DELIVERING ICONIC URBAN INFRASTRUCTURE
LESSONS FROM HONG KONG WKT & OTHER GLOBAL PROJECTS

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Aurecon is an engineering, design and advisory company.

We bring vital **engineering** experience, technical capability, and **design** expertise to collaborate with our clients to shape a better future.
Pushing the boundaries of span, lightness and elegance

Marvel Stadium, Melbourne
Wembley Stadium, London
Melbourne Cricket Grounds
Qatar Science & Technology Park, Doha
West Kowloon Terminus, Hong Kong
Etihad Stadium, Melbourne
Margaret Court Arena
5 Martin Place, Sydney
Spotless Stadium, Sydney
5 Martin Place, Sydney
A development made possible through engineering-led design
Wembley Stadium, London
West Kowloon HSR Terminus, HK
West Kowloon HSR Terminus, HK
West Kowloon HSR Terminus, HK

Aedas
(lead architect)

Leighton-Gammon Joint Venture (LGJV)
(main contractor)

AECOM / Buro Happold
(design engineer)

Alfasi / Aurecon HK
(steelwork contractor, erection analysis engineer, temp works designer)

MTR Corporation
West Kowloon Terminus Roof: an Architecturally-led Design

Courtesy of Aedas
Challenges
West Kowloon HSR Terminus, HK

**Key Dimensions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>175m</td>
</tr>
<tr>
<td>Width</td>
<td>40~70m</td>
</tr>
<tr>
<td>Primary truss span</td>
<td>50m</td>
</tr>
<tr>
<td>Cantilever truss</td>
<td>20m</td>
</tr>
<tr>
<td>Column</td>
<td>up to 45m</td>
</tr>
<tr>
<td>Roof rise</td>
<td>25m</td>
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</tbody>
</table>

Approved by LGJV

**Diagram of West Kowloon HSR Terminus, HK**
Site area: 11 hectares or about 15 football fields

Green landscaping at rooftop

Roof area: 1.5 hectares or about two football fields

Roof is held laterally by two stiff horizontal frames

All supported on inclined mega columns

Roof tonnage: 10,000 tonnes (structural steel and concrete)
Concurrent Construction of Roof and Basement Structures
Stable

Unstable
When there are 8 UNSTABLE desks and more books are to be added...
Drift of Inclined Mega Columns

Roof horizontal drift towards south

“P-δ Effect”
Temperature
Lateral load is 5 times higher than the spike of the worst case typhoon & thermal event!

Lateral load to be supported by a typical Temporary Tower
Prefabricated assemblies

Stability system

Temporary supports and jacking stools

3D scan at fabrication yard
Architecturally-led vs Engineering-led Designs
Western Sydney Stadium

Design for speed in fabrication and erection
Sydney Harbour Bridge Approach
Wind Engineering
Design for speed of fabrication and construction
Macau Eiffel Tower, Macau

48% scale "faithful" replica of the Eiffel Tower in Paris

h = 324m

h = 155m
Digital Replication: Macau Eiffel Tower
Structural engineering and beauty

Gustave Eiffel: French Engineer 1832 – 1923

“... the tower would symbolise, not only the art of the modern engineer, but also the century of Industry and Science in which we are living....”
"For my part, I believe that the Tower will possess its own beauty. Are we to believe that because one is an engineer, one is not preoccupied by beauty in one's constructions, or that one does not seek to create elegance as well as solidity and durability."

*Le Temps* newspaper, 14 Feb of 1887
Modern high-rise buildings made possible by technology of steel and lifts

Gustave Eiffel’s 300m tower (1889) using pre-assembled iron components (*doubling the height of the previously tallest Washington Monument*) showed viability of tall metal structures.
Sagrada Familia, **Antoni Gaudí**
Back to “Master Builder” model of engineering?