Trimble DIMENSIONS 2018

BIM in Office: BIM Level 3 for Infrastructure | Tuesday November 6

BIM level 3 for Infrastructure is a tailored program for civil engineers, infrastructure project managers and other professionals with the ambition to meet the current - as well as shape the future - requirements of the civil engineering and construction industry.

6:30 – 17:30	Registration
6:30 – 8:30	Breakfast
8:30 – 9:00	**Trimble Civil Construction Continuum: using the Trimble ecosystem for BIM level 3 collaboration** Trimble has a wide range of solutions that support the workflows throughout the project lifecycle, from early planning of Infrastructure, to conceptual and detailed design, planning and execution of construction, and finally to model hand over and maintenance. The role of the BIM model is becoming increasingly important, as it is being enriched with information and sophisticated data at every stage of the project lifecycle. The result; the BIM Level 3 model then follows the lifecycle of its objects, not only the lifecycle of a given project. We call it the Trimble Civil Construction Continuum. *Heidi Berg, Mats Fensholt and Idar Kirkhorn, Trimble, Norway*

9:00 – 9:30 **The BIM Level 3 requirement from Infrastructure owners**

The BIM level 3 requirement from Infrastructure owners drives innovation in Norwegian Road projects. Nye Veier, the new road client in Norway, was established in 2017, with a mandate of reducing the design and construction time and costs. One of their solutions to this was to set high demands of BIM level 3 in their Best Value Procurement tender documents, showing a clear path towards the vision of a fully digitized design and construction process within 2020. This has created a strong movement in the market, where contractors, designers and suppliers need to innovate and take major leaps towards full digitalization. Their mandate, given through the Parliament proposal, was to construct 534 km of highways (mainly 4-lane) at an estimated cost of 148 billion NOK (2015 cost level) (approx. 16.4 billion EURO) and complete the construction in 20 years. Their ambition is to complete the job in 12 years with a 20% reduction in cost.

Øyvind Moshagen, Nye Veier, Norway

9:30 – 10:00 Break

10:00 – 10:30 **How to Integrate Quantm System into China Highway BIM technology**

Infrastructure construction is booming in China today, and a great deal of road construction projects are also extending from the eastern plain to the western mountainous areas. Highway routing in mountainous regions is a complex and far-reaching systematic work. It needs to take full account of overall planning, topography, engineering scale, project investment, environmental impact and social benefits. If the alignment planning depends on the individual engineers, it takes a large amount of time and manpower to determine a reasonable and feasible route scheme. The Trimble Quantm system combines engineers` experience in route selection and road design regulations with computers` calculation function. In that way engineering could quickly and reasonably determine the road plan in the early stage of project determination. In the Sichuan province’s mountainous area, highway engineering applies the Quantm system for alignment selection. By setting the control conditions, such as project scale, investment, environmental factors and also its weight values. Analyzing and calculating by computer gets 20 to 50 reasonable route schemes. The outcomes include the corresponding route plane, profile and cross-section, as well as bridges, tunnels, digging and filling. We have also used Trimble UX5 Unmanned Aircraft System in some projects as a substitute for conventional survey. Digital orthophoto map and the Quantm system’s scenario could be imported to China's current mainstream highway design platform for in-depth detailed adjustment and optimization.

Ming Zhu, Sichuan Communication Surveying & Design Institute, China

10:30 – 11:00 **The Jokeri Light-Rail Line (Integrated Project Delivery) – A 25 km long multidisciplinary design environment**

Constructing a new light-rail connection, the Jokeri Light Rail Line, in a built environment created a substantial challenge in the capital area of Helsinki. The project is realized as an Alliance project, i.e. an integrated project delivery with early contractor involvement. The model includes a development phase where the best and most cost-effective solutions are currently investigated as a joint effort by the client, the contractors and the designers. The project has a joint organization and a joint contract with no-blame clauses, shared pain and gain. The designers in the project are Ramboll, Sitowise and VR-Track, the contractors YIT and VR-Track, and the clients are the cities of Helsinki and Espoo.

The new Jokeri light-rail line aims at serving an increasing number of passengers traveling across the region, the forecast for 2040 is 102 000 passengers per day. The light-rail connection is 25 km long (15.5 miles) and the investment amounts to ca 275 MEUR (320 MUSD) excluding rolling stock and a depot. The overall goals of the project are to improve the reliability of traffic, grow the capacity of public transportation in the region, improve orbital public transport connections, connect to radial metro and train stations, promote sustainable transportation, and to improve land use.
Presenting innovative solutions for the light-rail line to decision makers, the residents of Helsinki and other stakeholders is an important part of the project's development phase. Coordinating the technical solutions between three designers, two contractors, and two clients requires tools that enable real-time information management throughout the design and construction phases. The Jokeri light-rail line project is being realized using Trimble Novapoint as the main design software and relying on Trimble Quadri as the information and communication management tool for the whole project.

Peter Molin, Ramboll, Finland

11:00 – 11:30 Break

11:30 – 12:00 **Collaboration across borders and companies using Trimble Quadri - a BIM Level 3 server; E18 Rugtvedt – Dordal**

The highway E18 Rugtvedt - Dordal is a Design-Build project where the contractor requires a BIM design- and build process. COWI applied its global design resources through model based collaboration across borders. The multi-domain infrastructure BIM model is continuously updated in the cloud, so all designers can collaborate on the latest version from all domains, in real-time. The client and contractor are given access to the model, to ensure that their input is handled using geo-referenced model commenting in an OpenBIM standard (BCF2).

Magnus Jacob Christensen, COWI, Denmark

12:00 – 12:30 **Trimble Quadri : a BIM Level 3 platform across multiple design applications**

All domains can use their own BIM design tools, sharing their changes and receiving calculation basis and changes from others through the multi-user BIM server, Trimble Quadri.
Being able to enrich the common BIM model with a range of other sources like IFC, LandXML, (City)GML and even GIS data, all users see the same single source of truth, in the common Quadri model.
All data gets stored as rich objects (features) with attached information (attributes). And more importantly, the structure that defines how the model is created and enriched is made available to the users through information on tasks and processes. With multi-domain design and existing terrain data in the same model, you can run analyses over the complete model and extract the information you need, independent of the source files.

Chris Dheere, Arkance Systems, BeNeLux

12:30 – 14:30 Lunch

14:30 – 15:00 **BIM modelling for infrastructure, using Trimble Novapoint Infrastructure Design Suite and Trimble Quadri for BIM Level 3 collaboration**

BIM is far more known within the building industry than the Infrastructure industry. In Norway, where Trimble Novapoint Infrastructure Design suite is developed, the official requirement from the government since 2012 has been to work after the principles of BIM and deliver BIM models to site. The design and construction market in this region has therefore developed fast and industry players now deliver “paperless” to sites, utilizing the BIM modelling tools from early planning all the way through an optimized, multidisciplinary BIM process, to a constructible set of models to the site.

Heidi Berg, Erling Tronsmoen and Patrick Mc Gloin, Trimble, Norway

15:00 – 15:30 **Multidisciplinary collaboration within the BIM model, Crown Bridges, Helsinki**

The Crown Bridges project in the city of Helsinki will connect the Laajasalo, Korkeasaari and Kalasatama areas to the center of the city by means of a 10 km tramway. The most visual part of the project are the three new bridges: Kruunuvuori Bridge, Finke Bridge, and Merihaka Bridge. With a total length of 1,200 meters, Kruunuvuori Bridge will be Finland's longest bridge.

In this presentation, the focus is on the street- and municipal infrastructure design. Digital models create enormous possibilities that enable controlled decision making within a design team and between owners, contractors and designers.

In the Crown Bridges Project Trimble Novapoint is used as the main design system for infrastructure and water supply design, Trimble Tekla Structures is applied in bridge- and structural engineering, and project collaboration in the BIM model is conducted using Trimble Quadri.

Mr. Valtteri Brotherus and Mr. Matti-Esko Järvenpää, WSP, Finland

15:30 – 16:00 Break

16:00 – 16:30 **How to monitor a construction project with Trimble TILOS?**

Site monitoring is a key aspect of construction project management. However, it is often managed with basic tools and is very time-consuming. Reporting progress, evaluating impacts, taking corrective actions and providing up-to-date reporting can not be improvised and requires special preparation. Fabien Gaboriau and Quentin Herbreteau, experienced planning managers, present some of their best practices, around project organization, scheduling and monitoring through a case study.

Fabien Gaboriau and Quentin Herbreteau, Project Lineaire, France

16:30 – 17:00 **How to get optimal value of an Open BIM Level 3 process. Panel Discussion**

OpenBIM has been a hot topic in the construction industry for some time now. What are the lessons learned? The approach has proven to give less errors and conflicts between the designed objects, but do we see the value and benefit all the way out on site and back to the client? The experienced panel will share and discuss their lessons learned: What needs to be in place (what requirement, contractual documents, procedures, level of detail etc.); What are the requirements for the infraBIM tools to be used for connecting planning and design phases, construction execution and maintenance of infrastructures; And best practices and lessons learned on information delivery with open infraBIM. Let's share and discuss the lessons learned and move forward.

Moderators: Merete Tøndel and Heidi Berg, Trimble, Norway

BIM within the Trimble Construction Continuum | Wednesday November 7

10:30 – 11:00

Case Study | Collaboration of VALTARI Project Alliance to Deliver New Road in Lahti Region

Highway 12 Lahti Southern Ring Road is currently the largest road construction project in Finland, including roads, interchanges, bridges, different soil reinforcements and tunnels containing both rock and concrete. The project is being completed by the VALTARI project alliance, the collaboration of Skanska (the contractor), the main consultant Pöyry, the Finnish Transport Agency and cities in the Lahti Region. For this project, Skanska and Pöyry developed their existing collaborative relationship further and integrated their expertise with BIM-based design and tunnel construction processes. VALTARI utilizes the Trimble Connect platform, Connect Sync and the Tekla Civil database with Trimble Connect for project data management. During the development phase, the Trimble Connect desktop model was assembled using a combination of design expertise, and supported collaboration and innovation in the joint Big Room. After the successful development phase, the VALTARI Project Alliance began the implementation phase in June 2018. During implementation, collaboration methods were expanded further to different on-site applications and monitoring technology. Construction data management utilizes the Trimble Construction Continuum, including different modes of the Tekla Civil database such as Field Mode Offline. Furthermore Trimble Locus platform is utilized in public briefing of the construction process. The overall cost of the project is over $300M and will be completed by the end of 2020.

Key Objectives
1) Understand BIM based design-construction workflow and data management systems used
2) Identify different types of on-site applications and monitoring technology used
3) Recognize how model-based civil software is utilized in design-construction process

Kyösti Kanerva, Pöyry Finland and Heikki Lehkonen, Skanska Infra

11:00 – 11:30

Case Study | Implementation of the MATTI System by the City of Vantaa, a Pioneer of Digitalization

The city of Vantaa, a technology pioneer in the Finnish public sector, is on the verge of taking an enormous digital leap into the future by implementing the MATTI system. MATTI is a land use procedure and information system, in short, a BIM-based approach to city development and data management systems. MATTI is revolutionary because it combines GIS with an action-controlled information system. MATTI aims to increase both effectiveness and productivity of technical operations and helps citizens and private suppliers to participate in city development. MATTI will serve as a total digital solution for the lifecycle management of land use, town planning, municipal infrastructure and more. The project is also developing entirely new digital operating models and processes. Both parts must be

created at the same time, the main benefit of digitalization is achieved by optimizing processes. In the heart of MATTI is a centralized information system, an operational and semantic BIM-based city model that connects design, construction, and maintenance in real time. The MATTI city model contains all infra lifecycle data so it will work as an infra asset management data storage, a great improvement to existing models. Civilpoint, an authorized value-added reseller for Trimble software in Finland, plays one of the key roles in this unique project. As an integral part of MATTI, Civilpoint delivers the Trimble Quadri BIM server and Trimble Novapoint design system fully integrated to the Esri ArcGIS platform and M-Files intelligent information management solutions and processes.

Key Objectives

1) Understand the importance of new operational processes when implementing new digital solutions
2) List the benefits of a centralized information system
3) Discuss the benefits of lifecycle information model AIM (Infra Asset Information Model) concept

Henry Westlin, The City of Vantaa

11:30 – 13:00 Lunch

13:00 – 13:30 **Case Study | Keilaniemi – Unbreakable Data Flow in BIM-Based Design, Construction and Maintenance Project (Design-Build Project Delivery)**

For the Ring Road Keilaniemi Highway and Tunneling project, Sweco has worked closely with contractor SRV Infra, the City of Espoo and several other stakeholders. Sweco has implemented Trimble Design software, Quadri server solutions and new working flows to ensure continuous data and information flow between designers, contractors, clients and other project stakeholders. Design and construction have been managed and executed simultaneously, the online design process increased project quality and facilitated schedule management. The Quadri model is accessible for all project stakeholders and can be used as an as-built model for asset management purposes. This session will also discuss how construction data is generated from the model, how as-built data is revised and updated to the design model.

Key Objectives
1) Manage the digital construction continuum dataflow, from design to construction and maintenance
2) Co-operate between designers, contractors, clients and other stakeholders
3) Increase value for project quality deliveries and manage the schedule

Juho Siipo, Sweco Finland

13:30 – 14:00

BIM Infrastructure Use Case: Winning Jaguar-LandRover's Future Production Plant Construction Project

In 2015, Jaguar-LandRover, the prestigious automotive manufacturer, issued a tender for the construction of a future major industrial plant in Slovakia. It was awarded in late 2016 to European subsidiaries of the Bouygues Group and the Colas Group. Targeting a production of 150,000 units a year initially, with a team of 2,800 employees, this project represents a €940M investment, the largest private investment ever by a foreign company. It is composed of a 3 sq km platform with over 300,000 sqm production units, requiring a 300.000m3 earthworks and 30 km of utility networks, being dry, pressurized or wet. During the tender phase, the Colas Group team decided to set up a BIM infrastructure model of the project on the basis of the tender documents, with a view to identify potential inconsistencies and areas of optimization, specifically in the field of utility networks. The Colas Group contracted Vianova France to provide Trimble BIM infrastructure solutions and services aimed at optimizing the layout of the many utility networks in the trenches required. Also, consequently identifying the options for the best quote and securing margins in a competitive context. Once the project was won, the Colas Group decided to leverage the BIM infrastructure model built in the tender phase to provide the construction team onsite with a reliable mean to develop the detailed design of such 30 km length of utility networks. This detailed BIM infrastructure model became the unified, one reference source of design and construction information for the management team. This shall be provided in late 2018 to Jaguar-LandRover as a trustful, as-built database of the project to serve its future automated maintenance processes.

Key Objectives

1) Identify inconsistencies in industrial plant construction tender documents
2) Optimize technical proposition, quantities, quote and margins
3) Leverage industrial plant BIM models from tender phase through the construction phase

Michel Rives, Vianova Systems France

14:00 – 14:30

Break

14:30 – 15:00

OpenBIM in Infrastructures and the Civil Engineering and Construction Industry

Traditionally, openBIM is defined as a universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows. With the buildingSMART concept, the open IFC format, standardized terminology defined in data dictionary and processes according to the information delivery manual together creates openBIM. But how suitable is this definition for infrastructures and the Civil Engineering and Construction (CEC) industry? Extending the openBIM concept to cover the infrastructures sector will have a positive impact—think about what all openBIM infrastructure could mean for the CEC industry. In infrastructure projects we have to cope with geospatial, civil and structural information, so it is important that the location-based data, the existing built environment and BIM data like roads, railways, tunnels, bridges and platforms works fluently with each other. Therefore, we should adapt the openBIM concept for the complete built environment and not only for buildings. In the buildingSMART community IFCRoad, IFCBridge, IFCRail and IFC

Tunnel development are already partly ongoing or starting. Open Geospatial Consortium (OGC) has recently published InfraGML 1.0 standard and work on 2.0 has started. Infrastructure projects and processes are often very complex with multiple stakeholders. By standardizing our way of working through the whole digital construction continuum we can create an information flow that matures from stage to stage. Finally, the asset owner can get relevant trustworthy information for infrastructure asset management. Critical areas for success in infrastructure projects are good communication and fluent collaboration between all different stakeholders, whichever domain they represent. In this session we will discuss what openBIM can mean in connected digital workflows in civil construction continuum, in project communication and collaboration in complex infrastructure projects.

Key Objectives
1) Understand on a general level the IFC development status concerning infrastructures
2) List BIM level 3 collaboration principles in civil engineering and construction data management
3) Understand the importance of open digital workflows in the civil construction continuum

Erkki Makinen, Strategic Marketing Manager / Civil Engineering Software, Trimble

15:00 – 15:30 **Quantm | Optimal Road Alignment - Best Possible Road Project**

Trimble Quantm is a software solution used by designers and planners globally in identifying and generating a range of 3D optimal routes / alternatives. Using Trimble Quantm significantly reduces planning time and construction costs. The Swedish consulting group ÅF has used Trimble's unique alignment planning system Quantm to find the optimal road line for a road project. With 100 automatically generated and rated alignment alternatives to choose from, planning time and construction costs were significantly reduced. The environment, culture sites, fauna, urban constraints, and more were taken into account. This session will discuss how Trimble Quantm gave ÅF the tools to succeed.

Key Objectives
1) Use Quantm to find the optimal road
2) Use Quantm to estimate building costs
3) Understand the integration between Quantm and Novapoint

Anders Eggers Høie, ÅF Engineering and Magnus Hedly, Trimble

15:30 – 16:00 Break

16:00 – 16:30 **Keeping Mega Projects On Track**

Under a public-private partnership agreement (P3), the State of Indiana hired a developer to upgrade 21 miles of State Road 37 (an existing four-lane divided highway) to full interstate standards. The developer was contracted to design, build, finance and operate the facility for 35 years. However, when the developer experienced several delays, the State of Indiana had to terminate the P3 arrangement and assume direct oversight of the construction. They contracted with Walsh Construction to serve as the prime integrator for the remainder of the project, to oversee several subcontractors for earthwork, structures and paving. Kapur & Associates began assisting Walsh Construction on the project in July 2017. Kapur quickly reestablished control and pieced together topography and as-builts along the corridor. Critical data was collected through a variety of methods, including mobile LIDAR, to quickly allow construction to resume. Surface data was also collected and provided to the design and construction teams to aid in design completion, traffic staging and budgeting. Trimble solutions were used throughout this project by Kapur & Associates, playing a key role in the success of the project. Kapur used Trimble Robots, Rovers, Data Collectors, DiNi Levels, and Business Center - HCE to support the project. UAVs were used and processed in Business Center - HCE for quick volume calculations and checks. In this session, see how Trimble products made operations from the field to the office seamless.

Key Objectives
1) List the benefits of Trimble technology
2) Understand how valuable surveying is to a mega project (model / fix strategy)
3) See improved quality because of survey management changes

Sammy VanPelt, Kapur & Associates