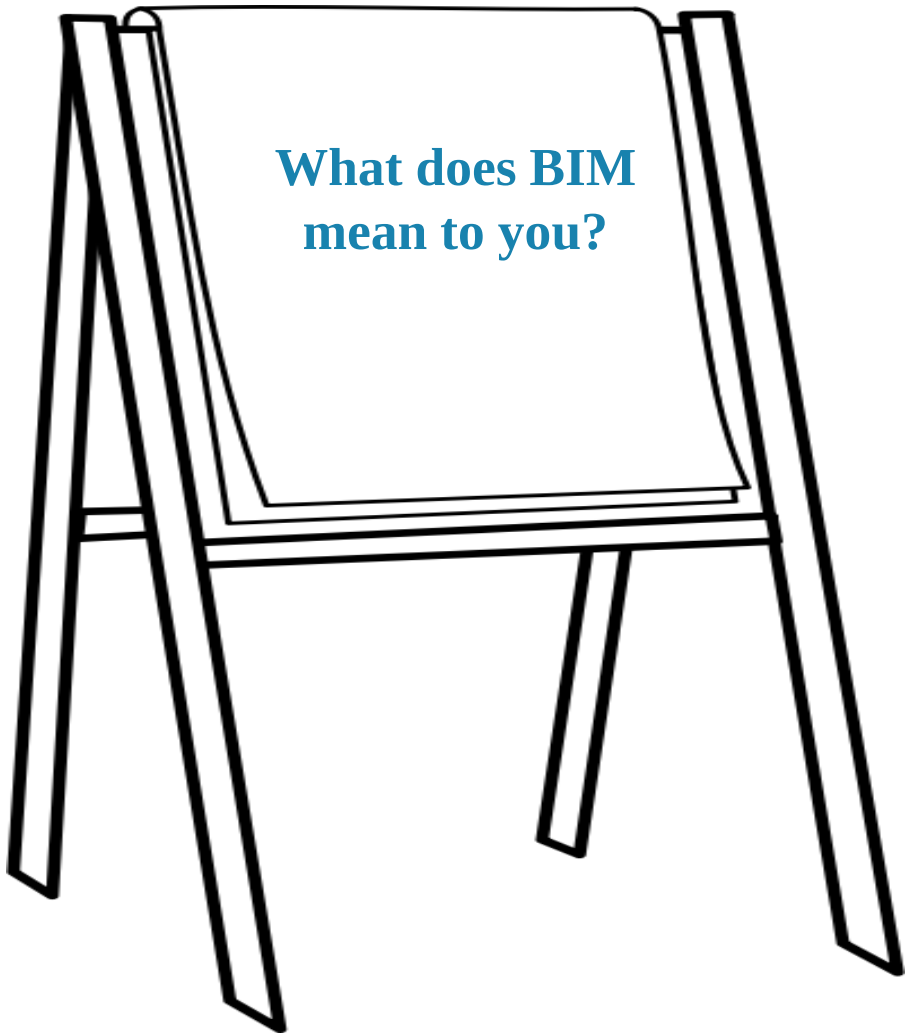
BIM In Infrastructure - Challenges & Solutions

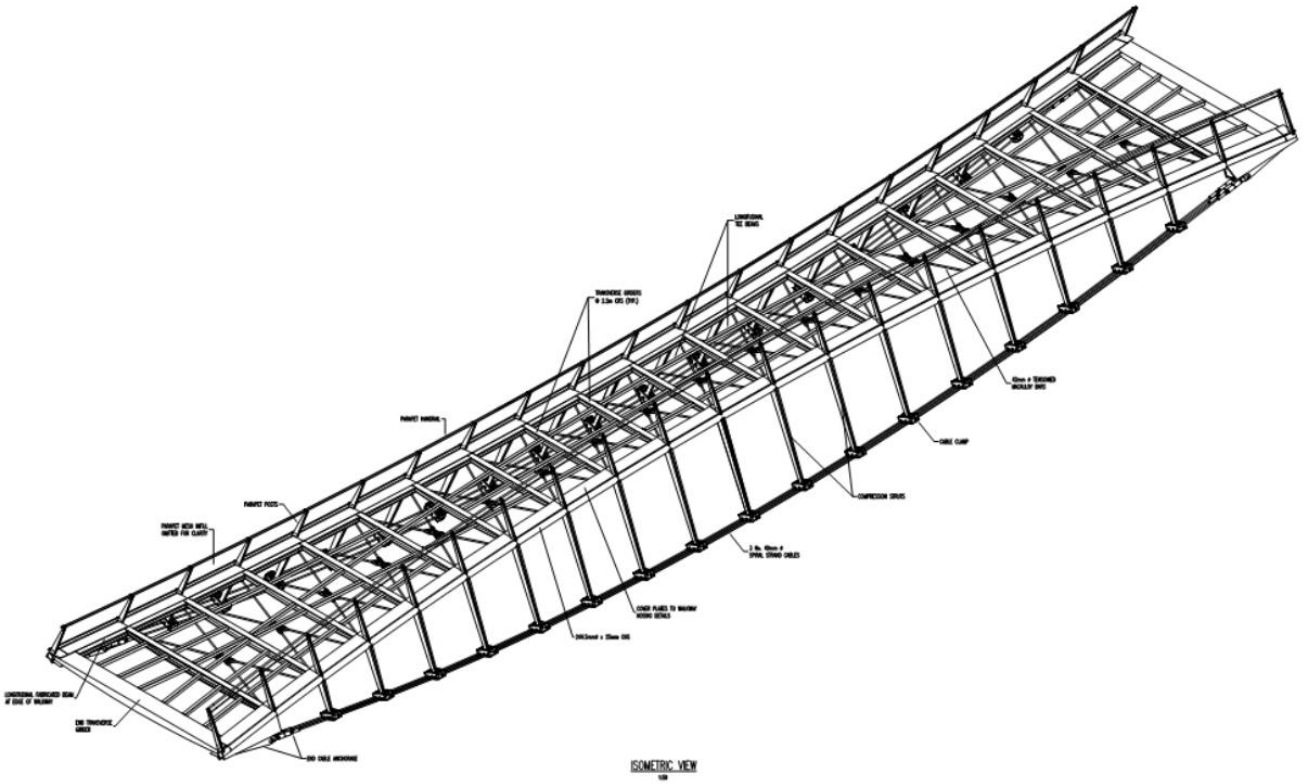
Robert Ryan

ARUP

BIM In Infrastructure – Challenges & Solutions



BIM In Infrastructure – Challenges & Solutions



Definition of BIM

✗ BIM is a software

✗ BIM is a 3D model

✗ BIM saves time and money

✓ BIM is a process

✓ BIM uses 3D models as tools

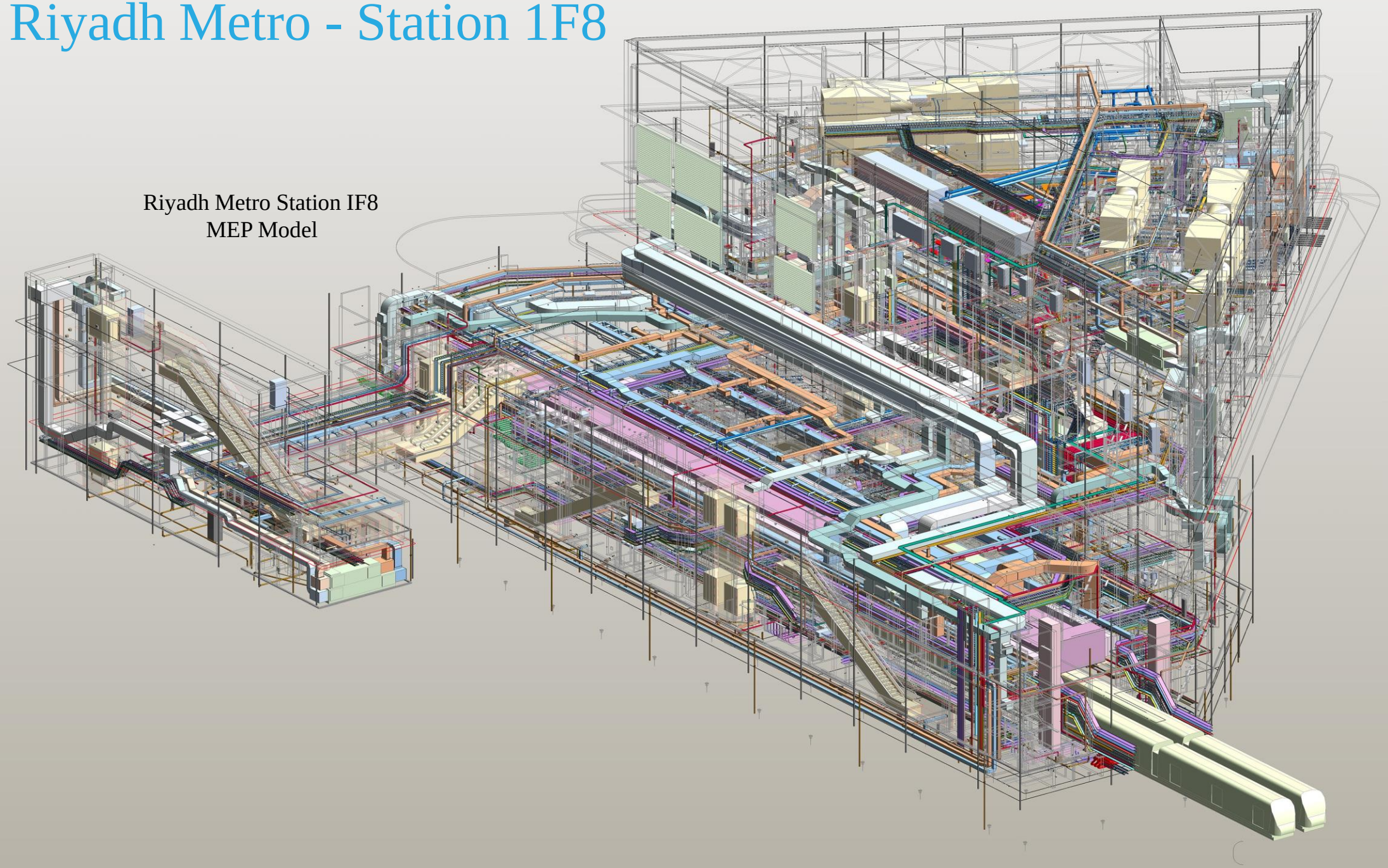
✓ BIM standardises mature and well defined process of project management

✓ BIM has a potential to achieve significant savings in time and money

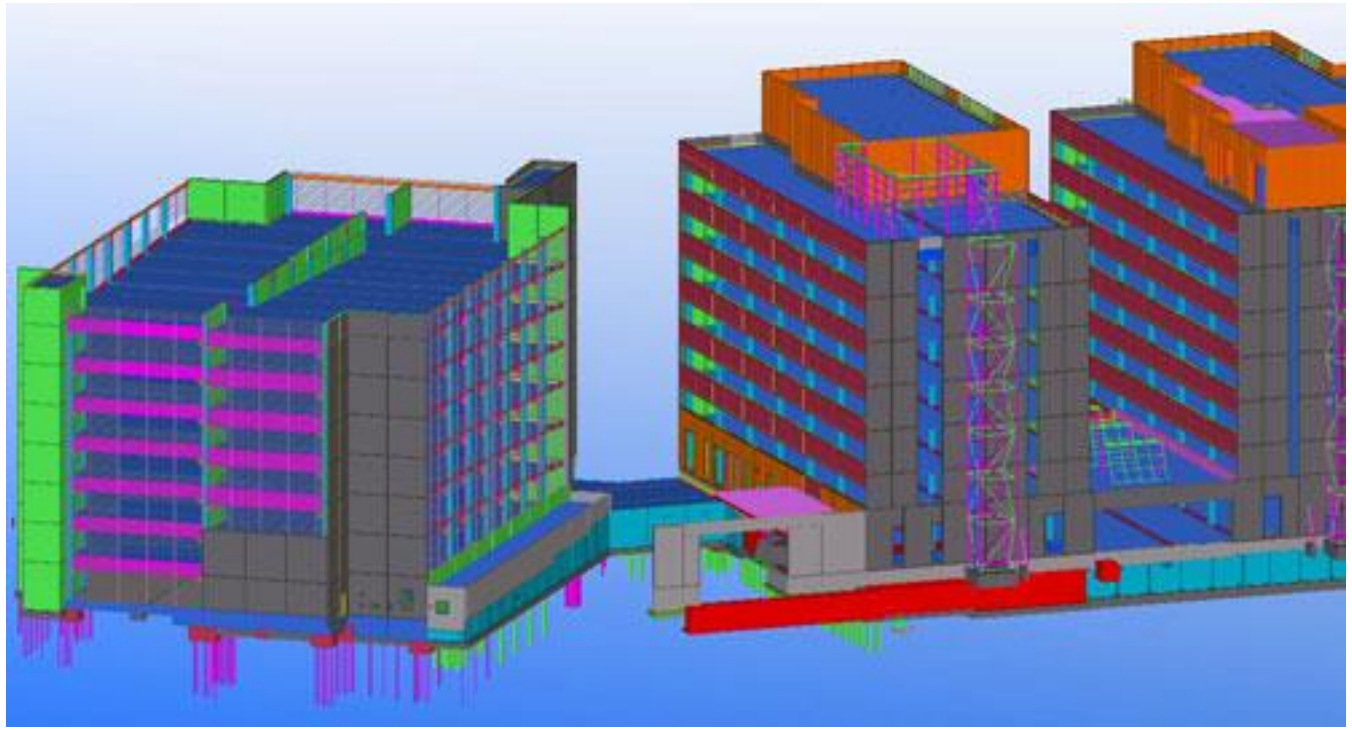
Efficient integration of models, design tools and data to increase collaboration and efficiency

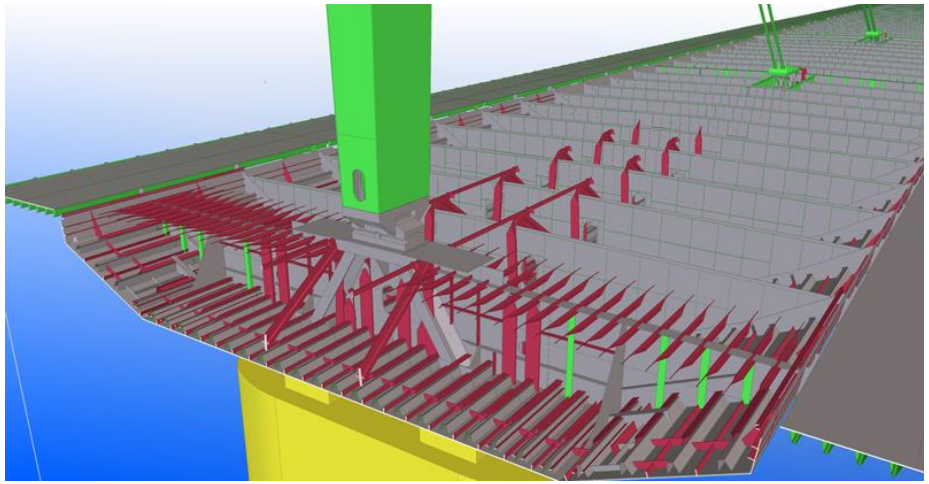
Riyadh Metro - Station 1F8

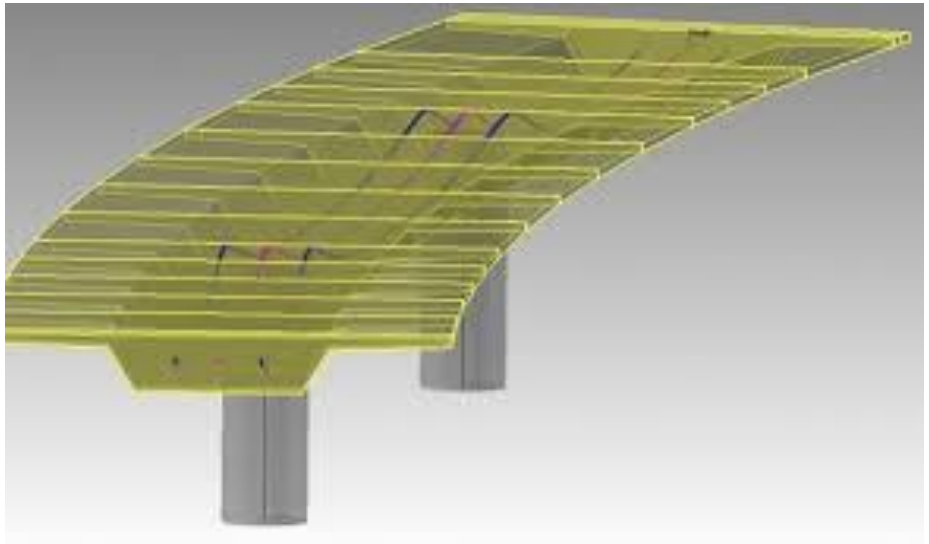
Riyadh Metro Station IF8
MEP Model



The Challenges



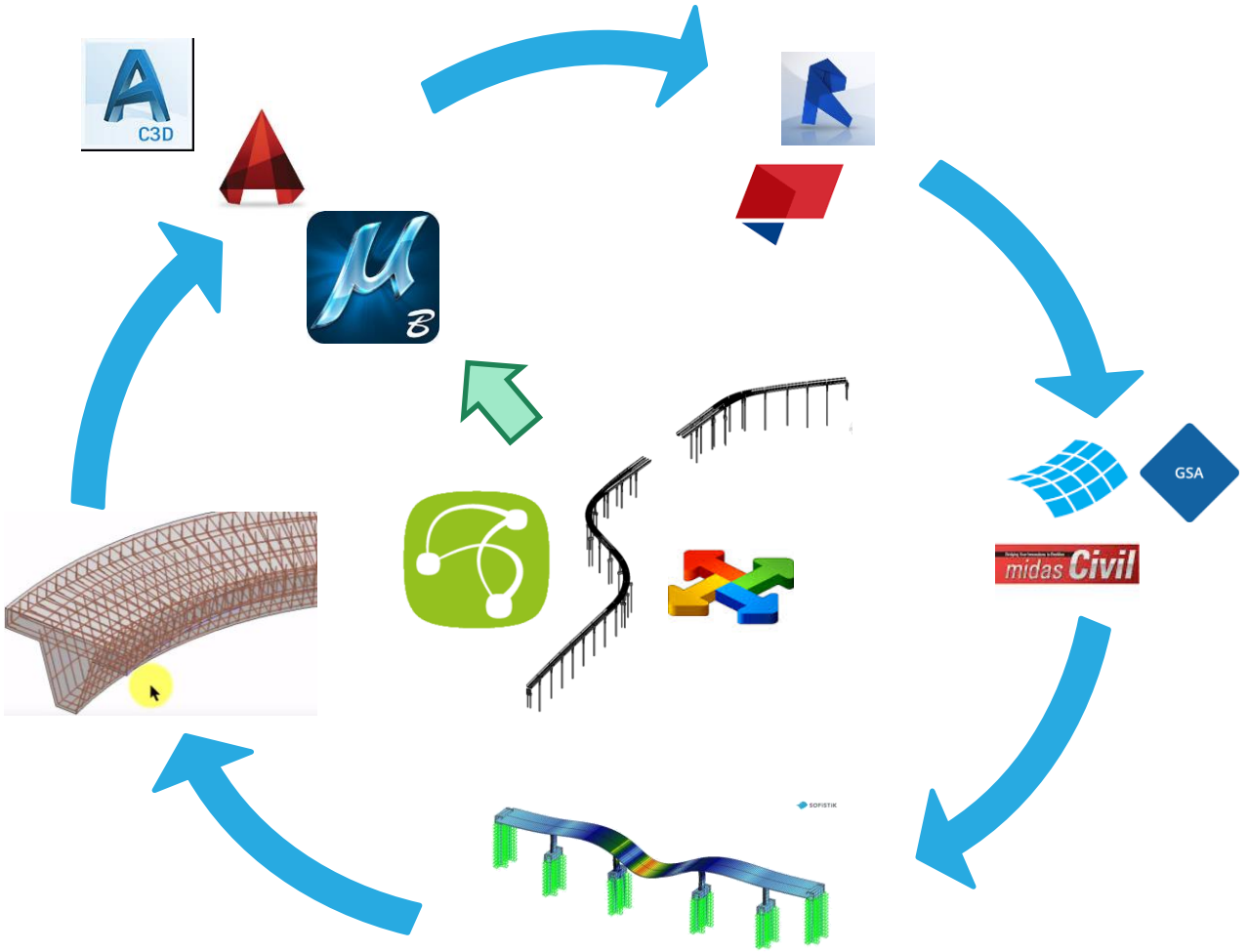




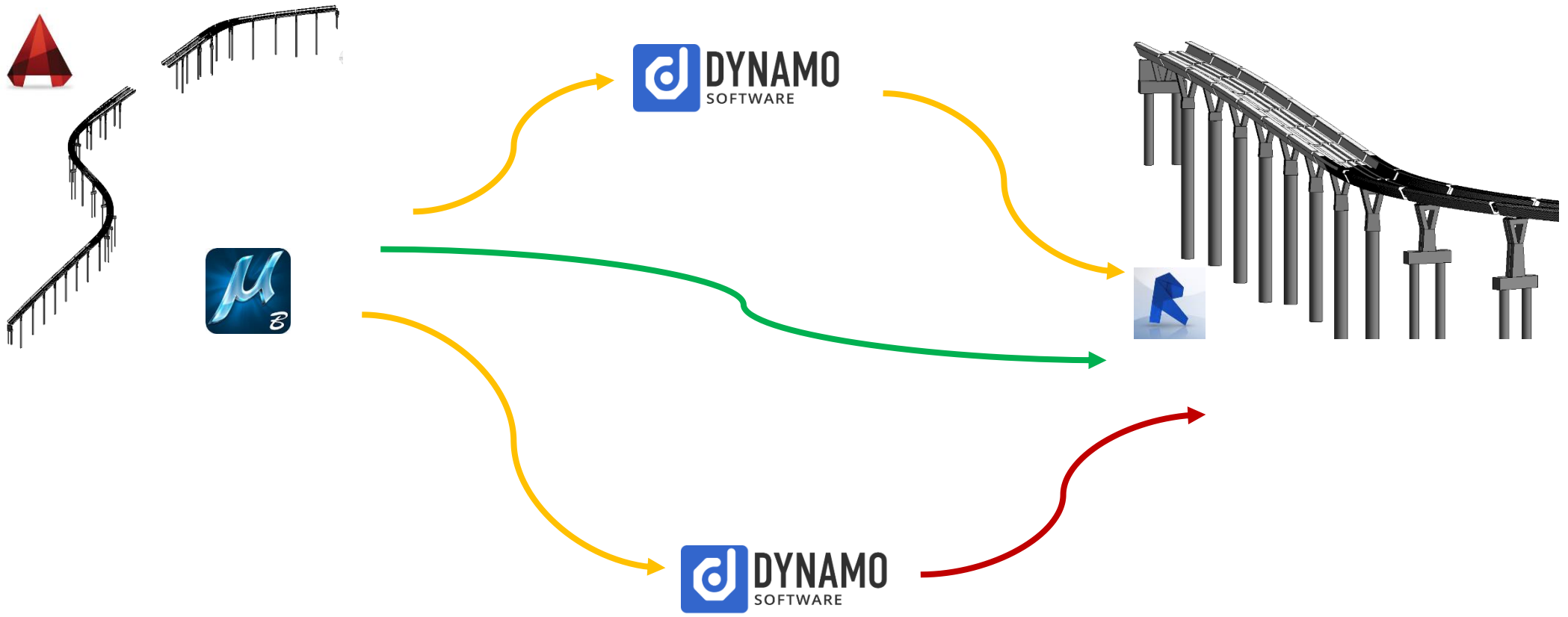
The Challenges

- Historic use of specialist software across disciplines
- Interoperability of software
  - Bridge
  - Rail
  - Highways
  - Geotechnical
- Difficulties handling geometrical variations over the length of linear alignment
- Tools maturity for infrastructure projects lower than buildings
- Reluctance of specialist disciplines to embrace new software

BIM Virtual Cycle



Alternative Software

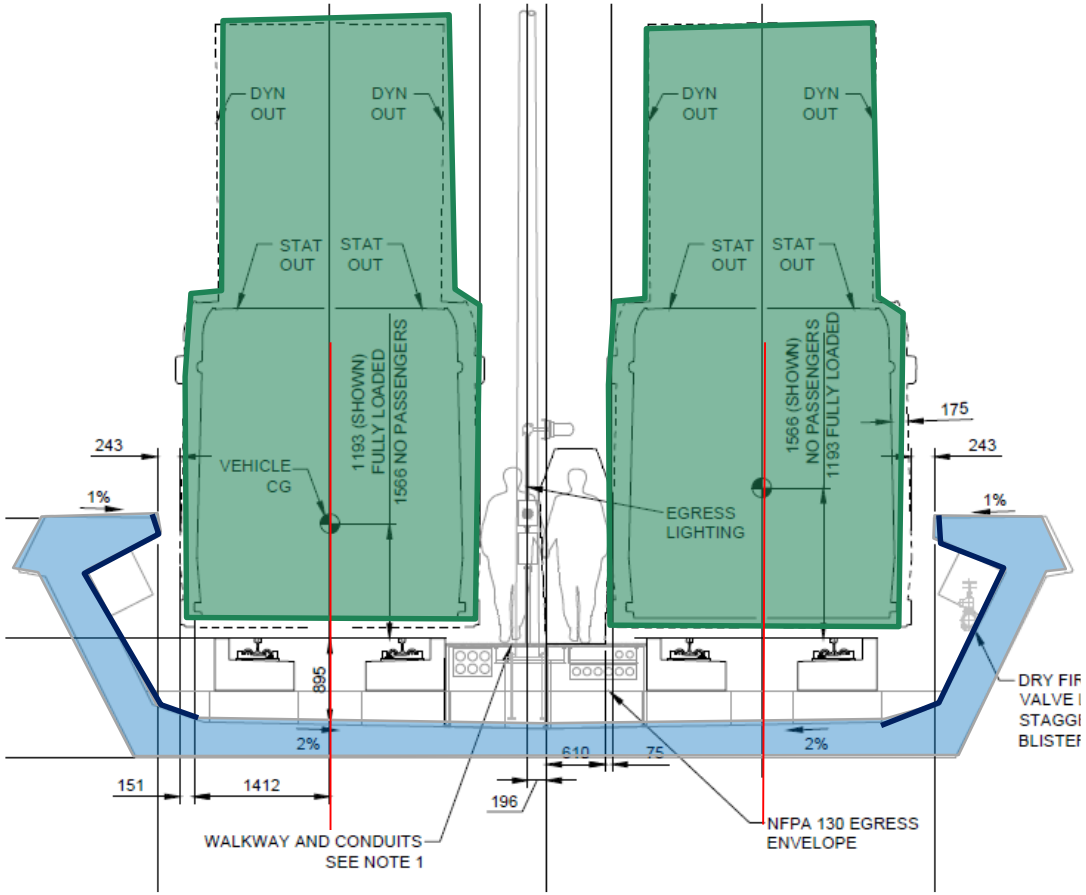


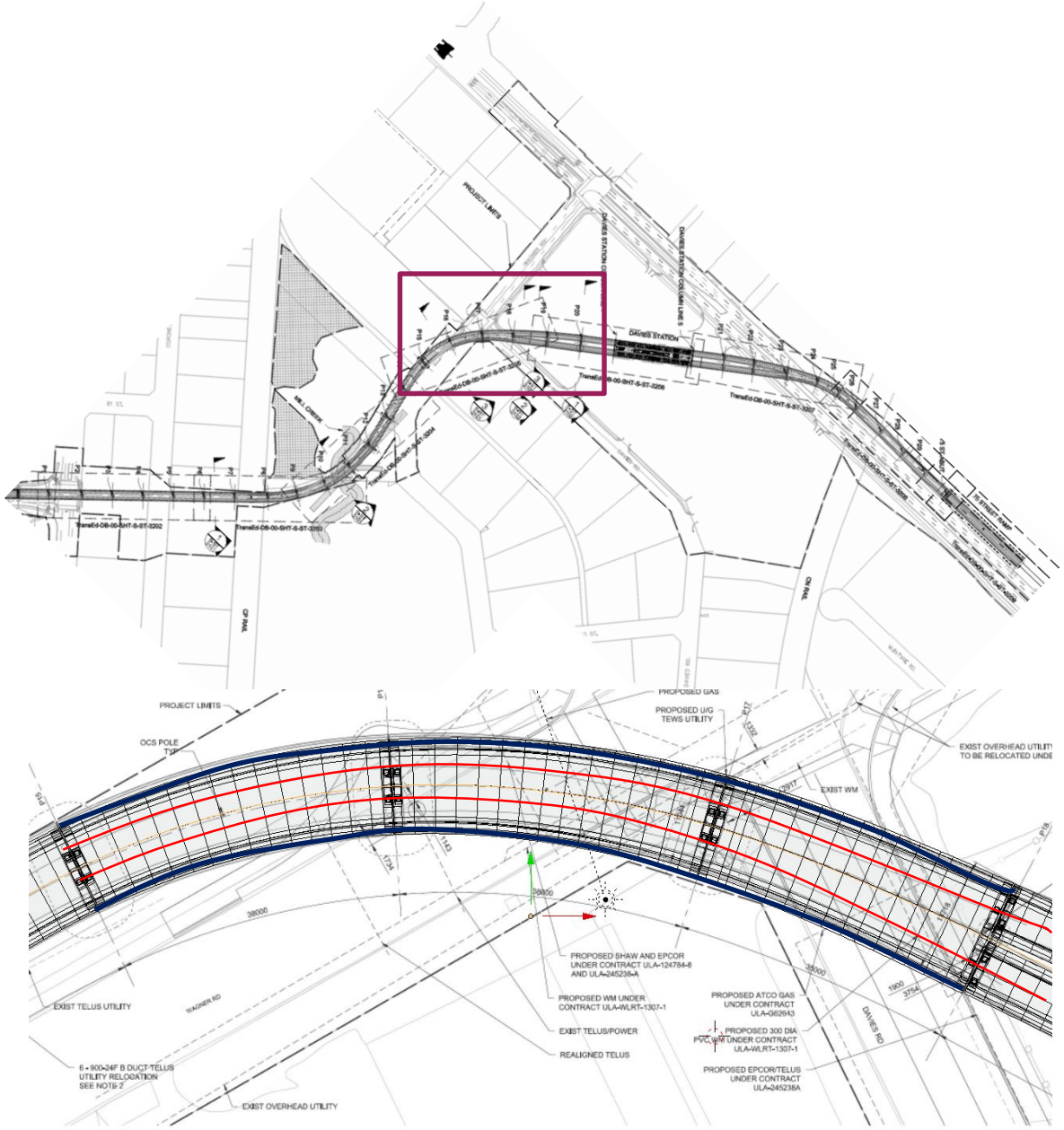
Edmonton LRT, Canada

Edmonton Light Rail

- Over 1.3km of Elevated Guideway
- 38 no. Spans of varying geometry (length, width, radius)
- 36 no. Piers of varying height
- Complex rail alignment

Complex Geometry





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Edmonton LRT. Davies Elevated Guideway

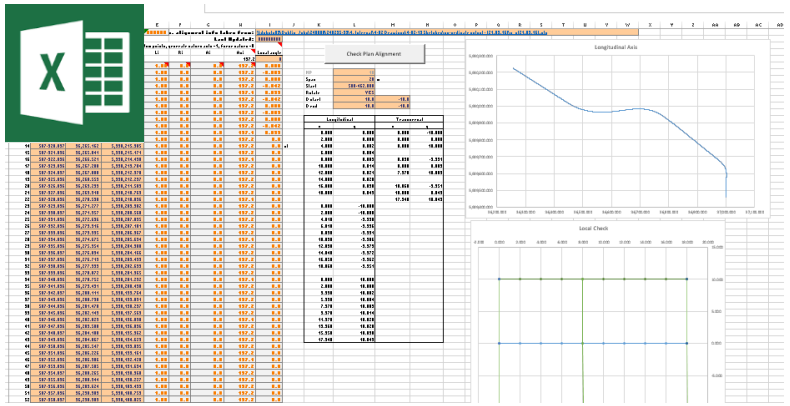
Challenges:

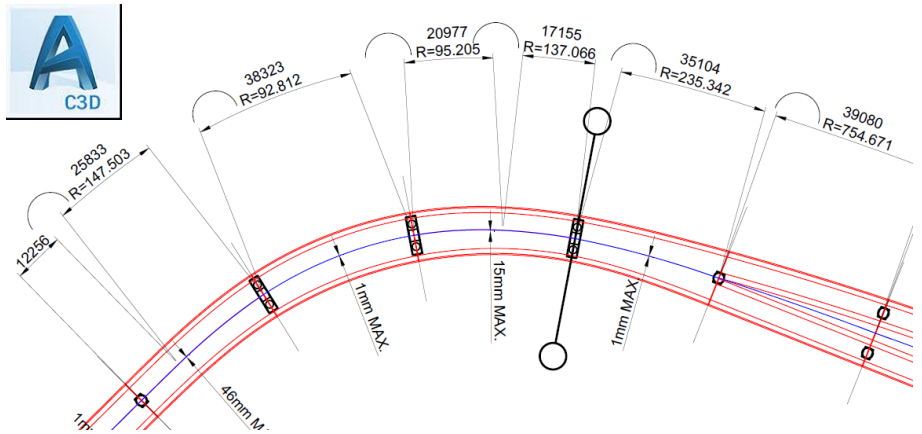
- Difficulties with parametric curved alignment
- Link between 3D Revit model and analysis model in Midas Civil

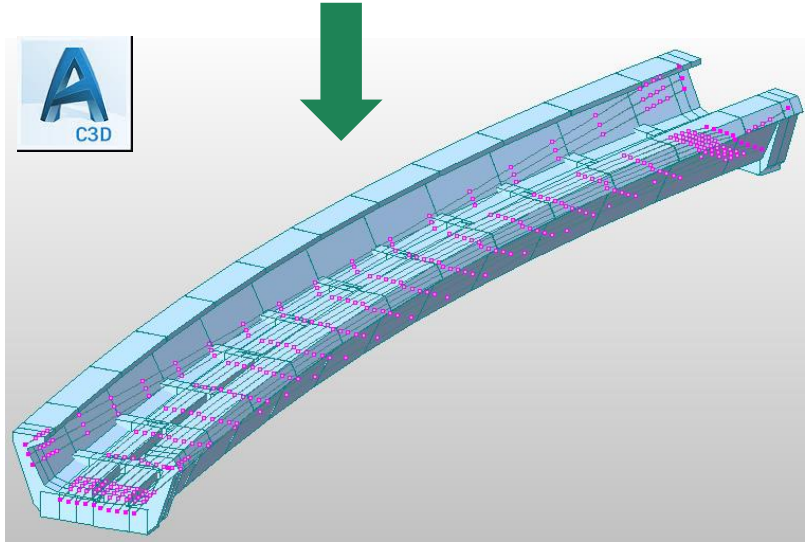
Approach:

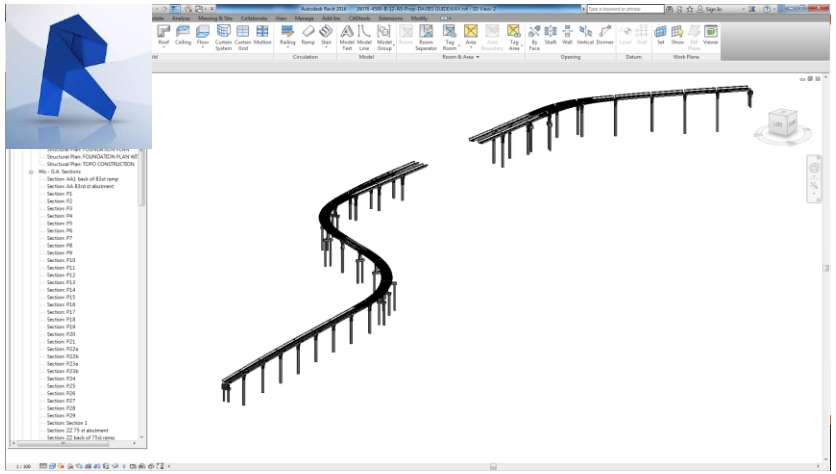
- Set up model in C3D using rail envelope as input data.
- Set up a series of assemblies within C3D to model the deck form and run through corridor matching the rail alignment
- Import deck into Revit and link to Piers modelled parametrically with Revit Families
- Ground profiles set up within Revit to model foundation depths
- Import alignment control points Excel for Structural model Generation
- VBA coding to generate analysis model in Midas Civil

BIM Workflow









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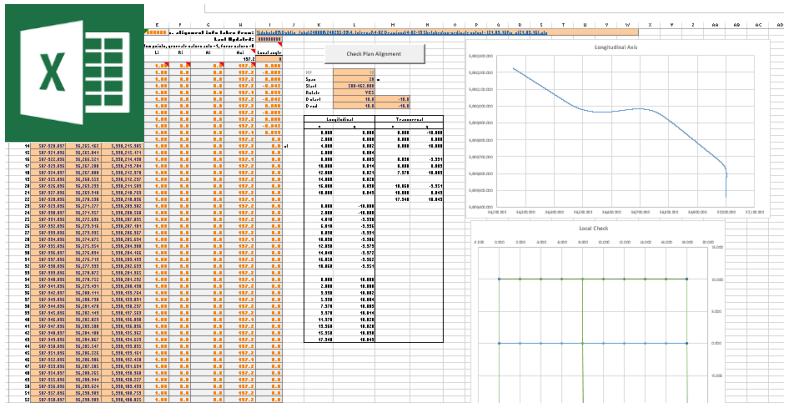

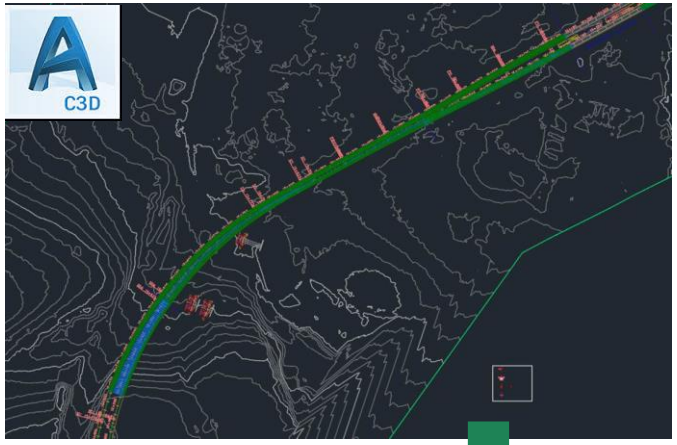

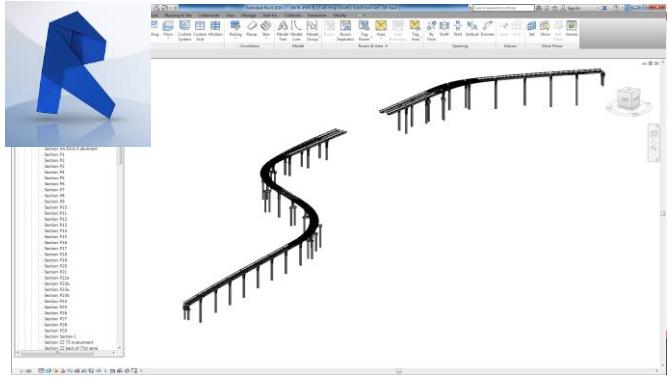

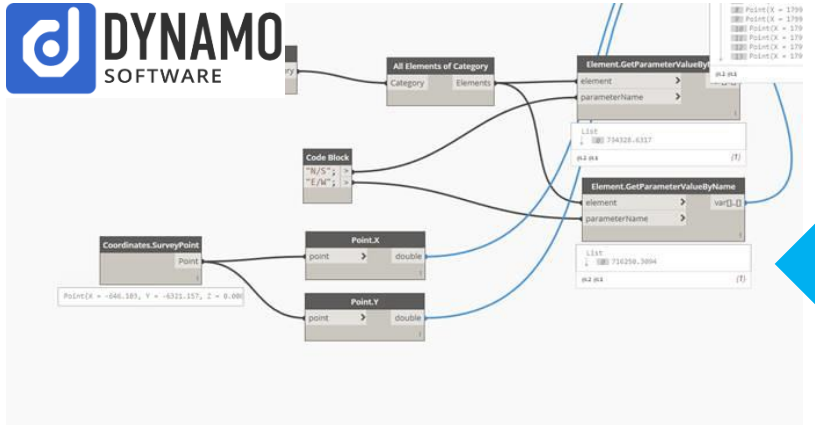

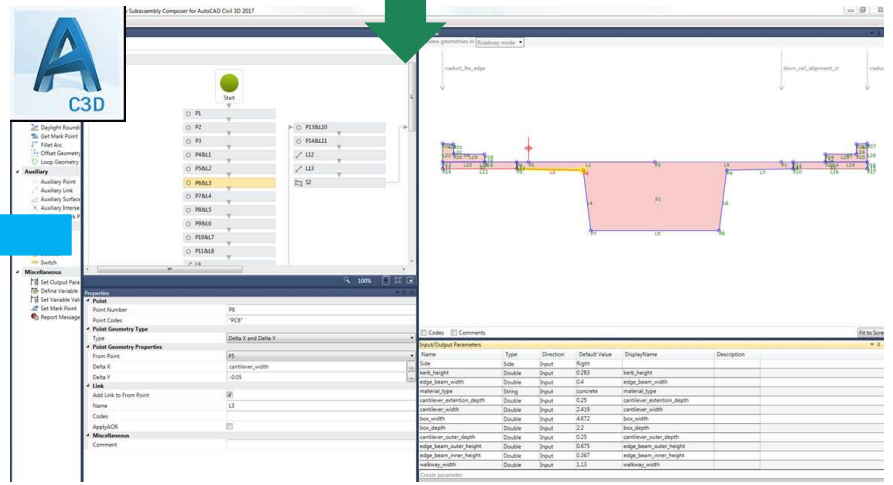

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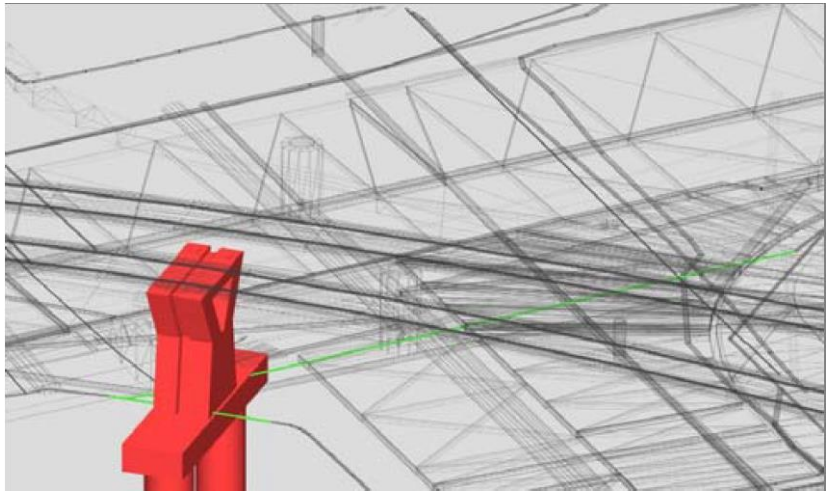
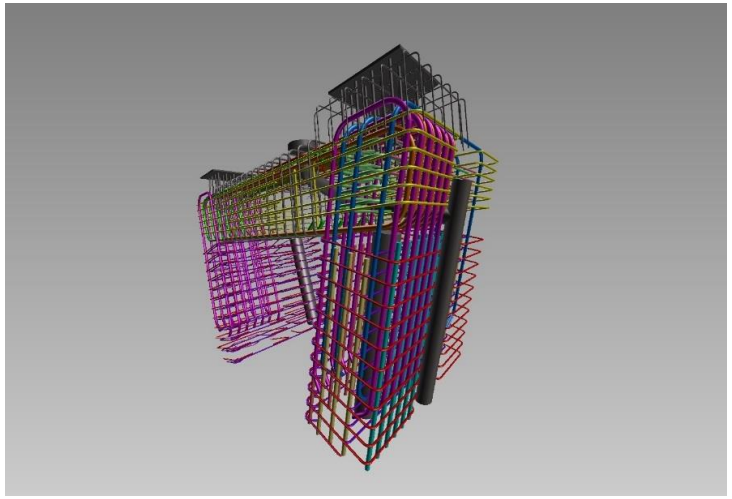
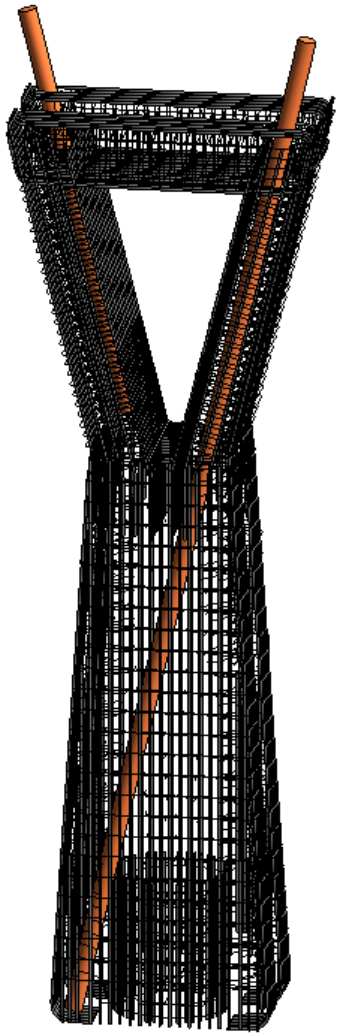
Modelling for Visualisations

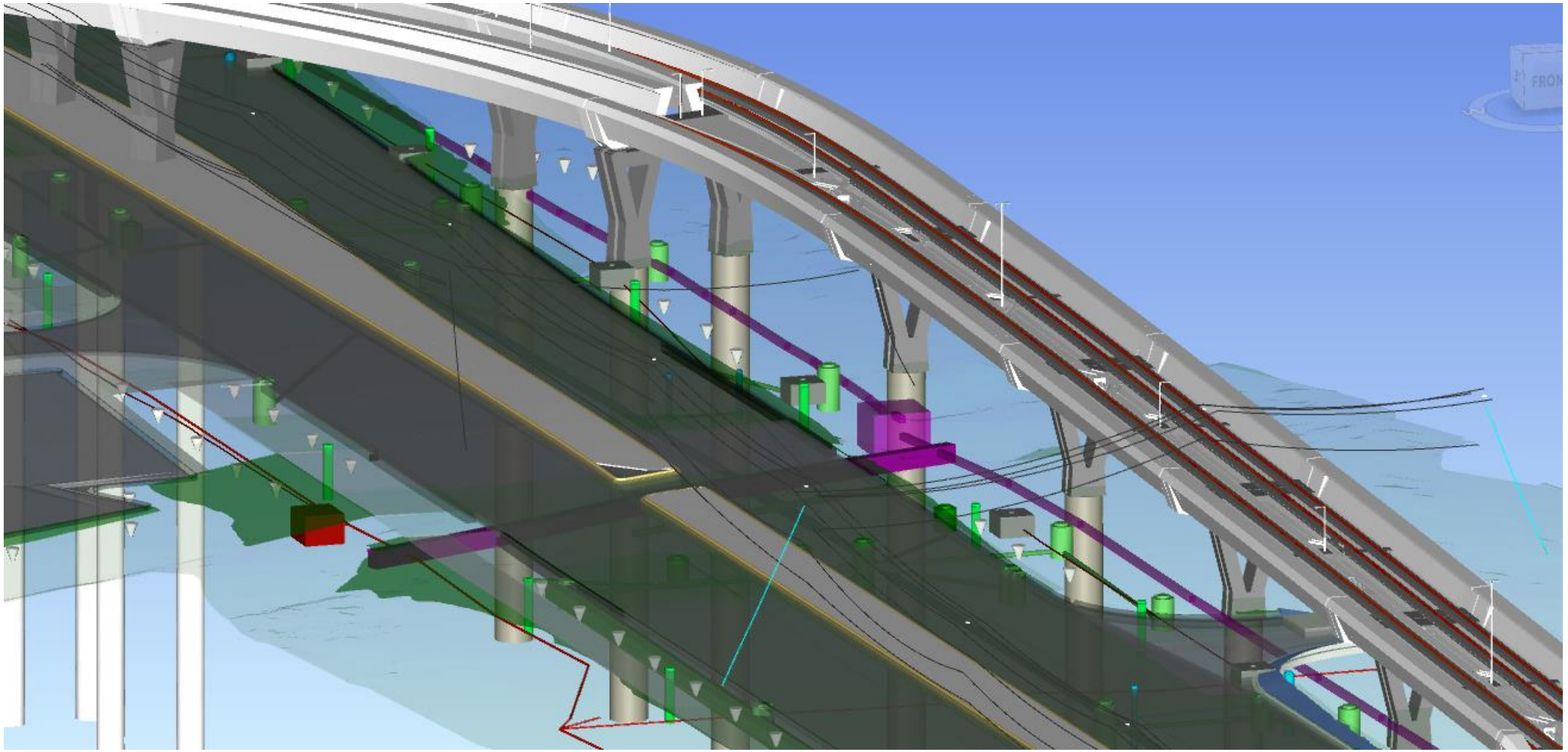
- Designers get a better understanding of their design
- Design teams have a better understanding of all the project challenges
- Contractors should be able to build more efficiently using the model
- Clients can fully visualise the design development
- Clash detection capabilities allows early identification of constraints using Navisworks



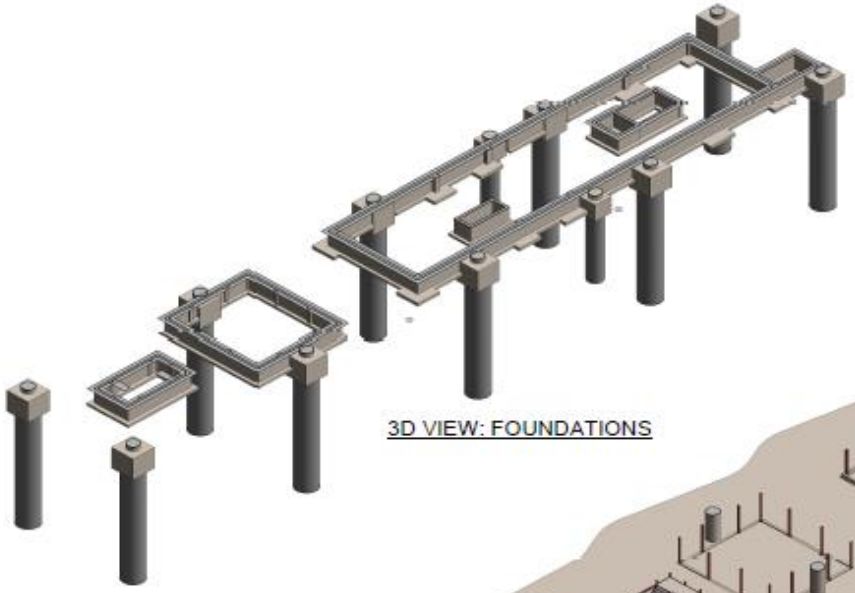




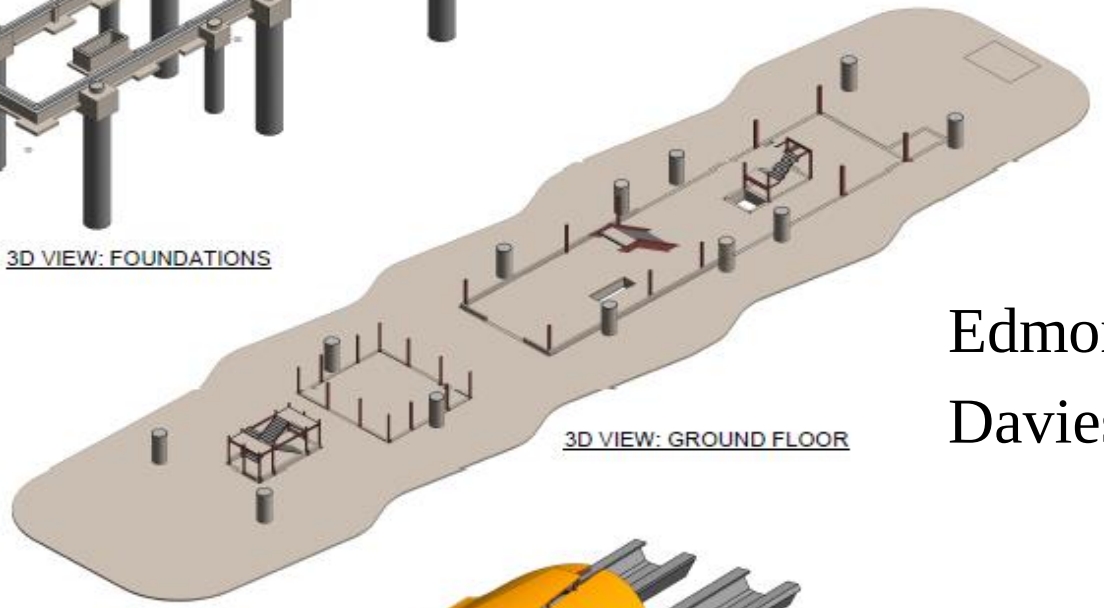
Clash Detection



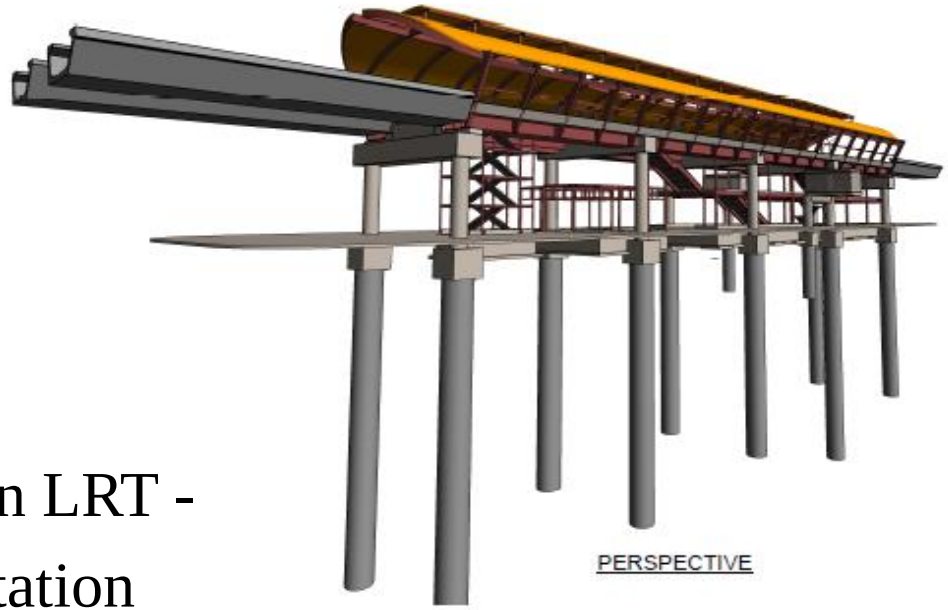
Edmonton LRT - Davies Station



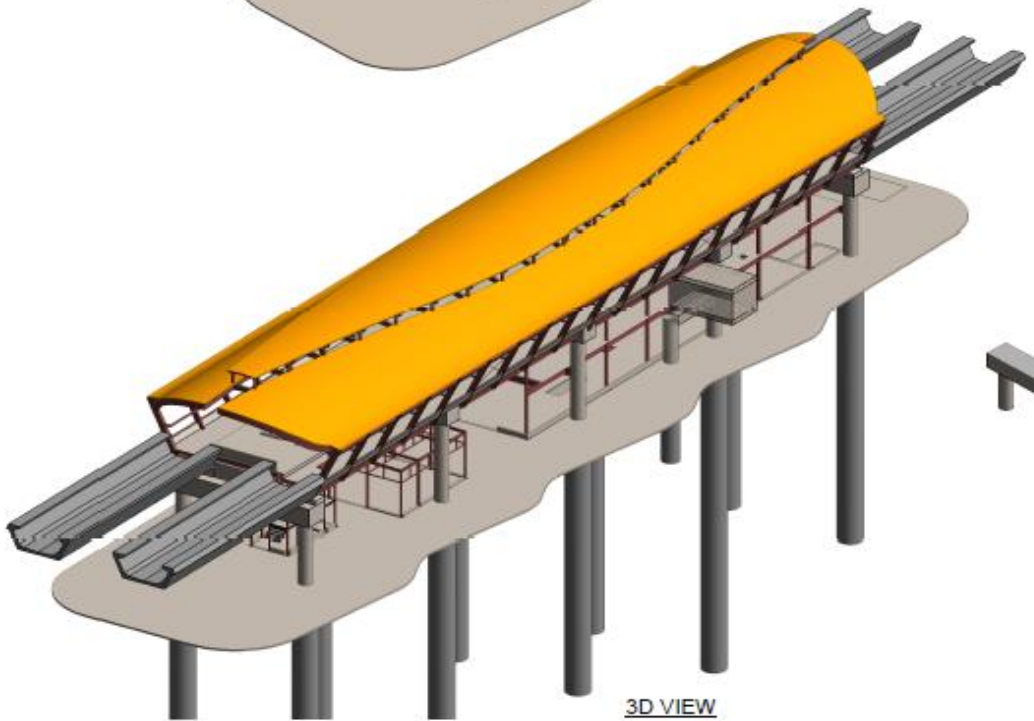
3D VIEW: FOUNDATIONS



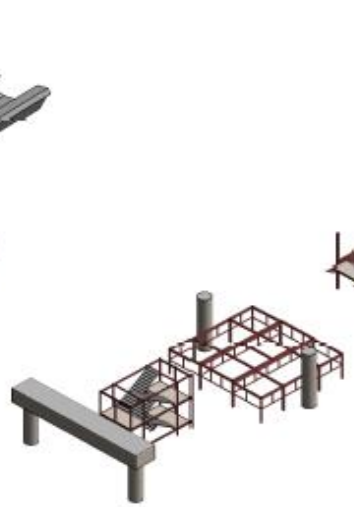
3D VIEW: GROUND FLOOR

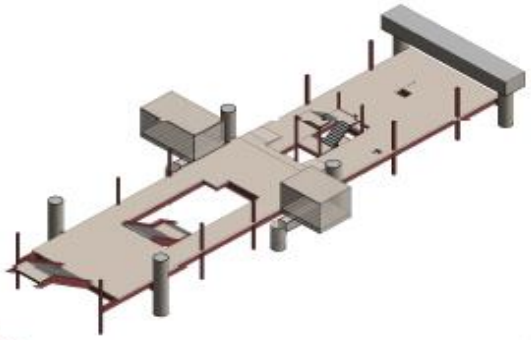


PERSPECTIVE

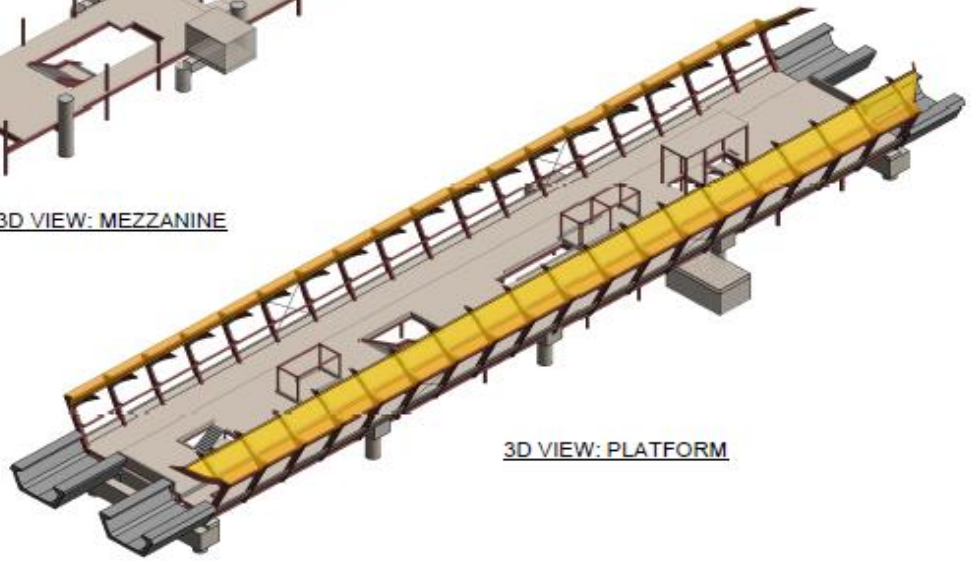


3D VIEW



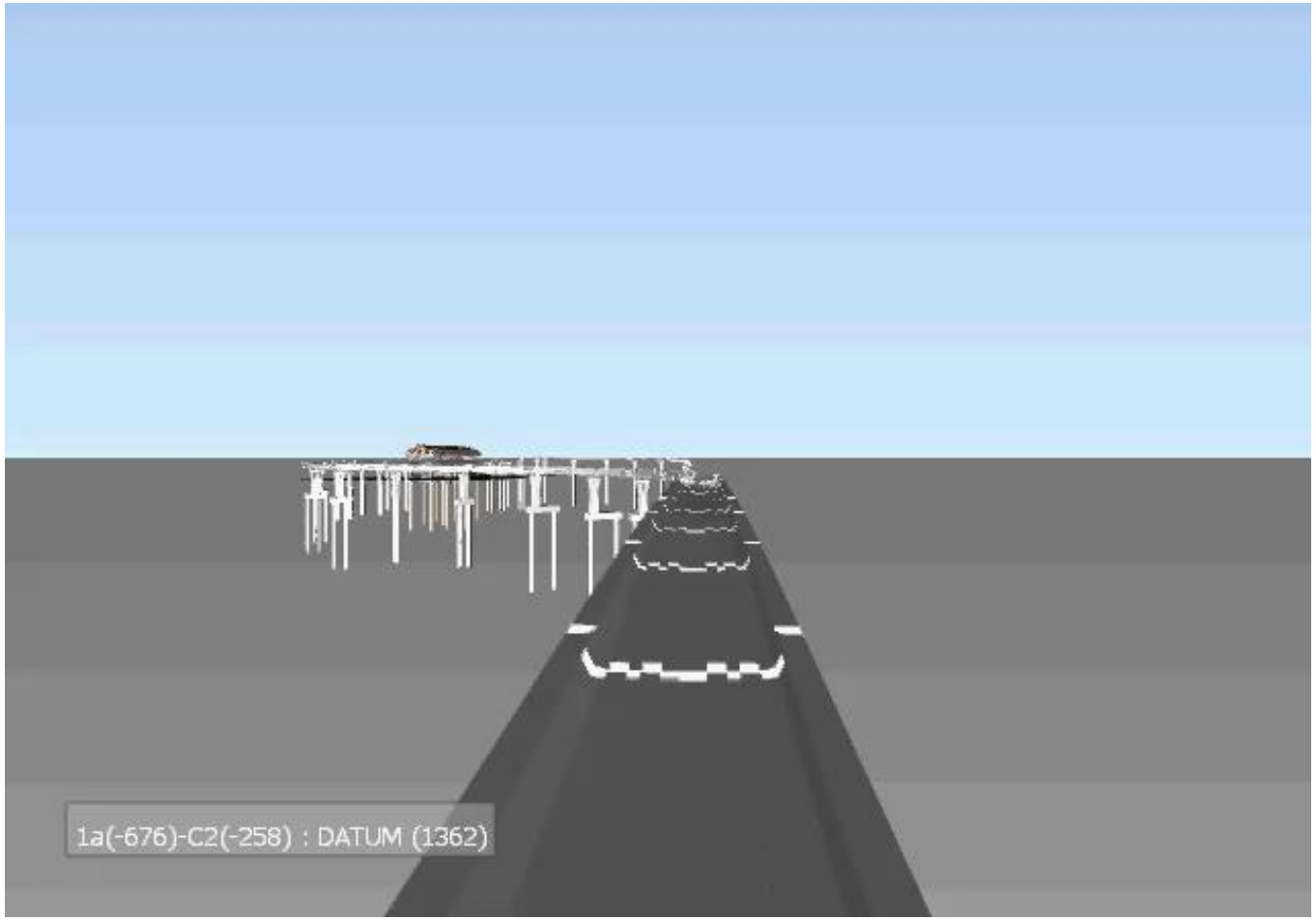


3D VIEW: MEZZANINE

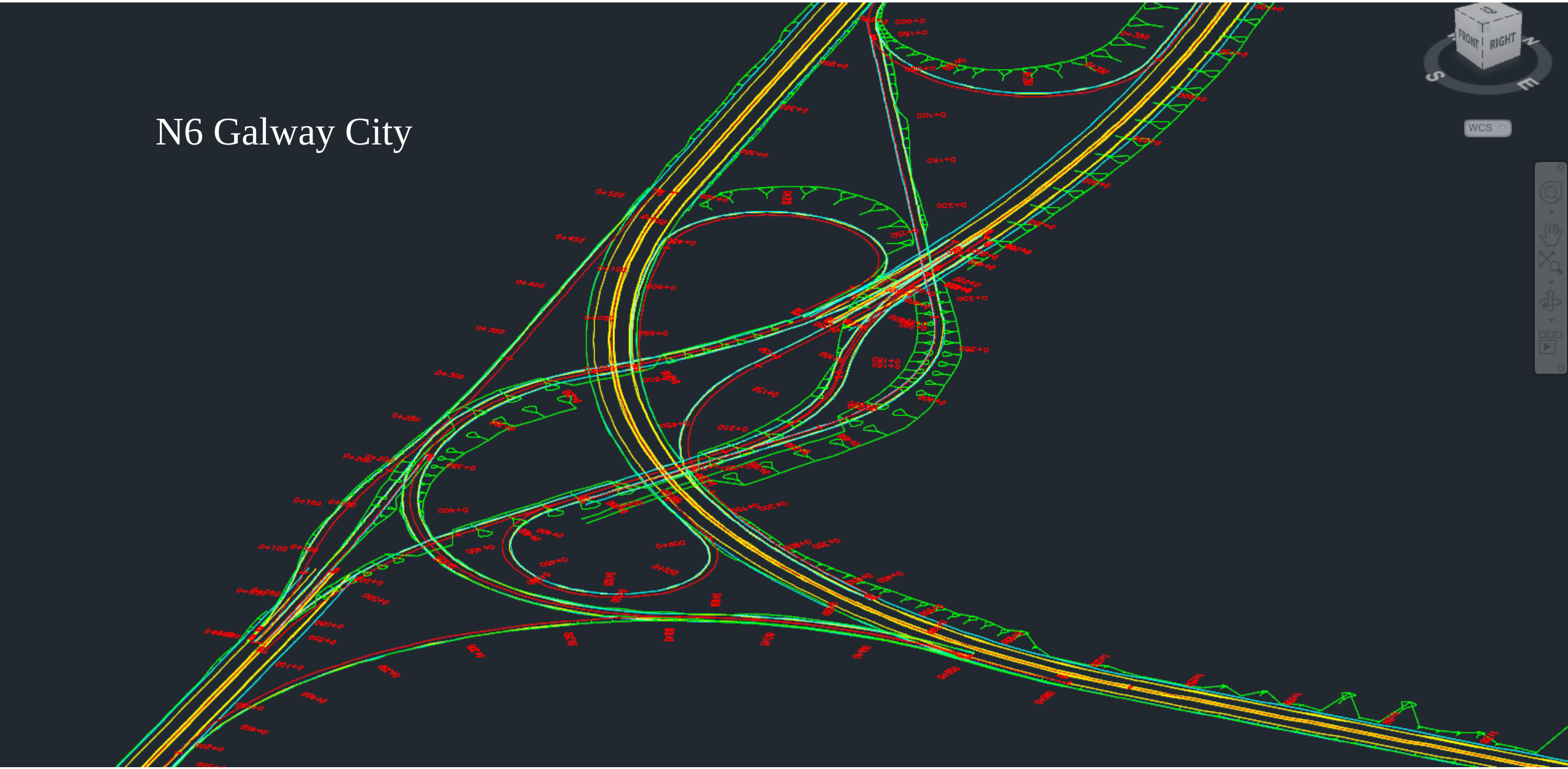


3D VIEW: PLATFORM

Edmonton LRT. Davies Elevated Guideway



N6 Galway City



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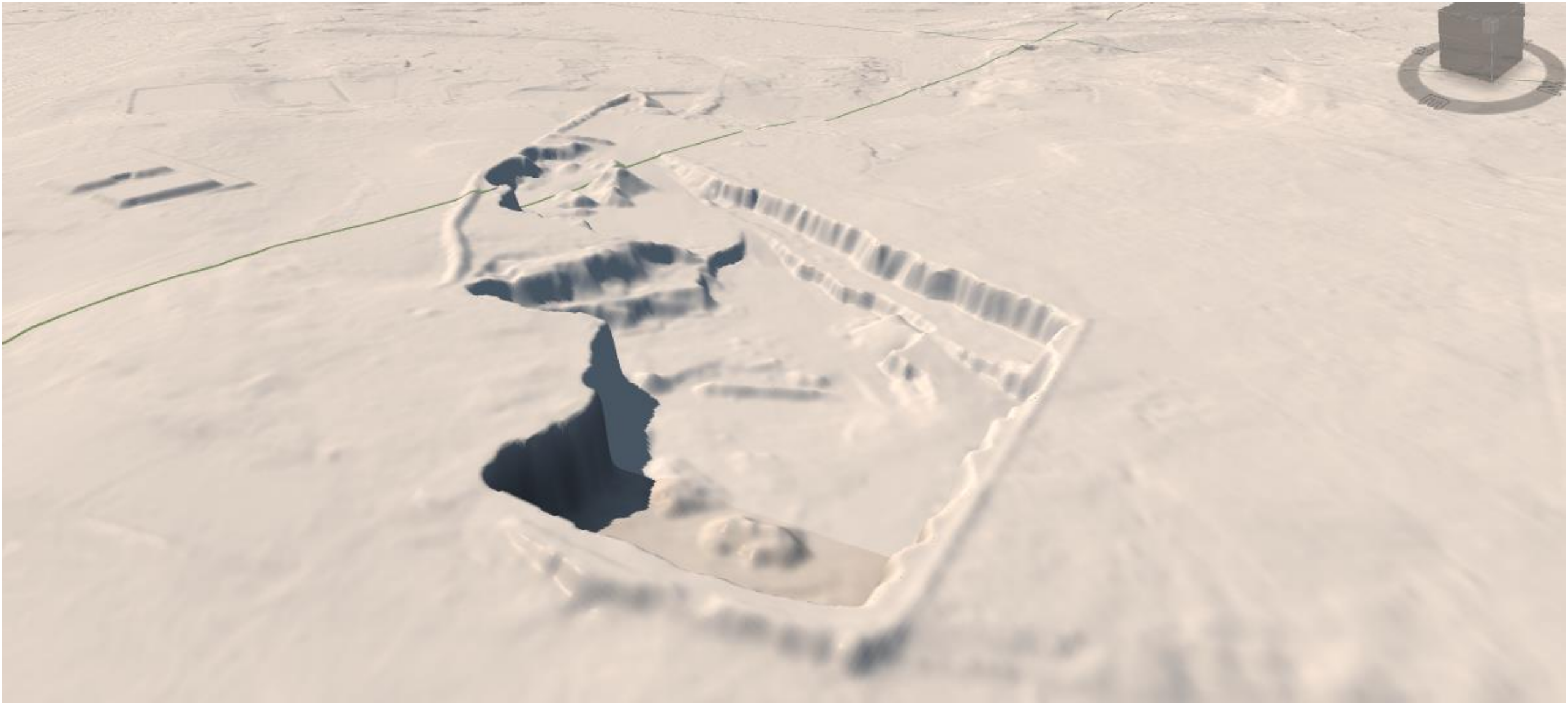

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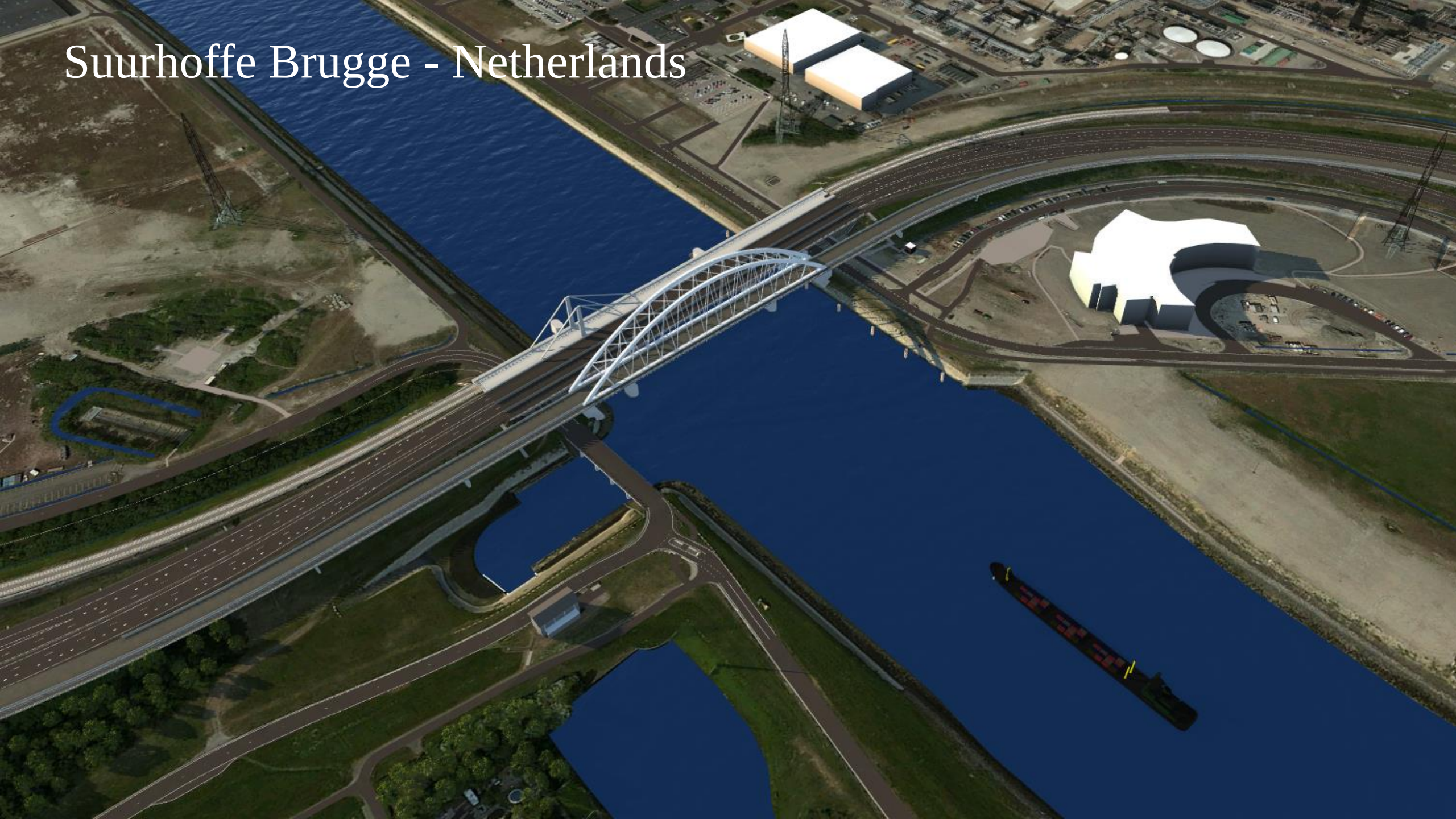
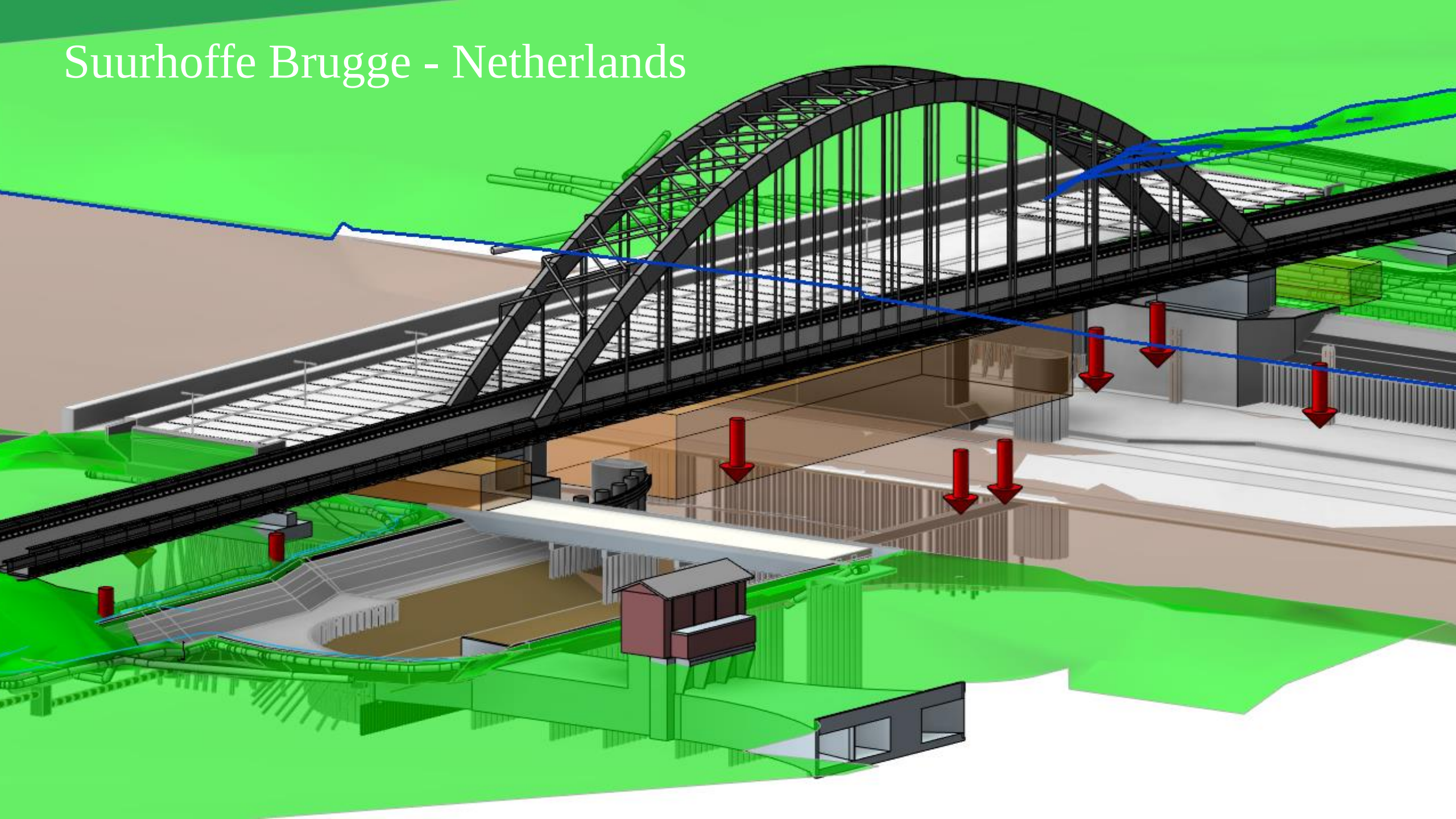
Suurhoffe Brugge - Netherlands

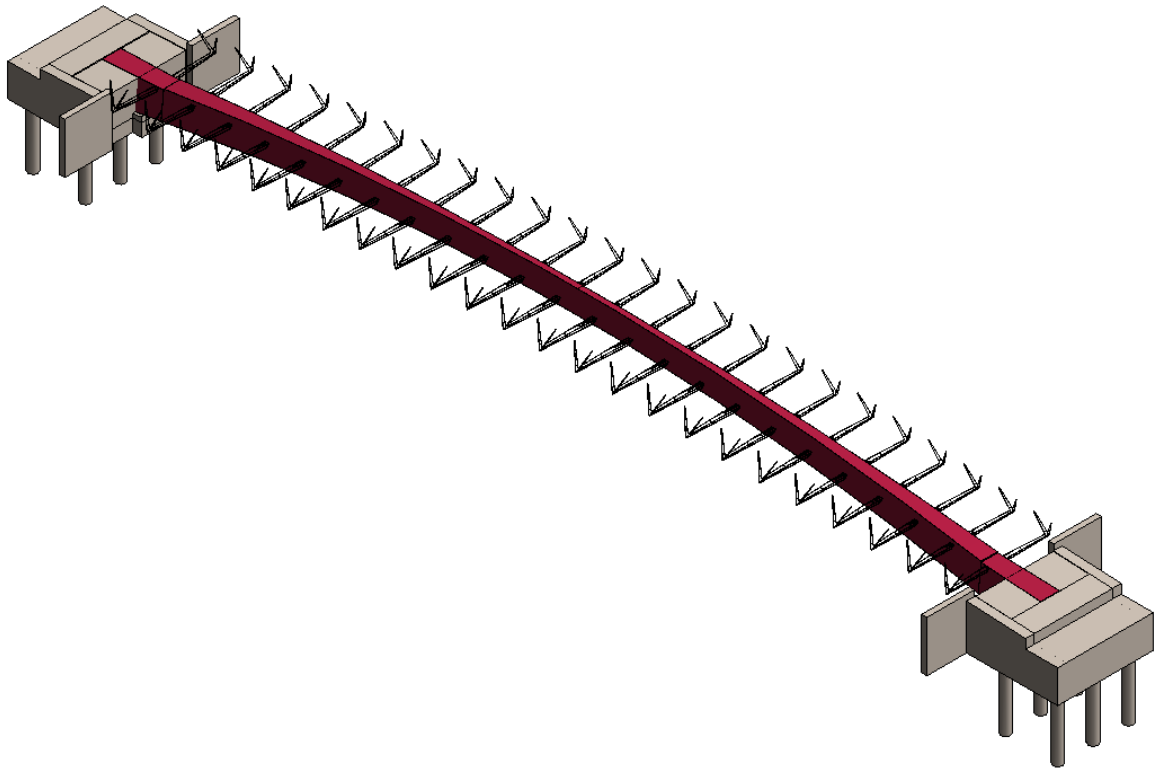


Suurhoffe Brugge - Netherlands



Harley's Street Bridge

Harley's Street Bridge



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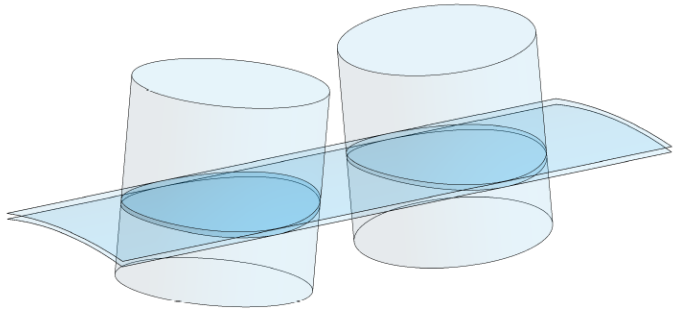
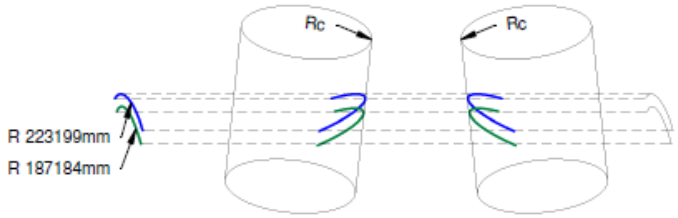
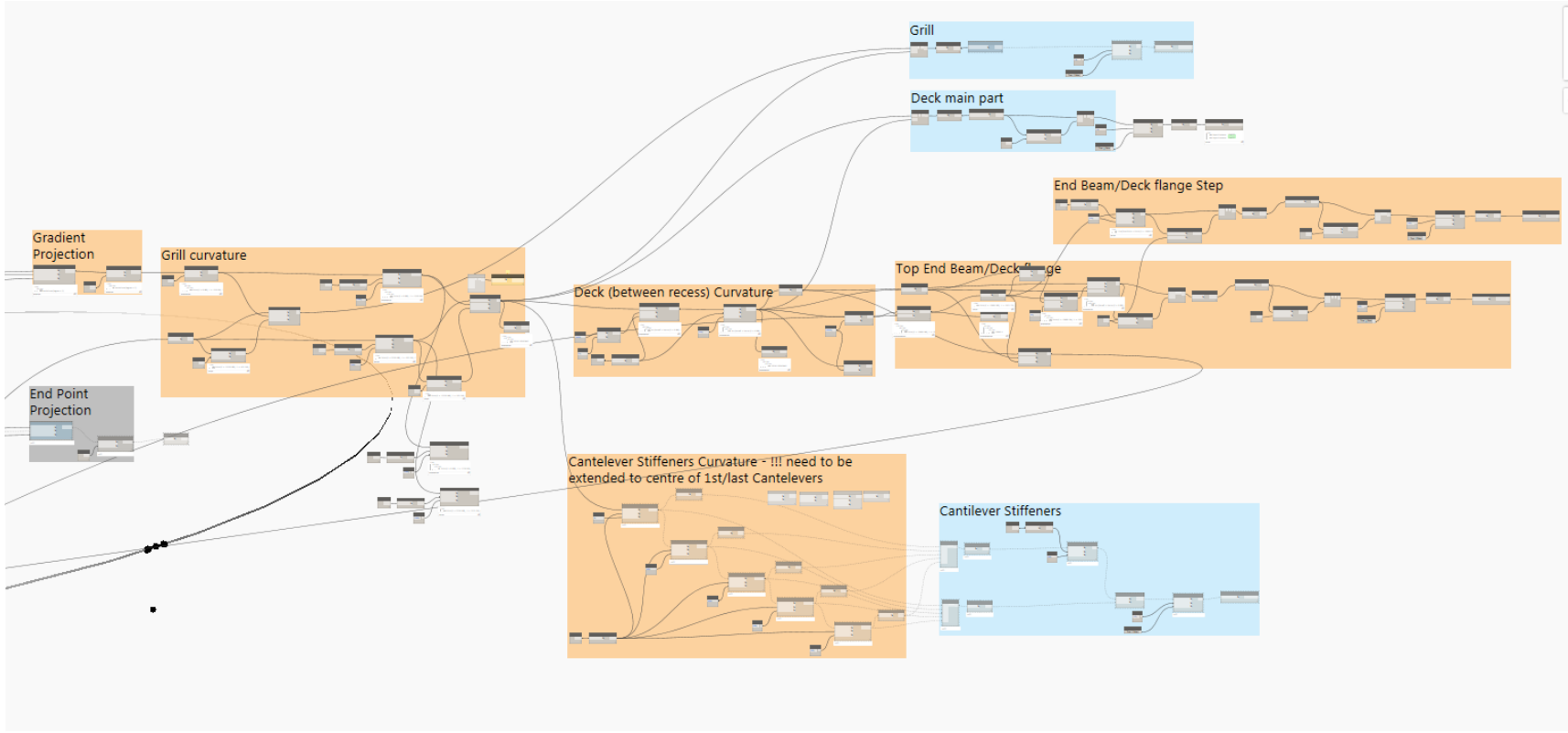


BEAM SETTING OUT





BEAM SETTING OUT

Scale 1 : 150

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Morrison’s Island Public Realm & Flood Defence Project

Where are we now and where do we need to get to

- Significant strides in 3D modelling and Analysis Capabilities
- Using robust workflows to integrate specialist disciplines/softwares into the overall deliverable
- Use of algorithm based tools such as Grasshopper and Dynamo to define the complex geometry and to create parametric links between alignment and 3D model files
- Staff Training – Need to be ambidextrous and be able to use multiple softwares
- Experimentation – There are ways around everything
- Client engagement – Clients starting to see the benefits and willing to invest in time to create data rich models

Thank you
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https://www.youtube.com/watch?v=rL7a4hvMVEE&feature=youtu.be