PEF2603
Estruturas na Arquitetura III – Sistemas Reticulados e Laminares

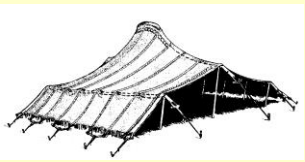
Evolução das Tensoestruturas

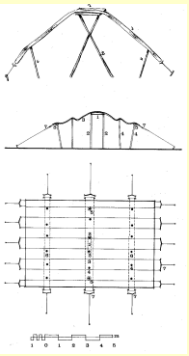
(29/05/2017)

Professores
Ruy Marcelo O. Pauletti , Leila Cristina Meneghetti, Luís Bitencourt Jr.

1º Semestre 2017

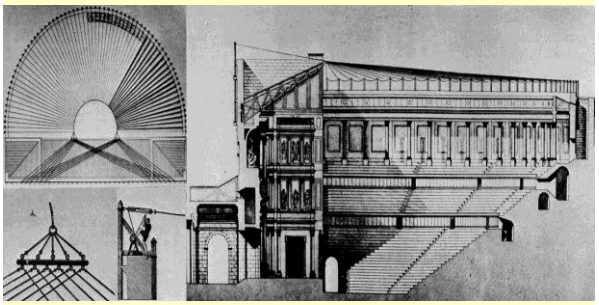
Primórdios: Tenda Negra do Oriente



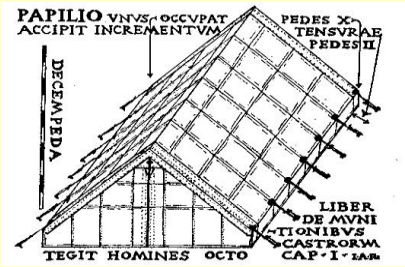


Tapeçarias representando tendas persas

Esquema de uma velária cobrindo um anfiteatro romano

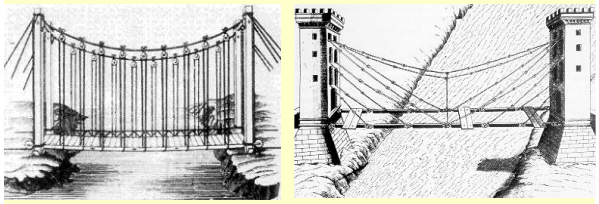


Tenda militar romana (papilio)

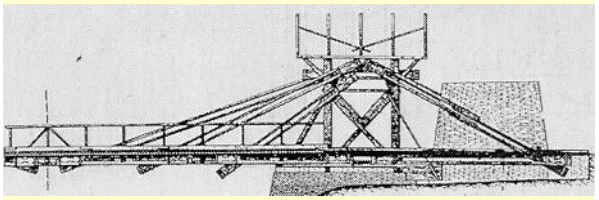


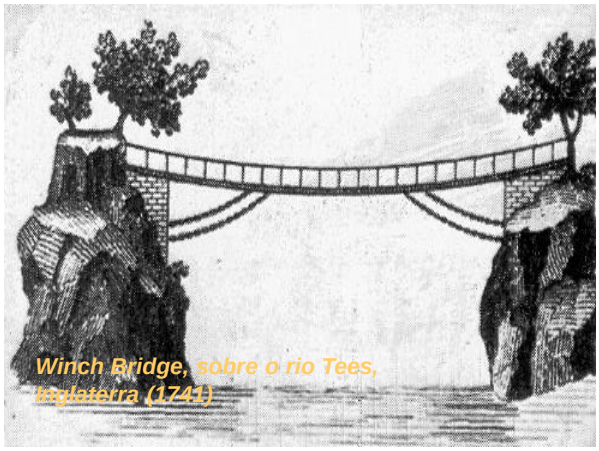
Pontes

Esquemas de Faustus Verantius para pontes suspensas e estaiadas (1617)

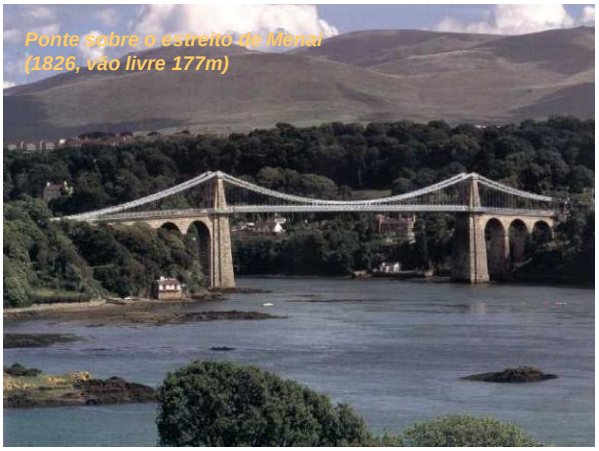


Esquema de Immanuel Loscher, para uma ponte estaiada de madeira (1784)

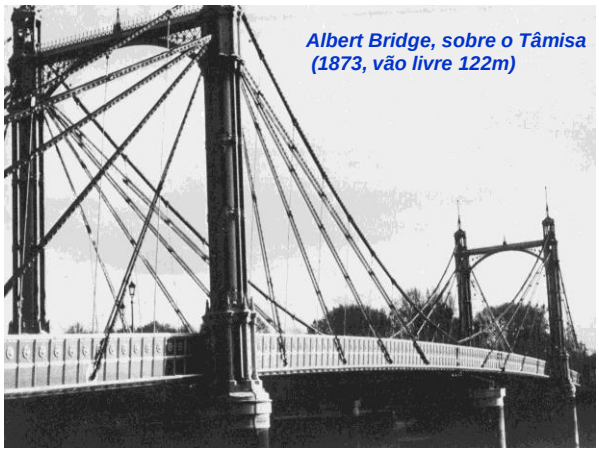




Winch Bridge, sobre o rio Tees, Inglaterra (1741)

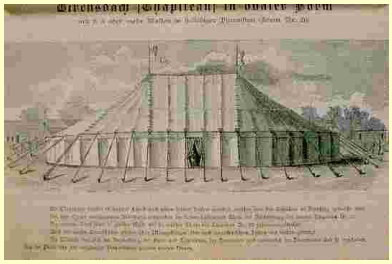


Ponte sobre o estreito de Menai (1826, vão livre 177m)



Albert Bridge, sobre o Tâmisa (1873, vão livre 122m)

Tenda de circo ("Chapiteu")



Tendas de aço da Exposição Pan-russa de 1896

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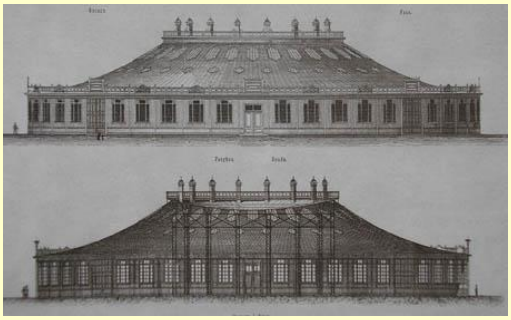
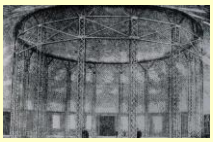
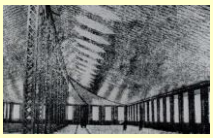
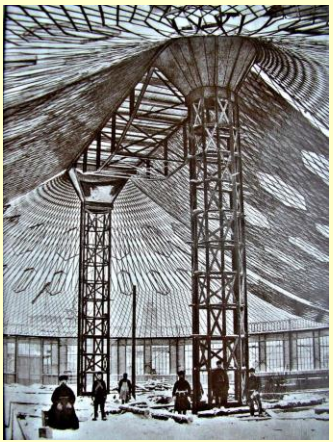


The world's first hyperboloid structure by Vladimir Shukhov, Nizhny Novgorod, 1896

Tendas de aço da Exposição Pan-russa de 1896



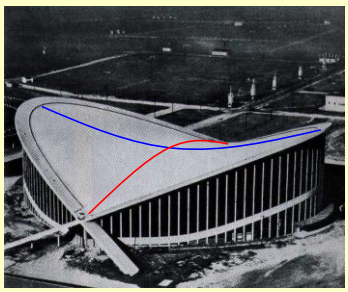




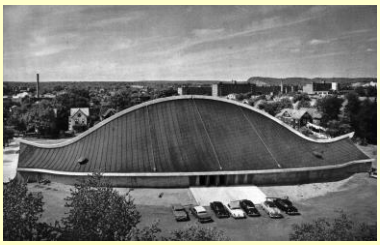
The world's first hyperboloid structure
by Vladimir Shukhov, Nizhny Novgorod, 1896

Description The double curvature diagonally framed Shell by Vladimir Shukhov in Vyksa near Nizhny Novgorod during construction, 1897
Source Trudy po istorii techniki, AN SSSR, 8, 1954.
Date 1897

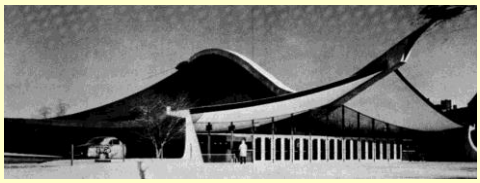
Arena de Raleigh (1950, vão 95m)



Estádio de Hokey de Yale, EUA (1958)

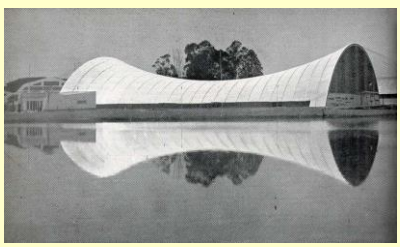


Estádio de Hokey de Yale, EUA (1958)

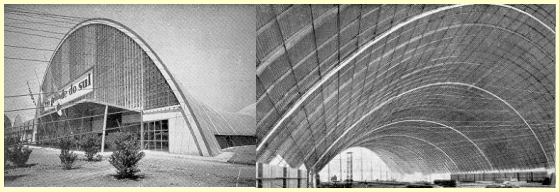


Estádios das Olimpíadas de Tóquio de 1966

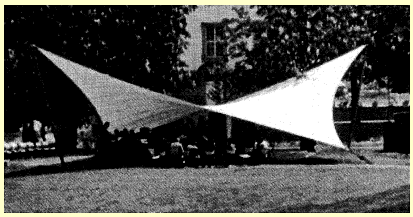
Pavilhão do Rio Grande do Sul
IV Centenário de São Paulo (1954)



Pavilhão do Rio Grande do Sul
IV Centenário de São Paulo (1954)

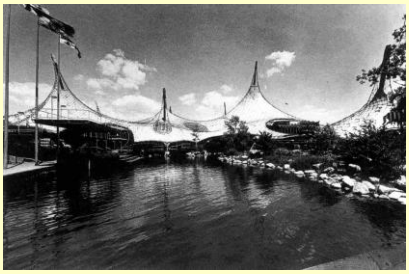


Frei Otto. Pavilhão de música em Kassel, 1955



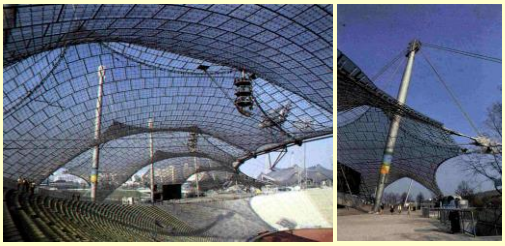
Concha acústica Sidney Myer
Melbourne, Austrália (1958)

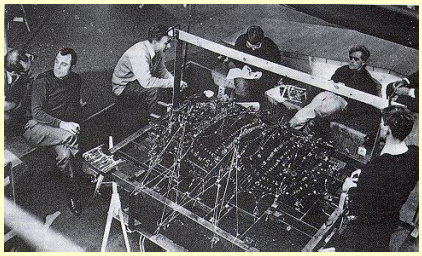
Pavilhão Alemão da EXPO67, Montreal



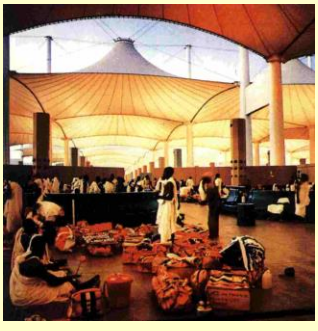
Estádio Olímpico de Munique (1972). Vista panorâmica.

Estádio Olímpico de Munique
(a) vista interna; (b) detalhe de coluna de sustentação



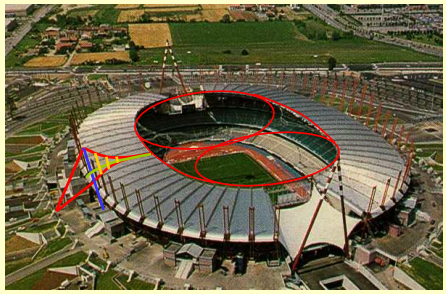


Terminal de Passageiros de Jeddah Arábia Saudita, 1981.

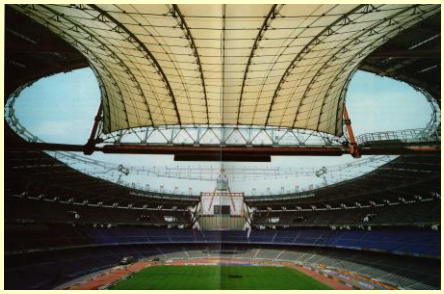


Cobertura da Piazzale Roma, Milão (1986)

Estádio dos Alpes de Turim (1990) Vistas aérea.



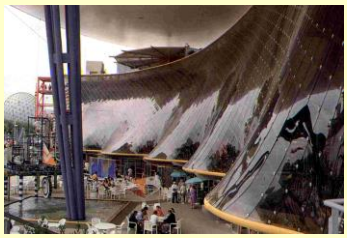
Estádio dos Alpes de Turim (1990) Vistas interna.



Estádio Olímpico de Roma (coberto em 1990) Vistas aérea.

Estádio Olímpico de Roma (coberto em 1990) Vista interna.

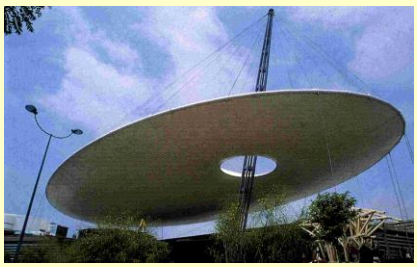
Figura 14 – Pavilhão Alemão na EXPO 92



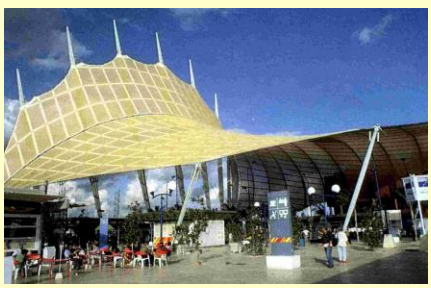
(a) Vista externa

(b) Vista interna

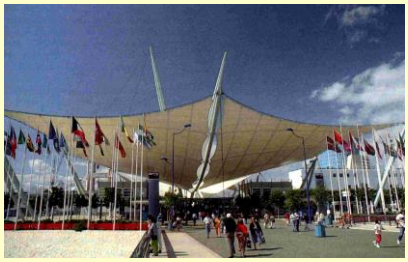
Lente pneumática de cobertura
Do Pavilhão Alemão na EXPO92



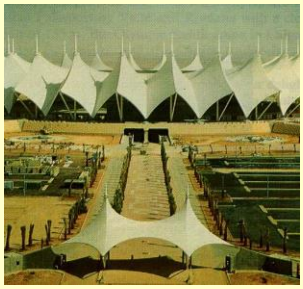
"Diadema". Portão de acesso à EXPO92 em Sevilha



"Oleada". Portão de acesso à EXPO92 em Sevilha

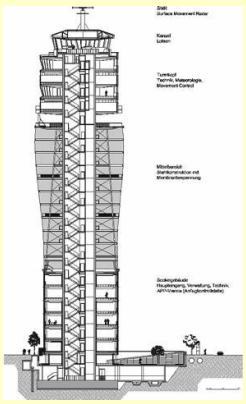


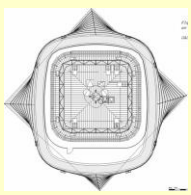
Estádio Rei Fahd, Riad, Arábia Saudita

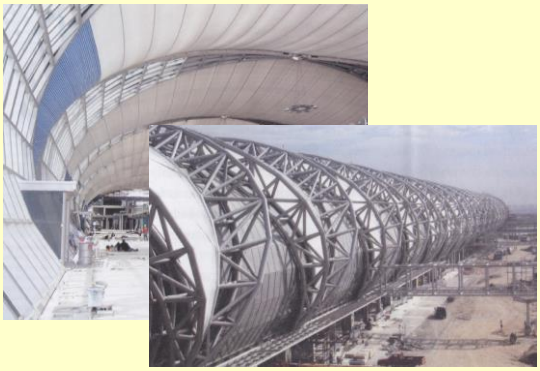


Estádio Rei Fahd, Riad, Arábia Saudita

Aeroporto de Denver (1993)







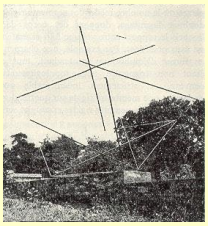

Domo do Milênio
– Londres, 2000

Domo do Milênio: cobertura e sistema de cabos.

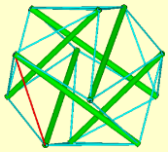
Detalhes Domo do Milênio...

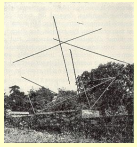
Estruturas tensegrity

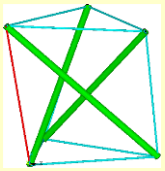
"Needle Tower",
Keneth Snelson, 1948

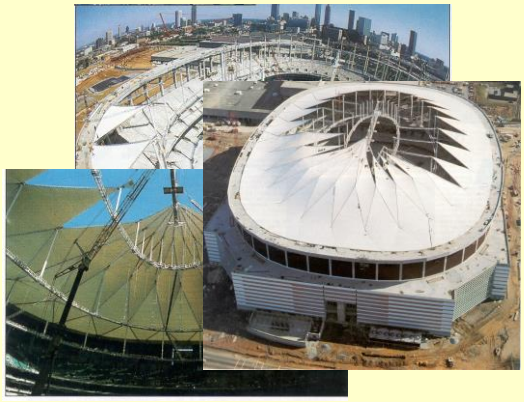


Monument à la Forme Futile
Emmerich, 1966



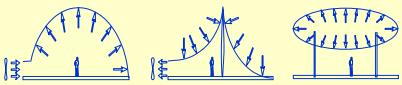




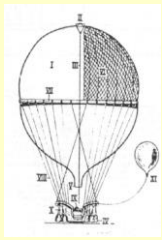


Evolução das
Estruturas Pneumáticas

Tipos de Estruturas pneumáticas



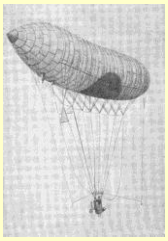
(a) Insufladas; (b) Aspiradas; (c) Infladas



(a/b) Balão de ar quente dos irmãos Montgolfier (1783)
(c) Balão de hidrogênio de Jacques Charles (1783)

Panic among the inhabitants of Gonesse, who believe a monster has fallen from the sky. August 27, 1785.

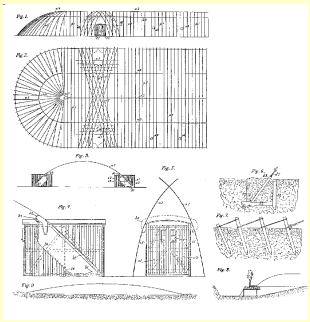
Robida's vision ot the future, Le Vingtième Siécle—la Vie électrique, 1883.



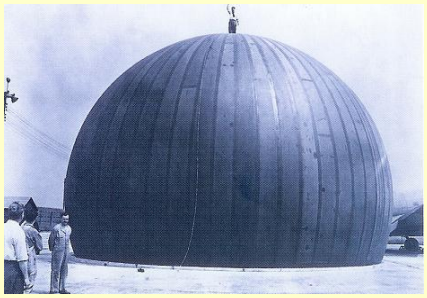
(a) Dirigível No 1 de Santos Dumont (1898)

(b) R101 –Royal Airship 101, UK (1929)

Detalhes da patente de F.W. Lanchester para tendas insufláveis (1918)

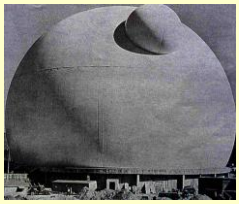


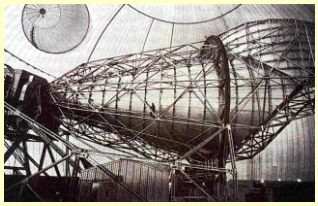
Camuflagens infláveis empregadas pelos britânicos, durante a II Guerra Mundial



O primeiro Radome, construído por Walter Bird no Cornell Aeronautical Laboratory , 1948.

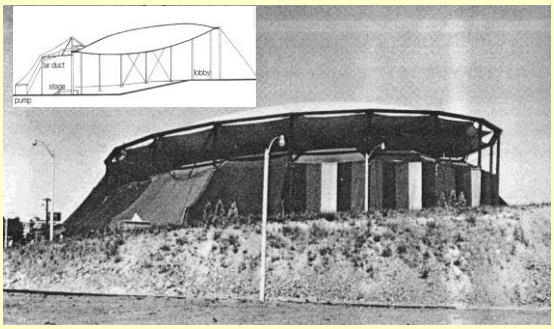
Radome no Maine, EUA (1961)





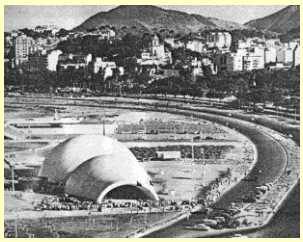
Concepção artística das pesquisas de Walter Bird no CAL, publicada no início dos anos 50.

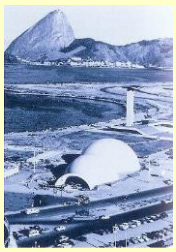
Teatro das Artes de Boston (1959)

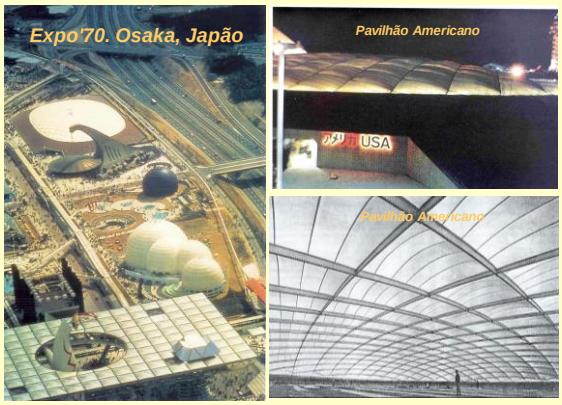


Pavilhão Atomos para a Paz, no Rio de Janeiro (1960)

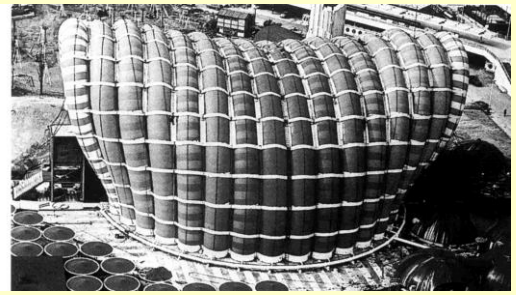
Projetado por Victor Lundy, produzido por Birdair.

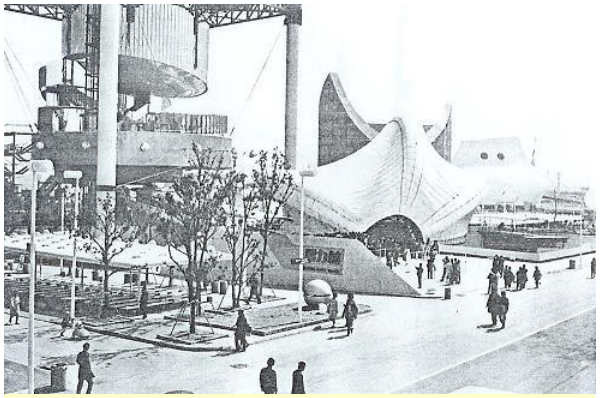


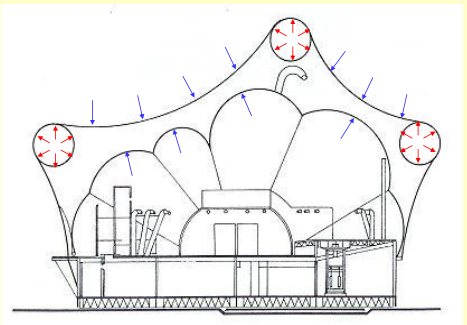




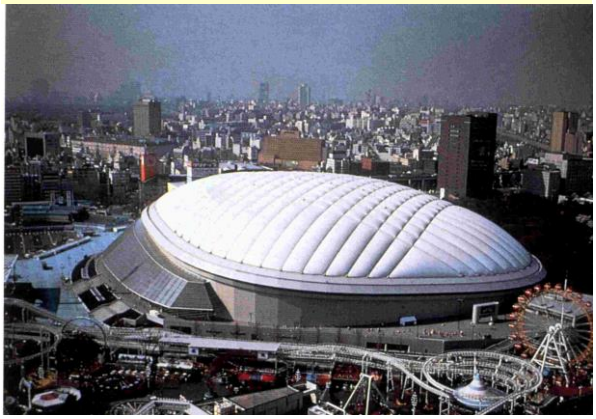
Expo'70. Osaka, Japão - Pavilhão da Fuji







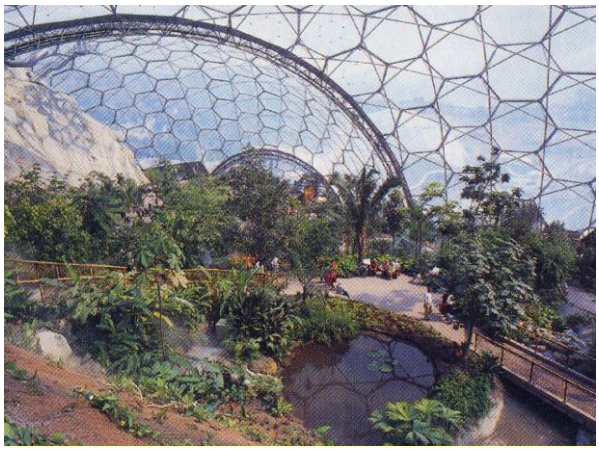
Tokio Big-Egg Dome (1988)

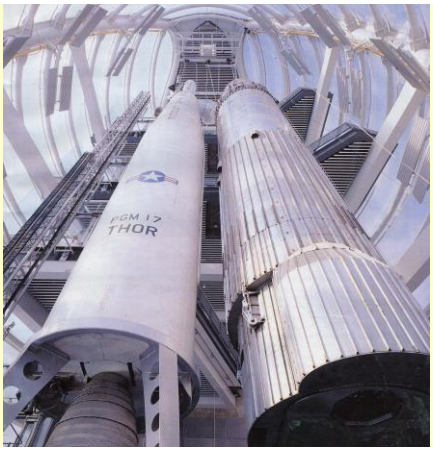


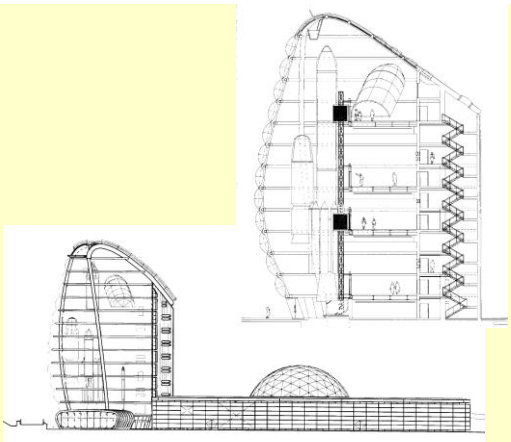
Tokio Big-Egg Dome (1988)

Anfiteatro romano de Nîmes (1988)

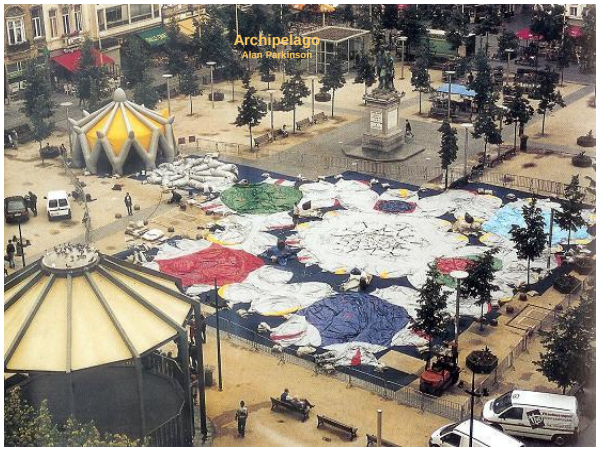
Eden Project, Cornwall, UK




PGM 17
THOR



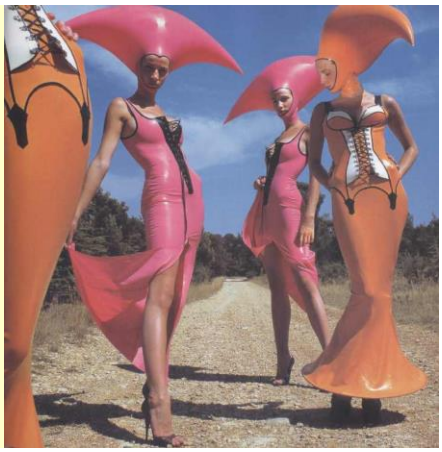

Dreamspace
Maurice Agis, 2000-2001

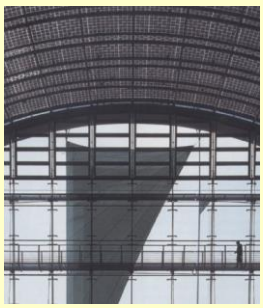

Archipelago
Alan Parkinson

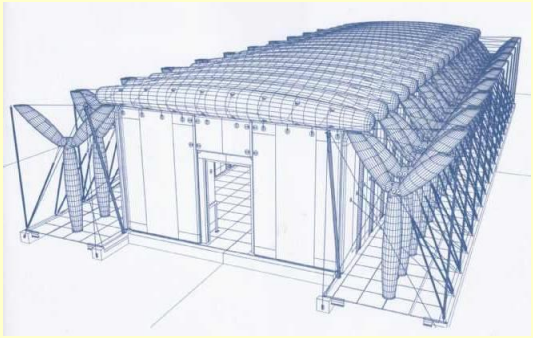

Archipelago
Alan Parkinson

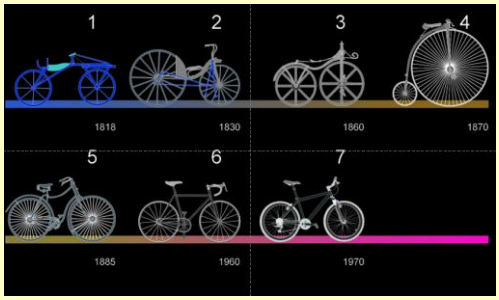
Jean Paul Gautier,
Mad Max Collection
Fall/winter, 1995-1996

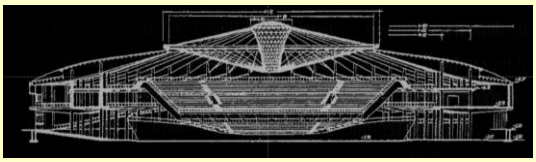
Robin Archer
Primavera 2001

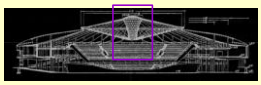


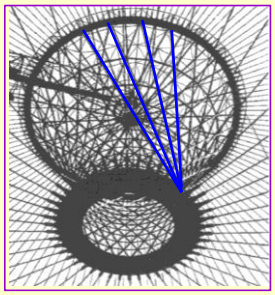


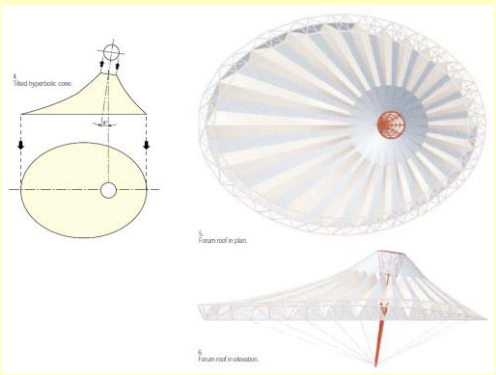


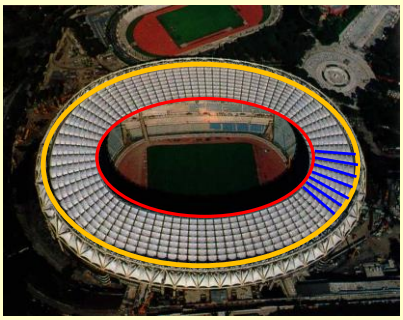

1
2
3
4
1818
1830
1860
1870
5
6
7
1885
1960
1970

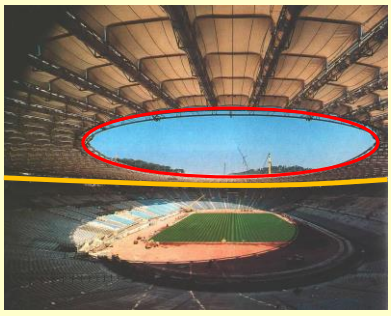


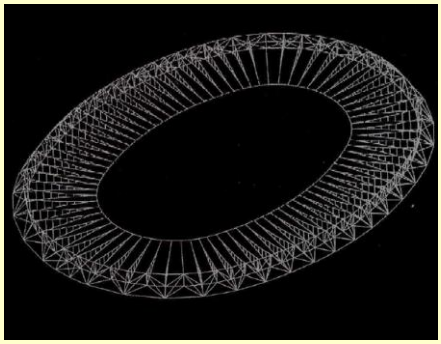




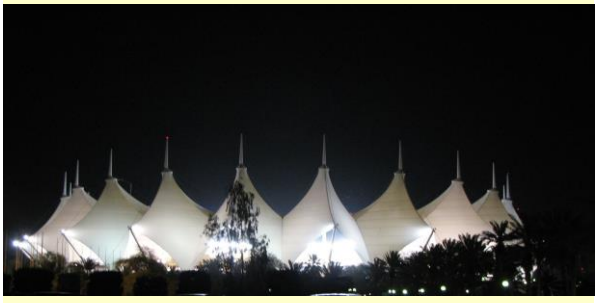

4
Tilted hyperbolic cone.
5
Forum roof in plan.
6
Forum roof in elevation.

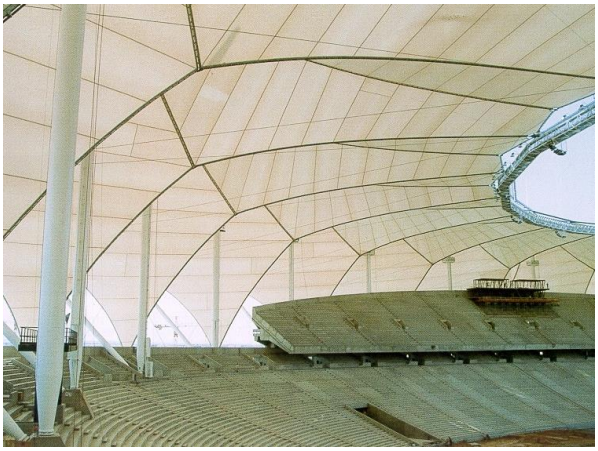


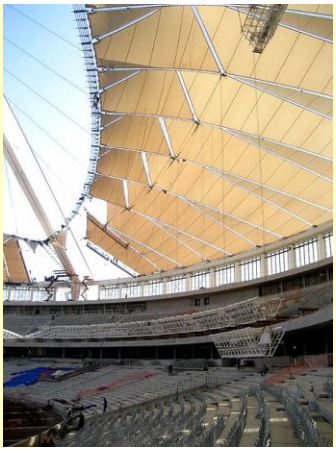


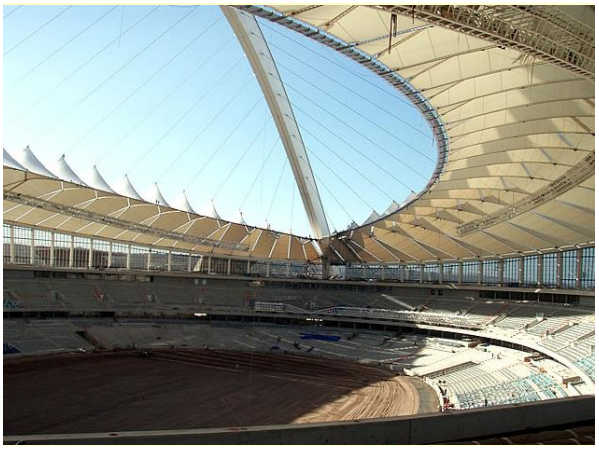


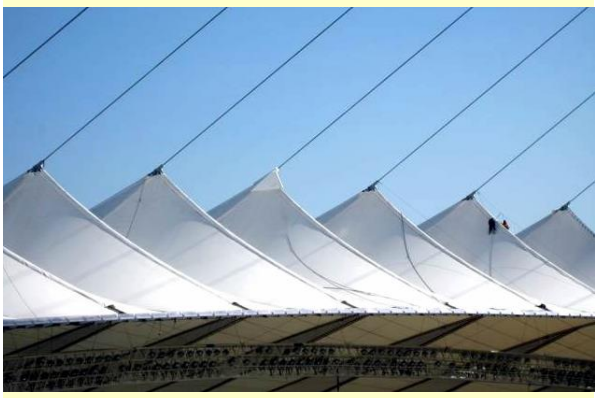

King Fahd Stadium, Riyadh, Arábia Saudita (1986

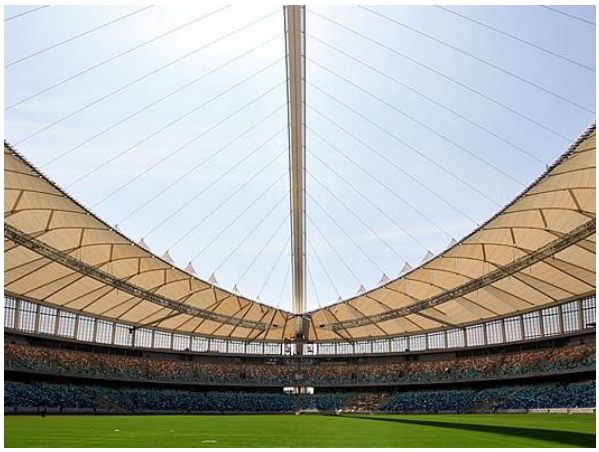




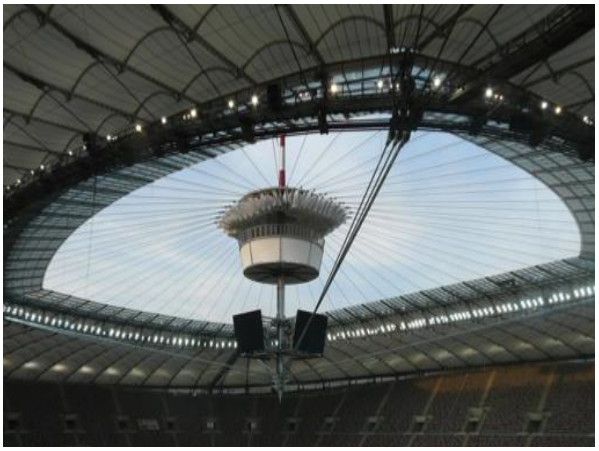


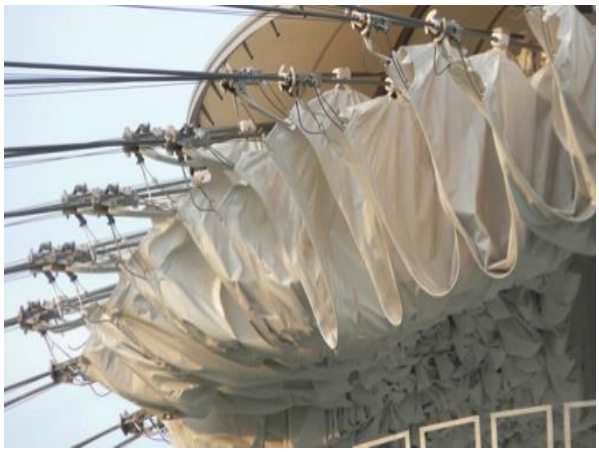




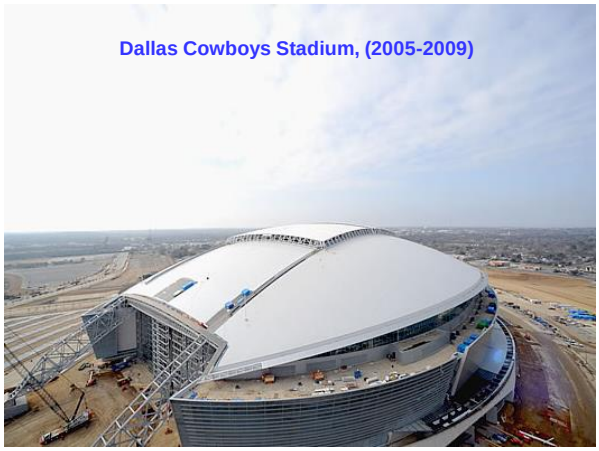


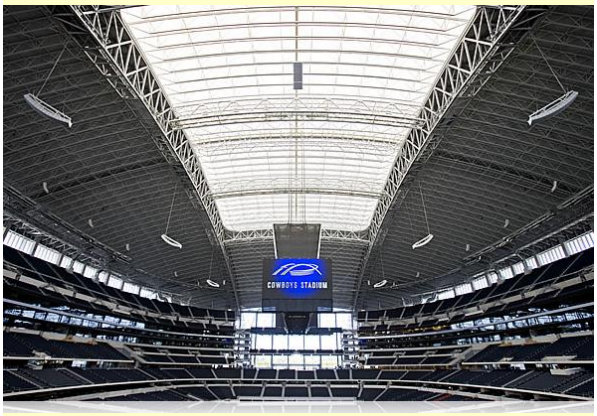

SOUTH
AFRICA

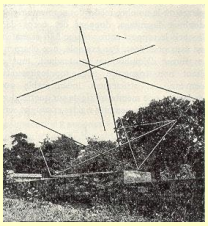


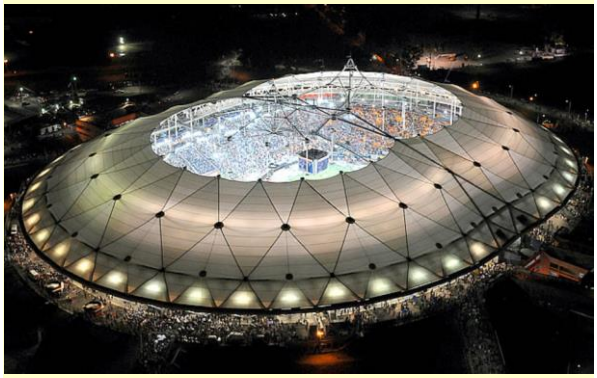


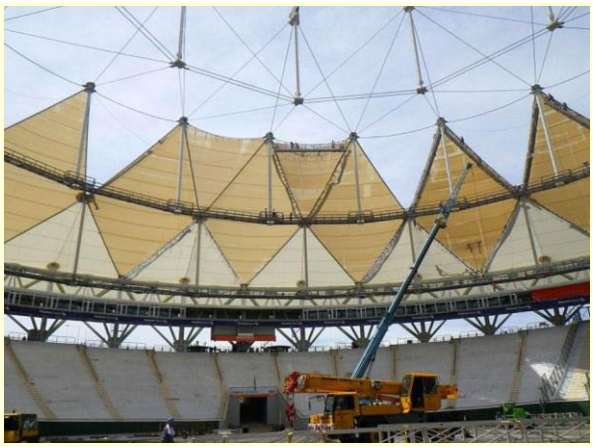
Dallas Cowboys Stadium, (2005-2009)




COWBOYS STADIUM







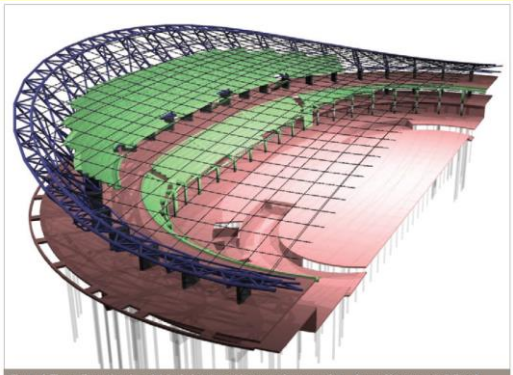


Figure 4. Three-dimensional model depicting the cable-net roof construction – the roof is suspended directly from the seating bowl, requiring only a planar ring truss

Figure 14. The £93 million Velopark, in which the Velodrome was completed 7 weeks ahead of schedule

Figure 9. Cable net being jacked into position from the conveniently flat ring truss – installation forces in the 16 km of cabling were close to those predicted

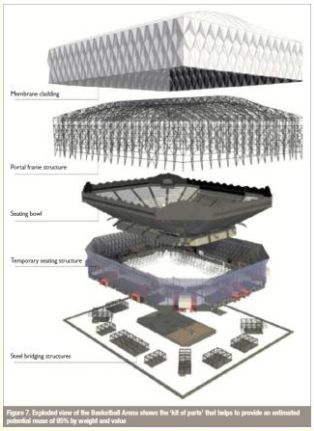
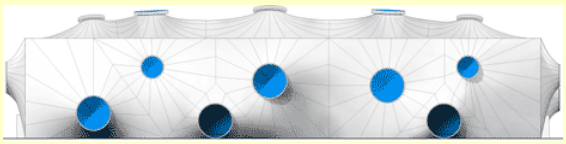
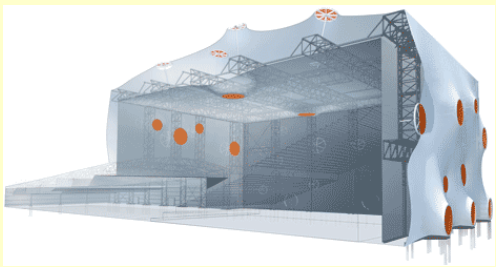
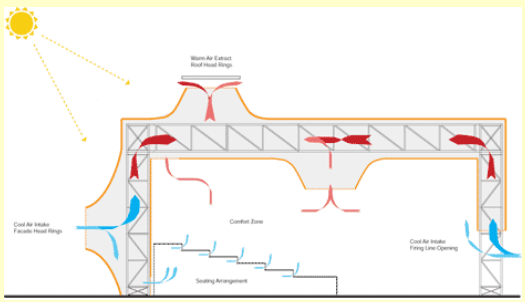


Figure 7. Exploded view of the Basketball Arena shows the 'kit of parts' that helps to provide an estimated potential reuse of 95% by weight and value






Warm Air Extract
Roof Head Rings
Cool Air Intake
Facade Head Rings
Comfort Zone
Cool Air Intake
Firing Line Opening
Seating Arrangement