

Measured data, Gladbeck-Zweckel
© Carmen Ehrenberger

BIM Implementation for the German Railway

What does it mean for the surveyor?

DB Engineering & Consulting | Dr. Manthe | I.TPU(T) | Helsinki | 28.05.2017

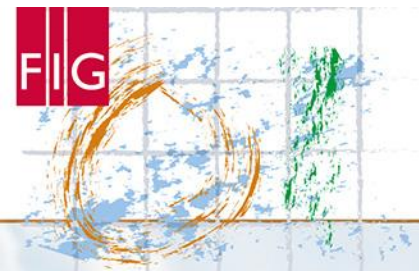


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Topics

- general information about the German railway
- BIM and the process of implementation
- What does it mean for surveyors?
 - Digitalization
 - Generalization
 - Information linking
 - Collaborating
 - Data storage
 - Information update



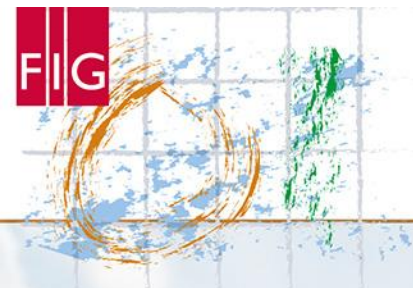


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Business Units

- DB Arriva
- DB Cargo
- DB Schenker Logistics
- DB Vertrieb
- DB Services
- DB Systemtechnik
- DB Bahn Regional
- DB Bahn Long Distance
- **DB Netze Stations**
- DB Netze Energy
- **DB Netze Track**

Other participating interests of Deutsche Bahn AG

- DB BahnPark GmbH
- **DB Engineering & Consulting**
- DB Immobilien
- DB International at a glance
- DB Vertrieb
- DB Zeitarbeit GmbH
- Deutsche Verkehrs-Assekuranz-Vermittlungs-GmbH
- Infra Silesia S.A.

http://www.deutschebahn.com/en/group/business_units/

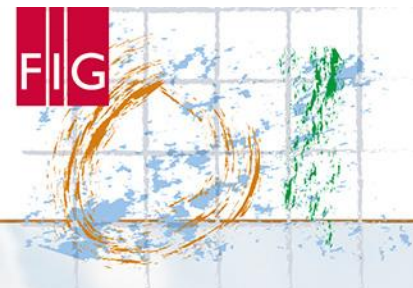


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

DB Netze Stations

■ **DB Station&Service AG**

- responsible for operating over 5400 railway stations
- nearly 1300 station buildings
- 80 per year results about 67,5 years for all

DB Netze Track

■ **DB Netz AG** - track infrastructure as the mobility base

- responsible for the rail infrastructure
- service provider for the currently 380 railway undertakings
- route network comprising over 34,000 km
- About 40.000 trains per day
- 4,5 Billion € business volume in year 2015

DB Engineering & Consulting

- offers technically sophisticated and customized infrastructure, mobility and transport solutions in Germany and around the globe
- Engineering
 - Design
 - Project management and project control
 - Realization management and construction
 - Design review and acceptance test
 - Environment, geotechnics and surveying
- Consulting
 - Business consulting
 - Operations and maintenance
 - Logistics

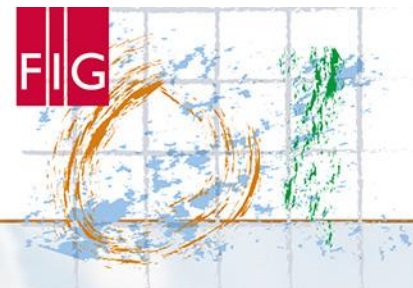
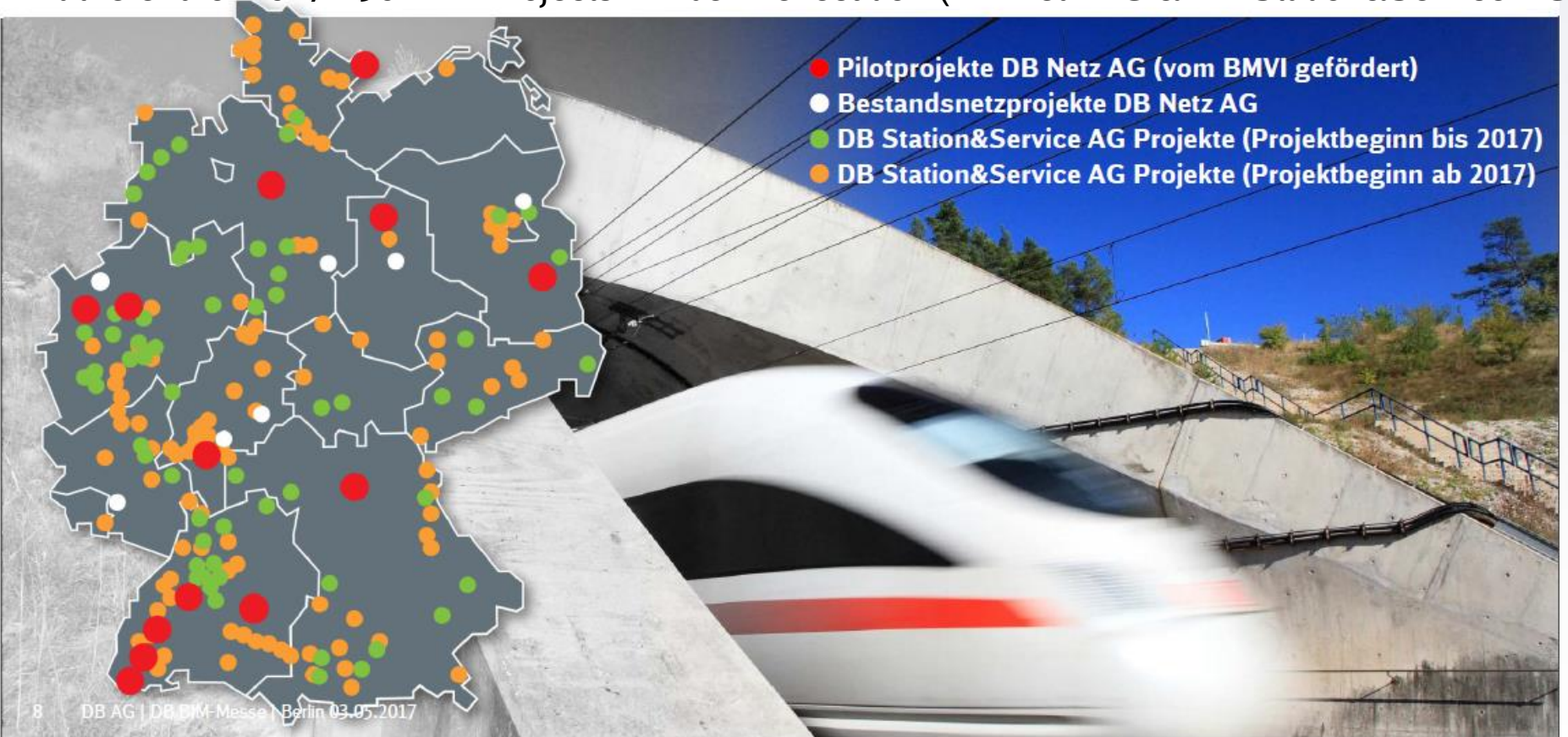


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

At the end of 2017 190 BIM-Projects will be in execution (DB Netz AG & DB Station&Service AG)



© Part of the official [presentation in the internet](#) about the “DB BIM-Messe 2017”



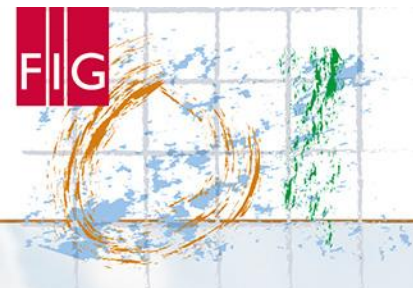
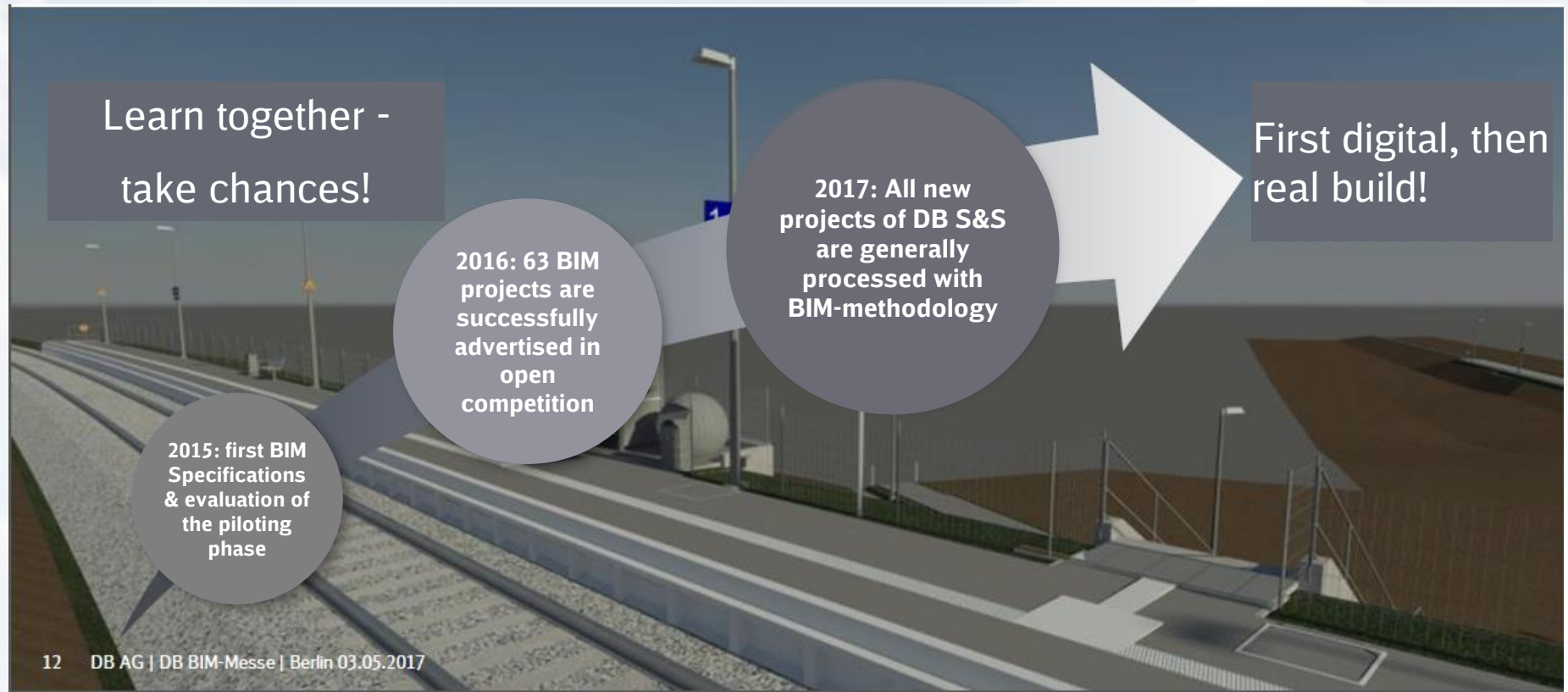


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

At present, DB Station&Service AG has 85 projects in execution, 160 by the end of the year



© Part of the official [presentation in the internet](#) about the “DB BIM-Messe 2017”

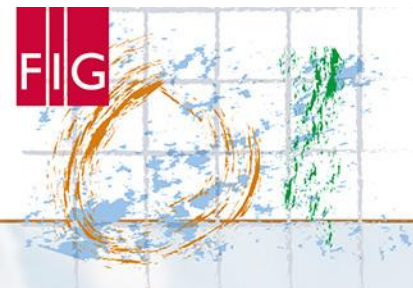


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Three companies work in the same structures at the implementation of BIM

Informationen

Strategie

IT-Infrastruktur

BIM

Anwendung

Prozesse

Menschen

Handlungsfelder gemäß „Planning guide for Facility Owners“ der Pennsylvania State University

DB S&S AG

DB E&C GmbH

DB Netz AG

DB 2020+

7 DB AG | DB BIM-Messe | Berlin 03.05.2017

© Part of the official [presentation in the internet](#) about the “DB BIM-Messe 2017”

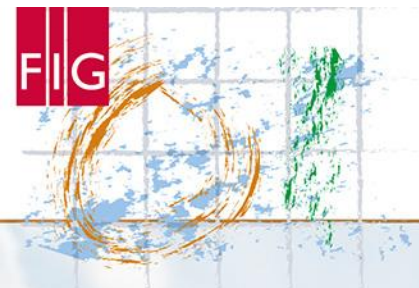
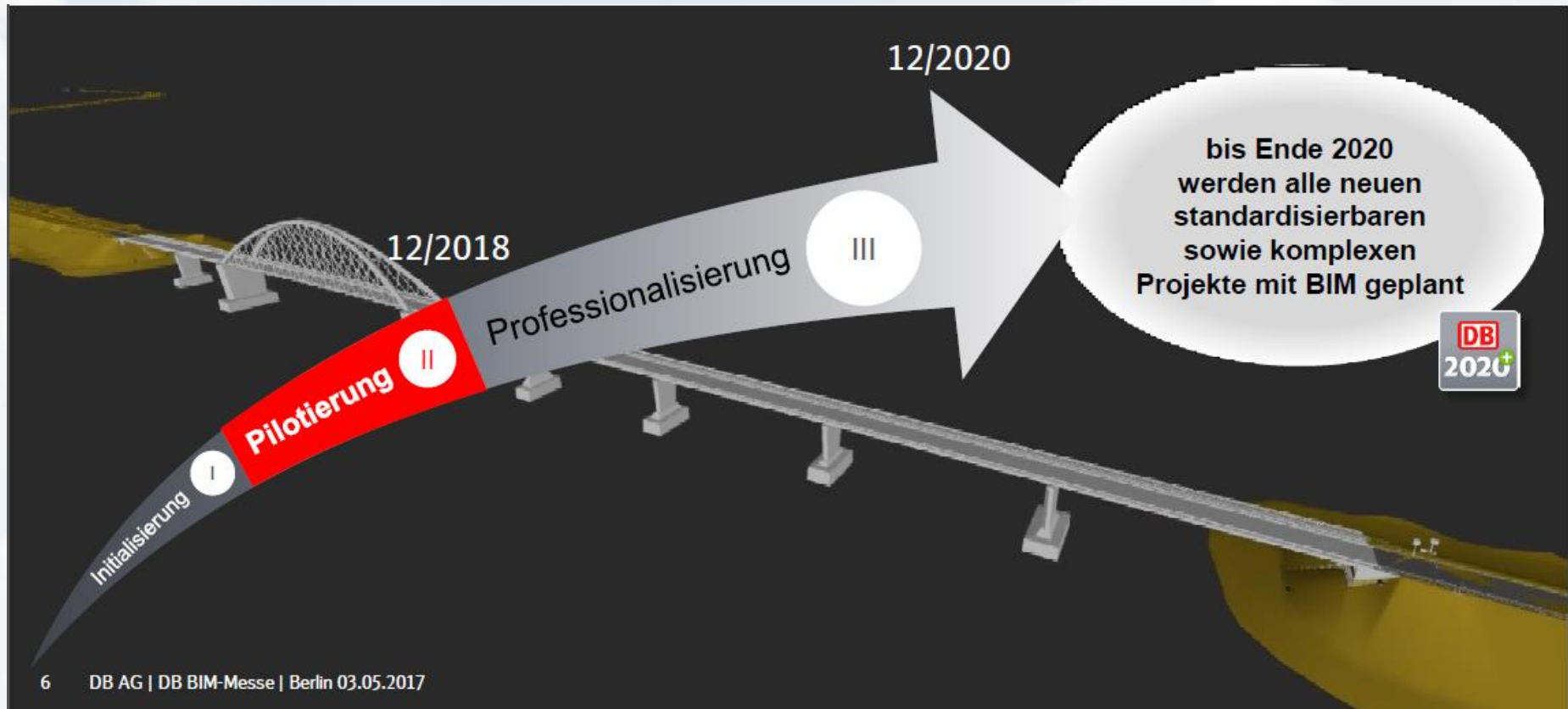


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Strategy of the DB Netz AG for the BIM implementation in 3 Steps till 2020



© Part of the official [presentation in the internet](#) about the “DB BIM-Messe 2017”

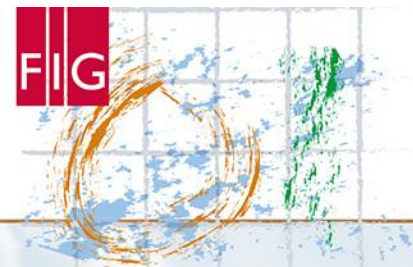
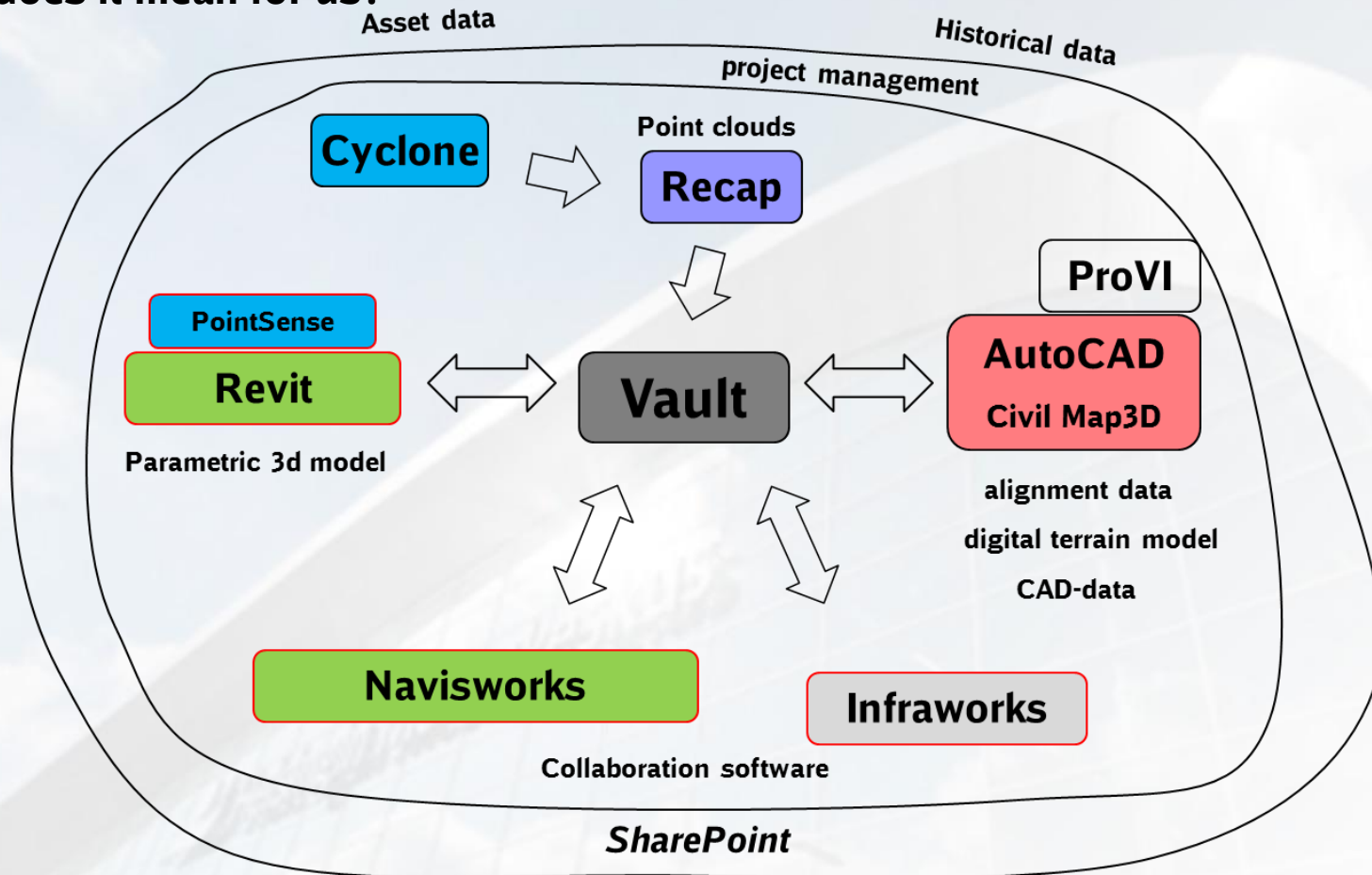


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

What does it mean for us?



© all pics by Chr. Manthe

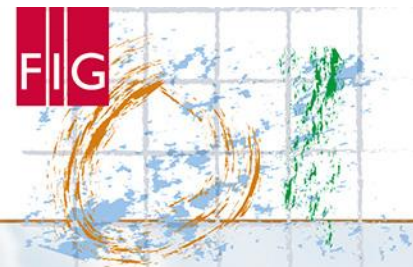


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

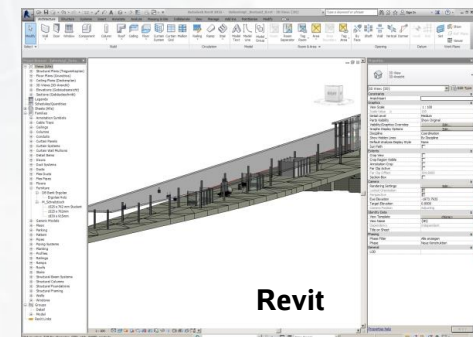
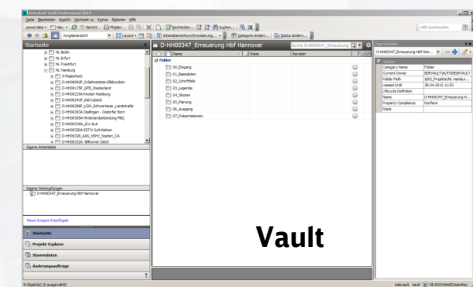
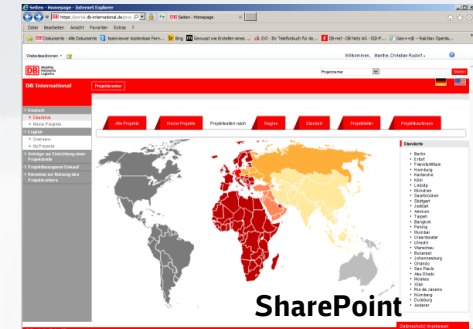
Helsinki Finland Sunday 28 May 2017

Requirement: on the collaboration with data

- Simple and fast data exchange
- Role based data access
- Central data management
- Single source of truth
- versioning of data

Existing software solutions in the company

- SharePoint Internet application
Easy access to information
- Vault distributed data storage for data with referenced
content and files
- Revit Application for generalization an designing
Allows you to work synchronously in a
model file



© all pics by Chr. Manthe



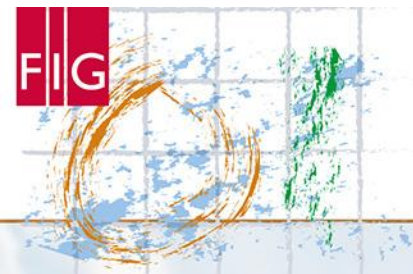
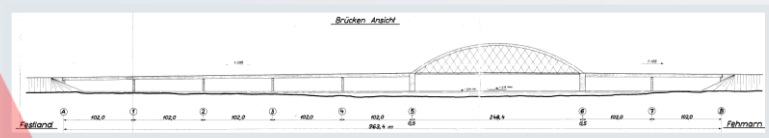
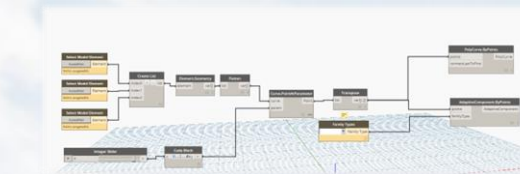


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

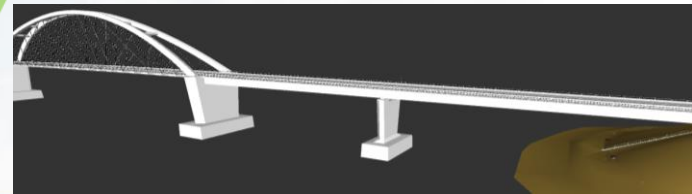
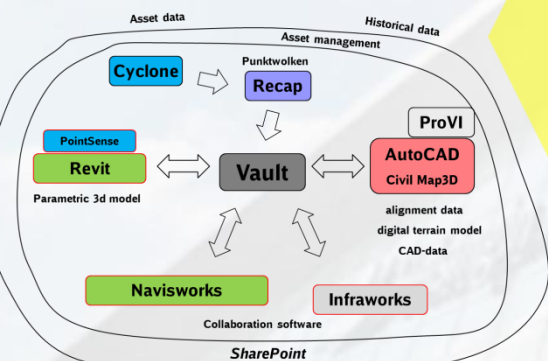
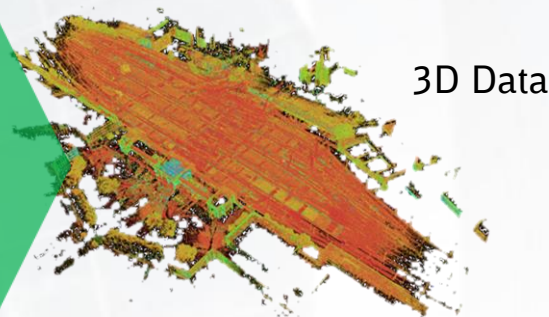
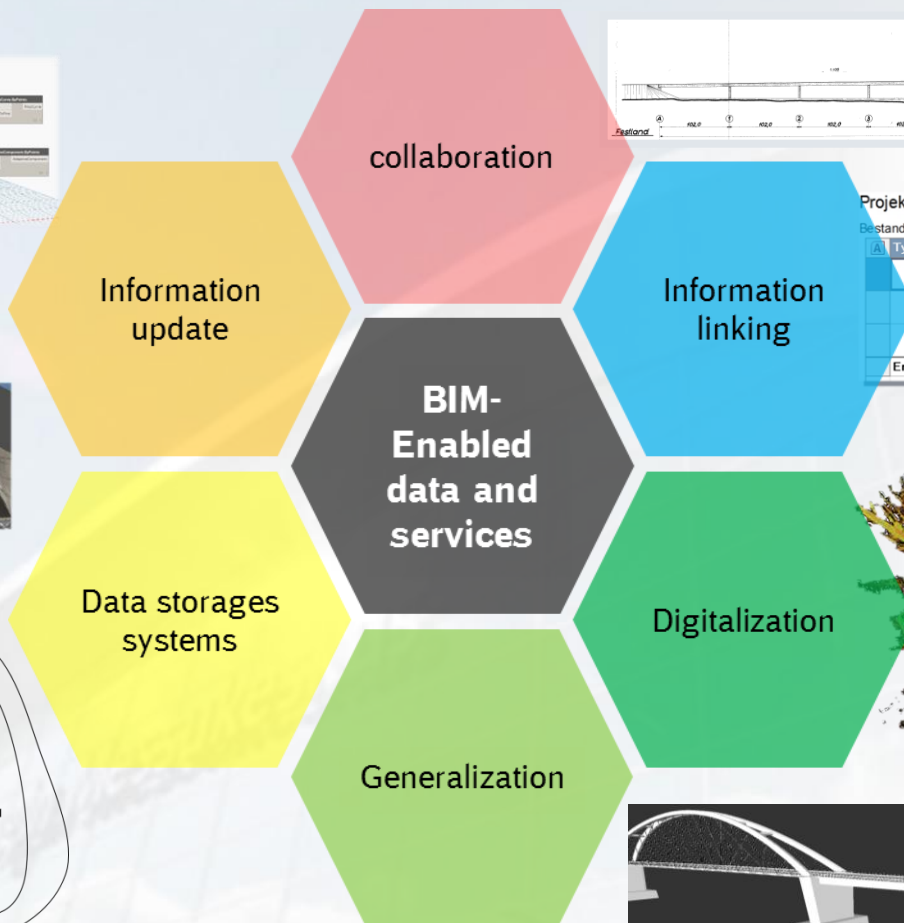
Helsinki Finland Sunday 28 May 2017



Projektdokumente > Bestandsdaten > BIM-Modell-Relevanz

Bestandsdatenmanagement

Typ	Dateiname - Freitext	BIM-Modell - Relevanz	tbl_Ortlichkeit
	Rampenkopf Festlandsseite, Böschungsbefestigung	1-sehr relevant	Widerlager A - Festland
	Querverbände zwischen Widerlager A und Pfeiler 5	2-mäßig relevant	Peiler 05, Peiler 06, Peiler 07, Widerlager A - Festland
	Widerlager A	2-mäßig relevant	Widerlager A - Festland
Ergeb...		3	3



Object orientated Information

© all pics from DB I.TPU(T)

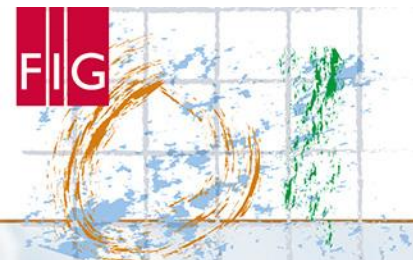


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Properties of historical data

- Been incomplete
- No naming convention
- no metadata, which describes the Content
- Different sources
- Duplicates
- Topicality is unclear

SharePoint document database with Metadata entries for each file

Bestandsunterlagen

Bestandsunterlagen ▶ Dokumente ▶ Bahnsteig E ▶ Diese Website durchsucht

ID	Typ	Name	Bezeichnung	tbl_Fachbereich	Örtlichkeit	DNK_Örtlichkeit	tbl_
5178		09_Kabelliste TK_2	Bf Hannover Hbf TK - Anlagen, FIA, Kabelliste 2	Telekommunikation	Bstg. D; Bstg. E; Bstg. F	Allgemeines/Übergreifendes	tbl_
5181		11_Verteilerbelegung GI11,12,13,14	Bestandsplan Bf Hannover Hbf Fahrgastinformationsanlage Projekt-Nr.: P09-1338 Telekommunikationsanlagen LWL-Verteilerbelegungsplan Aufsicht Bstg. 11/12, 13/14	Telekommunikation	Bstg. E; Bstg. F	Allgemeines/Übergreifendes	
5192		14_Schaltplan UV 22.1_GI.11,12	Bestandsplan Bf Hannover Hbf Fahrgastinformationsanlage Projekt-Nr.: P09-1338 Starkstromanlagen Übersichtsschaltplan UV22.1 Sonderstrom GI. 11/ 12, Bstg. E	Telekommunikation	Bstg. E	Bahnsteig11/12 (E)	
5216		00006	Hannover Hbf Grundriss 1. OG - Gleisebene Bahnsteigeinhausung Bstg. E Strakstrom - Installation	Bahnstrom / 50Hz	Bstg. E	Bahnsteig11/12 (E)	



Column for metadata entries



Filter with respect to the metadata

© all pics by Chr. Manthe

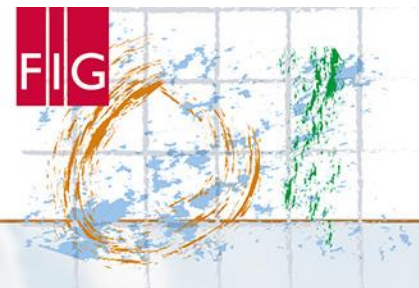
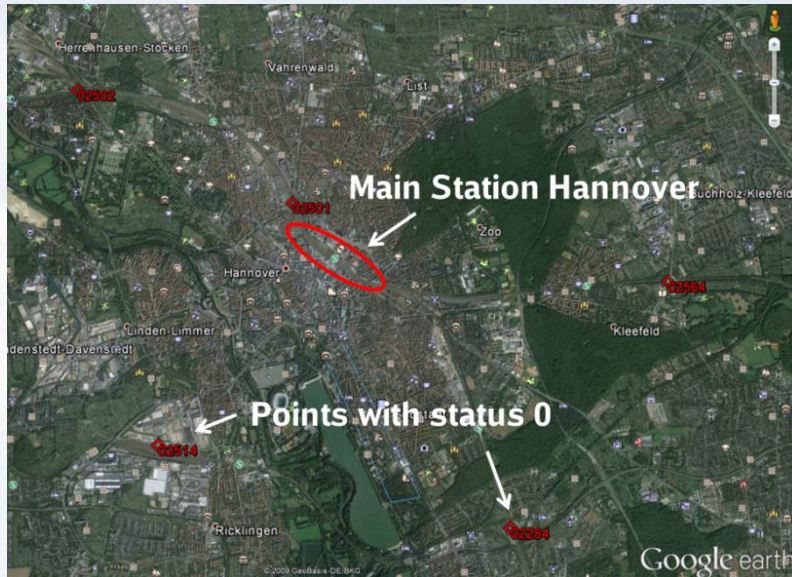


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Basic surveying



© all pics by Chr. Manthe

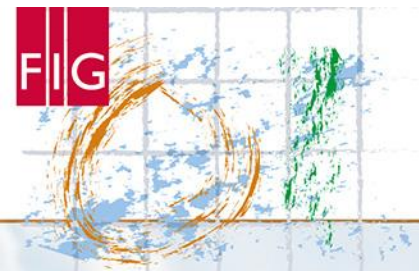


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

requirement from Station&Service AG:

- scale between model and real object should be 1:1

Requirement from DB Netz AG

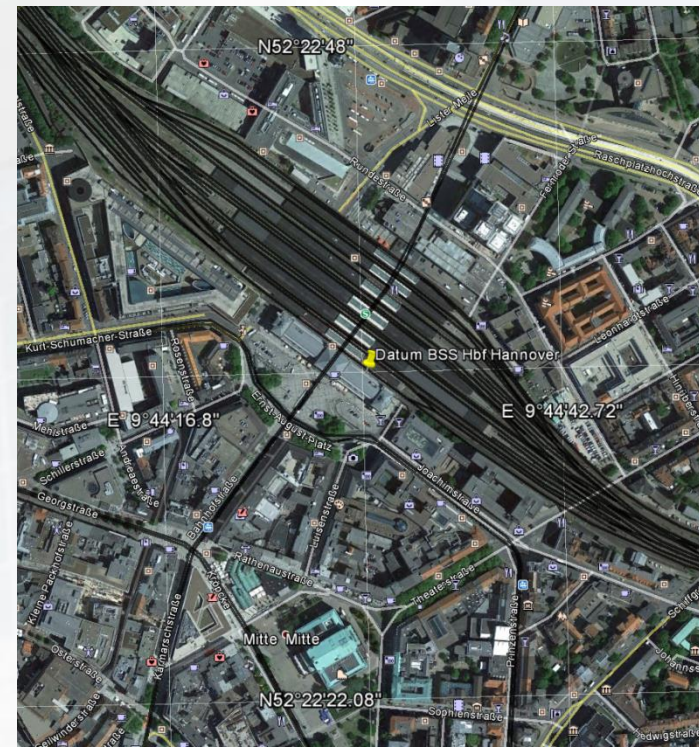
- Every Information has to be in the DB system DB_REF

Requirement from the workflow with laser scan data

- Avoid large numbers with many digits

Solution

- Definition of an building site system
- based on given transformation parameter between DB_REF and ETRF89 and the codes of the European Petroleum Survey Group (EPSG)



© all pics by Chr. Manthe



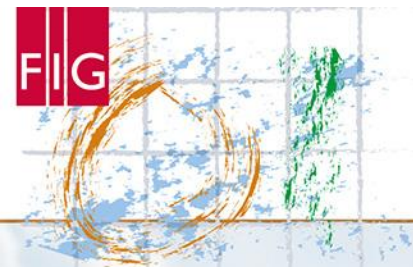


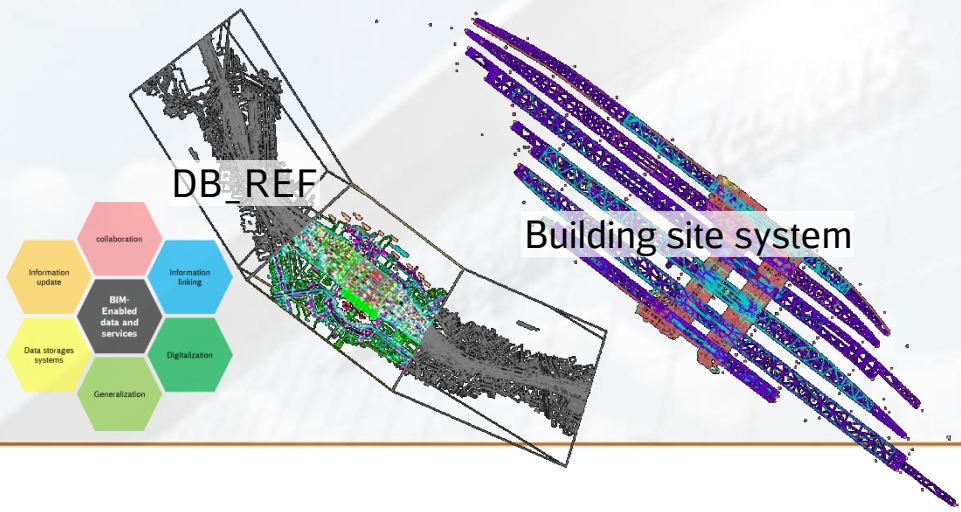
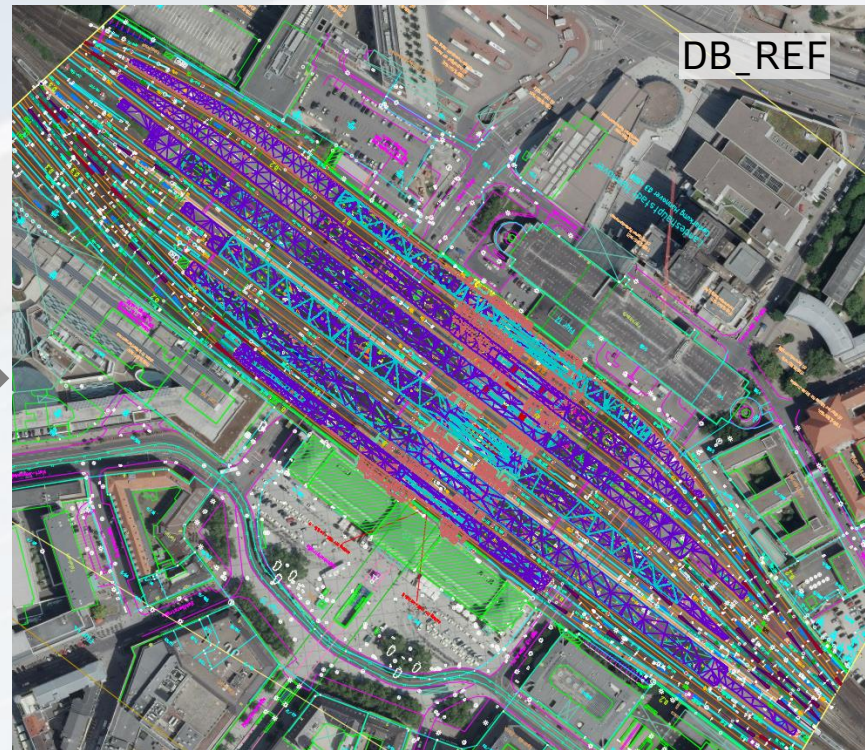
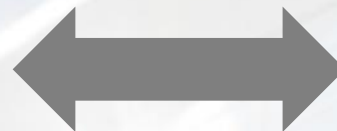
FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017



Multi-directional transformation without pass points



© all pics by Chr. Manthe



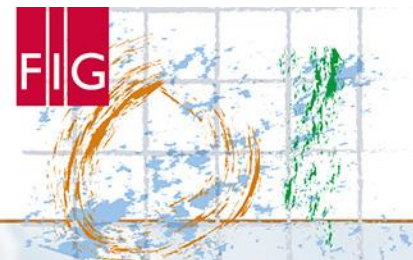


FIG WORKING WEEK 2017

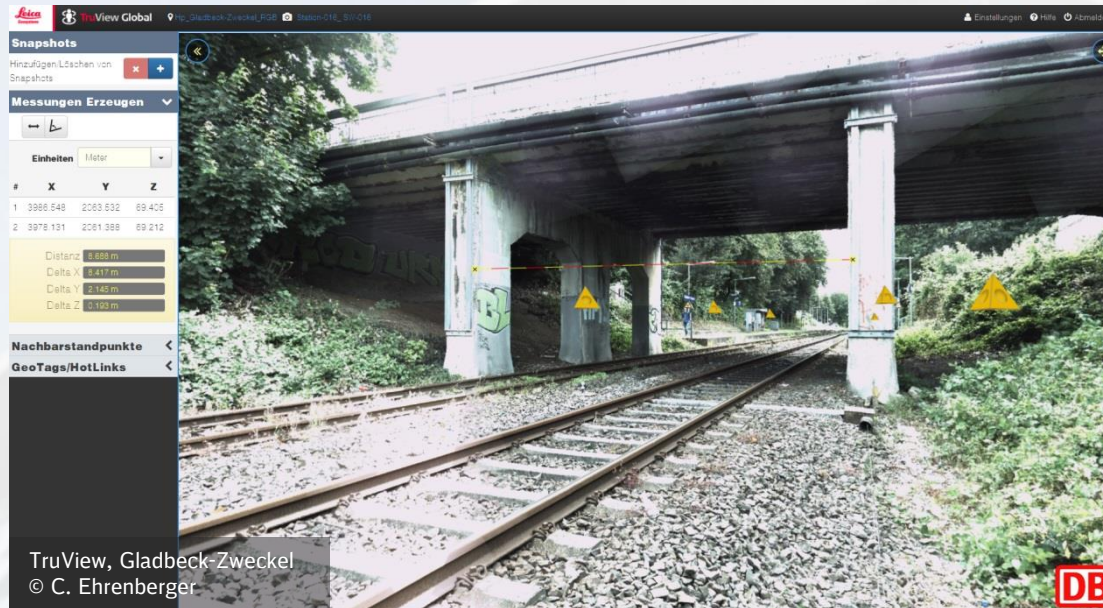
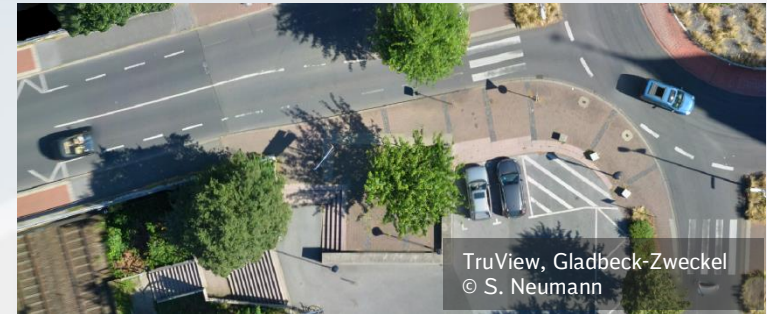
BIM FOR SURVEYORS

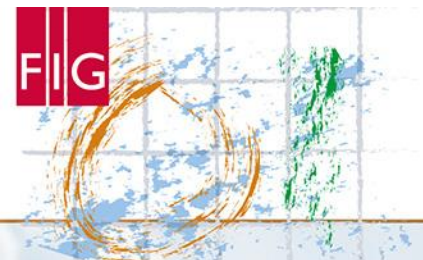
Helsinki Finland Sunday 28 May 2017

Surveying for preliminary design

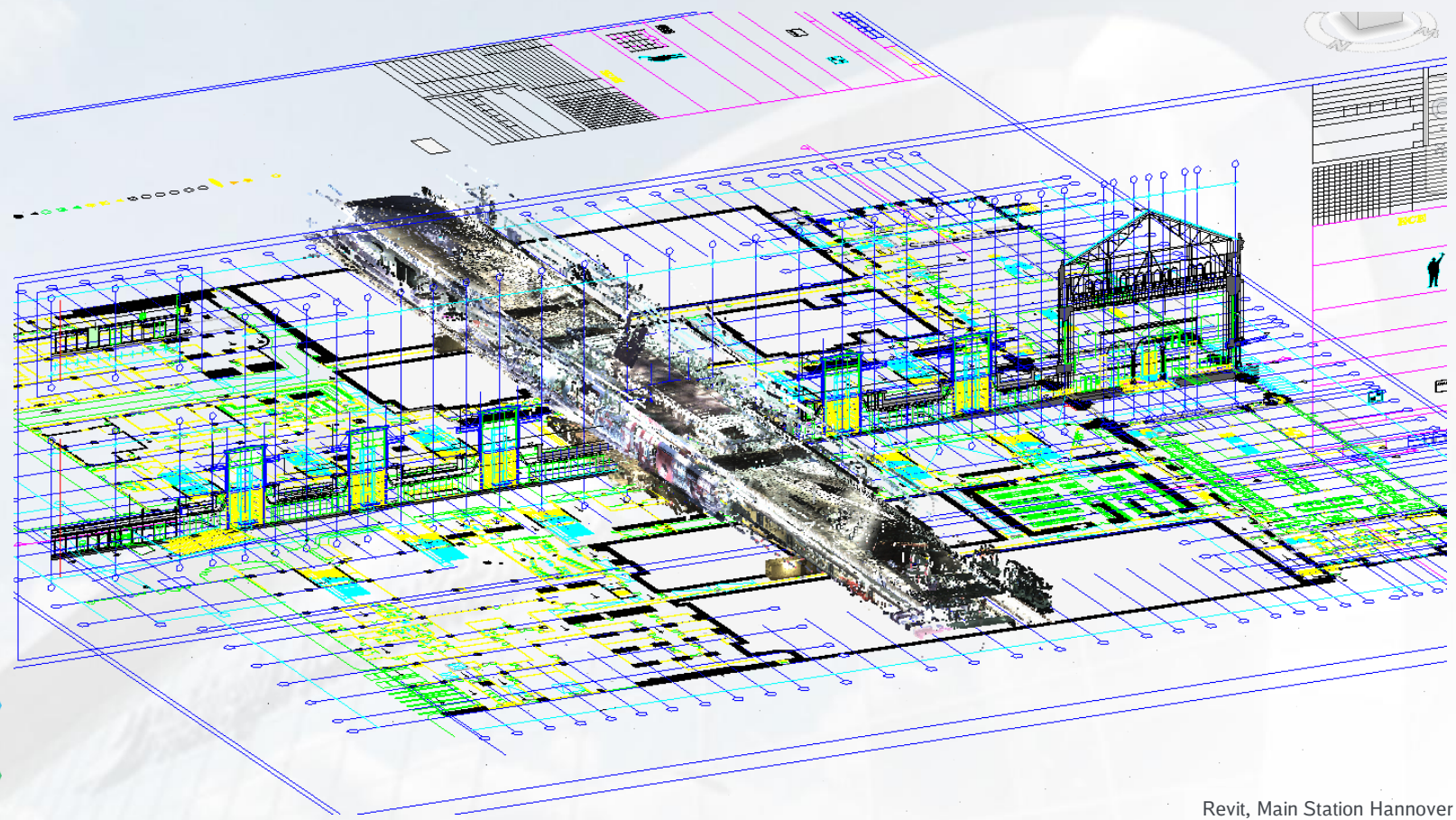
- Terrestrial laser scanning
- data acquisition multicopter

Providing the data as ReCap files for modelling and TruView for communication with project partners





Information linking: CAD-drawing with point cloud



Revit, Main Station Hannover
© Chr. Manthe

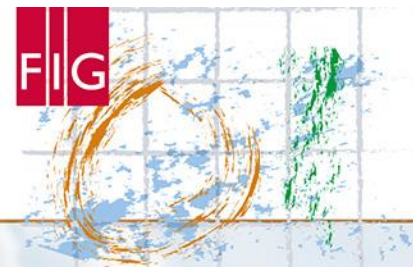
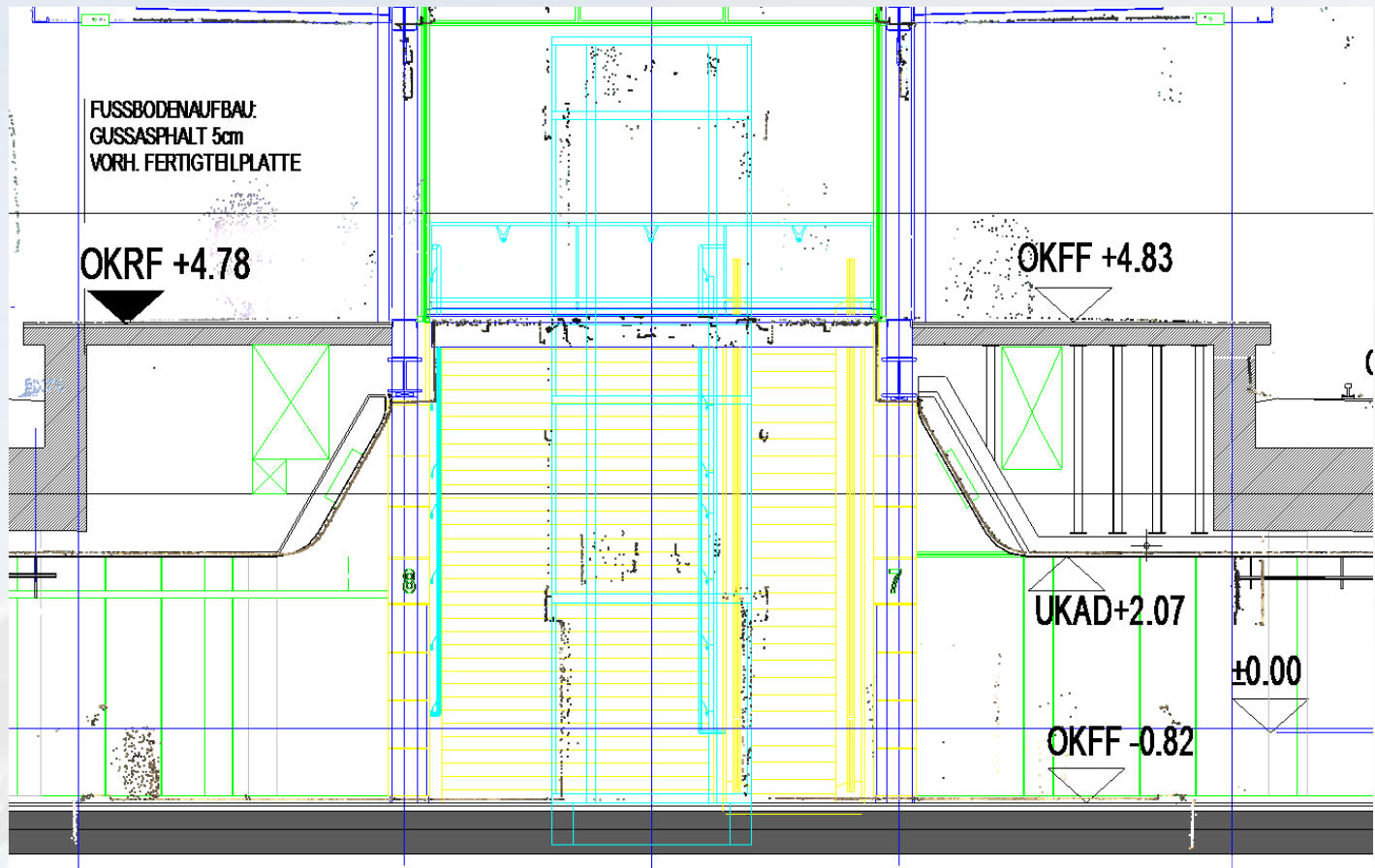


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Information linking: CAD-drawing with point cloud



Revit, Main Station Hannover
© Chr. Manthe



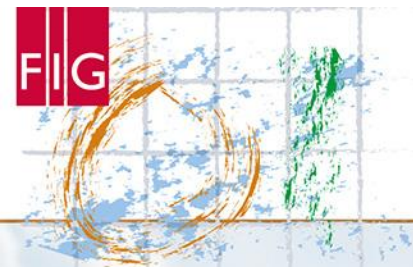


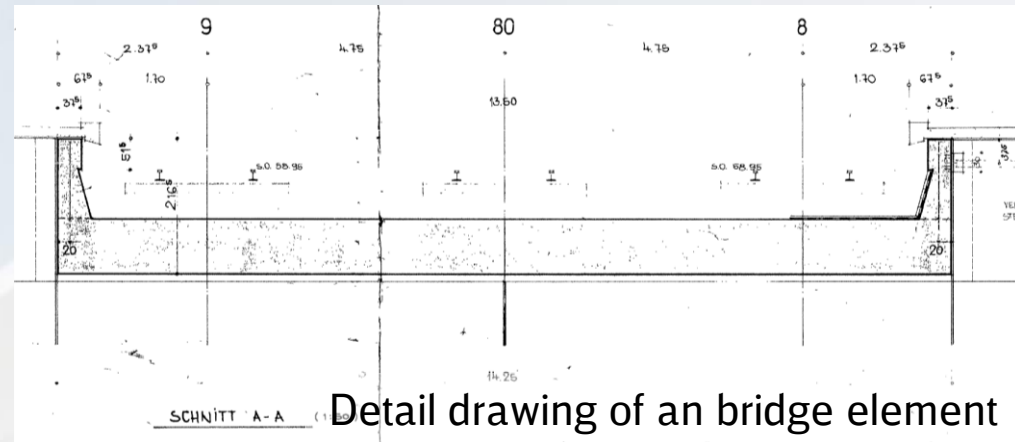
FIG WORKING WEEK 2017

BIM FOR SURVEYORS

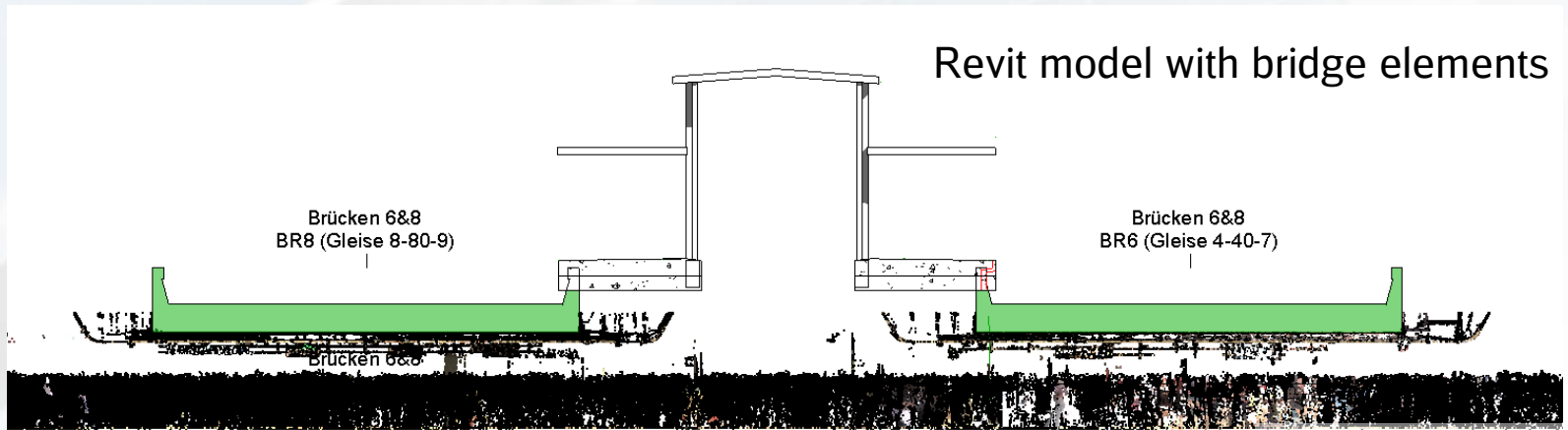
Helsinki Finland Sunday 28 May 2017

Information linking: CAD-drawing with point cloud

- Detail drawing used to create a Revit family
- Point cloud as frame for the object



Detail drawing of an bridge element



Revit model with bridge elements

Revit, Main Station Hannover
© Chr. Manthe



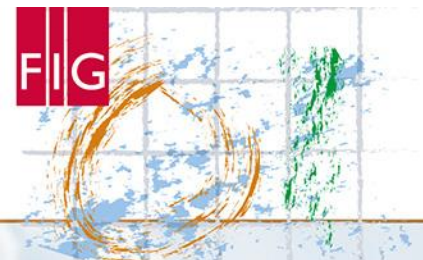
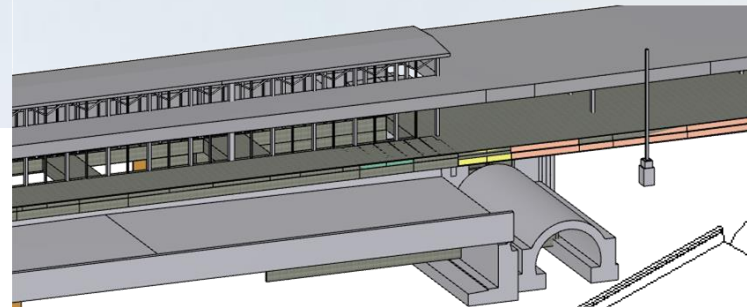


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Information linking: model with detail-drawing over SharePoint



Brücken 6&8
BR8 (Gleise 8-80-9)
11692

Brücke 8
Widerlager West

Fluchttunnel
(noch nicht
ausmodelliert)

Gewoelbe2
Gleise 8-80-9

Tunnelaufweitung
Bauabschnitt J

Gewoelbe1
Gleise 6-60-7

Brücke 6
Widerlager Ost
11799

Brücken 6&8
BR6 (Gleise 4-40-7)
11796

Brücke6
Westliches Widerlager
11797

Eigenschaften

Allgemeines Modell (1) Typ bearbeiten

Abhängigkeiten

Erhebung 0.0000

Verschieben mit u...

Abmessungen

Volumen 315.411 m³

ID-Daten

Bild

Kommentare

Kennzeichen

SharePoint_ID 11797

SharePoint_URL <https://portal.db-i-...>

Bearbeitungsbereich Bearbeitungsbere...

Geändert von

Phasen

Phase erstellt Neue Kons...

Phase abgebrochen Keine

[Hilfe zu Eigenschaften](#)

https://portal.db-international.de/projektcenter/D-HH00348A/Planung/Bestandsunterlagen/Dokumente/Bestandsdaten_IZ-Plan_Br%C3%BCcken_Tunnel_Erdbau/Strecke%201700-1705-1710-1730-1733-1760/1337026014-1162484-PLA-04-000.pdf



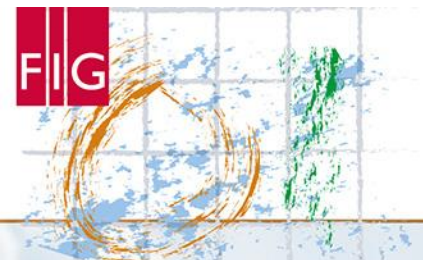
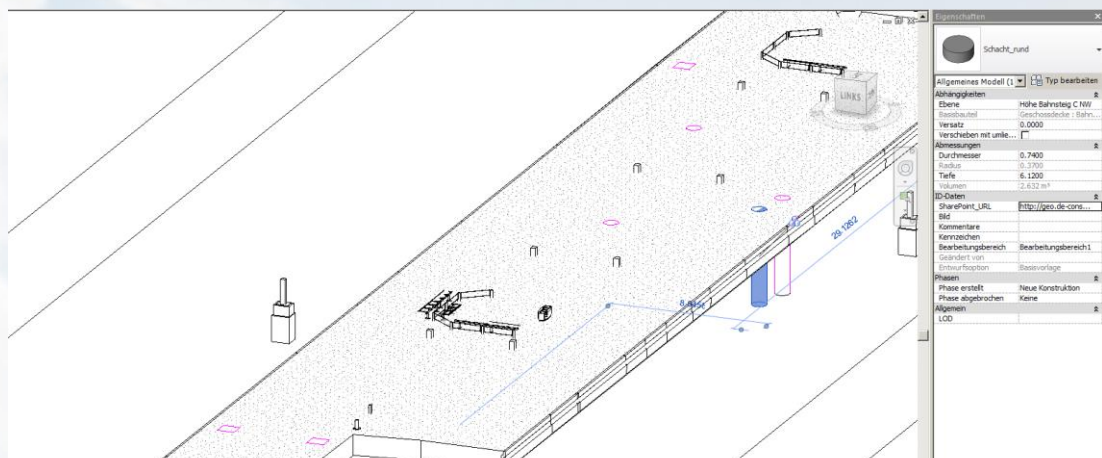


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Information linking: Link between model and measurement protocol via SharePoint



<Schachliste>

A	B	C	D	E	F	G
Familie	Durchmesser	Laenge	Breite	Tiefe	SharePoint_URL	Kommentare
Schacht_rund	0.780			5.720	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			0.700	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			6.120	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			6.060	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			5.750	http://geo.de-consult.de/Hann	Sollte nochmal relativ zu den Stützen eingeme
Schacht_rund	0.650			1.530	http://geo.de-consult.de/Hann	
Schacht_rund	0.650			1.220	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			6.520	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			4.450	http://geo.de-consult.de/Hann	
Schacht_rund	0.740			0.780	http://geo.de-consult.de/Hann	
Schacht_eckig		0.850	0.780	1.120	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	0.770	0.650	http://geo.de-consult.de/Hann	
Schacht_eckig		0.890	0.890	1.800	http://geo.de-consult.de/Hann	
Schacht_eckig		0.800	0.850	0.500		konnte noch nicht geöffnet werden!
Schacht_eckig		0.520	0.770	1.400	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	0.770	0.990	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	0.770	0.970	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	0.770	0.960	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	1.540	2.440	http://geo.de-consult.de/Hann	
Schacht_eckig		0.770	0.840	0.910	http://geo.de-consult.de/Hann	
Schacht_eckig		0.840	0.840	1.380	http://geo.de-consult.de/Hann	



Schachtaufnahme

Bl. Anz.: Bl.:	
Auftraggeber: DB Station & Service AG	Projektnr.: D-V000756
Bauvorhaben: Hannover Hbf	Objekt: Schachtdokumentation
Lagesystem: DB_REF Hörsystem: DHHN92	
gemessen/abgesteckt: Russkoff	
Datei:	DB International GmbH Vermessung
vom Punktnr.: bis Punktnr.:	
geprüft: 17.11.2014	

<p>Lageskizze:</p> <p>Ø (Ring) 0,74</p> <p>Ø (innen) 0,60</p> <p>Foto:</p>	<p>Nr.: C 10</p> <p>Schachtdeckel: Beton</p> <p>Rechtswert:</p> <p>Hochwert:</p> <p>Hohe:</p> <p>Ein- und Ausläufe: <input checked="" type="checkbox"/> nicht messbar</p> <p>Nr. Tiefe Höhe <input checked="" type="checkbox"/> Material</p> <table style="width: 100%;"> <tr><td>1</td><td>6,27</td><td>?</td><td>nicht messbar</td></tr> <tr><td>2</td><td>6,27</td><td>?</td><td>nicht messbar</td></tr> <tr><td>3</td><td>6,28</td><td>?</td><td>nicht messbar</td></tr> <tr><td>4</td><td></td><td></td><td></td></tr> </table>	1	6,27	?	nicht messbar	2	6,27	?	nicht messbar	3	6,28	?	nicht messbar	4			
1	6,27	?	nicht messbar														
2	6,27	?	nicht messbar														
3	6,28	?	nicht messbar														
4																	



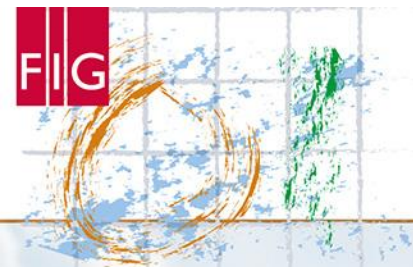


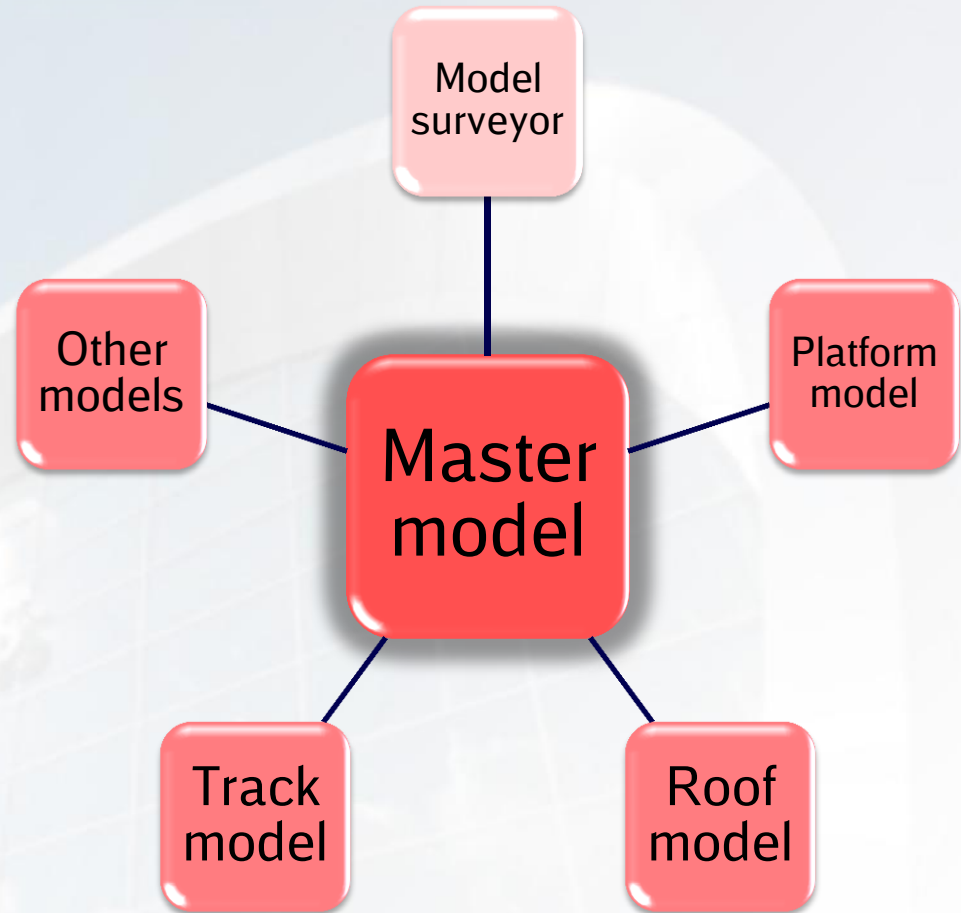
FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Collaboration: in Revit

- One template for all
- Everyone is only responsible for their own model
- In Revit all data has to be in the same coordinate system
- No translation of model parts
- shared parameters should be used if it make sense



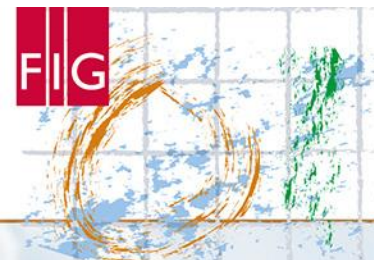


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

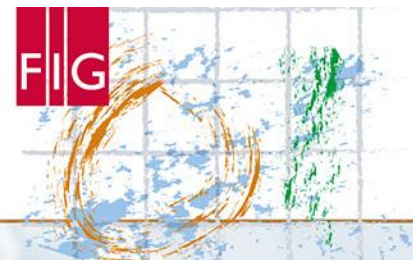
Helsinki Finland Sunday 28 May 2017

Collaboration: with Navisworks

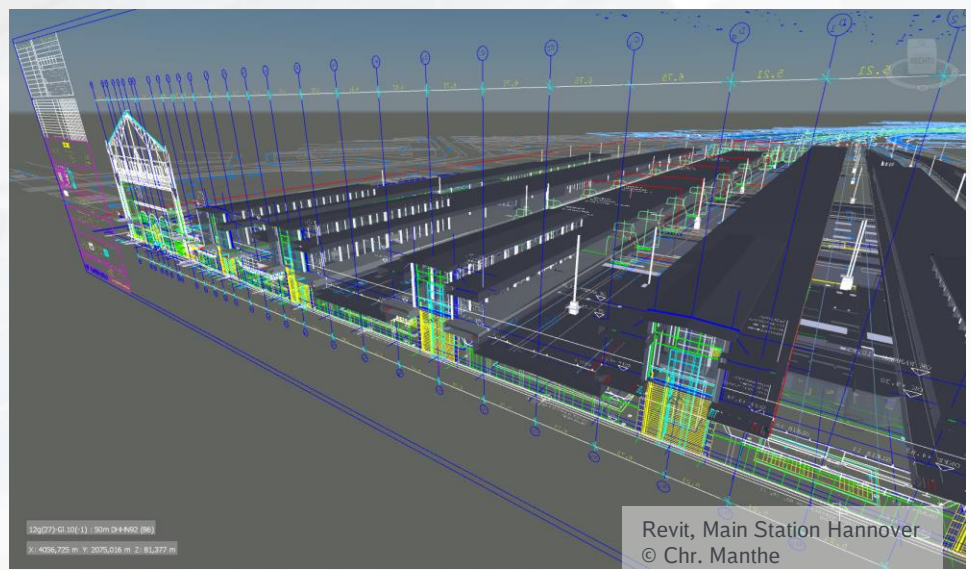
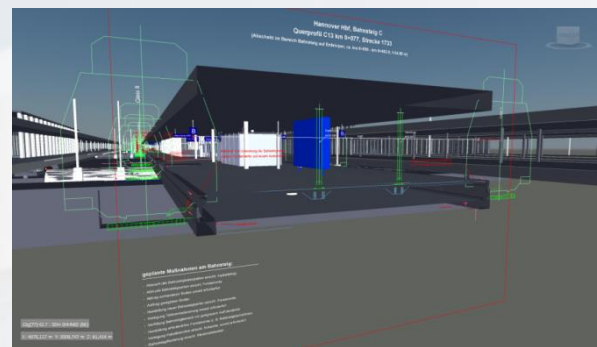
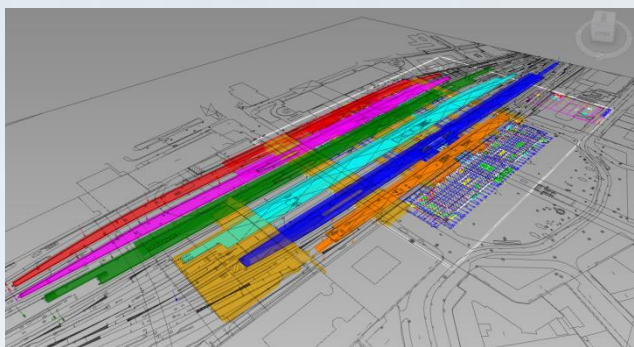
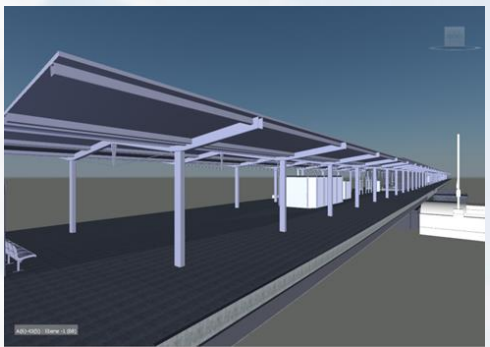
The screenshot displays the Autodesk Navisworks software interface. The main window shows a 3D perspective view of a complex BIM model, likely a railway station, with various components highlighted in green and red. The interface includes several toolbars and panels:

- Top Bar:** Contains file management icons, a search bar, and user information.
- Navigation Bar:** Includes options for 'Start', 'Ansichtspunkt', 'Überprüfung', 'Animation', 'Ansicht', 'Ausgabe', 'Elementwerkzeuge', 'Schnittwerkzeuge', 'BIM 360', 'Rendering', and 'Vault'.
- Left Panel:** Features 'Navigationshilfen', 'Auswahlstruktur', and 'Standard' views. A list of elements is visible, including 'UV_000_B007_1_PBS_00001_00000_B_Gesamtkoordinierungsumgebung.nwf' and various 'Bestandsmodell' and 'Planungsmodell' entries.
- Right Panel:** Shows 'Gespeicherte Ansichtspunkte' (Saved Viewpoints) with a list of views such as '3D-Ansicht (IK_360_B007_2_PIS_00002_000)' and '3D-Ansicht (HB_360_B007_2_PIS_00003_000)'. It also includes 'Eigenschaften' and 'Vault-Browser' sections.
- Bottom Bar:** Displays 'Revit, Main Station Hannover' and system information like '1 von 1' and '930 MB'.





Collaboration: with Navisworks to make decisions



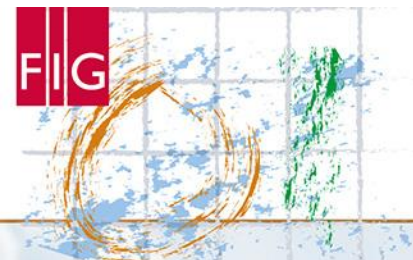


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Clash detection Navisworks

Projekt | Auswählen und suchen | Sichtbarkeit

auswahlstruktur

- Standard
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Hauptstuetze
 - System Ostkreuz_Mittelaufgang
 - UK Bahnsteigdach Ostkreuz
 - Allgemeines Modell
 - Dächer
 - Fassadenelemente
 - Fassadenpfosten
 - Skelettbau
 - Tragwerksstützen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen
 - System Ostkreuz_Rahmen

Test hinzufügen | Alle zurücksetzen | Alle komprimieren | Alle löschen | Alle aktualisieren

Regeln | Auswählen | Ergebnisse | Bericht

Auswahl A: Standard

- Skelettbau
 - Tragwerksstützen
 - System Ostkreuz_Rahmen

Auswahl B: Standard

- DB Lampe Typ17
- DB Schacht T2
- Schacht_eckig

Einstellungen

Typ: Freiraum | Toleranz: 10,000 m

Verknüpfung: Keine | Schritt (Sek.): 0,1

Konfliktprüfung für zusammengesetztes Objekt

Test ausführen

Clash Detective

Schacht gegen Stütze Dach Ostkreuz

Zuletzt ausgeführt: Konflikte - Insgesamt

Name	Status	Konfli...	Neu	Aktiv	Geprüft	G
Schacht gege	Ausgeföh	5	0	5	0	0
Test 2	Neu	0	0	0	0	0

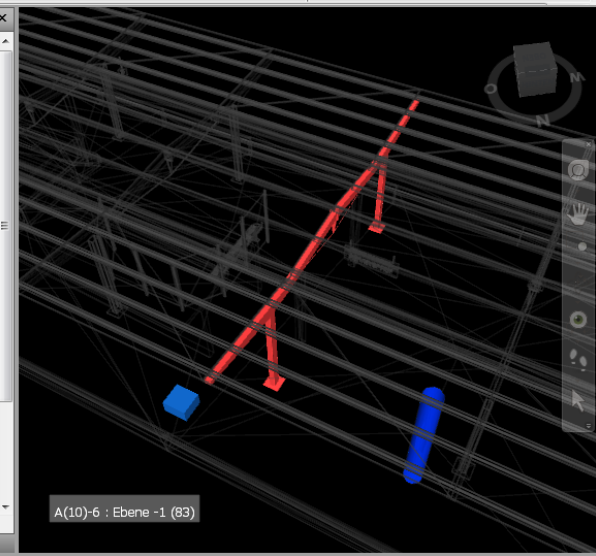
Test hinzufügen | Alle zurücksetzen | Alle komprimieren | Alle löschen

Regeln | Auswählen | Ergebnisse | Bericht

Neue Gruppe | Zuweisen | Keine

Name	Status	Ebene	Rasters...	Gefunden
Konflikt1	Aktiv	Floor_7 (...	A-7(1)	10:42:18 07-04-201
Konflikt2	Aktiv	Floor_7 (...	B-26(1)	10:42:18 07-04-201
Konflikt3	Aktiv	Floor_7 (...	A-8(-1)	10:42:18 07-04-201
Konflikt4	Aktiv	Floor_7 (...	A-7(-2)	10:42:18 07-04-201
Konflikt5	Aktiv	Floor_7 (...	B-26(-1)	10:42:18 07-04-201

Auswahlstruktur | Clash Detective



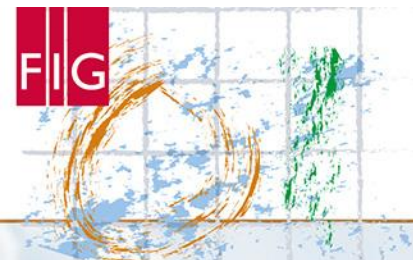
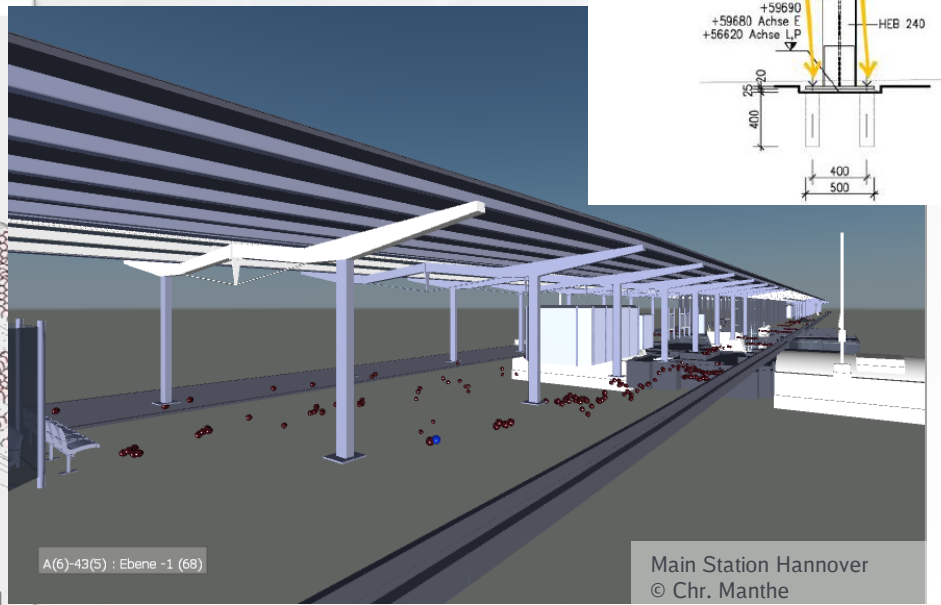
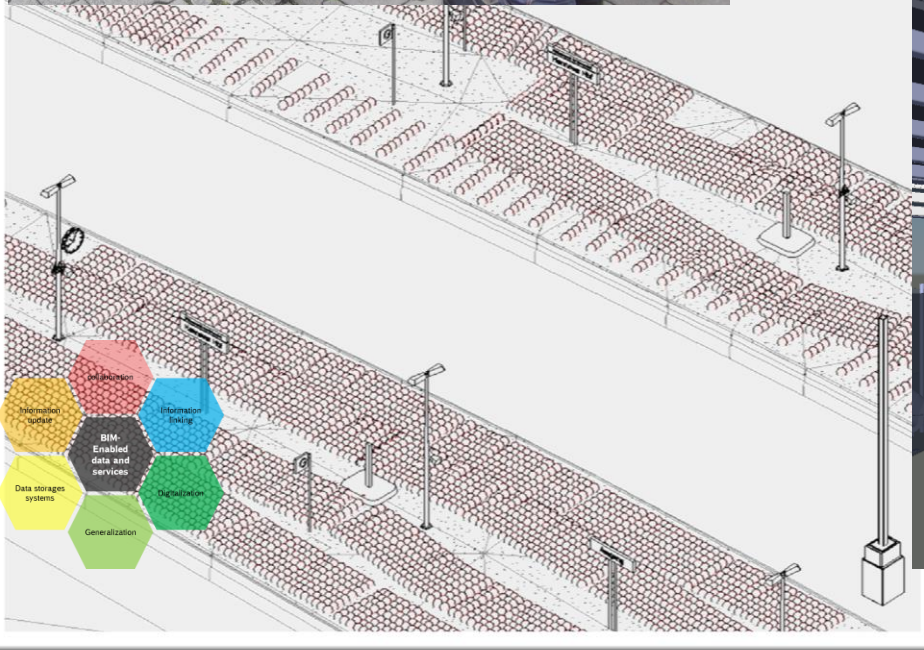
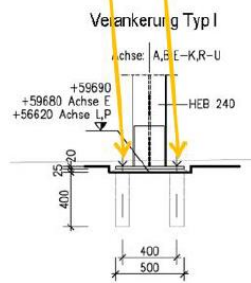
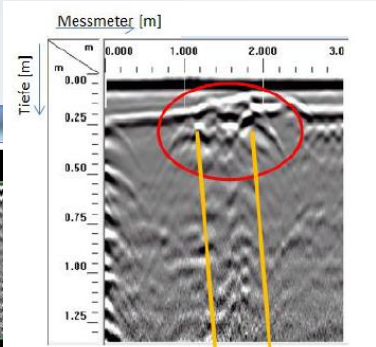
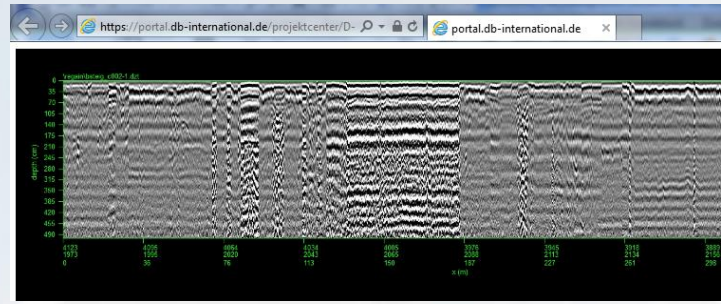


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Information update: ground-penetrating radar



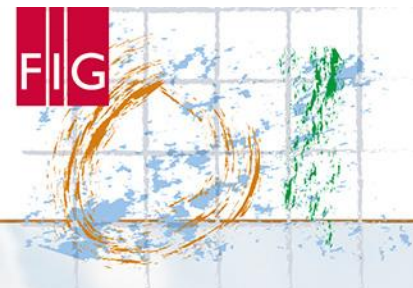


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

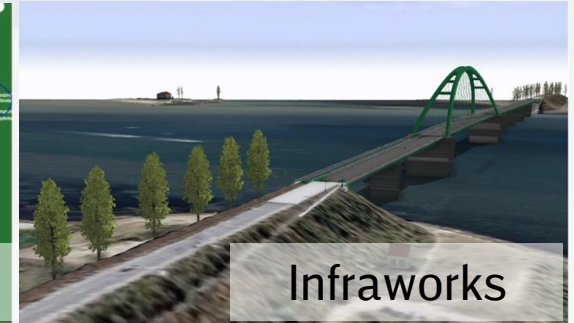
Helsinki Finland Sunday 28 May 2017



Infraworks

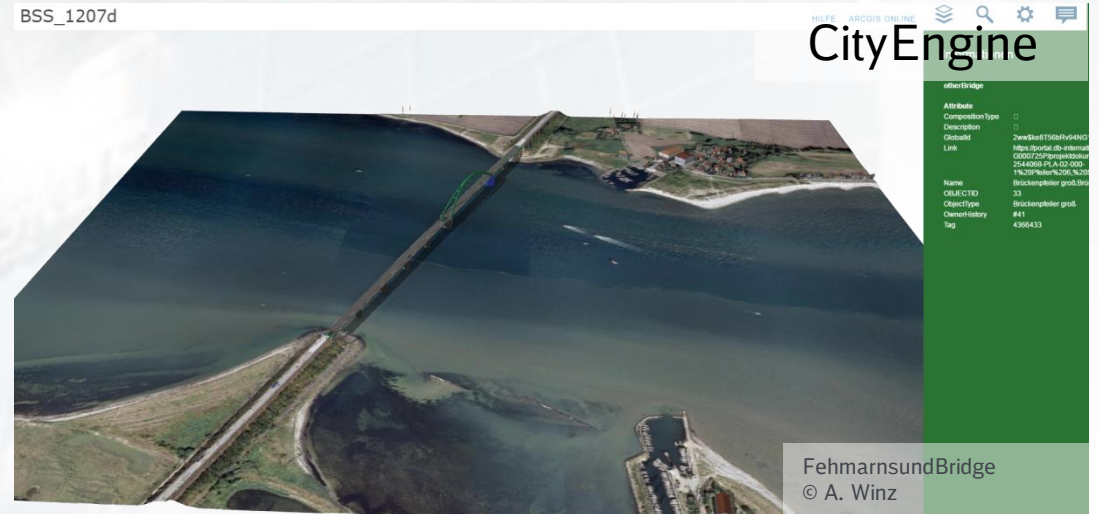


CityEngine



Infraworks

BSS_1207d



FehmarnsundBridge
© A. Winz

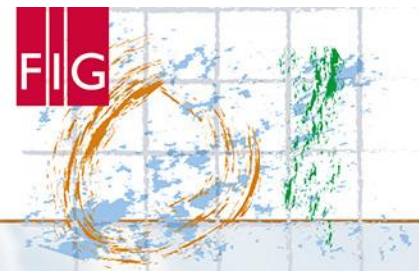


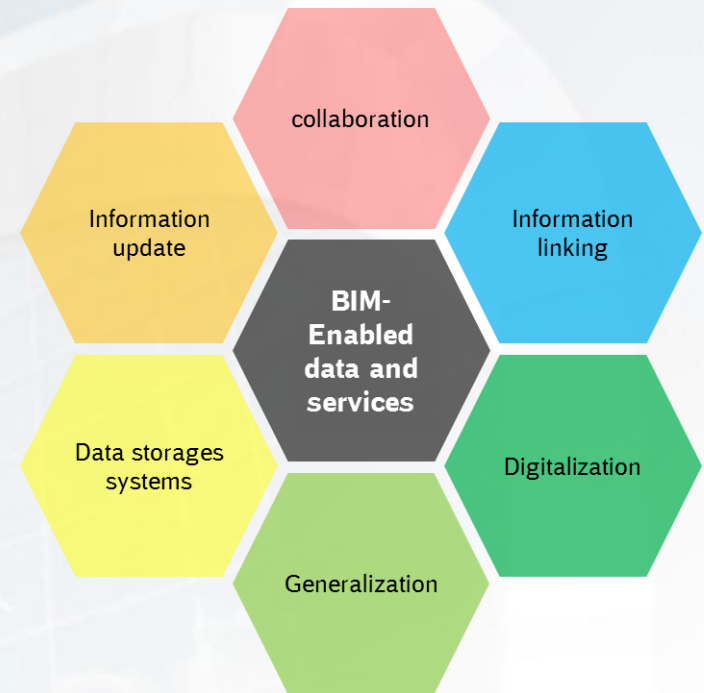
FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017

Summary :

- different tools and applications are accessible but we are just at the beginning
- Some key words for the future
 - Distributed Data storage
 - Databases and Application interfaces
 - Web services, integration GIS and BIM
 - Streaming of data and Information
 - Joining the object information out of BIM with the resource information out of Enterprise resource planning (ERP) tools
 - Sensor information and communication
 - Predictive Maintenance
 - measurement update
- Needed
 - people familiar with the technic in that field
 - Surveyors skills in dealing with data



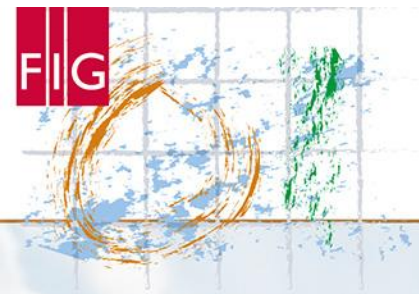
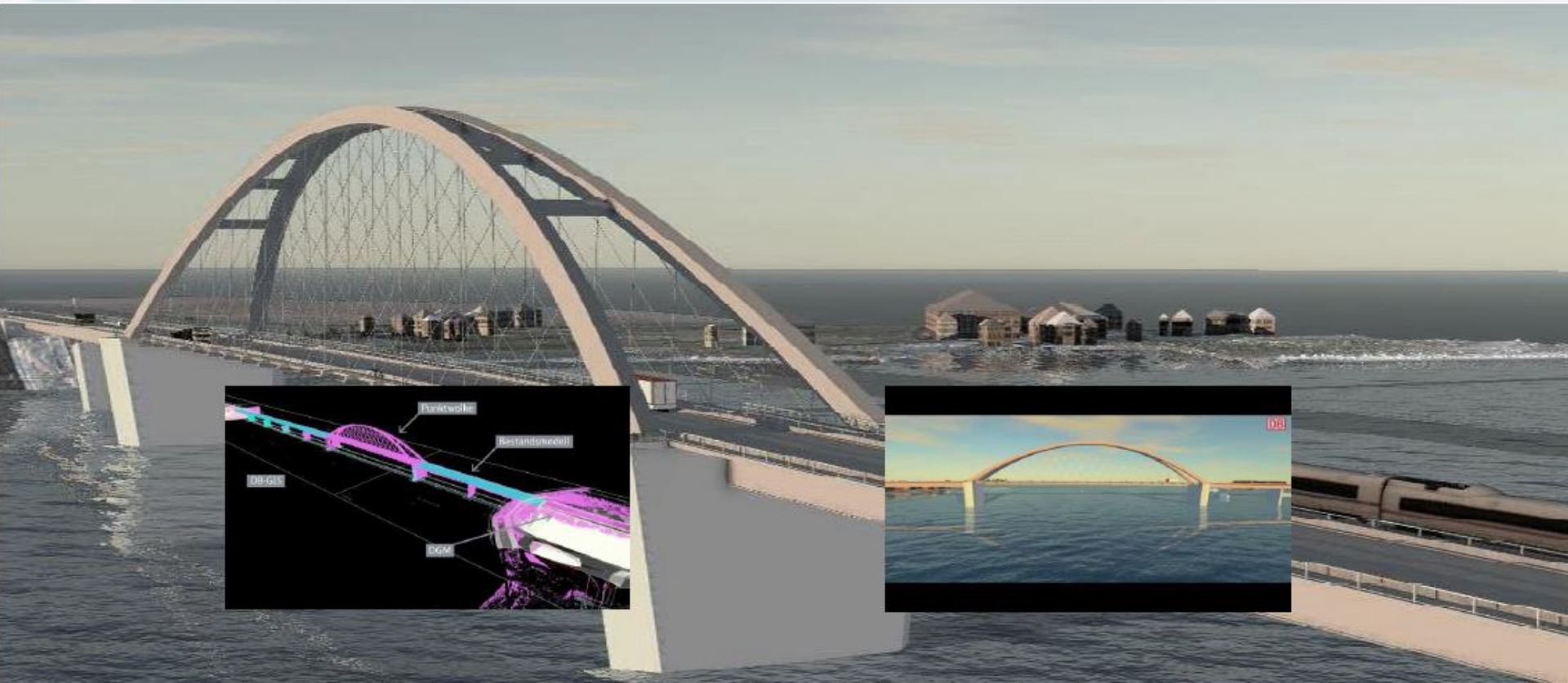


FIG WORKING WEEK 2017

BIM FOR SURVEYORS

Helsinki Finland Sunday 28 May 2017



Thank for your attention!