



Muscat International & Salalah Airport

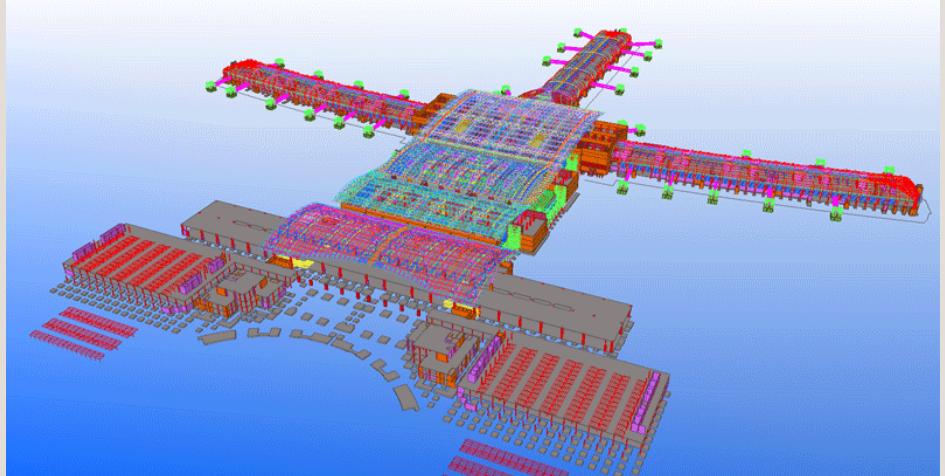
Amar Mirza
Birol Uyar

1 | 15 NOVEMBER 2012
DSI OMAN AIRPORT

COWI

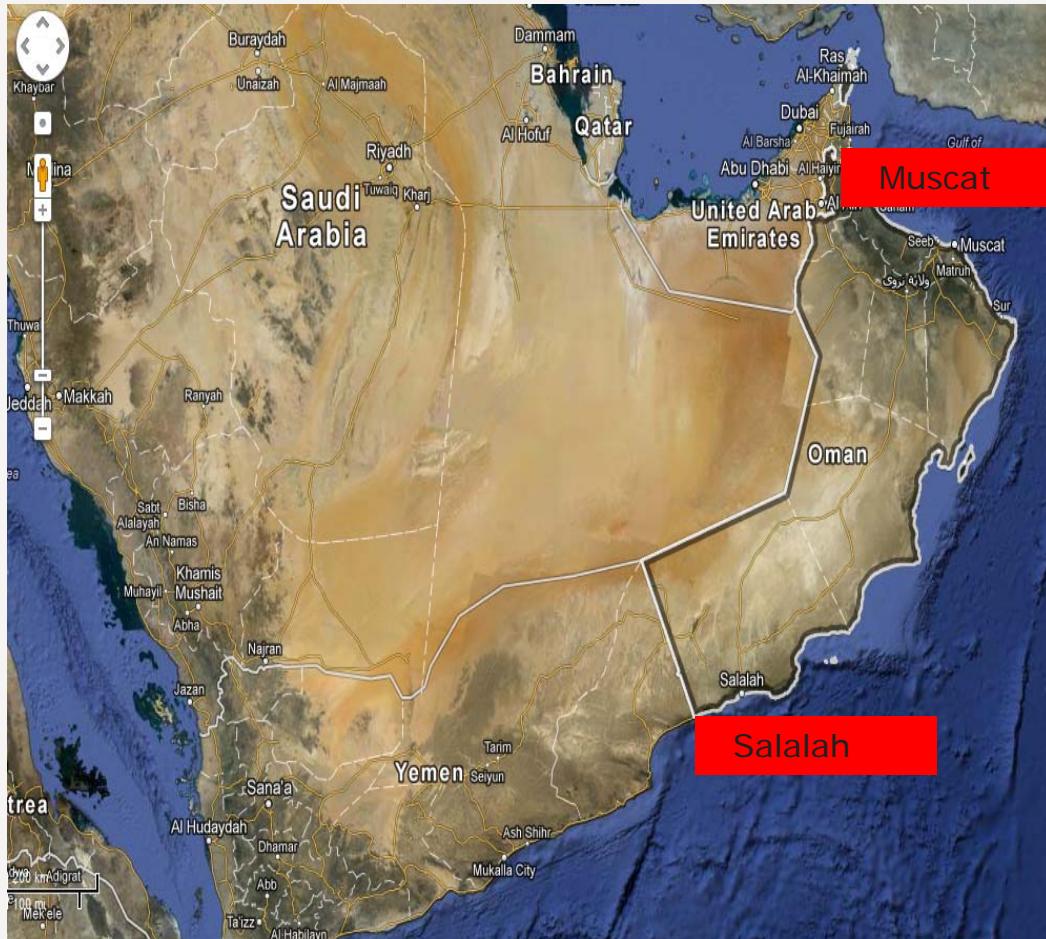
Agenda

- › Project History
- › Muscat and Salalah PTB Steel Roof
 - › Design
 - › Fabrication
 - › Erection
- › Status now.

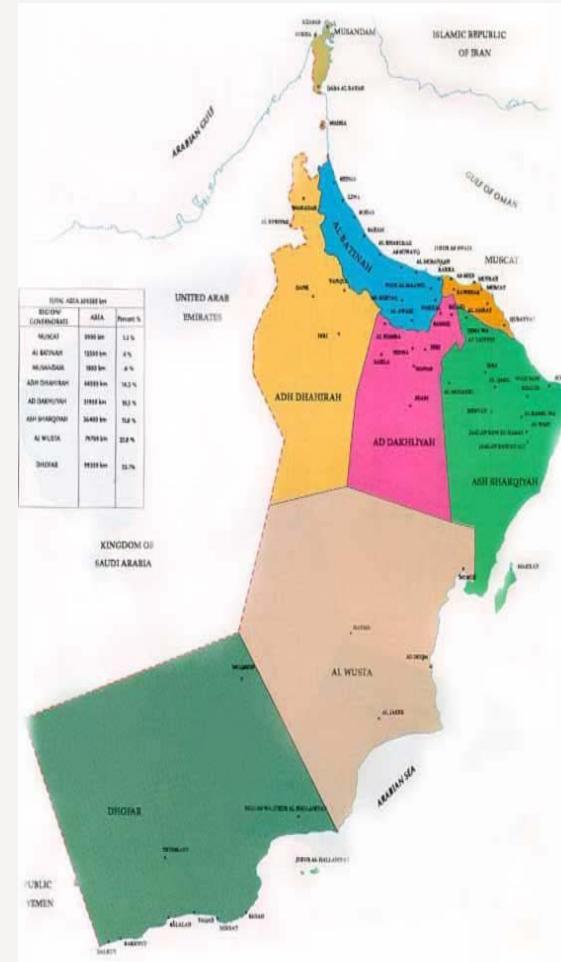


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Sultanat of Oman



7 Regions

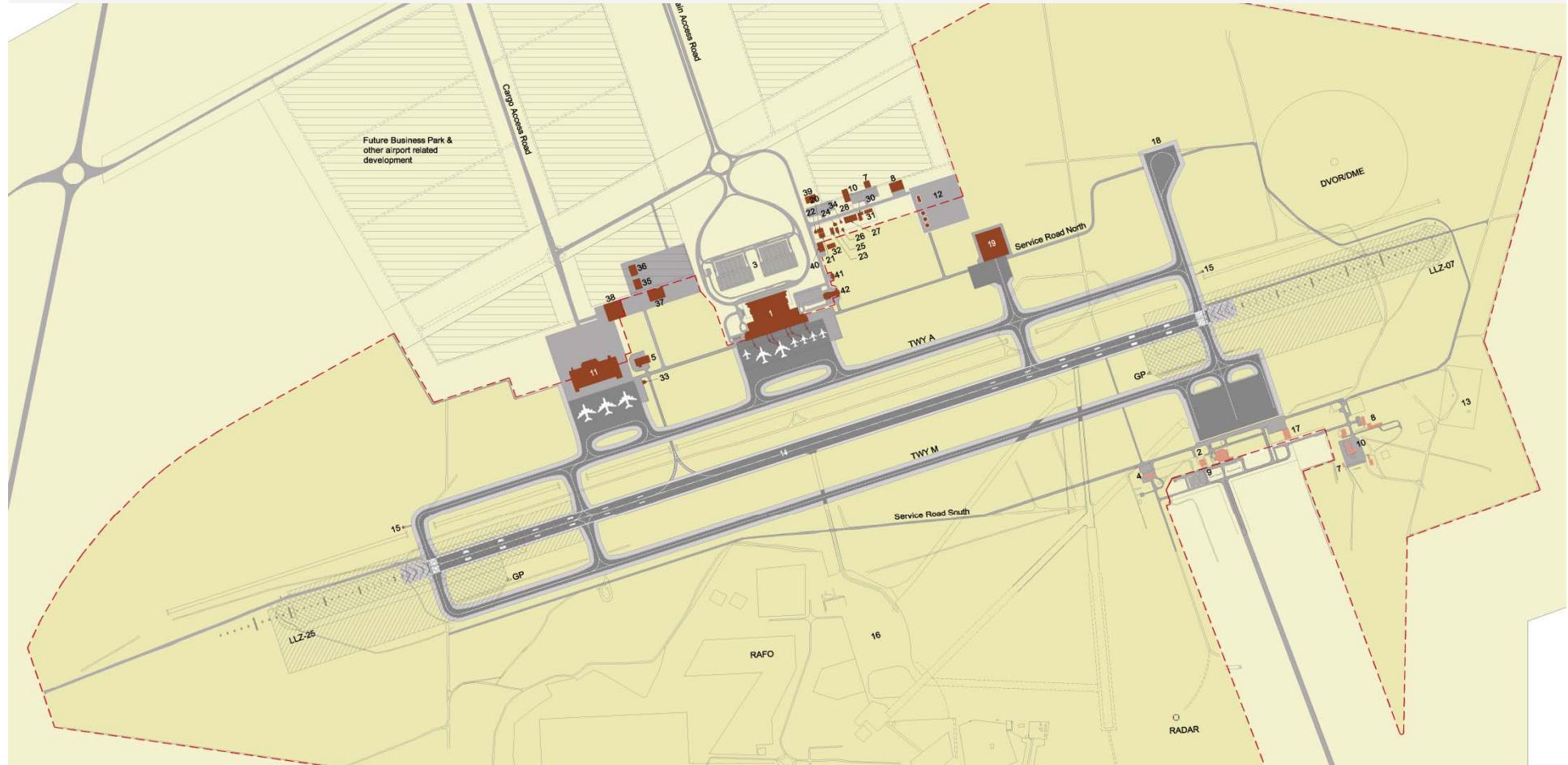


History of the project – Cyclone GONU

- › Start Jan 2005
- › Inception Report Feb 2005
- › Masterplan Apr 2005
- › Concept design July 2005
- › Preliminary design Feb 2006
- › Conditional Approval PD June 2006
- › Start Detailed Design Aug 2006
- › GONU Cyclone

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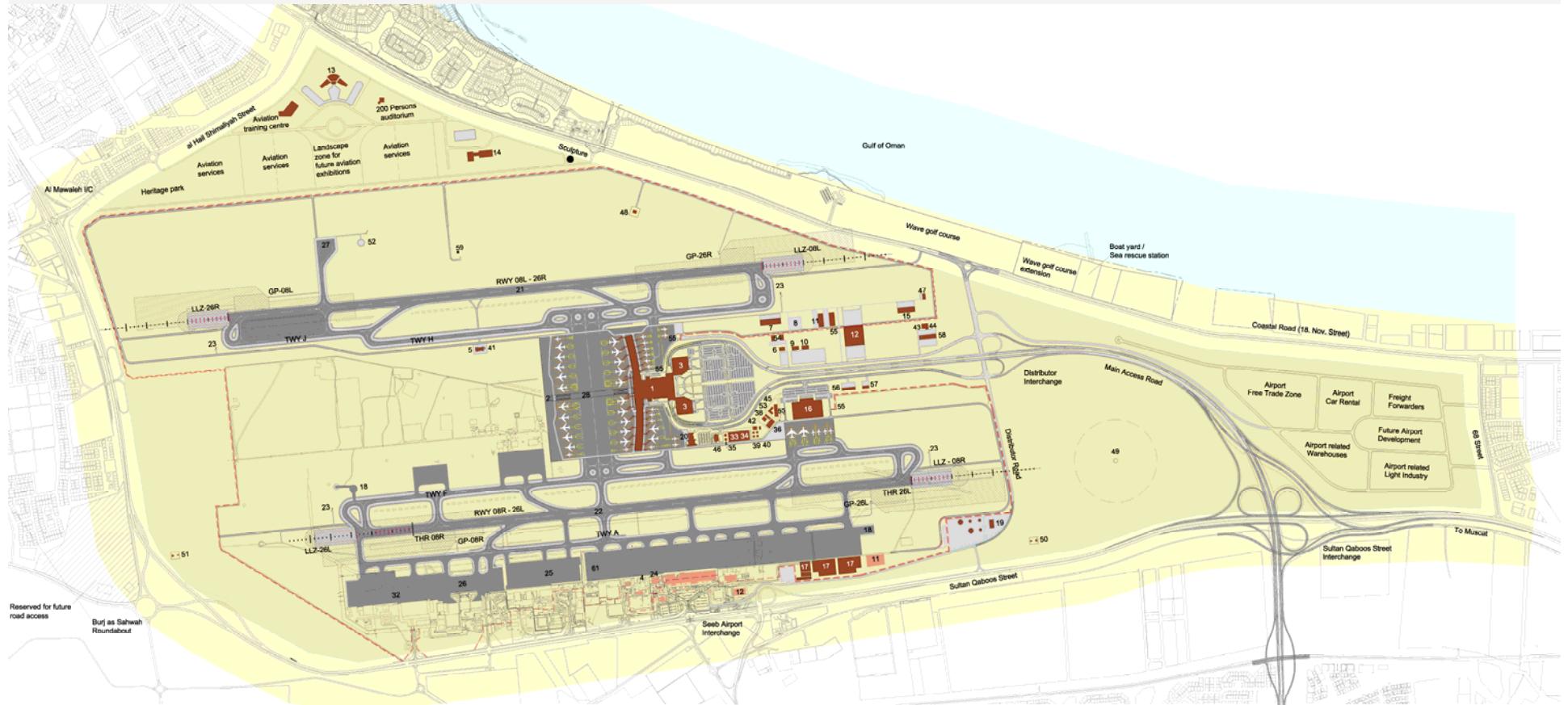
Salalah Master Plan 2 mill. pax



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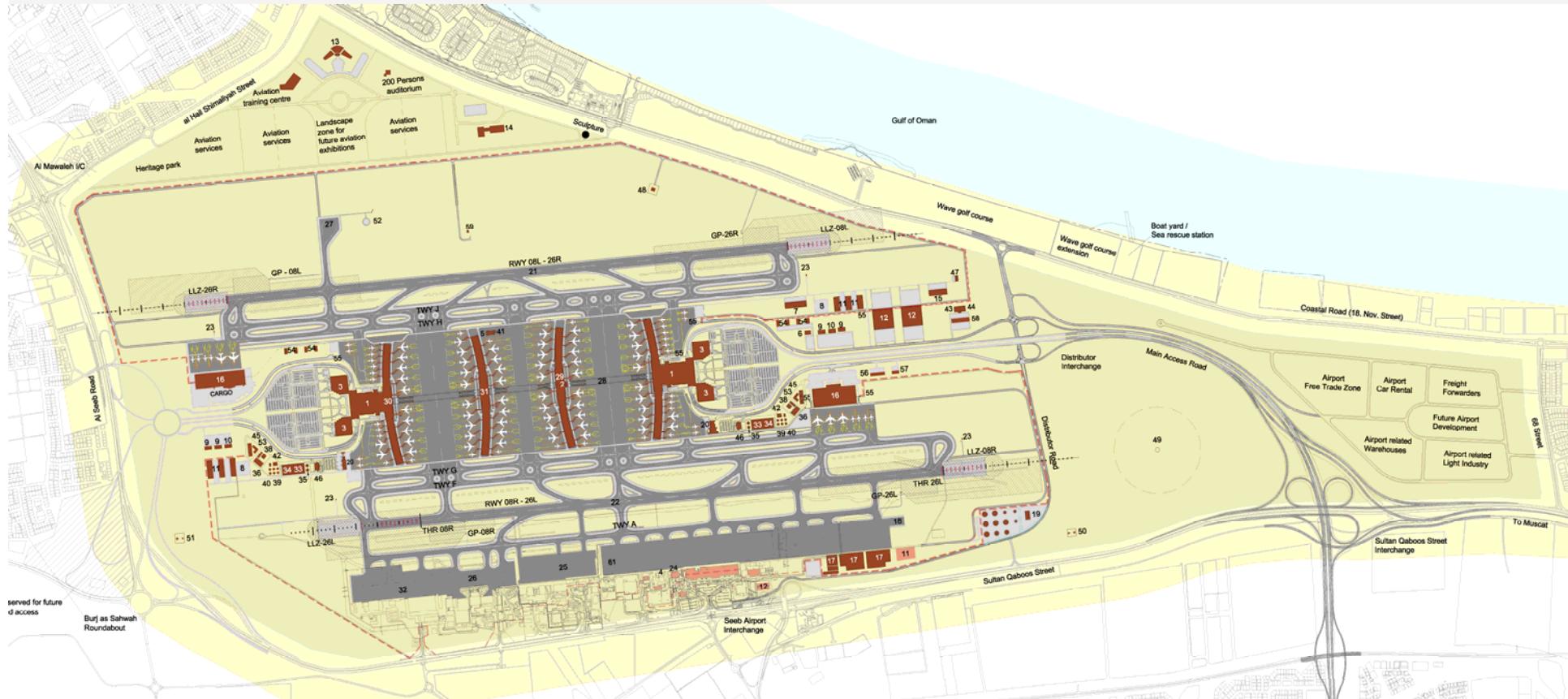
Muscat Master Plan, Phase 1

12 mill. pax



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Muscat Master Plan, Phase 4



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GONU – 6 June



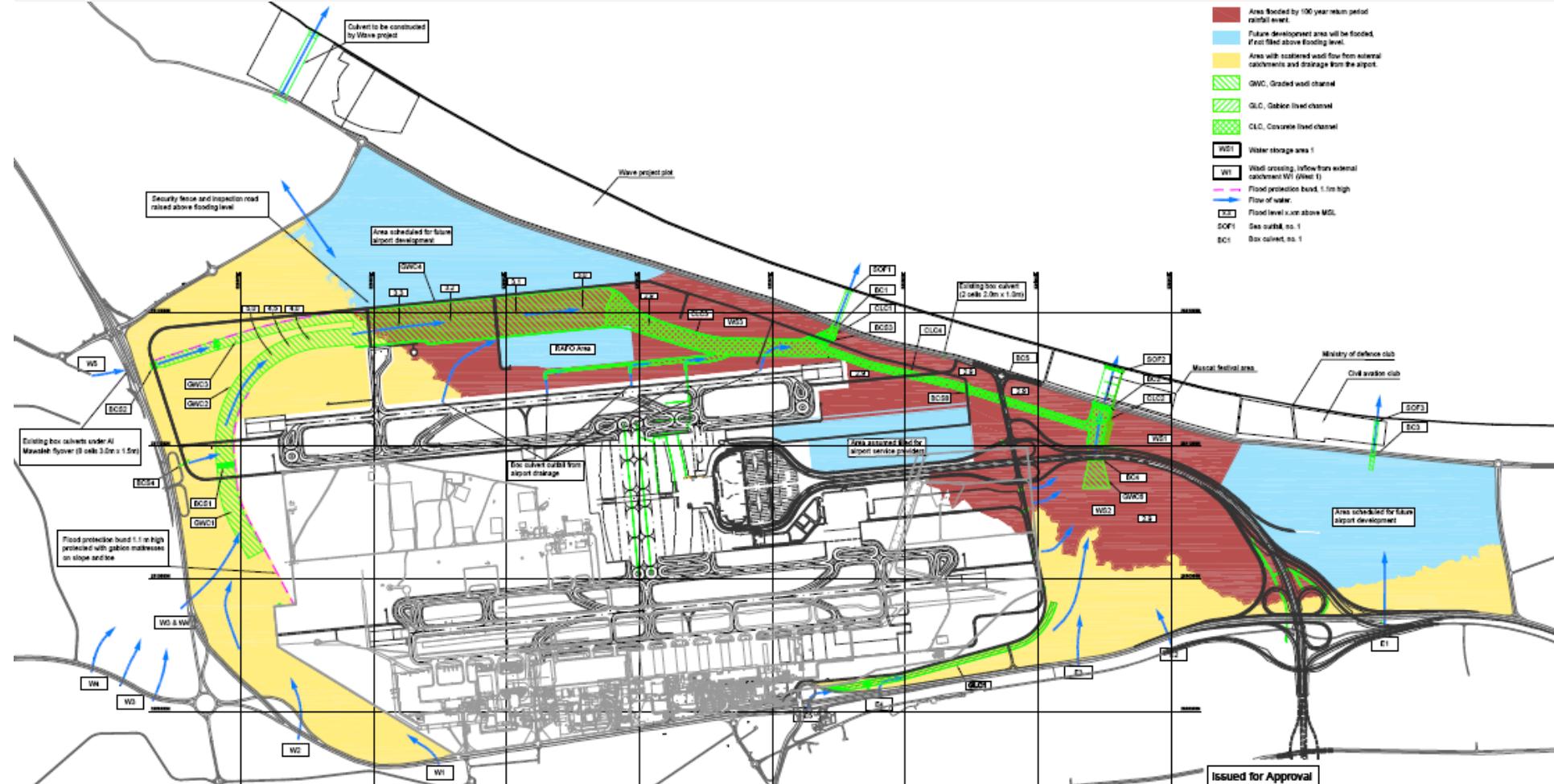
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50 % New Airport Site Flooded



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Discharge of 100 Year Flood



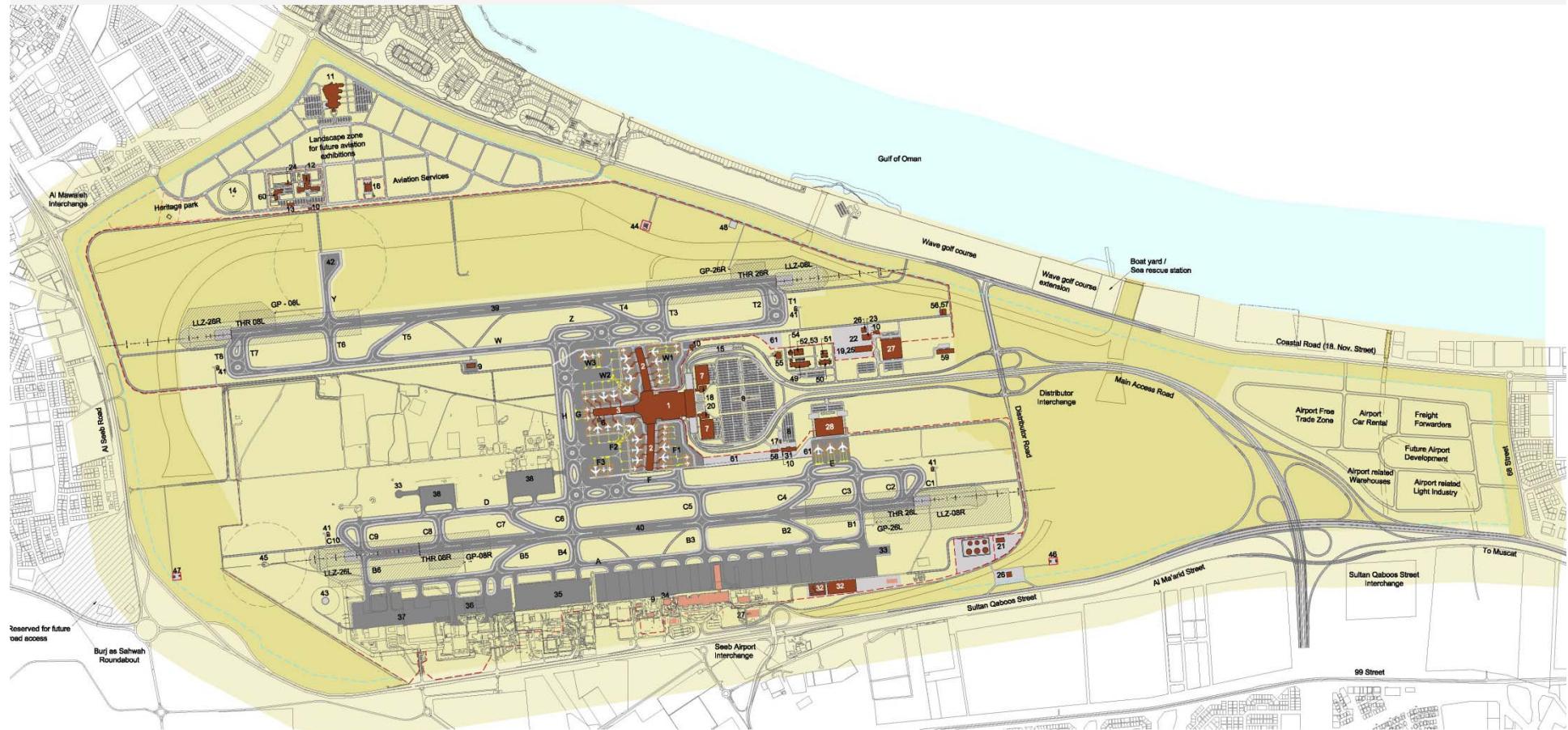
Post Gonu

Client Decision: No tunnels and basements

- › New Master plan Jul 2007 - Sep 2007
- › New Concept Design, buildings Sep 2007 - Dec 2007
- › New Preliminary Design, buildings Jan 2008 - Jun 2008
- › Tender Design, buildings Jun 2008 - Nov 2008
- › Detailed Design, civil works Muscat Jan 2008 - Aug 2008
- › Tender
 - › Civil Works based on DD Aug 2008 - Dec 2008
 - › Building Works based on PD Nov 2008 - Dec 2010
- Construction excl. ORAT Mar 2009

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Master Plan for Muscat, Phase 1



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Model photo



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Model



General Data

| | |
|----------------------------|---|
| Passenger terminal (PTB): | 2 level concept, dep/arr |
| PTBsize | 320,000 m ² |
| PTB Steel Roof | 10.600 ton of steel, spans up to 60m |
| No. gates (INT/DOM/remote) | 25/3/9 |
| Shopping area | 11,000 m ² |
| Hotel | 98beds |
| Check-in counters | 77 space for 96 |
| Visa counters, departure | 24 |
| Security check, positions | DEP: 10 space for 14, TRF: 10 |
| Visa counters, arrival | 51 |
| Bagage belts (INT/DOM) | 6 INT, 2 DOM space for total 10 |
| Runways: | Independent parallel RWY, Type F, 3900m |
| Stands, C/E/F/all-cargo) | 21/18/2/5 |



Other buildings

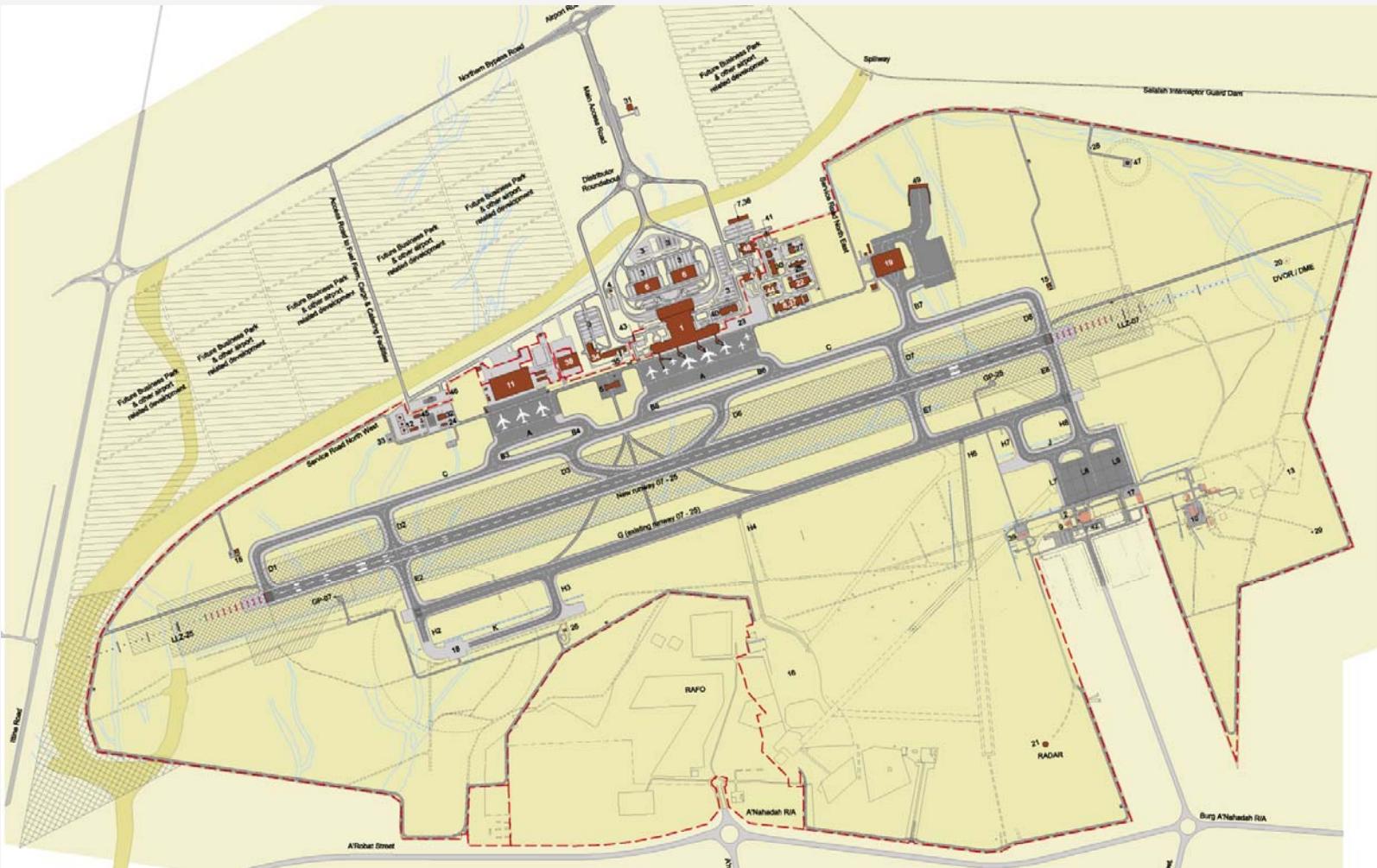
- › Approx. 50 buildings
 - › 94.7 m ATC Tower
 - › ATM complex
 - › Cargo village
 - › Catering building
 - › Utilities buildings
 - › Work shops etc.





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Salalah Airport



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Salalah Model photo



Muscat International & Salalah Airports

Salalah Model photo



Muscat International & Salalah Airports

| | |
|---------------------------------|---------------------------------|
| Capacity | 1-2 mppa |
| Passenger terminal (PTB): | 1 level concept |
| PTB size | 49,000 m ² |
| PTB Roof | 3000 tons |
| No. gates (INT/DOM/Flex/Remote) | 4/2/2/2 |
| Check-in counters | 16 and space for 20 |
| Visa counters, departure | 6 |
| Security check, positions | 2 and space for 3 |
| Visa counters, arrival | 12 |
| Baggage belts (INT/DOM/Flex) | 1/1/1 |
| Runway System: | Single, A380 compatible , 3900m |
| Staands | 12C/4E+2F |
| Ancillary Buildings | |



Muscat International & Salalah Airports

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PTB Roof structure



Design

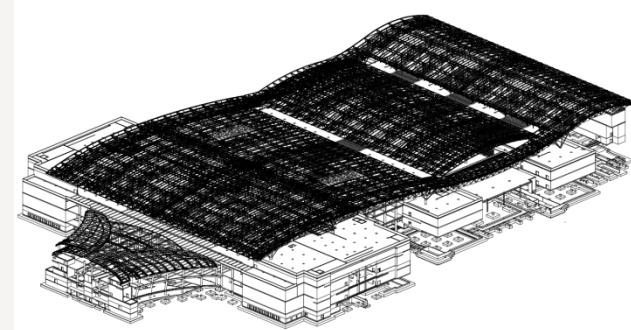
- › The design is based on BS and UBC 97 code
- › The 3D design has been performed in Staad pro
- › The structures in Muscat has been designed for Zone 2a earthquake
- › The Structures in Salalah has been designed for Zone 1

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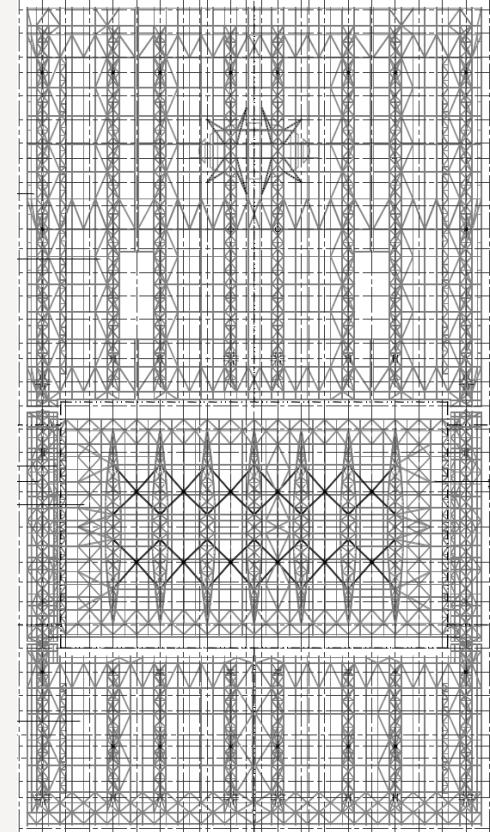
Architectural features



principel of design



- › The following structural items are included in the model:
 - › Main trusses spanning between concrete columns
 - › Trussed purlins spanning in between main trusses
 - › Beams and bracings at bottomchord of purlins
 - › Beams and bracings at topchord of purlins
 - › North and south facades
 - › East facade



Main girder and primary purlins

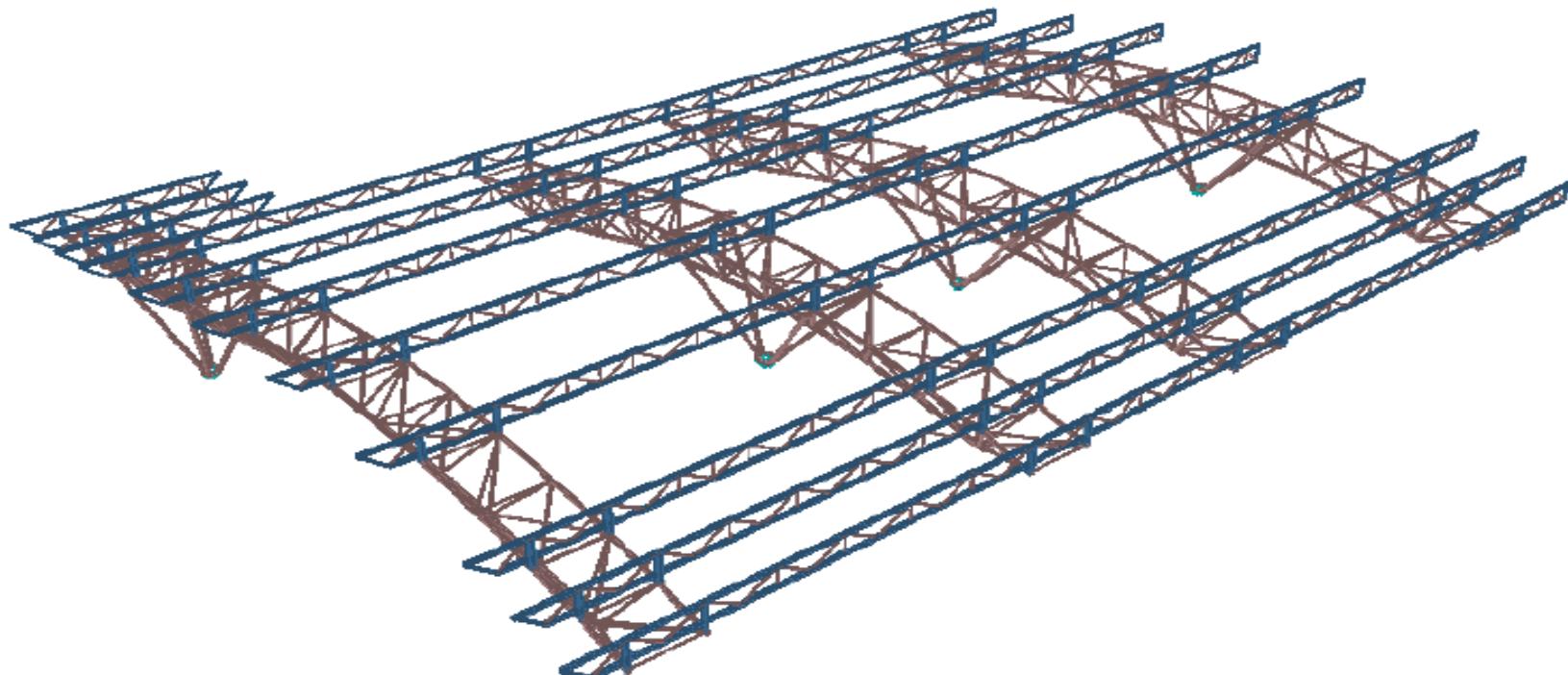
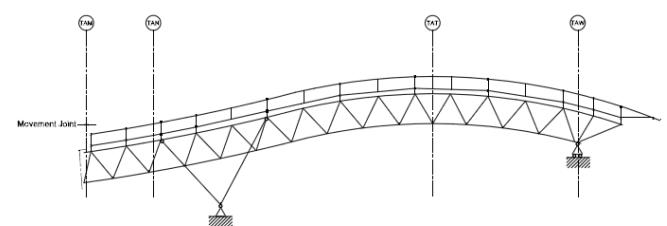
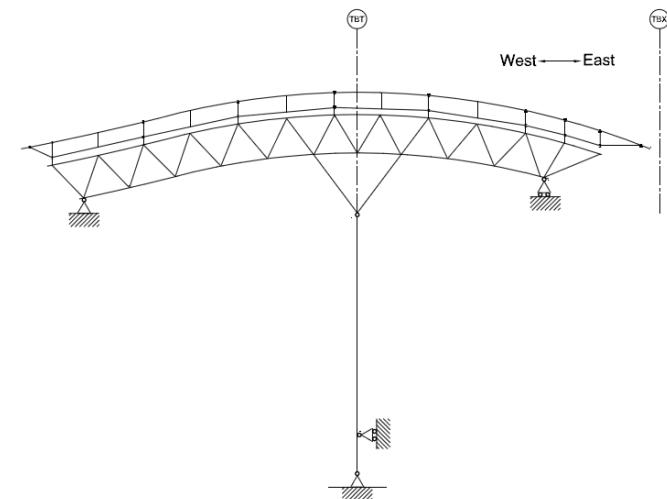
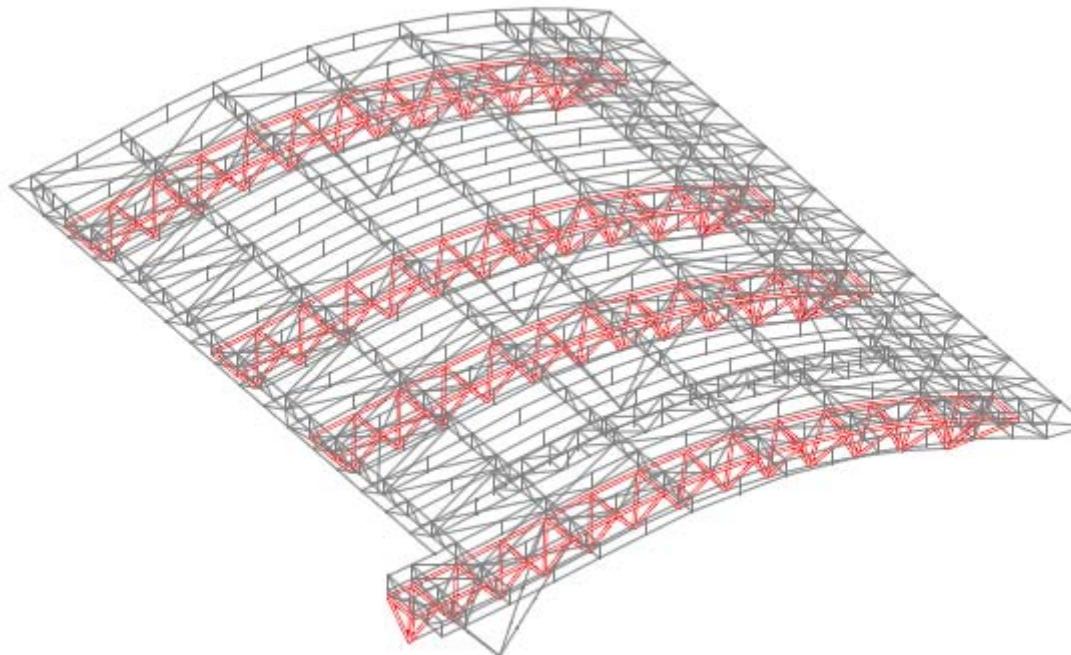


Fig. shows main trussed girder with supported trussed primary purlin

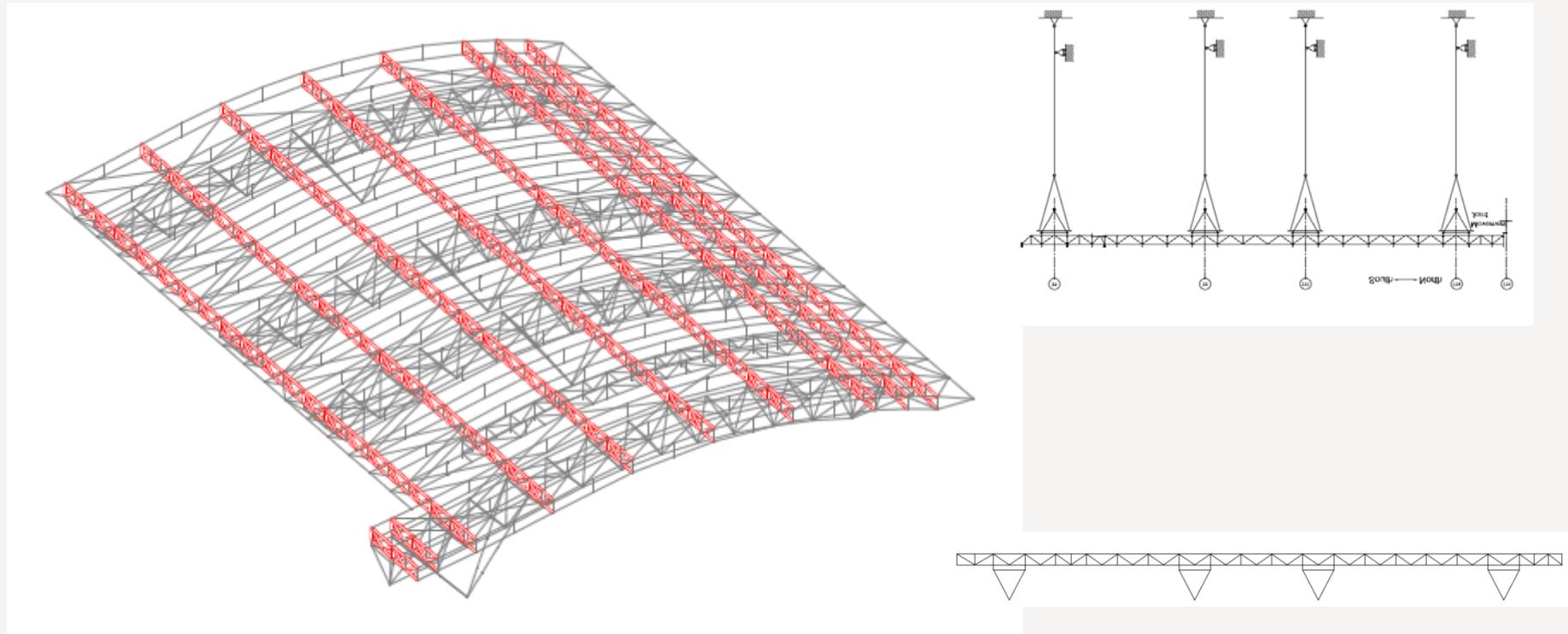
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Main trussed girder



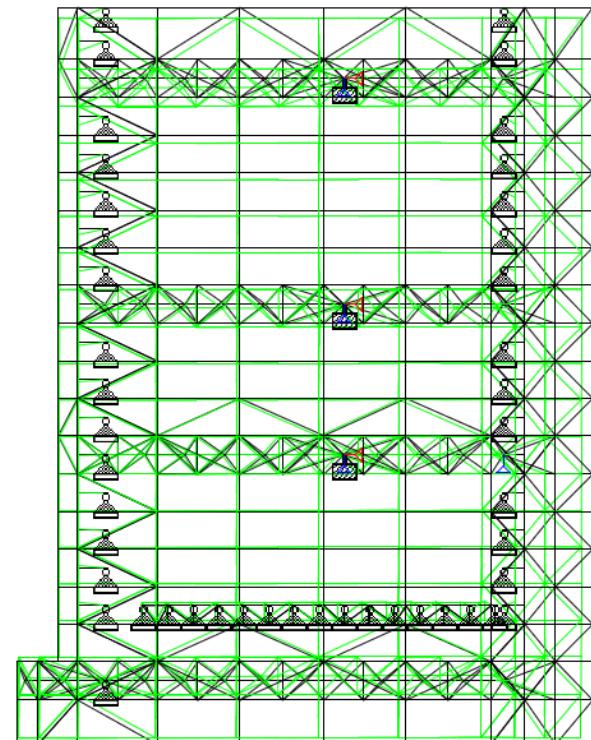
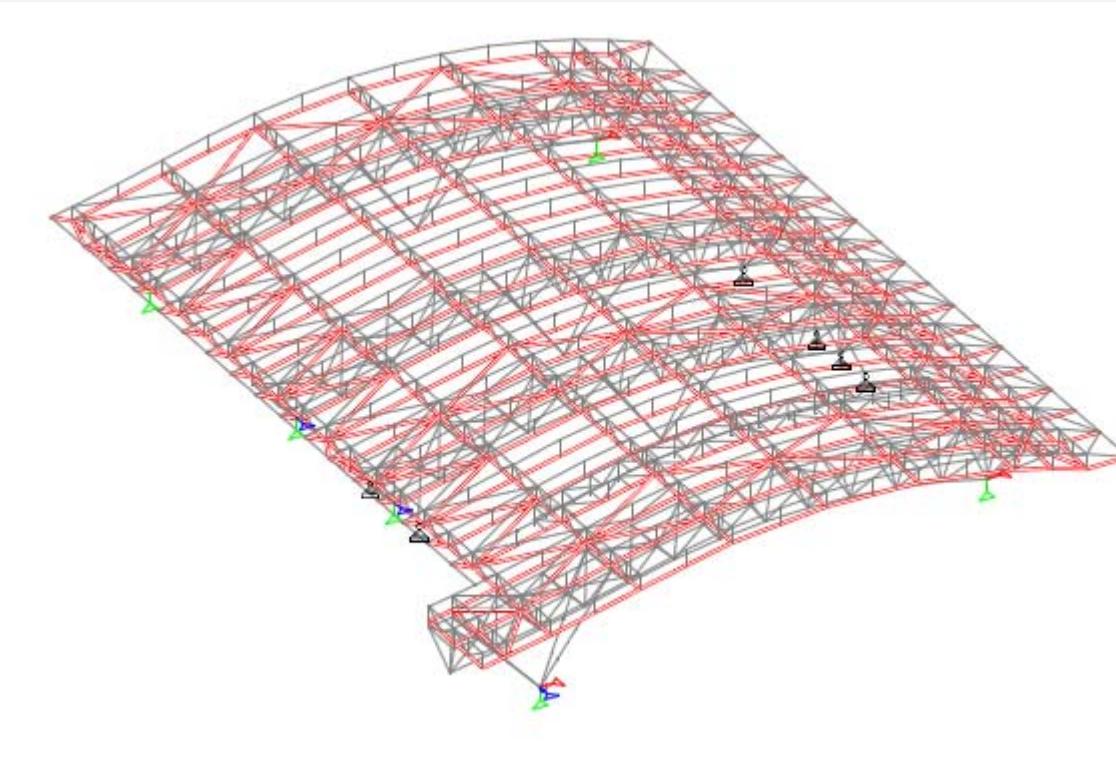
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Trussed primary purlin



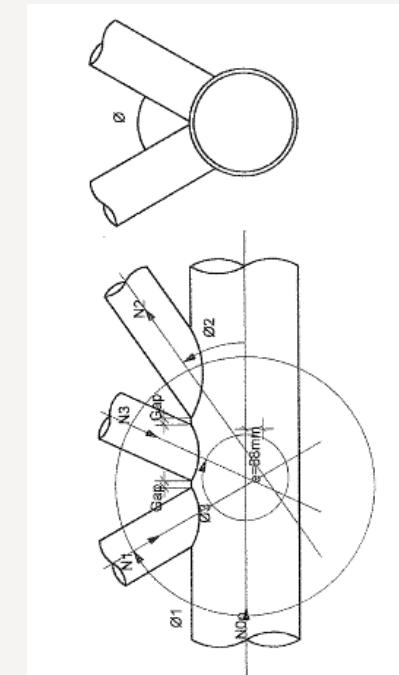
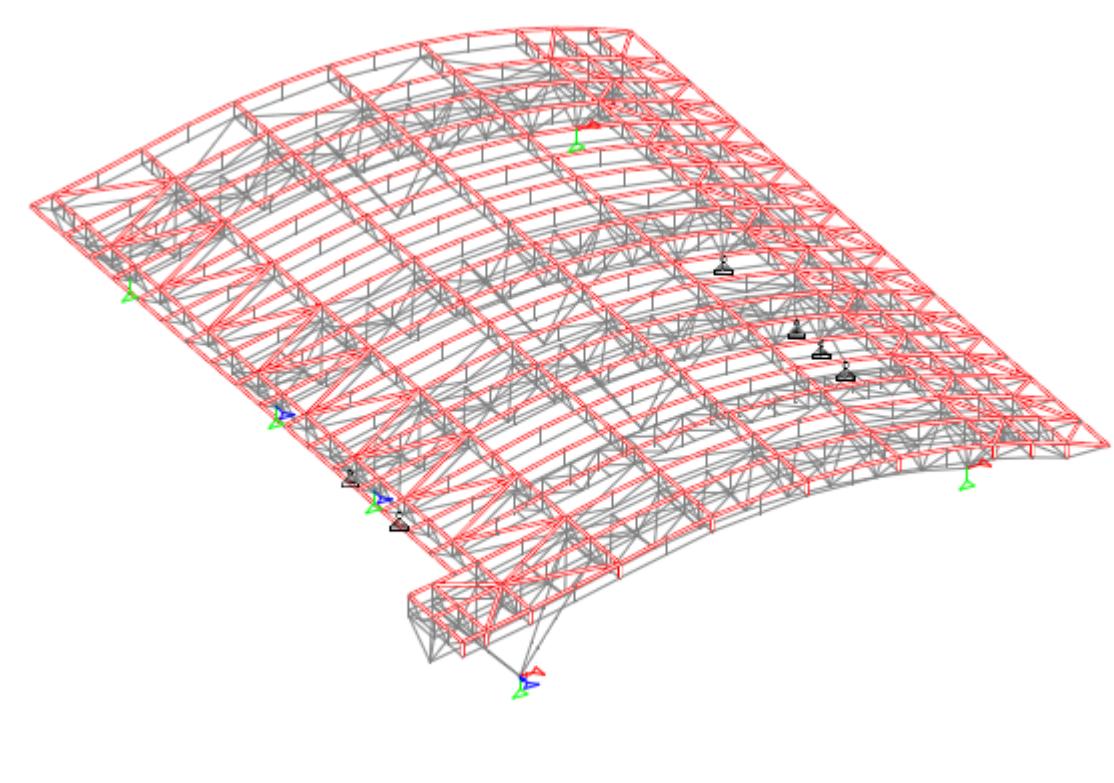
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Bottom flange level



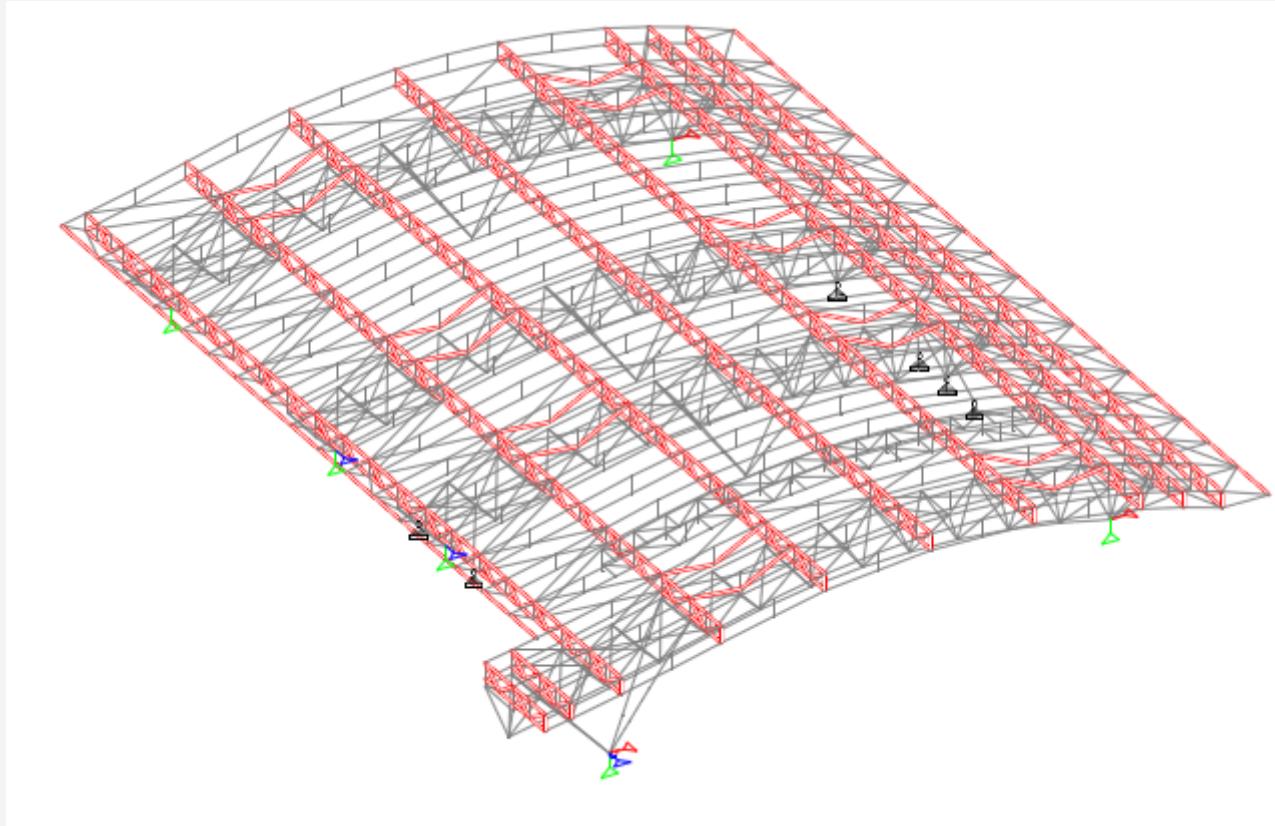
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Top flange level



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Horizontal load take down



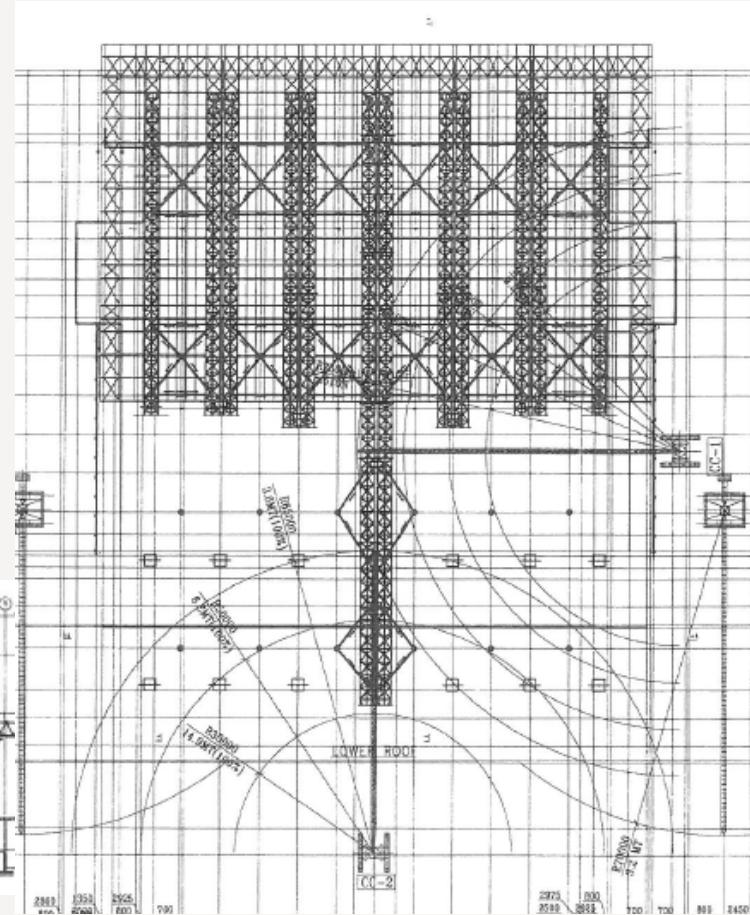
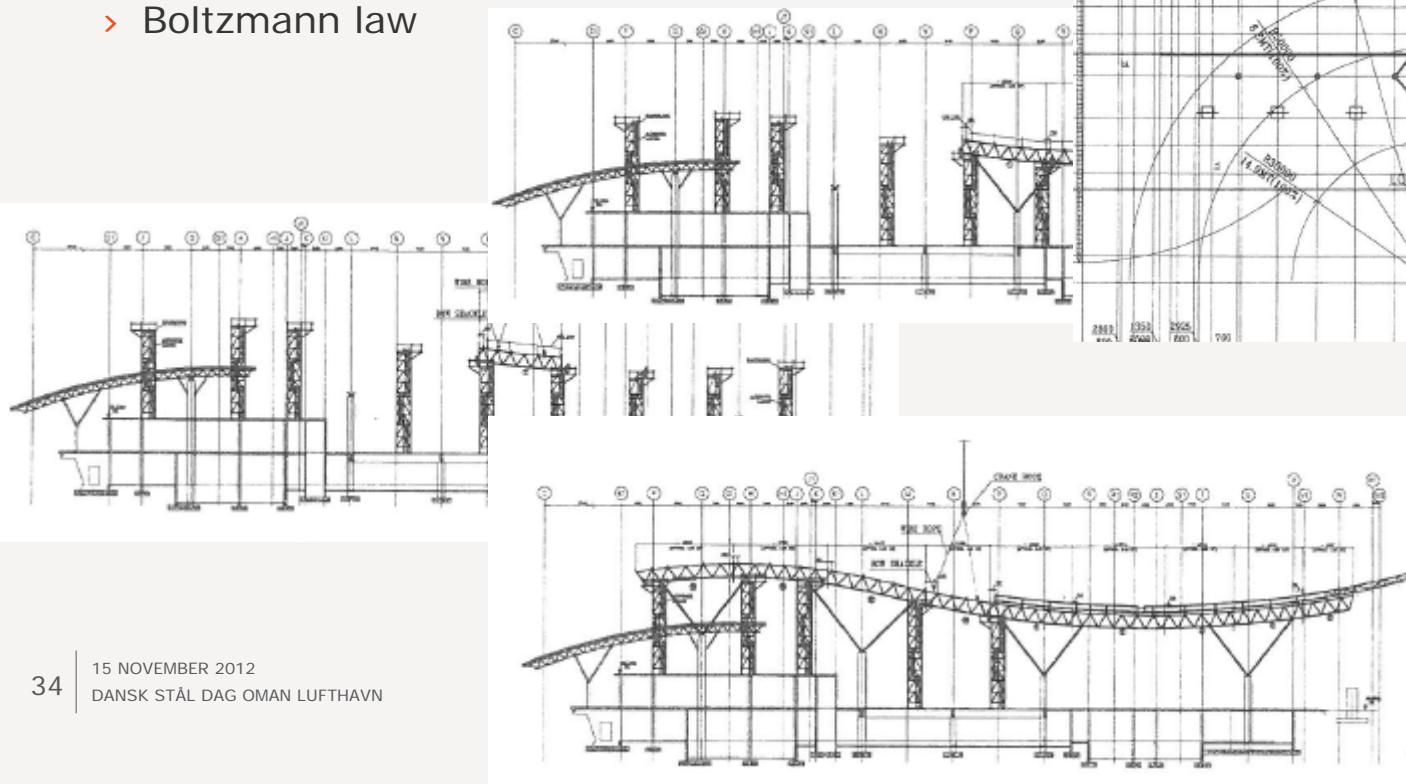
Fabrication

- › PTB Muscat is fabricated by Cimtas in Turkey
- › PTB Salalah is fabricated by Eversendai In UAE
- › COWI has performed factory audits.



Erection

- › Sequence of erection has been checked
- › Fixing the "elements" before welding
- › Sun radiation and temperture
 - › Boltzmann law



Boltzmanns law

Calculation for temperature due to solar radiation

Radiation energy of a subject surface as per Stefan-Boltzmann Law expressed as below:

$$q = \epsilon A \sigma T^4$$

Where:

q: Radiation Energy (Watts)

ϵ : Emissivity of the Surface.

σ : Stefan-Boltzmann Constant, $\sigma=5.6703 \times 10^{-8} \text{ W/m}^2\text{K}^4$

T: Absolute Temperature in Kelvins

A = area of the object

If a hot object is radiating energy to its cooler surroundings the net radiation loss rate can be expressed as below:

$$q = \epsilon \sigma (T_h^4 - T_c^4) A_c$$

Where:

T_h = hot body absolute temperature in Kelvin

T_c = Cold surroundings absolute temperature in Kelvin

A_c = area of the object (m^2)

Rearranging the above equation to calculate hot body absolute temperature as below:

$$T_h = [(q/\epsilon \sigma A_c) + T_c^4]^{0.25}$$

$$\begin{aligned} \text{The solar radiation in Oman} &= 226 \text{ kCal/m}^2/\text{hr} \\ &= 263 \text{ Watts/m}^2 \end{aligned}$$

Hence $q/A_c = 263 \text{ Watts/m}^2$

Cold surrounding temperature = $50^\circ\text{C} = 323^\circ\text{K}$

(1) Hot body temperature of Iron, dark gray surface

Emissivity Coefficient = 0.31 (refer attachment)

$$T_h = [(q/\epsilon \sigma A_c) + T_c^4]^{0.25}$$

$$T_h = [(263/(0.31*5.6703 \times 10^{-8}))+323]^0.25$$

$$T_h = 400.9^\circ\text{K} = 128^\circ\text{C}$$

(2) Hot body temperature of iron (painted)

Emissivity Coefficient = 0.96 (refer attachment)

$$T_h = [(263/(0.96*5.6703 \times 10^{-8}))+323]^0.25$$

$$T_h = 354^\circ\text{K} = 81^\circ\text{C}$$

(3) Hot body temperature of concrete

Emissivity Coefficient = 0.85 (refer attachment)

$$T_h = [(263/(0.85*5.6703 \times 10^{-8}))+323]^0.25$$

$$T_h = 354^\circ\text{K} = 84.5^\circ\text{C}$$

(4) Hot body temperature of rubber

Emissivity Coefficient = 0.91 (refer attachment)

$$T_h = [(263/(0.91*5.6703 \times 10^{-8}))+323]^0.25$$

$$T_h = 355.5^\circ\text{K} = 82.5^\circ\text{C}$$

Conclusion:

From (1) and (2) above, the hot body temperature unpainted iron is 128°C and painted steel is 81°C . In accordance with Section 32.3.3.5, ER, the maximum metal temperature exposed to direct sun is 65°C .

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Status



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Status

