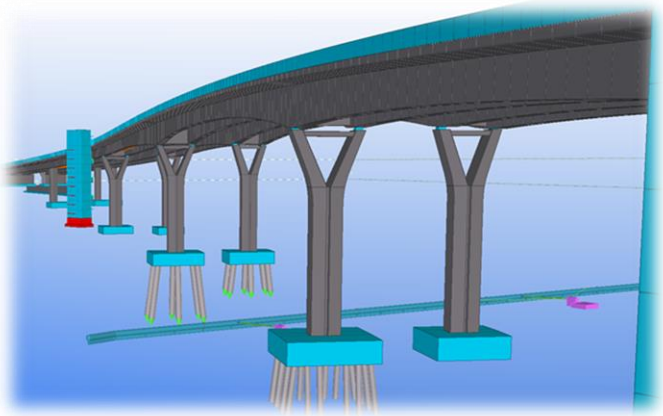
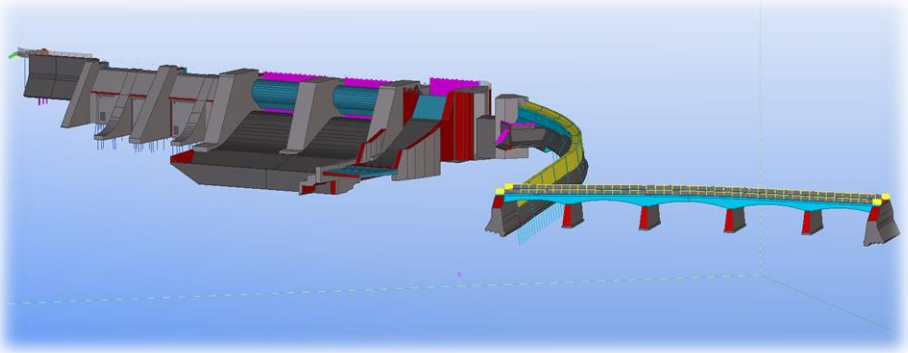




Infrastructure BIM development process and application in Finland

BIM guideline development process and practical solutions in Sweco Finland

Eetu Partala
Project engineer, bridges
Quality coordinator,
Sweco structures, Finland

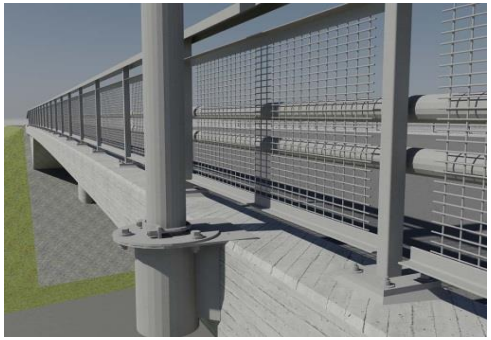
SWECO

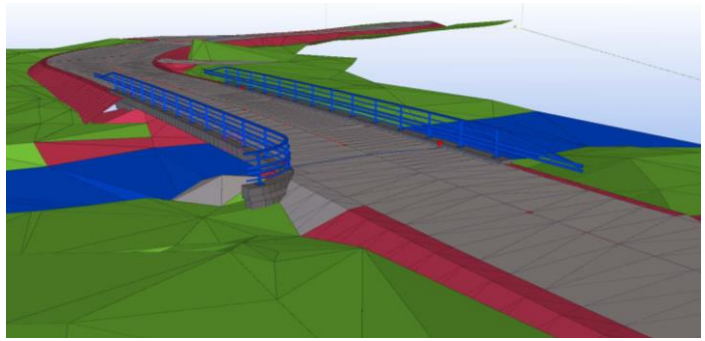
Sweco Structures Ltd.

BRIDGES AND INFRASTRUCTURES

Infrastructure BIM development process and application in Finland

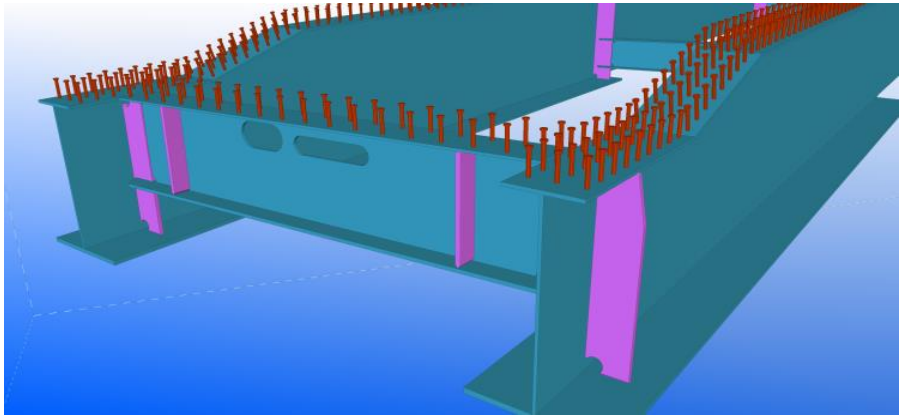
- Development process of infra BIM in Finland
- Bridge BIM in practice
- Model based design inspection
- Structure inspection and maintenance

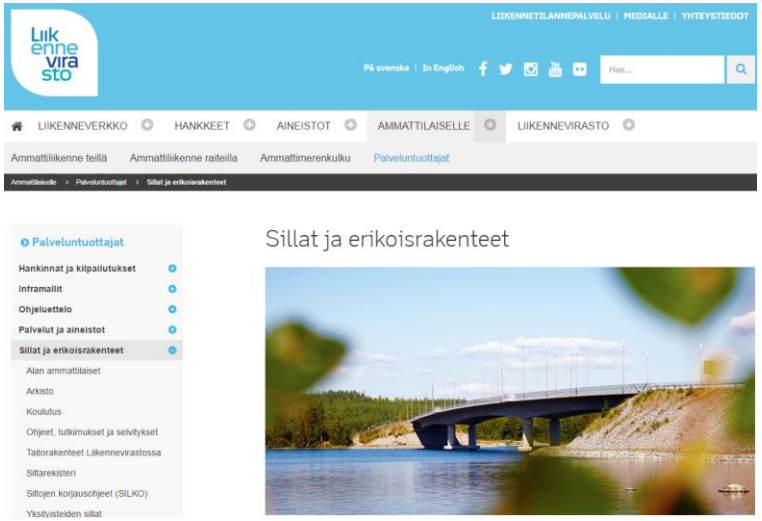


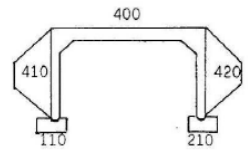


Building information modelling development in Finland

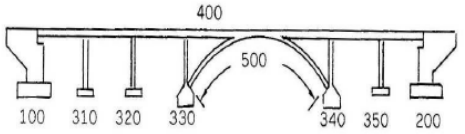
- Finnish Transport Agency = Liikennevirasto (Fin)
  - Wide variety of instructions for road, water, bridges and geotechnical design and execution
  - Guidelines for bridge and infrastructure modeling
- Requirements
  - Detailed BIM requirements for each phase of the project
- Outcome
  - Improved quality in design





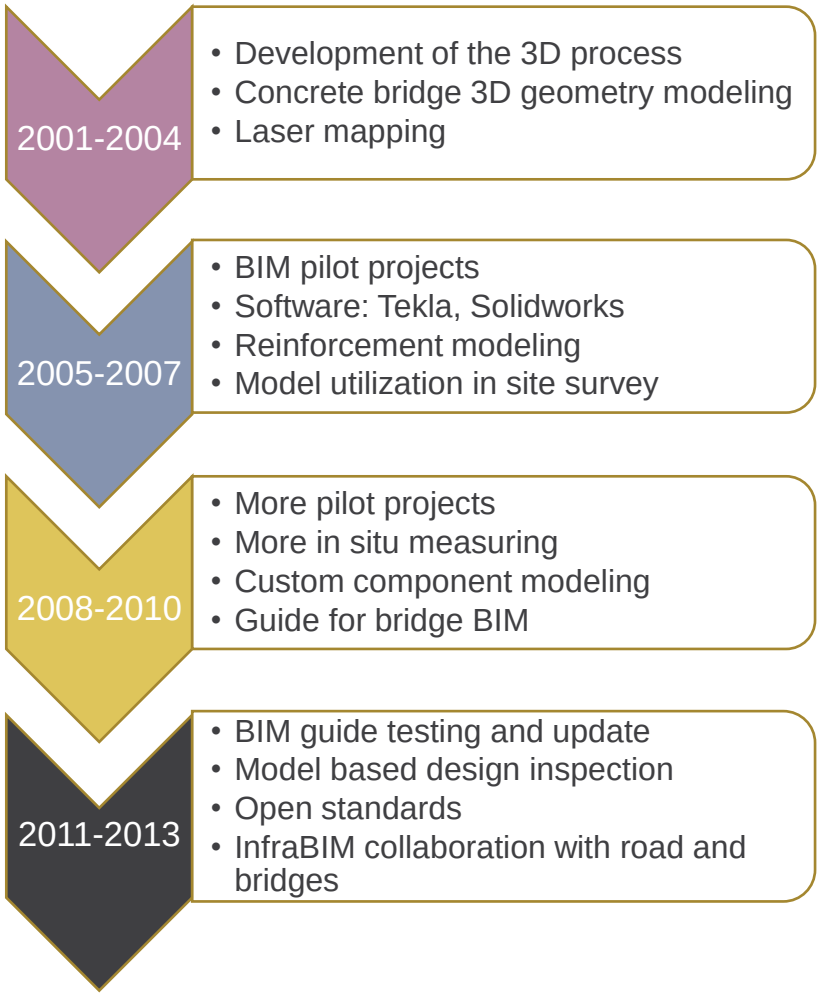


Kuva 2. Kehäsilta.



Building information modelling development in Finland

- The guideline development process for bridges
  - Multi step project, 5D bridge
  - Coalition led by Finnish Transport Agency involving consultants, contractors, software houses etc.
  - Every subproject with separate goals and reports



BIM in practice – Sweco environment

Why do we use Tekla and Sweco Bridge Environment ?

- It saves time
- It saves money
- Improves quality in design
- Makes Tekla easier to use

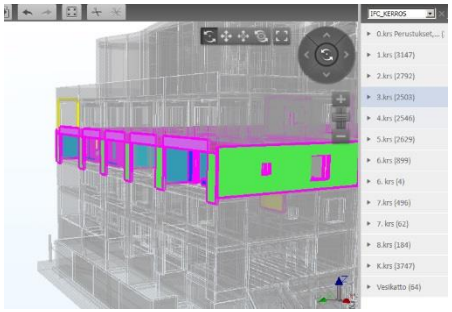
Environment → Common tools, common methods → Efficiency & quality

BIM in practice – Sweco environment

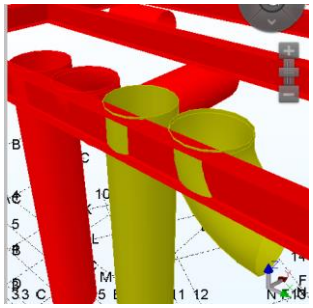
From traditional use of BIM to …

…tailor made Sweco Finland Environment

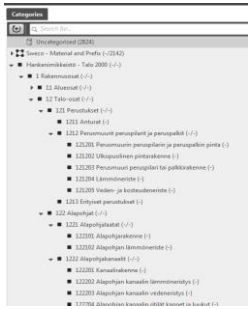
Visualization and coordination



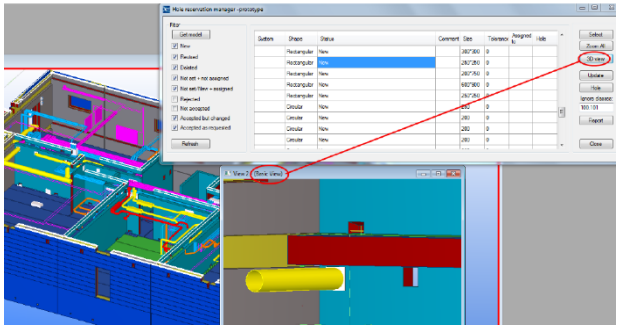
Quality Assurance



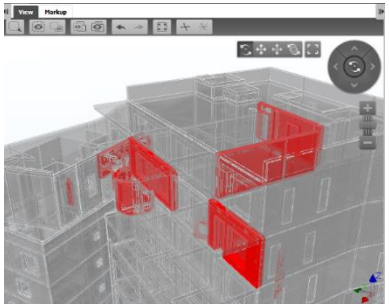
Bills of Materials



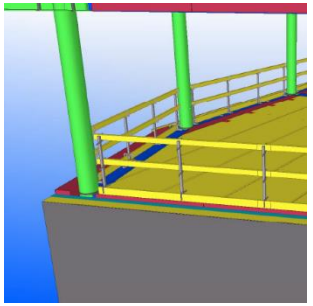
Hole and Opening Design (Sweco@Hole)



Scheduling & Status Reports



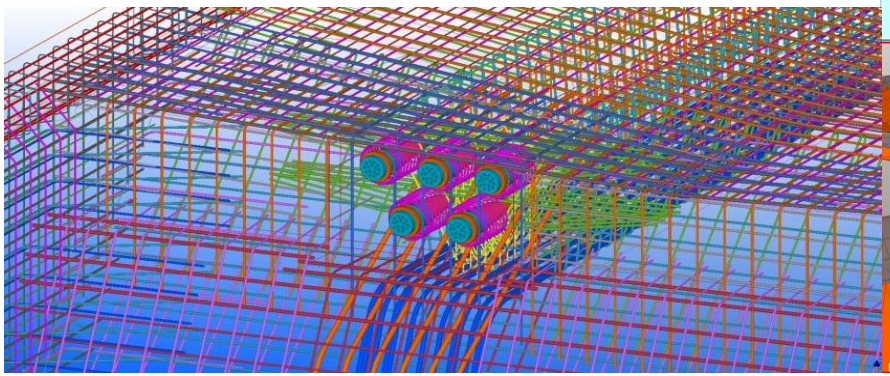
Safety

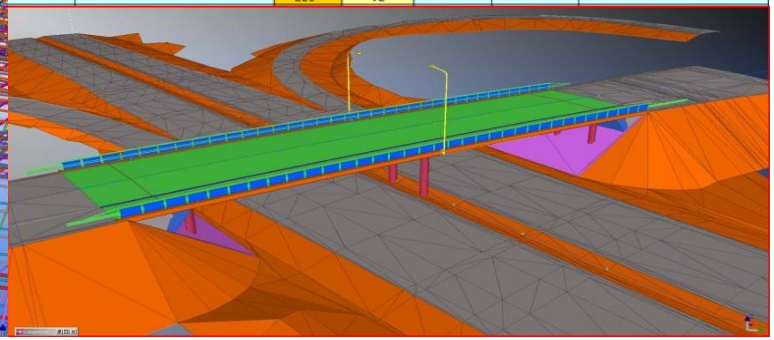


BIM in practice – Sweco environment

- Bridge naming, numbering and modeling instructions
- Predefined settings
  - Reports
  - Quantities,
  - Coordinate information
  - Tools

Phase	Nimi	Class	Prefix (FI)	Part/Plate (	Part/Plate (E	Selite
600	**VARUSTEET JA LAITTEET**	280-				
	BETONIKAIDE/MELUESTE	280	BK			
	SIIRTYMÄLAATTA	281	VL			
	LIIKUNTASAUMA	289	VL			
	KAAPELIKOURU	290	VL			
	LISÄOSA	257	XXX	XXX	XXX	
	PAALUKÄRKI	282	T*			Kalliokärki, maakärki
	TERÄSKAIDE	283*	TK	TKP	TKL	H2, Örsta. Tolppa 283, Johde 2831, Verkko 2832
	LAAKERI	284	LAA	LAP	LAL	Kumilevylaakeri, kumipesälaakeri, rullalaakeri, kalottilaakeri, kiinteä laakeri
	KUIVATUSLAITTEET	285*	KL			Tippuputket 1, pintavesiputket 2, salaojat 3, paineentasausputket, pintavesien viemäröinti
	MUUT VARUSTEET JA LAITTEET, YLEISET	286*	VL			Panostustarvikkeet 0, kontaktitapit 1, pylväiden kiinnityslaitteet,valaisinpylväs 2, kaapelihyllyt 3, kolhaisusuojat 4, putket ja johdot 5,suoja- ja tarkastustilat,

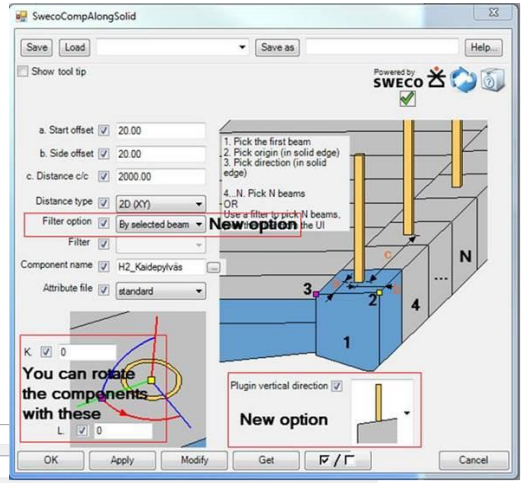


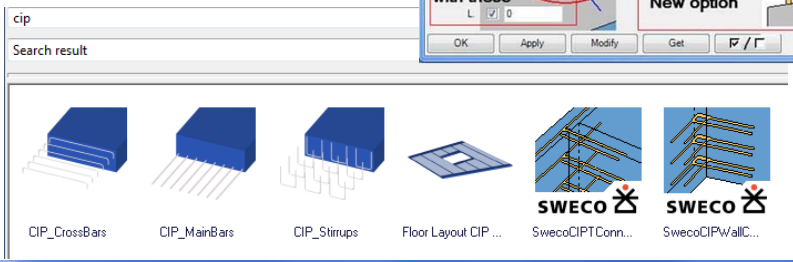


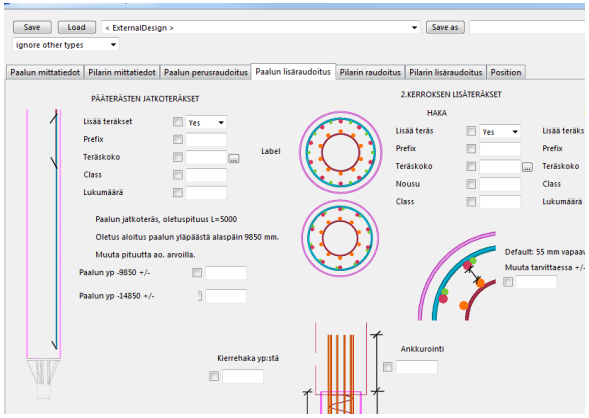
BIM in practice – Sweco environment

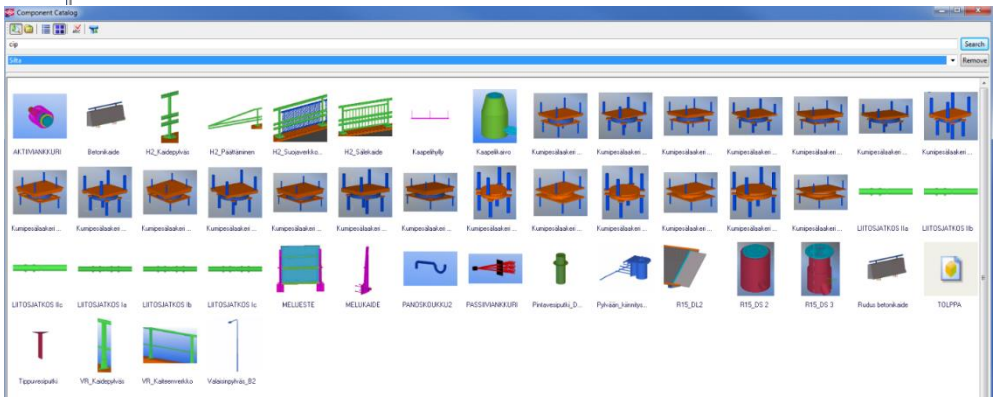
- 50 own custom components
  - Bearing, rails, etc.
  - Pile and column components
  - Plugins: Railing tool

- Tekla Warehouse
- Beam extruder
  - Road line coordinates
  - CIP reinforcement tool (model)



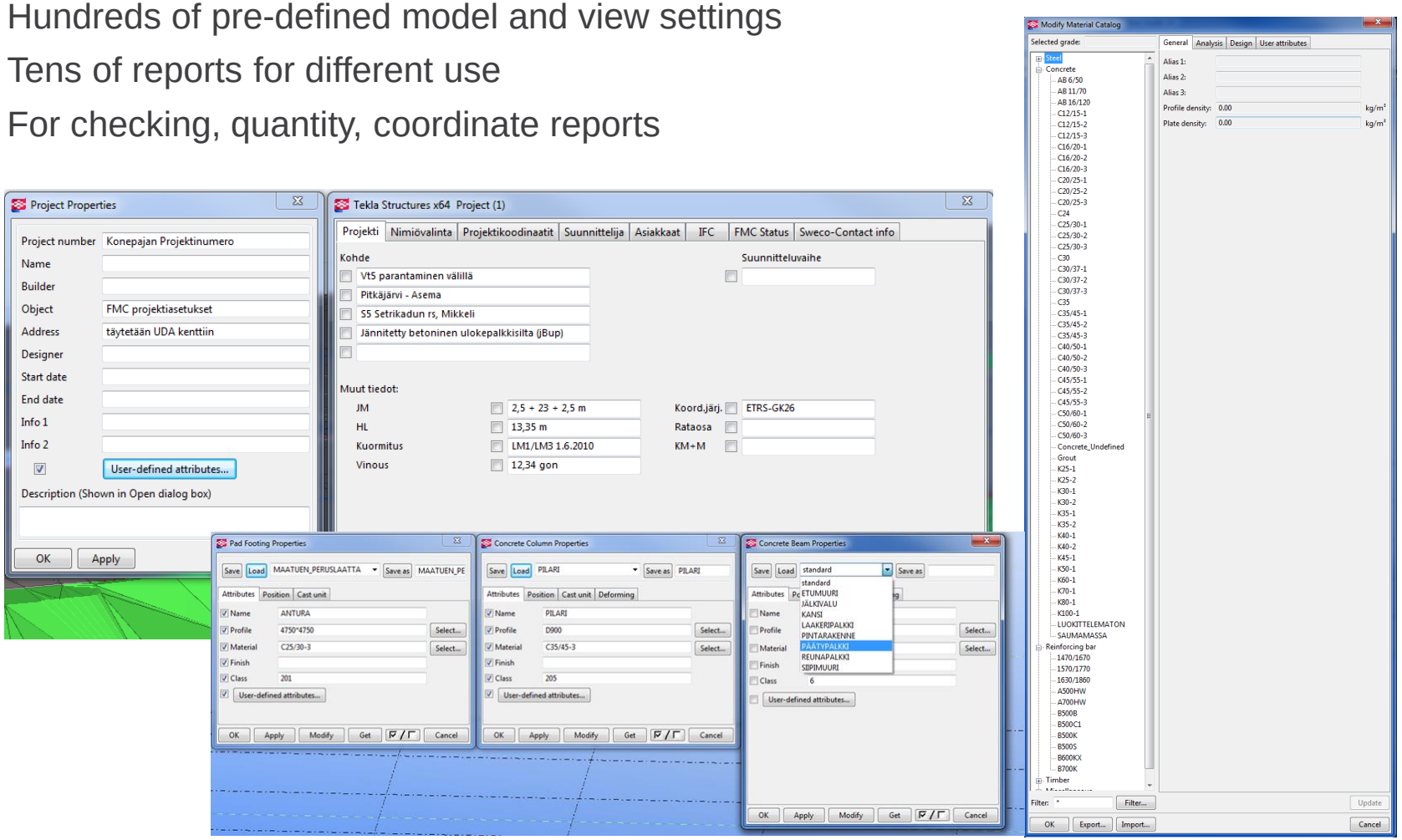






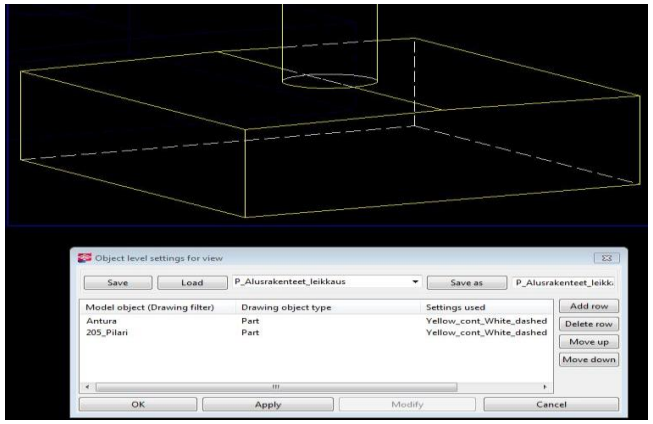
BIM in practice – Sweco environment

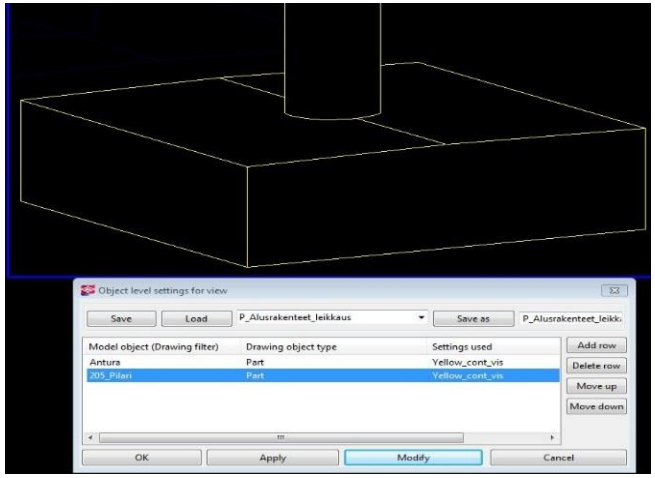
- Hundreds of pre-defined model and view settings
- Tens of reports for different use
- For checking, quantity, coordinate reports



BIM in practice – Drawing settings for concrete bridges

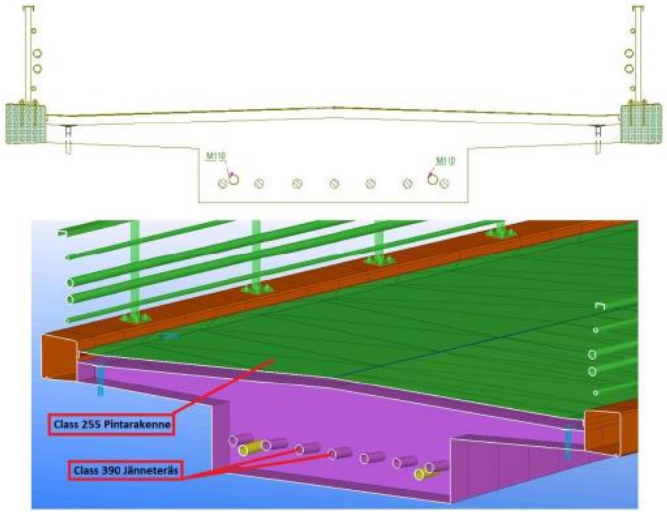
- Drawings are made from the model
- Over 40 drawing view settings
- Every bridge part has its own pre-set view
- Settings using Phase and class numbers





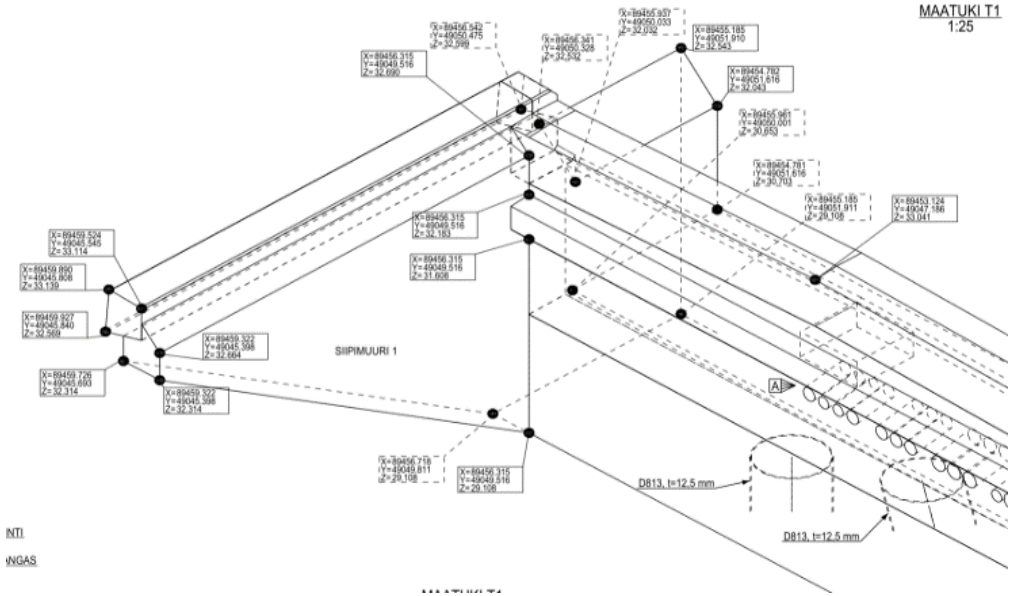
Kannen varusteiden numerointi ja nimeäminen:

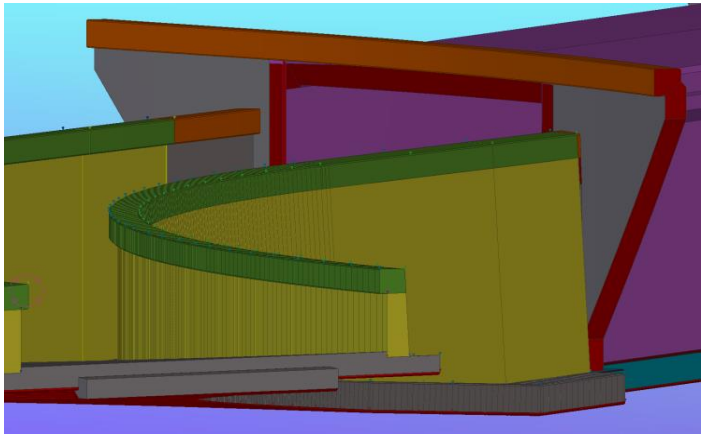
Näkymään Class numeroilla filteröityvät osat:
4 = TSV
5 = Pääpisteet
250 = Kansi
251 = Reunapalkki
252 = Päätypalkki
253 = Siipimuuri
255* = Pintarakenne
280 = Betonikaide
283* = Teräskaide
285* = Kuivatuslaitteet
286* = Muut varusteet ja Laitteet, Yleiset
289 = Liikuntasauma
390* = Jänneteräs

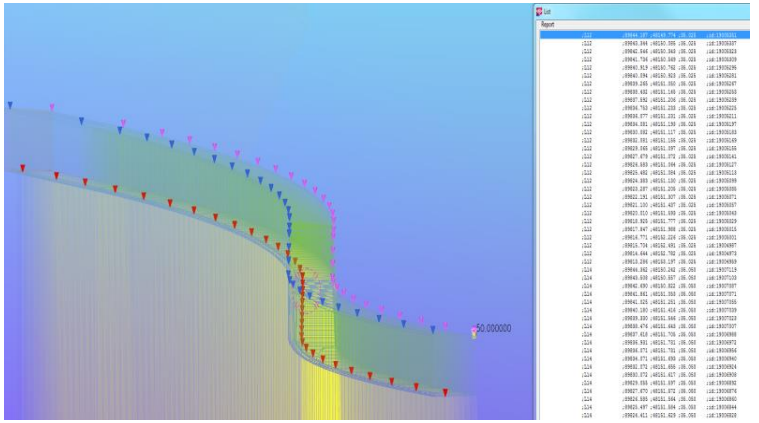


BIM in practice – Sweco environment

- Measures
- Layout points





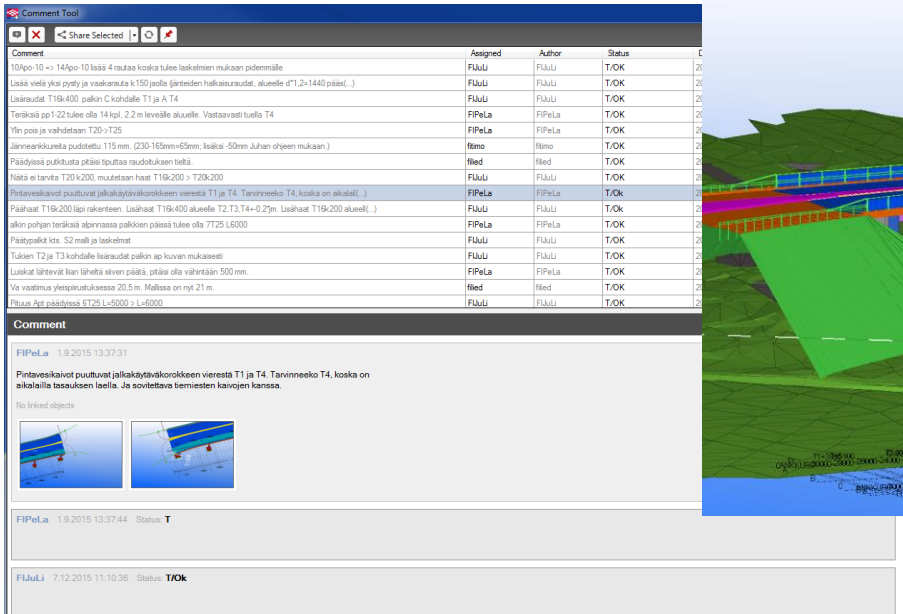


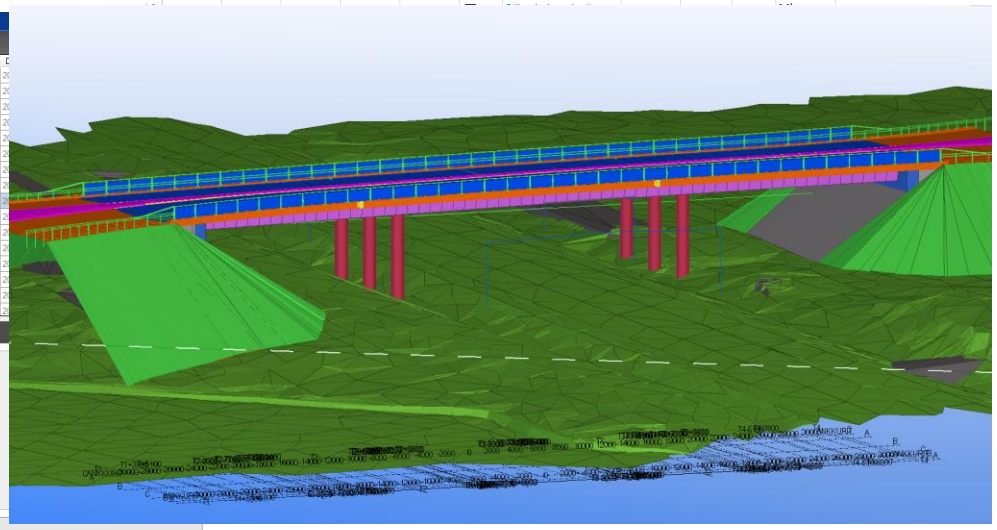
BIM in practice – Model based inspection (internal)

- Vital tool for quality control
- Collaboration between the design team
- Collision check and commenting
- Reporting

	A	B	C	D	E	F	G	H	I	J	K	L
1	SWECO					Vt8						
2	Puijonkatu 26-28, 70110 KUOPIO											
3	Puh. 0207 421 100, fax. 0207 421 101											
4	Osa:	Päällysrakenne										
5		MITTA- JA GEOMETRIATIEDOT, MATERIAALIT JA VARUSTEET										Menetelmä
6	Tarkastajan kommentit:											
7						☒	SR100 kortti tiesuunnittelijalta					Visuaalinen
8						☒	Tietomalliseloste					Visuaalinen
9						☒	Osien nimi (plr), class, phase, prefix, valuyksiköt					Raportti *S_Cla*
10						☒	Korkeus- ja koordinaattijärj.					Project Prope
11						☒	Pääpisteet					Mittaus Custo
12						☒	Ylimenevän tien paalulukemat ja tsv					Mittaus Custo
13						☒	Alimenevän tien paalulukemat ja tsv					Mittaus Custo
14						☒	Väylien keskilinjojen leikkauspiste					Mittaus Custo
15						☒	Ylimenevän tien poikkarin yhteensopivuus					Mittaus yp:stä
16						☒	Alimenevän tien poikkari, ojien leveys + korot					Mittaus
17						☒	Silta-aukkojen vapaat korkeudet					Mittaus + Ks.
18						☒	Silta-aukkojen vapaat leveydet					Mittaus + Ks.
19						☒	Liikenteen vaatima vapaa tila (sama kuin va)					Mittaus + Ks.
20	~~Ei ole saatu aineistoa tiesuunnittelijalta (13.8.2015)~~					☒	Etuluiskien kaltevuus					Leikkaukset +
21	~~Ei ole saatu aineistoa tiesuunnittelijalta (13.8.2015)~~					☒	Puskupalkki maan sisään >500 mm					Visuaalinen +
22	~~Ei ole saatu aineistoa tiesuunnittelijalta (13.8.2015)~~					☒	Siivet penkereessä > 500 mm sisällä					Visuaalinen +
23						☒	Ajoratojen ym. kaistojen leveydet					Visuaalinen +

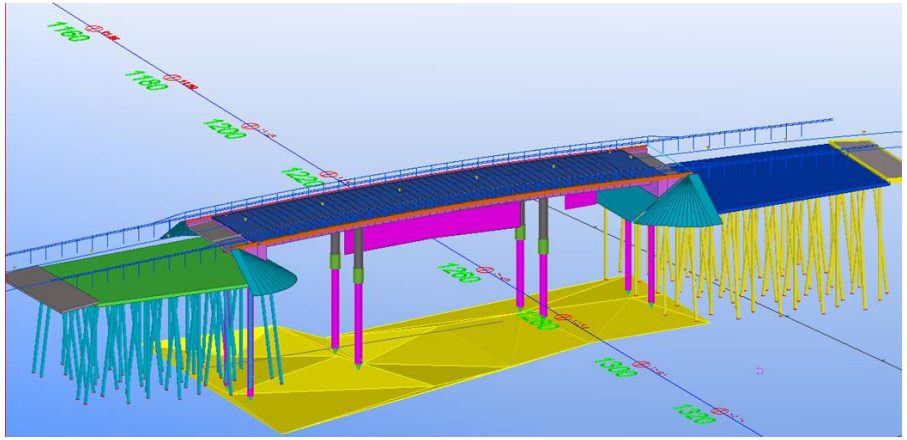
COMMENT TOOL



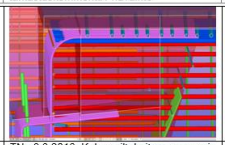
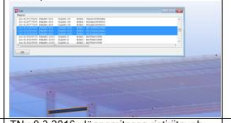
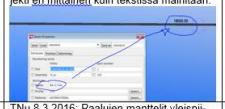


BIM in practice – Model based inspection (external)

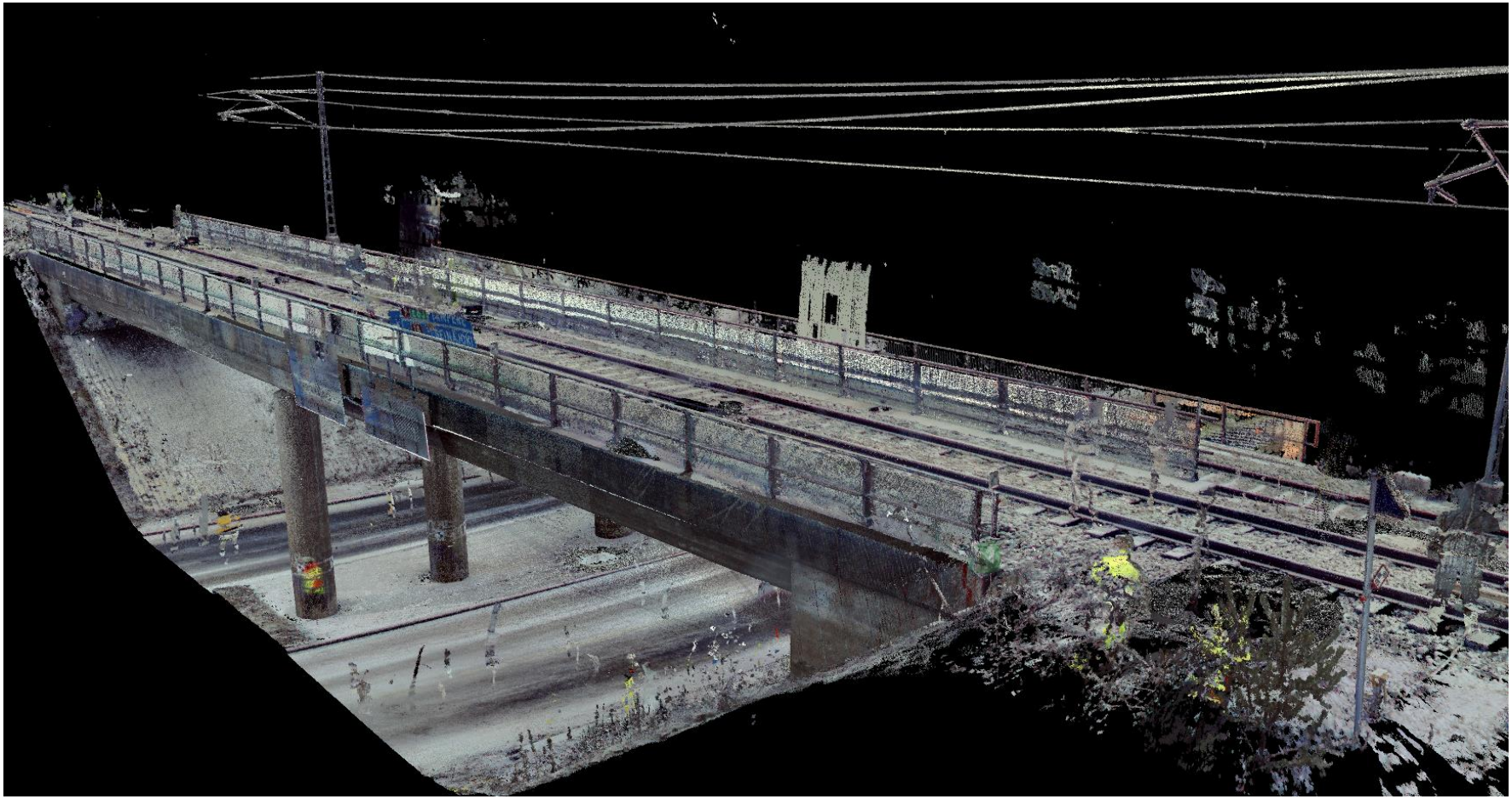
- 3rd party design inspection
- Inspection is based on the IFC or native format BIM model
- Comments on a separate document,
- In model commentary can also be used
- Instructions for the structural and model inspection are used



SWECO Tarkastusraportti-S11-0 *Tarkastuskommentit* 13 (19)

No	asiakirja	asia	tarkastuskommentti / havainto	taso(**	suunnittelijan vastaus	status(*
						
16.	Tietomalli	Class-tunnus.	TNu 8.3.2016: Kolme siltakaiteen osaa eri classilla kuin tietomalliselostuksessa on esitetty. 	4		
17.	Tietomalli	Jännemitta	TNu 8.3.2016: Jännemitassa ristiriita, objekti eri mittainen kuin tekstissä mainitaan. 	3		
18.	Tieto-malli/R15_19982_a 1	Betonipeite	TNu 8.3.2016: Paalujen manttelit yleispii-rustuksessa cnom=40 mm, tietomallissa cnom=45 mm.	3		

BIM in practice – Structure inspection and maintenance

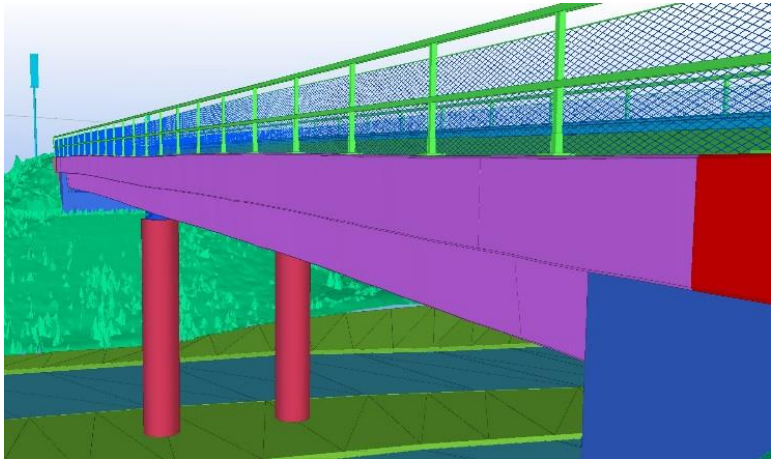


BIM in practice – Structure inspection and maintenance

Hämeensilta I

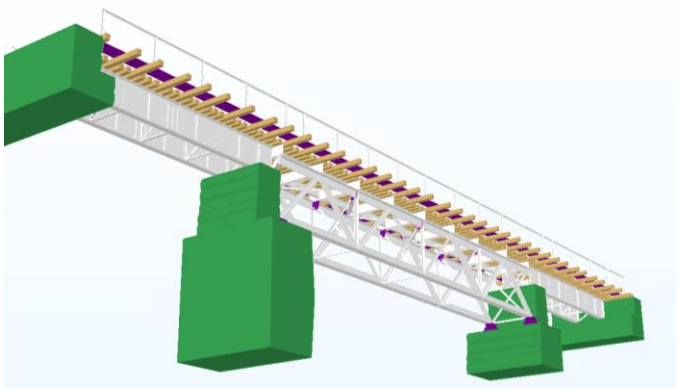
Hämeensilta I, , laser scanning and IFC model comparison (Navisworks Simulate)

Hämeensilta I, laser scanning (Navisworks Simulate)

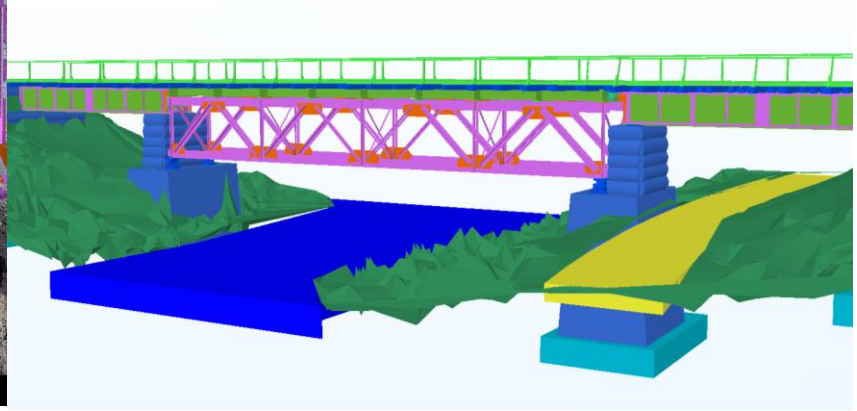


Hämeensilta I, ylläpitomalli (Tekla Structures)

BIM in practice – Structure inspection and maintenance



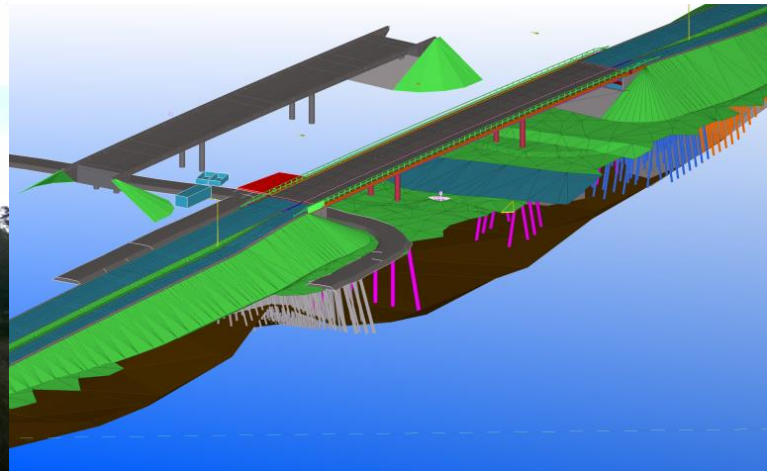
Raisionjoki railway bridge, laser scanning (Navisworks Simulate)



Raisionjoen railway bridge, laser scanning and IFC comparison (Navisworks Simulate)

BIM in practice - Summary

- Structural modeling
- Model based design inspection
- Structure inspection and maintenance
- Laser scan based models



DĚKUJI

THANK YOU!

SWECO