



# STEEL

Architecturally  
Exposed Structural  
Steel

SPAN

## Span Types:

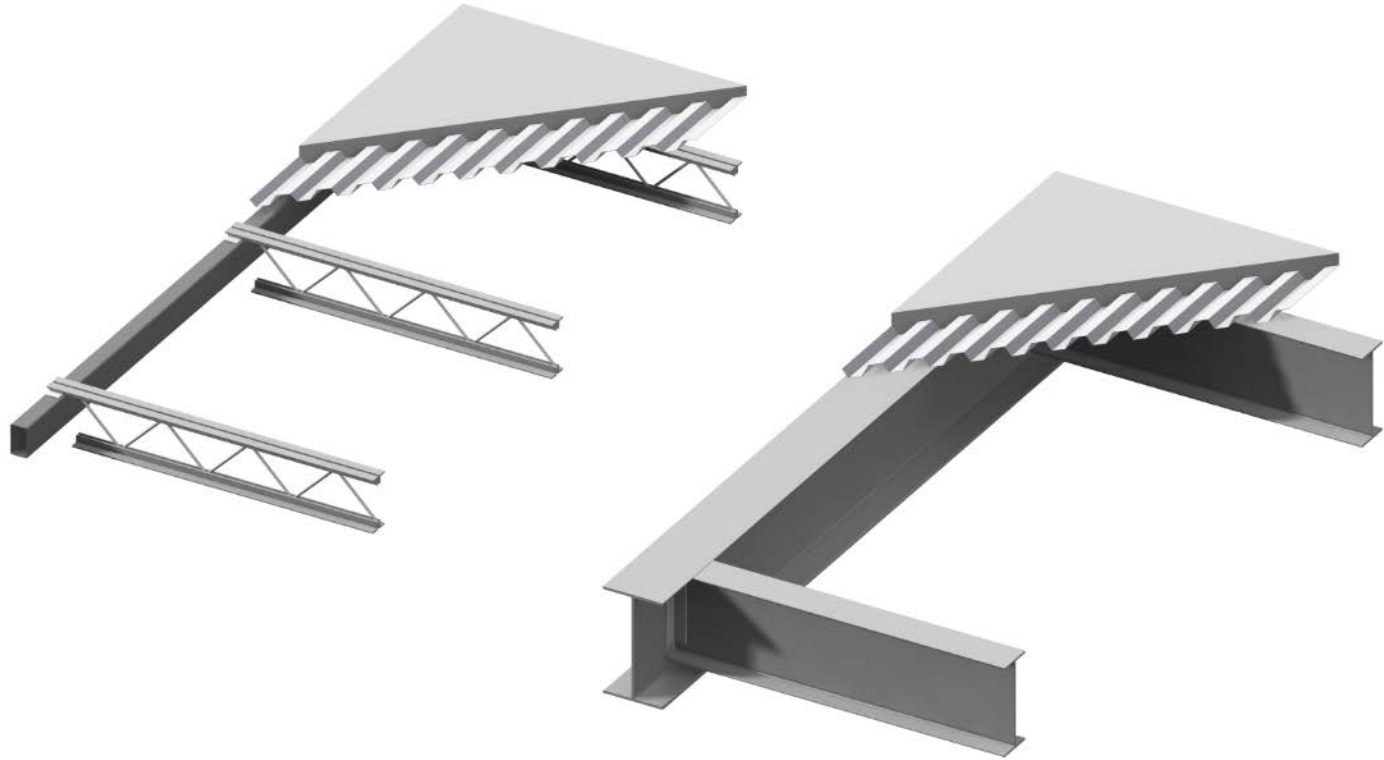
- Floor systems (flat)
- Opaque roof support systems (flat, curved, sloped)
- Skylight support systems
- Extremely long span systems for buildings (where column free spaces are essential)
- Bridges (separate lecture on this)


## Specialty Systems:

- Space frame systems
- Lattice grid systems



Floor  
and Flat  
Roof  
Systems






Lillis Business School  
Eugene, Oregon









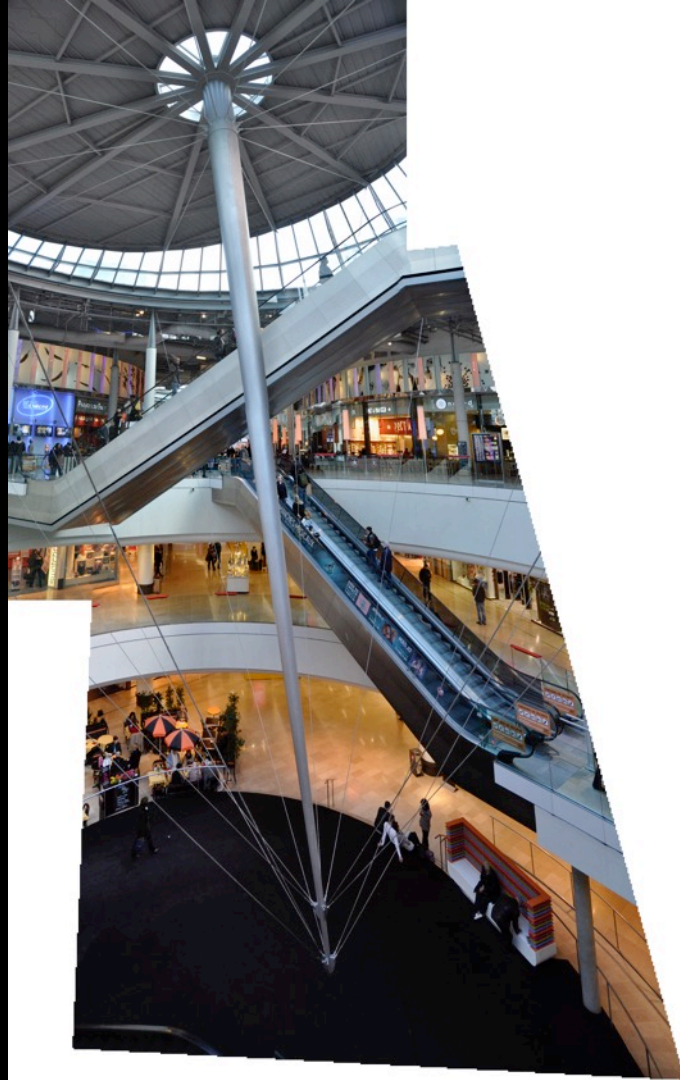
The image captures the vast, modern interior of the Grand Palais in Paris. A prominent feature is a wide, white staircase with a glass railing, where several people are seen walking. In the foreground, a black grand piano is displayed on a circular platform, cordoned off by stanchions and a dark rope. The ceiling is a complex, high-tech structure with a large, curved glass skylight that allows natural light to illuminate the space. The architecture is characterized by its clean lines and industrial aesthetic, with various levels and walkways visible. People are scattered throughout the space, some walking and others standing, adding a sense of scale and activity to the scene.

Les Quatre Temps  
La Defense, Paris  
Atelier LWD  
1981











PAWS Climbing Centre  
University of Alberta  
Edmonton, Alberta  
Group 2 Architecture  
2015



























Federation Square  
Melbourne, Australia  
Batesmart and LAB Architecture  
2002



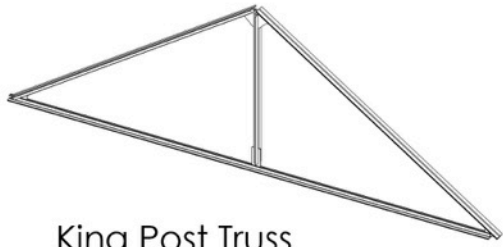








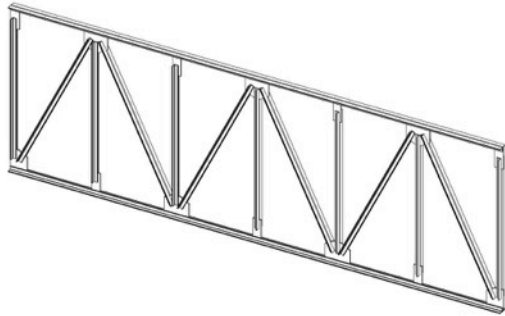
## COMMON TRUSS TYPES



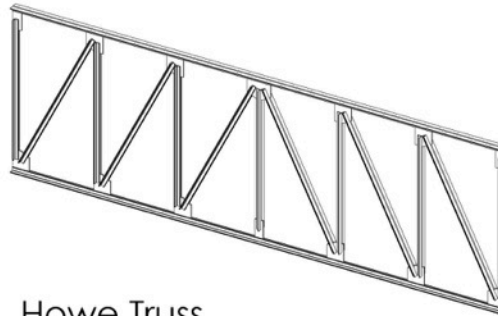
King Post Truss



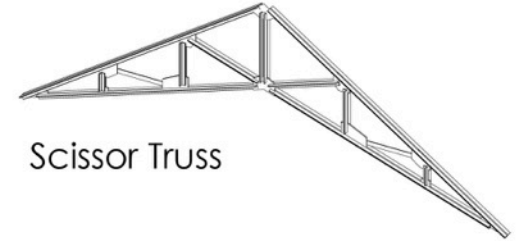
Pitched Howe Truss



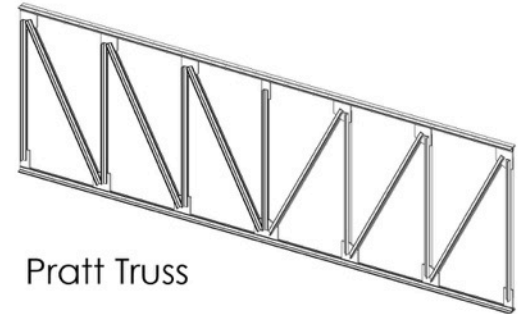
Modified Warren Truss



Howe Truss



Scissor Truss



Pratt Truss





Abilities Centre  
Whitby, Ontario  
B+H Architects  
2012













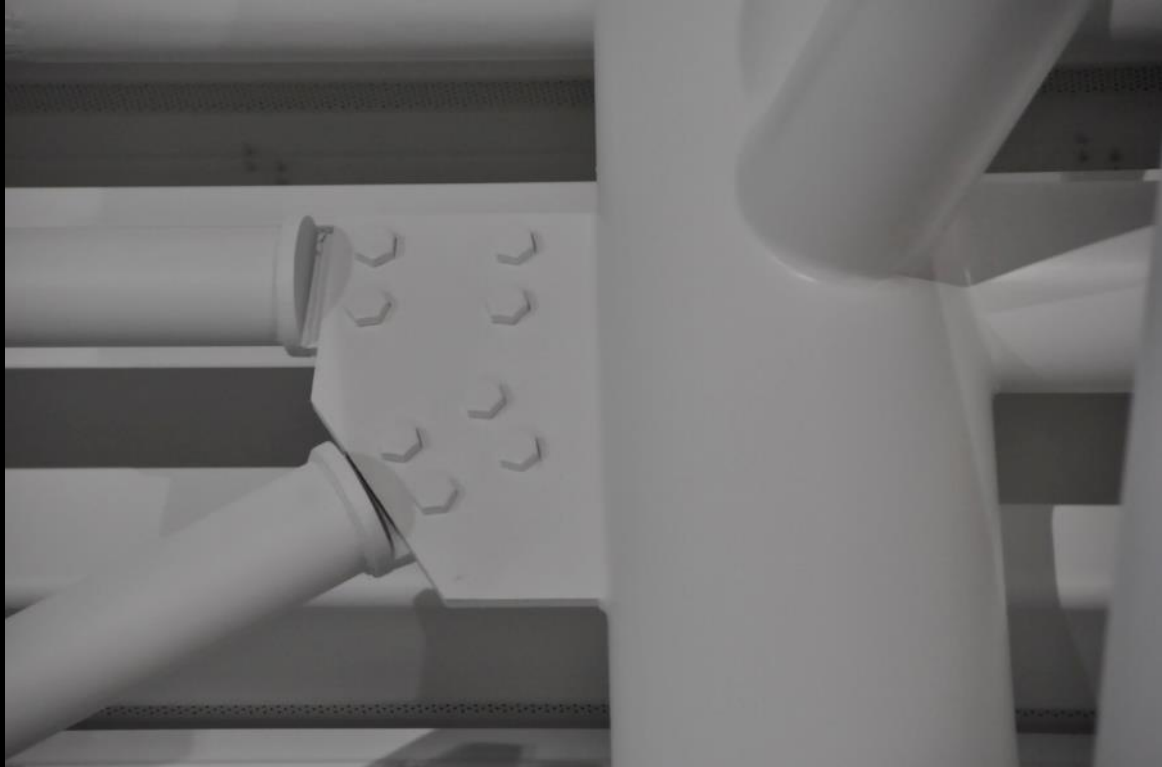














A photograph of the Auckland Marine Events Centre, a modern building with a series of white, curved, wave-like roof sections. The building is situated on a waterfront, with several boats docked at a pier in front of it. The water is a light blue-green color. The sky is blue with scattered white clouds. In the foreground, a concrete pier with wooden pilings and dark, rounded bollards runs along the water's edge. A sign on the building reads "VIADUCT EVENTS CENTRE" in red letters. Another sign on a boat reads "ZMOI". A sign on the pier reads "2 3 5". A sign on another boat reads "SAN COVILLE".

Auckland Marine Events Centre  
Auckland, New Zealand  
Moller Architects  
2014













**D&H STEEL CONSTRUCTION**



2010 8 11



















Rogers Place Arena  
Edmonton, Alberta  
360 Architecture  
2016





















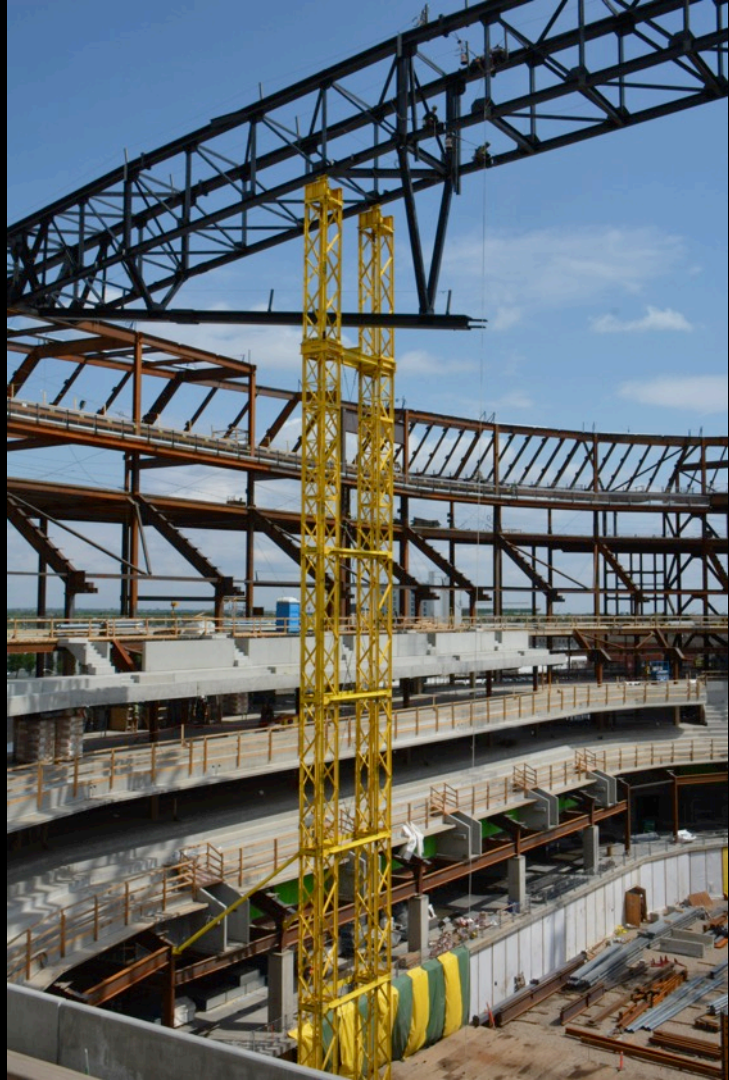






















A photograph of the Atocha Station Roof in Madrid, Spain. The image shows a complex, multi-level structure of brown steel trusses and beams. A prominent, light-colored concrete pillar stands in the center, supporting the roof. The structure is illuminated by natural light, creating strong shadows and highlights. In the background, a walkway with a railing is visible. A teal text box in the bottom left corner contains the text "Atocha Station Roof Madrid, Spain".

Atocha Station Roof  
Madrid, Spain









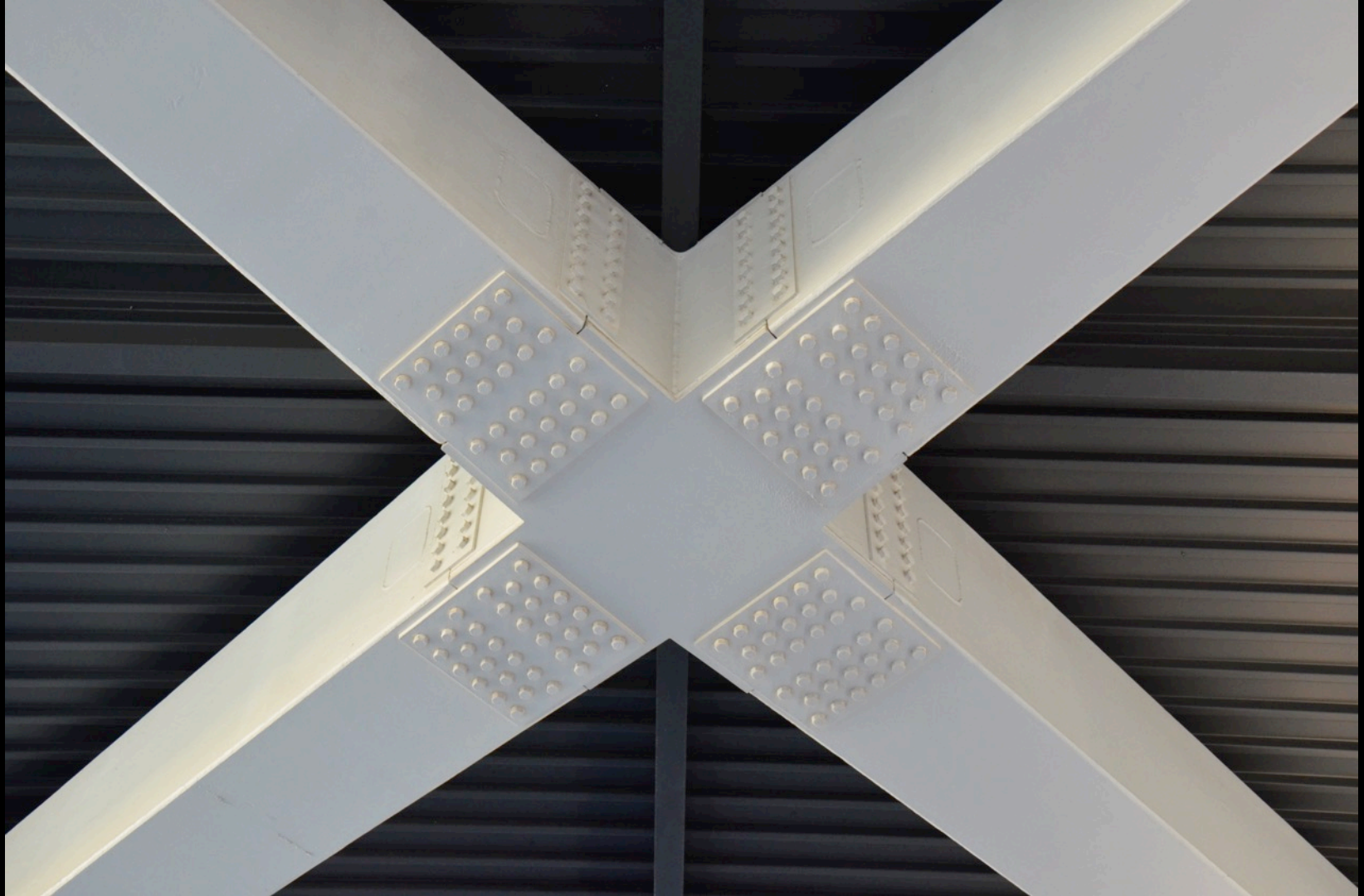


Valencia Train Station  
Valencia, Spain















Southern Cross Station  
Melbourne, Australia  
Nicholas Grimshaw  
2007





















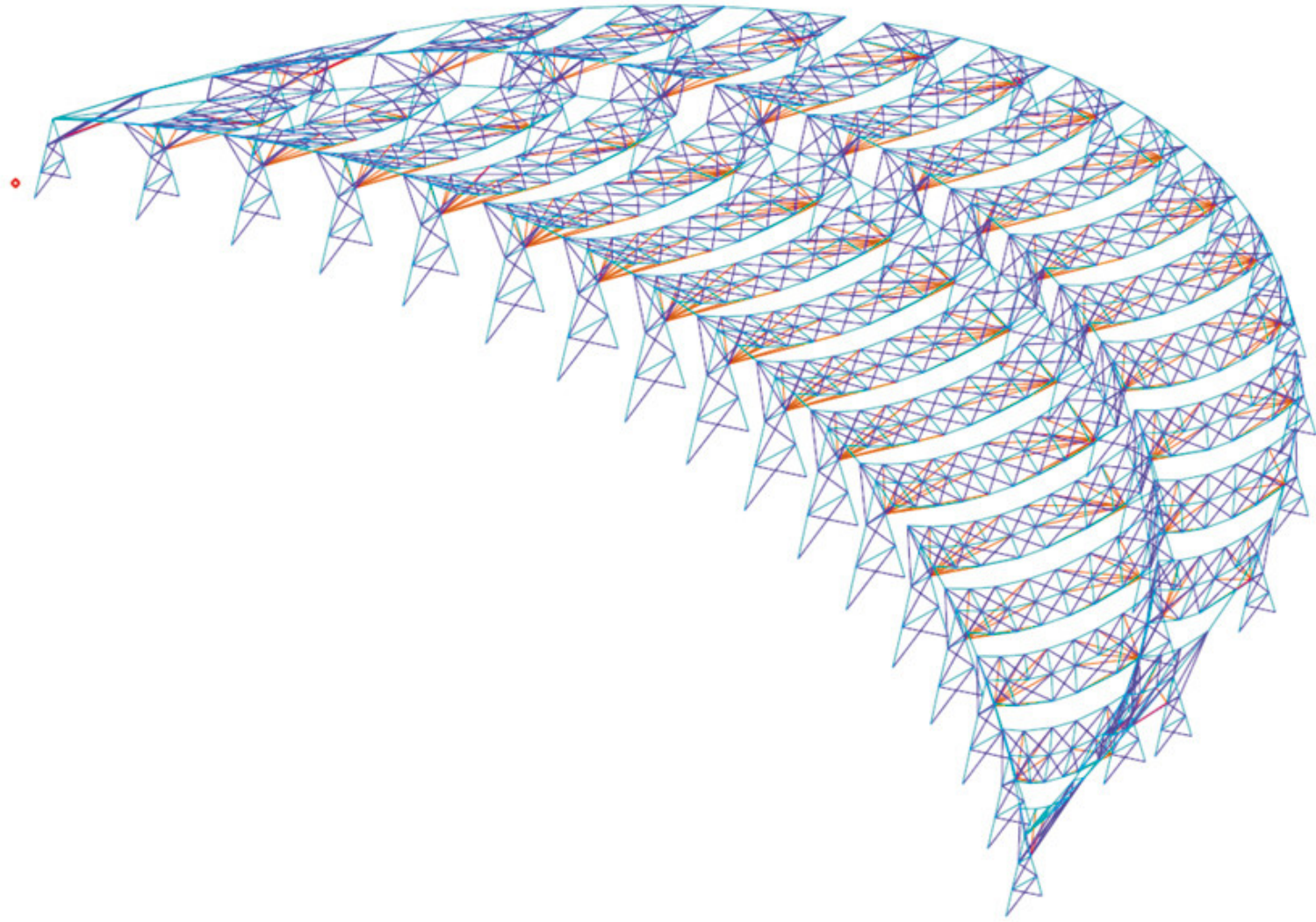




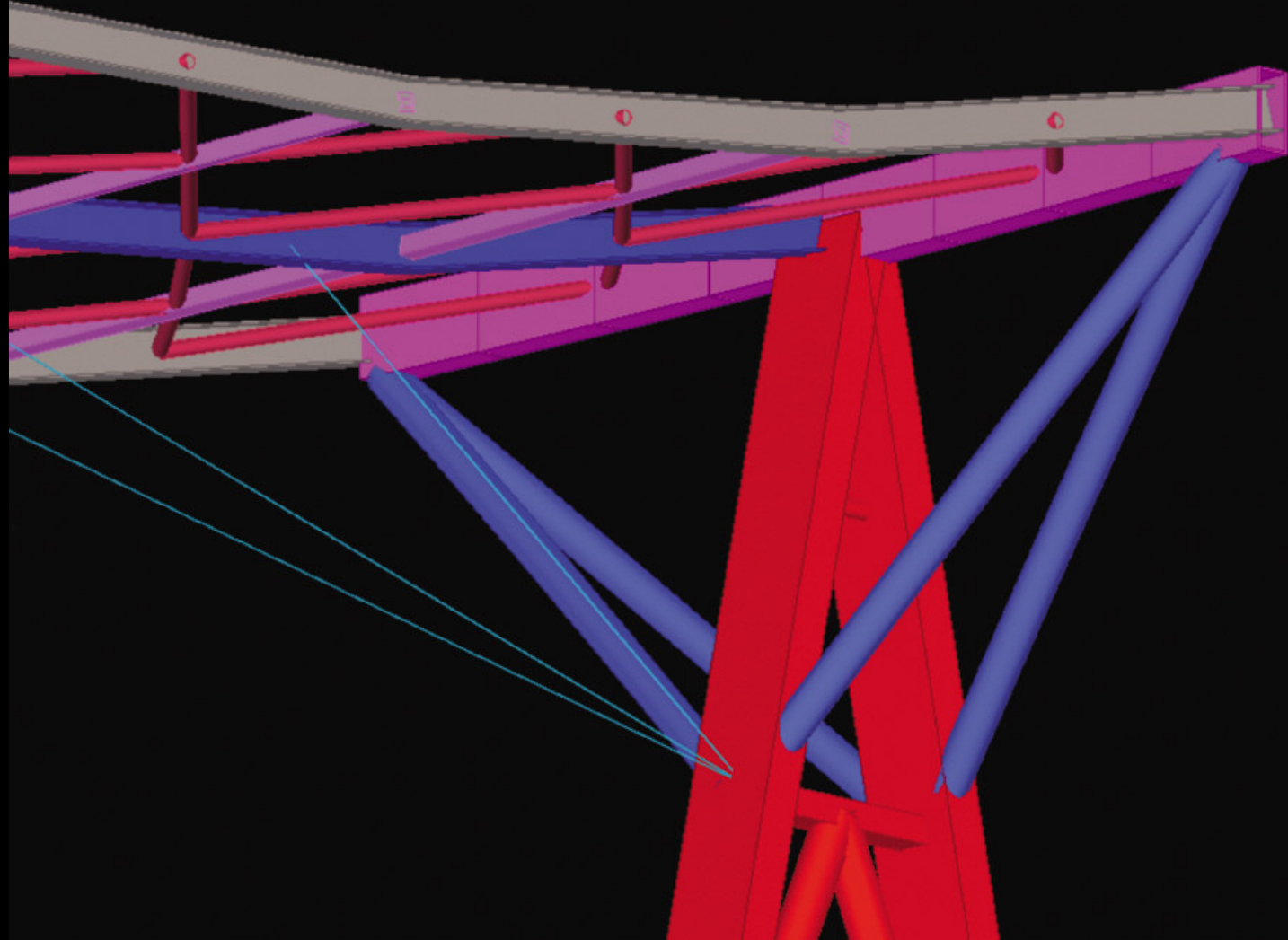


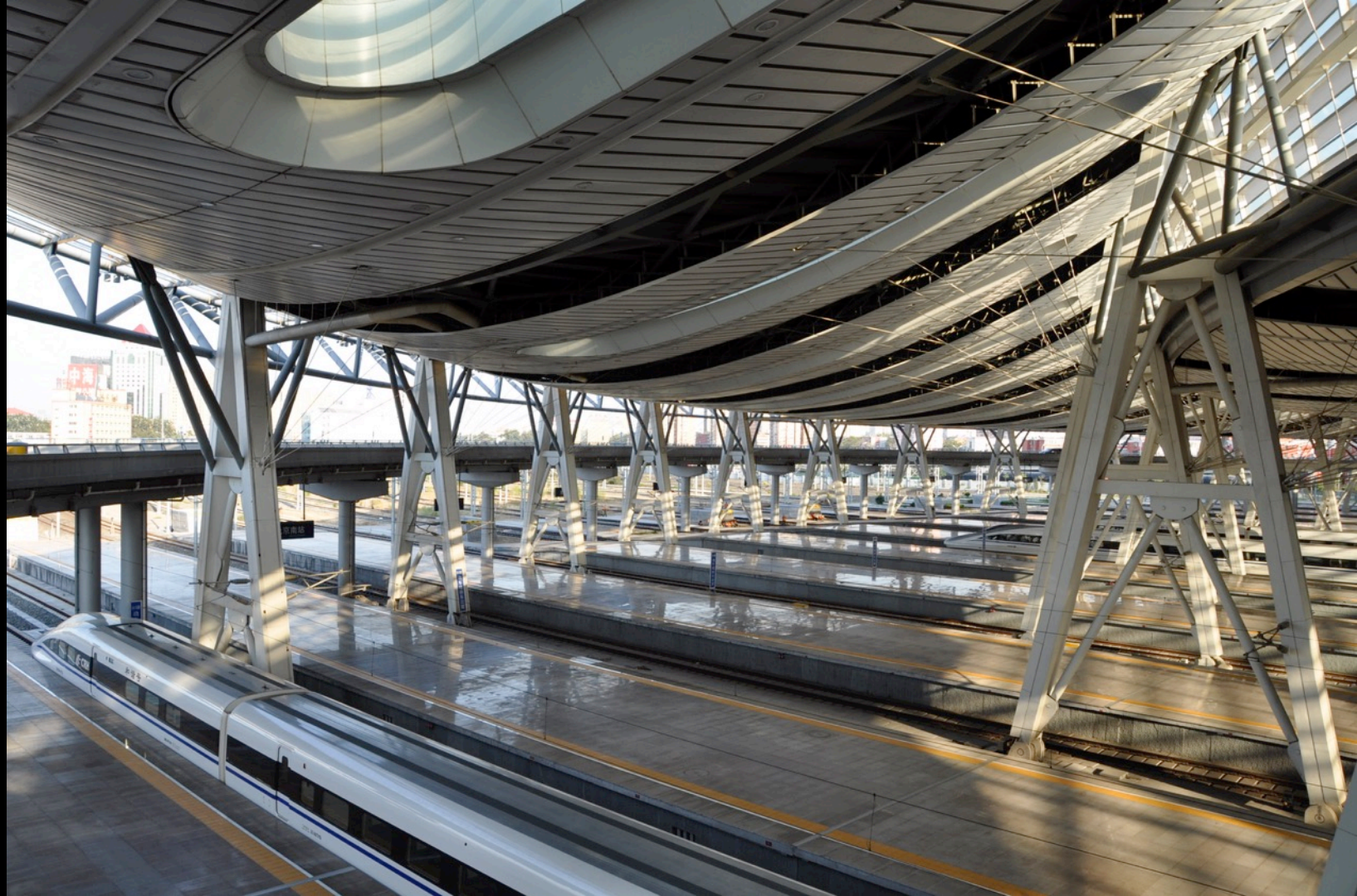


South Railway Station  
Beijing, China  
TFP Architects with Arup  
2008



























Pudong International Airport  
Terminal 2  
Shanghai, China

















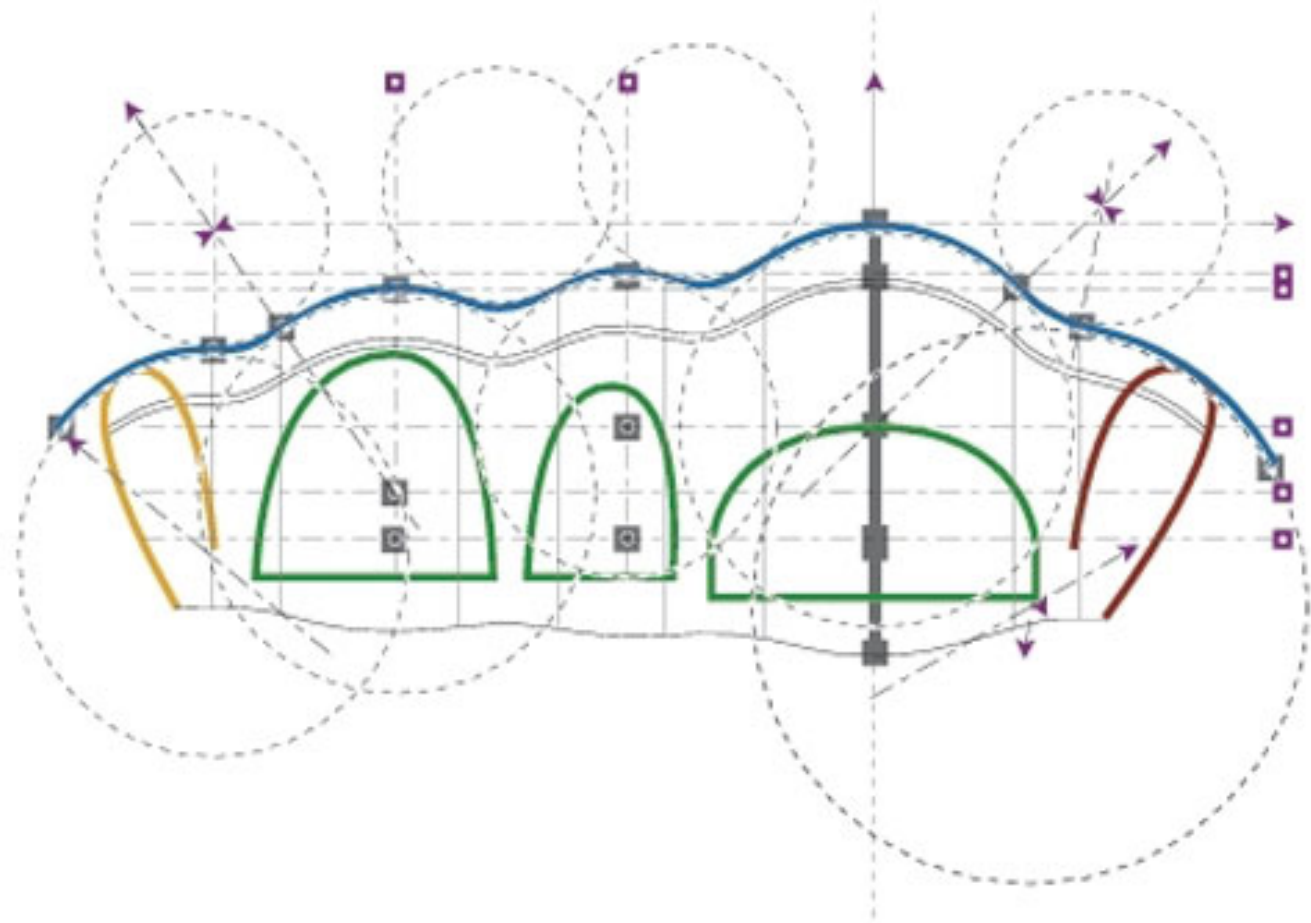




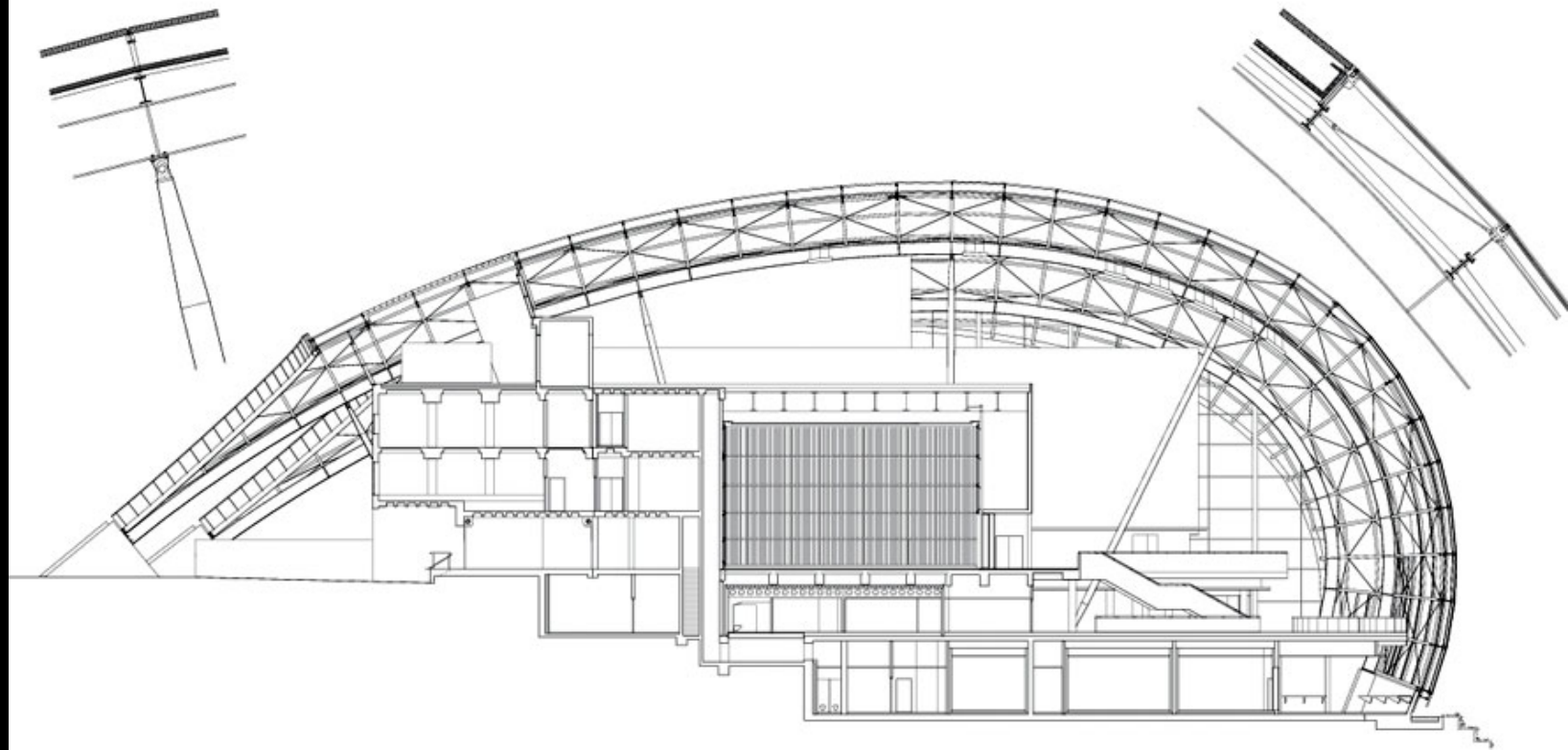




Sage Theatre  
Newcastle/Gateshead, UK  
Foster and Partners  
2004













The Sage Gateshead







Hall Two





























Mainly Supporting Expansive Glazing



Gaylord Hotel  
Dallas, Texas



















Centro Vasco da Gama  
Lisbon, Portugal









optimus  
TARIFARIO  
OPTIMUS  
LIGA













Tokyo Midtown  
Tokyo, Japan  
SOM  
2007





































TGV Station  
Charles de Gaulle Airport  
Paris, France  
Peter Rice

























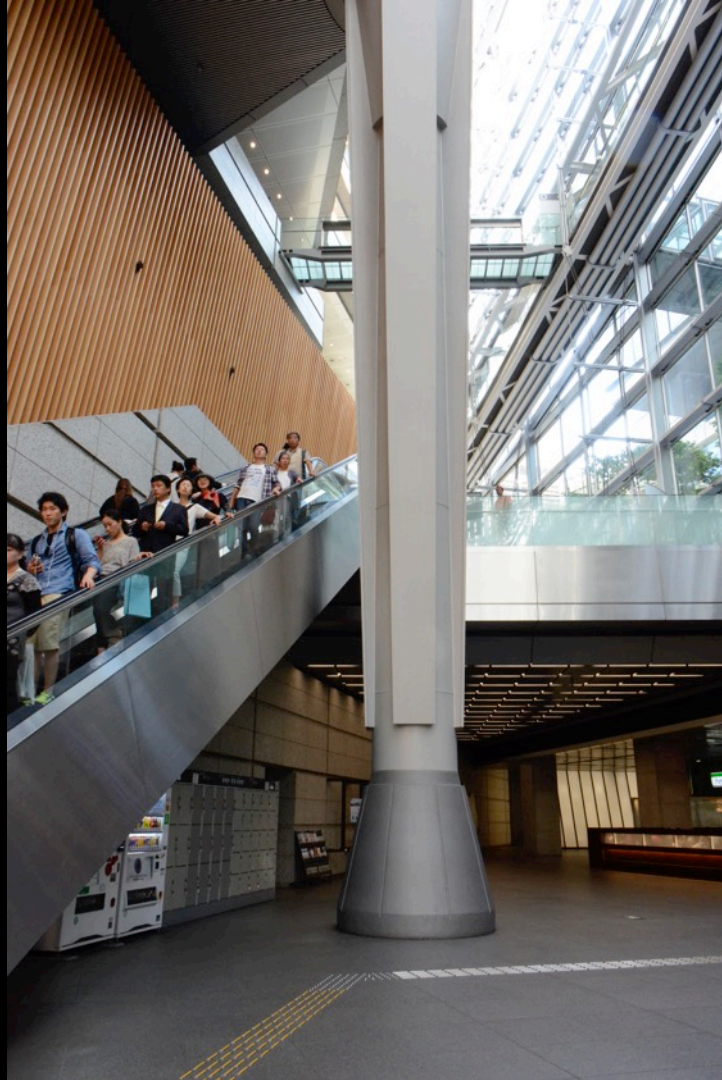
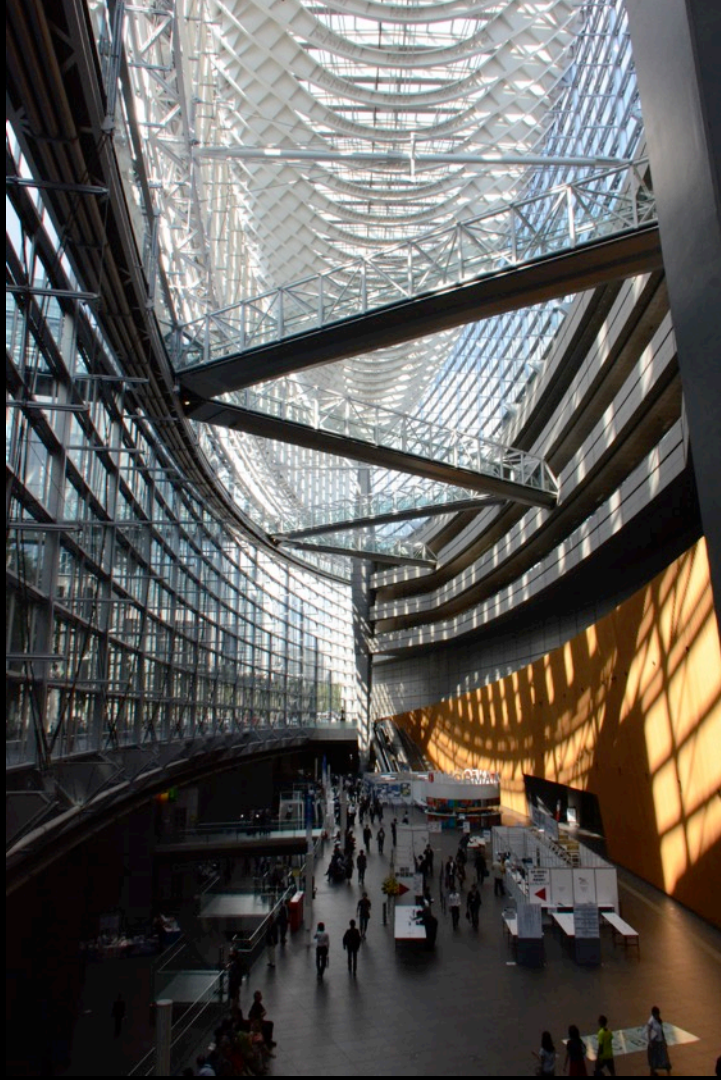


A photograph of the Tokyo International Forum building in Tokyo, Japan, designed by Rafael Vignoly in 1996. The building features a prominent glass and steel facade with a complex, grid-like structure. The sky is blue with scattered white clouds. In the foreground, there are some dark, rectangular structures and a street lamp.

Tokyo International Forum  
Tokyo, Japan  
Rafael Vignoly  
1996













































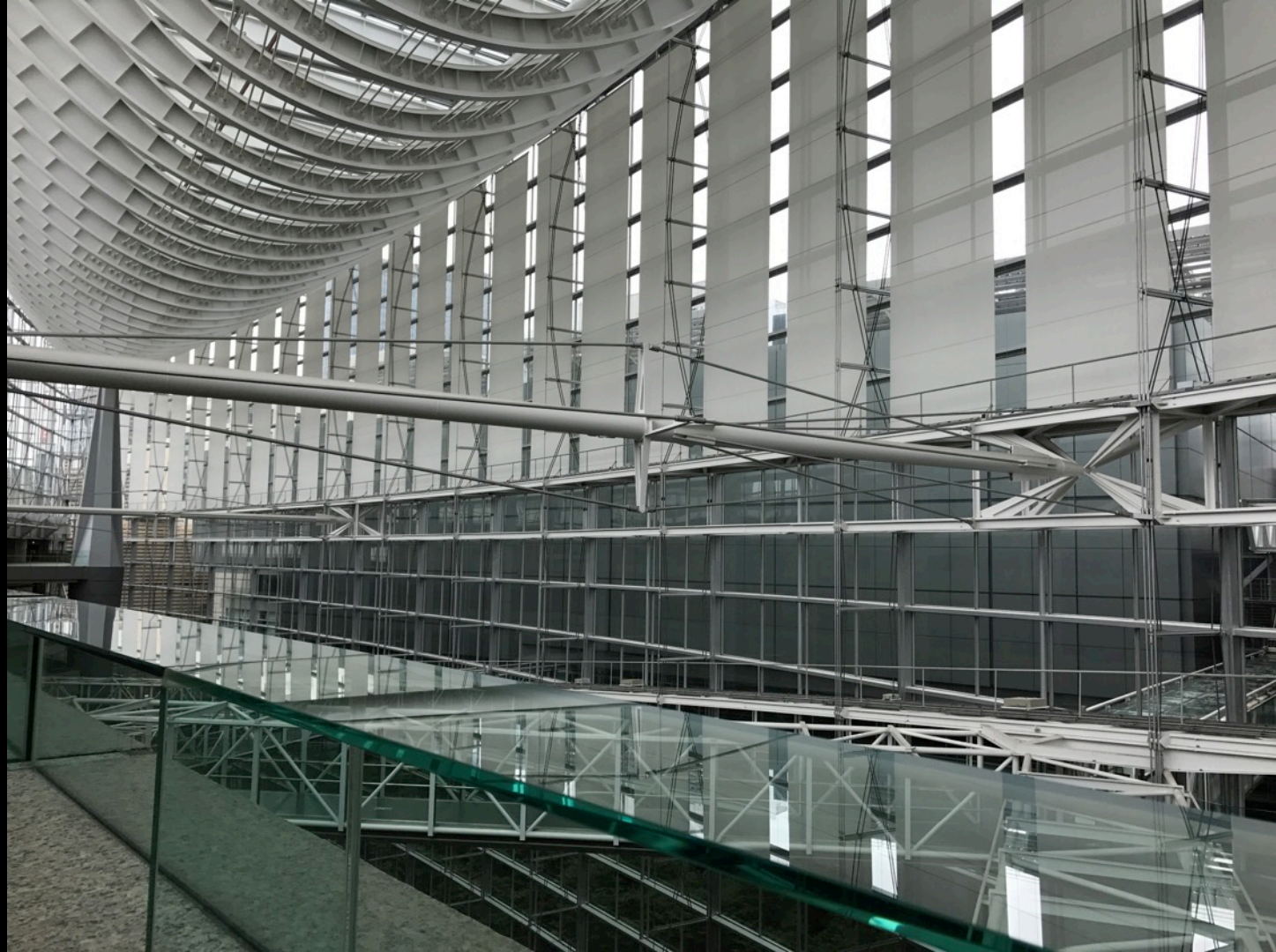






















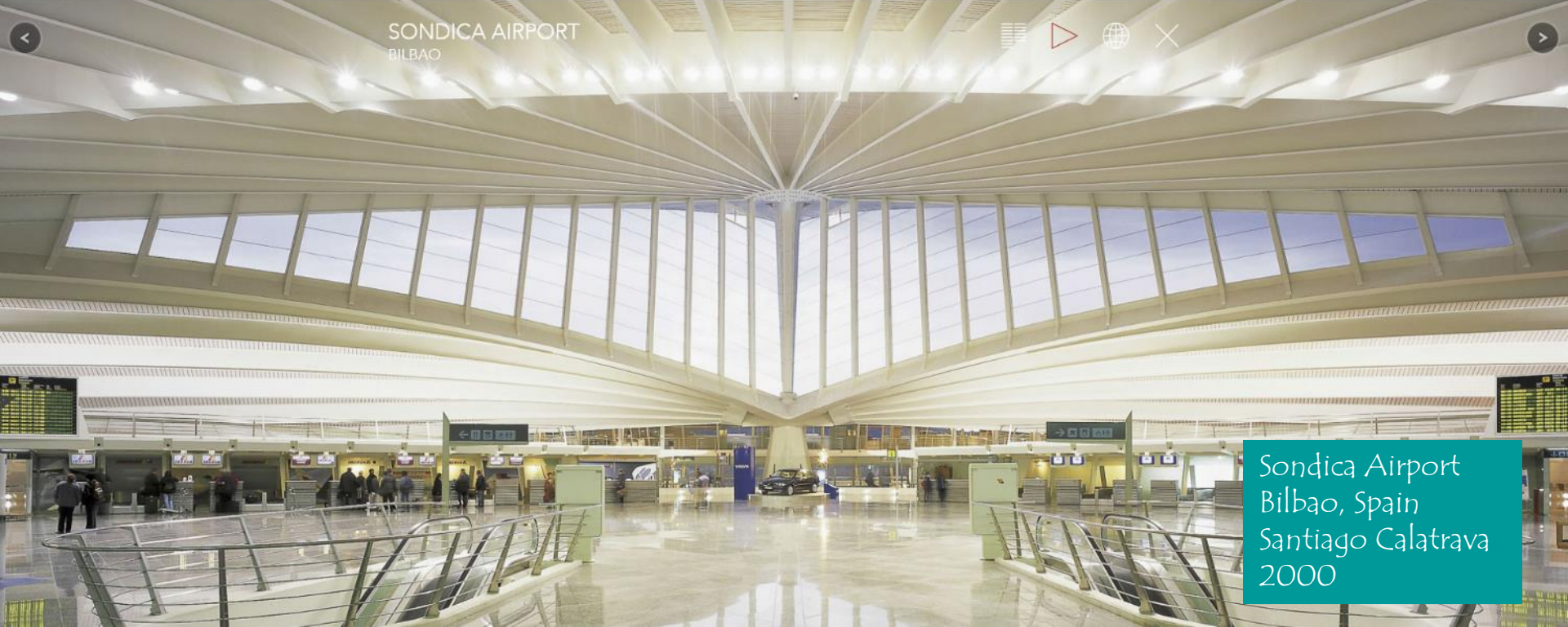








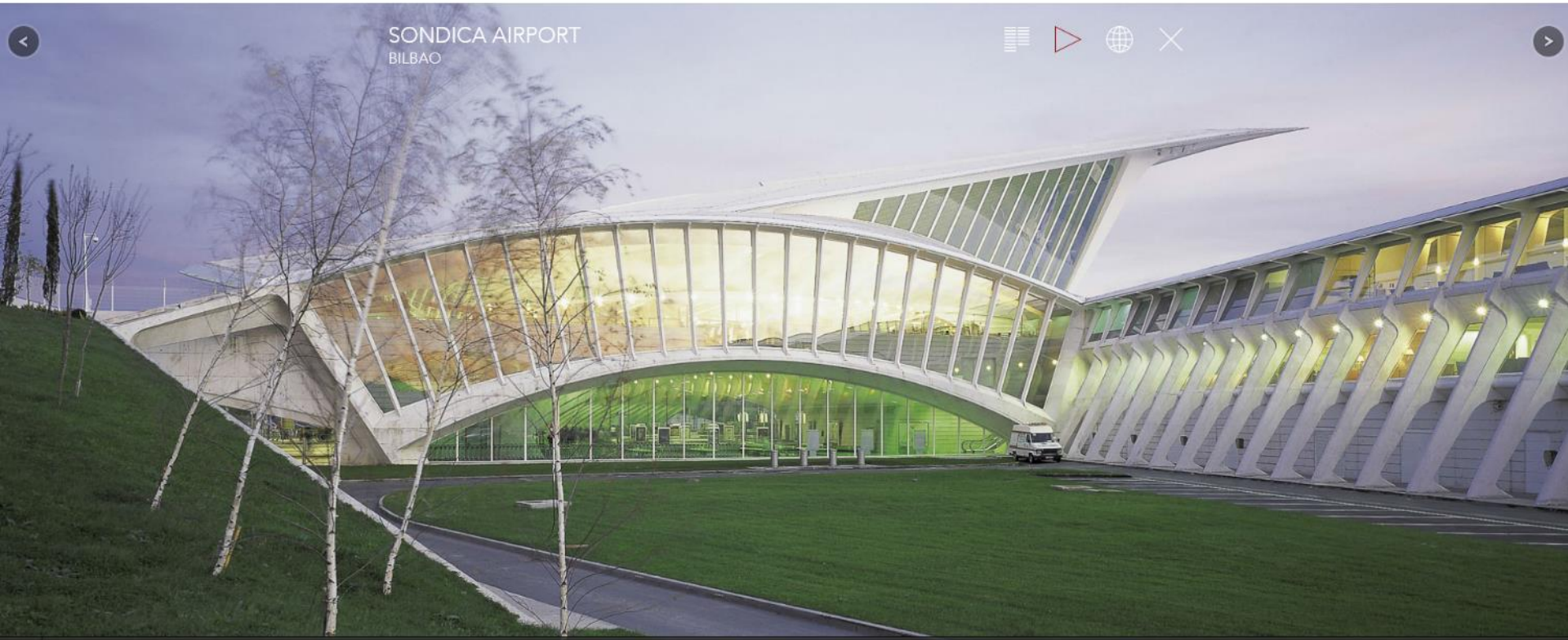
SONDICA AIRPORT  
BILBAO



Sondica Airport  
Bilbao, Spain  
Santiago Calatrava  
2000



SONDICA AIRPORT  
BILBAO









































Chihuly Garden and Glass  
Seattle, Washington  
AHBL  
2012



















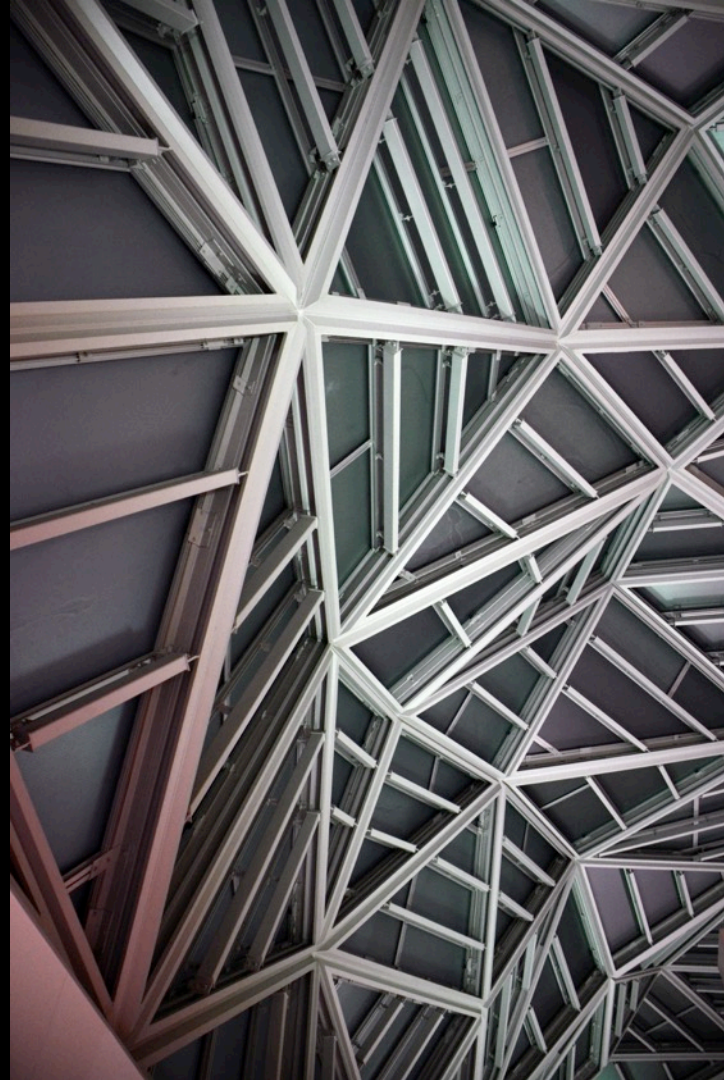






Kyoto Station Hotel  
Kyoto, Japan













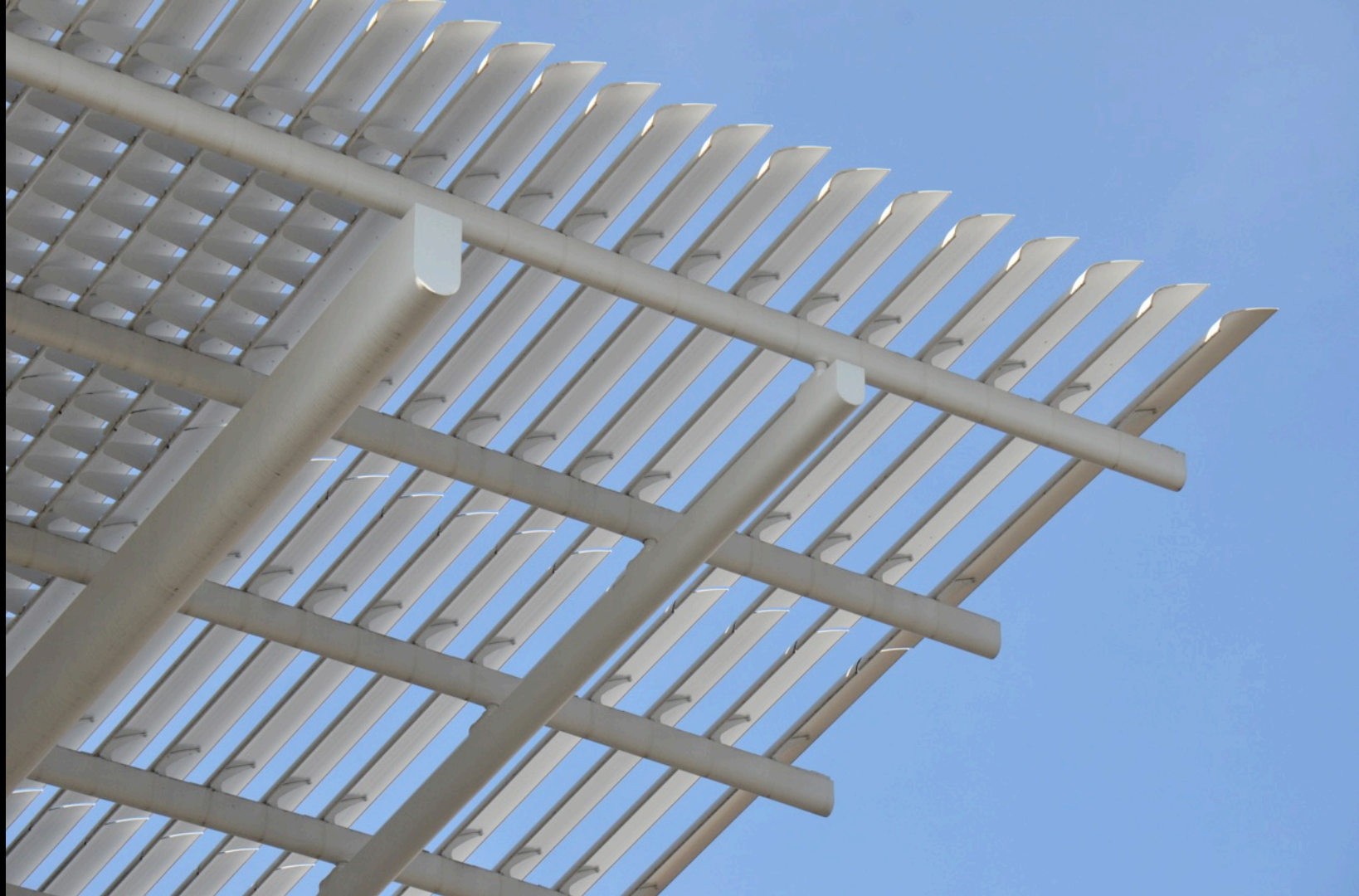
Chicago Art Institute Addition  
Chicago, Illinois  
Renzo Piano  
2009































Island City Central Park  
Fukuoka, Japan  
Toyo Ito  
2002









































Melbourne Central Shopping Mall  
Melbourne, Australia

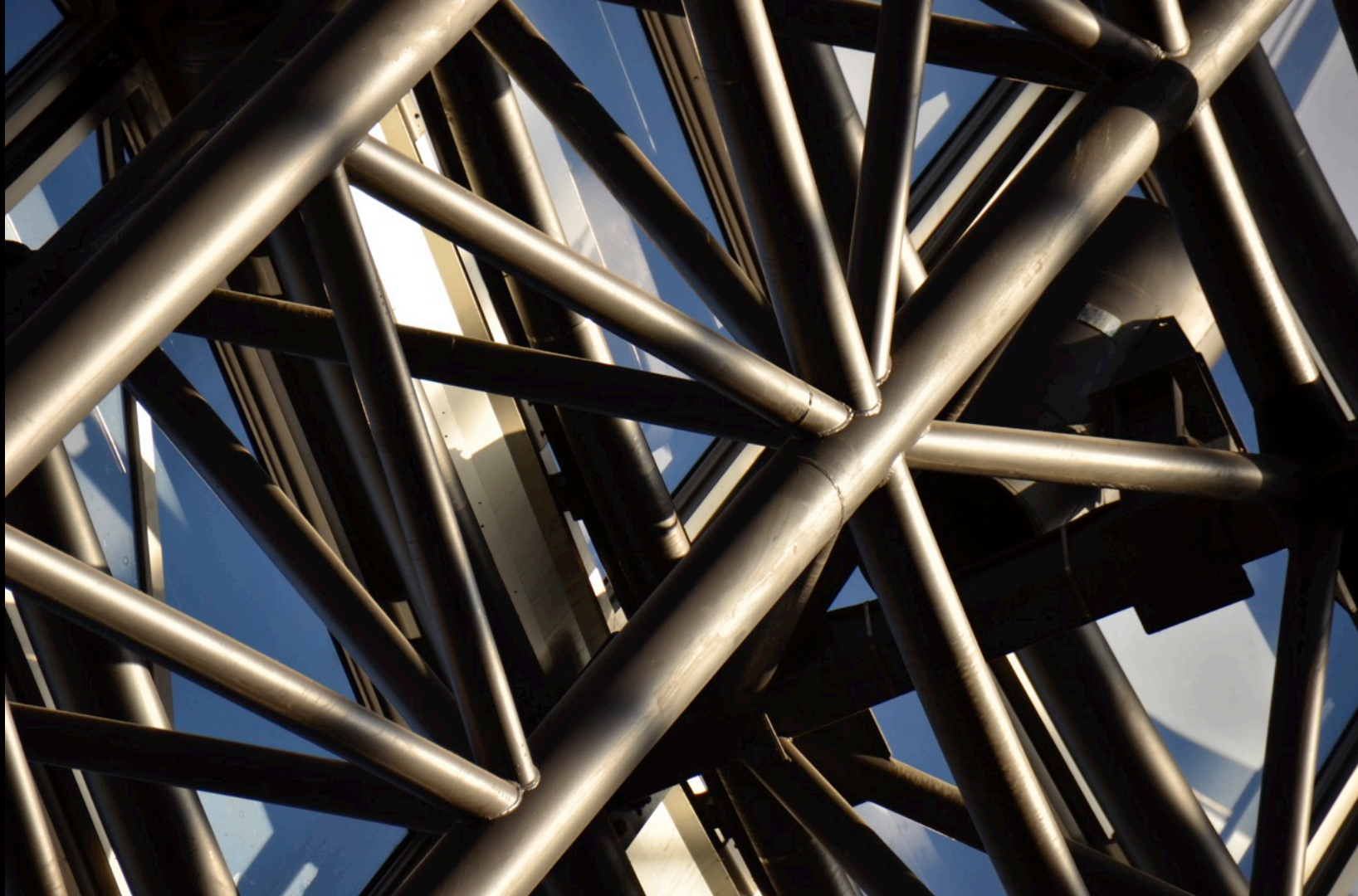














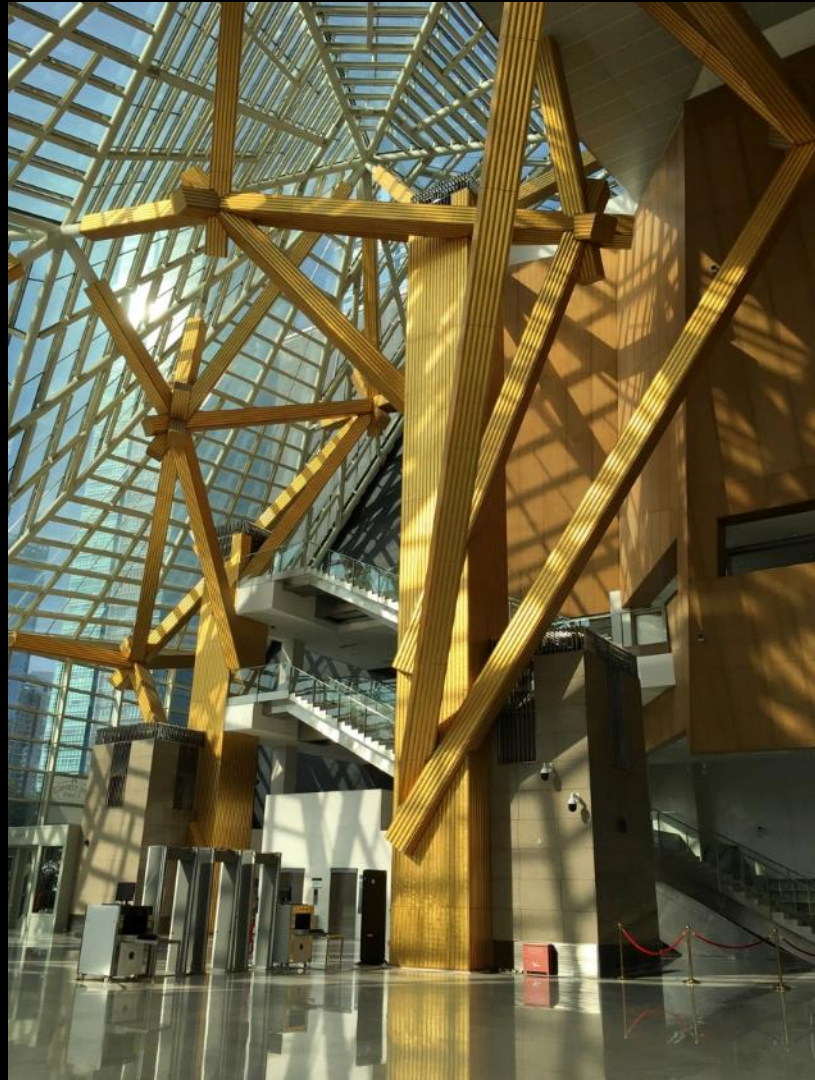


The image shows the Shenzhen Cultural Centre, a modern architectural structure. The building features a prominent glass facade with a grid of vertical and horizontal metal supports. In the foreground, a wide, multi-level staircase made of light-colored stone steps leads up towards the building. The sky is a clear, bright blue with some light clouds. The overall scene is captured from a low angle, emphasizing the scale of the architecture.

Shenzhen Cultural Centre  
Shenzhen, China  
Arata Isozaki  
2000



















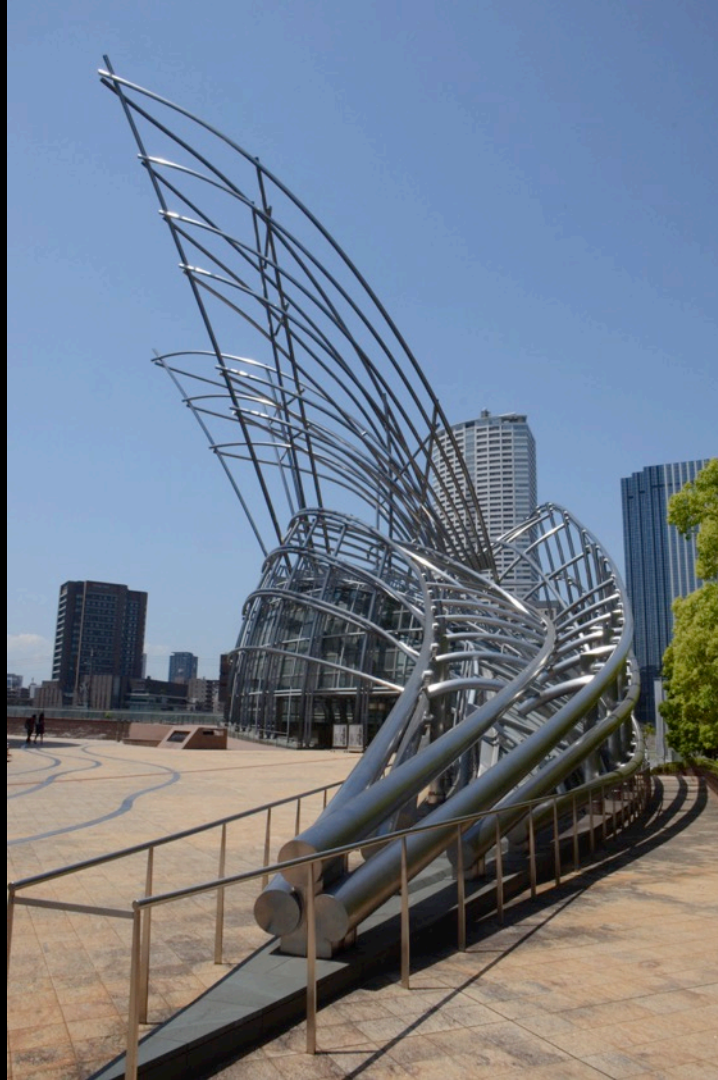












National Museum of Art  
Osaka, Japan  
Cesar Pelli  
2004











































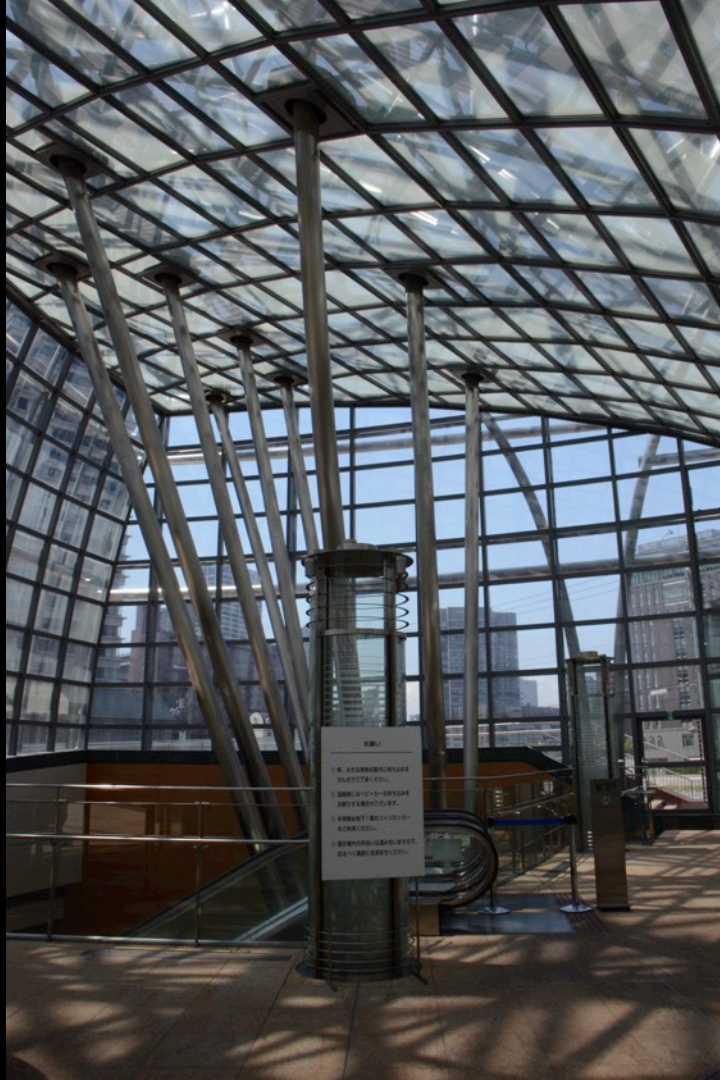













图例：  
1. 北京国家大剧院  
2. 北京国家大剧院  
3. 北京国家大剧院  
4. 北京国家大剧院  
5. 北京国家大剧院







高松市立中央図書館の軌跡  
2021

A wide-angle photograph of the L'Umbracle in Valencia, Spain, designed by Santiago Calatrava. The structure is a massive, white, ribbed canopy that arches over a walkway. The ribs are arranged in a complex, overlapping pattern, creating a series of deep, shaded arches. In the foreground, a concrete ledge with a row of green plants and red flowers runs across the frame. In the background, several multi-story urban buildings are visible under a clear blue sky. The overall scene is bright and sunny.

Valencia Science City  
L'Umbracle  
Valencia, Spain  
Santiago Calatrava  
2001




























Space Trusses and Space Frames  
– 3D systems spanning in all directions

A photograph of the Vancouver Law Courts building, a prime example of Brutalist architecture. The building features a prominent, exposed steel truss structure that supports a large glass facade. The concrete structure is characterized by thick, horizontal and vertical beams, creating a sense of mass and scale. The building is partially covered in green ivy, which softens the stark concrete. The sky is overcast, and the overall atmosphere is one of a well-maintained, modern urban structure.

Vancouver Law Courts  
Vancouver, B.C.  
Arthur Erickson  
1973

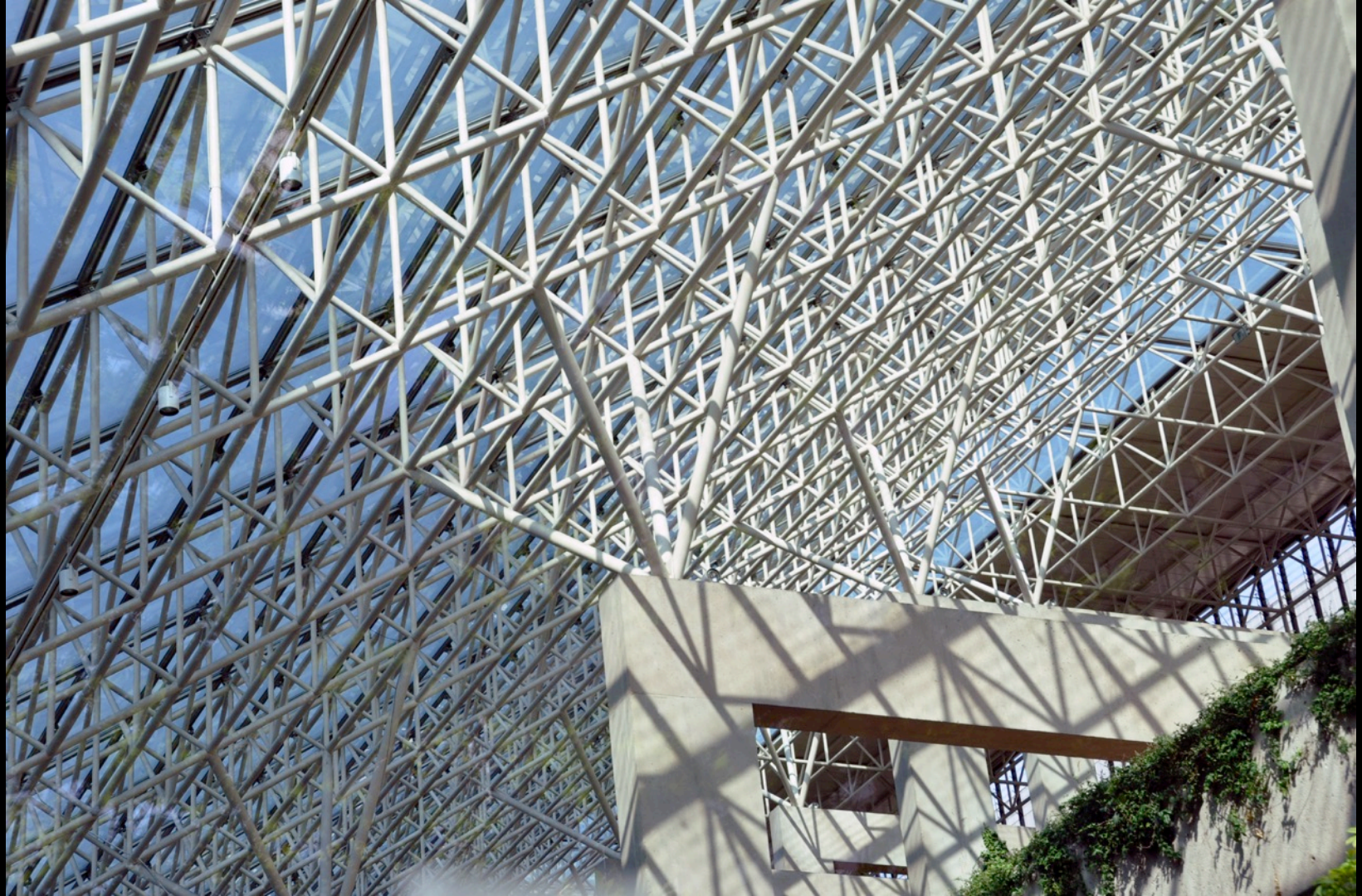




















Shenzhen Bao'an International Airport  
Shenzhen, China  
Stúdio Fuksas  
2013



















Beijing International Airport  
Beijing, China  
Foster and Partners with Arup









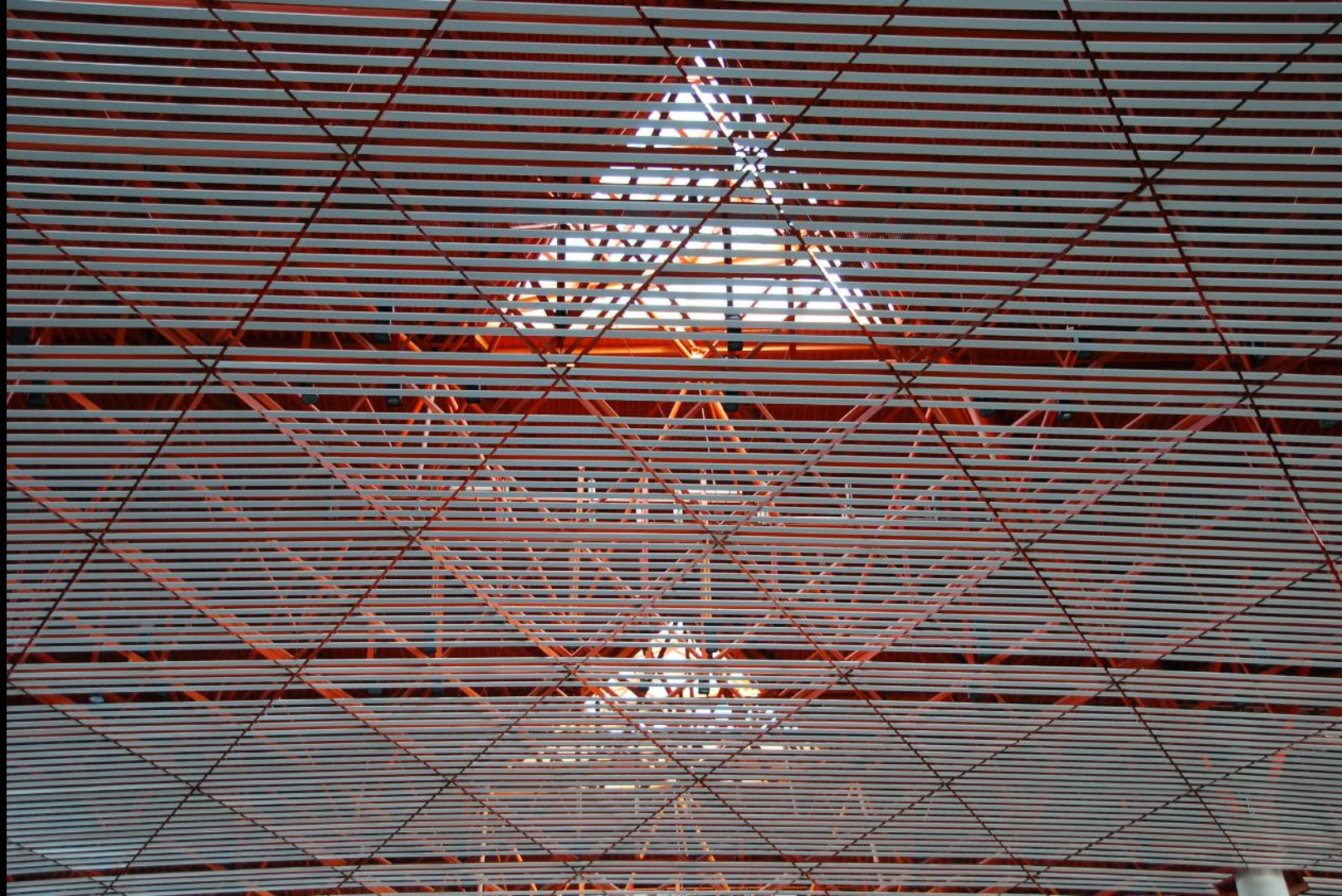




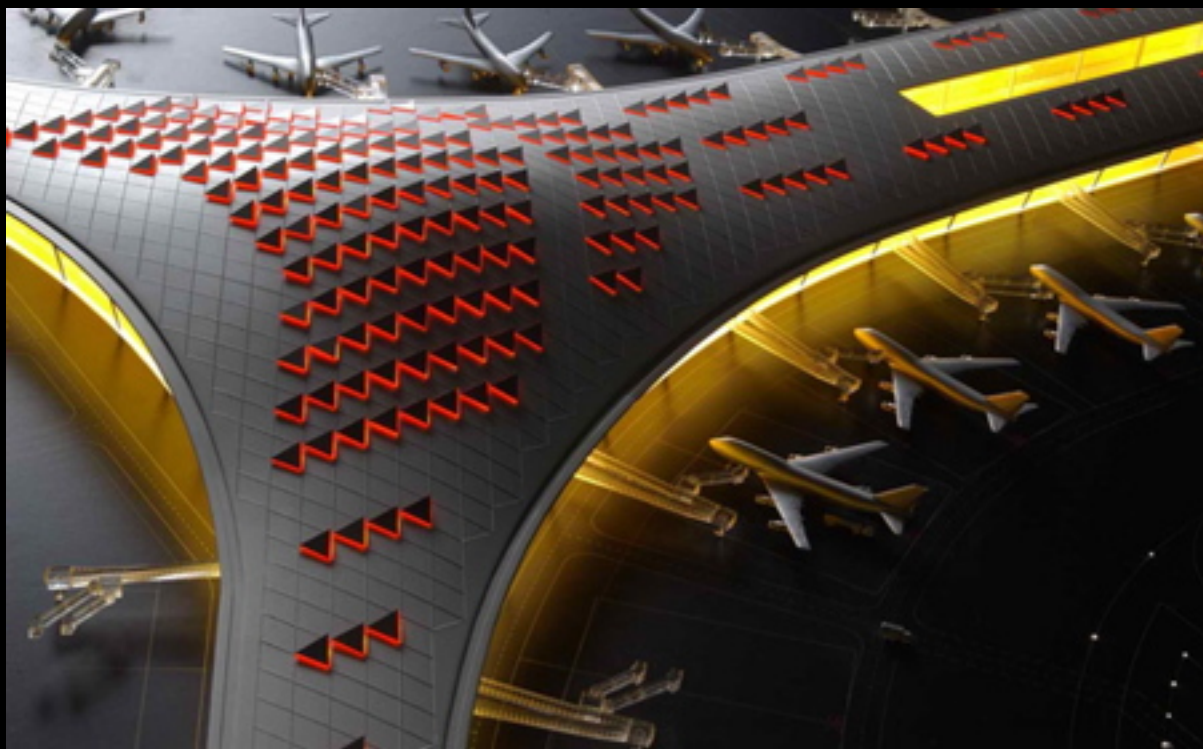














Ferrari World  
Abu Dhabi, UAE





































Eden Project  
St. Austell, U.K.  
Nicholas Grimshaw  
2001





































## Lattice Grids

- Single plane systems spanning in all directions



Addition to Kings Cross Station  
London, UK  
John McAslan and Partners with Arup  
2013





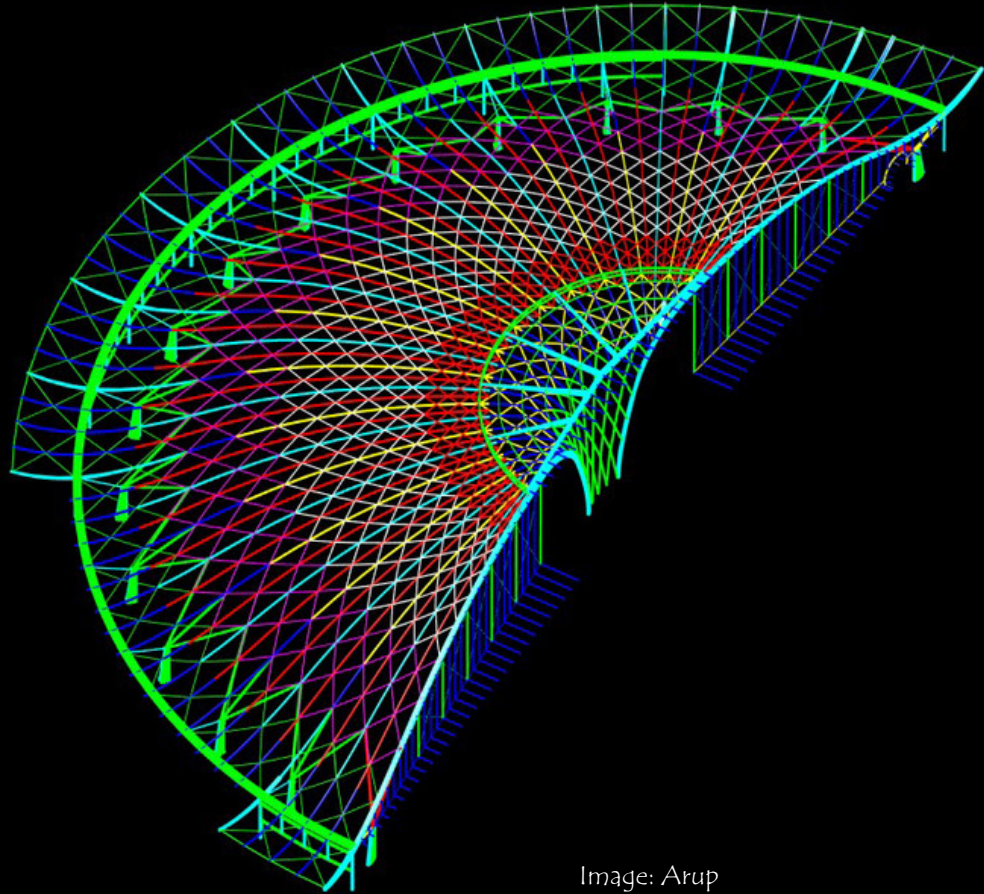


Image: Arup



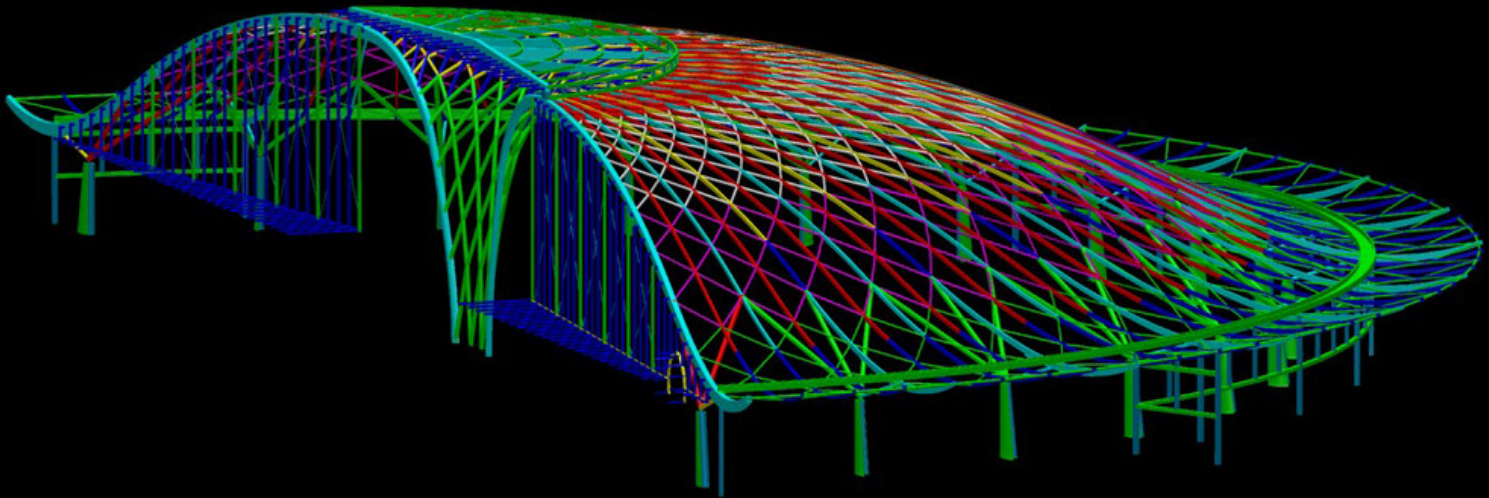


Image: Arup





















Image: Arup







Image: Arup





A wide-angle photograph of the Smithsonian Courtyard Roof in Washington, DC. The image shows a large, open-air courtyard with a prominent, white, diamond-patterned glass and steel roof structure. The courtyard is surrounded by classical stone buildings with columns and windows. In the foreground, there is a paved area with a rectangular water feature. To the right, a group of people is seated at outdoor tables, and a few people are walking. The overall atmosphere is bright and modern, blending historical architecture with contemporary design.

Smithsonian Courtyard Roof  
Washington, DC  
Foster and Partners  
2010





ROBERT AND AILEEN BOGDAN COURTYARD

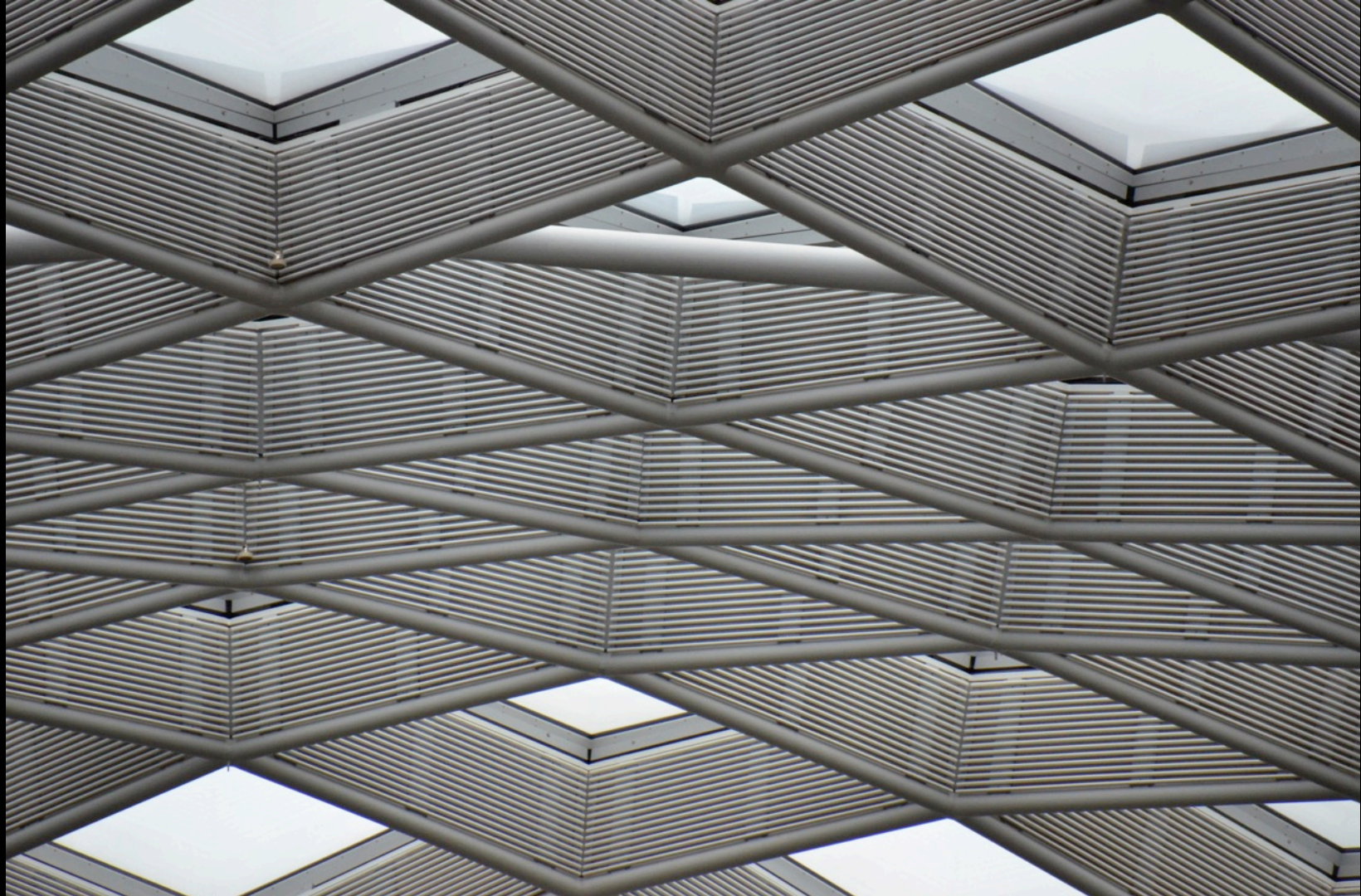






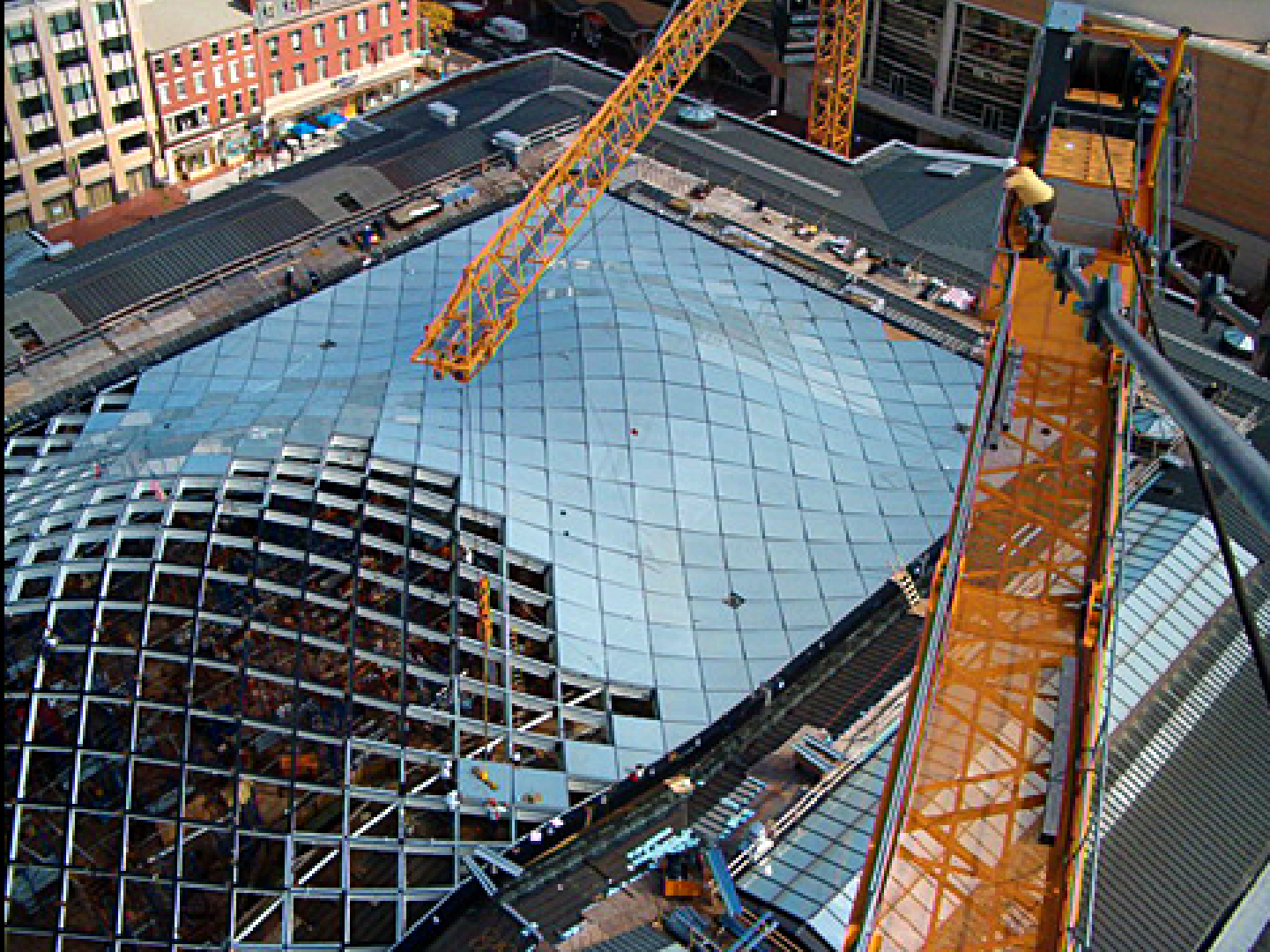














More on lattice grids to be covered in the steel and glazing lecture!