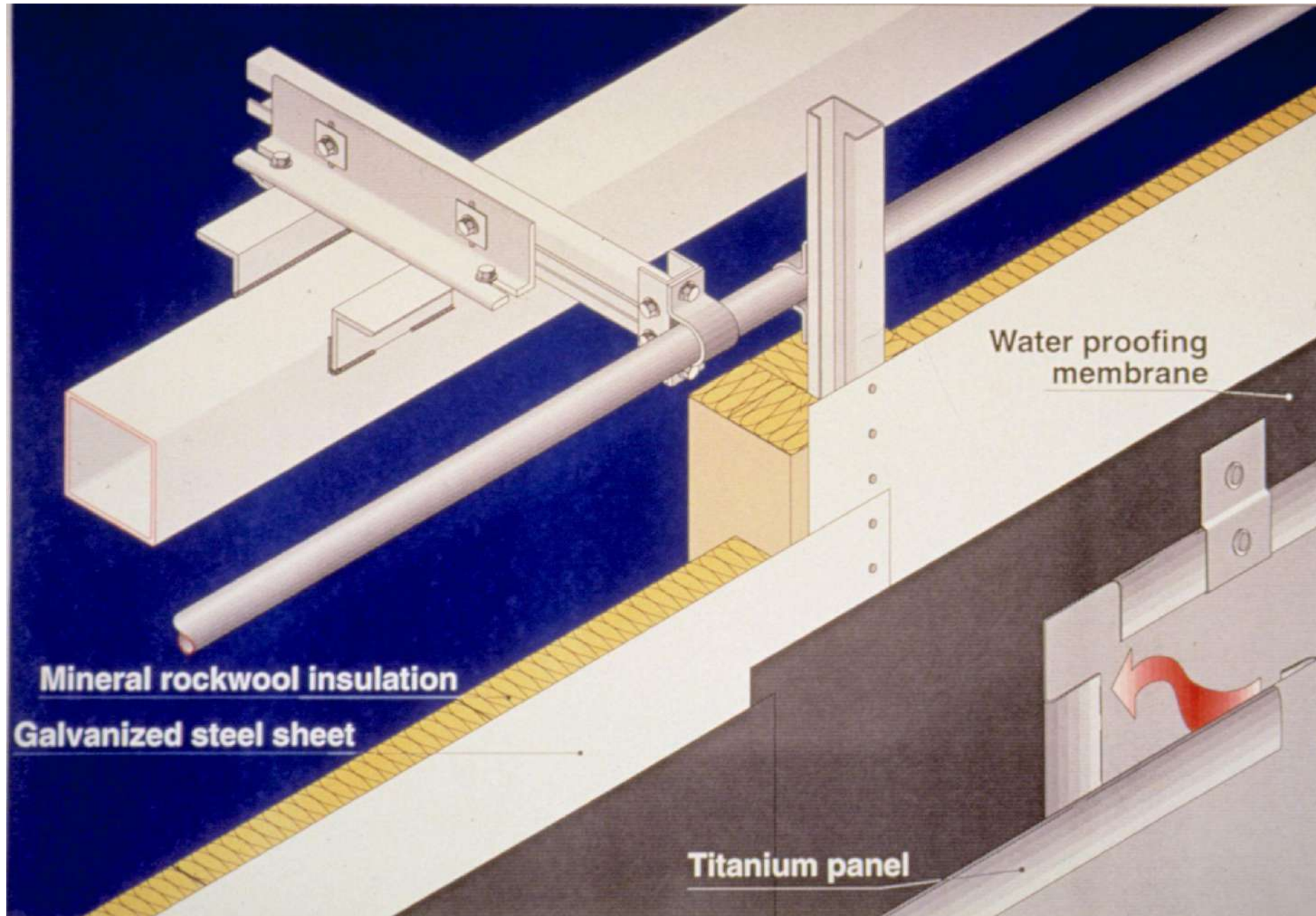






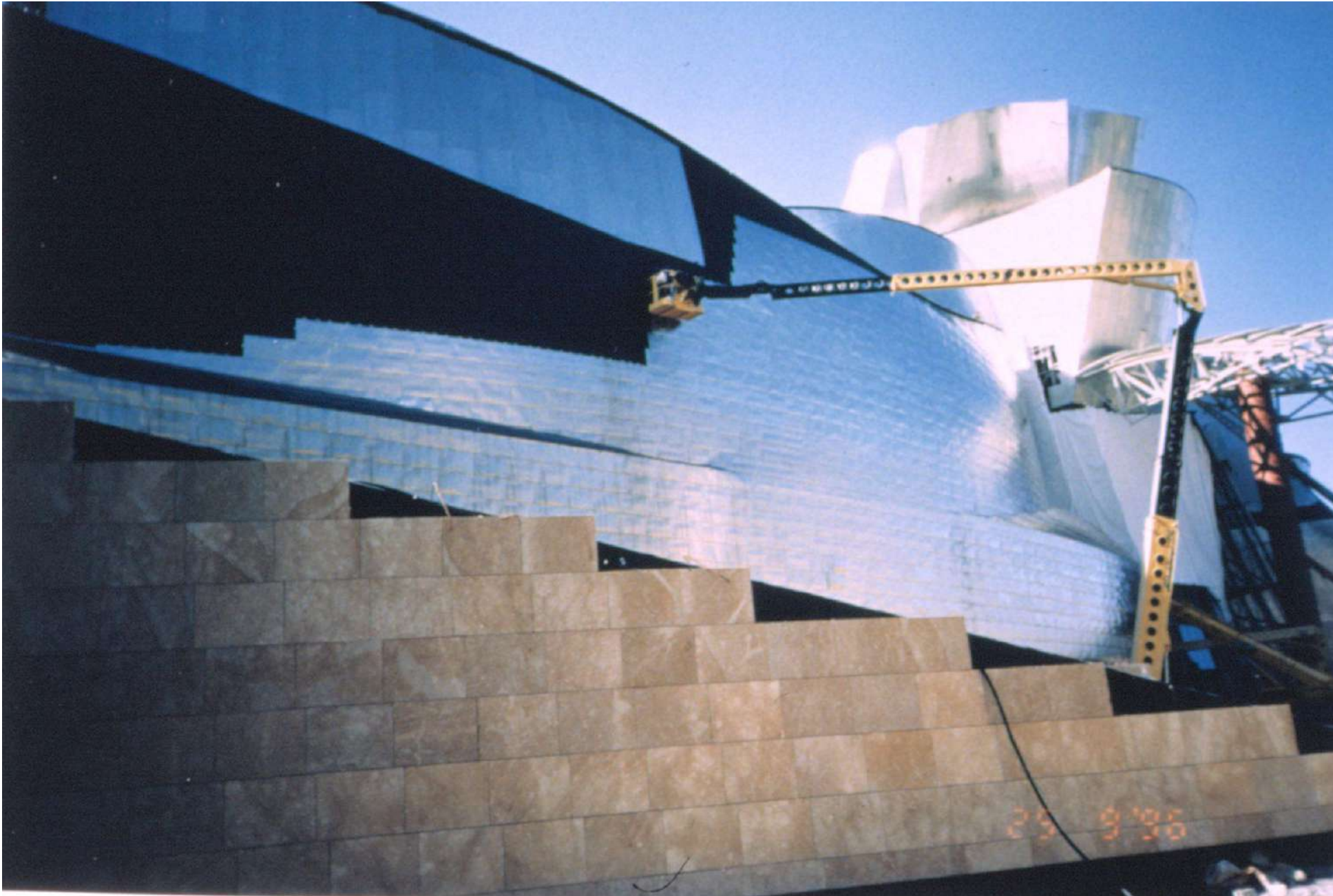


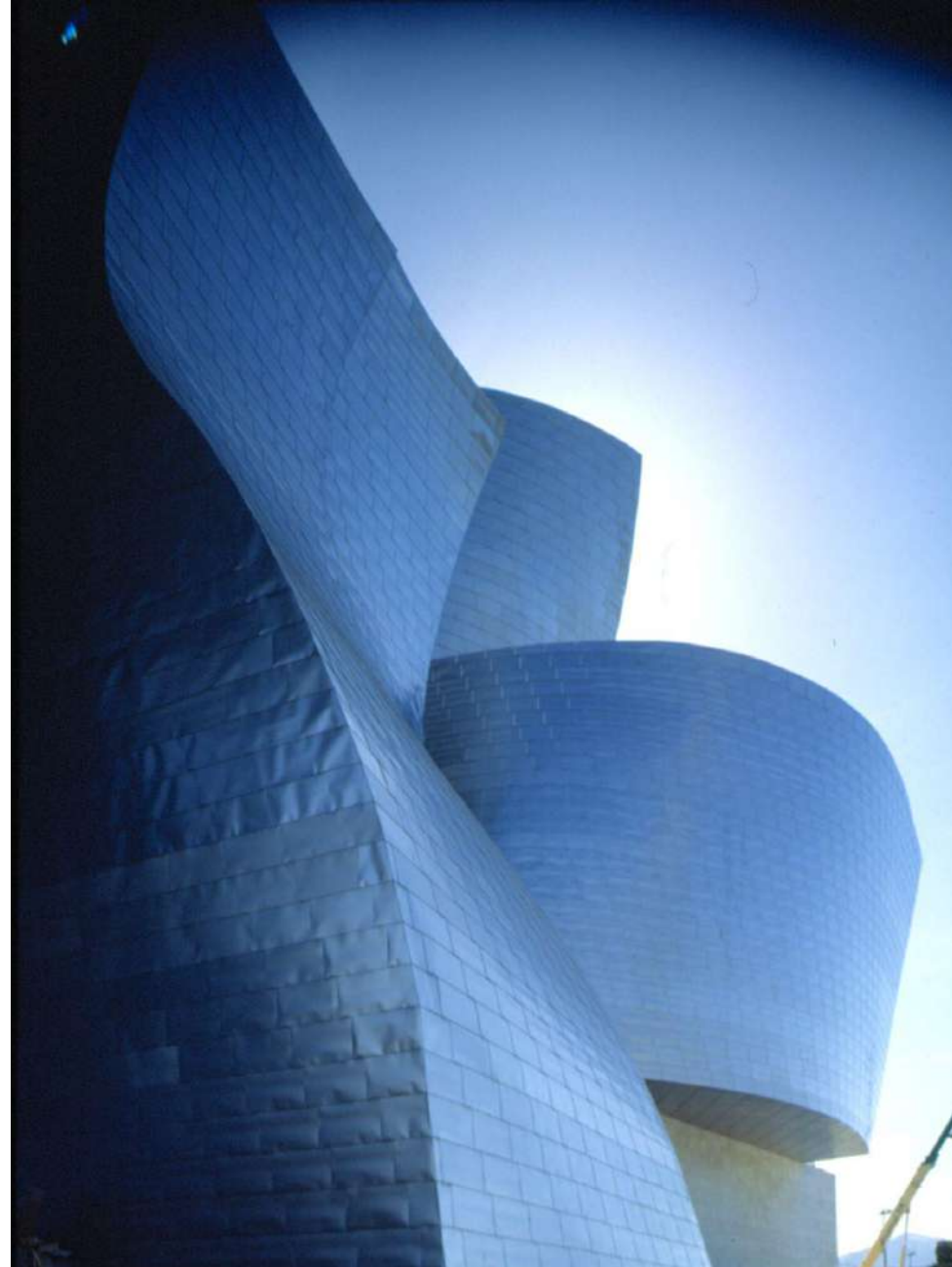
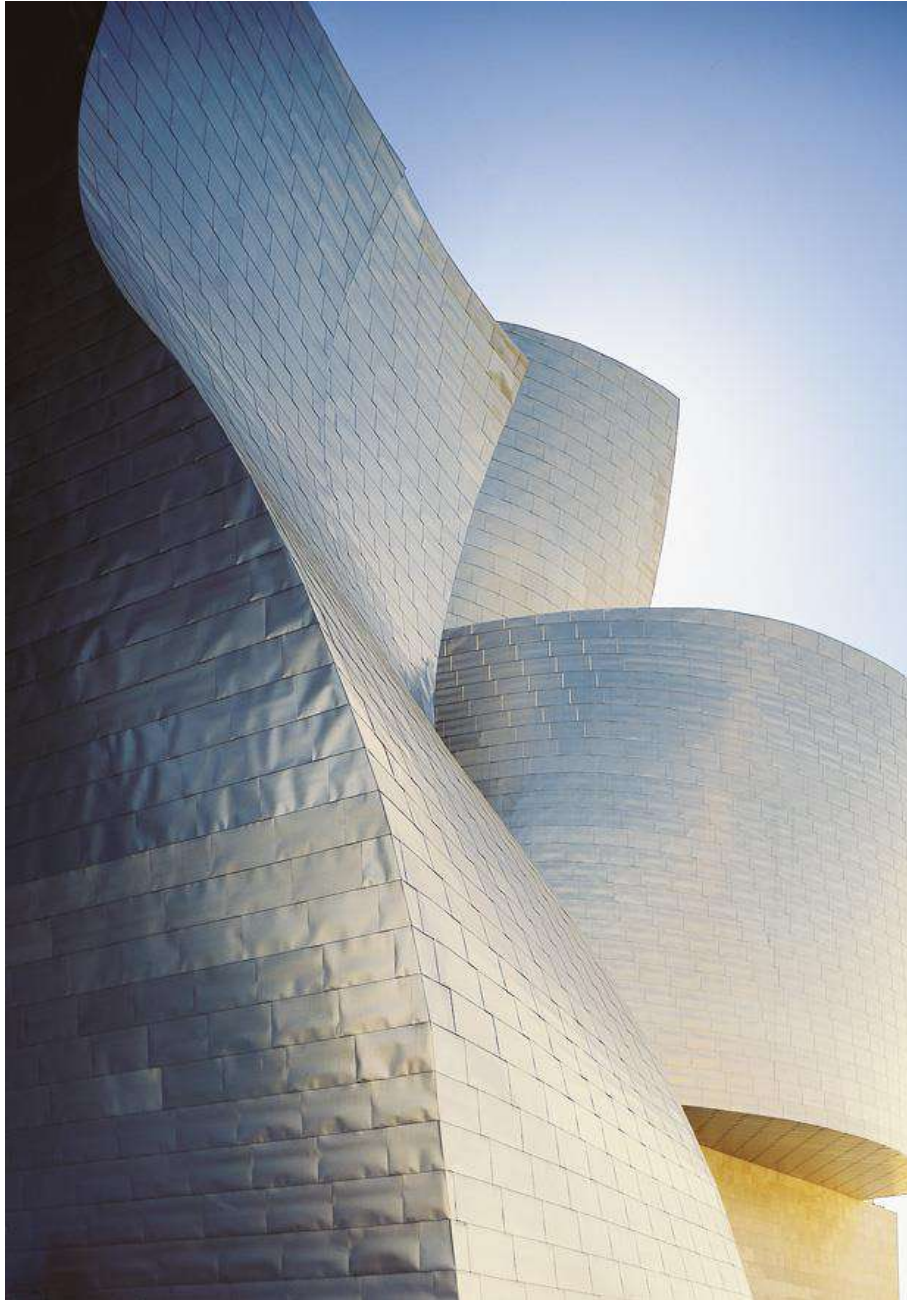


















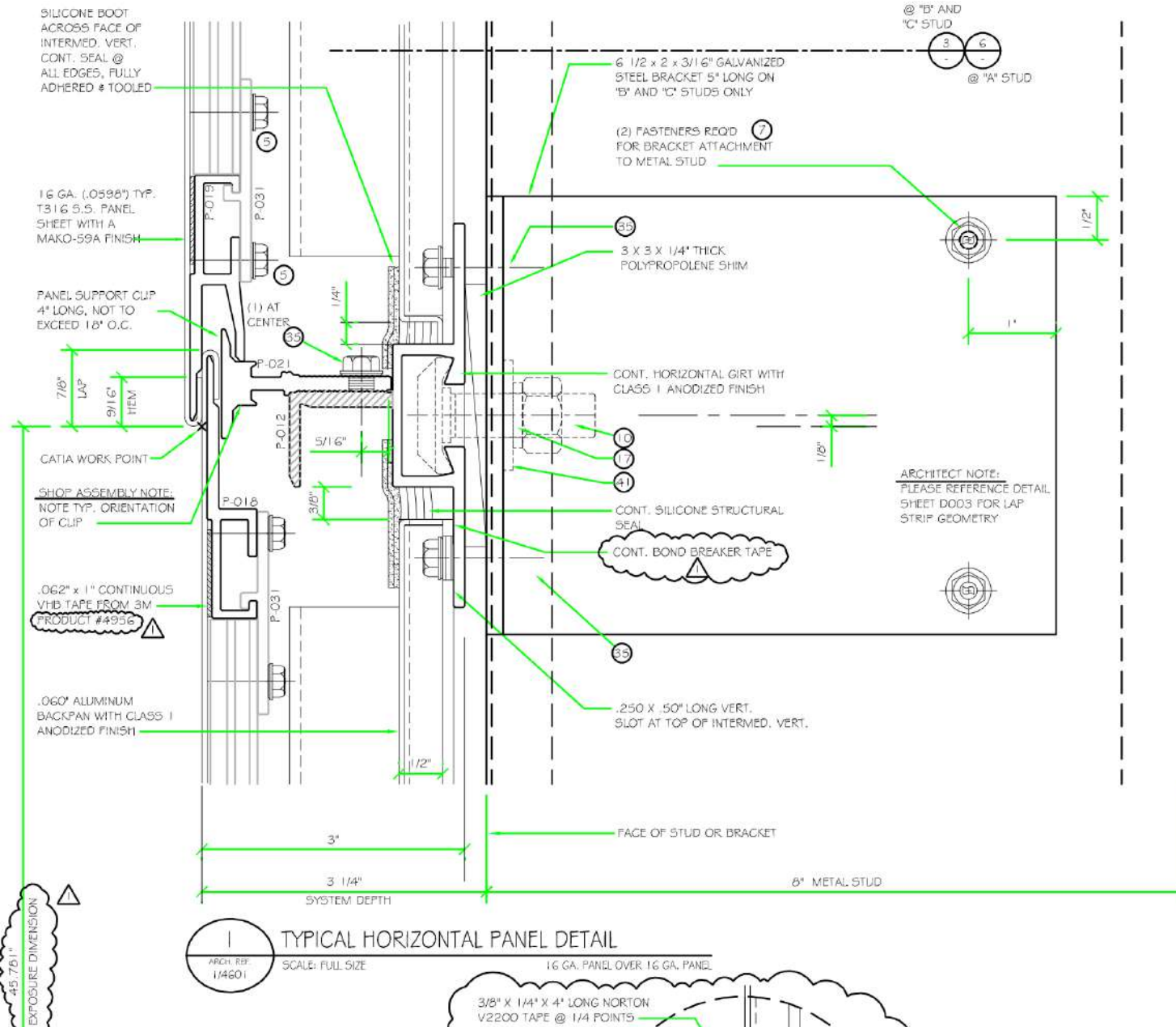
# Walt Disney Concert Hall

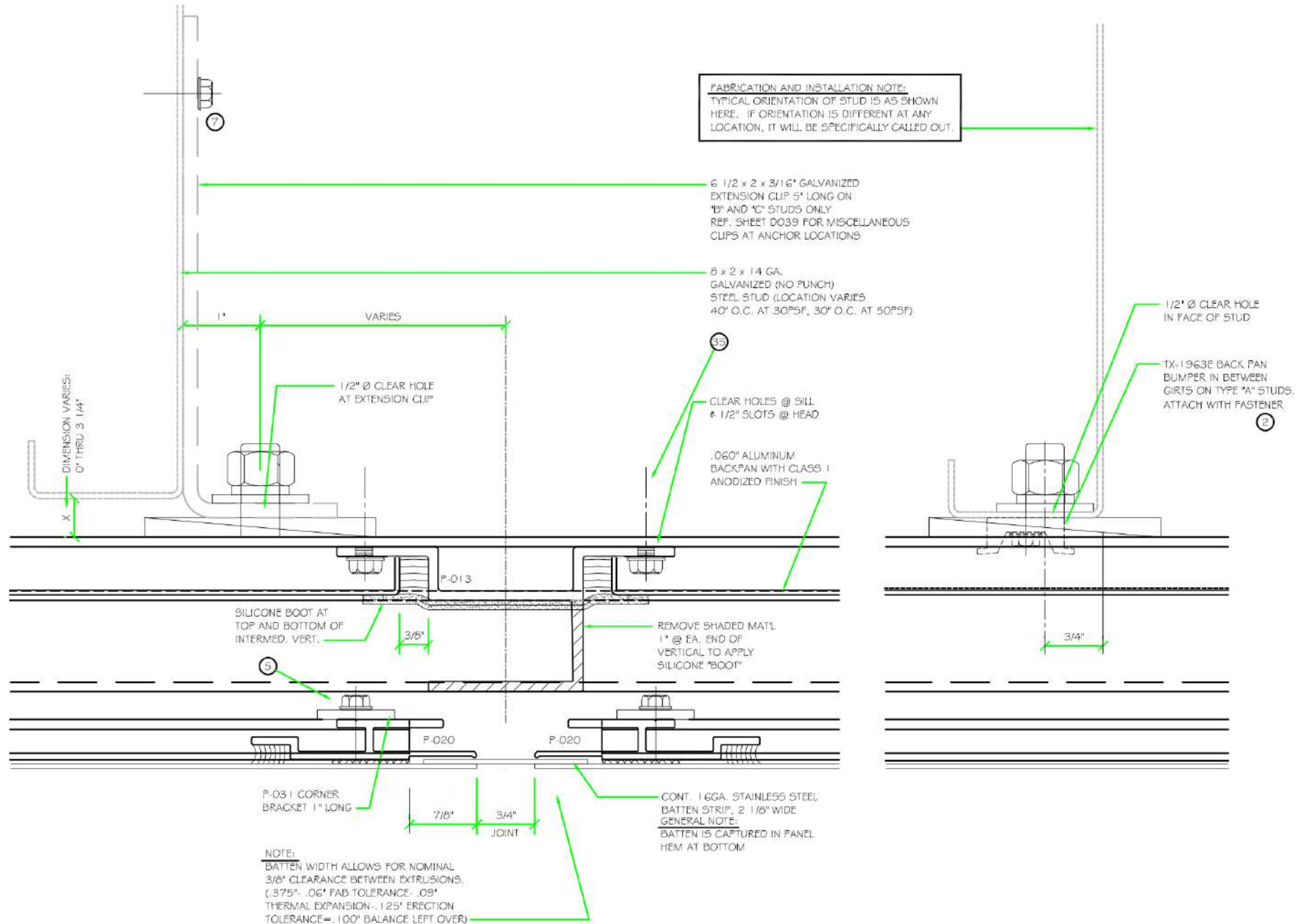
.....  
LOS ANGELES, CA  
USA

Gehry & Partners











20 Fenchurch (Walkie-talkie), London  
Rafael Viñoly



20 Fenchurch (Walkie-talkie), London  
Rafael Viñoly





# Harvard Art Museums

.....  
CAMBRIDGE, MA  
USA





**Merck  
Serono**

.....  
GENEVA  
SWITZERLAND

  
**PERMASTEELISA  
GROUP**



**BMW  
Welt**

.....  
MUNICH  
GERMANY

  
**PERMASTEELISA  
GROUP**



# Sathorn Square

.....  
BANGKOK  
THAILAND

DZ Bank, Pariser Platz 3, Berlin  
Frank Gehry





# Novartis Campus

.....  
BASEL  
SWITZERLAND



# Yas Hotel on Yas Island

.....  
ABU DHABI  
UAE



**Hamad  
International  
Airport  
Architectural  
Stair**

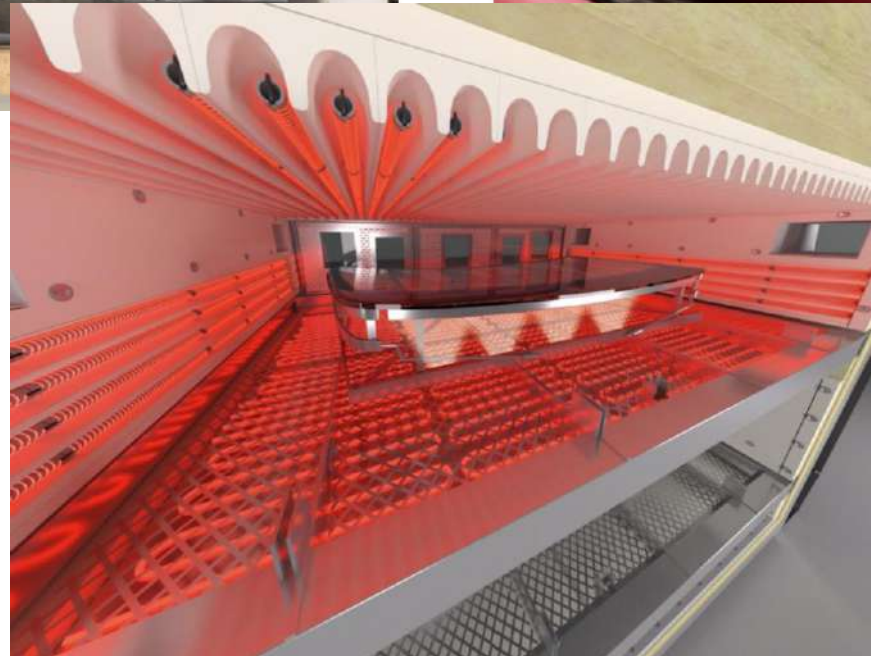
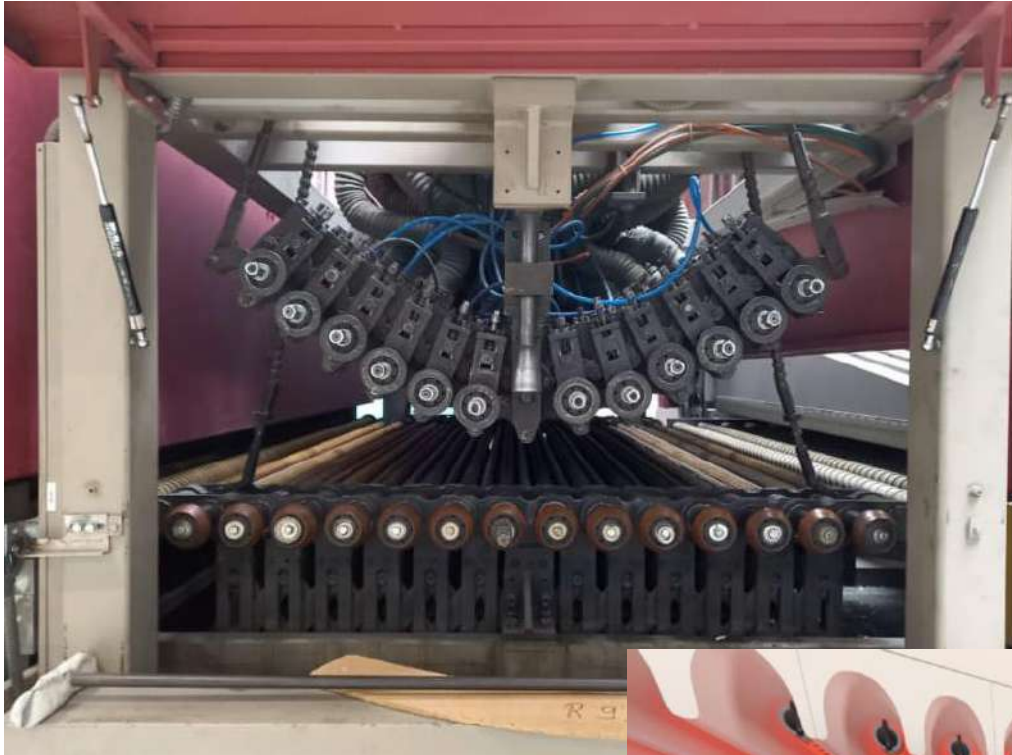
.....  
DOHA  
QATAR

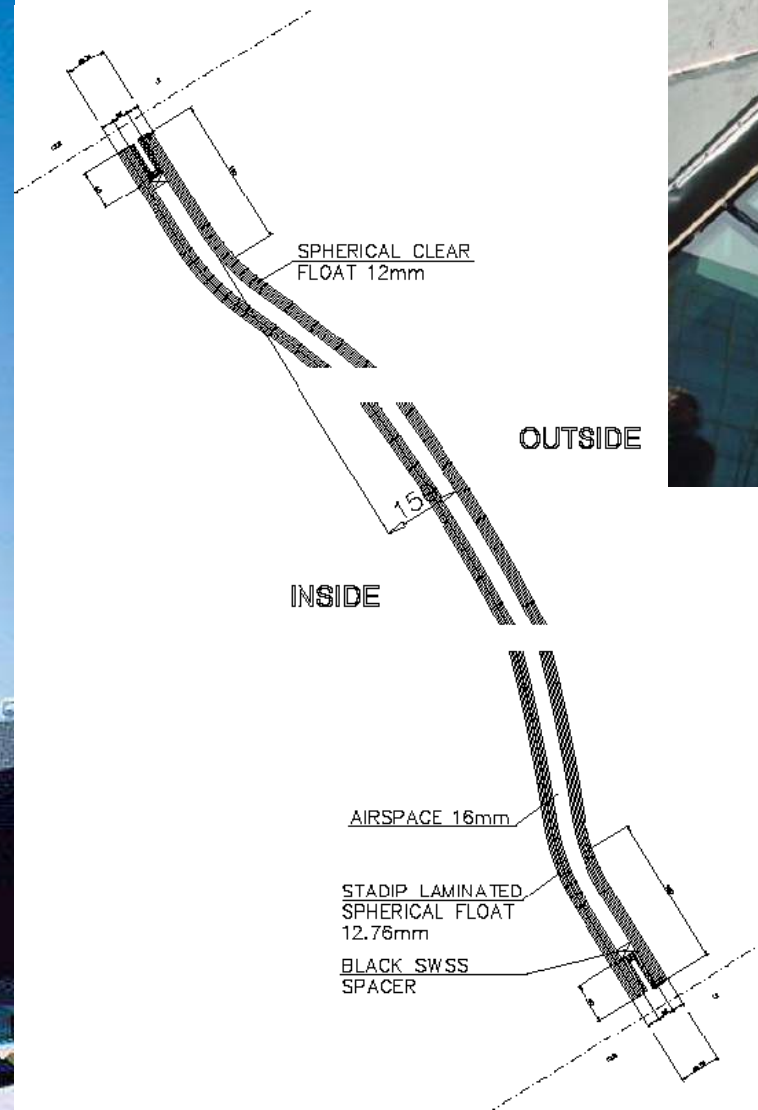
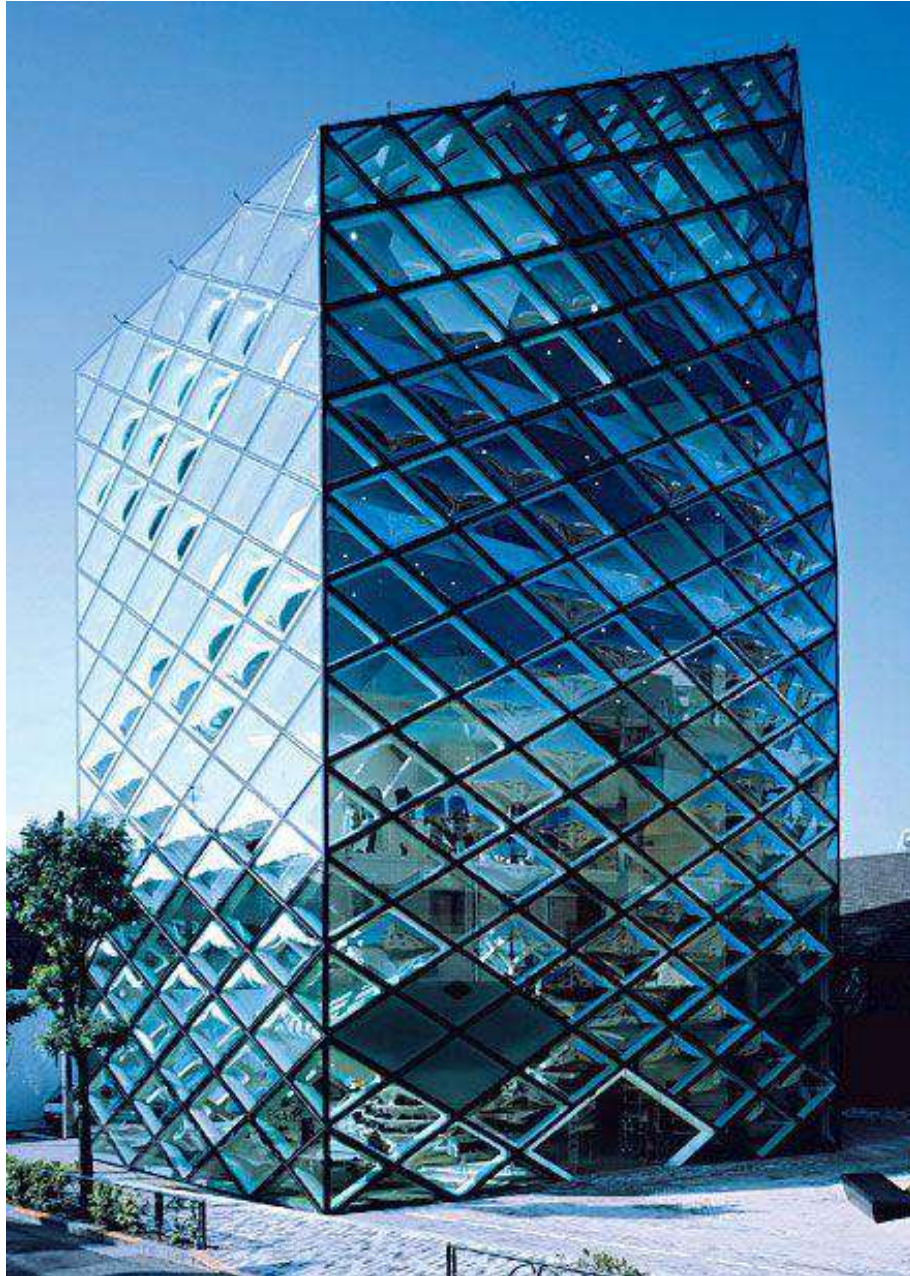


# Drugstore Publics

.....  
PARIS  
FRANCE







Prada – Tokyo  
Herzog & de Meuron

# Svijet ovješnih fasada

Elbphilharmonie Hamburg, Herzog & de Meuron









# Apple Campus 2

.....  
CUPERTINO, CA  
USA



## Apple Campus 2

.....  
CUPERTINO, CA  
USA







## Apple Campus 2

.....  
CUPERTINO, CA  
USA





## Apple Campus 2

.....  
CUPERTINO, CA  
USA



## Apple Campus 2

.....  
CUPERTINO, CA  
USA



# California Academy of Sciences

.....  
SAN FRANCISCO, CA  
USA

  
**PERMASTEELISA  
GROUP**

Ammonhof, Dresden  
Ingenhoven Architects

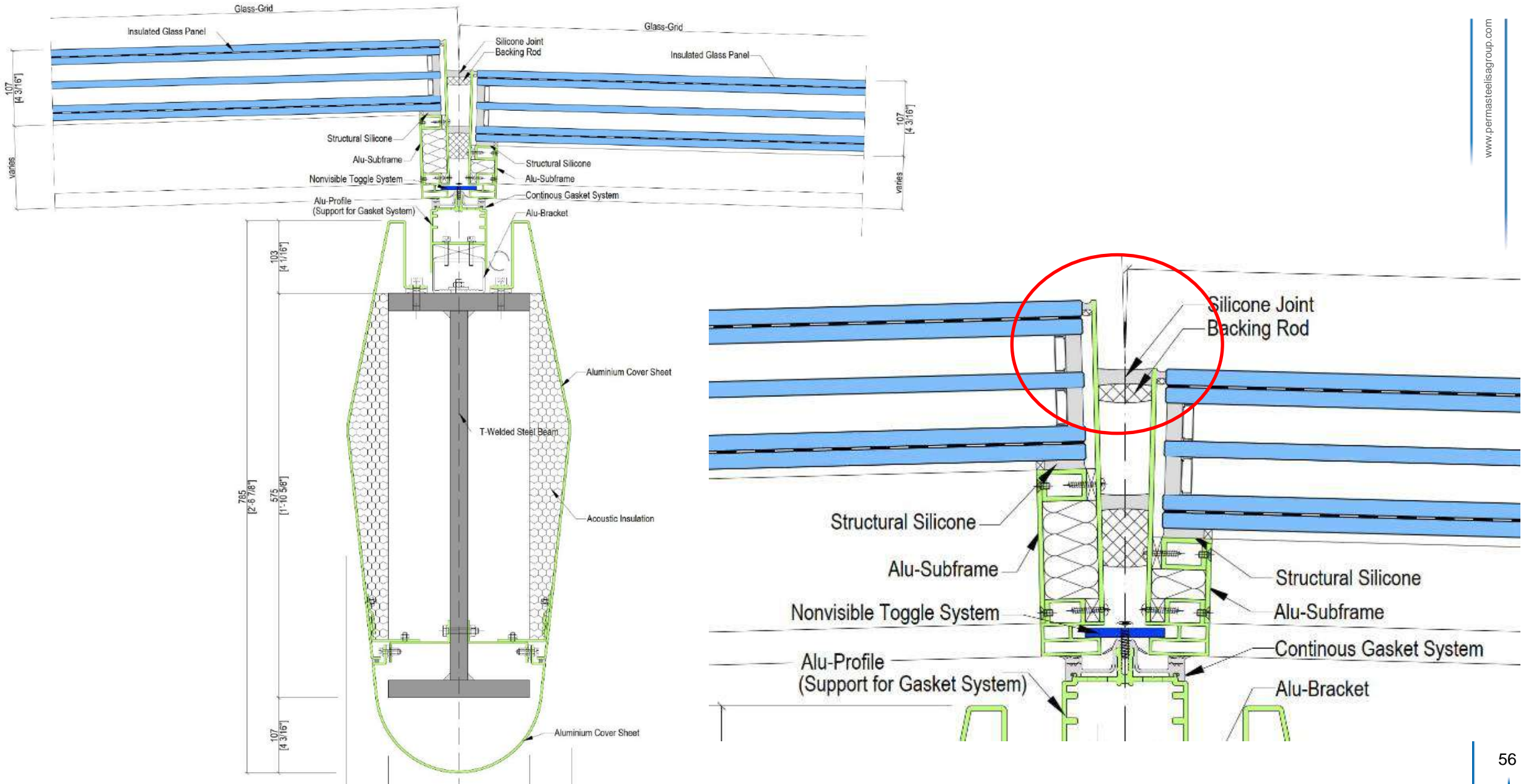




# Robert and Arlene Kogod Countryard

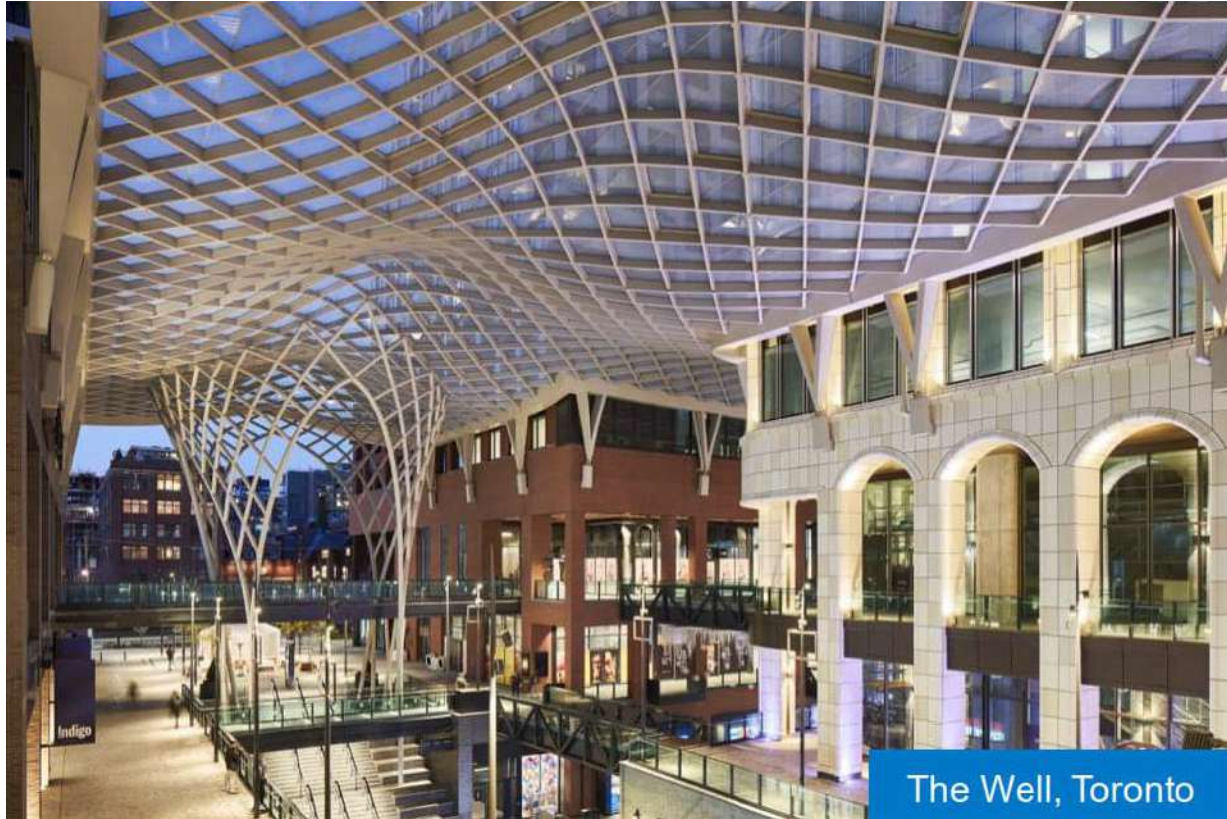
.....  
WASHINGTON, DC  
USA

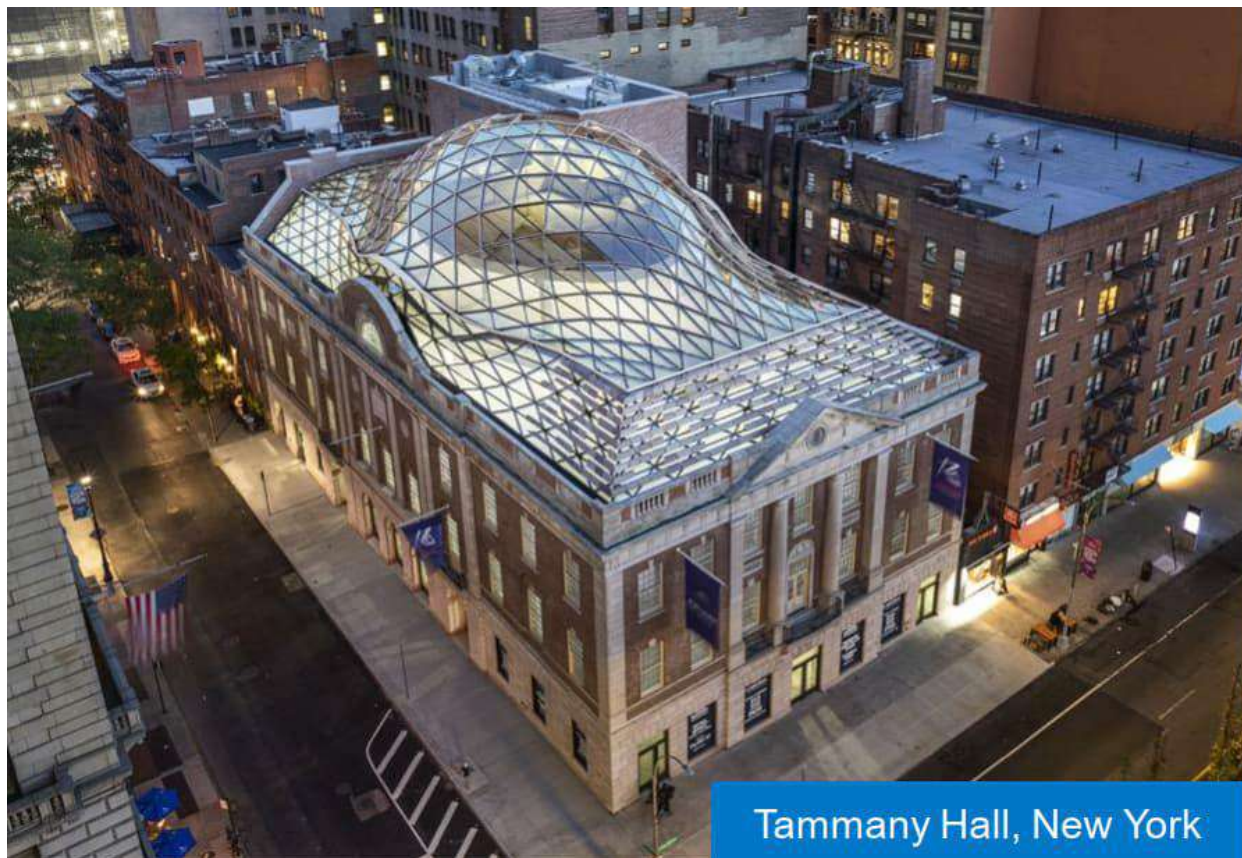
# Svijet ovješnih fasada

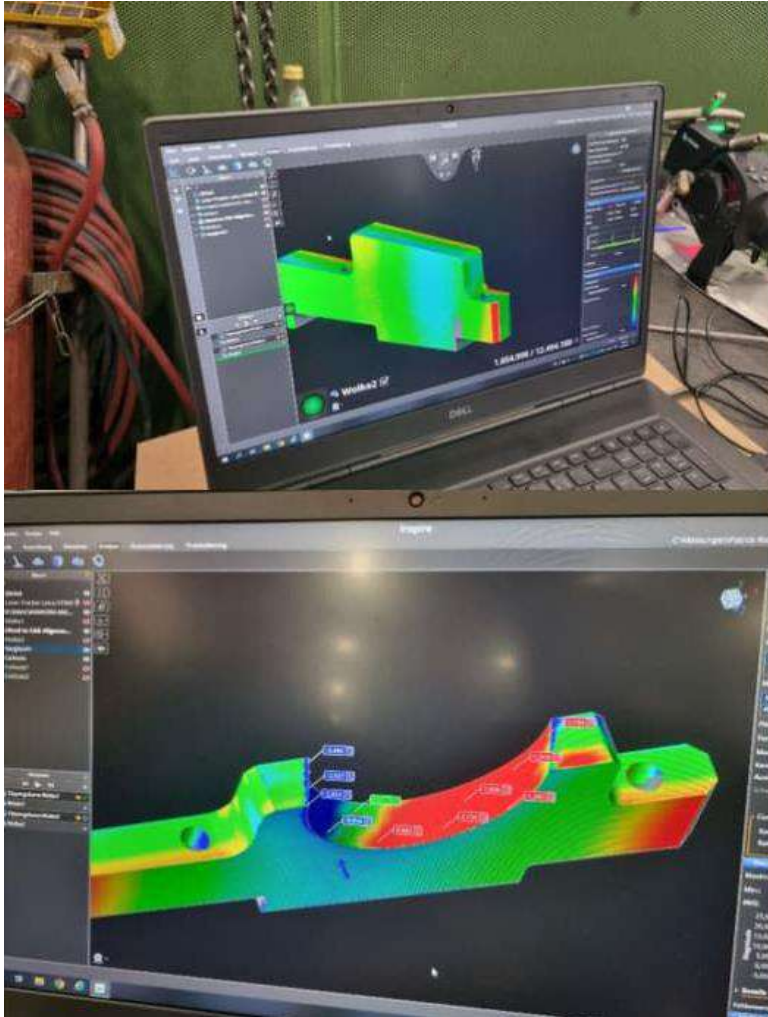
















Bridge of Peace, Tbilisi

Struktura: Ostakljena čelična

Površina staklene opne: 2.000 m<sup>2</sup>

Duljina: 115 m

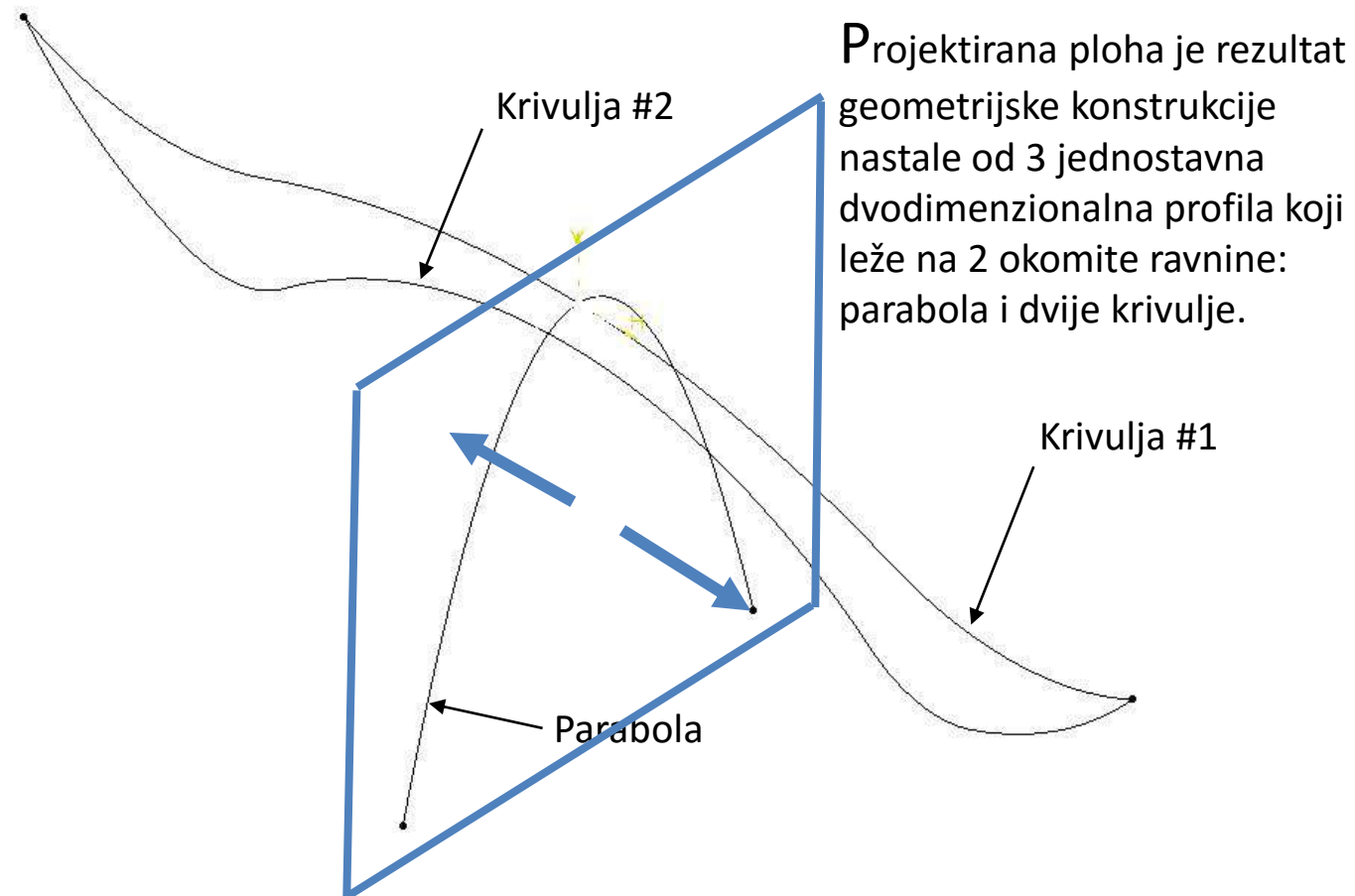
Ahitekt: Michele De Lucchi

Konstrukter.: F&M (Mira – Ve)

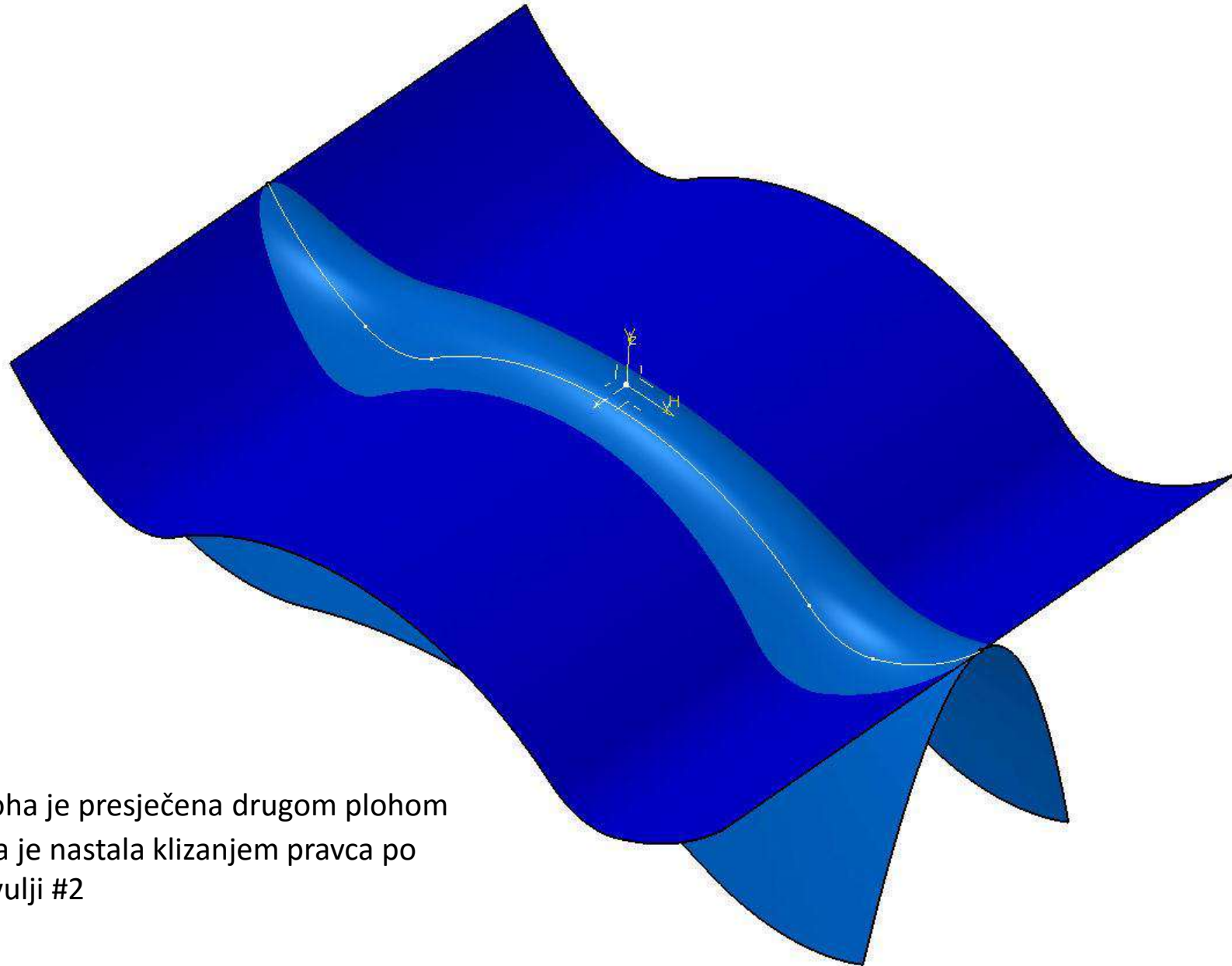
Dovršeno: maj 2010

## The Bridge of Peace

.....  
TBILISI  
GEORGIA



Parabola leži u vertikalnoj ravnini i generira plohu klizeći po krivulji #1



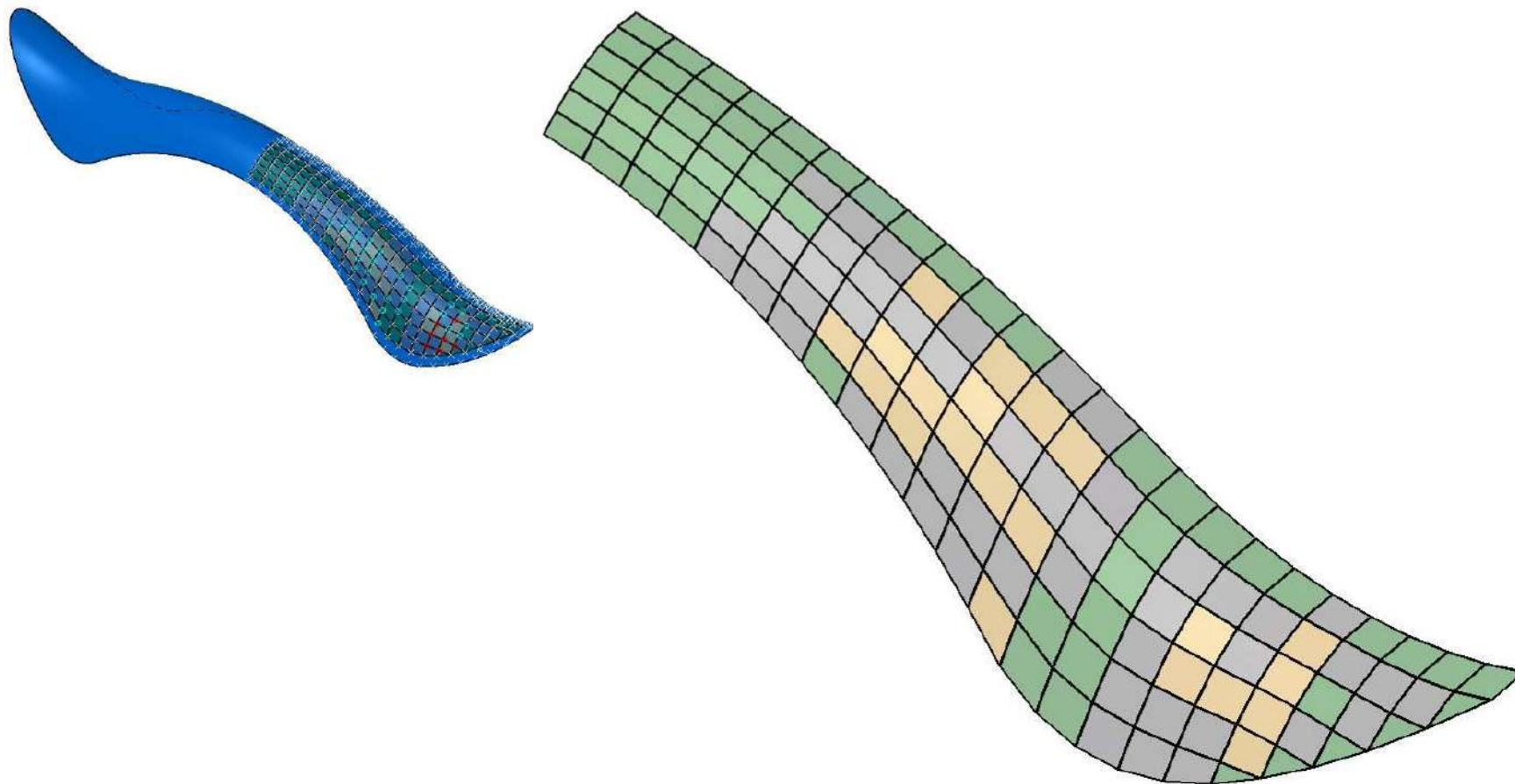
Ploha je presječena drugom plohom  
koja je nastala klizanjem pravca po  
krivulji #2








Ploha je presječena glavnim vertikalnim ravninama u 49 presjeka.

Svaki parabolični presjek je razdijeljen u 15 dijelova jednake duljine.



Odmak van ravnine je minimaliziran i organiziran u 3 skupine:

	zeleno	(0-20mm),	46%
	sivo	(20-40mm),	38%
	žuto	(40-60mm)	16%

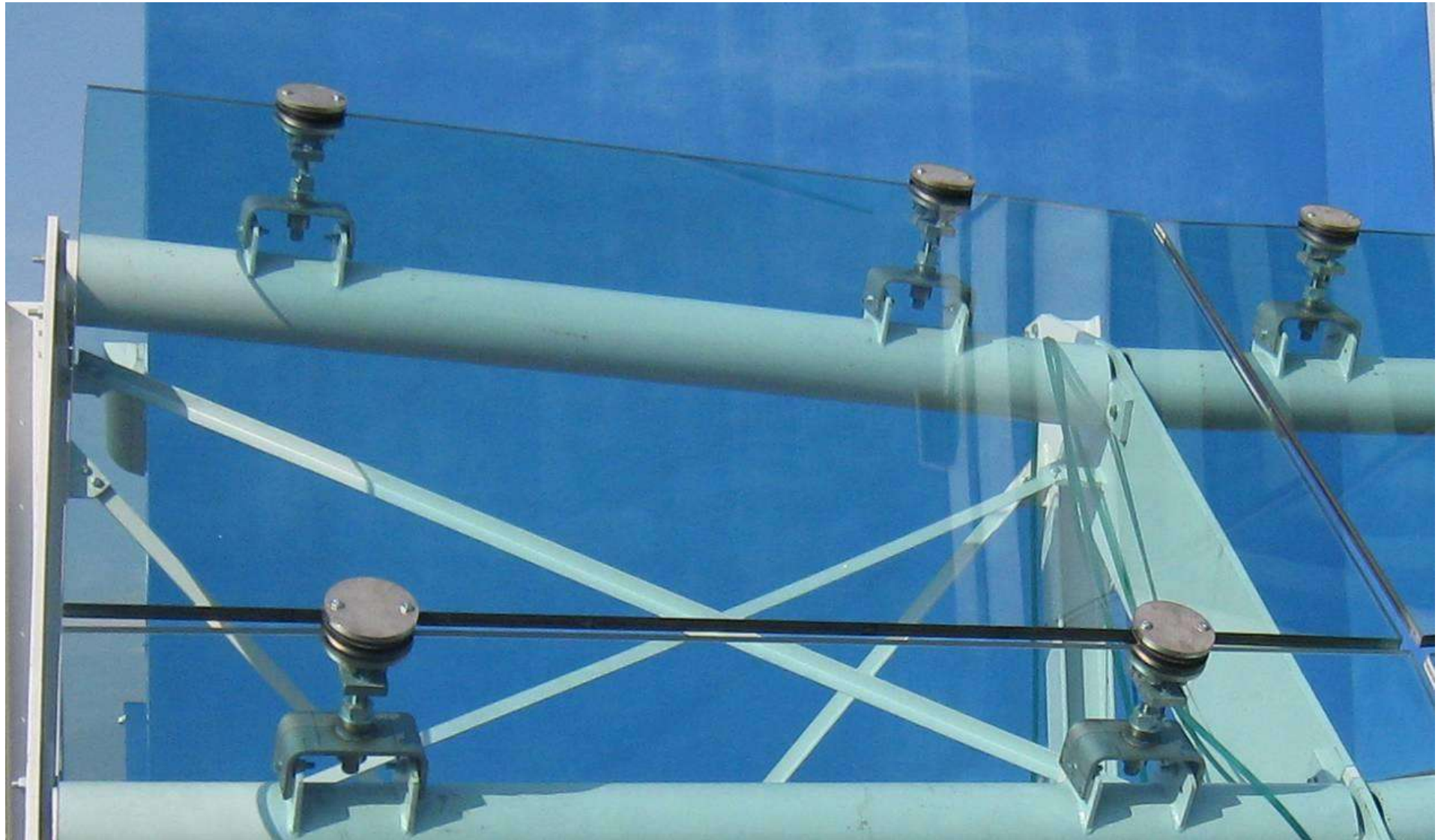
20% referentnih točaka je pomaknuto do 150 mm po presječnoj paraboli, kako bi optimizirali odmake van ravnine, ali uz minimalni poremećaj geodetske mreže.

Karakteristike stakla:

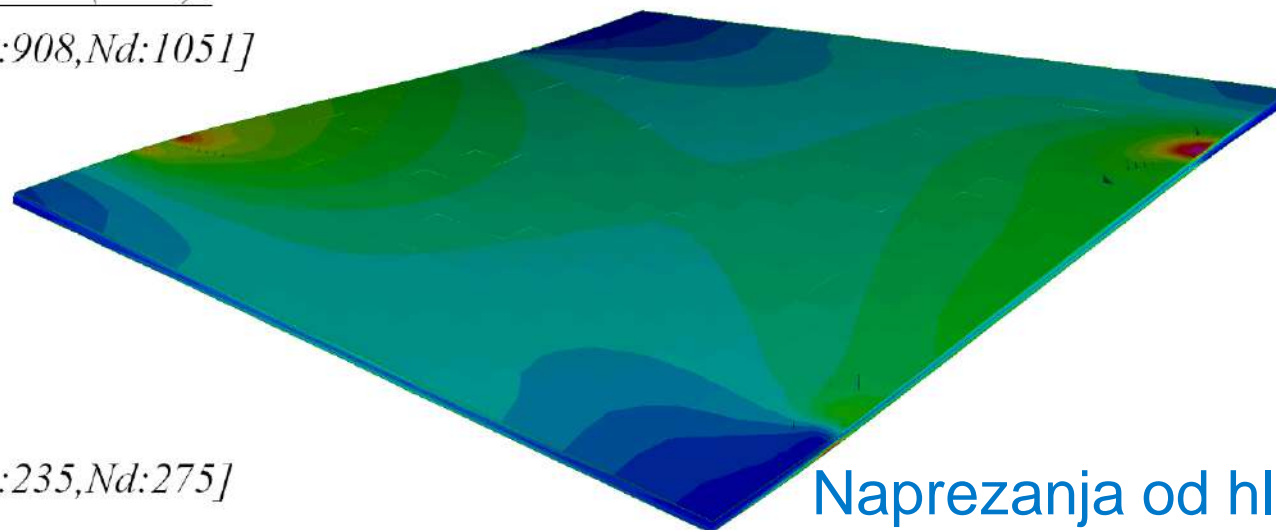
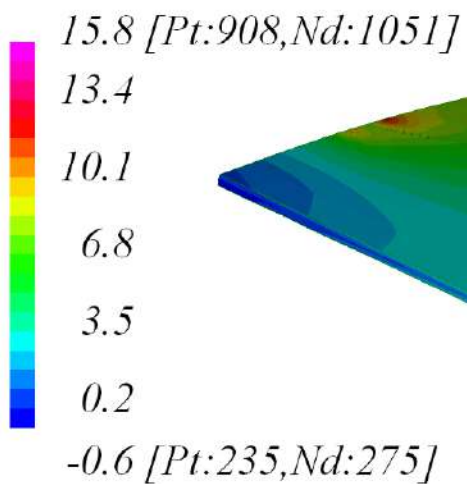
Najveća dimenzija:  
2500 mm x 2100 mm

Sastav stakla:  
15FT.12HS.4

Oslonci:  
4 stezaljke (clamp)

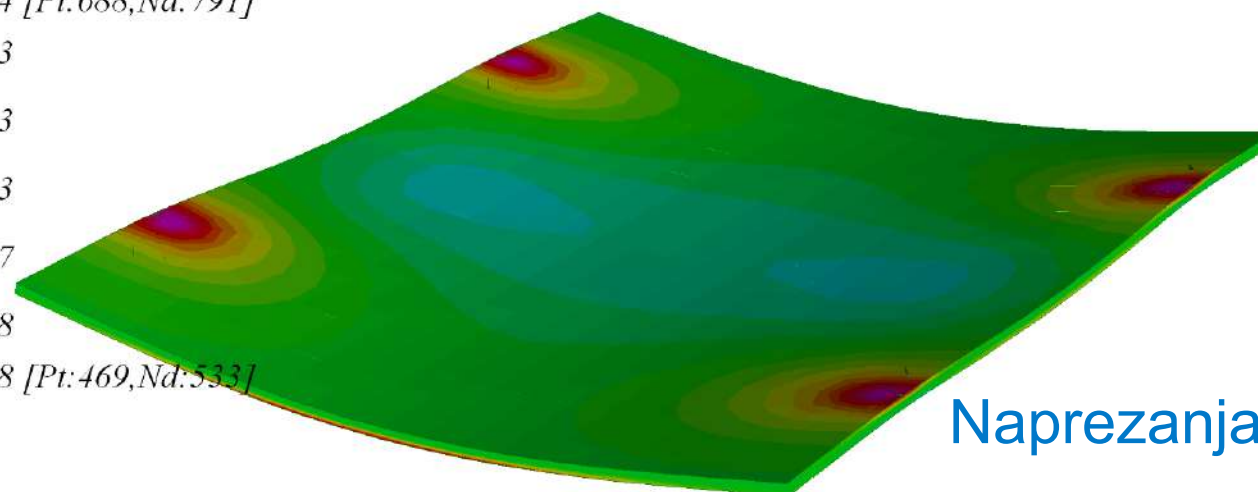
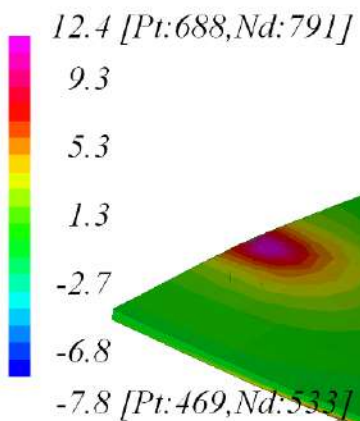


*Plate Stress:11 (MPa)*



Naprezanja od hladnog savijanja

*Plate Stress:11 (MPa)*

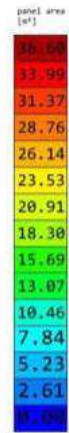
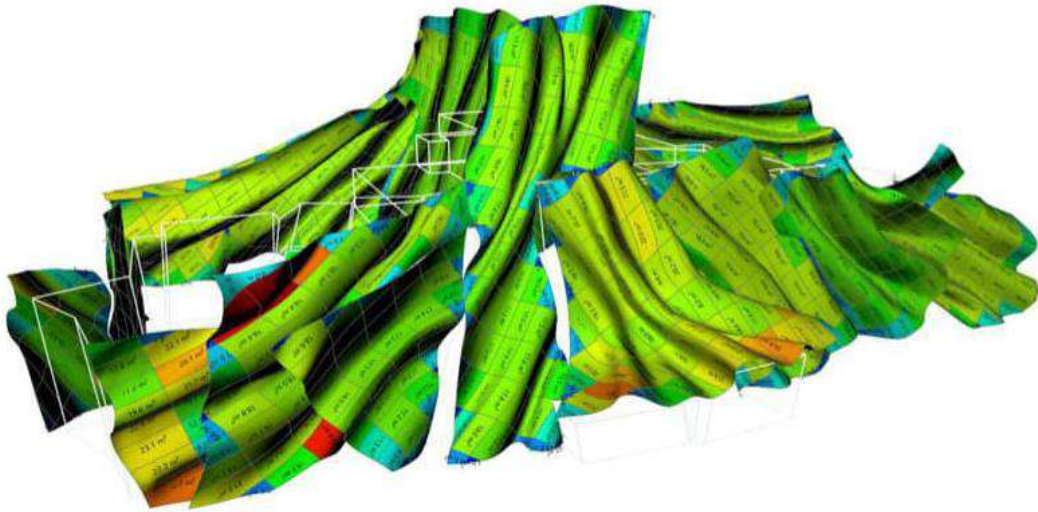


Naprezanja od opterećenja



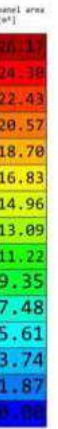
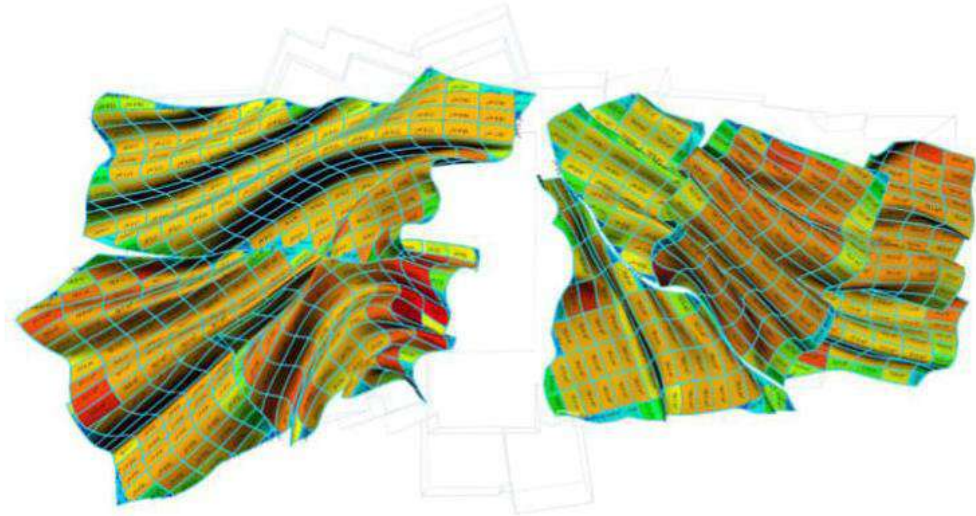
EG1 glass area, Isometric view 2

Total panel count = 1471 pcs, total A = 20772.9 m<sup>2</sup> (min A = 0.0 m<sup>2</sup>, max A = 36.6 m<sup>2</sup>)



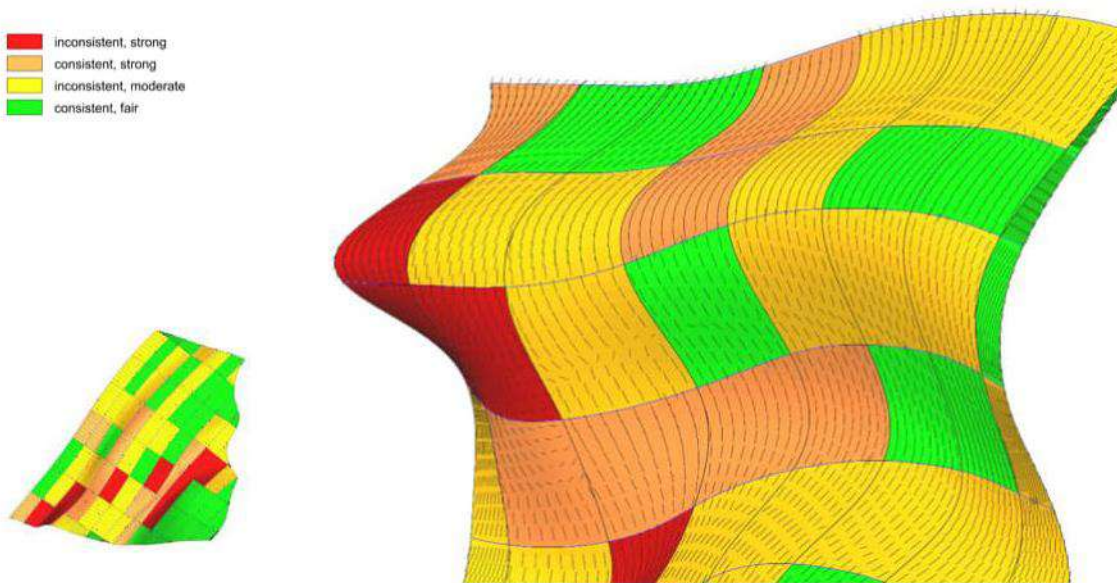
EG2 glass area, perspective top view

Total panel count = 891 pcs, total A = 13280.9 m<sup>2</sup> (min A = 0.0 m<sup>2</sup>, max A = 26.2 m<sup>2</sup>)

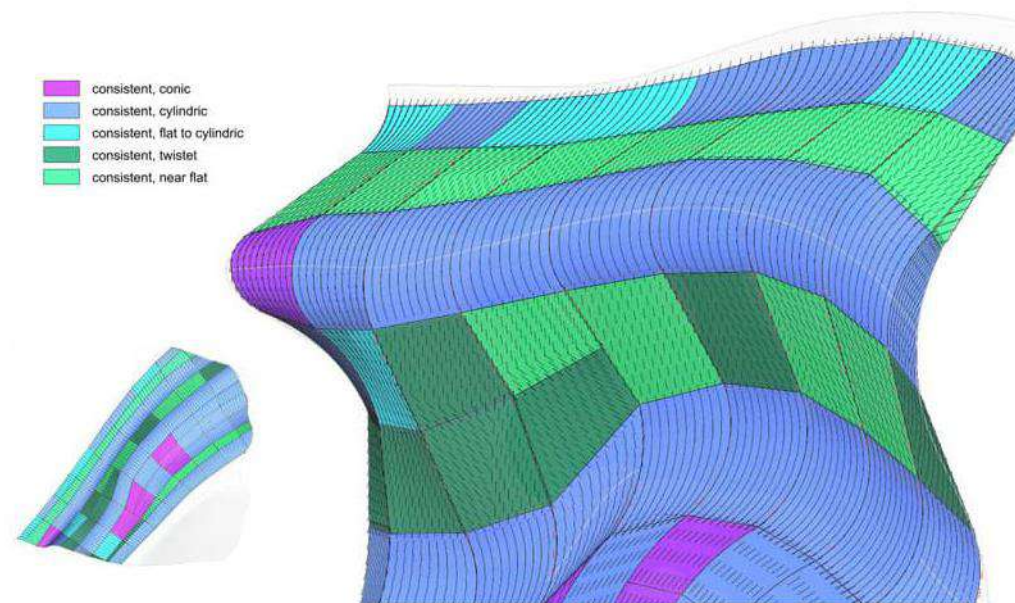


## CURVATURE ANALYSIS / POTENTIAL OPTIMISATION

- inconsistent, strong
- consistent, strong
- inconsistent, moderate
- consistent, fair



- consistent, conic
- consistent, cylindric
- consistent, flat to cylindric
- consistent, twistet
- consistent, near flat



## Interactive Corp. HQ – New York (USA)

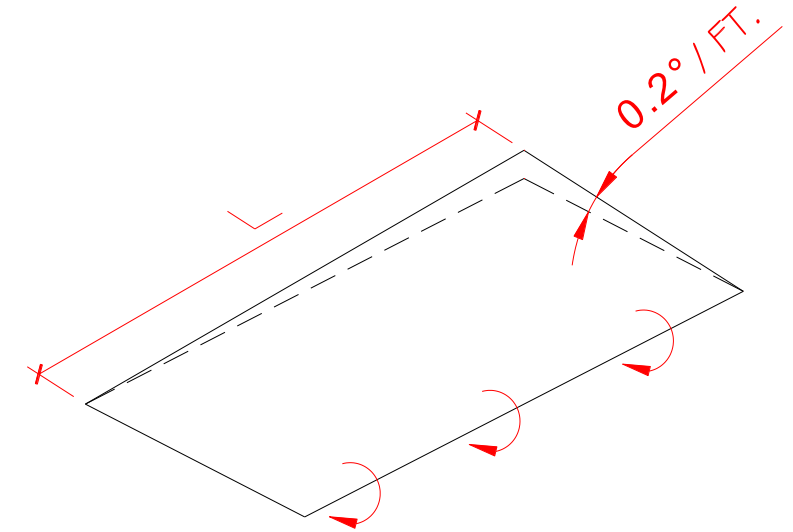
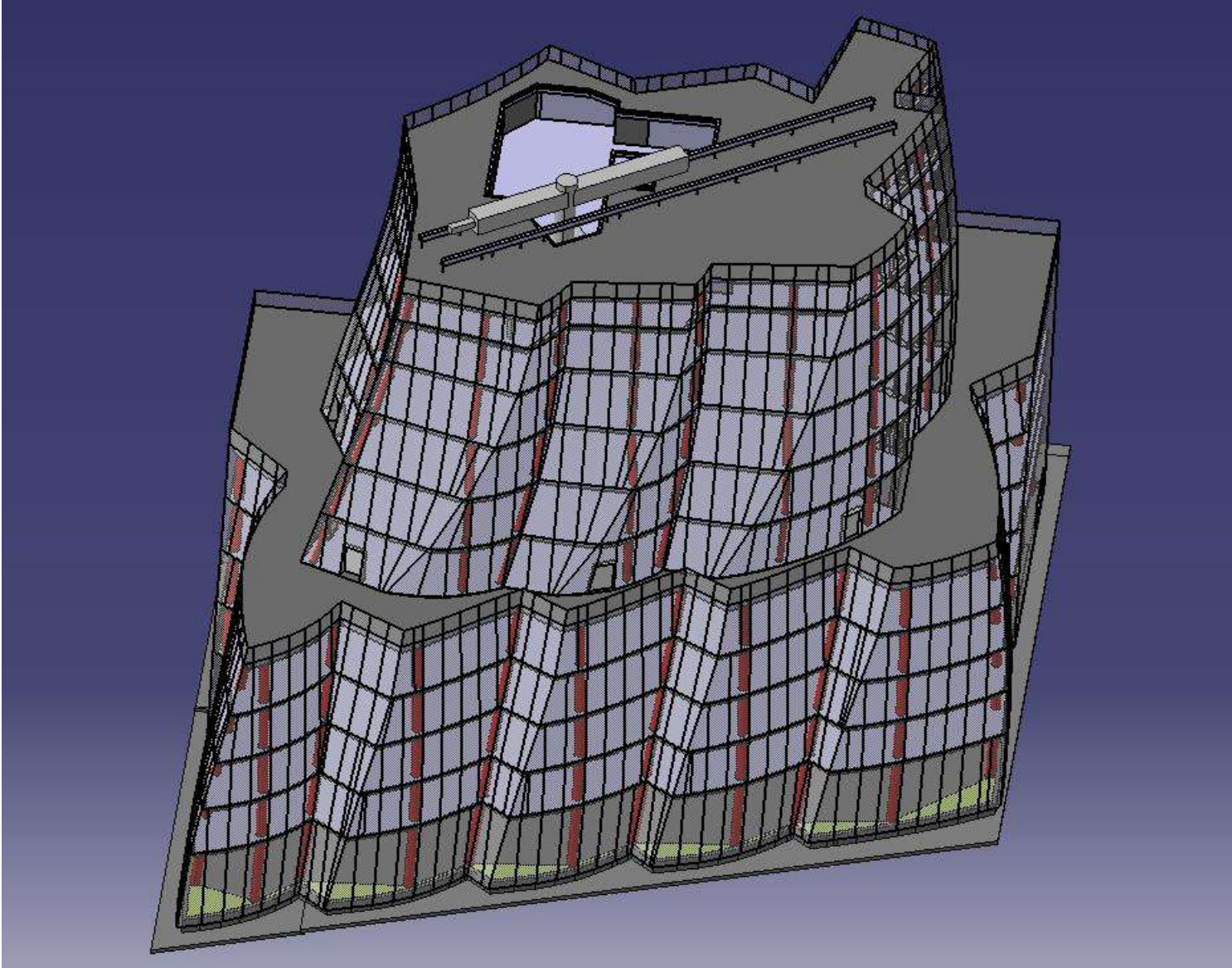


**Architect: Frank O. Gehry  
& Associates**

**Developer: IAC -  
Interactive Corporation**

**Hladnooblikovana panelna  
ovješena fasada**





**0.2°/Ft duljine po vertikali (L)**  
**6" (150 mm) pomak točke u kutu**

9.800 m<sup>2</sup>  
Fasade

35 novih  
ekstruzija

4 setova profila:  
rotacija od  
-3° do + 14°

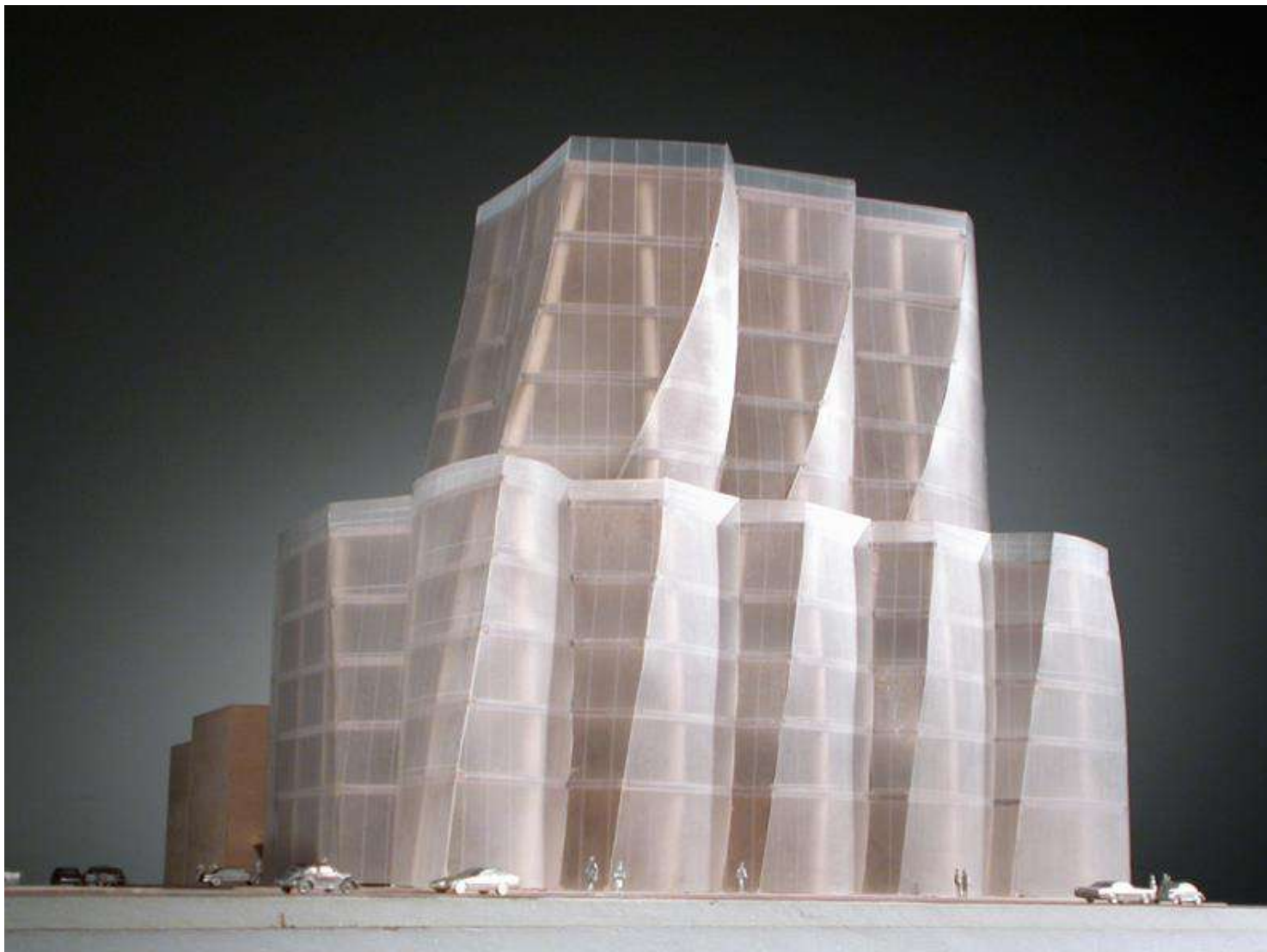
Rotacija horizontalne  
reške +/- 5°

1442 panela  
1330 zasebnih  
112 ponovljenih

86.335 komponenti  
18.290 zasebnih  
68.045 ponovljenih

318.794 zasebnih  
parametara za  
strojnu obradu

146 GB  
podataka





**Nominalna debljina stakla 33 mm**

- **6 mm polukaljeno vanjsko staklo**
- **12 mm zračni prostor**
- **6+6 mm laminirano unutarnje staklo, 4 PVB**

6/21/2006



[www.permasteelisa.com](http://www.permasteelisa.com)





# Evolution Tower

.....  
MOSCOW  
RUSSIA



**PERMASTEELISA  
GROUP**

Thank You for Your Attention!

