Progress in BIM

ENCORD Virtual Construction Platform
and 5D Initiative

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ECTP Conference 2011
Progress in BIM: ENCORD VCP & 5Di
4-5 October 2011 | Warsaw, Poland

Menno de Jonge | Ballast Nedam – Director of Innovation
Menno de Jonge | ENCORD – Vice President
Content

- Introduction to ENCORD
- Introduction to ENCORD VCP
- 5D Initiative
- Discussion
ENCORD’s Main Objective

Be Europe’s forum for the promotion of industry-led research, development and innovation in the construction sector

Our members are leading construction companies and suppliers from all over Europe
Goals of ENCORD

- Exchange experiences and best practice, discuss strategies for the development of the construction sector, develop new ideas for research projects (...and do it together)
- Define priorities for European construction R&D&I / Communicate with EU administration and EU research community, to initiate new R&D&I programmes, proposals, projects / Influence the R&D&I agenda
- Create awareness of the benefits of (increased) investments in construction R&D&I
Activities

- Three Council Meetings per year
- Thematic R&D&I groups
- Workshops
ENCORD R&D&I thematic groups

Key issues facing the construction sector today:

- Eco-efficient / Sustainable construction
- Health & Safety (H&S)
- Lean construction Management (LCM)
- Knowledge Management (KM)
- Mastering Greenhouse Gases Emissions
- Infrastructure
- Virtual Construction & ICT (Information and Communication Technology)
- Implementation of Results of Research Activities
ENCORD R&D&I thematic groups

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- Mastering Greenhouse Gases Emissions
- Infrastructure
- Virtual Construction & ICT (Information and Communication Technology)
- Implementation of Results of Research Activities
- ... open for new topics
ENCORD
European Network of Construction Companies for Research and Development
http://www.encord.org

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Menno de Jonge | Ballast Nedam  Vice-President
Claude Dumoulin | Bouygues Construction  Vice-President
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Content

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ENCORD VCP
Virtual Construction Platform
www.encord.org
Virtual Construction (BIM = Building Information Modelling)
ENCORD VCP – How did it start

- 1st ENCORD Virtual Construction Workshop
  - November 2001 - Essen, Germany
  - Organized by Hochtief
  - Co-organized by HBG (Royal BAM Group)
  - 50 participants
    - Construction companies
    - Universities and Research Institutes
    - Software vendors
- Objective
  - Exchange experiences on current technology
  - Set up future collaboration
ENCORD VCP – How did it start

- Reasons for initiating ENCORD VCP:
  - Individual developments and research approaches are expensive, slow and will not set standards;
  - Difficult to monitor fragmented but emerging technical developments;
  - Co-operation and exchange of experiences with clients, industry, suppliers, universities and research institutes is desired to gain synergies.
ENCORD VCP – How did it start

☐ Aims of the Virtual Construction Platform:
  ■ Improve efficiency of construction process
  ■ Improve quality of construction process
  ■ Reduce failure costs and make (more) money
  ■ Enlarge awareness in construction sector

☐ Focus on construction management:
  ■ Detailed design coordination
  ■ Quantity take off
  ■ Time scheduling
  ■ Project monitoring
  ■ Standardization
ENCORD VCP – How did it start

- 1st ENCORD VCP (kick-off) meeting
- June 2002 – Delft, Netherlands
- Hosted by Royal BAM Group
- Aims of the kick-off meeting:
  - Reasons for participation and expectations
  - Agree on platform objectives and organization
  - Define issues of common interest
## ENCORD VCP – Results issue rating

<table>
<thead>
<tr>
<th>Issue</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss Long Term Goal and distillate short term actions</td>
<td>48</td>
</tr>
<tr>
<td><strong>State of the art systems</strong></td>
<td></td>
</tr>
<tr>
<td>System map / mapped on processes</td>
<td>50</td>
</tr>
<tr>
<td>Exchange (pilot) projects</td>
<td>49</td>
</tr>
<tr>
<td><strong>Share best practices</strong></td>
<td></td>
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<tr>
<td>Implementation strategies</td>
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</tr>
<tr>
<td>Change</td>
<td>47</td>
</tr>
<tr>
<td>Culture / Organisation</td>
<td>44</td>
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<tr>
<td>Convince management</td>
<td>47</td>
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<tr>
<td>Internal Marketing</td>
<td>44</td>
</tr>
<tr>
<td>Processes</td>
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<tr>
<td>Change Management / Workflow</td>
<td>43</td>
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<tr>
<td>Collaborative Engineering</td>
<td>43</td>
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<tr>
<td><strong>Influence</strong></td>
<td></td>
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<tr>
<td>Software developments</td>
<td></td>
</tr>
<tr>
<td>Guideline specification roadmap</td>
<td>45</td>
</tr>
<tr>
<td>Interoperability between standard solutions</td>
<td>44</td>
</tr>
<tr>
<td>R&amp;D projects</td>
<td></td>
</tr>
<tr>
<td>Short term pilot projects within companies</td>
<td>43</td>
</tr>
<tr>
<td>Pull them instead of being pushed</td>
<td>43</td>
</tr>
</tbody>
</table>
ENCORD VCP – Meeting overview first 2-½ years

2. October 2002 – Essen (Hochtief)
3. January 2003 – Essen (Hochtief)
4. April 2003 – Utrecht (Ballast Nedam)
5. June 2003 – Leighton Buzzard (Taylor Woodrow)
7. February 2004 – Bunnik (Royal BAM Group)

Average participation:
- 7 ENCORD companies
- 2 guest companies (Software vendors)
- 15 participants

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ENCORD VCP – First results after 2-½ years

- Individual company VC roadmaps and discussion on a common roadmap
- Best practice presentations
- Guest speakers (institutes, CAD, PDM) to discuss state of art and the construction industries expectations
- Common approach towards current R&D projects
- Reference list of valuable documents
- BIM discussion with CAD vendors
- Exchange on “convincing management”
ENCORD VCP – First results after 2-½ years

European Network of Construction Companies for Research and Development
2nd ENCORD Virtual Construction workshop

- June 2004 - Weimar, Germany
- Organized by Hochtief
- Co-organized by ENCORD VCP
- 52 participants from 10 different countries
  - Construction companies
  - Universities and Research Institutes
  - Software vendors
2nd ENCORD Virtual Construction workshop

☐ Aims for the workshop

- Communicate industry needs to scientific community;
- Get to know leading edge of research on Virtual Construction;
- Get to know commercially available software for Virtual Construction;
- Initiate exchange of experiences and collaboration with other industries like automotive, shipbuilding and aerospace industry;
- Best practice exchange of experiences in the implementation of Virtual Construction solutions in industry;
- Show impact of Virtual Construction on the built environment and on sustainable construction.
ENCORD VCP – Meeting overview until now

9. September 2004 – Bremen (Hochtief)
10. April 2005 – Helsinki (YIT)
11. October 2005 – Utrecht (Ballast Nedam)
12. April 2006 – Paris (Bouygues)
13. October 2006 – Bunnik (Royal BAM Group)
15. October 2007 – Stuttgart (Züblin)
17. October 2008 – Athens (CCC)
18. April 2009 – Copenhagen (NCC)
19. October 2009 – Helsinki (YIT)
20. April 2010 – Essen (Hochtief) → Cancelled due to “ash cloud”
21. October 2010 – Paris (Bouygues)
ENCORD VCP – Meeting overview 2011

9. September 2004 – Bremen (Hochtief)
10. April 2005 – Helsinki (YIT)
11. October 2005 – Utrecht (Ballast Nedam)
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19. October 2009 – Helsinki (YIT)
20. April 2010 – Essen (Hochtief) → Cancelled due to “ash cloud”
21. October 2010 – Paris (Bouygues)

22. April 2011 – Essen (Hochtief)
23. October 2011 – Nieuwegein (Ballast Nedam)

European Network of Construction Companies for Research and Development
ENCORD VCP – Meeting overview until now

- Average participation:
  - 8 ENCORD companies
  - 3 guest companies (Software vendors)
  - 21 participants
ENCORD VCP – Results until now

- Best (and worst) Practice exchange
- What’s new presentations
- Software vendor presentations

- Massive progress at member companies
- BIM is now standard practice in ENCORD VCP companies

- Need for improvements BIM software
- Need for collaboration tools
- Need for sustainability tools
ENCORD VCP – Results until now

European Network of Construction Companies for Research and Development
Content

☑ Introduction to ENCORD
☑ Introduction to ENCORD VCP
☑ 5D Initiative
☐ Discussion
5D Initiative (5Di) – How did it start

- Initiative presented by Züblin and Max Bögl in ENCORD VCP meeting April 2008;
- Objective:
  - Setup common requirements for model based IT tools for planning, realising and operating buildings and infrastructure => BIM for Construction / BIM 2.0;
  - Open: results should be public and directed to software / hardware vendors;
  - Active: several workshops per year with partners and members

European Network of Construction Companies for Research and Development
ENCORD and ENCORD VCP support 5D Initiative in which many of their members are actively involved.
**5Di - Definition of 5D Design**

**Geometry**
- Object-based 3D model with user-defined attributes
- What you see is what you build

**Sequence**
- Construction sequencing by linking the geometric model to a scheduling program
- What you see is how you build it

**Data/Processes**
- Quantity take-off from the 3D model
- What you see is what you calculated

- **BIM**
- Building Information Model, managing all relevant data in a central database

- **Virtual construction site**
- Dynamic construction process
- „virtual mock up“

- **Data- & process management**
- Company-wide logistics
- Connecting all business processes to the 3D model and the work flow

**Development**

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5Di – Our motivation

The construction sector is the largest industrial sector with a portion of approx. 10% of the entire European GDP. Changes brought around by virtual planning, production and operation will have the largest economical impact across the whole European construction market.

Towards BIM for Construction (5D)

Before a product is produced it has been designed and constructed in 3D within a virtual environment. Virtual product development using models that will:

- Do sustainable analysis and calculations over the entire product life cycle at a very early stage, i.e. from the design idea right up to the final disposal of the product
- Simulate and optimize the production process and the project operation & maintenance phase
Psychological and Technical Challenges

**Challenges**

**Psychological**
(Competing but Cooperating Transparently and Openly, Traditional Methods, Resistance to Change, Accepting IT Solutions, Trust, the Complexity of the Construction Industry, Fast Increasing Demands of the Industry)

**Technological**
(SW competitions, Focus on Design, Interoperability, SW Pricing Strategies, Lack of efficient solutions, Business logic & Communicating Business Needs)
5D Initiative (5Di) - Achievements

- Establish openness and collaboration amongst competing 5Di members
- Terms of Reference and Position Paper
- 5Di website (http://www.5d-initiative.eu)
- Definition of 5Di goal (vision map)
- Definition of 5Di requirements
- Process maps (level 0 & level 1)
- Develop use cases 1.0 & 2.0 to explain our needs
- Bi-monthly active meetings
- Bi-weekly conference calls (ensure strong momentum)
- Started collaboration with SW industry / R&D institutes
5Di Achievements – Vision map (solution components)

- **5D Modeller**
  - 3D / object oriented / parametric

- **5D Expert Systems**
  - statics / MEP / calculation / simulation / scheduling / ERP / etc.

- **5D Viewer**
  - native interface to 2D/3D/database

- **5D Process Management**
  - direct communication on model and database

- **5D Data Management**
  - graphics-driven

- **Operational Data listings / analysis**
  - database-driven
### 5Di Achievements – Project lifecycle process maps

<table>
<thead>
<tr>
<th>Processes</th>
<th>Project Development</th>
<th>Technical Design</th>
<th>Construction</th>
<th>Facility Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual design</td>
<td>feasibility studies / financial engineering</td>
<td>construction methods</td>
<td>(de)mobilisation planning / logistics / HRM</td>
<td>as-built design</td>
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<tr>
<td>Feasibility studies / financial engineering</td>
<td>construction site planning</td>
<td>sequencing / scheduling</td>
<td>progress monitoring</td>
<td>asset management / material &amp; equipment lists</td>
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<tr>
<td>Marketing / CRM</td>
<td>financial calculation</td>
<td>Technical presentation</td>
<td>Cost control</td>
<td>operation / maintenance</td>
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<tr>
<td>Construction</td>
<td>Construction method statements</td>
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<td>Procurement</td>
<td>costs of utilisation</td>
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<tr>
<td>Work Preparation</td>
<td>Budgeting</td>
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<td>Marketing</td>
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<td>Detailed design</td>
<td>Construction site planning</td>
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<td>Detailed site installation</td>
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<td>Issued for construction</td>
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<td>Management of design changes</td>
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<td>Quality assurance</td>
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<td>and control</td>
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<td>Marketing</td>
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5Di Achievements – Use Cases

- Manage Change – Change Managed
- Building Process Integration – Systems Engineering and BIM / Client Requirements Processing
- Progress Collection, Monitoring and Control
- Model based estimation – QTO processes
- Design to Fabrication

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5Di Achievements – Use Cases

- **Use Case 1.0**
  - General description, input, output, requirements and link to 5Di process map and 5Di solution components (mid 2010)

- **Use Case 2.0**
  - Describe details, workflows, roles of stakeholders, activities involved, list of the requirements addressed to SW vendors and industry leaders (Feb 2011 – Oct 2011)

- **Use Case 3.0**
  - Integrated use case linked to actual project data for testing and validation of 5Di targets (to be developed)
**5Di Achievements – Software partners**

The 5Di Group collaboration partnerships with SW industry leaders

- **Autodesk**: Autodesk, Inc., is a leader in 3D design, engineering and entertainment software

- **Bentley**: Bentley is the global leader dedicated to providing comprehensive architecture and engineering software solutions for sustaining infrastructure

- **CCT**: CCT has several mobile and 3D Visual based solutions for data collection in the field

- **RIB**: RIB Group is one of the leading providers of technical ERP software solutions for the construction industry

- **Tekla**: Tekla provides an accurate, detailed and data-rich 3D BIM software environment

**European Network of Construction Companies for Research and Development**
PRESS RELEASE

The 5D Initiative enters into a process of more intensive cooperation with Autodesk, Bentley, CCT, RIB and Tekla in order to develop new BIM software solutions that fit needs of European contractors.

Based on the strategic discussions over the past 2 years, the 5D Initiative moves forward by taking pragmatic steps together with Autodesk Inc (Autodesk), Bentley Systems Incorporated (Bentley), Computers and Communication Technology International (CCT), RIB Software AG (RIB) and Tekla Corporation (Tekla), in order to reflect the practical needs of higher process integration in the whole life-cycle in construction.

Stuttgart, Germany. April 21, 2011 — The 5D Initiative, founded and working as an independent think tank and task force within the ENCORD Virtual Construction Platform, was established by Ballast Nedam, Royal BAM Group, Consolidated Contractors Group S.A.L. – Offshore (CCC), Max Bögl and Strabag. Today, 5D Initiative announced that collaboration with Autodesk, Bentley, CCT, RIB and Tekla is moving forward to incorporate pragmatic requirements for a 5Di solution, which is the amplification of BIM solutions for contractors to ensure higher process integration from very early design, engineering...
5Di – Challenges

- Continue our efforts and collaboration more closely with our partners trying to speed up the development process and ensuring that our partners’ strategies include and support the 5Di vision and targets.

- Although efforts with research organizations did not conclude a partnership yet, awareness has been strongly created and more efforts towards more effective collaboration with R&D partners are expected within 2012.

- Develop use-case 3.0 which will provide our partners with an integrated use-case that will collect all the current individual use-cases into one comprehensive use-case supported and linked to actual data that can be used to generate and validate the development of the targeted 5Di solutions.

European Network of Construction Companies for Research and Development
International 5D Conference 2012

- Applied 5D in Construction
- University of Applied Sciences Konstanz
- 21-22 May 2012
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