Role of BIM Standards in Quality Assurance

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Construction Process Leaks 30%

In the United States alone up to a $15.8 billion/year loss of capital in the architectural, engineering, construction and facility management industries. (US Commerce 2004 NIST report).

According to french FFB study: additional maintenance cost 2 €/m²/year.

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24—25 September, Doha, Qatar
Quality issues

- Poor quality work on site has been measured to be between 10 to 20% of the total project costs.
  - Design is the major cause of poor quality work on site
  - Construction errors, which constitute about half that caused by design
- Loss of value caused by exceptional maintenance requirements has been estimated to be about 3% of annual construction production.
  - Design problems are responsible for a little over 50%
  - Construction errors are responsible for 36%
  - Incorrect usage of the building facility is associated with about 9%
- Wastes and losses caused by bad design are larger than the cost of design itself
Trends in Construction

- Quality Cost (waste) is too High
- Productivity
- Buildings are Getting More Complex
- Energy Efficiency Requirements

- =>BIM Process
- =>BIM Standards
- =>Proper Quality Assurance is a MUST
openBIM
Utilising buildingSMART Standard

• Big part of the information flow in a building project can be interpreted with a computer. This sets more demands on:
  – Definition of the Information – what is the purpose/need for the information
  – Information Quality – reliable information is required
• buildingSMART defines the placeholders for the information
• buildingSMART does not define when information is required nor how components or spaces should be modelled
Example: Space Area – many options
GSA BIM Requirements

Standard Properties:
Space Number (ID)
Space Name
Space Area:
= net area
Example: Space Area – many options
GSA BIM Requirements

Standard Properties:
- Space Number (ID)
- Space Name
- Space Area: =net area

Derived from geometry:
- GSA Net Area
- GSA Usable Area
- Height
- Volume
- XYZ Location
Example – Space Height
GSA BIM Requirements

- Spaces shall be defined and modeled with a vertical extent from finished floor to finished ceiling.
- Suspended ceilings are optional in these cases, but the space heights must be modeled to the intended height of the suspended ceiling.
BIM Standards - IFC

• Definition

• Vehicle

These Are Global!
How to Use Standards

- Creating Information of the Building
- Exporting Information
How to Use Standards

BIM Guide
• Creating Information of the Building

BIM Authoring Tool Guide
• Exporting Information
How to Use Standards

BIM Guide
- Local
- Contract Policy
- Design Practices
- Legal Responsibilities

Creating Information of the Building

BIM Tool Guide
- Local
- User Instructions
- Information According to BIM Guide!

Exporting Information

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BIM Guide Development

- U.S. General Services Administration (GSA) Started in 2005
- Senate Properties BIM Requirements Started in 2007
- COBIM 2012 National BIM Requirements of Finland
- Statsbygg BIM Manual, Norway
GSA BIM Guide – Spatial Program Validation
Part of 3D->4D->BIM Project

- Design Coordination and Quality
- Accurate Estimates
- Rentable Areas
- Developing solicitation and contractual language
- Partnering with BIM vendors, organizations
- Constructing GSA BIM Toolkit

Source: www.gsa.gov/bim
GSA BIM Guide Series
Architectural Mostly

• Series 01 – 3D-4D-BIM Overview
• Series 02 – Spatial Program Validation
• Series 03 - 3D Laser Scanning
• Series 04 - 4D Phasing
• Series 05 - Energy Performance and Operations

• Series 06 - Circulation and Security Validation
• Series 07 - Building Elements
• Series 08 - Facility Management

Source: www.gsa.gov/bim
Acknowledgements (Series 02)

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  – Richard See, Managing Director, Digital Alchemy, Inc.,
  – Anne Urrila, Project Manager, Solibri, Inc

Source: www.gsa.gov/bim
Senate Properties BIM Requirements
Mandatory in Finland Since 2007

- Design Coordination and Quality
- All Disciplines
- Cost Estimation
- Energy Analysis
- Harmonized with GSA BIM Guide
- Open for re-use when Senate Properties is Acknowledged
Requirements

- Publication of models
- Quality checking
- Use of models in analysis and simulations

IFC compliant BIM is a mandatory requirement for architects after October 1st, 2007. Structural and MEP models are preferred but not mandatory in all projects. (Mandatory in 2009)
BIM Guidelines

Building Information Model (BIM) Requirements from October 1st, 2007 (pdf)

Volume 1: General part (pdf)
Volume 2: Modeling of the starting situation (pdf)
Volume 3: Architectural Design (pdf)
Volume 4: MEP design (pdf)
Volume 5: Structural design (pdf)
Volume 6: Quality assurance and merging of models (pdf)
Volume 7: Quantity take-off (pdf)
Volume 8: Using models for visualization (pdf)
Volume 9: Use of models in MEP analysis (pdf)

Senate Properties’ BIM Requirements for Architectural Design, 2007 (pdf)

Available at: www.senaatti.fi/document.asp?siteID=2&docID=588
<table>
<thead>
<tr>
<th>Paikka:</th>
<th>Aika:</th>
<th>Tarkastaja:</th>
<th>Kohde:</th>
<th>Versio:</th>
<th>Version päiväys:</th>
<th>Tiedostomuoto:</th>
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### Arkkitehtimallin tarkastuslomake

| Malli luotu sovitulla IFC-versiolla | Mallissa on määritetty kerrokset | Rakennusosat ja tilat on määritetty kerroksittain | Sovitut/ohjeen mukaiset rakennusosat on mallinnettu | Rakennusosien tyyppit ovat oikein (käytetty oikeita työkaluja) | Rakennusosien rakennetyypit | Mallissa ei ole ylimääräisiä rakennusosia | Mallissa ei ole sisäkkäisiä tai tuplarakennusosia | Mallissa ei ole merkittäviä komponenttien välisiä leikkausia | Mallissa on bruttoalatilat | Bruttoalatilojen ja muiden tilaryhmien nimet ja tyyppit | Huonetilojen nimet ja tyyppit ovat sallittuja | Huonetilat vastaavat huoneohjelmaa | Huonetilat, seinät ja pilant kattavat kerroksittain bruttoalainen | Tilavaruuskset taloteknikalle on tehty | Tilojen korkeus on määritellyt (välihajan ja alakaton välinen lila) | Tilojen muoto (tilat kohtaaavat ympäröivät seinät ja muut objektit) | Tiloja ei ole päällekkäin | Tilat on numeroitu yksilöllisesti |
| | | | | | | | | | | | | | | | | | | | |

### Tunnuslukuja

- Huonetilojen suhde huoneohjelmaan
- Huonetilojen suhde bruttopinta-alaa

### Allekirjoitus:

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**Building Information Modeling Summit QATAR 2012**

24—25 September, Doha, Qatar
BIM Requirements 2007 in Different Phases of the Design and Construction Process

Workgroup:

Arto Kiviniemi, Mirkka Rekola, Jun Kojima, Tiina Koppinen, Tarja Mäkeläinen, Kaisa Belloni (VTT)
Heikki Kulusjärvi (Solibri)
Jiri Hietanen (Tocosoft)
Common BIM Requirements 2012

• buildingSMART Finland participated also in the financing of the project. As a result, the updated Series 1-9 and new Series 10-13 were released in Finnish on March 27th 2012.
COBIM 2012

- COBIM = Common BIM Requirements (of Finland)
- Improved knowledge management for building owners, clients and contractors design and engineering
- Clear requirements for consultants reduce risks in design, improve quality and enable new service opportunities
- Improved business processes and productivity
- Improved management of “green” issues
COBIM: Common National BIM Requirements

• **R&D Topic - WHAT**
  – Several actors i.e. Senaatti, Skanska, Helsinki, Ministry of the Environment (Building Inspection) among others have prepared, or intend to prepare BIM modeling requirements. Senaatti’s present requirements form a baseline

• **Business value - WHY**
  – Modeling evolves rapidly, present requirements need to be updated to enable full benefit of modeling
  – Several requirement projects of diverse quality = poor models, waste of resources and weak acceptance
Common BIM Requirements 2012

Common BIM Requirement 2012, COBIM, is based on the BIM Requirements published by Senate Properties published in. The update project was funded by Senate Properties in addition to several other real estate owners and developers, construction companies and software vendors. BuildingSMART Finland participated also in the financing of the project. As a result, the updated Series 1-9 and new Series 10-13 were released in Finnish on March 27th 2012.

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Series 6: Quality assurance
Series 7: Quantity take-off
Series 8: Use of models for visualization
Series 9: Use of models in MEP analyses
Series 10: Energy analysis
Series 11: Management of a BIM project
Series 12: Use of models in facility management
Series 13: Use of models in construction

http://www.en.buildingsmart.kotisivukone.com/3
Partisipants

= Stearing Group

= Management Group
# COBIM 2012, Authors

<table>
<thead>
<tr>
<th>Part</th>
<th>Organization</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General part</td>
<td>Gravicon Oy</td>
<td>Tomi Henttinen</td>
</tr>
<tr>
<td>2. Modeling of the starting situation</td>
<td>Tietoa Finland Oy</td>
<td>Marko Rajala</td>
</tr>
<tr>
<td>3. Architectural Design</td>
<td>Gravicon Oy</td>
<td>Tomi Henttinen</td>
</tr>
<tr>
<td>4. MEP design</td>
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<td>Tero Järvinen</td>
</tr>
<tr>
<td>5. Structural design</td>
<td>Finnmap Consulting Oy</td>
<td>Tero Kautto</td>
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<tr>
<td>6. Quality assurance</td>
<td>Solibri, Inc.</td>
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<td>Matti Tauriainen</td>
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<td>Gravicon Oy</td>
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<tr>
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<td>Granlund Oy</td>
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</tr>
<tr>
<td>10. Energy Analysis</td>
<td>Granlund Oy</td>
<td>Tero Järvinen</td>
</tr>
<tr>
<td>11. Managing BIM Project</td>
<td>Pöyry CM Oy</td>
<td>Elina Mäkelä</td>
</tr>
<tr>
<td>12. BIM in use and FM</td>
<td>Granlund Oy</td>
<td>Tero Järvinen</td>
</tr>
<tr>
<td>13. BIM on Site</td>
<td>Skanska Oy</td>
<td>Marjo Peltomäki</td>
</tr>
<tr>
<td>14. BIM for Building Code Checking</td>
<td>Ministery of Environmental Affairs</td>
<td>Pekka Lukkarinen</td>
</tr>
</tbody>
</table>

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Links

• GSA:
  – www.gsa.gov/bim

• COBIM:
  – http://www.en.buildingsmart.kotisivukone.com/3

• STATSBYGG:
Thank You!

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