MTHøjgaard

Peter Langkilde, Discipline Leader BIM/VDC

Virtual Design and Construction (VDC)

IABSE Denmark, October 26

Agenda

- Short about MT Højgaard
- VDC in MT Højgaard
- VDC process
- VDC in projects:
  - Ringsted-Fehmarn 56 bridges
  - Bridge Hardangerbrue – Norway. *Mounting*
  - Bridge Ras, Qatar. *Tender*
  - Cement plant. Air slide bridge. *Detailed design*
  - Prefab elements. *Reinforcement*
  - Bridge Hisingsbron – Sweden. *Major project*

MT Højgaard

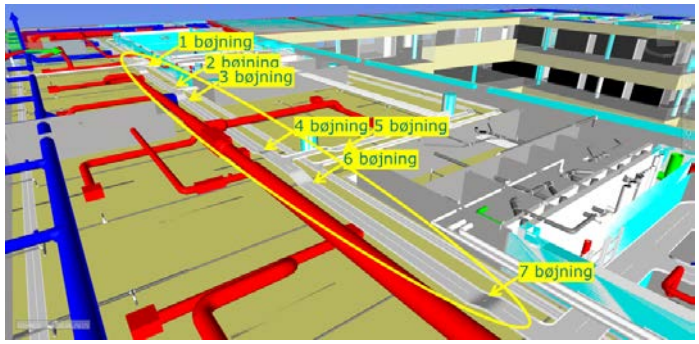
- One of the Nordic region's leading construction and civil engineering companies
- Design, construction and renovation of plants, bridges, buildings and commercial construction
- All competencies under one roof
- 4200 employee
- Headoffice in Denmark
- Turnover: 6.8 billion DKK in 2016

VDC in MT Højgaard

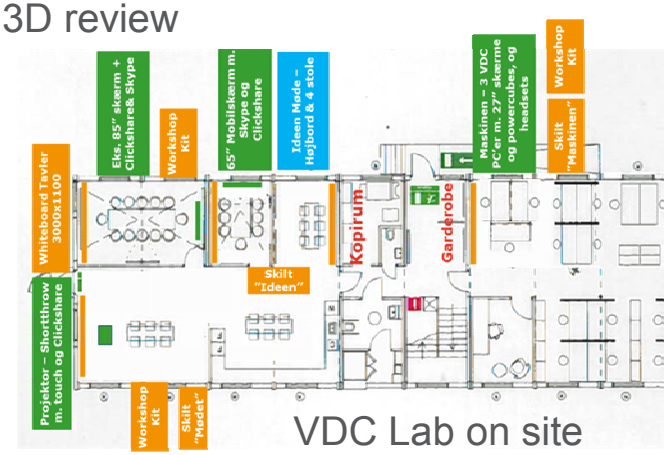
We are building virtual before we actually build

Input to design and planning

Production. Collaboration.



3D review

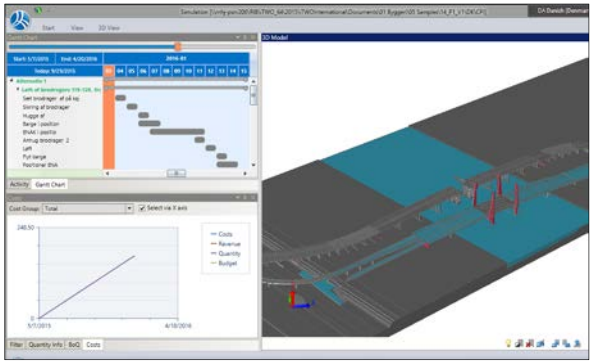


VDC Lab on site

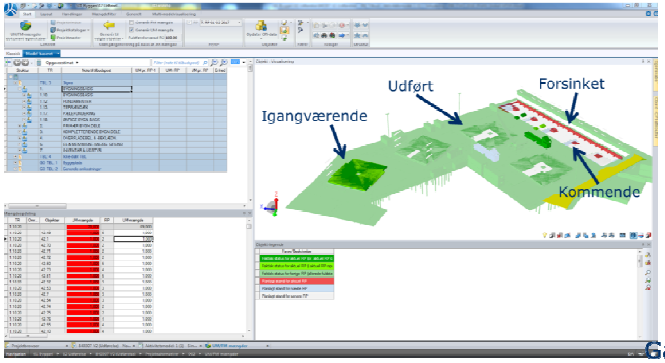
Risk procedure

Workshops - supplier

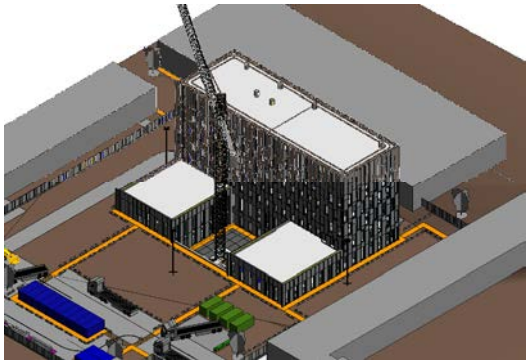
Time and budget. 4D and 5D



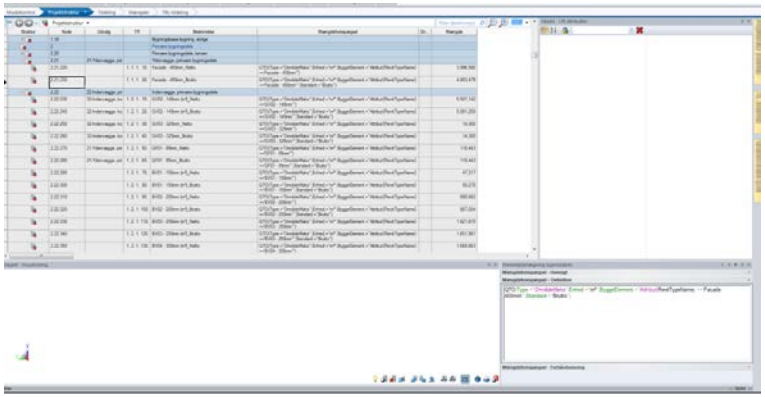
5D simulation



Model based follow-up



4D simulation



Model based calculation

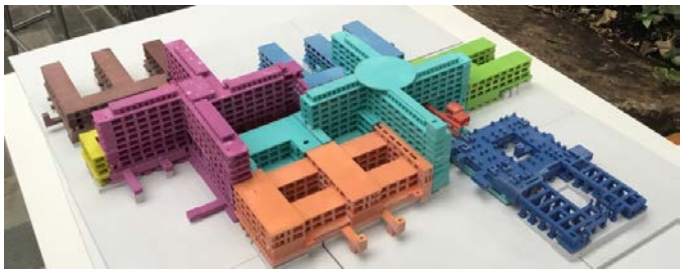
Gateway III 15/8

Gateway II 28/5

	Beskrivelse	Kostpris GW3	Kostpris GW2	Difference	Afvigelse i %
1	Forberedende arbejder	321.150	611.264	709.946	9%
2	Byggemodning	651.971	897.737	-245.766	-6%
3	Byggeplads	382.019	897.950	515.931	-14%
4	Råhus	286.513	195.437	-908.924	-2%
5	Lukning	801.146	400.263	400.883	1%
6	Komplettering	236.335	195.306	-958.971	-3%
7	El	789.378	207.028	582.350	9%
8	CTS	855.231	855.231	0	0%
9	VVS	470.850	470.850	0	0%
10	Luftarter	371.400	371.400	0	0%
11	Ventilation	150.258	149.164	001.094	25%
12	Laboratorieinventar	300.484	440.696	140.212	-33%
13	Øvrige bygninger og installationer	393.399	015.000	-621.601	-12%
14	Landskab	011.840	449.196	437.356	-55%
15	Commissioning	0	100.000	100.000	-100%
16	DBNG-krav	500.000	500.000	0	0%
	Totalsum:	521.974	756.462		-1%

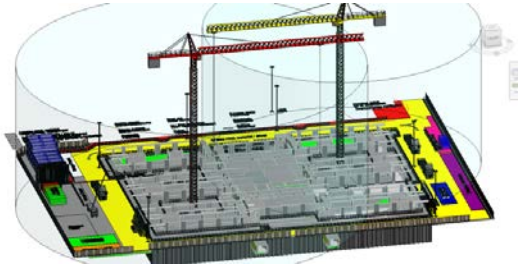
Compare budgets

Easy access to current information gives an overview of the project



3D print

VDC lab on site



Building site model

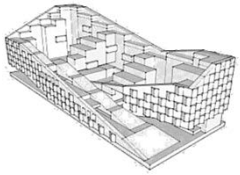
VR

iPads on site

Drone

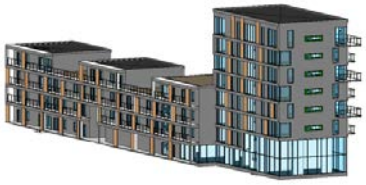
VDC process

Project-centric approach and process



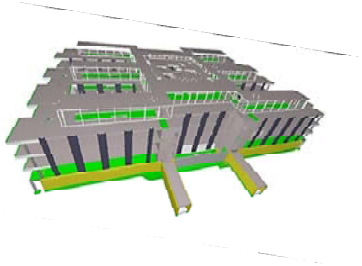
Project development

Urban VDC



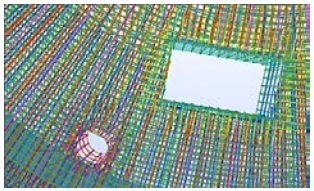
Tender and planning

VDC 5D



Production and design

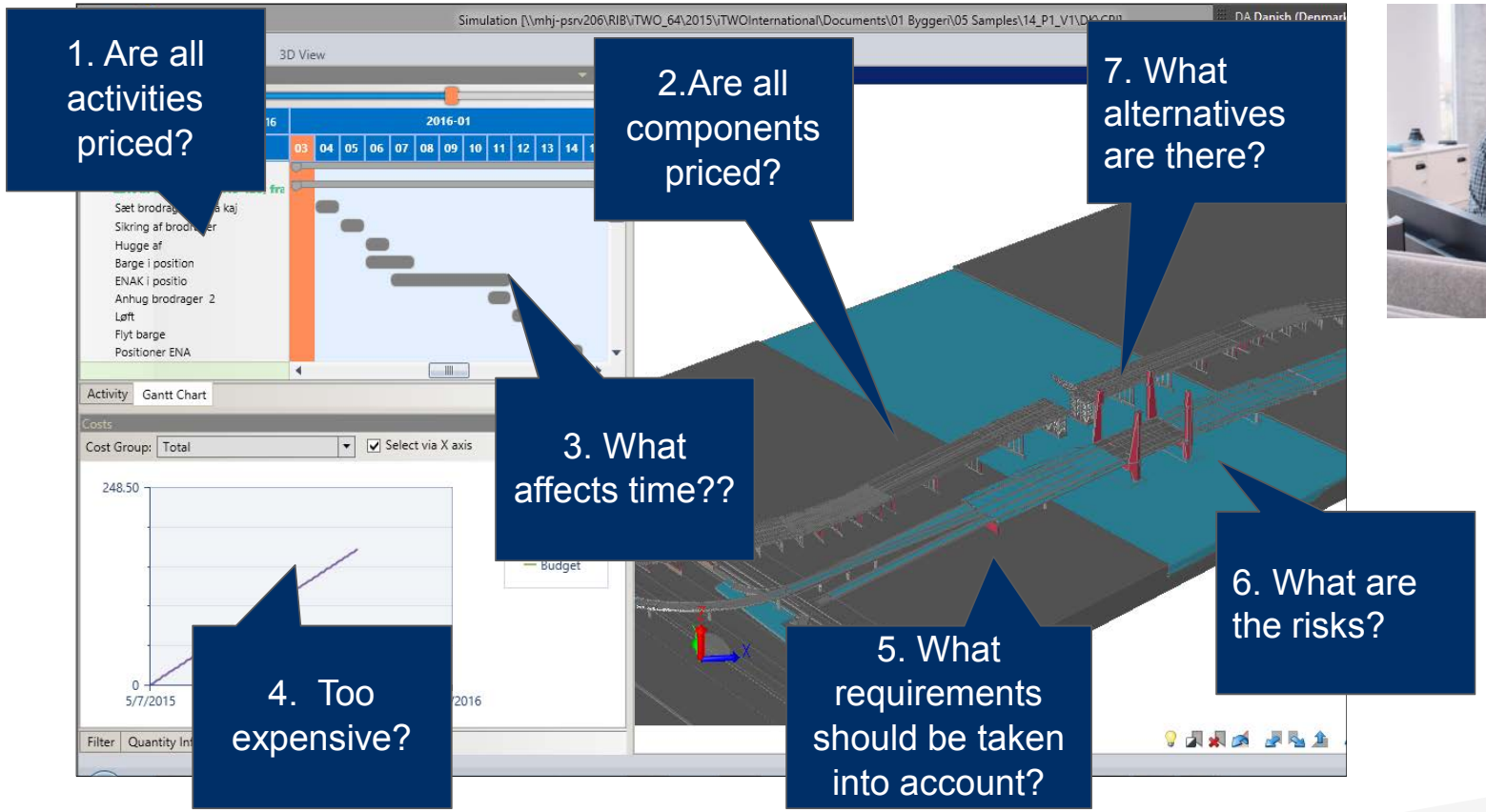
BIM+

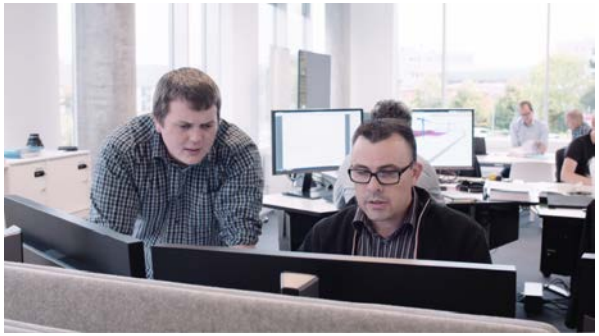


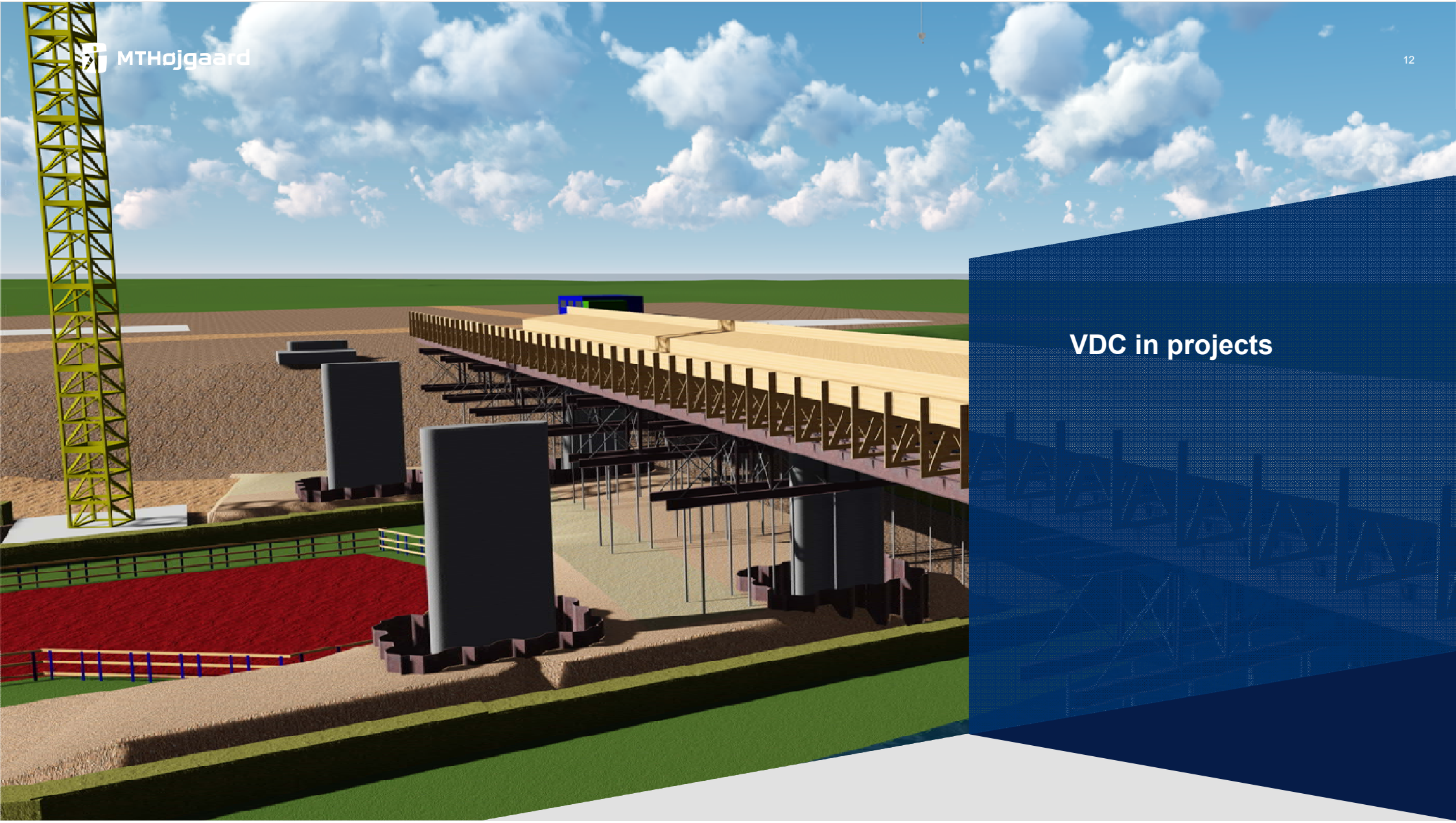
Handover. Delivery and operation

FM

Simulation and optimize







VDC in projects

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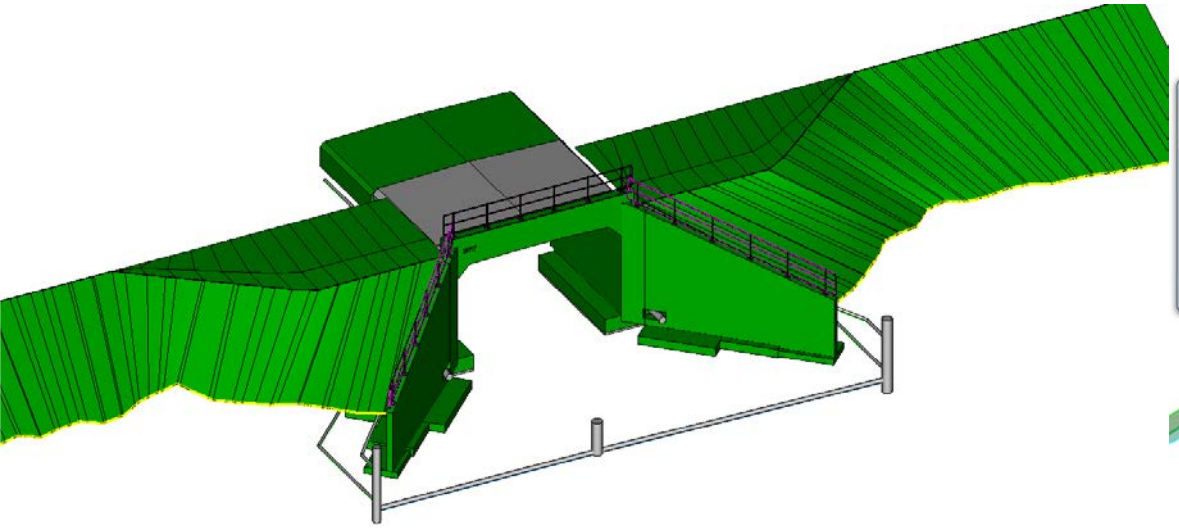
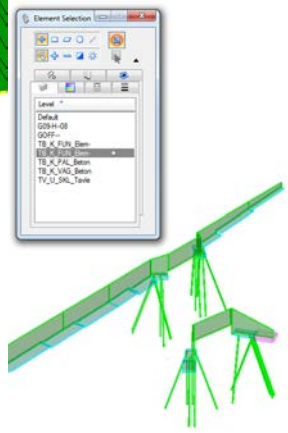
Ringsted-Fehmarn 56 bridges

- Working for Banedanmark:

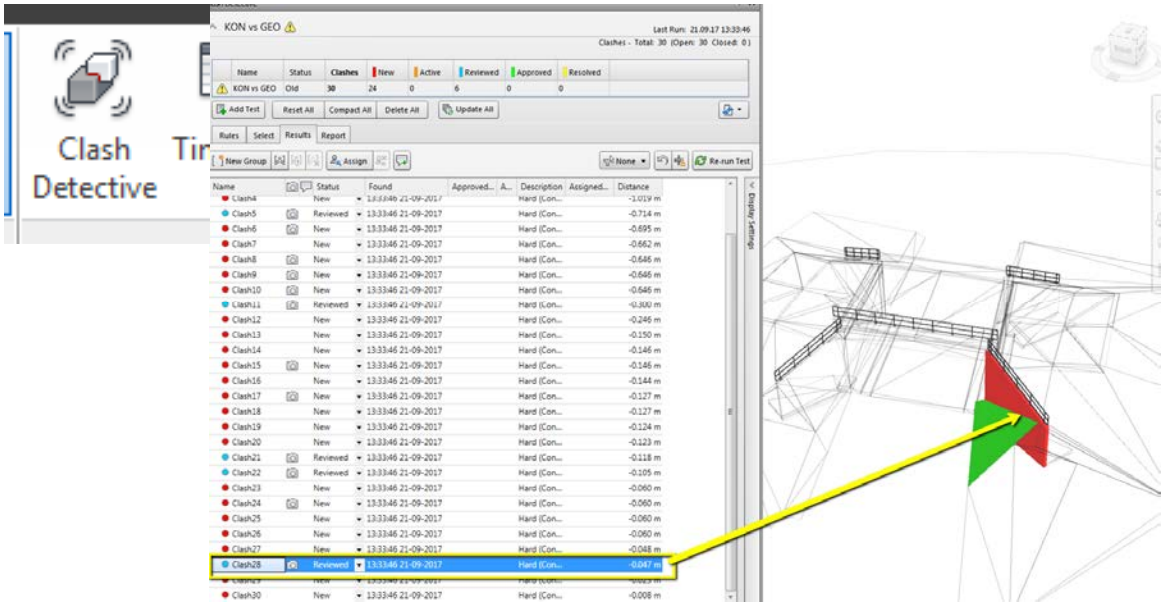
- Requirements to our software.
- Requirements how to make QA

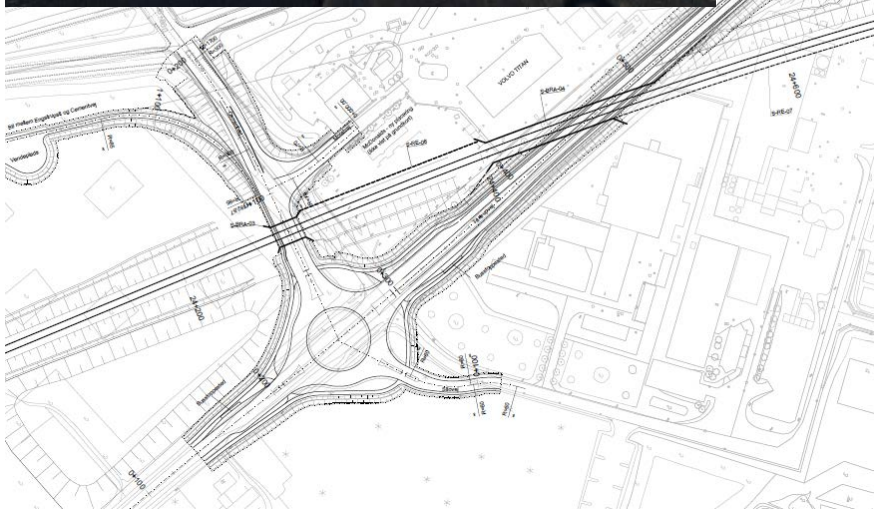
- Models are collected for clash detective and constructability





Ringsted-Fehmarn - 56 bridges





Ringsted-Fehmarn - 56 bridges

Sagsnummer:	16801	
Modelnavn:		Modelansvarlig:
	M302B-02-17620X-8-KON-001-KS-23.06.2017	HSN
KS af:	PETL	
Dato:	23.06.17	

Der henvises *M302B-02-17620X-8-KON-001_KS_13.01.2017.xlsx* for KS af AFV og GEO

Tjekliste

Generelt	Kommentarer	√	Status
Er modelskilt tilstede og udfyldt?	KON: ja	ok	
Korrekt koordinatsystem er brugt, samt koordinatkryds	KON: ja	ok	
Er koordinatsystem stemplet i model ?	KON: ja	ok	
Alt relevant input er indarbejdet	KON: ja, se billede 3	ok	
Objekterne ligger i rigtig lag iht. DDA (Det Digitale Anlæg)?	KON: ja	ok	
Er modellen renset for lag, hjælperlinjer og referencer?	KON: se billede 1		
Er der udført clash -detection mellem fagmodellerne?	se M302B-02-17620X-8-KON-001_KS_13.01.2017.xlsx		
Hvis ja. Er der clash?	se billede 2		

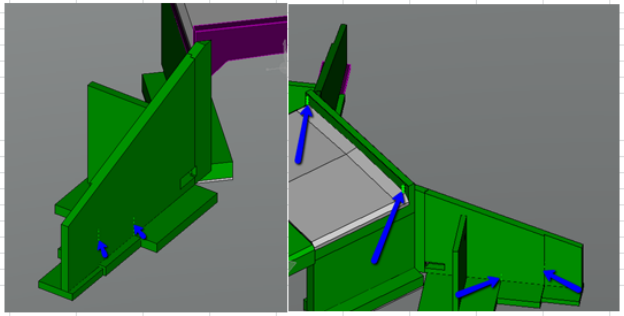
Konstruktionsmodel	Kommentarer	√	Status
Er objekterne som solids? Breaklines?	Solids	ok	
Kan man udtrække mængde fra objekterne?	ja	ok	
Ligger konstruktionen rigtig ift. banen?	ja	ok	
Hænger objekter/elementerne sammen?	ja	ok	

Terrænmodel/Surfaces	Kommentarer	√	Status
Er der Breaklines?	se M302B-02-17620X-8-KON-001_KS_13.01.2017.xlsx		
Surfaces har korrekt omfang / areal	do		
Surfaces har korrekte koter	do		
Surfaces har korrekt fald	do		
Surfaces er uden huller / fejl	do		

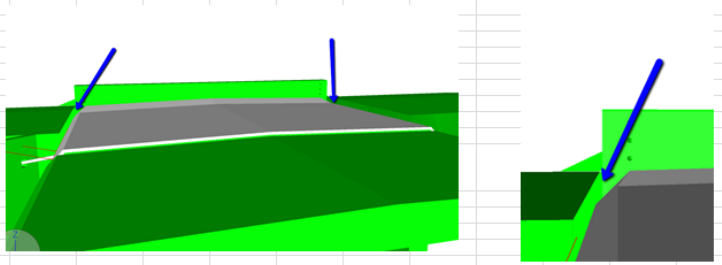
Vejmodel	Kommentarer	√	Status
Er vejkassen vist og korrekt?	Ikke tjekket		
Ligger vejen rigtig ift. bro/banen?	Ikke tjekket		
Er vejtilslutninger korrekt og ligger i 3D?	Ikke tjekket		
Er vejskråning tilpasset ift. bro?	Ikke tjekket		

Afvandingsmodel	Kommentarer	√	Status
Ligger rør og brønde som solids?	se M302B-02-17620X-8-KON-001_KS_13.01.2017.xlsx		
Er tilslutning mellem rør & brønde "tæt"	do		
Er der referencelinijer for afvandingen?	do		
Ligger rør og brønde korrekt ift. vejel/broen?	do		

Billede 1: slet hjælpe linier.

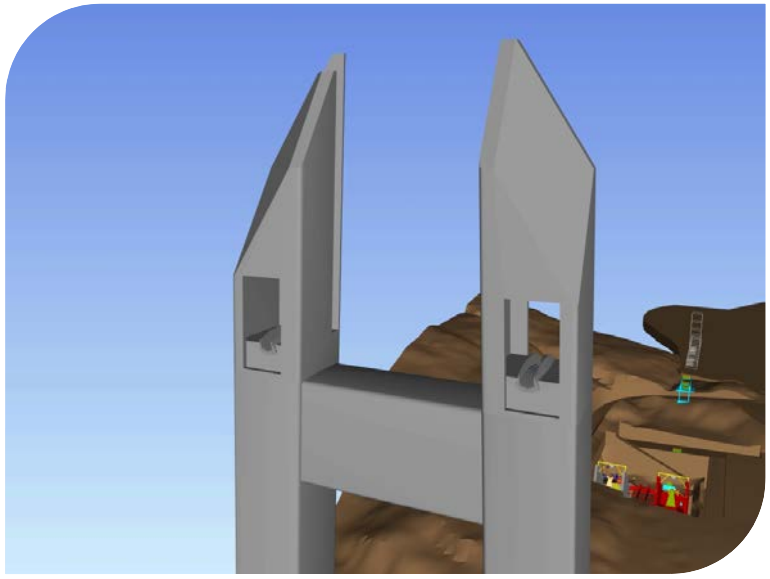


Billede 2: afstand mellem terræn og TB_K_PLA_Beton korrekt ?

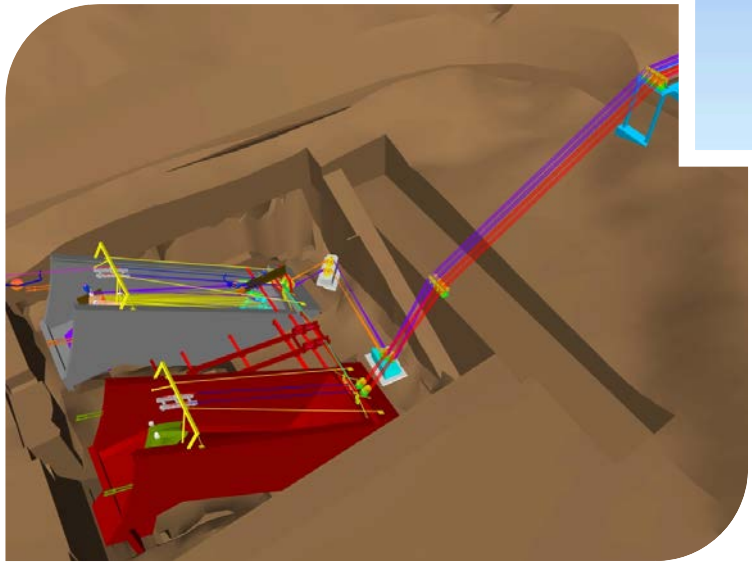


Bridge Hardangerbrue – Norway.

For planning mounting
Study of space conditions.
Stages of spinning wire
Calculation of center of gravity

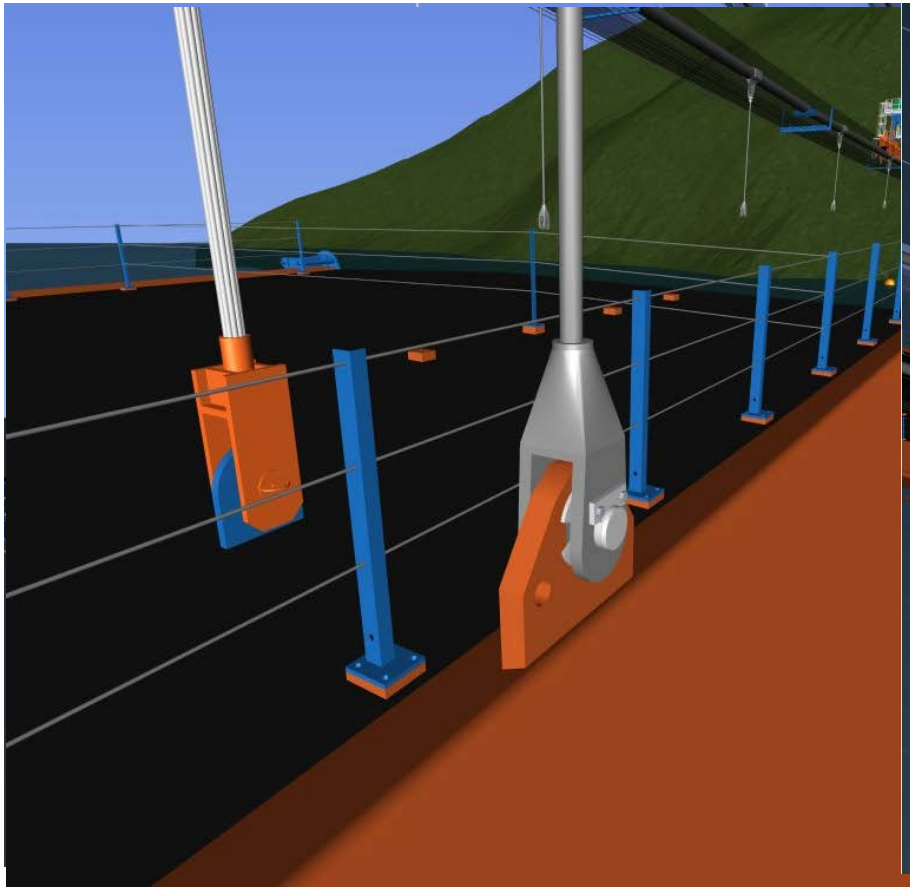


Softwares:
-AutoCad
-Tekla
-Inventor
-Sketcup
-Navisworks



See video: Box Girders-28sek

Bridge Hardangerbrue – Norway.



Bridge Ras, Qatar.

Tender project
-reviewing site area

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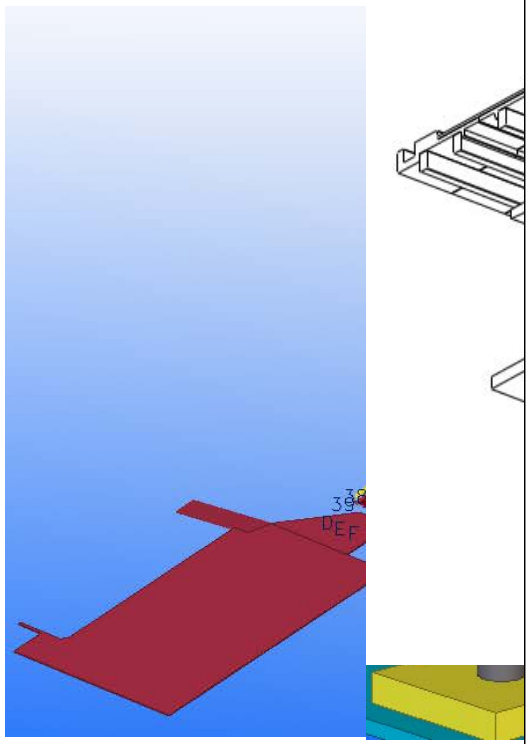
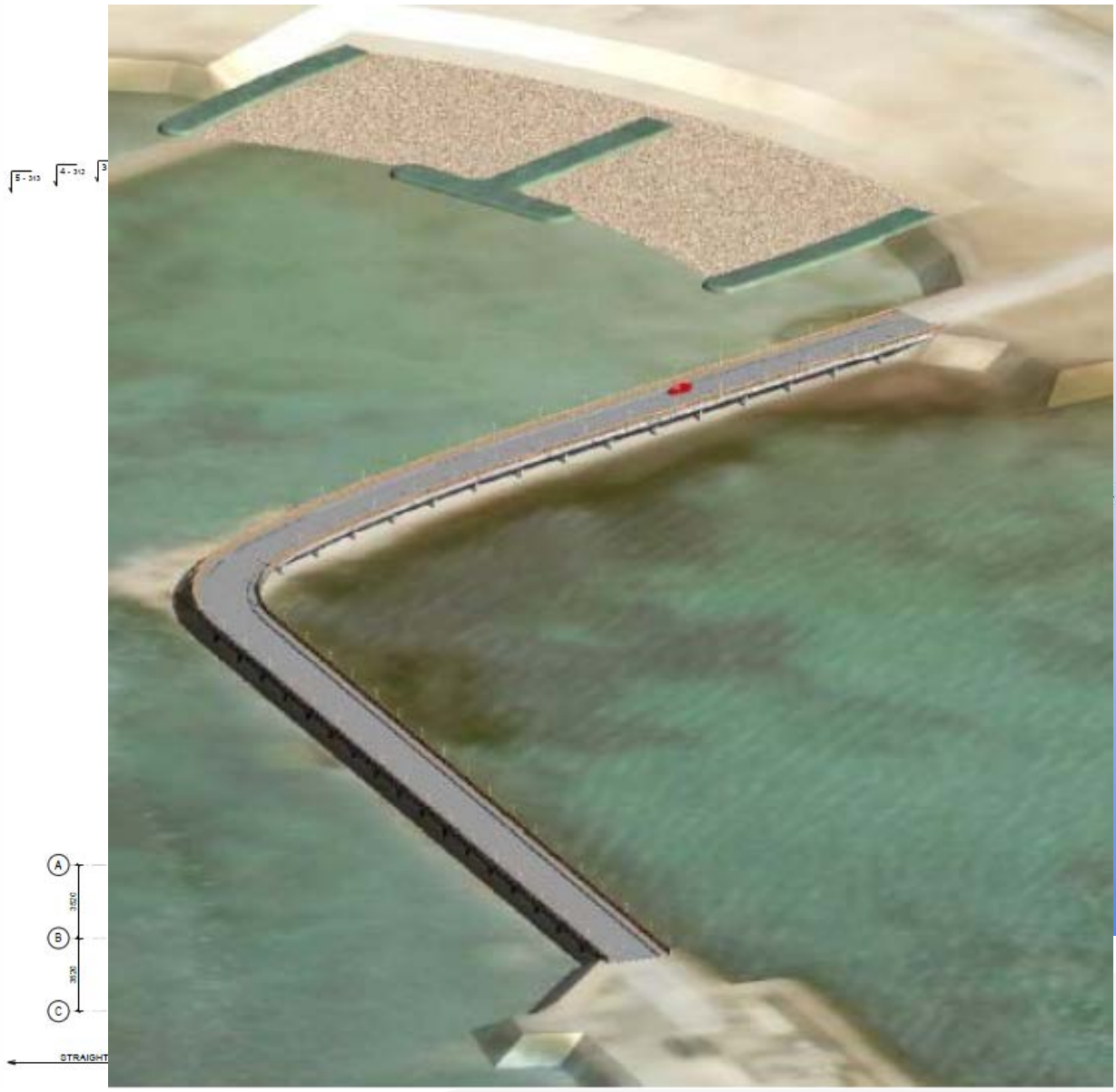
Bridge Ras, Qatar.

Tender project

- Tekla – 3D model
- Calculations
- Quantities
- Geometry
- Design
  - -anchors
  - -gratings
  - -railings
  - -etc.



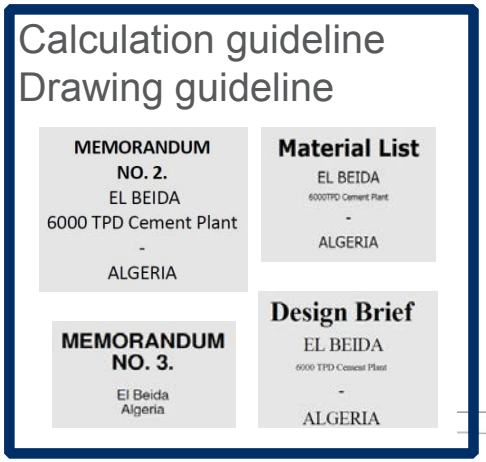


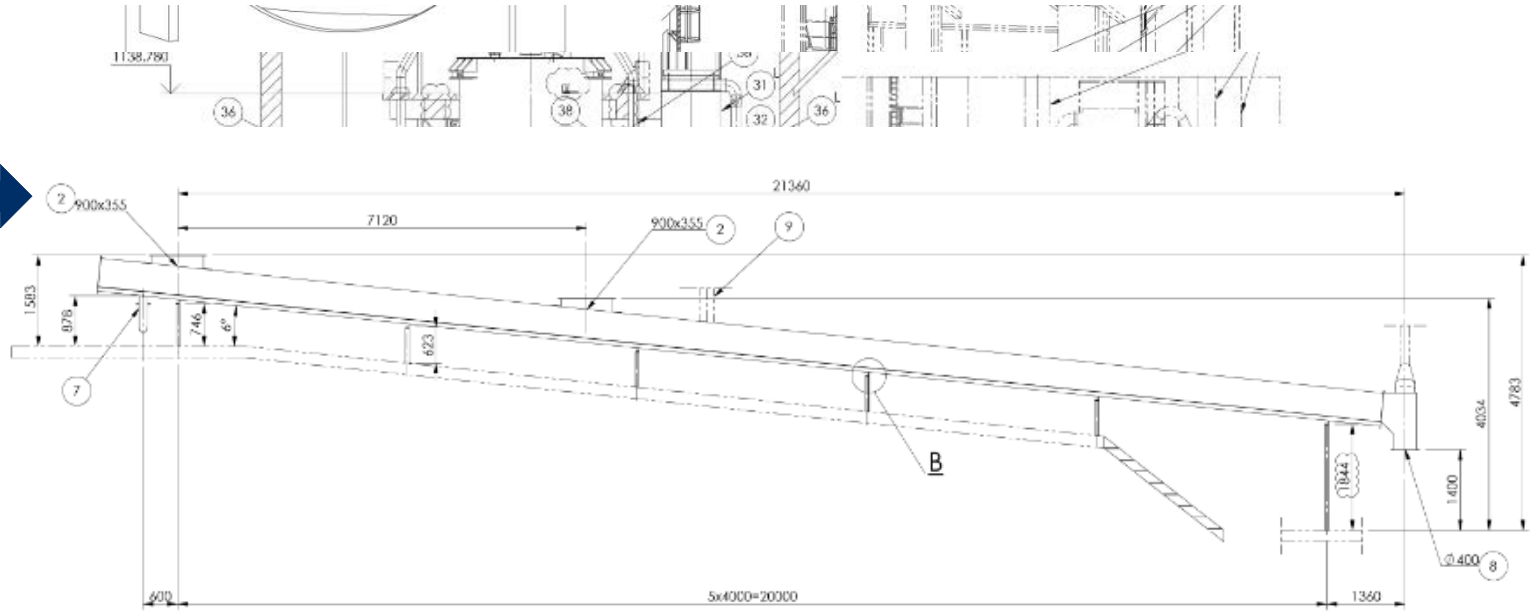
Cement plant. Air slide bridge.

Detailed design

GA drawings

Calculation guideline
Drawing guideline



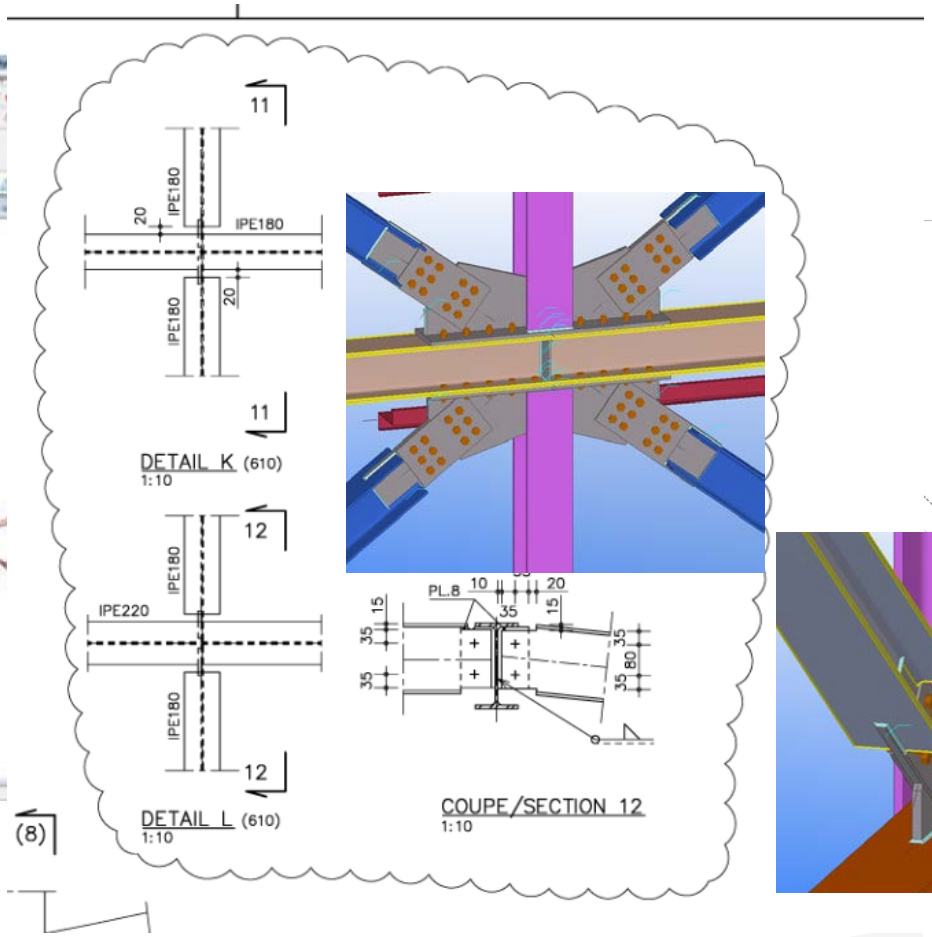


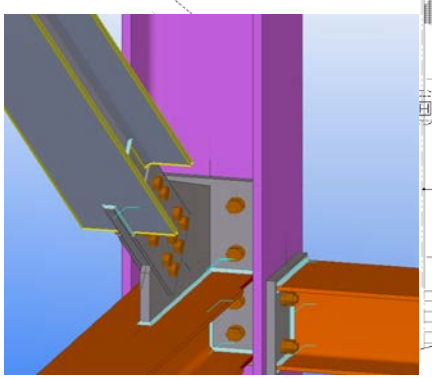
Cement plant. Air slide bridge.

Detailed design

Staad.Pro

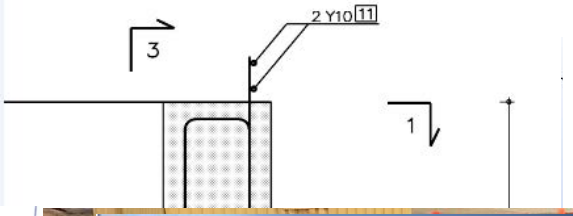
Tekla





Prefab elements. Reinforcement

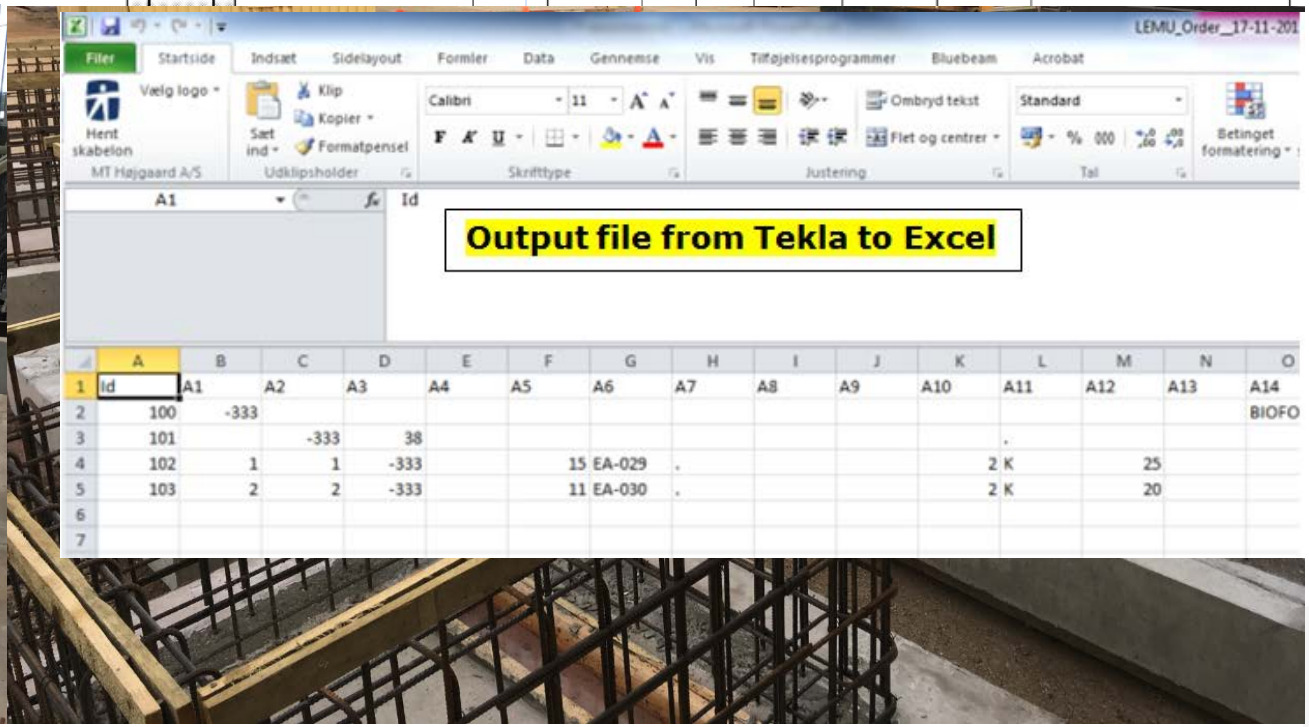
-Tekla. Reinforcement



BAR BENDING SCHEDULE

DEFINITION OF REBAR QUALITY:
TYPE "Y" = (Y) 550 MPa

BAR NO.	TYPE/ DIA.	QTY.	LENGTH	WEIGHT kg/piece	WEIGHT kg/all	BENDING SHAPE (MEASURES IN mm)
05	Y10	37	899	0.6	21.3	380, 180
06	Y10	11	900	0.6	6.3	900
09	Y10	32	4737	3.0	97.0	2030, 1215, 180



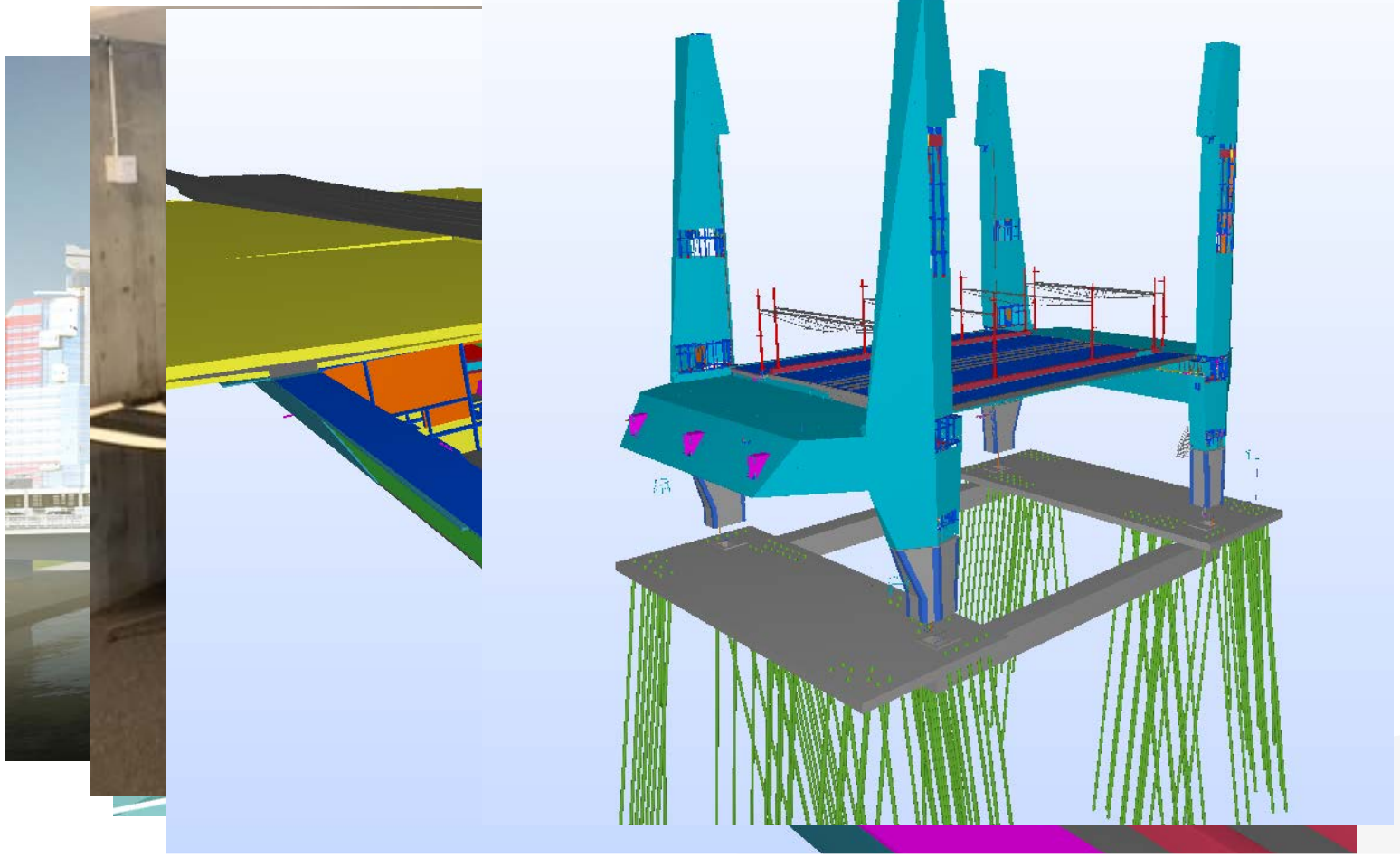
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Id	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14
2	100	-333													BIOFO
3	101		-333	38											
4	102	1	1	-333		15	EA-029	.			2	K	25		
5	103	2	2	-333		11	EA-030	.			2	K	20		
6															
7															

Bridge Hisingsbron – Sweden

-**Hisingsbron JV project.**
New bridge in Göteborg
Project office.

3D print

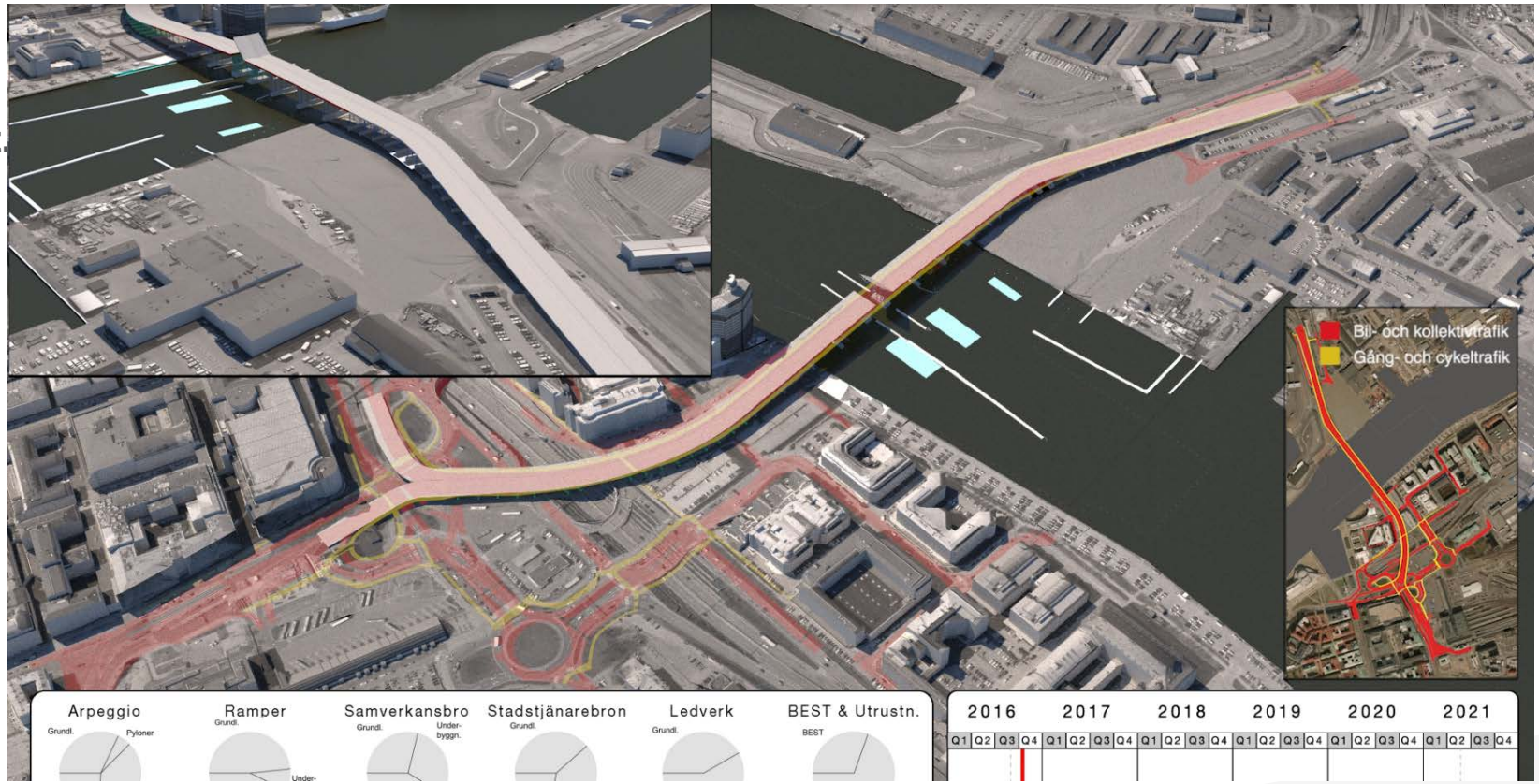
3D models updated daily in
Navisworks



Bridge Hisingsbron – Sweden

-**Hisingsbron JV project.**
New bridge in Göteborg

See video:
Time schedule



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Thank you

IABSE Denmark, 26 October