

Delivering projects **WITHOUT DRAWINGS**





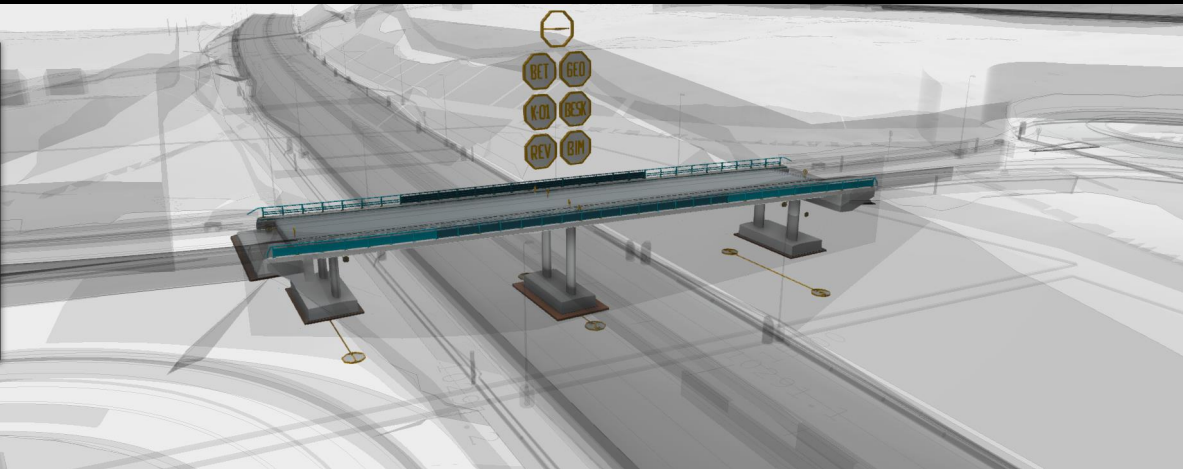
JOHN
LEGGE-WILKINS



OYSTEIN
ULVESTAD

HISTORY

2017

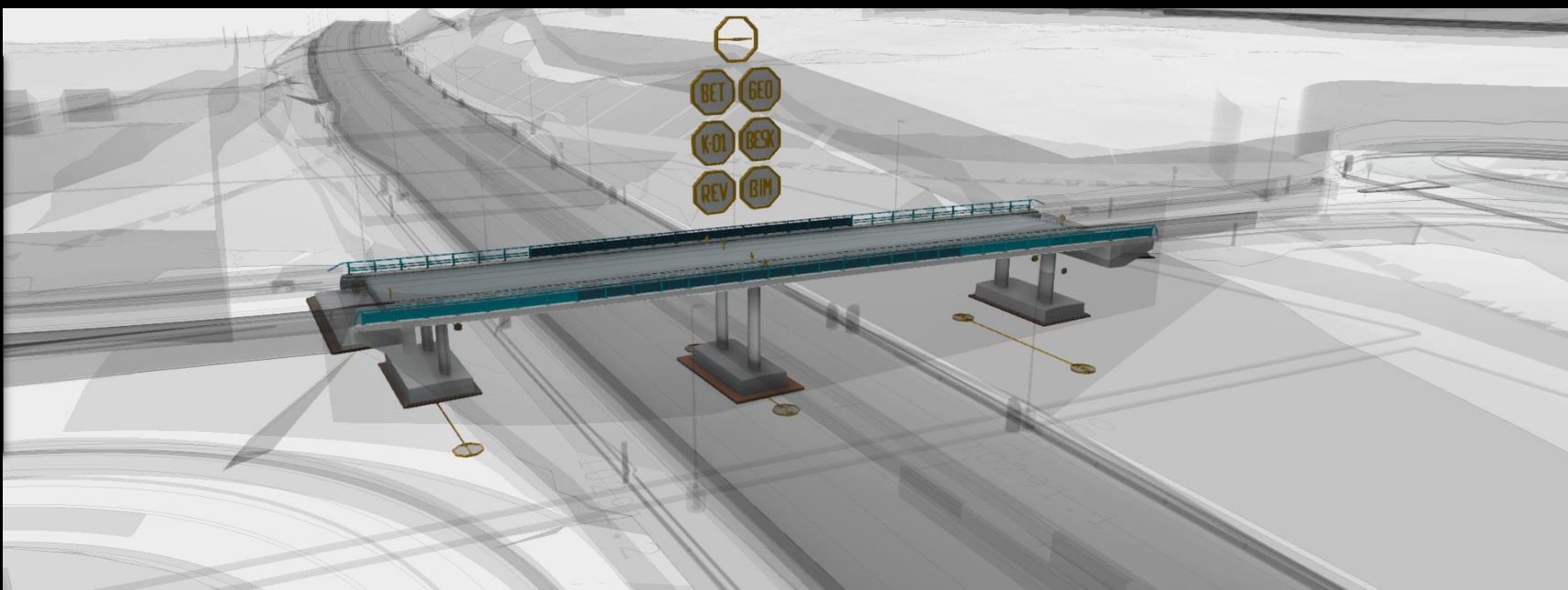


2020



66%

← E6
Innlandet
Google Street View
sep. 2023 Se flere datoer



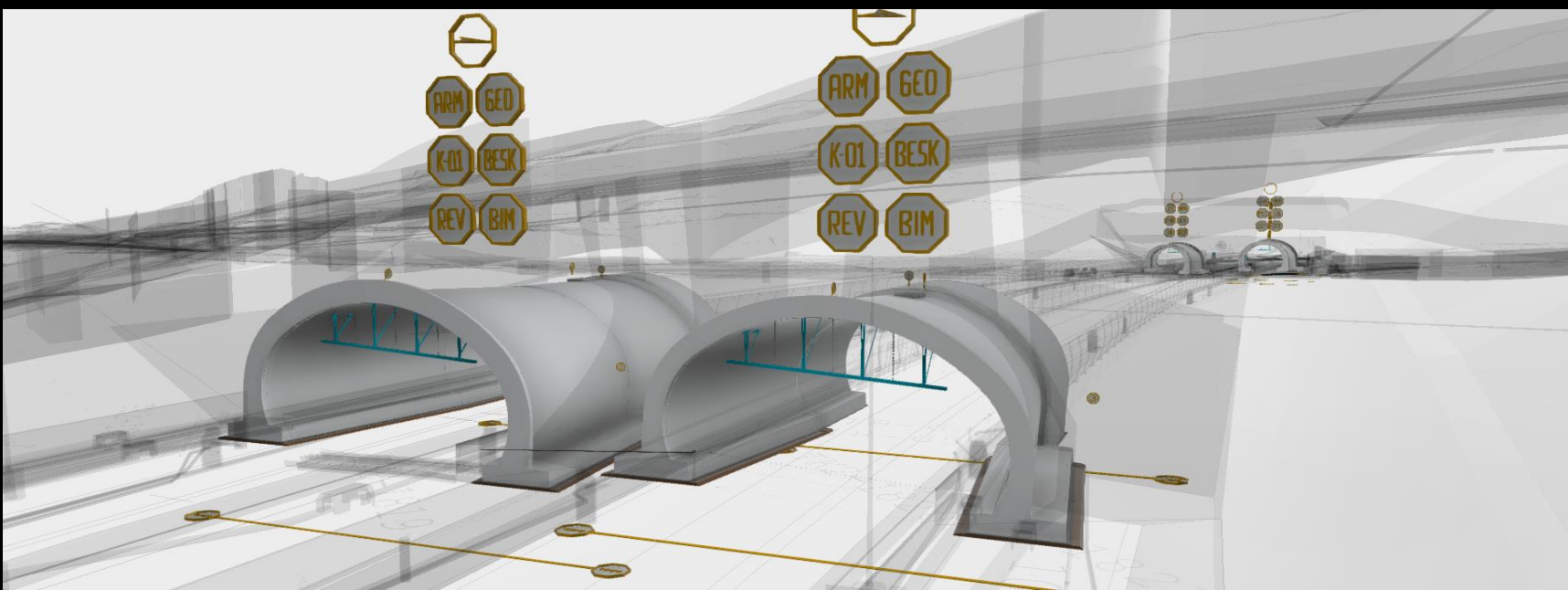
ARUP



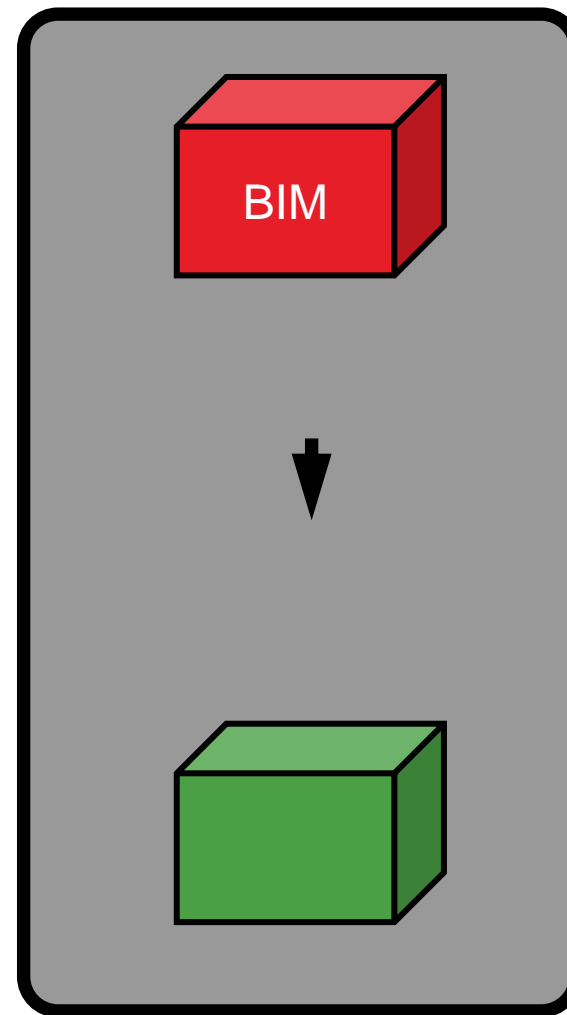
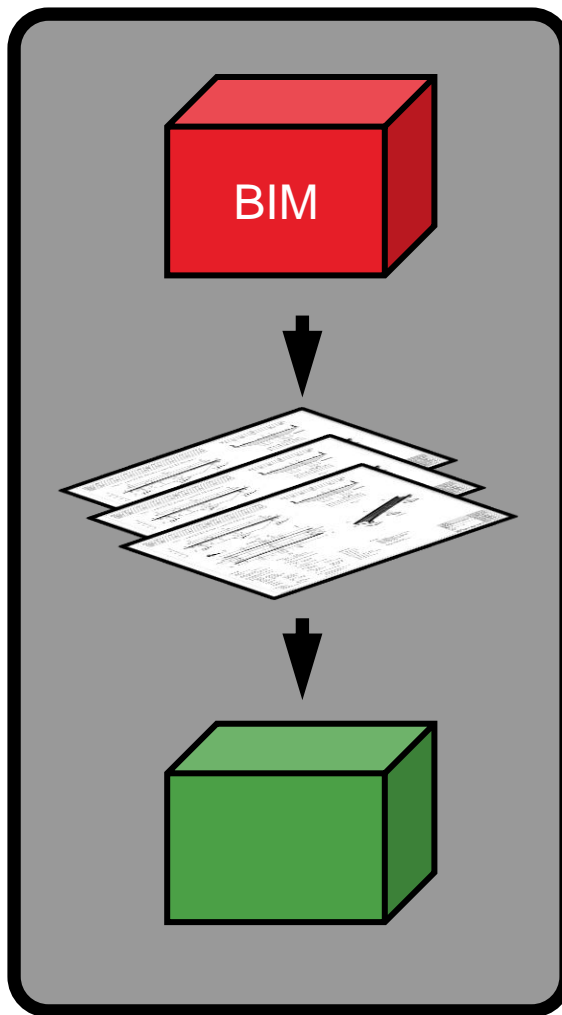
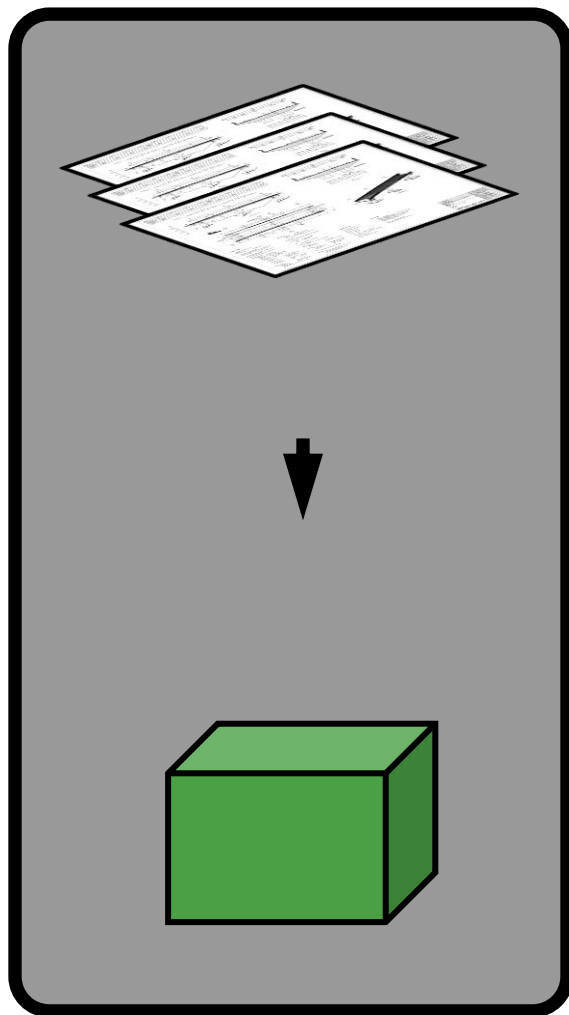
← E6
Ringsaker, Innlandet
Google Street View
juni 2023 Se flere datoer



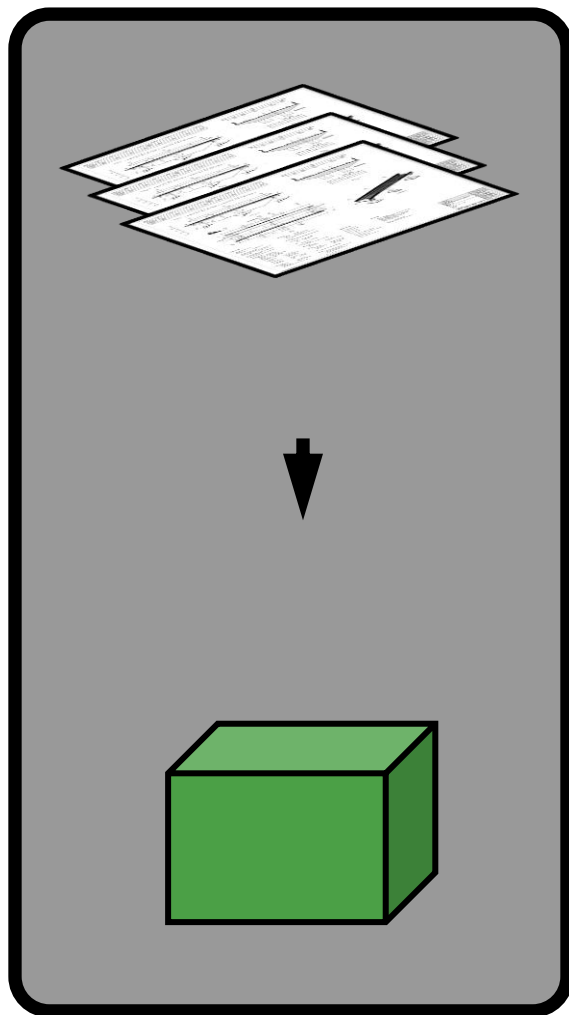
ARUP



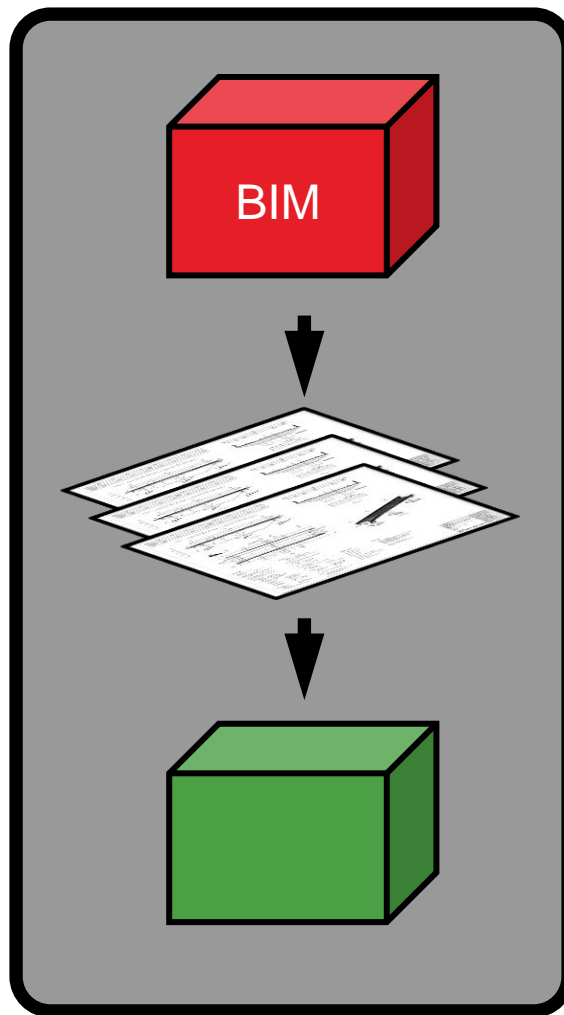
VALUE



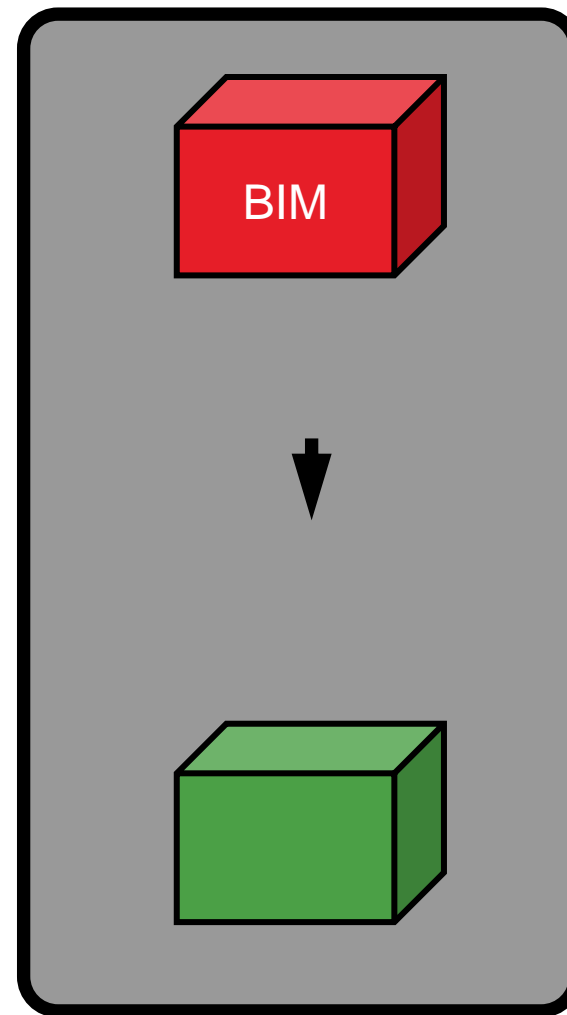
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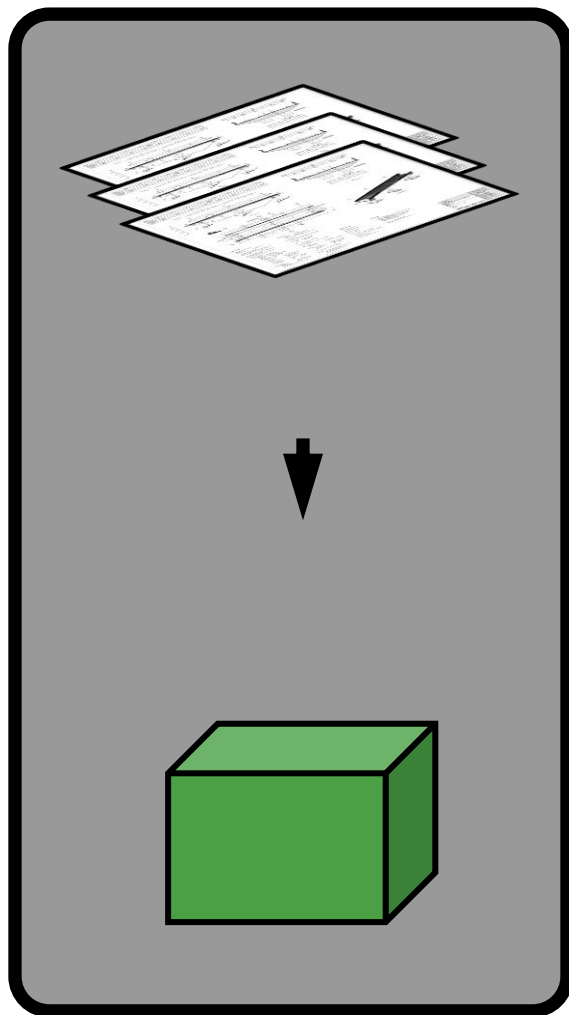


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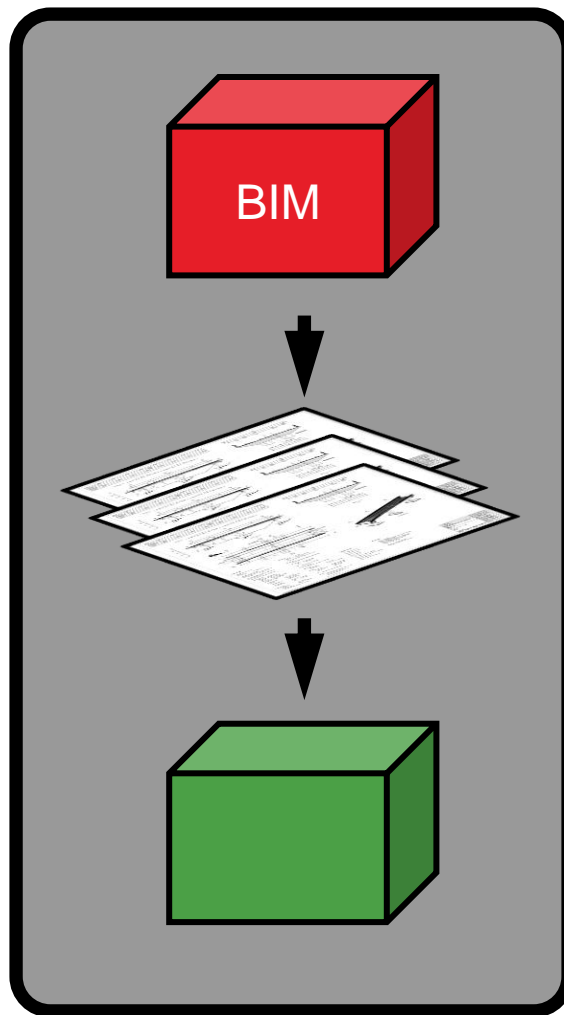


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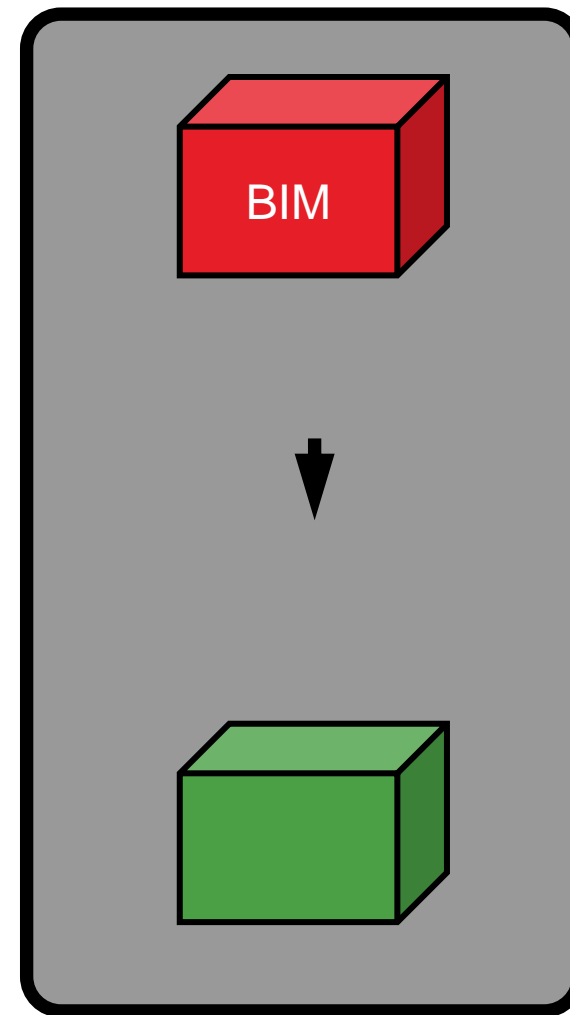




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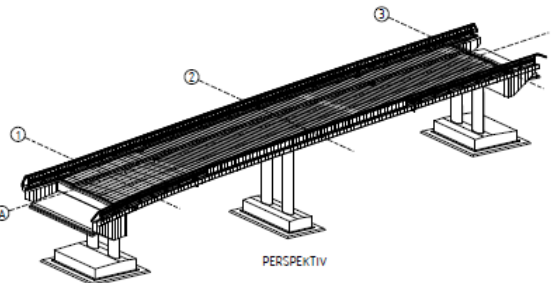
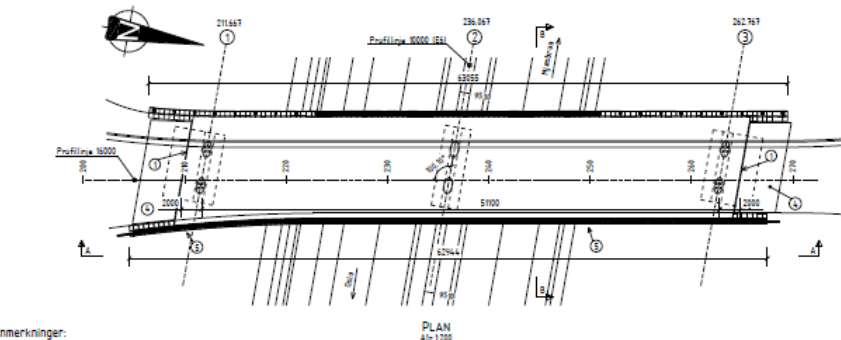
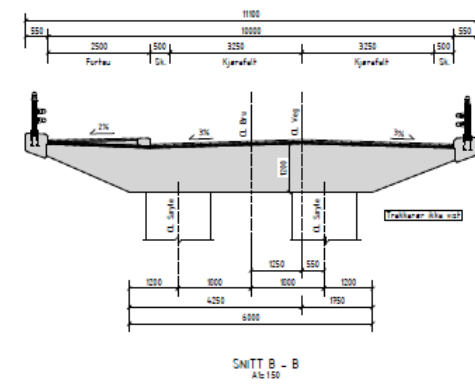
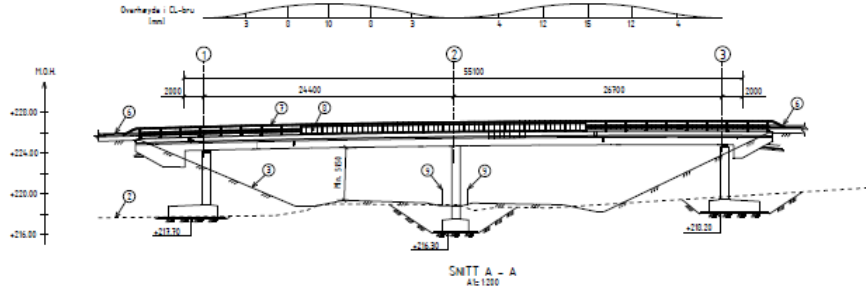


9%



5%

Profil	200	210	220	230	240	250	260	270
Verkhøjdelse					R _u 2000 m			
Horisontalkurve					R _u 600			
Profilhøjde	225,20	225,55	225,76	225,94	226,04	226,11	226,19	226,19
Tværnfall	3%							



Anmerkninger:

- Overliggende vag (Strukturtype 10000)
 - Vagklasse H1
 - ZDT: 1400 (028)
 - Om. hastighed: 50 km/h
- Underliggende vag (Strukturtype 10000)
 - Vagklasse H1 (dramatiseringsklasse for rullevej med 10 km/h)
 - ZDT: 2000 (031)
 - Om. hastighed: 10 km/h
- Konstruktions-type: Peger på spændemateriale i betong
- Ansvar for konstruktion: 2010
- Udføres i overens med Procestekst 1, nr 8762 (028)
- Projekteringsgrundlag
 - Håndbog H20
 - Brugerbekendtgørelse
 - Regulering af trafiklysning
 - Håndbog H02
 - Vag- og Dækningsregulering
 - Håndbog H01
 - Balkværk og vognspor
 - DAT er udarbejdet for høringsmateriale
 - Reference: Håndbog H1/H20-v
- Materialiseringsklasse
 - Højdepunktsklasse: 3, ref. H2-D1 100
 - Kurvelastklasse: 800/3000 ref. H2-D1 100
 - Strømningsklasse: A1-0205 - H2-D10
 - Strømningsklasse: H2-D1 100 / H2-D10
 - Udførelsesklasse: 3, REF. H2-D1 (026)
 - Konstruktionsklasse: Hæmpeplan: A, ref. H2 8762
 - Strøg: B, ref. H2 8762
- Betongkonstruktion
 - Betong: generelt: S10 C17-20
 - Armering: S200HC, ref. H2 8762-3-010
 - Betongdekkingsklasse: F10
 - Alle udførelsesoplysninger er i overens med 2010-materiale.

- Spændemateriale
 - Armering: 13 str. S200HC
 - Stålbalkværk: ref. H2 100/160 HPA
 - Armering: S200 H2/160H
 - Strømningsklasse: ref. H2 100/160 HPA
- Fundamentering
 - Driftundersøgelser på alle dele af konstruktionen
- Lager i klasse 1 og 2
 - Varene: Betongstøbt glasblokke
 - Måske: Almindelige glasblokke
- Fuger
 - Risikovarede fuger i begge brænder
- Færdigstilling i længderetning
 - Passer (jærtyl) på alle steder i begge brænder
- Bælg/Sikring
 - Bælgingsklasse: A3-4, ref. H2 8762
 - Brød- og sikring: I overens med 2010-materiale
- Forsikring
 - Brugerbekendtgørelse: Længdeliggende forsikring
 - Lærer/højdepunktsklasse: Skilte: Forsikringsklasse
 - Skilte: Hæmpeplan: Vag- og Dækningsregulering
- Balkværk
 - Strømningsklasse: H2, CE-godkendt
- Løstværk
 - Trafiklysning: Trafiklysning for brug H2 P28-015-11-15-100
 - L10 skal være monteret på brug
 - Overliggende belysningsklasse: S3 H100

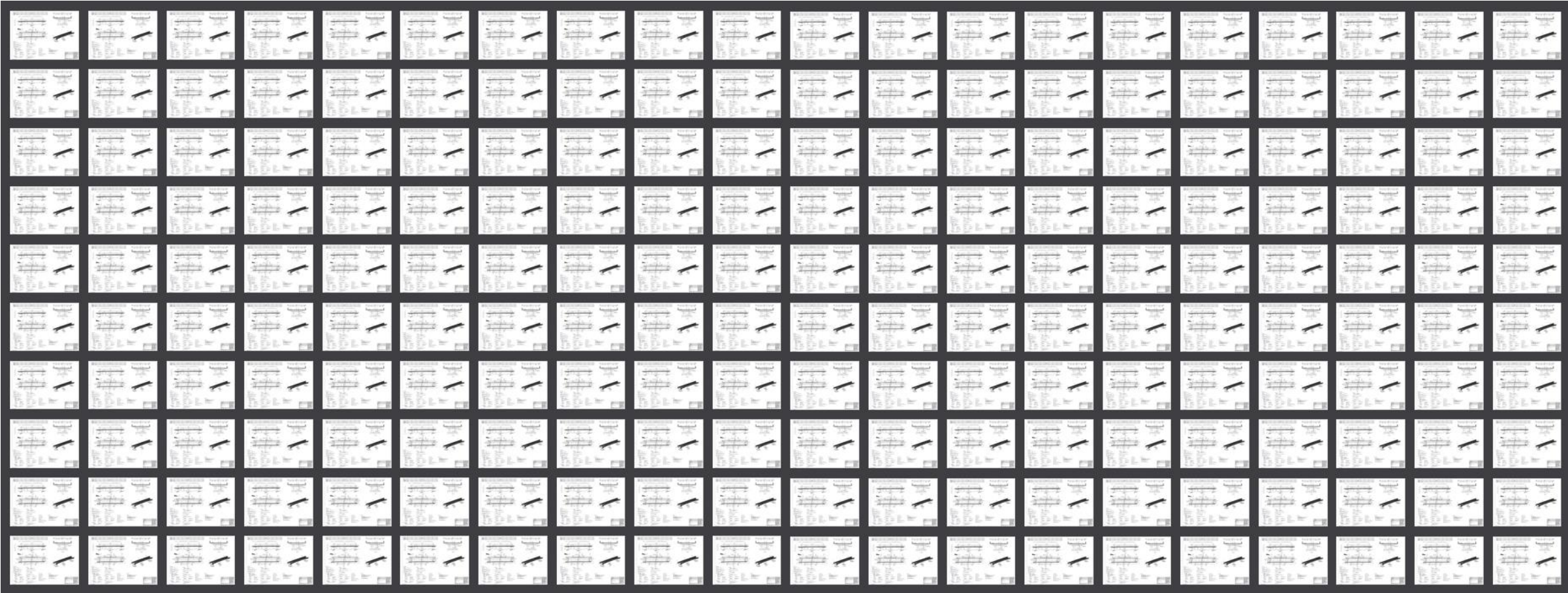
Tegnforklaring:

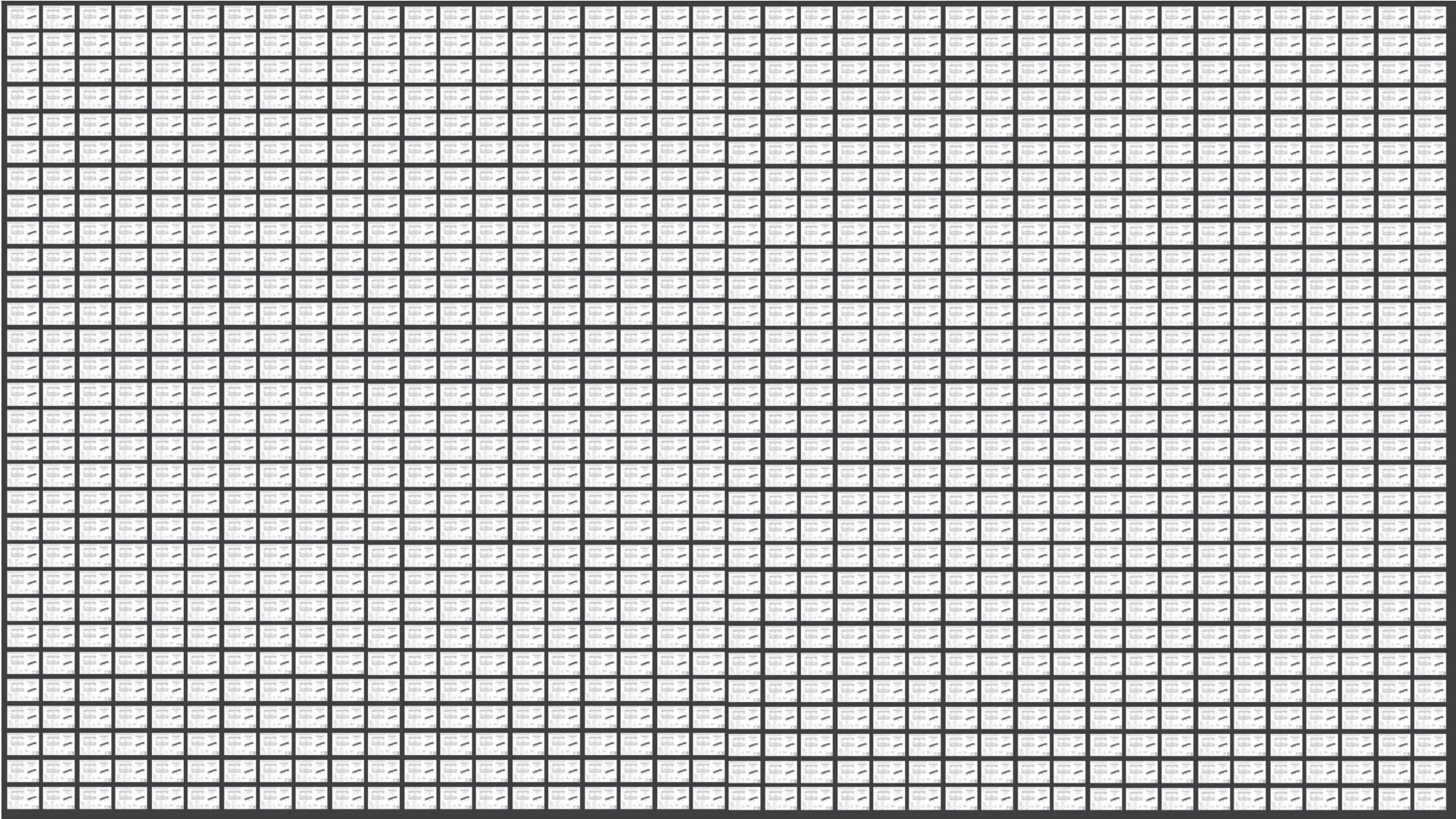
- ① Risikovarede fuger
- ② Elastiske færmag
- ③ Nytt færmag
- ④ Overgangsplate
- ⑤ Belysning
- ⑥ Stødtæt overgang til vegnbalkværk
- ⑦ Strømningsklasse H2, CE-godkendt
- ⑧ Brændeplade
- ⑨ Vegnbalkværk, styringsklasse H2

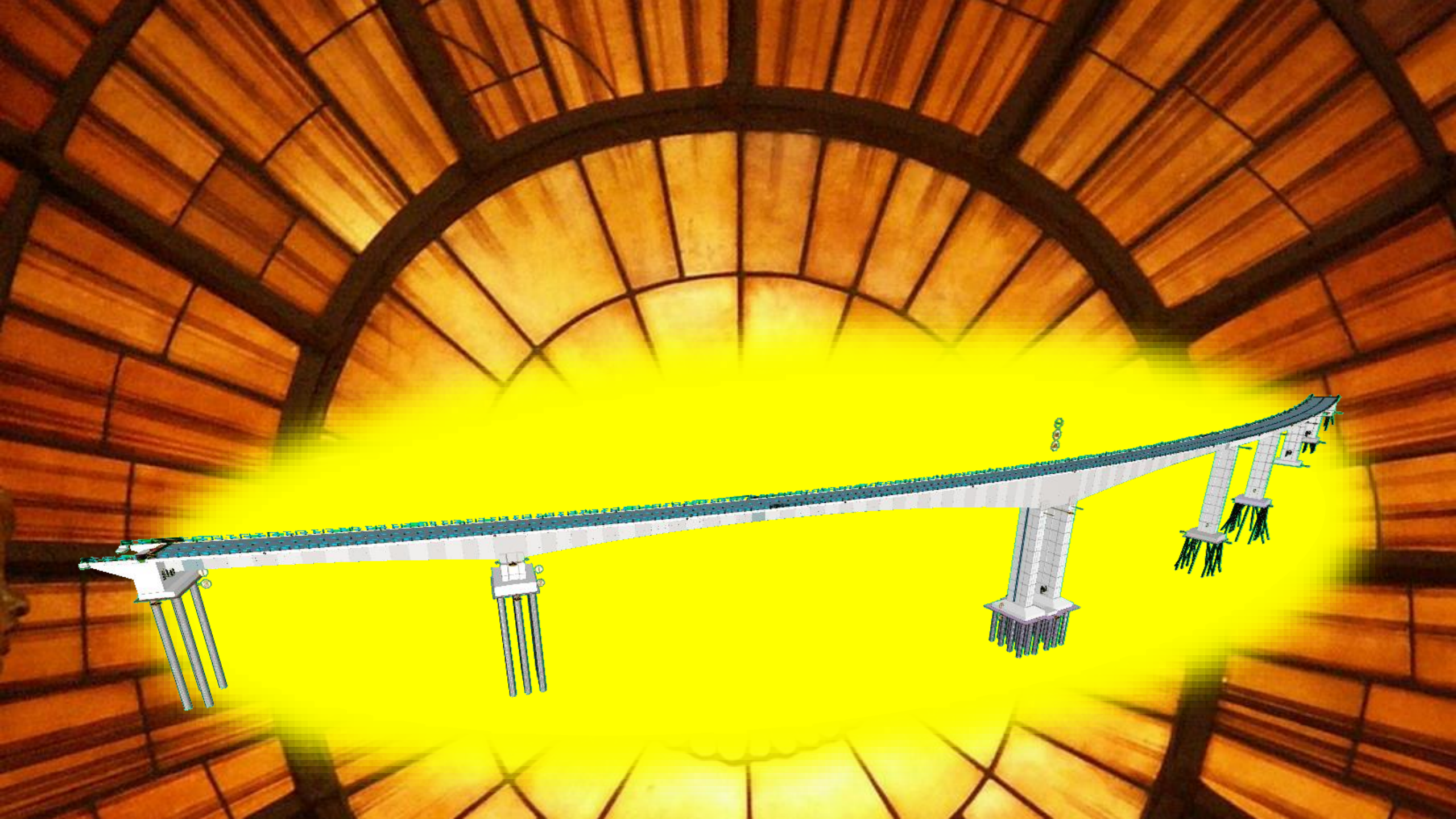
Henviisninger:

- K190-01 - Overbygning
- K190-02 - Hæmpeplan og Hæmpeplan med konstruktion
- K190-03 - Hæmpeplan og Hæmpeplan med konstruktion
- K190-04 - Belysning
- K190-05 - Belysning
- K190-06 - Belysning
- K190-07 - Belysning
- K190-08 - Belysning
- K190-09 - Belysning
- K190-10 - Belysning
- K190-11 - Belysning
- K190-12 - Belysning
- K190-13 - Belysning
- K190-14 - Belysning
- K190-15 - Belysning
- K190-16 - Belysning
- K190-17 - Belysning
- K190-18 - Belysning
- K190-19 - Belysning
- K190-20 - Belysning

Udarbejdet af	Godkendt af	Udarbejdet af	Godkendt af
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
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37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
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81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100







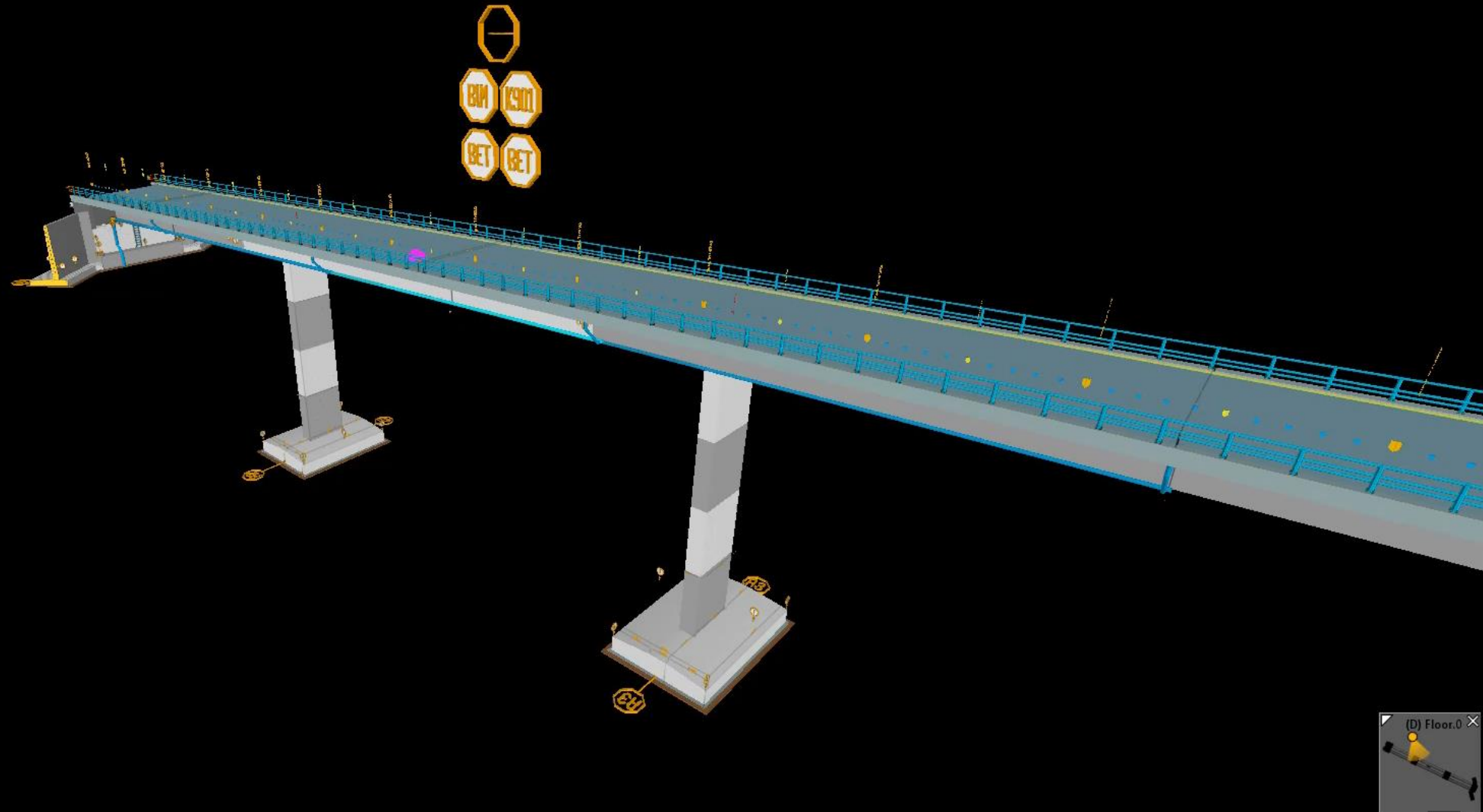
HOW



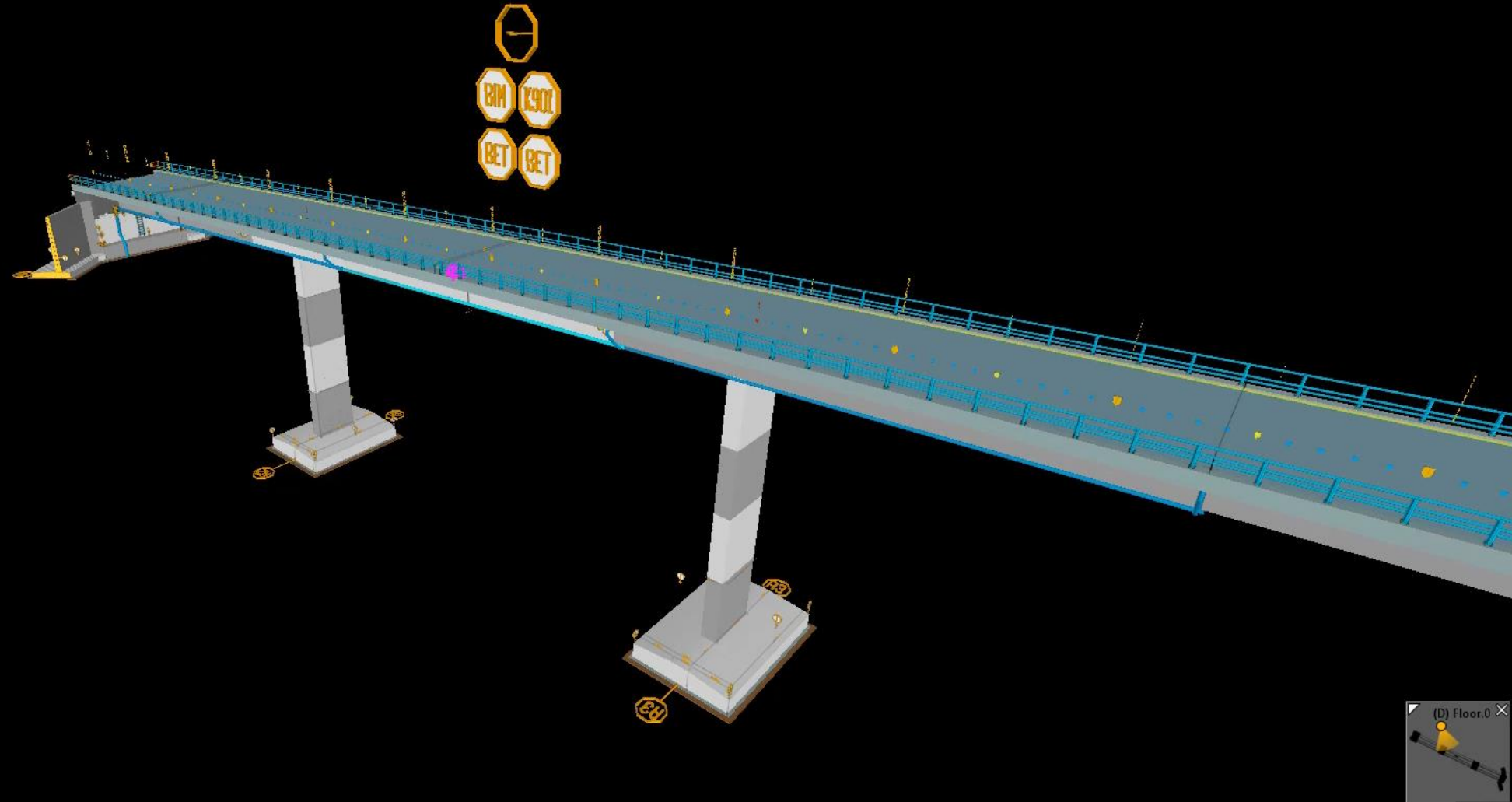
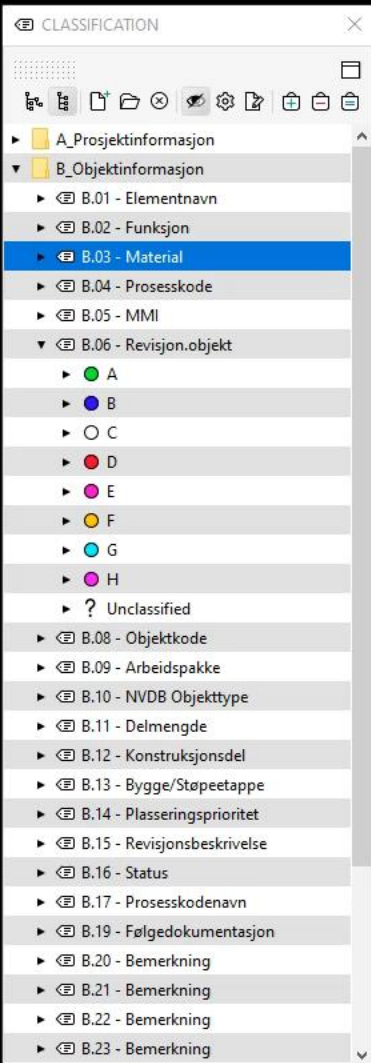


FILTERS

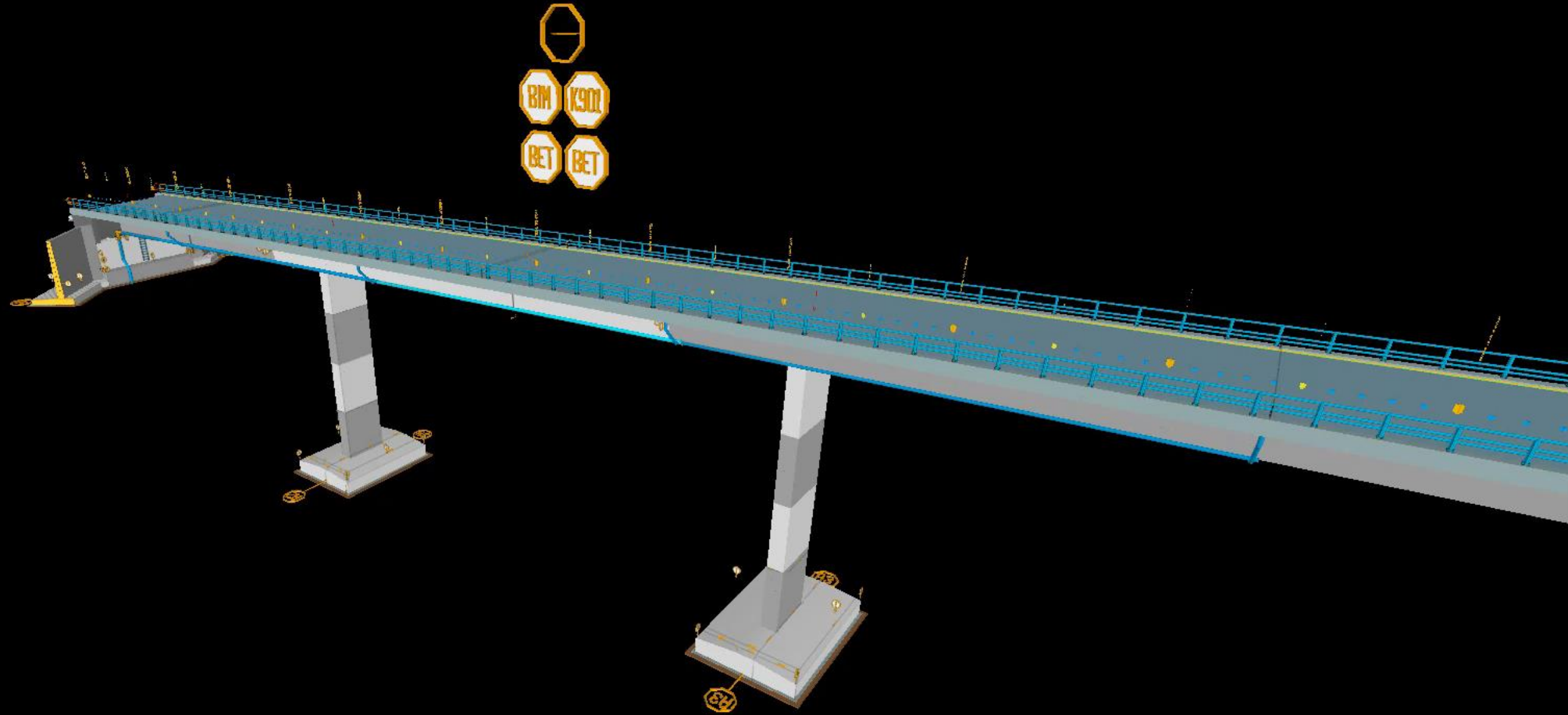
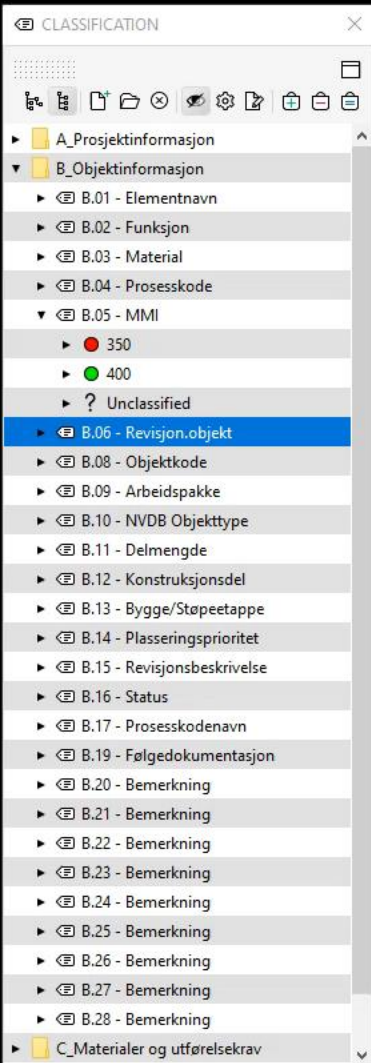
FILTER: MATERIAL



FILTER: REVISION



FILTER: STATUS





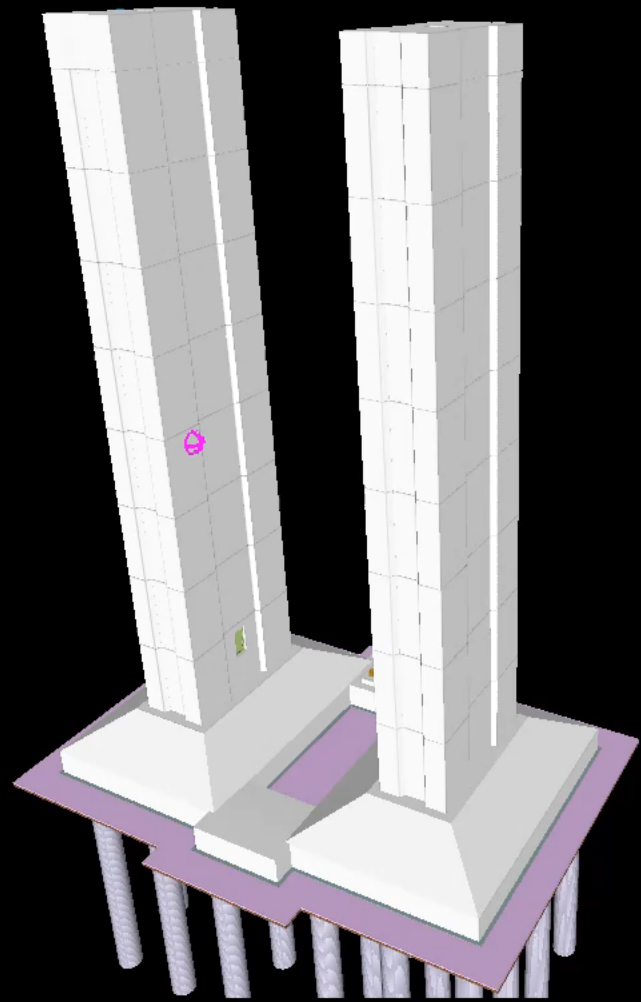
Search

- MODEL TREE
- ▶ (B) E16E01_F_KON_SUB-AKSE3-ARMERING
 - ▶ (F) E16E01_F_KON_SUB-AKSE3-FORM
 - ▶ (I) E16E01_F_KON_SUB-AKSE3-INFO
 - ▶ (J) E16E01_F_LARK_AKSE3
 - ▶ (T) E16E01_G_TERRENGOVERFLATE_AKSE3
 - ▶ (X) E16E01_F_KON_SUB-AKSE3-AKSE

CLASSIFICATION

- ▶ ○ A
- ▶ ○ XX
- ▶ ? Unclassified
- ▶ ◀ 08_Revisjonsdato
- ▶ ◀ 09_Plasseringsprioritet
- ▶ ◀ 10_Material
- ▶ ◀ 11_Dimensjon
- ▶ ◀ 12_Bygg-etappe / Støpeetappe
 - ▶ ○ 3A01-01
 - ▶ ○ 3A02-01
 - ▶ ○ 3B01-01
 - ▶ ○ 3B02-01
 - ▶ ○ 3B04-01
 - ▶ ○ 3B04-02
 - ▶ ○ 3B05-01
 - ▶ ○ 3C01-01
 - ▶ ○ 3C01-02
 - ▶ ○ 3C01-03
 - ▶ ○ 3C01-04
 - ▶ ○ 3C01-05
 - ▶ ○ 3C01-06
 - ▶ ○ 3C01-07
 - ▶ ○ 3C01-08
 - ▶ ○ 3C02-01
 - ▶ ○ 3C02-02
 - ▶ ○ 3C02-03
 - ▶ ○ 3C02-04
 - ▶ ○ 3C02-05

3D

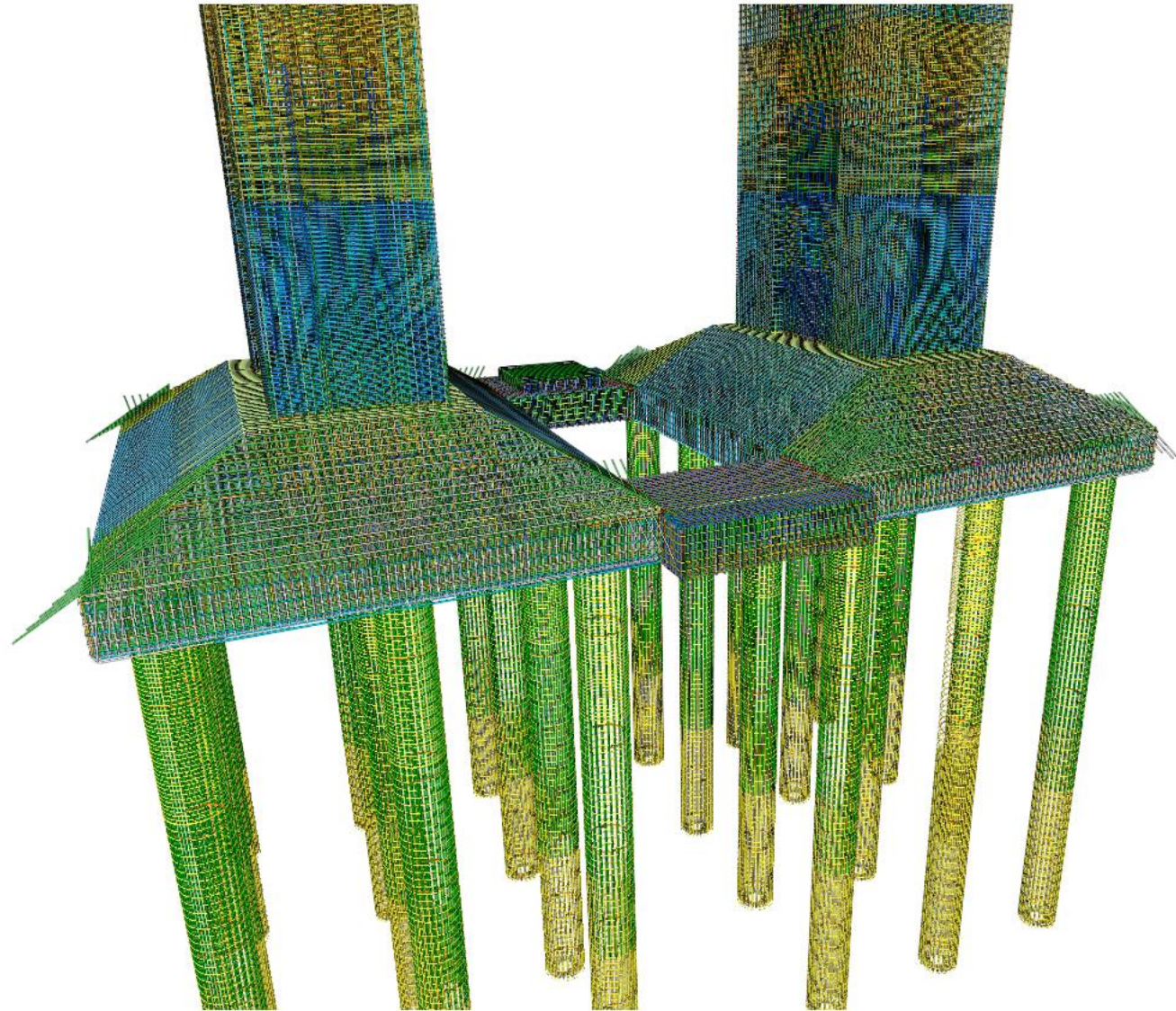




Search

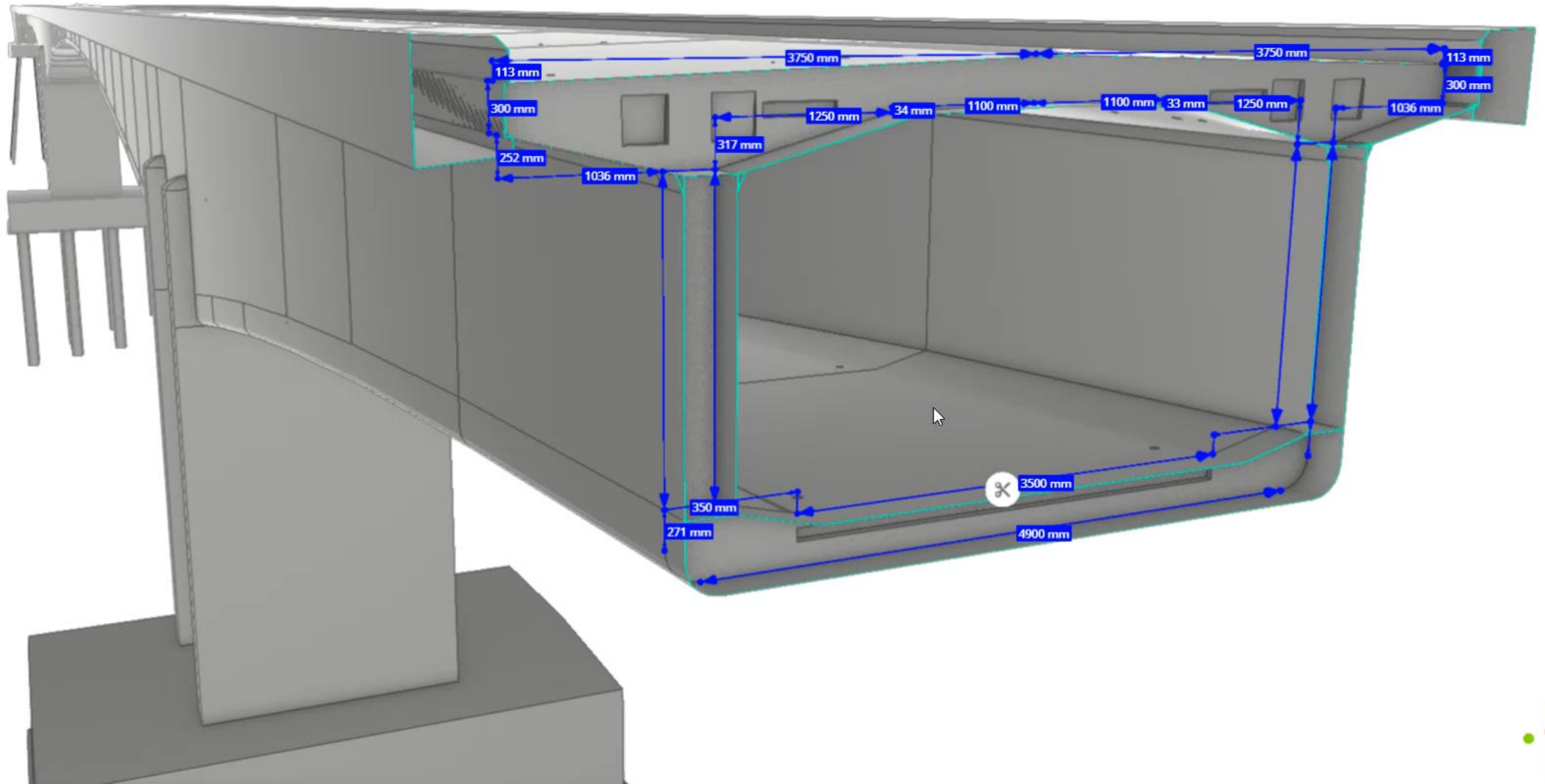
- MODEL TREE
- (B) E16E01_F_KON_SU
 - (F) E16E01_F_KON_SU
 - (I) E16E01_F_KON_SUE
 - (J) E16E01_F_LARK_AK
 - (T) E16E01_G_TERREN
 - (X) E16E01_F_KON_SU
 - (Y) E16E01_G_FLOMN
 - (Z) REBAR_SUPER_AXI
 - (Z2) TEMP_SUPER_AX

- CLASSIFICATION
- 22_Merknad_10
 - Building Elements
 - Furniture
 - Rebar_CC
 - Rebar_CLASS
 - 101
 - 102
 - 103
 - 104
 - 105
 - 106
 - 107
 - 108
 - 109



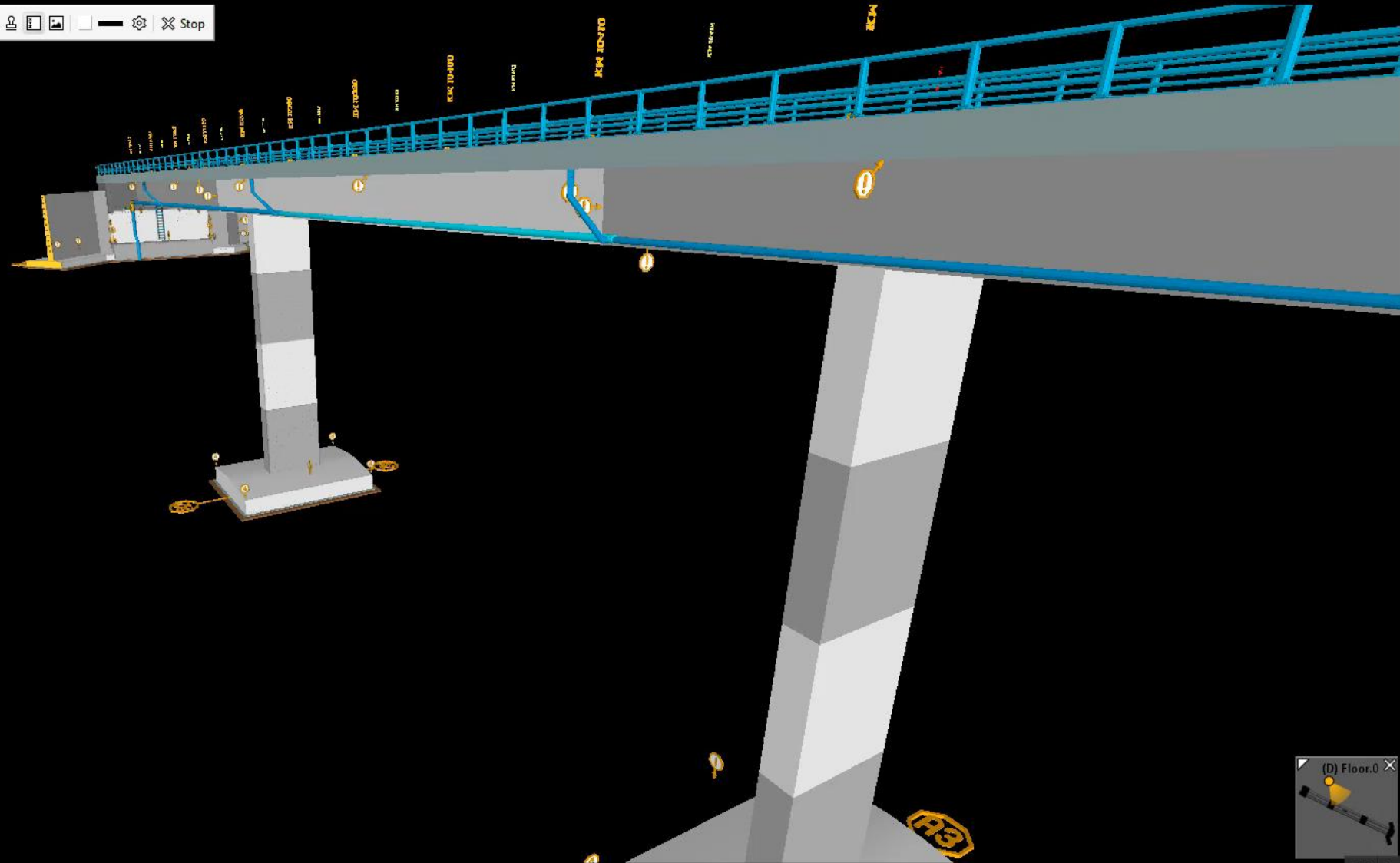
REPLACING
DRAWINGS





COORDINATES

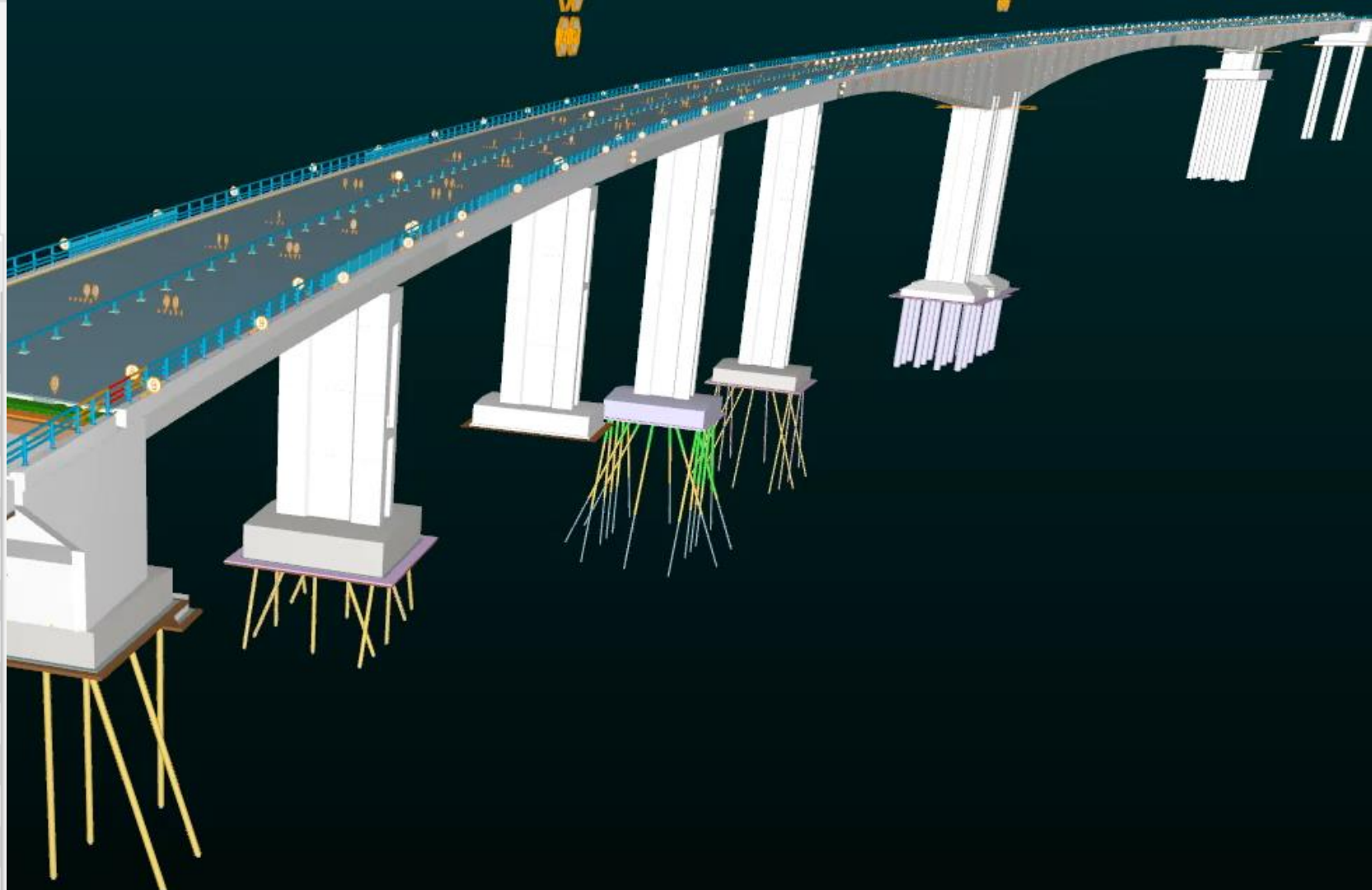
ARUP



(F) Object.0.5

Classification	Hyperlinks				A_E16_CONCRETE_INFO	
Identification	Location	Quantities	Material	Relations		
A_E16_PART_INFO	Pours	Tekla Common	Tekla Quantity			

Property	Value
01 Name	Column
02 Description	-
03 Object code	C2
04 Process	84400000
05 LOD	350
06 Status	Ready for 3 rd party control
07 Revision	01
08 Revision date	2019.08.09
09 Placement prio.	350
10 Material	C45
11 Dimension	-
12 Constr. sequence	2019.08.09
13 Free 01	-
14 Free 02	-
15 Free 03	-
16 Free 04	-
17 Free 05	-
18 Free 06	-
19 Free 07	-
20 Free 08	-
21 Free 09	General reinforcement information, see K50
22 Free 10	https://a360.co/2KmKhM7



BIM

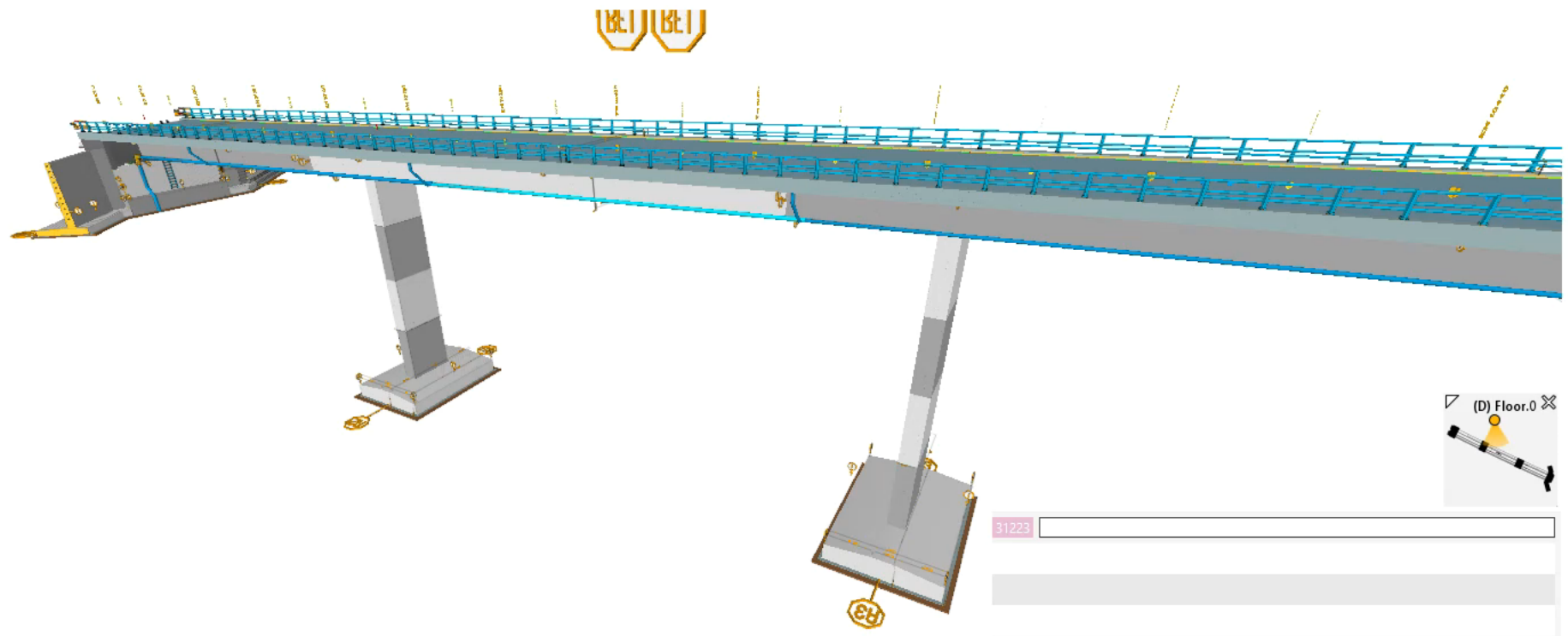
QUALITY
CONTROL



Search

- PRESENTATIO... New Presentation Report
- Armering_Test (4)
- Presentation 1 (18)
- TEST (5)**

3D



ISSUE DETAILS

Title

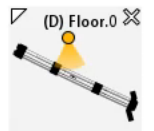
Description

Coordination

Status Issue Type

Stage Due Date

Priority



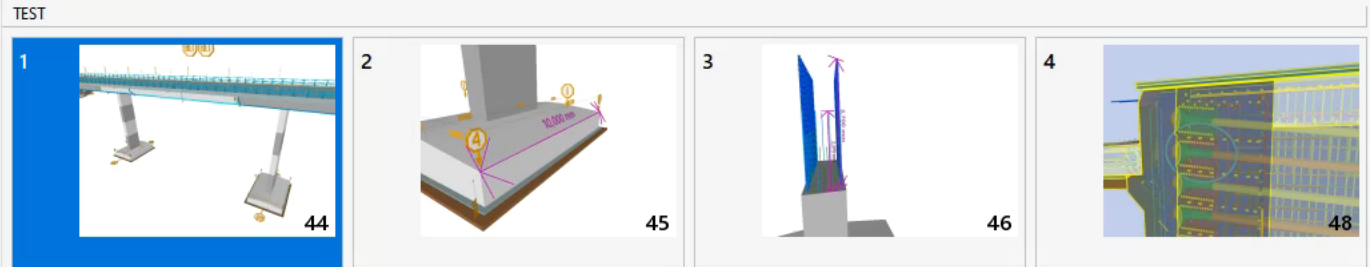
31223

ISSUES New Issue

Presentation	No.	Title	Tracking ID	Status
TEST	1		44	Open
TEST	2		45	Open
TEST	3		46	Open
TEST	4		48	Open

Navigation icons: back, forward, search, status dropdown (Open), and other controls.

ISSUE SORTER





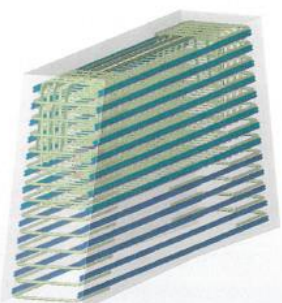
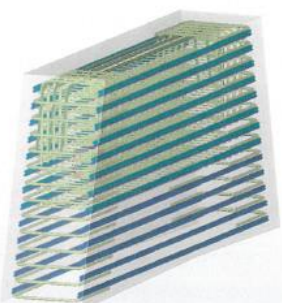
SJEKKLISTE - Armering

Prosjekt: 55008001 E6 Arnkvern - Moelv

Konstruksjon: K340

Bygningsdel: Landkarvegg akse 1 og 2

REV 01

KONTROLL AKTIVITET	EK	DK	BILDE FRA MODELL 01	
1 Har armering rett overdekning?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
2 Har armering rett Ø og CC iht. beregning?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
3 Er spesielle støpeskjøter plassert?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
4 Alle jern nødvendig forankring/omfar?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
5 Armering i konflikt med utsparinger / andre fag?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
8 Har armering rett pre-fix?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
9 Har armering rett nummer?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
10 Er nummerering av armering gjort?	<input type="checkbox"/>	<input type="checkbox"/>		
11 LM – Er rett nummer og info gitt?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
12 LM – Er skjøter modellert rett i modellen?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		 <p><i>- Gjennomgå med adm: - Vegg tykkelse endret 600 → 800mm → Lagerbjelke forankrings- jernene.</i></p>
13 Har rett armering fått status «D»?	<input type="checkbox"/>	<input type="checkbox"/>		
14 Jern i bøy alle steder?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
15 Er armeringen riktig plassert?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
16 Plass til armering iht. NS-EN1992, pkt 8.2?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
17	<input type="checkbox"/>	<input type="checkbox"/>		
18	<input type="checkbox"/>	<input type="checkbox"/>		
19	<input type="checkbox"/>	<input type="checkbox"/>		
EGENKONTROLL: NOILKK	DATO SIGN	06.09.18	BILDE FRA MODELL 03	
DISIPLINKONTROLL: MOKRZY	DATO SIGN	03.08.18		
Evt. kommentarer:				



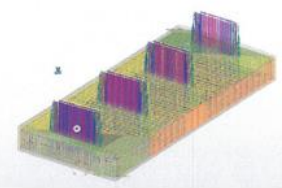
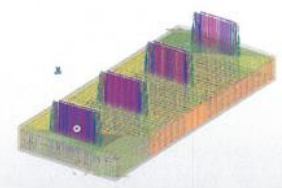
SJEKKLISTE - Armering

Prosjekt: 55008001 E6 Arnkvern - Moelv

Konstruksjon: K340

Bygningsdel: Fundament i akse 1 og 2

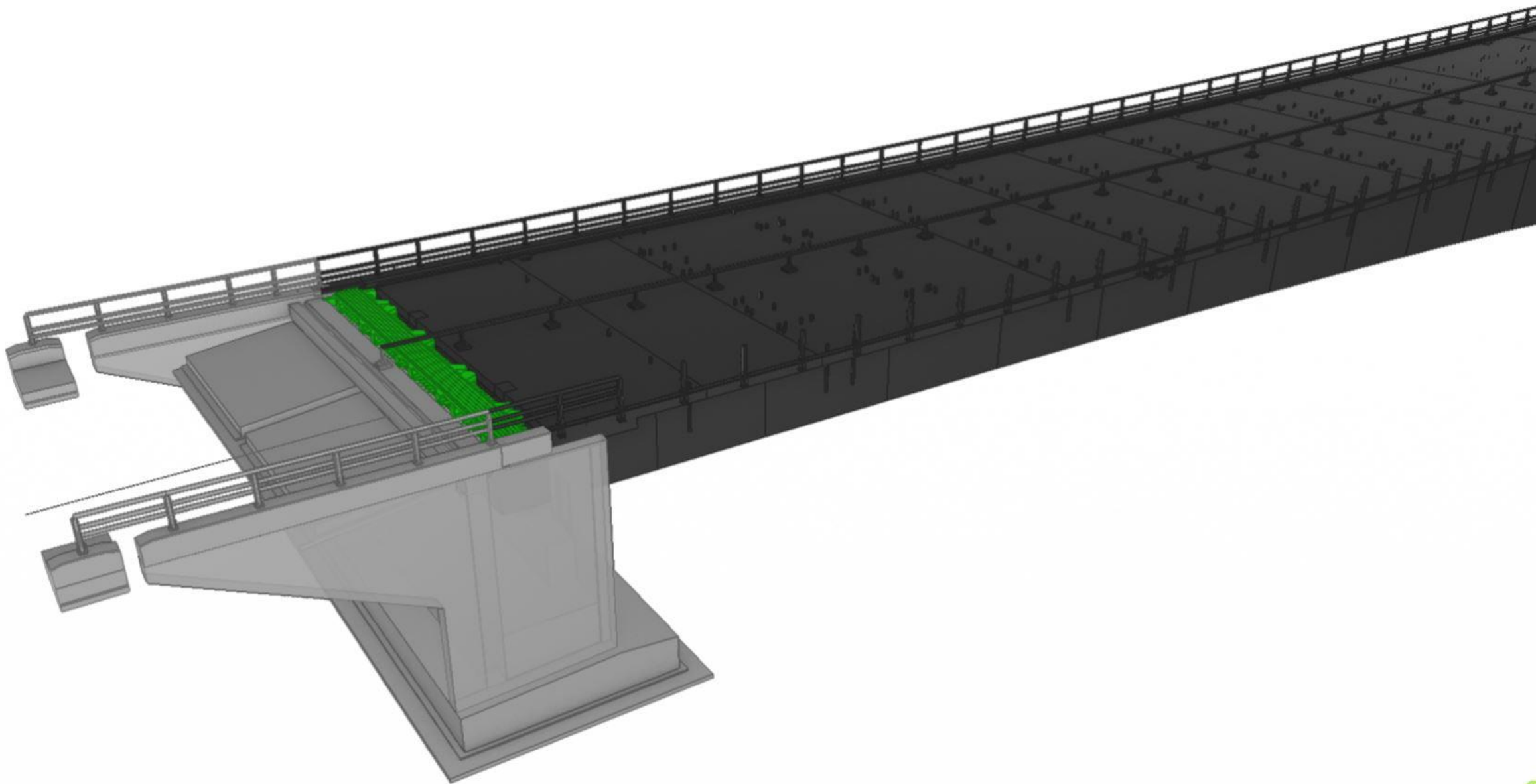
REV 01

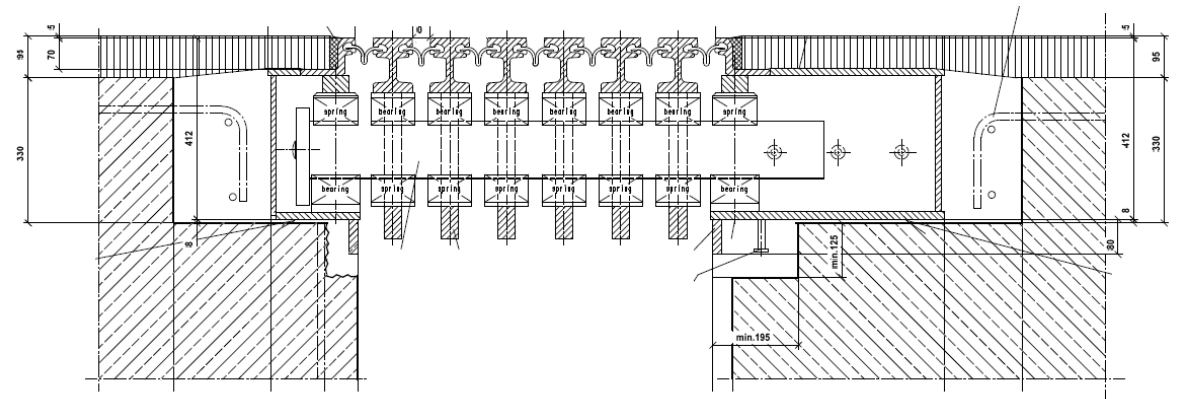
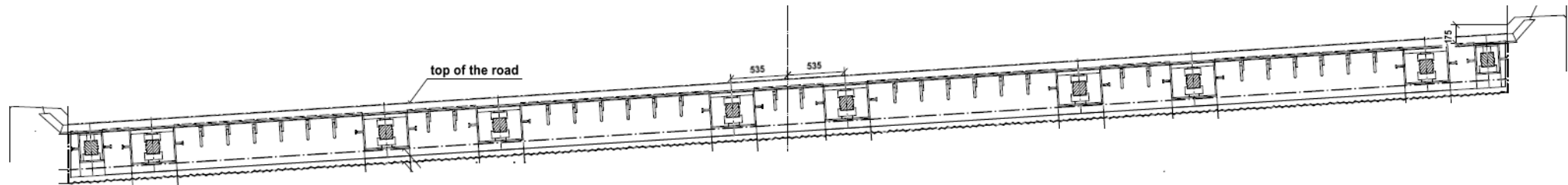
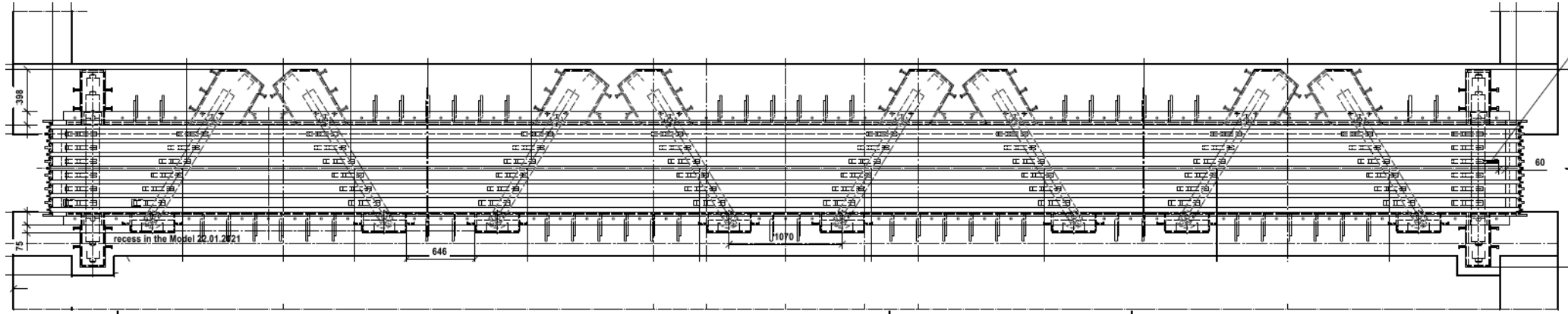
KONTROLL AKTIVITET	EK	DK	BILDE FRA MODELL 01	
1 Har armering rett overdekning?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
2 Har armering rett Ø og CC iht. beregning?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
3 Er spesielle støpeskjøter plassert?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
4 Alle jern nødvendig forankring/omfar?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
5 Armering i konflikt med utsparinger / andre fag?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
8 Har armering rett pre-fix?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
9 Har armering rett nummer?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
10 Er nummerering av armering gjort?	<input type="checkbox"/>	<input type="checkbox"/>		
11 LM – Er rett nummer og info gitt?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
12 LM – Er skjøter modellert rett i modellen?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
13 Har rett armering fått status «D»?	<input type="checkbox"/>	<input type="checkbox"/>		
14 Jern i bøy alle steder?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
15 Er armeringen riktig plassert?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
16 Plass til armering iht. NS-EN1992, pkt 8.2?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
17	<input type="checkbox"/>	<input type="checkbox"/>		
18	<input type="checkbox"/>	<input type="checkbox"/>		
19	<input type="checkbox"/>	<input type="checkbox"/>		
EGENKONTROLL: NOILKK	DATO SIGN	06.09.18	BILDE FRA MODELL 03	
DISIPLINKONTROLL: MOKRZY	DATO SIGN	03.08.18		

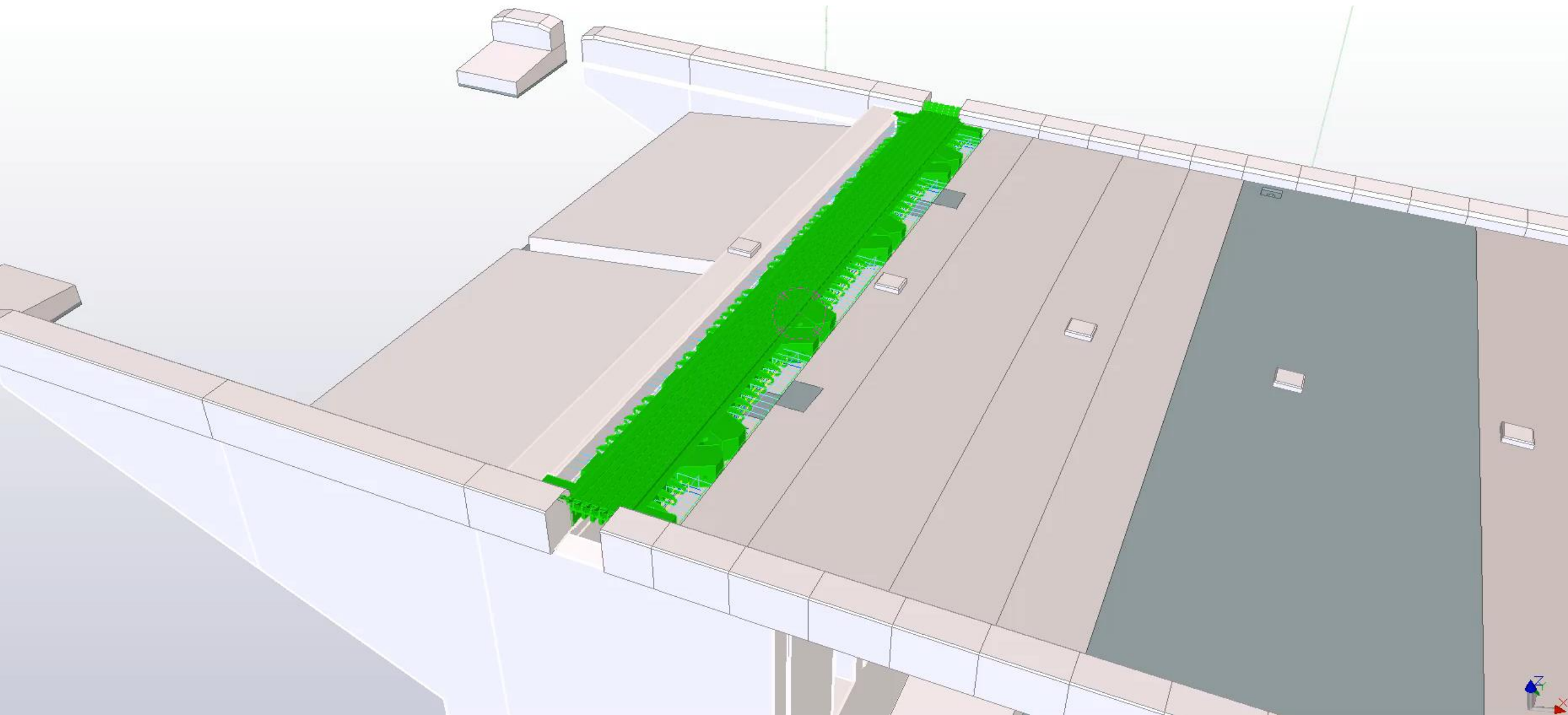
Gjennomgå med Adm:

- Landkarshive armering forankringslengde
- UK tverre- og lengdearmering i akse 2, s. landkarshive
- Skjøtearmering

ADAPTION

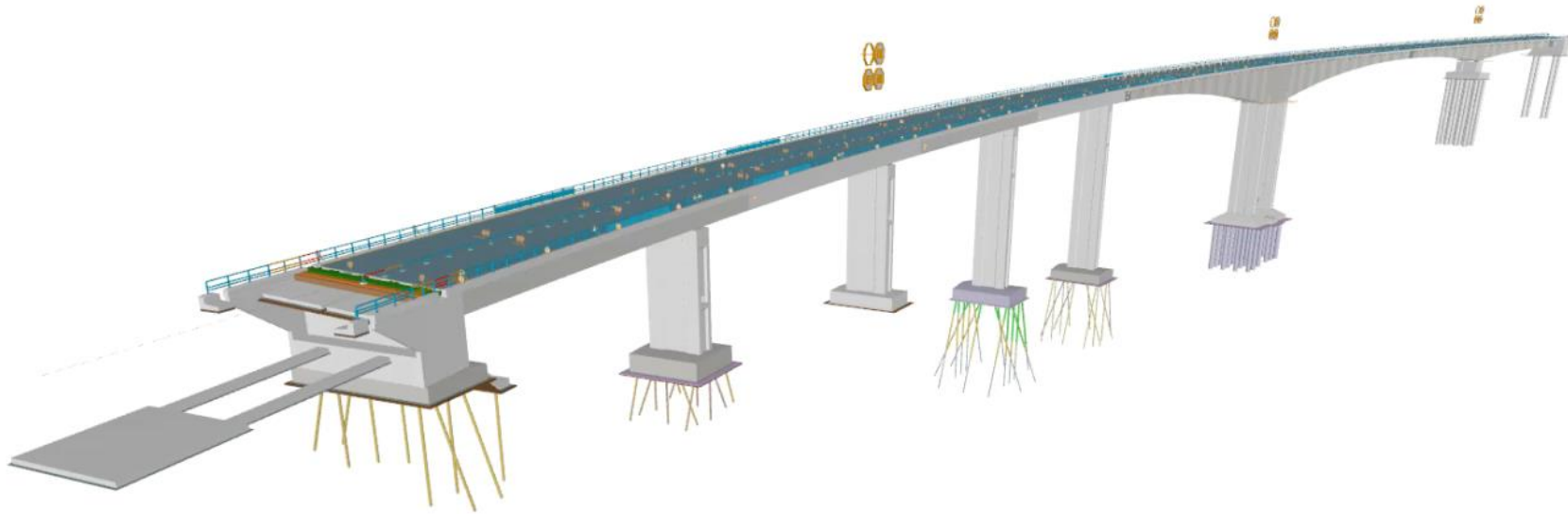






AGILITY

3D

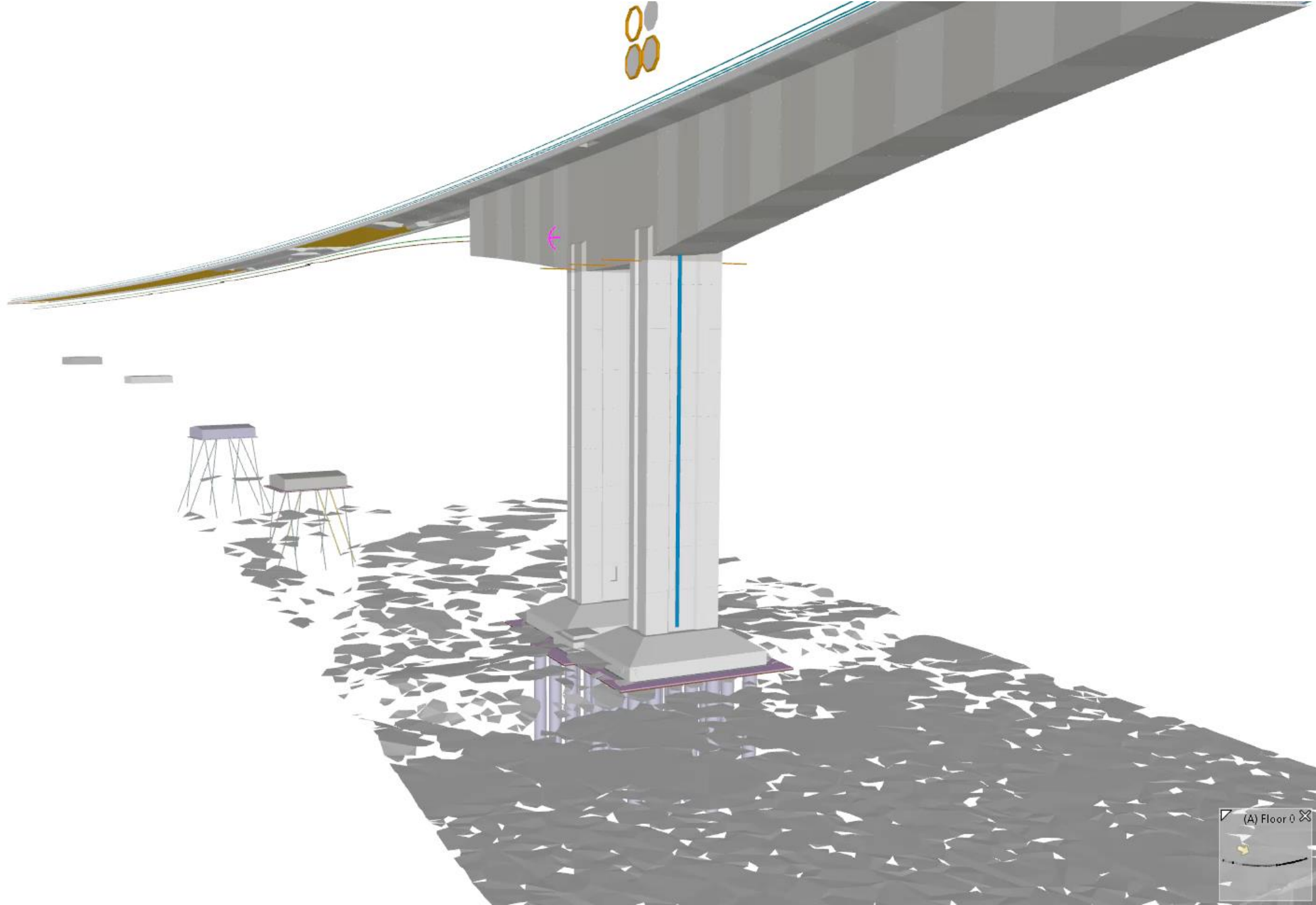


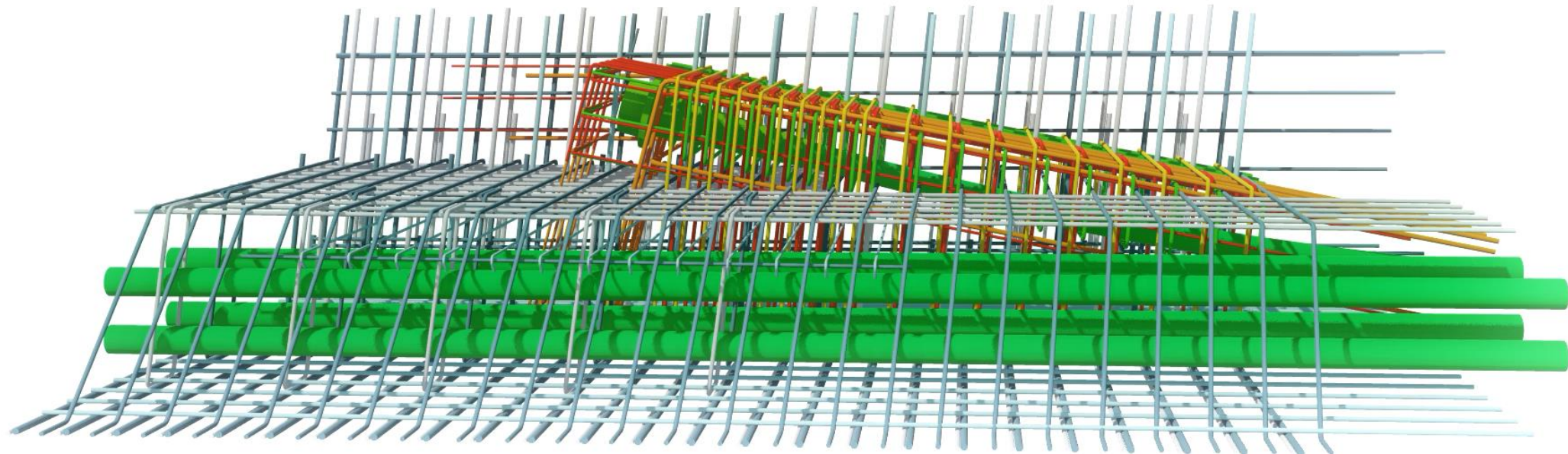
ISSUE SORTER



INFORMATION TAKEOFF Takeoff Selected E16_arm_BL_SmithStal

Pos.	Type	Bygg/Støpetappe	MMI	Revisjon	Antall	Kval.	Dia.	Lengde	Vekt/stk
SB310B-1001	Armering	SB310B	360	02	25	B500NC	16	8,500.00 mm	
SB310B-1002	Armering	SB310B	360	02	15	B500NC	16	5,990.00 mm	
SB310B-1003	Armering	SB310B	360	02	25	B500NC	16	3,510.00 mm	
SB310B-1004	Armering	SB310B	360	07	33	B500NC	16	5,710.00 mm	
SB310B-1006	Armering	SB310B	360	07	12	B500NC	16	2,270.00 mm	
SB310B-1009	Armering	SB310B	360	07	34	B500NC	16	5,700.00 mm	

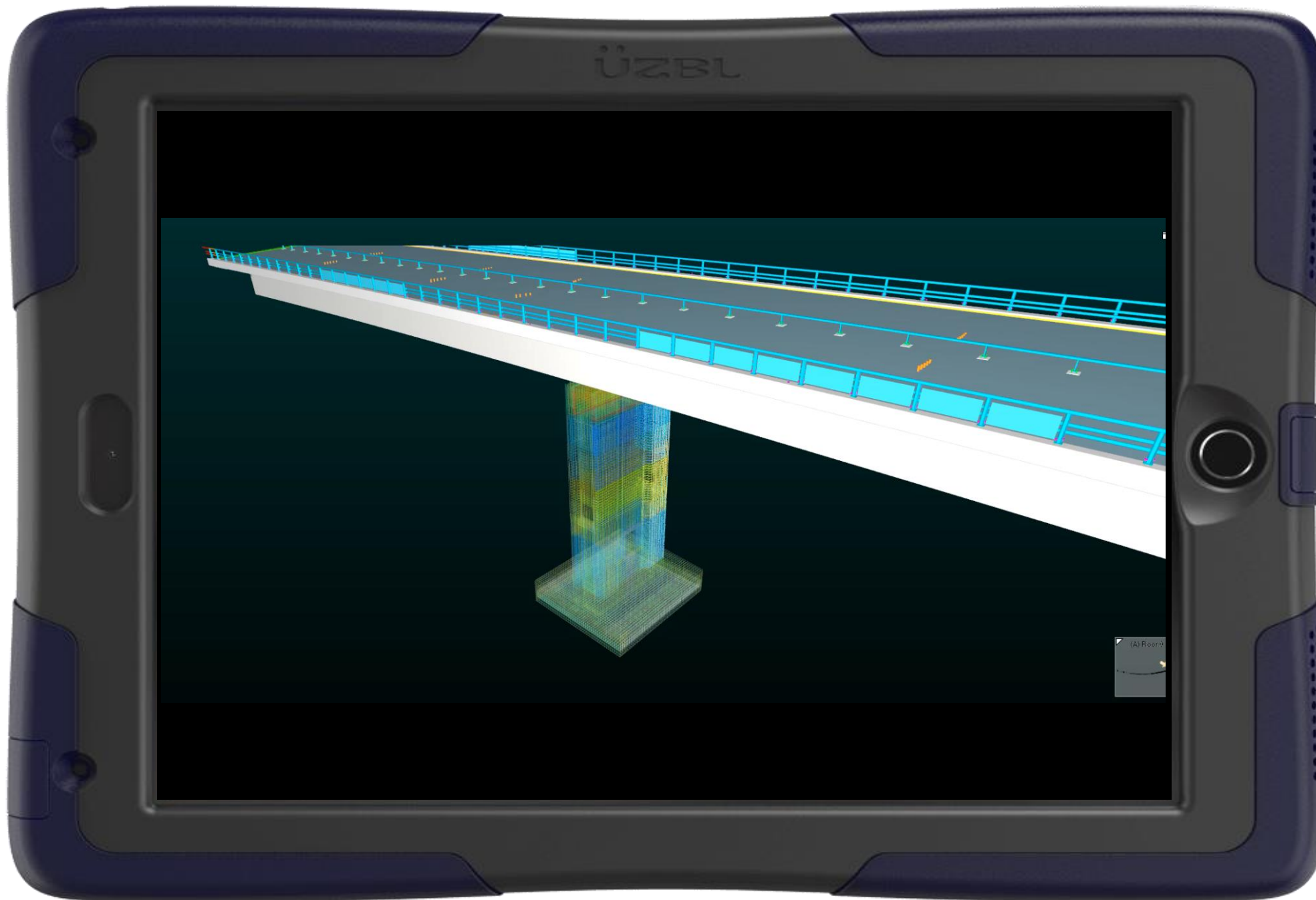




AT
SITE



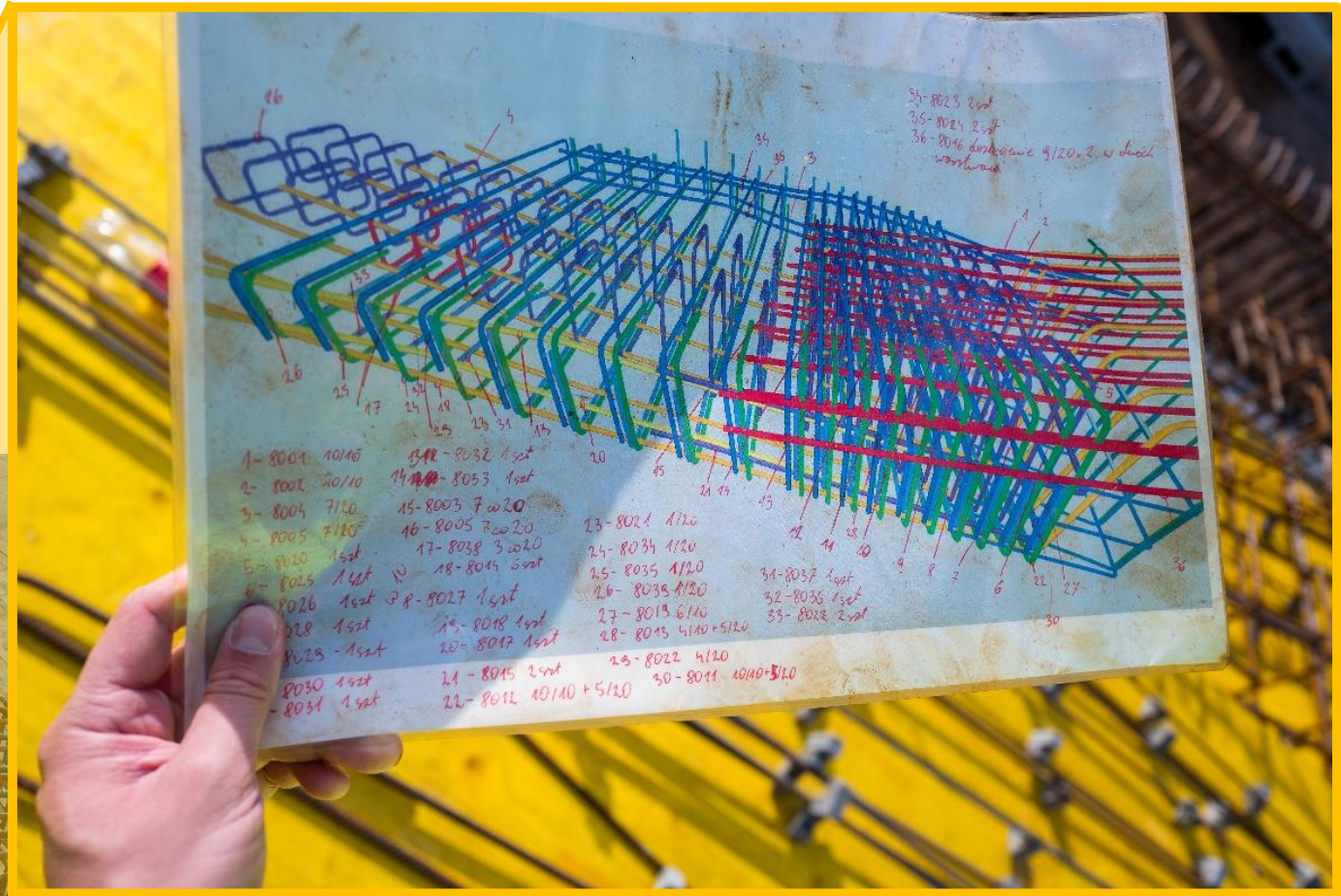
ARUP



ARUP

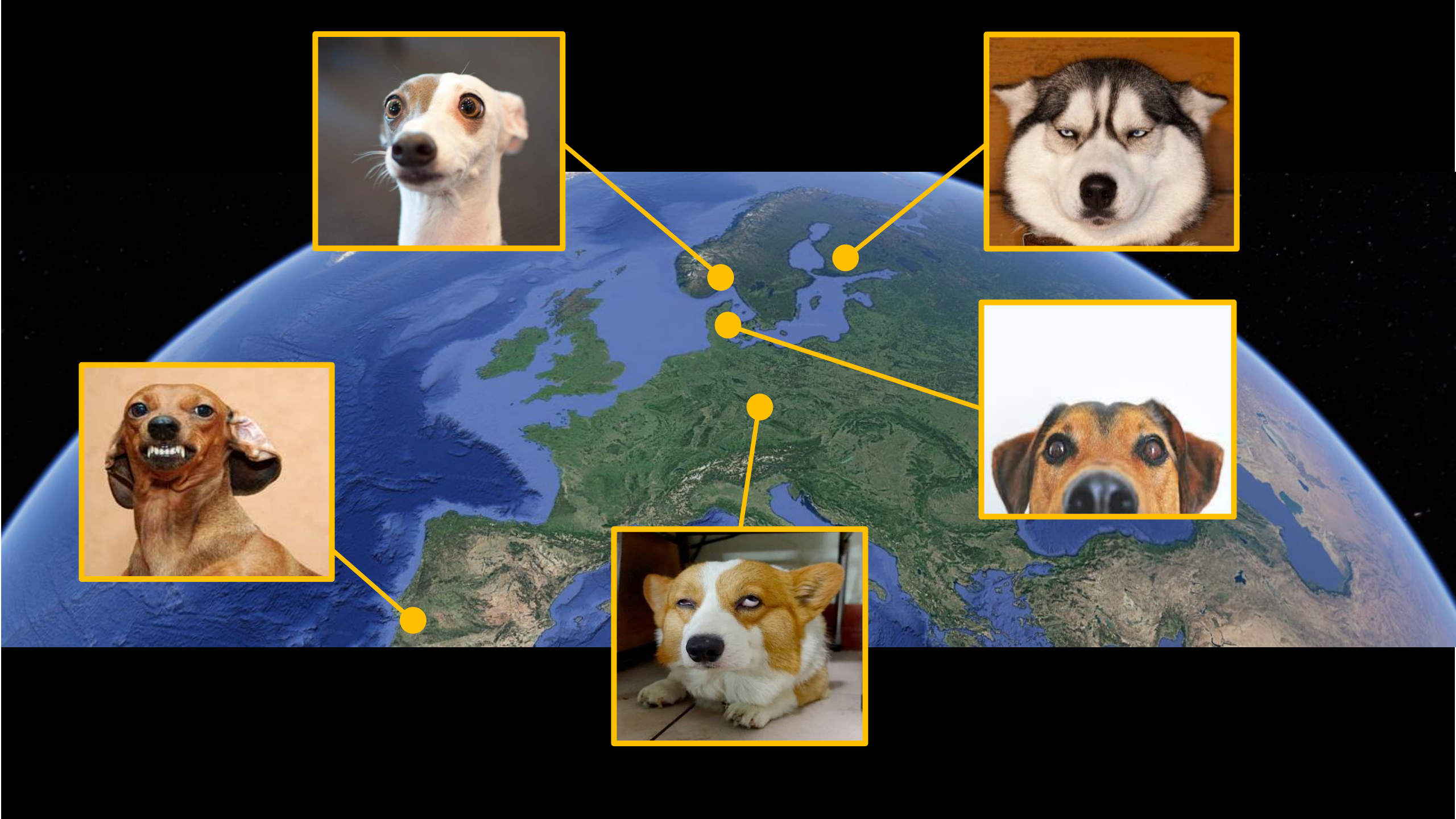
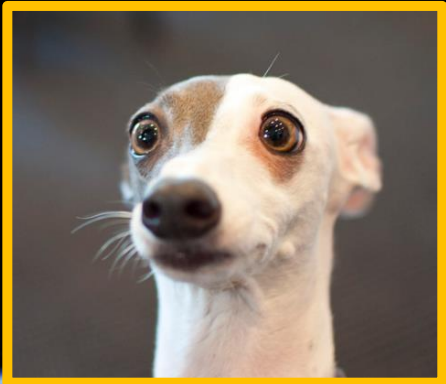




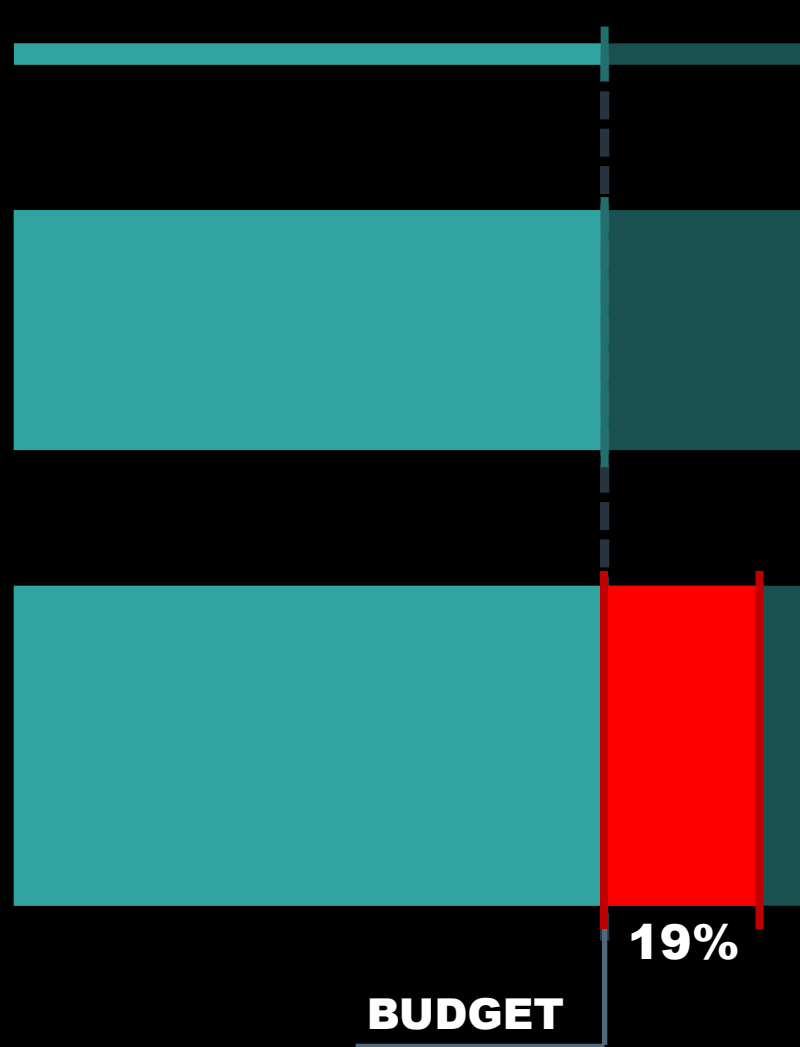
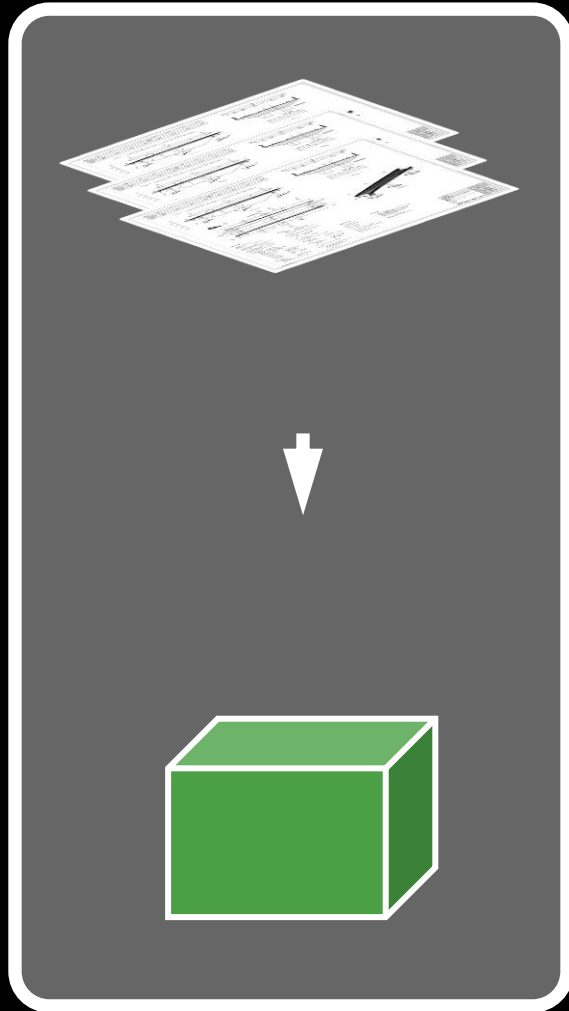


OTHER

ADVANTAGES



COST vs
SAVINGS



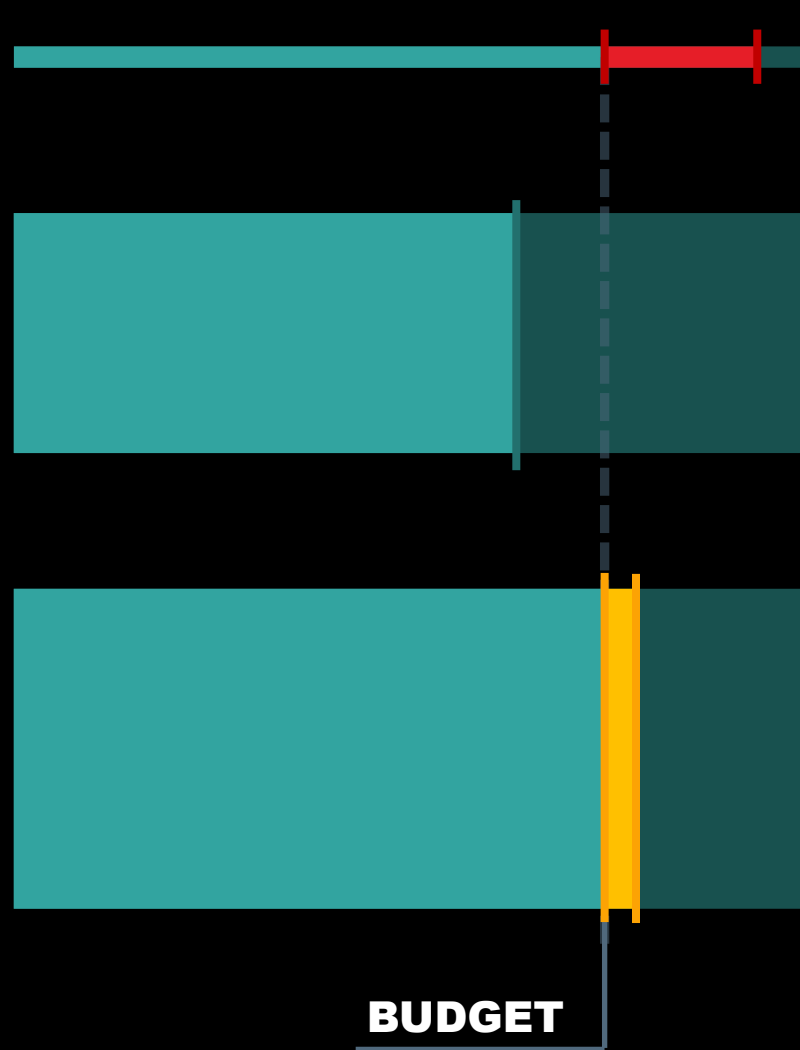
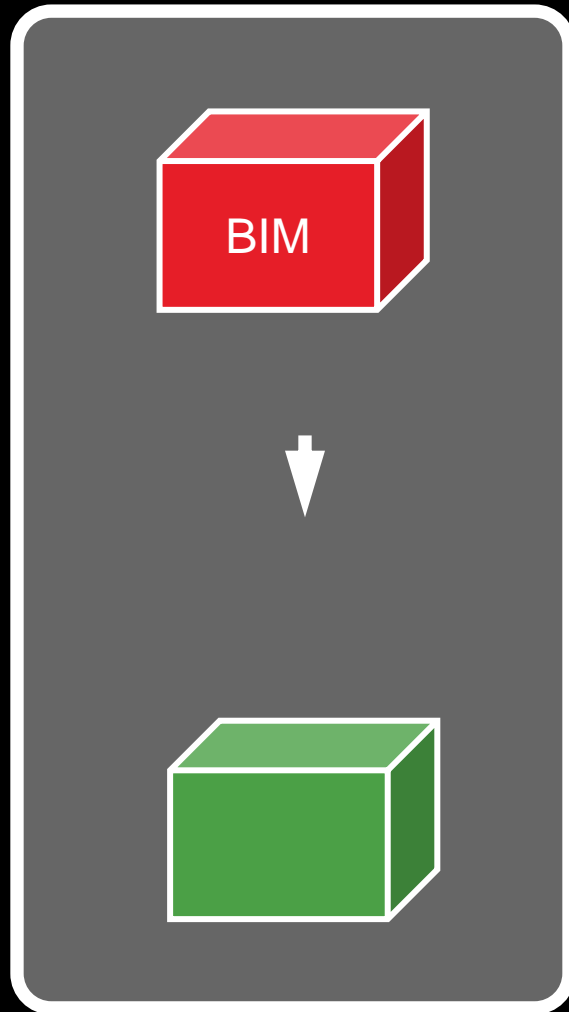
CONSULTANT
[HOURS]

CONTRACTOR
[HOURS]

PROJECT
[\$]

BUDGET

19%

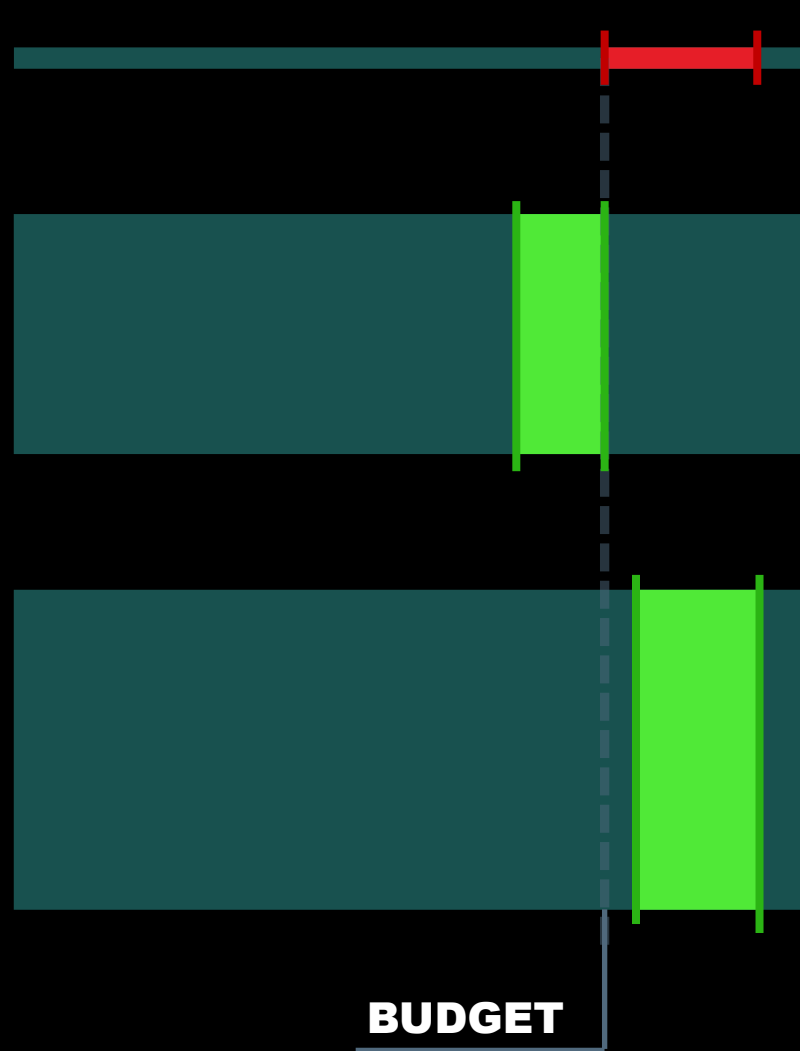
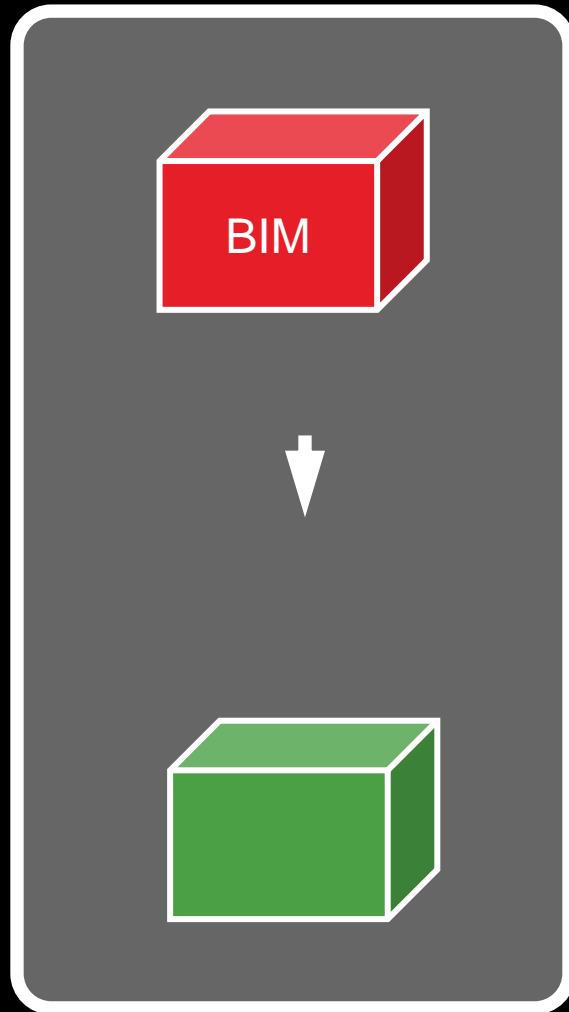


CONSULTANT
[HOURS]

CONTRACTOR
[HOURS]

PROJECT
[\$]

BUDGET



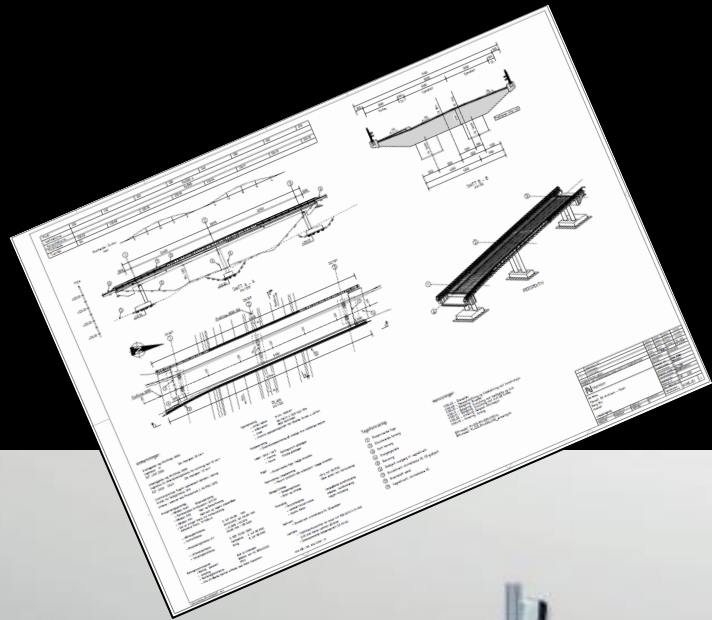
CONSULTANT
[HOURS]

CONTRACTOR
[HOURS]

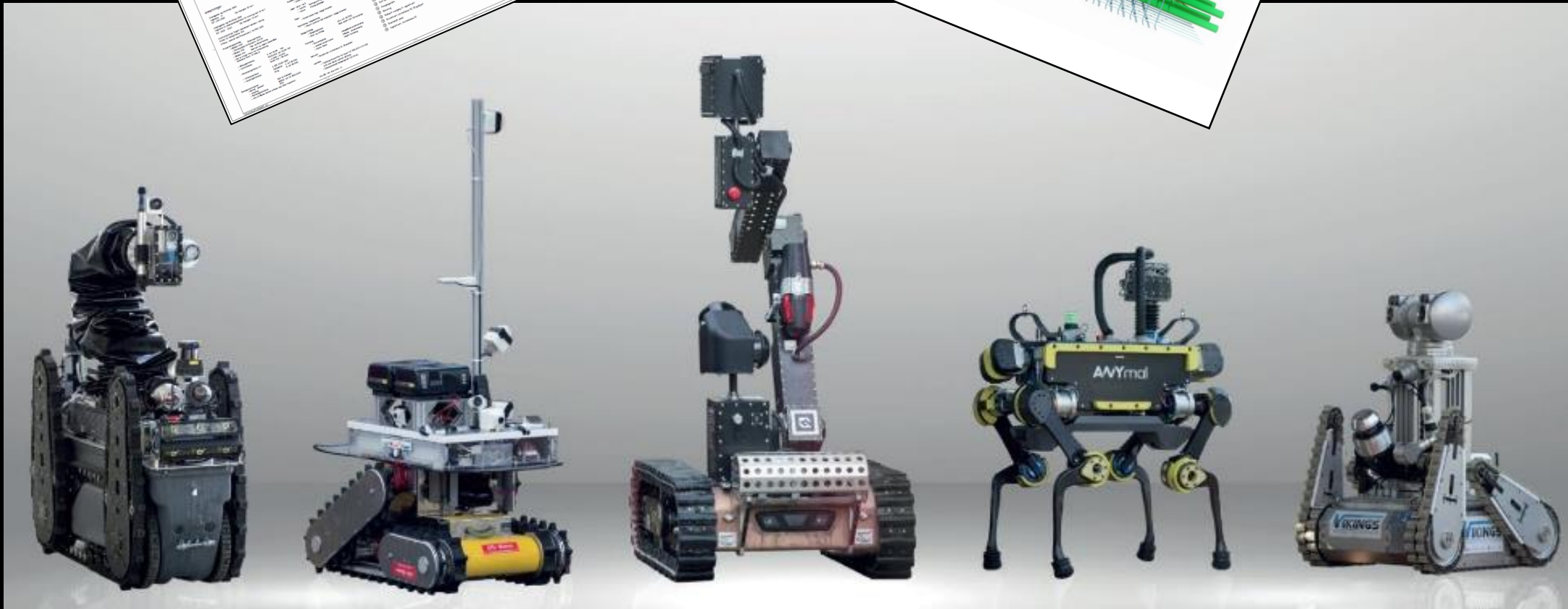
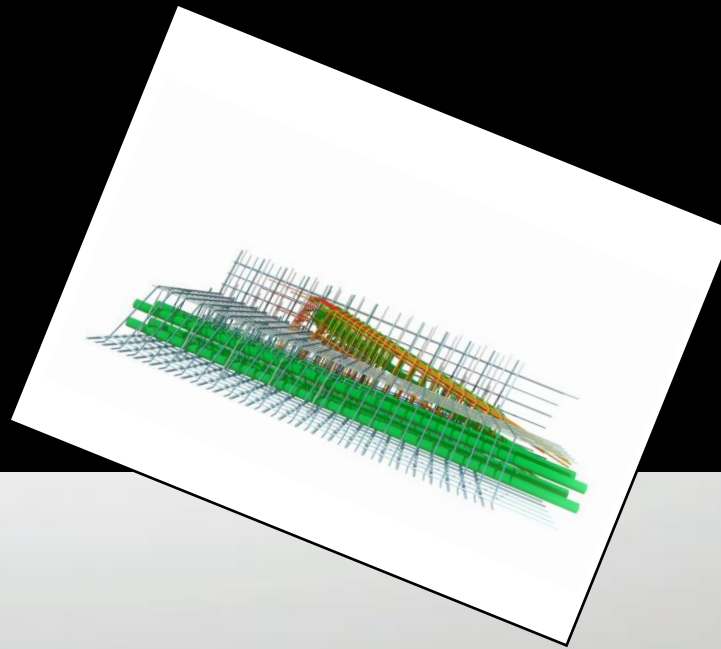
PROJECT
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BUDGET

PREPARE

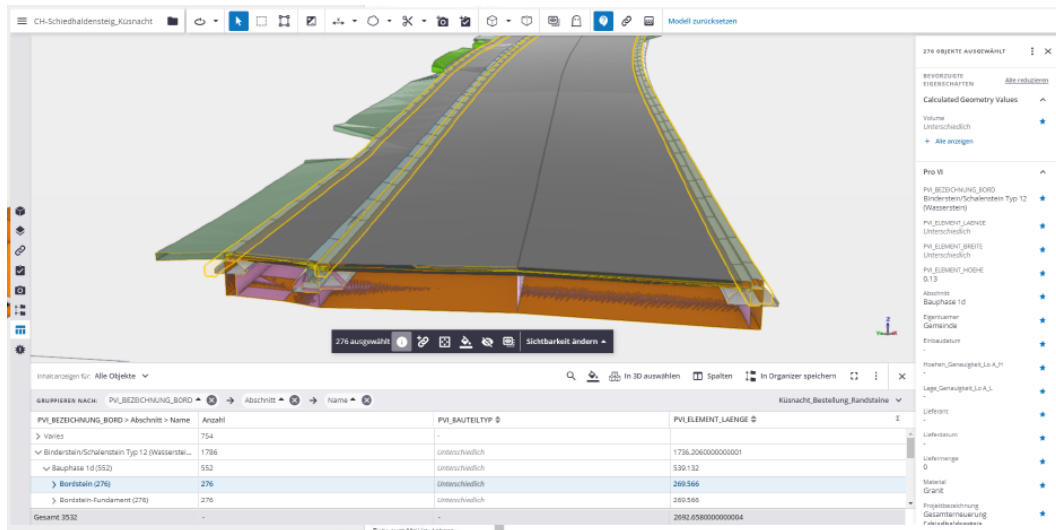
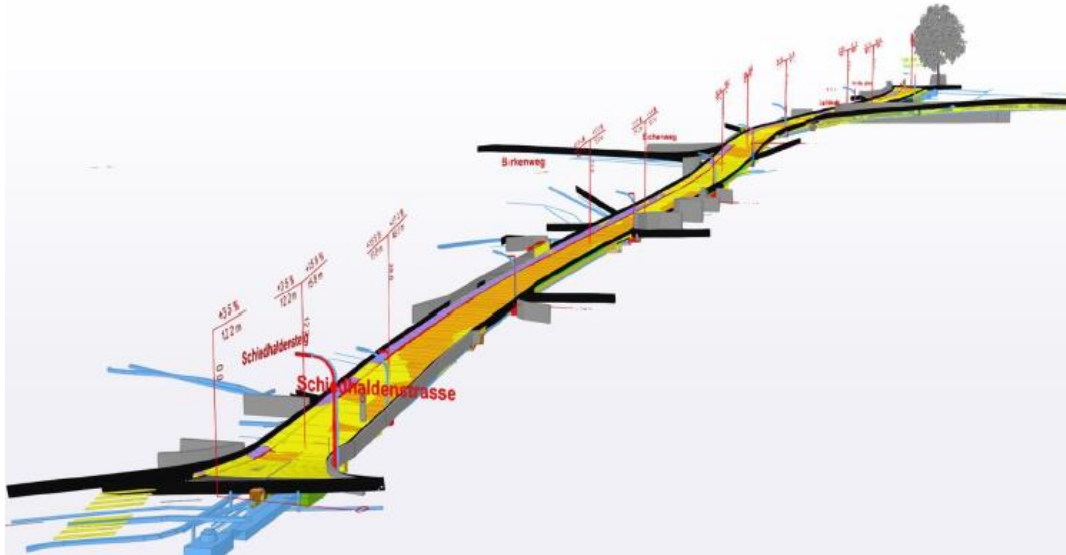


VS



Strabag - Switzerland

ARUP



Destia - Highway 4 Kirri-Tikkakoski - Finland

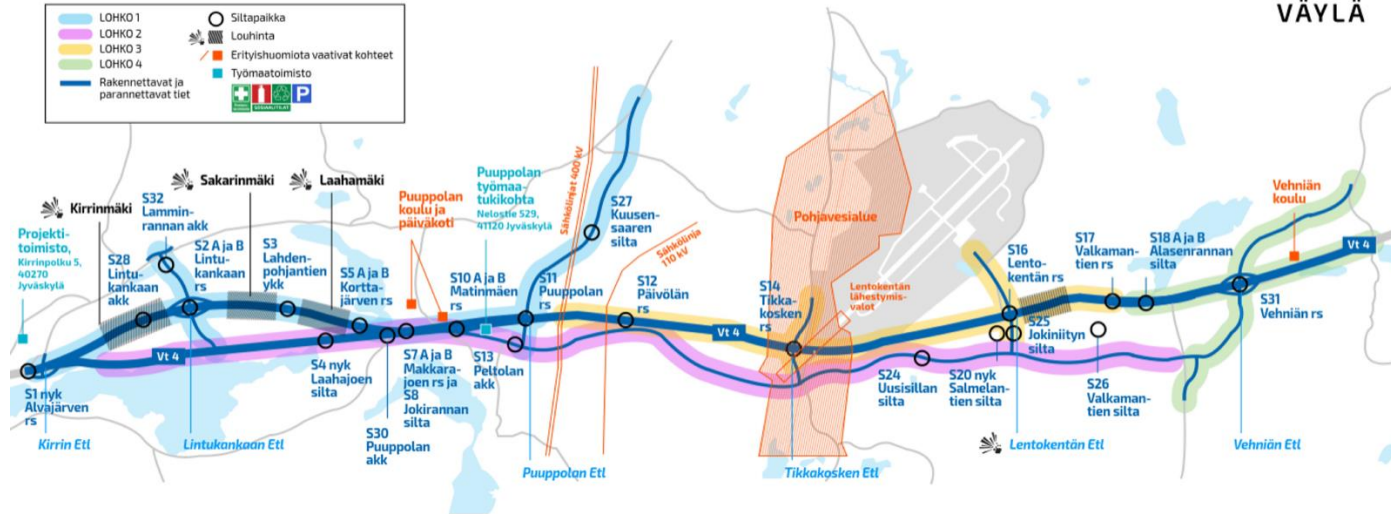
ARUP

Vt 4 KIRRI-TIKKAKOSKI STk, TYÖMAA-ALUE

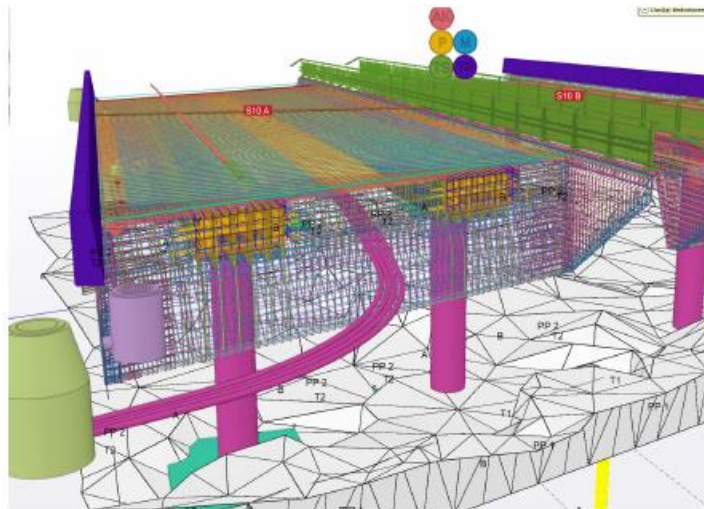
DESTIA



- LOHKO 1
 - LOHKO 2
 - LOHKO 3
 - LOHKO 4
 - Rakennettavat ja parannettavat tiet
- Siltapaikka
 - Louhinta
 - Erityishuomiota vaativat kohteet
 - Työmaatoimisto



BIM HIGHWAY CONSTRUCTION IN FINLAND | Jaakko Taipale



How?

“Disruptive innovations always look like toys”

DOMINIC BASULTO 22 February, 2011



The Non-Negotiables

*Client enabled
Model is the Law*

*Setout from the model
Model for Construction
officeField / Field2office*

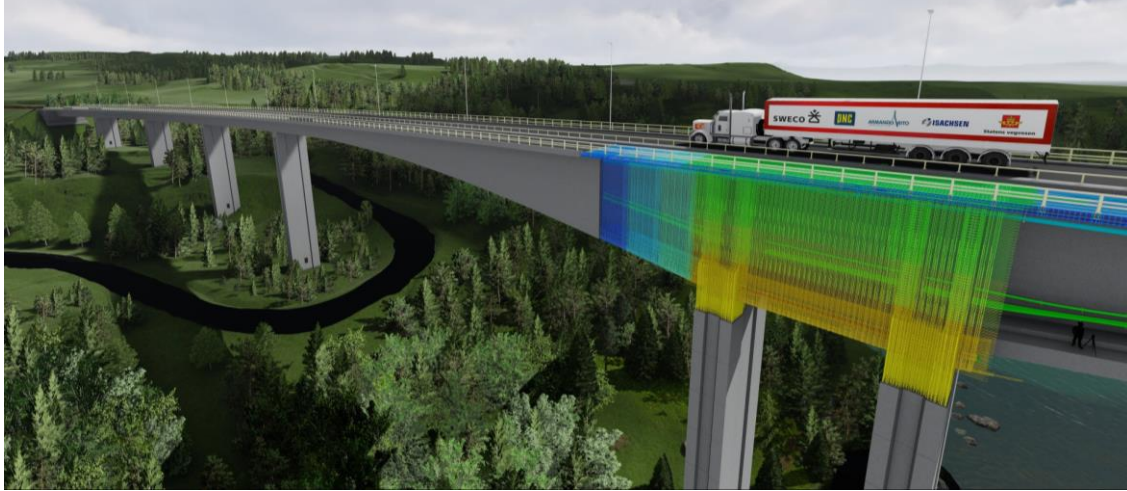
“to do new things ... we need new ways”

FROM
PRE APPROVAL PROCESS
Stamped drawings Signed drawings Signe approved changes Approver push changes Only approved files shared
LOCKED/RESTRICTED

TO
TRACKING/MONITORING
The system track changes The system track who did what when The approver monitor the changes All push and pull changes All is visible, but marked with maturity level
DYNAMIC/TRANSPARENT



Tekla
BIM Awards 2020
WINNER



Why?

ARUP

“Do more with less”

“Get more infrastructure”

What?

Less Risk : = More certainty

Less RFI := Improved communication

Less Effort : = Save Resources

Less Time : = Deliver early

How?

Model Based Delivery

End to End workflows

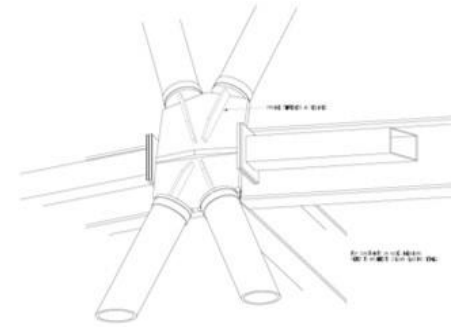
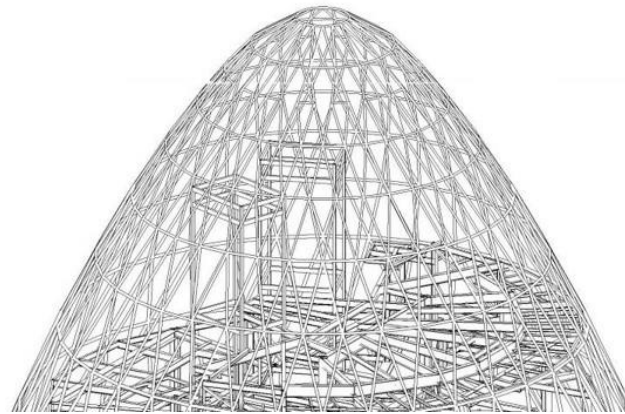
Re-use of data

Office2Field / Field2Office

HANG ON ...



SwissRe London (1999)



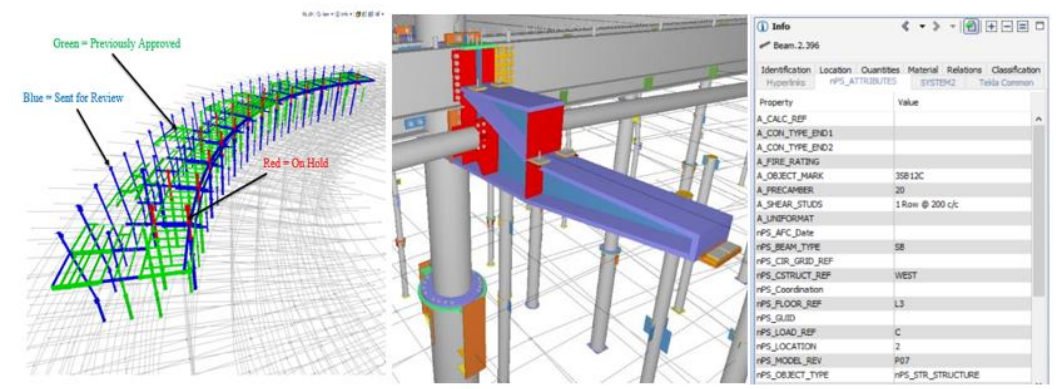
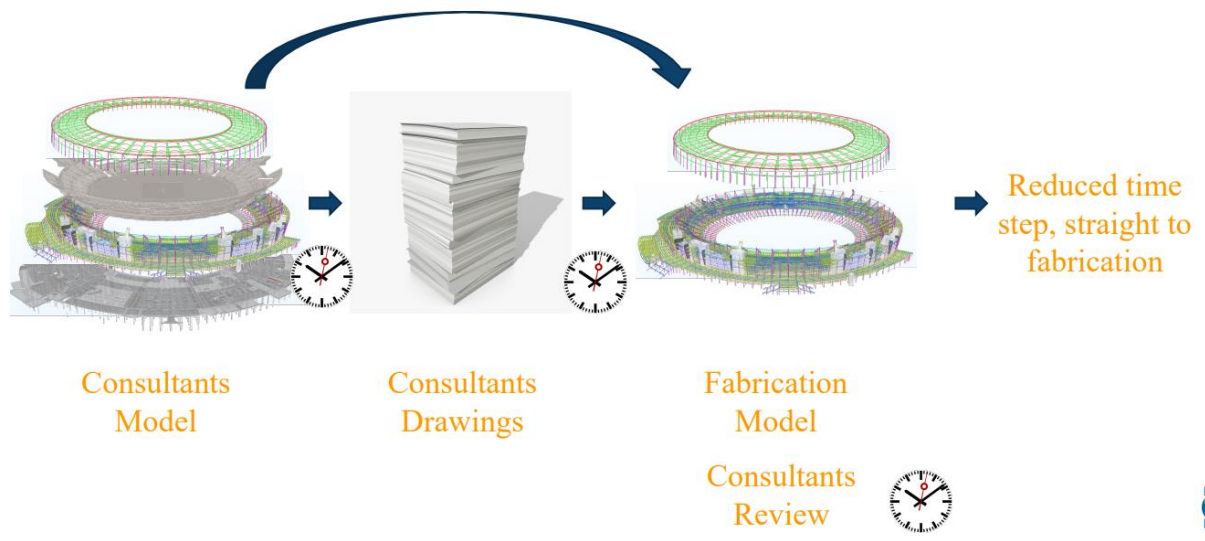
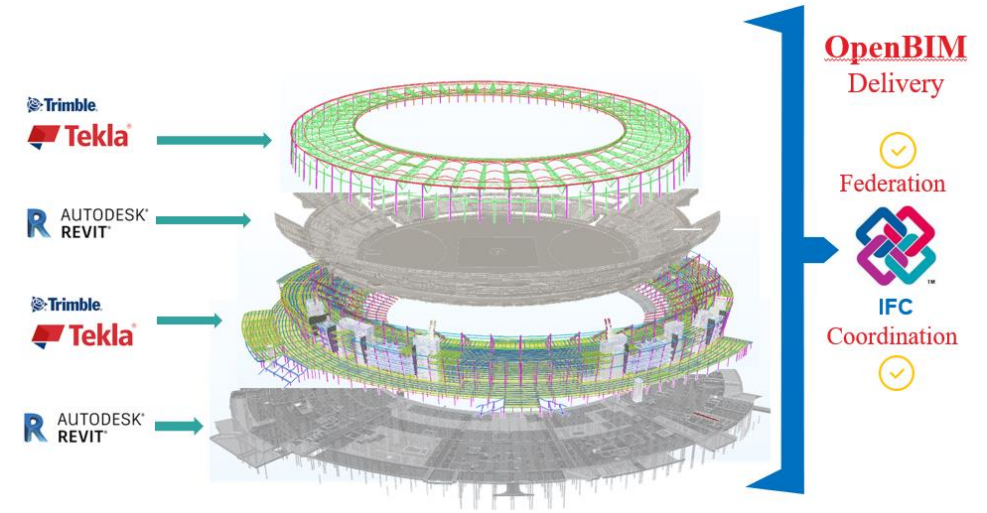
City Hall London (1999)





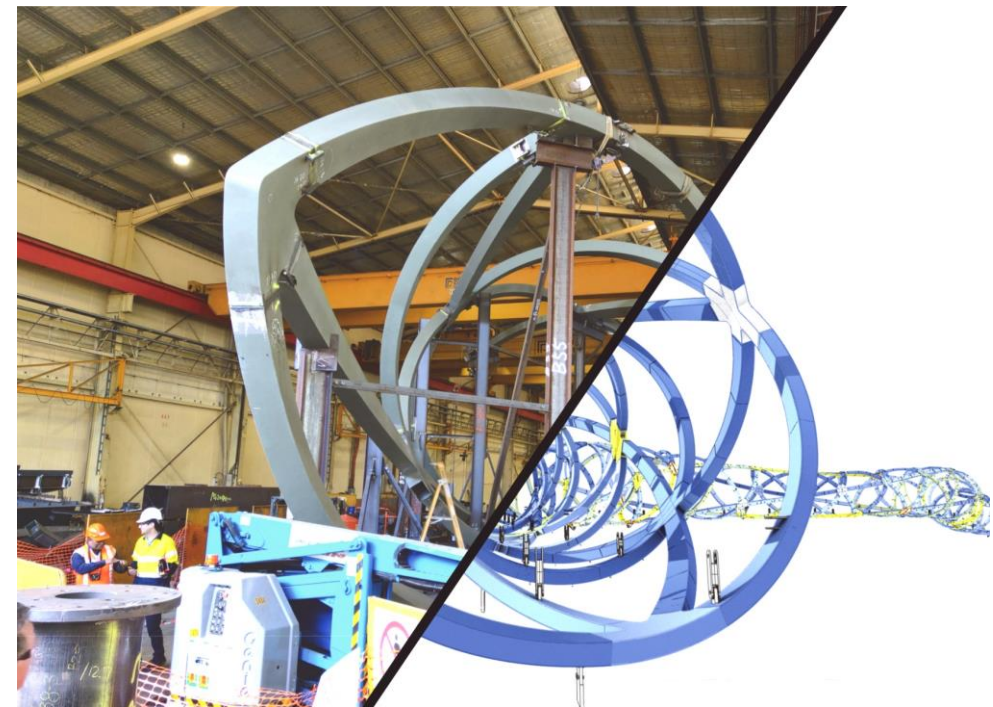
Perth Stadium (2015)

ARUP



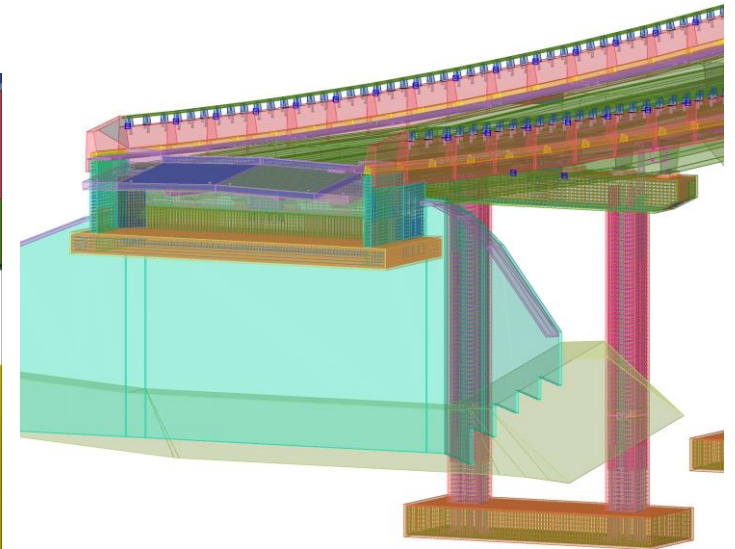
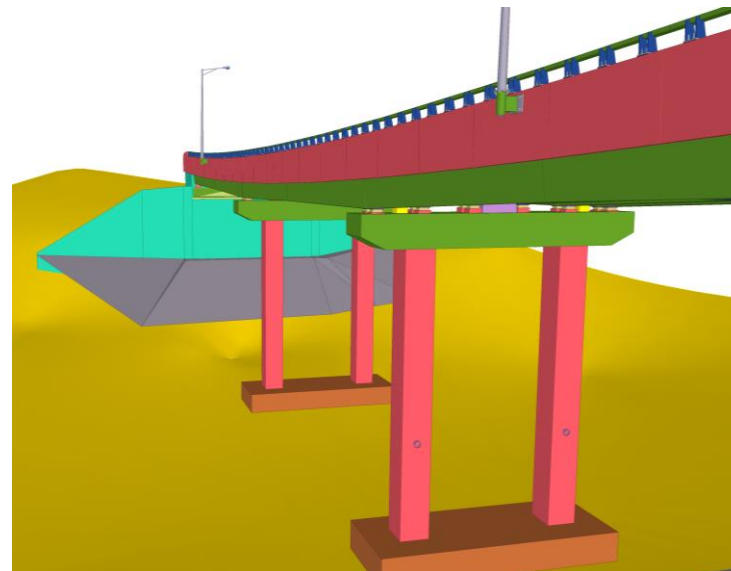
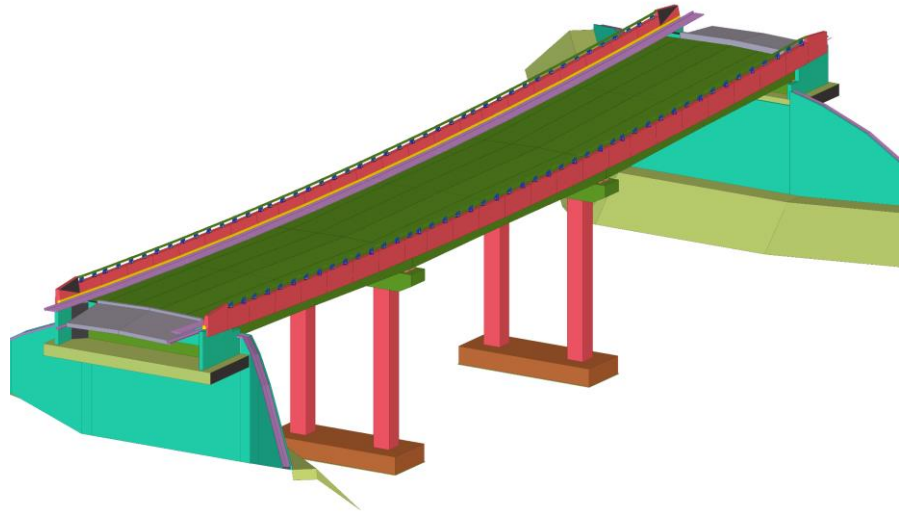


Lachlans Line
Sydney



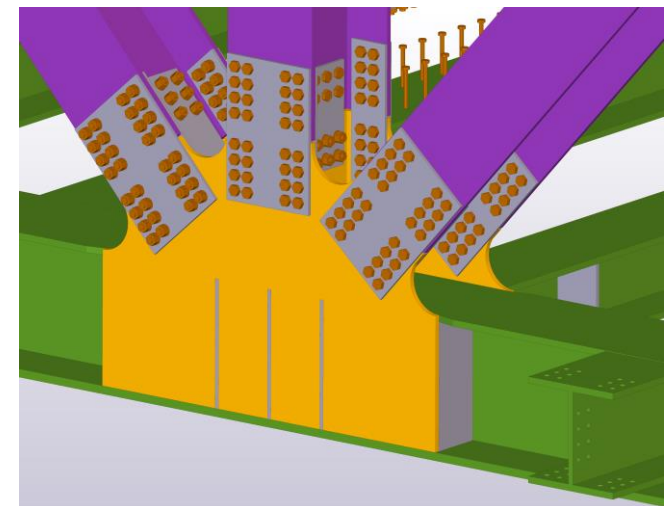
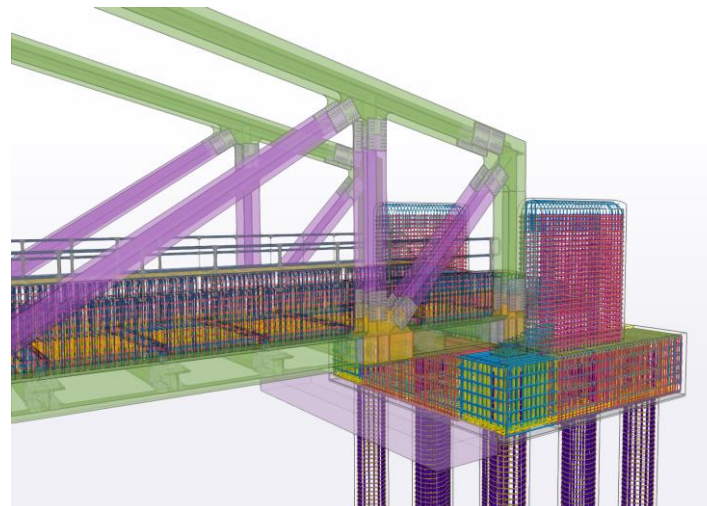
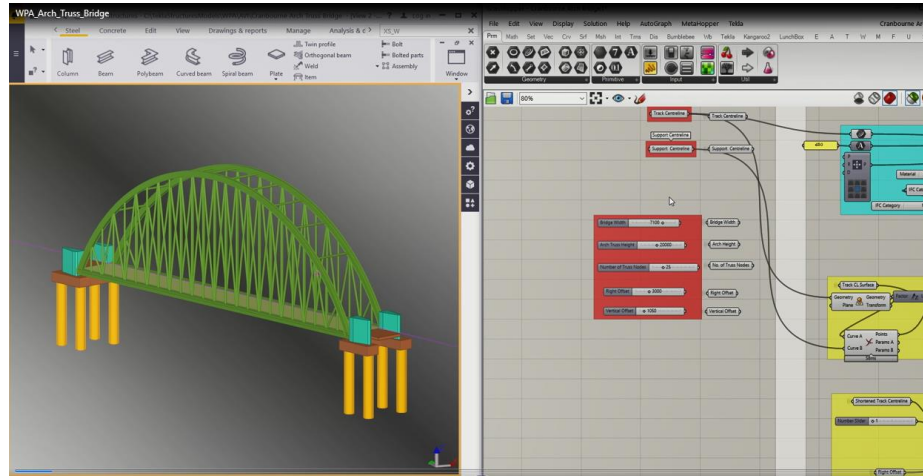
What are we doing now?

ARUP

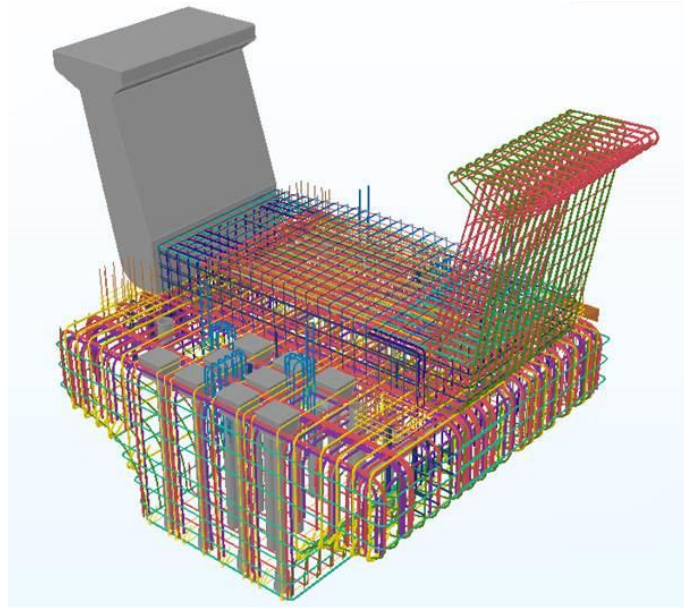
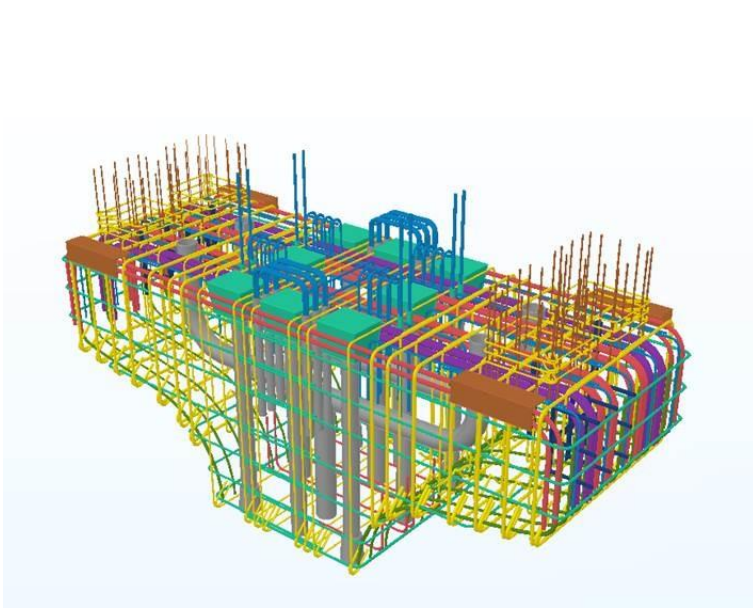


What are we doing now?

*"If a picture tells a thousand words ...
what value does a model bring?"*



why 3d reinforcement?



*If a picture tells a thousand words ...
what value does a model bring?*

"to do new things ... we need new ways"

ARUP

