CI2283 - BIM workflow on the Highway A4 construction project

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Lead Designer Roads

Cristian Otter
BIM Specialist
About the speakers

Jeroen Tishauser
Jeroen is an experienced Road Design Specialist from the Netherlands. At Volker InfraDesign he uses his knowledge of a wide range of Autodesk products to streamline the process of BIM in large construction projects. Jeroen was one of the founders of the C3D User Group Benelux

Cristian Otter
Cristian is a BIM Advisor who works on large scale infrastructure projects. He is primarily engaged in integrated road design projects, including bridges, tunnels, and other structures. He also implemented 3D modeling in design and build processes. As a board member of the Civil 3D Usergroup Benelux and Revit usergroup for infrastructural projects, he is stretching the possibilities of integrated design.
Class Summary

In this class, we will guide you through the Building Information Modeling (BIM) process of an actual project: the construction of the Highway A4 in The Netherlands. After a contract and project overview, we will dive into the process that makes this project succeed as a true BIM project. Learn where to start, what to do, and what to avoid to have your own success. Find out how to let designers use their favorite program and then bring the intelligent model together in Autodesk® Navisworks® software for your contract management.
Learning Objectives

At the end of this class, you will be able to:

- Successfully implement BIM in civil projects
- Explain how to use Navisworks for contract management
- Explain the importance of think-before-you-start
- Describe the Autodesk® Infrastructure Design Suite workflow
See more of this

- New Civil Engineer – november 2012 issue

Dutch engineers are taking advantage of geospatial data to enhance use of Building Information Modelling in creating and communicating a detailed blueprint for the new A4 motorway. NCE reports.

Geospatial data can be used to significant advantage in construction and infrastructure projects, particularly when design concepts are being developed, where it can enhance understanding of existing social, bicycle and walking paths and sustainable agriculture. Amongst a range of other technical considerations, engineers had to factor in the rebuild of a major intersection and the installation of new covering layers on three existing roads along the route.
(Quick) General introduction to BIM
### What is BIM about?

<table>
<thead>
<tr>
<th>BIM is</th>
<th>BIM is not</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ About collaboration</td>
<td>✗ Everyone for themselves</td>
</tr>
<tr>
<td>✓ A Helping Hand</td>
<td>✗ An end in itself</td>
</tr>
<tr>
<td>✓ Use of 3D models</td>
<td>✗ Just Software</td>
</tr>
<tr>
<td>✓ Communicate better</td>
<td>✗ A solution to everything</td>
</tr>
<tr>
<td>✓ Share Information, Save and Re-use it</td>
<td>✗ A sole application or database</td>
</tr>
<tr>
<td>✓ Supporting multidisciplinary organizations and projects</td>
<td>✗ Just something the design department does</td>
</tr>
<tr>
<td>✓ Usable in all project phases (full project lifecycle)</td>
<td>✗ Working conform standardized methodologies</td>
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<tr>
<td>✓ Detect errors sooner and prevent them</td>
<td>✗ For Sale</td>
</tr>
<tr>
<td>✓ Not possible without coding/naming conventions (eg Systems Engineering structures)</td>
<td>✗ Fully Developed</td>
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Why BIM

- McLeamy Curve
What software
BIM Software Product exchange process

- Who makes which models?
- What tools do they use?
- What is their input and output?
Results

- About 20 different applications are being used
- Lean approach
- Got ourselves a Tabled, Smartphone and … A cool Smartboard
- Dedicated project server at project location
Organization changes

- Project roles changes
  - Modeller instead of Draftsman
  - Model operator and –driver

- Organization Impacts
  - Project management – facilitate and stimulate BIM usage
  - Design – Use of Lean and concurrent engineering
  - Preparatory work – Model accessibility and availability
  - Construction – Inspections, tests and inspections
The project
Project overview (1)

- Joint Venture between VolkerWessels, Heijmans and Boskalis
- Rotterdam area, The Netherlands
- Design Phase with approximately 200 people
- Summer 2013, Construction Phase approximately 1000 people
Project Overview (2)
Applying BIM, why is obvious, but how?
Project approach

- What is the BIM level for this project?
- What is the purpose?
- What is needed?
Add project value

- Project 1: Add 4D
- Project 2: Temporary Works and building Sites in 3D
- Project 3: Model integration, clash detection and interference checks
- Project 4: Visualization
- Project 5: Construction Drawings
- Project 6: Add 5D
- Project 7: Rebar in 3D
- Project 8: Machine control
- Project 9: Quantities from a dynamic model
- Project 10: Verification, as-built and maintenance
# Project 3 in detail

## Projectpart 1: Modelintegration, clashdetection/visualising interference checks

General: Integrate design models from different disciplines in central model(s). Detect errors and clashes early, especially interference checks, optimise design between disciplines and maintainance.

<table>
<thead>
<tr>
<th>No.</th>
<th>Subject</th>
<th>Apply?</th>
<th>Design</th>
<th>Construction</th>
<th>Relevance</th>
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<tbody>
<tr>
<td>3.1</td>
<td>Verifying road design with construction clearance</td>
<td>V</td>
<td>I/N</td>
<td>I/N</td>
<td>I</td>
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<tr>
<td>3.2</td>
<td>Gantry (including foundation and poles) in 3D for interference checks</td>
<td>V</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<tr>
<td>3.3</td>
<td>Road Lightning in 3D for interference checks</td>
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<td>I</td>
<td>I</td>
<td>I</td>
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<td>3.4</td>
<td>Guardrail in 3D for interference checks</td>
<td>V</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<tr>
<td>3.5</td>
<td>Signs in 3D for interference checks/line of sight</td>
<td>V</td>
<td>I/N</td>
<td>I/N</td>
<td>I/N</td>
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<tr>
<td>3.6</td>
<td>Technical installations in 3D for interference checks/line of sight</td>
<td>/</td>
<td>N</td>
<td>I</td>
<td>I/N</td>
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<tr>
<td>3.7</td>
<td>Noise barriers foundation and poles in 3D</td>
<td>V</td>
<td>I/N</td>
<td>I/N</td>
<td>I/N</td>
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<td>3.8</td>
<td>Noise barriers for interference checks with gantries in 3D</td>
<td>/</td>
<td>I/N</td>
<td>I/N</td>
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<tr>
<td>3.9</td>
<td>Noise barriers for joining with constructions (viaducts) in 3D</td>
<td>/</td>
<td>I</td>
<td>N</td>
<td>I/N</td>
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<tr>
<td>3.10</td>
<td>Capture entire existing situation in 3D: including manholes and technical installations</td>
<td>X</td>
<td>mtb</td>
<td>N</td>
<td>N</td>
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<tr>
<td>3.11</td>
<td>Utility design in 3D</td>
<td>V</td>
<td>I</td>
<td>I</td>
<td>I</td>
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<td>3.12</td>
<td>Exitings utilities in 3D</td>
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<td>I</td>
<td>I</td>
<td>I</td>
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<td>3.13</td>
<td>Constructions in 3D</td>
<td>V</td>
<td>N</td>
<td>I/N</td>
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## Projectpart 4: Visualisations
Temporary works, and safety

Temporary Building Roads
Clearance and Safety boundary
- Existing situation
- Final design

- Used AutoCAD® Civil 3D® with Subassembly Composer
Clash detection

- **Design Phase**
  - Bring together all design models in one system
  - Roads, earthworks, constructions, signs, guardrails, technical installations, sound barriers, temporary works, lampposts, utilities (cables, gas) and surrounding area (buildings)

- **Building Phase**
  - Classes through time (overlapping constructions)
    - Ram works next to concrete construction
  - Clashes with building material (soft clashes)
    - Turning circle Crane
  - Used Autodesk® Navisworks® Manage
Communication

- Client
  - Design Sessions
- External parties
  - information centre
  - Visuals

- Used Autodesk® 3ds Max® Design with Civil View (see class CI2284)
Used Autodesk® Revit® Structure and AutoCAD®
Model information and Review

- 3D and 4D information accessible for everyone
- Manage the Review design process

- Use Autodesk® Design Review and Autodesk® Navisworks® Freedom
4D animation = 3D + time
nD = Requirements and Documents

- Linking more…
  - Using links in Autodesk® Navisworks®
  - Link to Requirements database (Relatics)
  - Link to Documents (Sharepoint)
  - Link to … any Hyperlink
nD = Requirements and Documents
Make your own apps
Field applications

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<th>Verificatiedatum</th>
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QR codes version checks
Currently under investigation
Autodesk Navisworks for asset management
You are now be able to:

- Successfully implement BIM in civil projects
  - Using BIM as a contractor and design firm
- Explain how to use Navisworks for contract management
  - Using links to external systems
- Explain the importance of think-before-you-start
  - BIM quick start for a project
- Describe the Autodesk® Infrastructure Design Suite workflow
  - What software to use and how
Questions?

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