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Margaret Court Arena Melbourne Park

Roof design

The project

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The project

To Melbourne CBD

Margaret Court Arena

Melbourne Park Masterplan

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The project

- **AUD$160m redevelopment.**
- **Enhances the facilities for the showcase Australian Open.**
- **Increased seating capacity by 1500 seats to over 7000 seats.**
- **Multi-purpose venue**
  - Tennis, netball, basketball, concerts, etc
- **Retractable roof – mainly for the Australian Open.**

Business case

- **Adjacent Rod Laver Arena, a well used multi-purpose venue.**
- **MCA currently used 2 weeks of the year with little shelter for people.**
- **Converted to an all year round venue that will cater for smaller, more intimate acts.**
- **Can operate simultaneously with RLA.**

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The team

Owner:	**Melbourne Olympic Park Trust**
Project Manager:	**Major Projects Victoria**
Managing Contractor:	**Lend Lease**
Architect:	**NH Architecture + Populous**
Structural engineer:	**Aurecon**
Services engineer:	**Aurecon**

5

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Fly through

6

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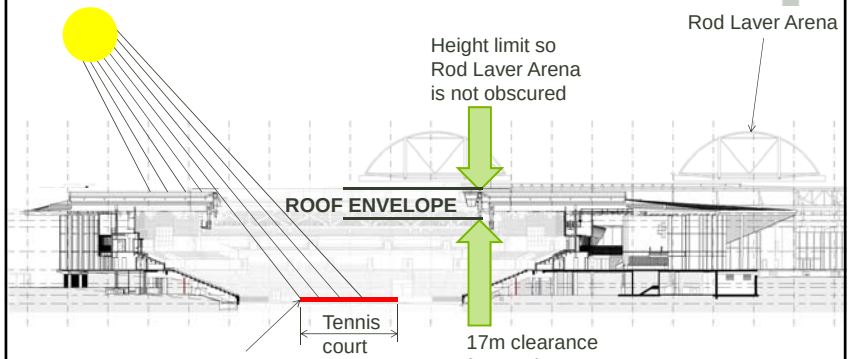
Design constraints



7

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Wind tunnel test

- Pressure tap locations
- Façade pressures
- External roof pressures
  - Max/Min Design Pressures
  - Load Response Coefficient method (LRC) used for main structural elements
- Internal pressures
- 360° wind direction (at 5° increments)

8

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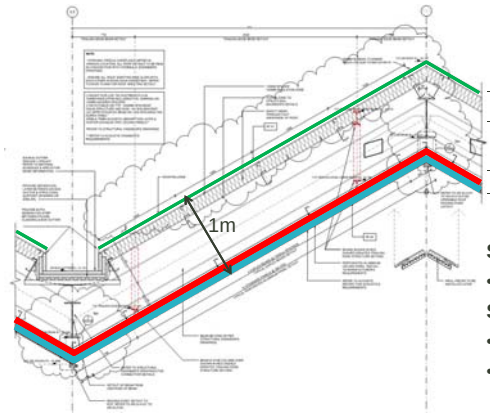
Acoustics and roof build-up

- **Total profile is just 1m deep from top of cladding to ceiling soffit**



Top of cladding
Thermal insulation
Structure (beams & braces) & drainage
Acoustic insulation
Ceiling soffit

Sound containment
- **Mass**

Sound quality
- **Prevent reverberation**
- **Wool (Tontine)**

9

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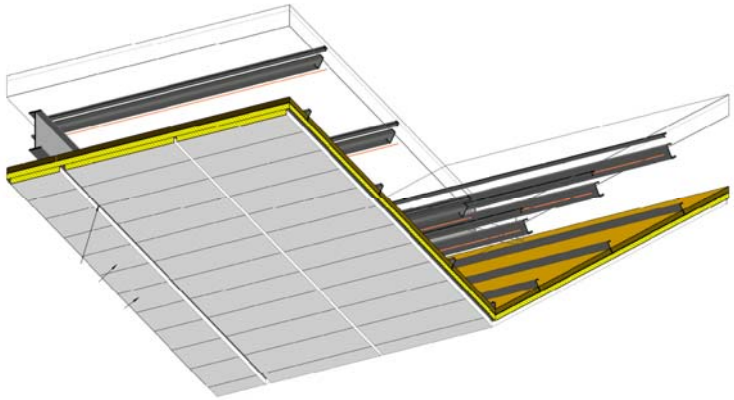
Acoustics and roof build-up



10

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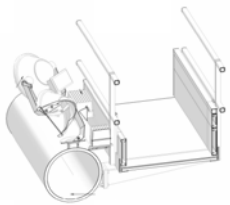
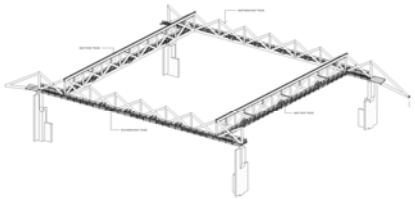
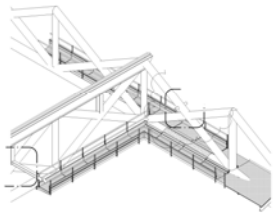
Fixed roof access

Catwalks
Sports lighting
Camera platforms
Hawk-eye







11

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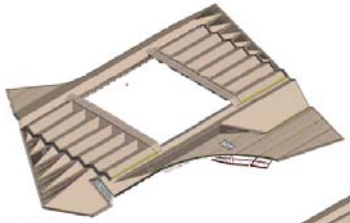
Operable roof

Opened



Closed

12

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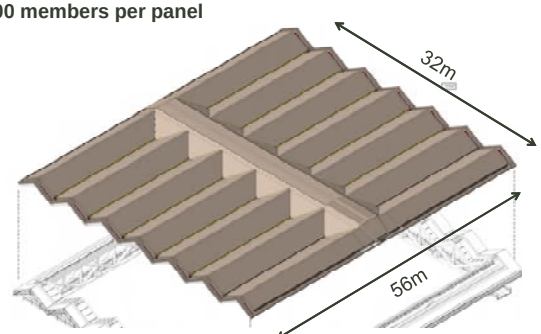
Operable Roof Design

- **Spans 56m x 32m**
- **Total dead load of 186 tonnes each panel**
- **Required to support additional rigging load of 13 tonnes per panel for concerts**
- **Over 400 members per panel**



13

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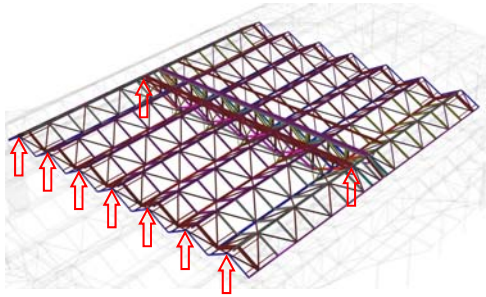
Operable Roof Design



Structural framing

14

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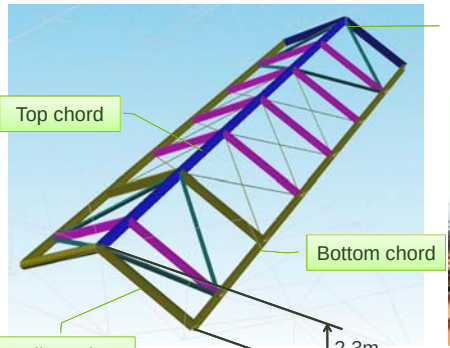
Operable Roof Design

- **Butterfly trusses**
- **Lessons learnt**



Slave bogie at each ridge on trailing edge

15

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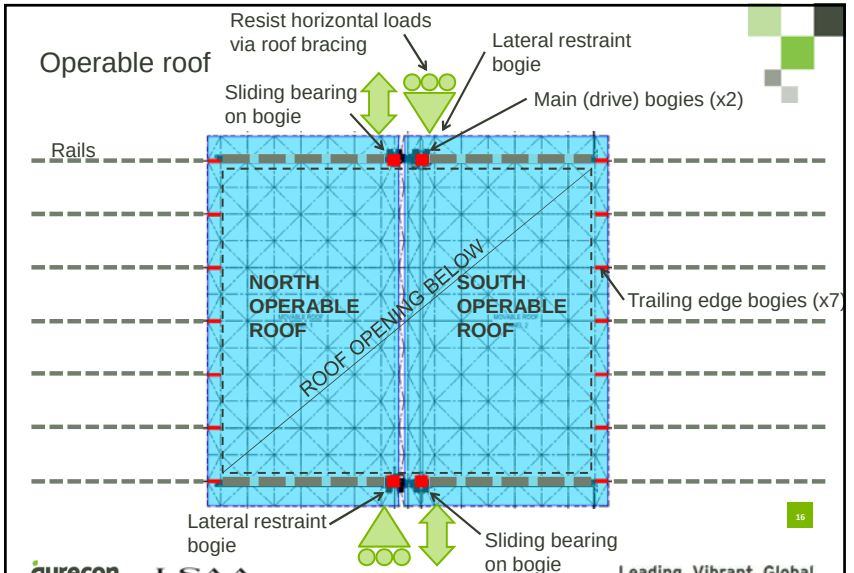
Operable roof



16

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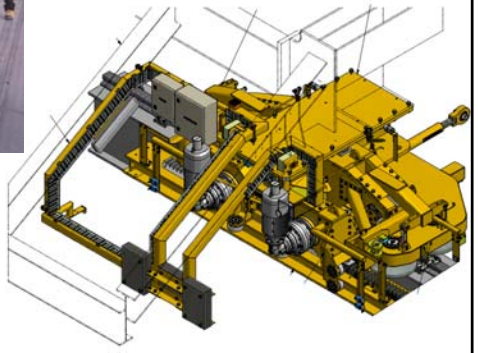
Main drive bogies



- Single rail
- Rack & pinion drive via pony truck
- Horizontal guide wheels
- Uplift restraints
- Brakes
- Position sensors
- Use a cordless drill to move during construction

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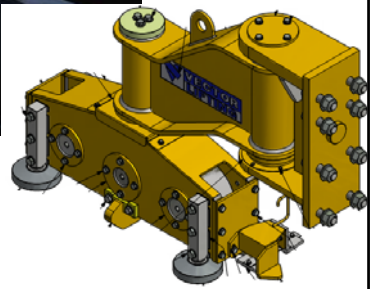
Trailing bogies



- Slave bogie
- Horizontal guide wheels
- Uplift restraint

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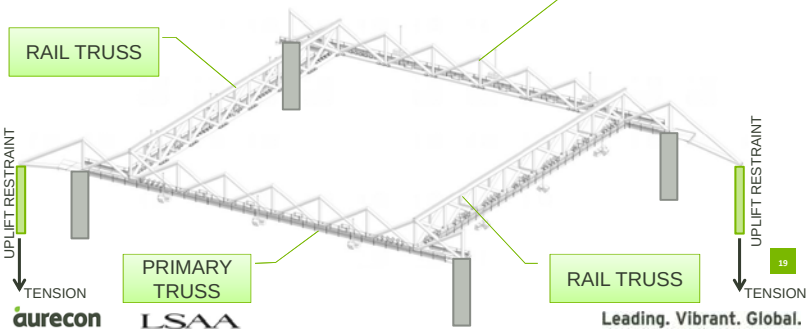
Fixed Roof Design

- Covers an area of 9300m²
- Supported on 4 concrete mega-columns and 76 steel column including 2 uplift restraints
- 4 trusses supported by the mega-columns provide the main primary support
  - 2 Primary trusses with a backspan to the uplift restraint
  - 2 Rail Trusses which support the main bogies of the operable roof



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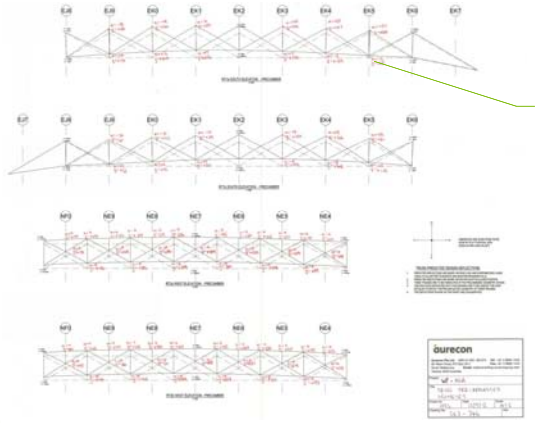
Fixed Roof Design

- All main truss pre-cambered to remove self weight deflection



X & Y Coordinates provided to shop detailer for each node

- Two 3D models created to produce shop drawings

20

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Cladding installation

Aim

- **Minimise working at heights**
- **Eliminate need for birdcage scaffolding**
- **Provide safe working environment**
- **Fast installation**

21

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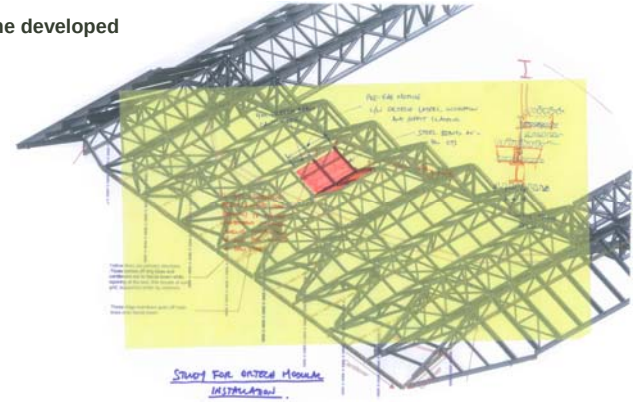
Cladding installation

Scheme developed



22

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Cladding installation

23

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Cladding installation

24

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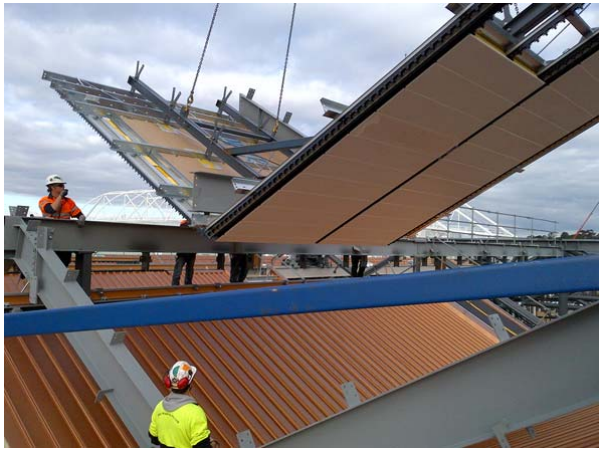
Cladding installation



25

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Cladding installation

26

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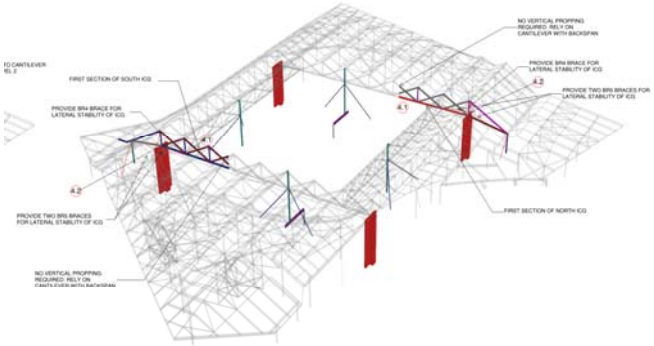
Construction Sequence



STAGE FOUR

27

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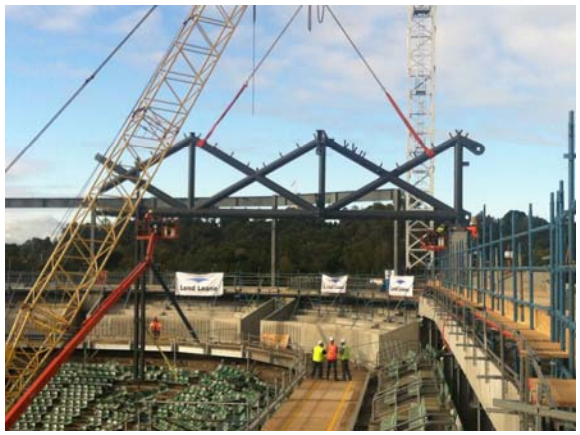
Construction Sequence



28

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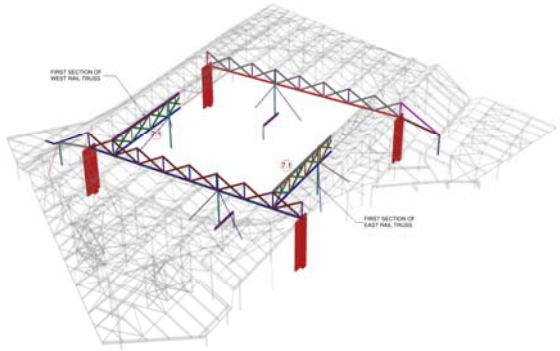
Construction Sequence



STAGE SEVEN

29

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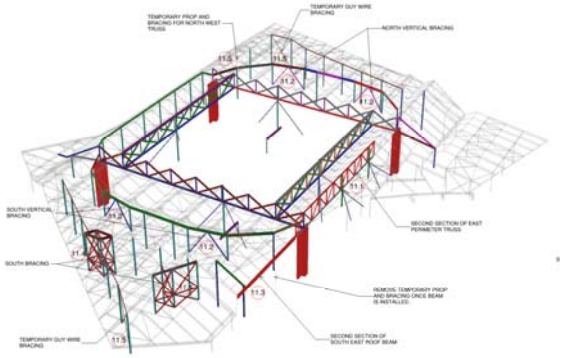
Construction Sequence



STAGE ELEVEN

30

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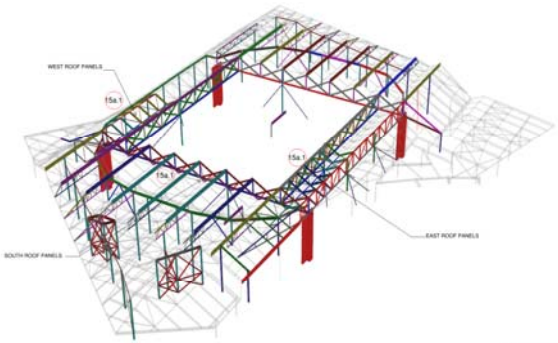
Construction Sequence



NOTE:
STAGE "a" AND "b" CAN BE UNDERTAKEN CONCURRENTLY. STAGE "a" REPRESENTS ROOF PANEL INSTALLATION AND STAGE "b" REPRESENTS ROOF FRAMING INSTALLATION.

STAGE FIFTEEN a

31

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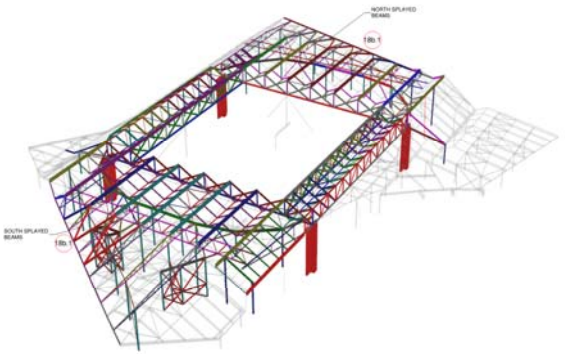
Construction Sequence



STAGE EIGHTEEN b

32

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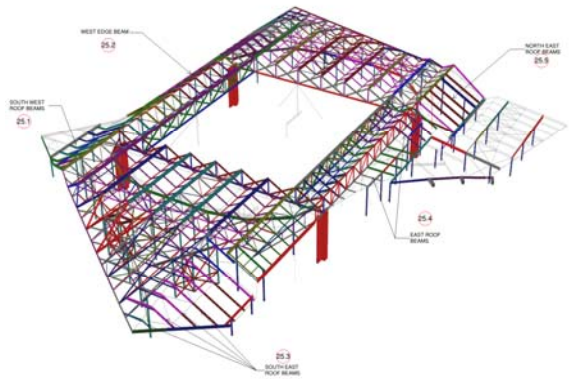
Construction Sequence



STAGE TWENTY FIVE

33

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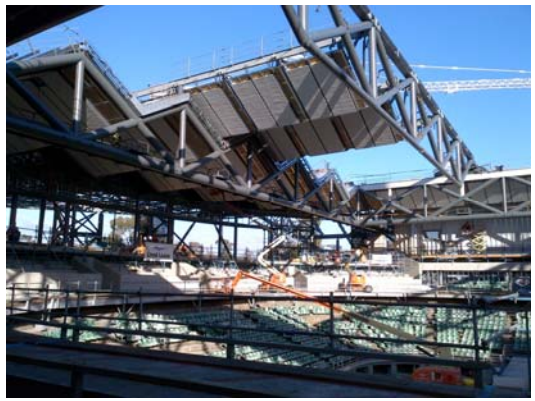
Construction Sequence
Operable Roof



34

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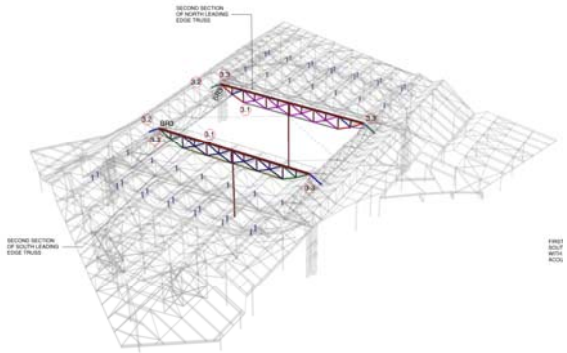
Construction Sequence
Operable Roof



STAGE THREE

35

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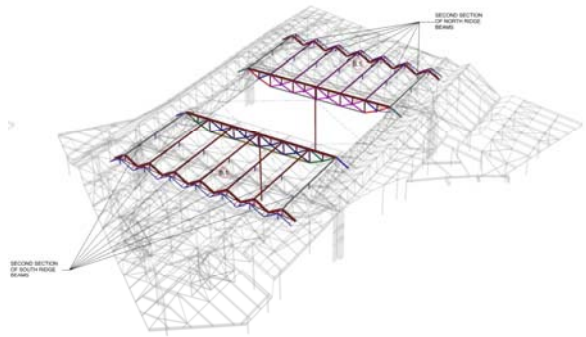
Construction Sequence
Operable Roof



STAGE EIGHT

36

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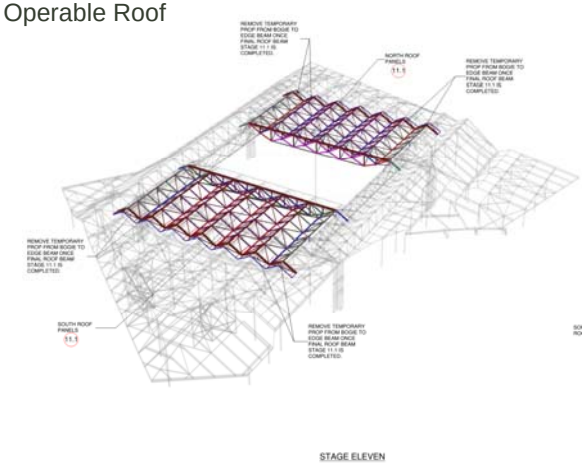
Construction Sequence
Operable Roof



STAGE ELEVEN

37

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Construction Access
Mouse-hole

- **Existing structure did not provide a clear access route to the court centre**
- **Solution: Cut an 8m wide hole through the existing building for truck, mobile crane and plant equipment access**

38

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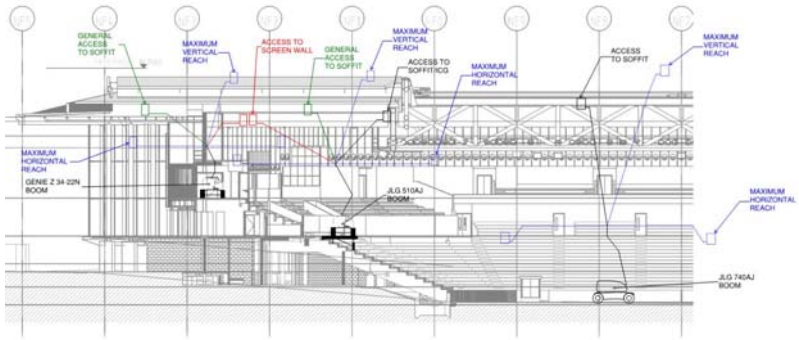
Construction Access
Race-Track

- **Provided an elevated platform for mobile booms to run along that was out of the way of other construction activities**



TYPICAL CROSS SECTION FOR BOOM ACCESS

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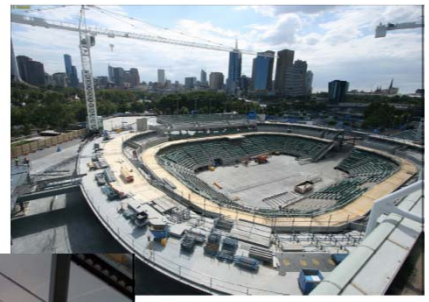
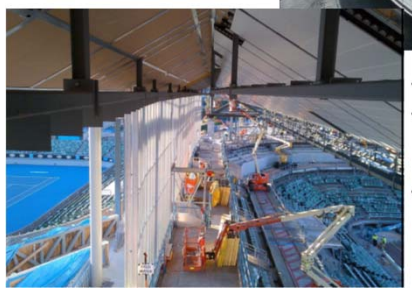
Construction Access
Race-Track





- Dedicated plant operating area
- Reduced congestion of plant, materials and pedestrians on the court surface
- Superior clear access to the high level work faces

40

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The end…

41

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