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Bringing ideas to life

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An unlikely story

Client

CITY OF MELBOURNE

VICTORIA

Design team

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COX

OCULUS

ELECTRO LIGHT

architecture & access

Builder

FITZGERALD

2

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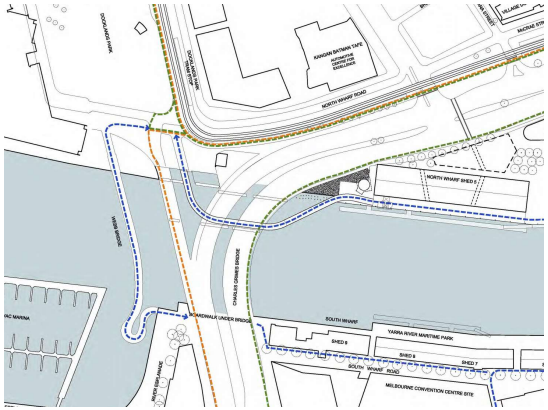
An unlikely story

The brief:

- **Linking Docklands - Connections**



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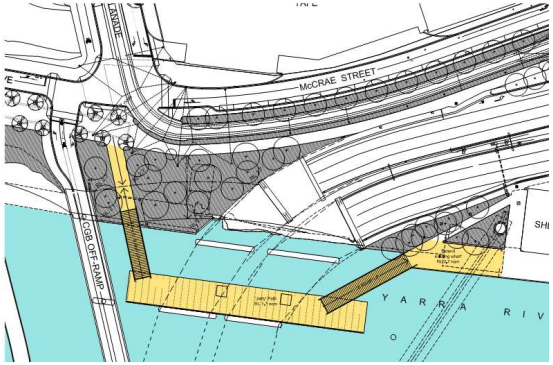
The brief



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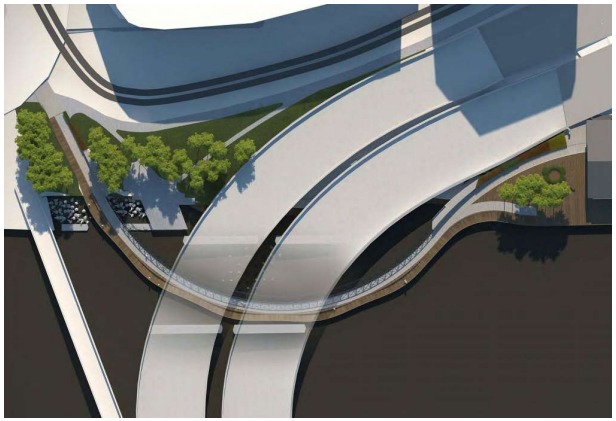
The idea



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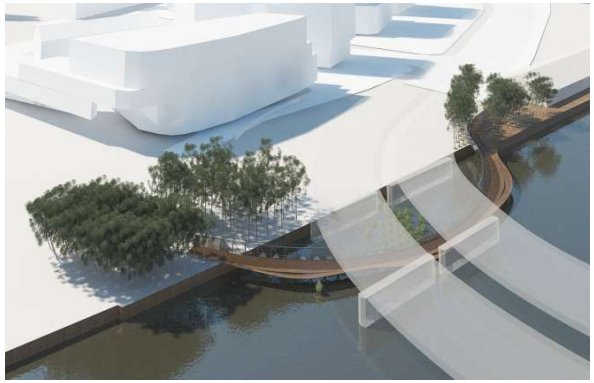
An unlikely story

The idea



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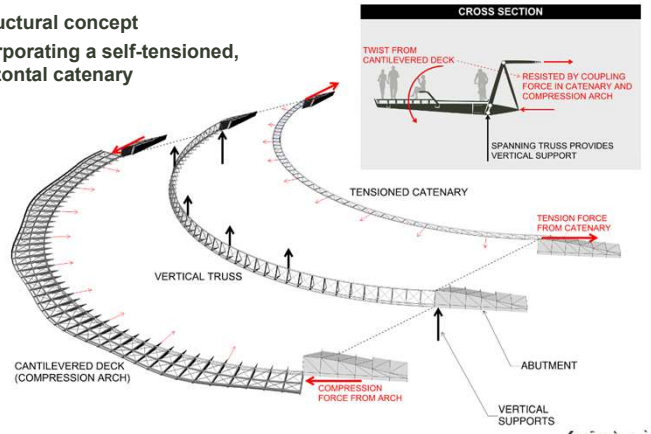
The structural concept

- **Incorporating a self-tensioned, horizontal catenary**



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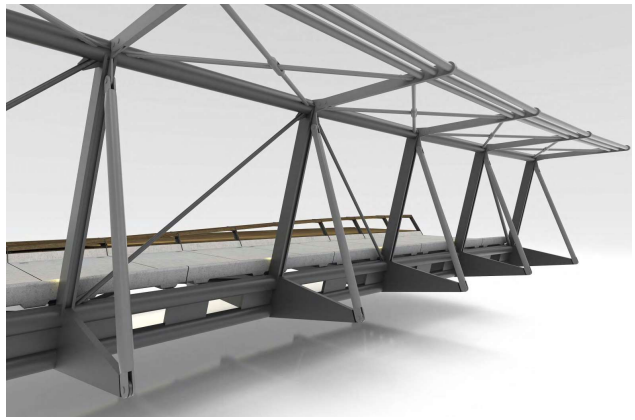
An unlikely story



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The intersection of architecture and engineering

- **The architecture is the structure**
- **Every element is there for a reason, nothing more, nothing less**
- **The form follows the flow of forces throughout the structure**
- **The finishes are the structure, robust in nature**
  - Steel truss
  - Concrete abutments
  - Separation of pedestrians and cyclists by using different materials: timber & concrete

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Selling the dream!

- Novel solution
- Technically challenging
- Overcome very large tension forces
- Dynamically sensitive
- Very tight constraints

Sell it within Aurecon

- Do enough design to get a level of comfort

Sell it to the client

- It can be built and it will be economical

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An unlikely story

Success

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The result

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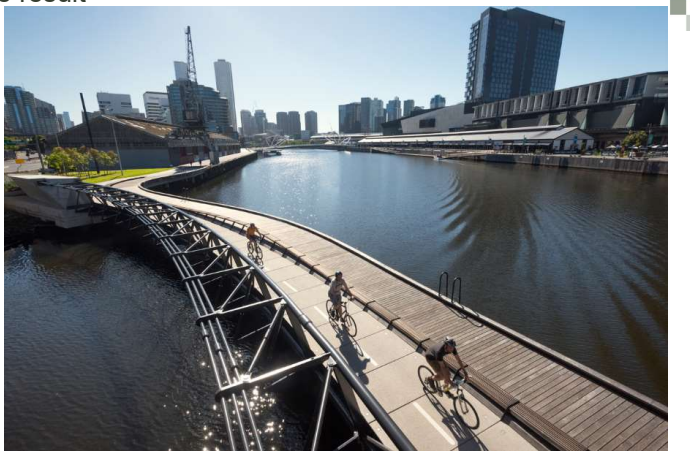
The result



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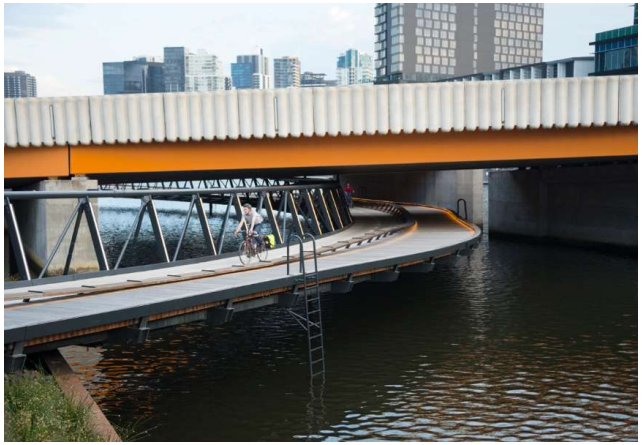
The result



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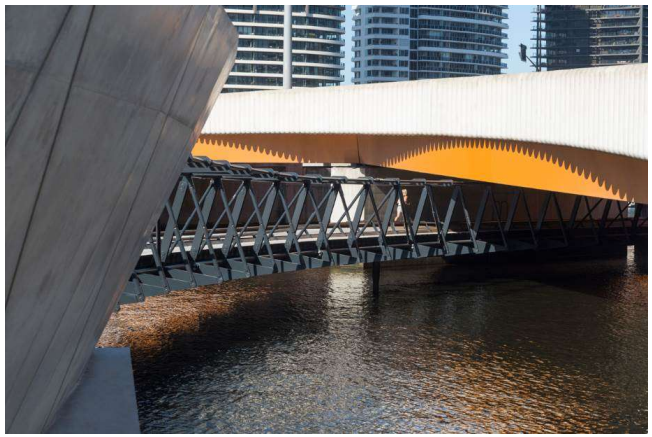
The result



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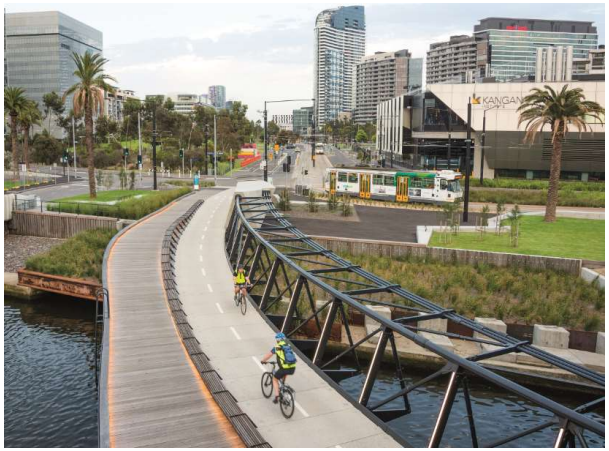
The result



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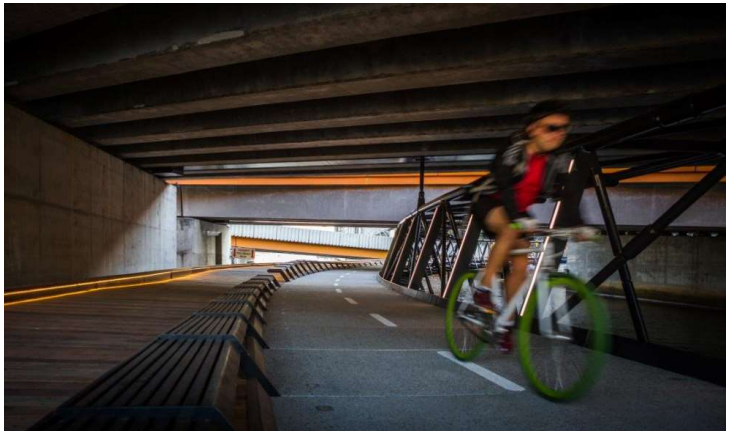
The result



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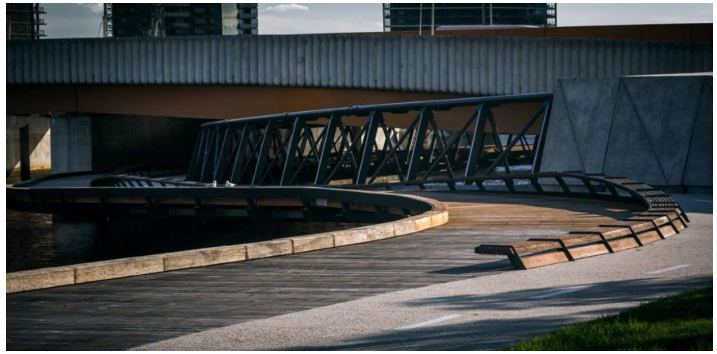
The result



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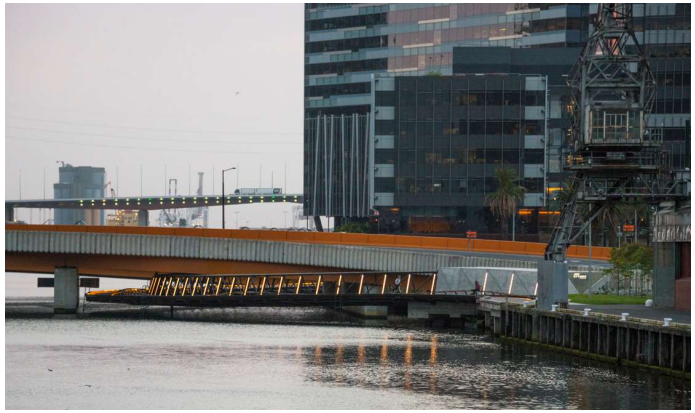
The result



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Stakeholders

City of Melbourne and State Government

Parks Victoria

Melbourne Water – river levels

Places Victoria

Bicycle Victoria

Public

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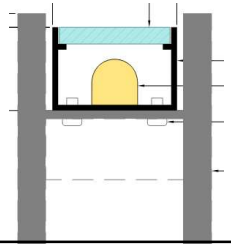
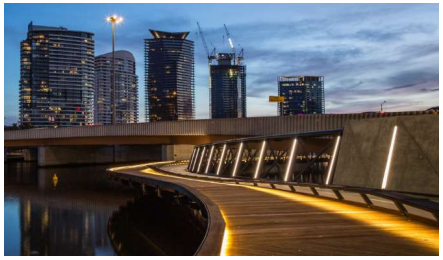
The intersection of architecture and engineering

Subtle lighting details

- **Statutory lighting is achieved with the specialist lighting**
- **Lighting assembly nestled into the steel structure**
  - Very clean design
  - Protected from damage





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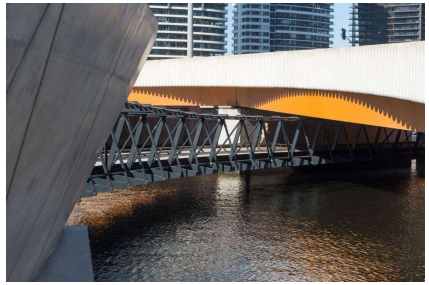
Threading the eye of the needle

- **Geometry is king!**
- **Below the road bridge with headroom for cyclists**
- **Rise up at each end to match the promenade**
- **Above a 1 in 10 ARI flood event**
- **Minimise impact on river levels during floods**
- **Perfectly circular in plan**
- **Wheelchair friendly**
- **Node alignment between bridge beams**



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A few statistics

Total length = 120m
Longest span = 40m
Width = 5m to 6m (cantilevered)

Lightweight – 2.5kPa steel weight (3.7kPa including decking)

Supports 5kPa ultimate load, up to 8kPa flood load.

High strength steel: 480MPa for tension members (5000kN tension force), up to fy = 1080MPa for localised, highly stressed areas.

85MPa concrete used in the abutments.

7 tuned mass dampers used to limit dynamics.

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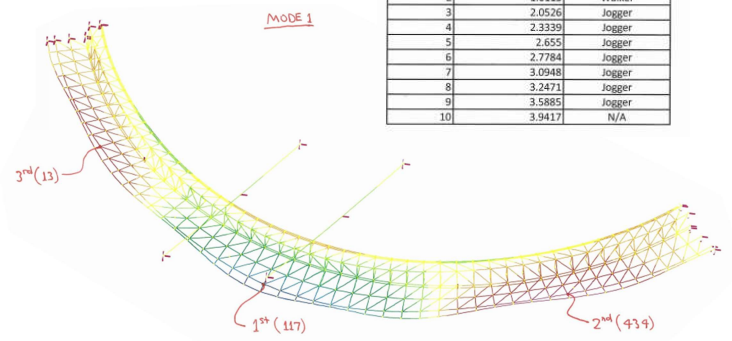
Dynamics

- **Single person walking**
- **Single person jogging**
- **Crowd walking**

Natural Frequency

Mode No.	Frequency	Critical Force Type
1	1.5097	Walker
2	1.6115	Walker
3	2.0526	Jogger
4	2.3339	Jogger
5	2.655	Jogger
6	2.7784	Jogger
7	3.0948	Jogger
8	3.2471	Jogger
9	3.5885	Jogger
10	3.9417	N/A



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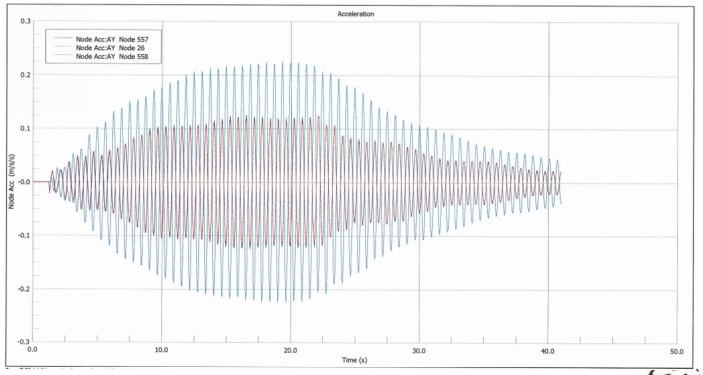
Dynamics

Time history analysis
- Strand7



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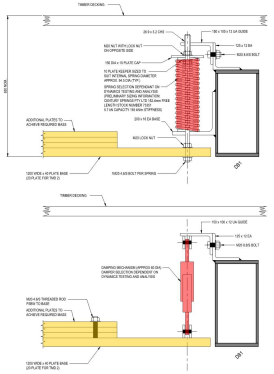
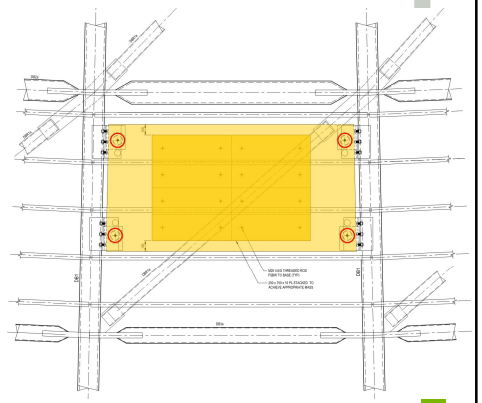
Dynamics

7 tuned mass dampers used to limit perception of movement





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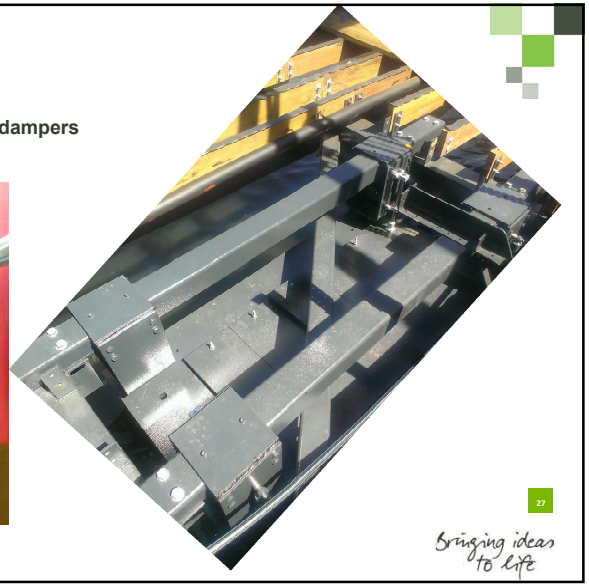
Dynamics

Installed tuned mass dampers



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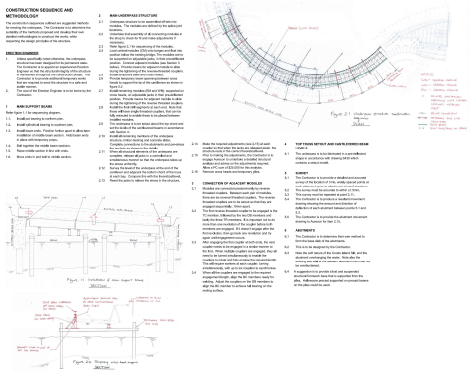
Construction

Selling it to the builder

- **How to build it…**



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Construction

Fabricated off site in assembled modules.

7 joining members to match adjacent panel.

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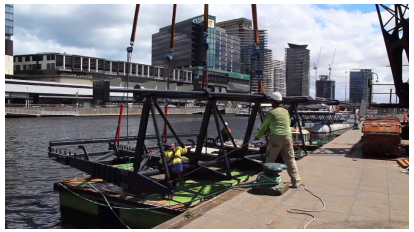
Construction

Transported to site and re-assembled

Loaded onto a barge



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Construction

Floated down the river

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Construction

Lifted into position

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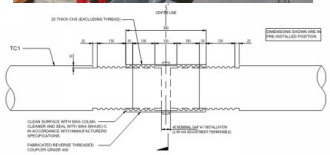
Construction

Joined to adjacent modules via threaded couplers



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The opening

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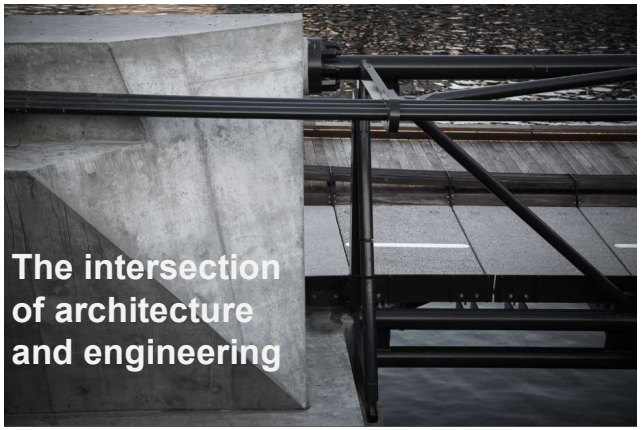

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