

LSAA
 LIGHTWEIGHT STRUCTURES ASSOCIATION OF AUSTRALASIA INC.

3 Stadiums for Brazil 2014

Membrane Roof Construction at 3 of Brazils new stadiums for the 2014 FIFA World Cup

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 MakMax



ARENA FONTE NOVA
 Salvador – Bahia, Brasil

Participants

- Client CONSÓRCIO ARENA SALVADOR 2014
- Architect SCHULITZ + PARTNER; SETEPLA
- Roof Engineers RFR Ingenieure GmbH (Germany)
- Contractor Fonte Nova Negócios e Participações (JV of OAS and Oderbrecht)
- Roof Steel Martifer (Portugal)
- Membrane Taiyo Birdair do Brasil

Project Statistics

Roof Structure

Steel 1600t

Cables 220t plus terminations

Membrane 28,000m²

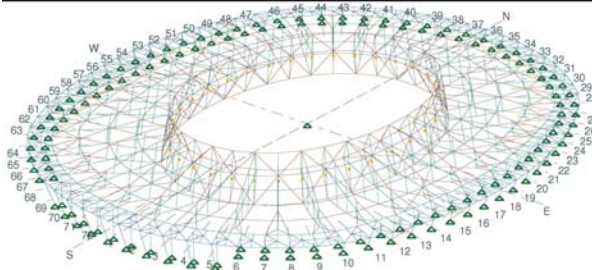
Fixed roofing 8000m²





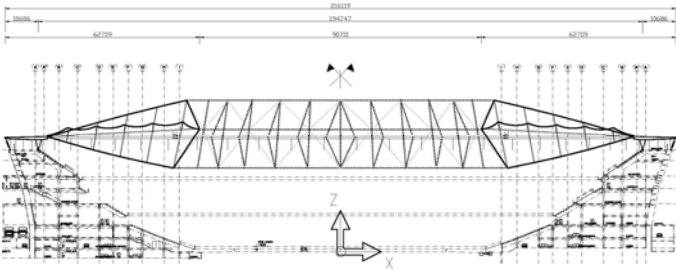

Structural Scheme

- Cable supported roof structure
- Compression ring = Horizontal Truss
- Two tension rings + "cantilever tip"

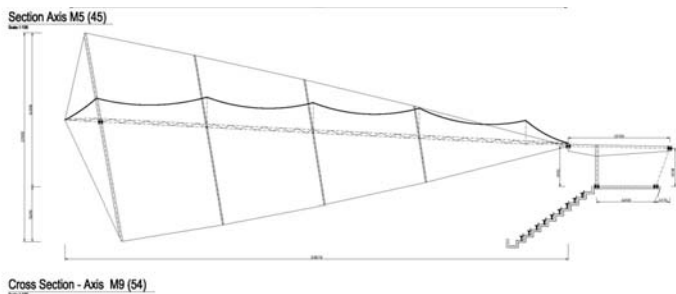


Isometric view of the global structural model

Transverse Section



Cable truss section

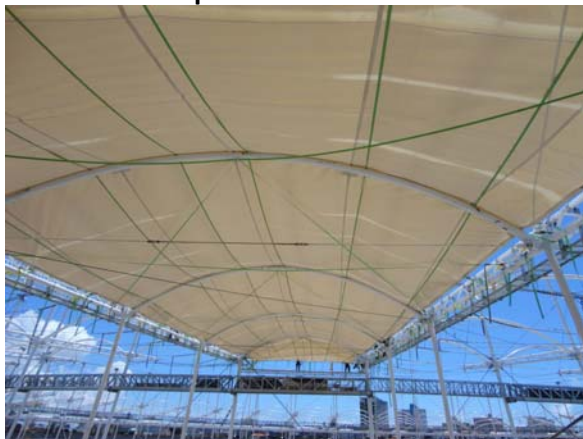




First panel installation



First panel installation

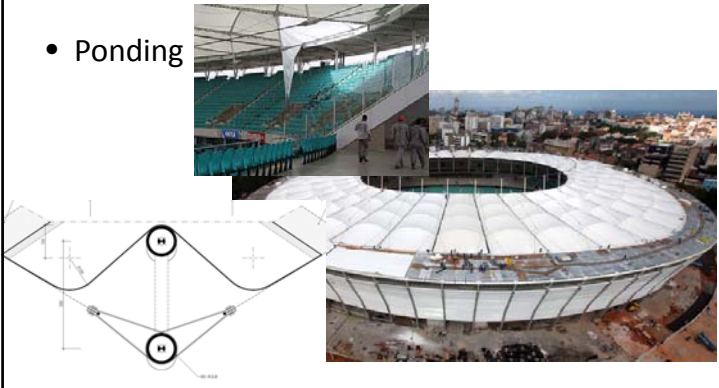


Last panel installation



Problems

- Ponding



Problems

- General low slope of fabric along drain lines
- Reliance on closures to guide run-off to contour
- Unequal prestress without the ability of the boundaries to cope with differences
- Details that create dams
- Perimeter truss roof is higher than the fabric

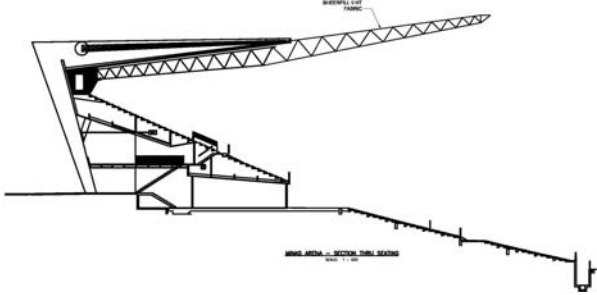
Mineirao Stadium (Minas Arena)

Belo Horizonte, Minas Gerais

- Client Governo de Minas
- Contractor Nova Arena BH (JV Construcap, Egesa, HAP)
- Engineer Engserj
- Membrane Taiyo Birdair do Brasil

Structural Scheme


- Existing heritage listed reinforced concrete cantilever roof
- External post-tensioning for added strength
- Add steel truss sections to nearly double the original span



Structural Scheme

Project Statistics


Fabric	13,000m ²
Steel	1300t



Installation Methodology



Temporary ramps



Truss winched up the ramp



Lift the truss section into place



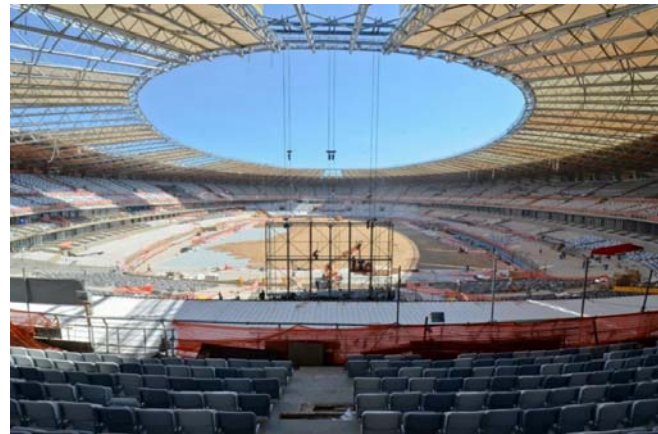
Nose Cone



Add and level the cantilever section



Fabric Installed in Panels



Simple fabric install



ESTÁDIO NACIONAL DE BRASÍLIA

- Client Novacap
- Architect Castro Mello Arquitetura Esportiva
- Engineer ETALP, SBP
- Contractor Andrade Gutierrez AG
- Roof JV Entap, Protende, Taiyo Birdair Brasil



Project Statistics

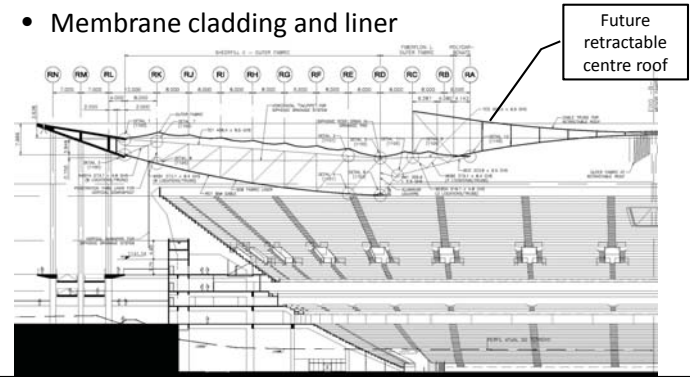
- Steel 1900t
- Cables 500t
- Castings 157t
- Cladding 57,000m2 membrane (SF2)
3000m2 polycarbonate
51,000m2 Liner (SGM9)



Roof Span 255m Circular

Structural Scheme

- Concrete Compression Ring
- Ballasted stiffened cable truss with tension ring
- Membrane cladding and liner



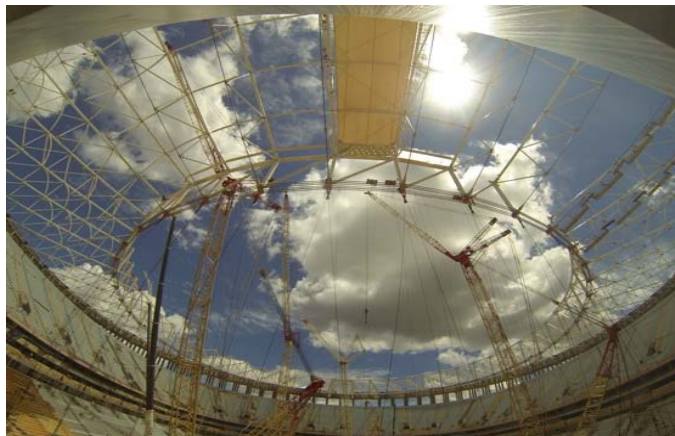
Cable Net Installation

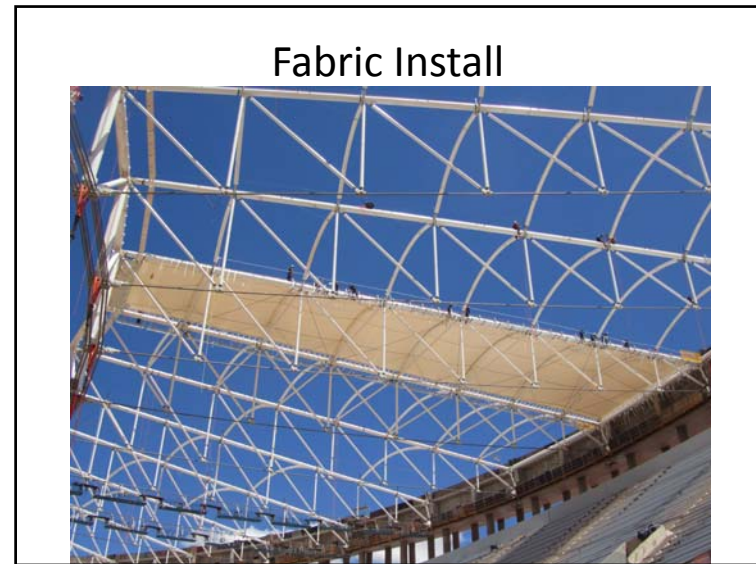
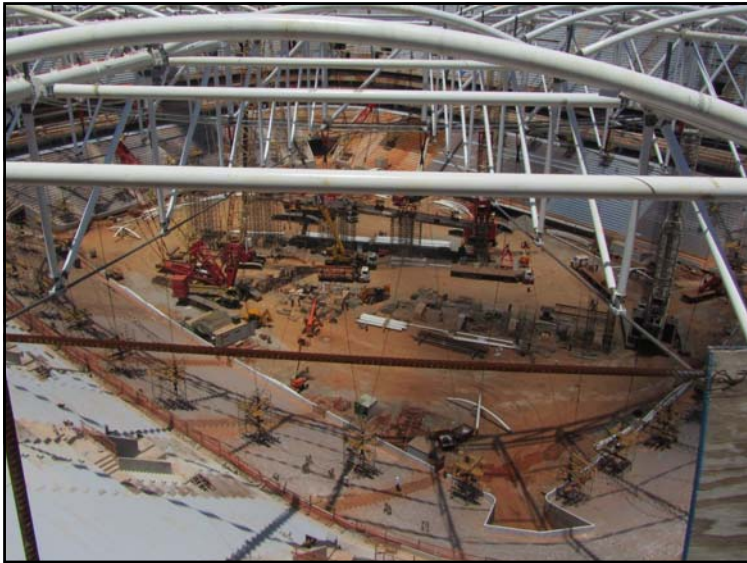


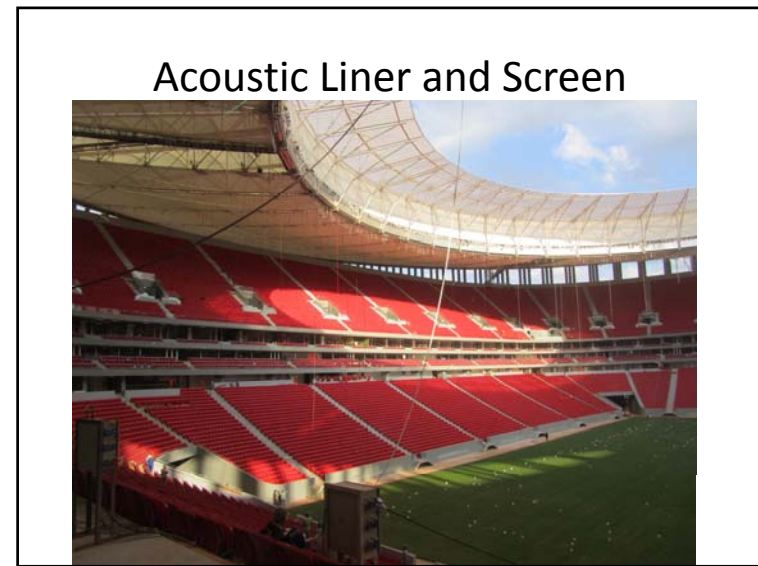
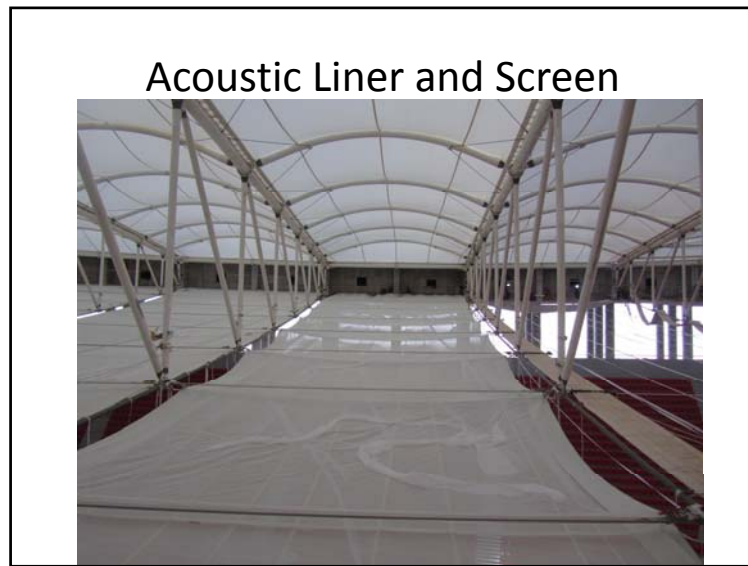
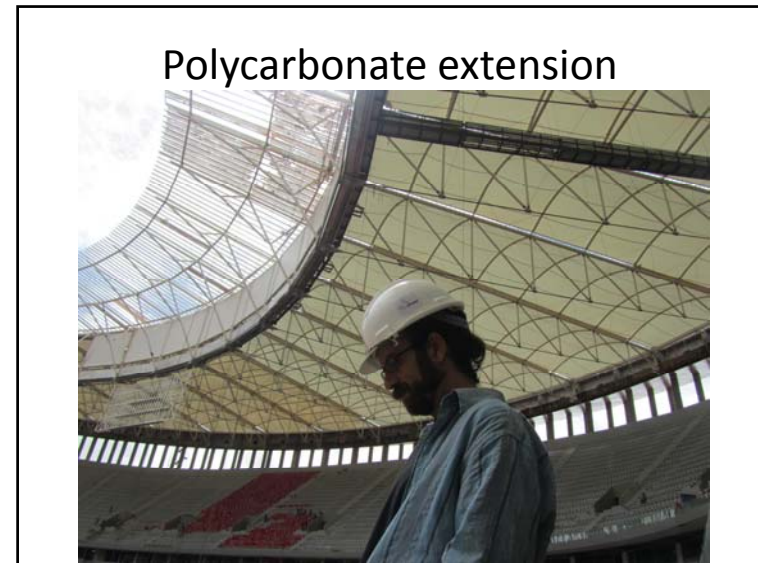
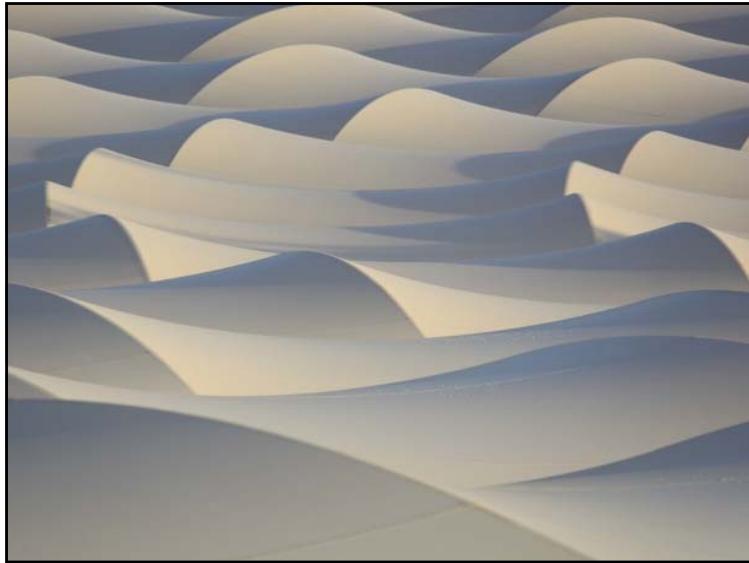
Steel Installation



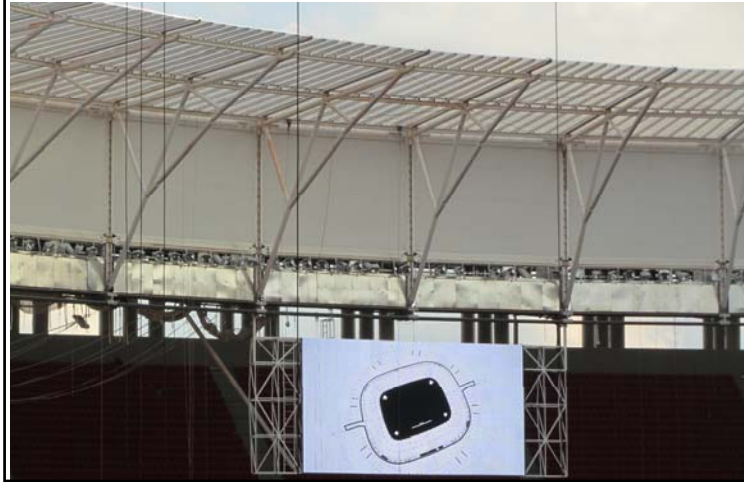
Steel Installation







Lighting and Video



Complete (Brazil 3 – Japan 0)

