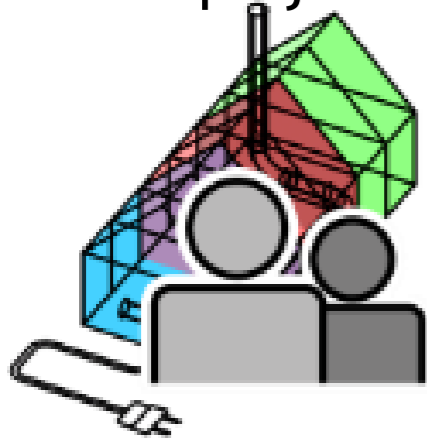


BIM in Finland today

TOMI HENTTINEN
M.Sc. (Archit.) SAFA
Gravicon Oy, CEO
buildingSMART Finland, Chair

GRAVICON BIM SERVICES

BIM Manager
Specifications
and
Supervision for
BIM projects

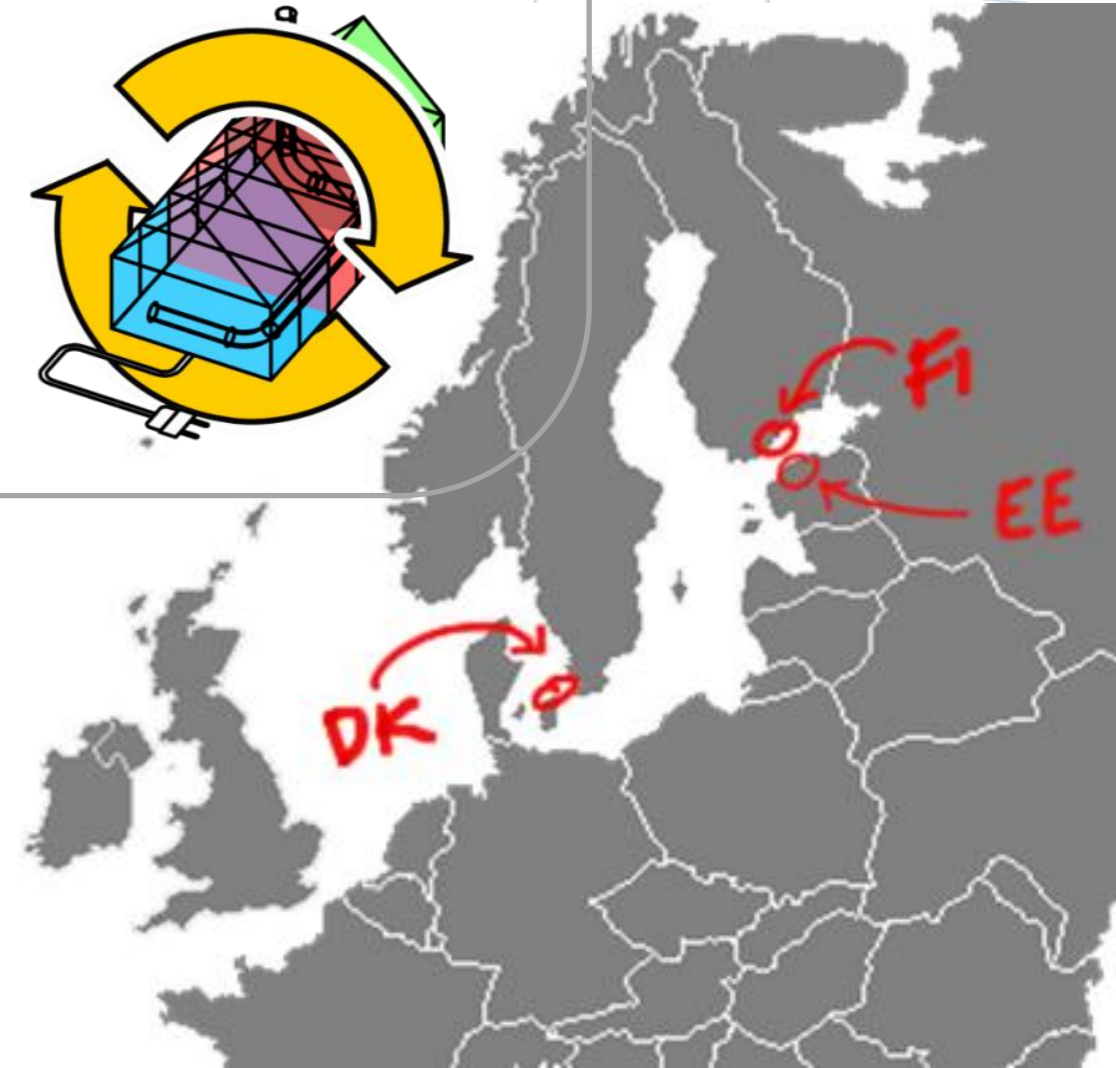


 **modelspace**

BIMwise
WEB-Based
Manager
Service



BIMary
Quality Assurance
and an archive for BIM
also for the Life-Cycle



BUILDINGSMART

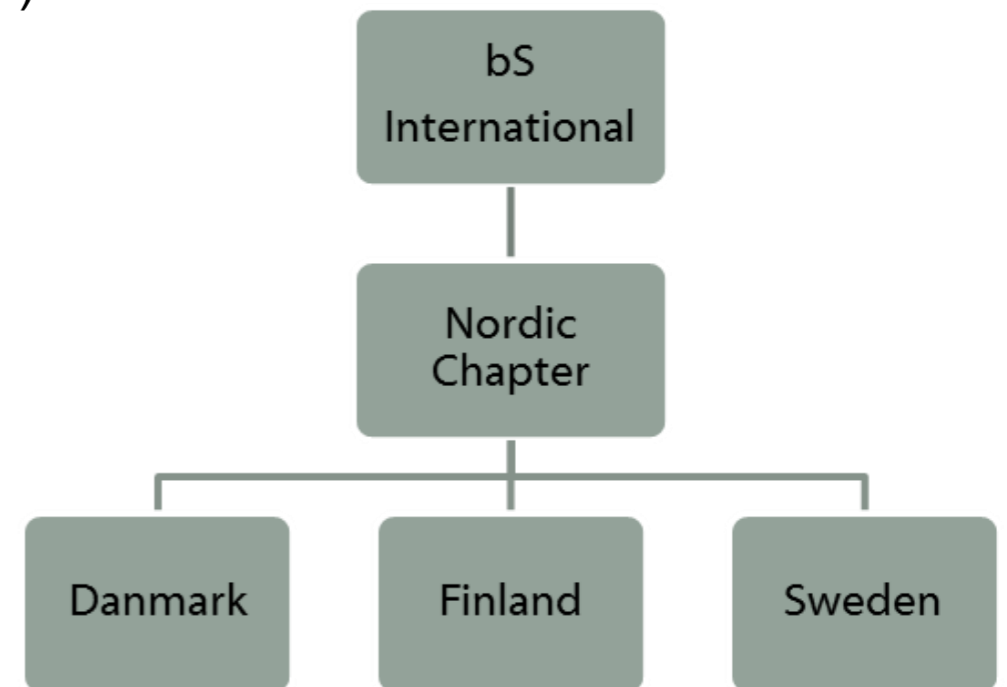
buildingSMART is an international organization that develops open BIM standards and processes and supports the use of BIM.

- **Common BIM formats**

- IFC, common BIM format for model exchange
- Data Dictionary definitions, a BIM enabled naming convention for building parts and detailed attributes
- In the near future, also BIM standards for Infra

- **Process and workflow development**

- IDM, Information Delivery Manual (process description)
- MVD, Model View Definition (technical description)
- BCF, Building Collaboration Format



CURRENT BIM TRENDS IN FINLAND

- **Guidelines and Requirements**
 - New Common BIM requirements (COBIM) were released early 2012.
 - Construction companies etc. are developing their own guidelines based on COBIM
- **New Energy Requirements**
 - BIM based analysis are needed because of the new energy regulations
 - Implementation of the regulations mean more HVAC systems both in new buildings and renovations
 - Design Integration becomes more challenging
- **Inventories and BIM**
 - Increasing number of projects and more challenging renovations
 - There is a need for more accurate measurement methods and models
 - Time schedules and document oriented process are a challenge for BIM design
- **New ways of working**
 - Adjustments to phasing needed because of BIM process
 - Advanced team integration
 - Fragmentation on construction process
 - New consulting roles and collaborations
- **BIM strategies**
 - Five main goals: sustainability, quality, efficiency, safety and maintenance.

USAGE OF BIM

- **Public sector has been the key driver in BIM adoption**
 - Senate Properties has had a major role by requiring BIM in their projects.
 - This activity has increased the awareness of BIM in general, and many others in the public sector have followed their example.
- **Private companies have taken very few actions**
 - Private sector and investors haven't acknowledged the benefits of BIM so far, and this is one of the future challenges to get them into the same boat.
- **The overall adaption in projects is 10-20%**
 - Among public sector clients the adaption is rather high, current execution is between 20% and 30% of the volume, near future intentions are up to 50%.
 - Private sector is far behind, adoption is less than 10%.
 - In large construction companies the current execution is more than 50% in their own production (in some cases almost 100%)
 - Small construction companies are mostly totally ignorant about BIM. Adoption is less than 10%.
 - Small house production use their own internal tools.
 - Among AEC's, the adoption is very high by any standards, more than 50% have used or are planning to use BIM in their projects.

GUIDELINES AND REQUIREMENTS

- **Many existing Guidelines**

- Senate Properties published first version of BIM guidelines 2007
- Construction companies are writing their own detailed requirements. This work includes also the best practices development.
- Many large consulting companies have their own BIM groups, who are trying to develop and train the best practices internally.
- Even though there are no national database for best practices, there are some consulting companies who are specialized in BIM and who have wide knowledge about the best practices.

- **From Guidelines to Common Requirements**

- COBIM requirements are based on the Senate Properties Guidelines.
- BIM benefits for the entire life cycle of the built environment
- The aim is to produce an operating culture for the use of BIM in building projects and BIM-based maintenance.
- Existing part (1-9) where updated and additional 4 were parts added.
- Part 14, BIM requirements for Building Permit process will be published later.
- Work started early 2011, was published 27th of March 2012.
- Can be downloaded from www.buildingsmart.fi, (available also in English)

COBIM PARTNERS

- **Funding:**

- Aitta Oy, Arkkitehtitoimisto Larkas & Laine Oy, **buildingSMART Finland**, Espoon kaupunki Tekninen palvelukeskus, Future CAD Oy, Helsingin kaupunki Asuntotuotantotoimisto, Helsingin kaupunki Tilakeskus, Helsingin yliopisto, Helsingin Yliopistokiinteistöt Oy, HUS-Kiinteistöt Oy, HUS-Tilakeskus, ISS Palvelut Oy, Kuopion kaupunki Tilakeskus, Lemminkäinen Talo Oy, M.A.D. Oy, NCC Rakennus Oy, Sebicon Oy, Senaatti-kiinteistöt, Skanska Oy, SRV Rakennus Oy, SWECO PM OY, Tampereen kaupunki, Vantaan kaupunki Tilakeskus, Ympäristöministeriö.

- **Authors:**

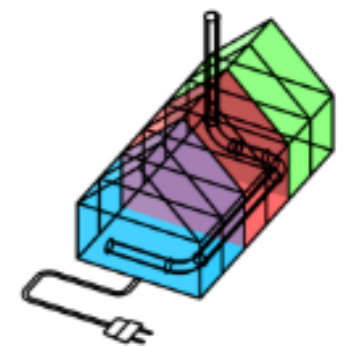
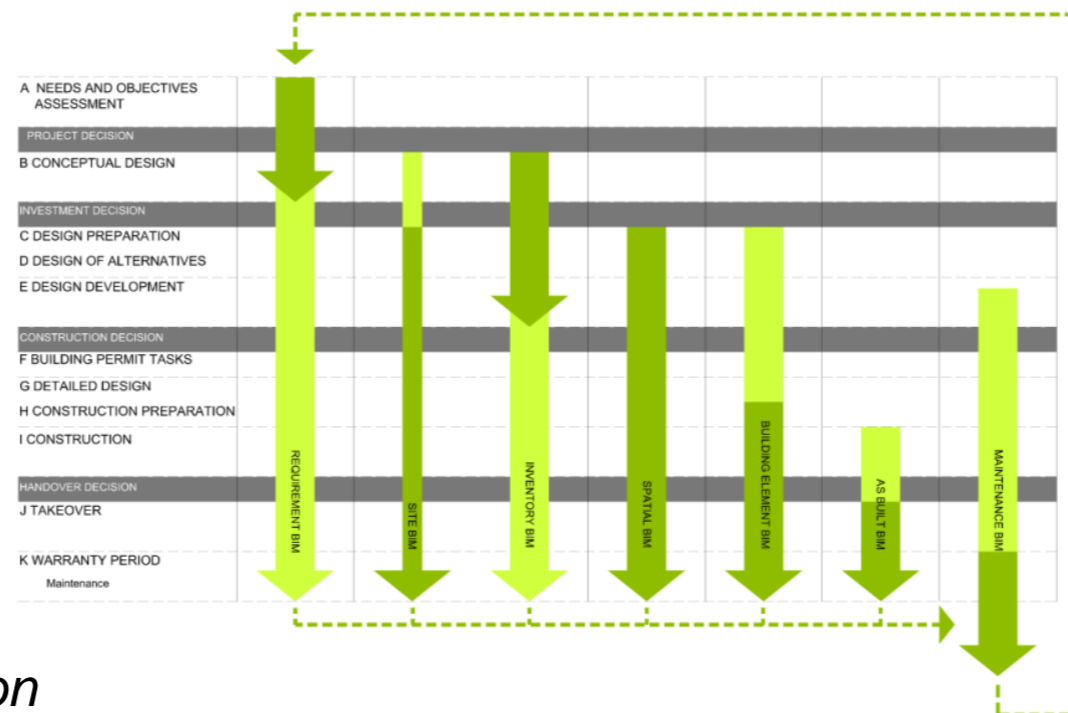
- Finnmap Consulting Oy, Gravicon Oy, Insinööritoimisto Olof Granlund Oy, Lemminkäinen Talo Oy, NCC Rakennus Oy, Pöyry CM Oy, Skanska Oyj/VTT, Solibri Oy, SRV Rakennus Oy, Tietoa Finland Oy.

- **Management:**

- Rakennustietosäätiö RTS.

SERIES 1 : GENERAL REQUIREMENTS

- The General section describes the basic principles, requirements and concepts that should be followed in BIM-based projects.
- This part defines also the general targets for BIM in projects.
- The **BIM Coordinator** will apply these targets for the project and supervise the modeling according to these objectives.
- In certain points of the project, such as building permit application or bidding, BIM and BIM-based analysis are tools for the decision making.
- **Working Models** are supposed to be a flexible and rapid method to exchange design information and to represent the intended design solutions in the everyday work



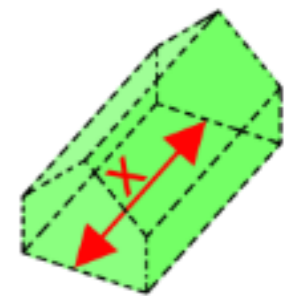
Author: Tomi Henttinen, Gravicon

SERIES 2 : INVENTORY MODELS

- Section 2 deals with the existing building and building site modeling as a source of information to design and construction needs. This part describes the requirements for measurements and other information, that are needed to create inventory models as well as other as-built documentation.
- With reliable and accurate source data, it is easier implement the new design to the existing building, and to make sure, that the new systems and appliances can be installed and maintained



Tietoa Finland Oy



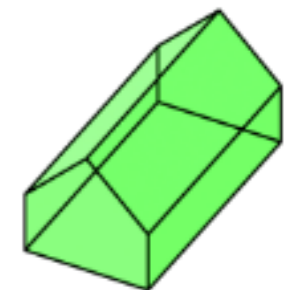
Author: Marko Rajala, Tietoa Finland Oy

SERIES 3 : ARCHITECTURAL DESIGN

- In the BIM-based design process, the **architect's BIM is mandatory for all the design phases**.
- Architect's BIM is the foundation for all other models and is an integral part of many analyzes and simulations. This part specifies the requirements for the architect's BIM in various phases of the project.
- These requirements are divided into **three levels**, but the details need to be adjusted according the different purposes of the Models. The intended use and accuracy of the model is specified in the **Model Description Document** each time the model is published.



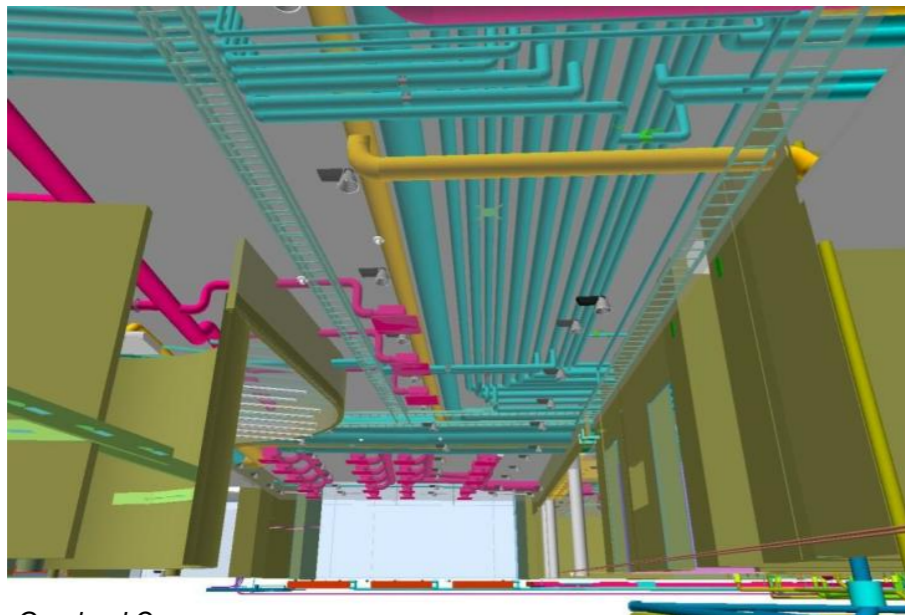
Arkkitehtitoimisto Brunow & Maunula Oy / Tietoa Visualisointi



Author: Tomi Henttinen, Gravicon Oy

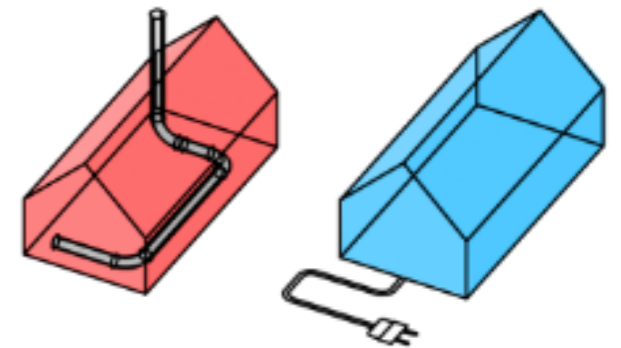
SERIES 4 : HVAC+EA DESIGN

- Section 4 specifies the contents of the building services (BS) design tasks that are performed BIM based.
- When building design and construction is realized in accordance with these requirements, the BS systems model will contain basic prerequisites for the utilization of the model in systems for use and maintenance, throughout the whole life cycle of the building.
- New issues: **BIM based service area maps**, **presentation of components**, and **definition of the detail level** for the information content and the geometry for each design phase.



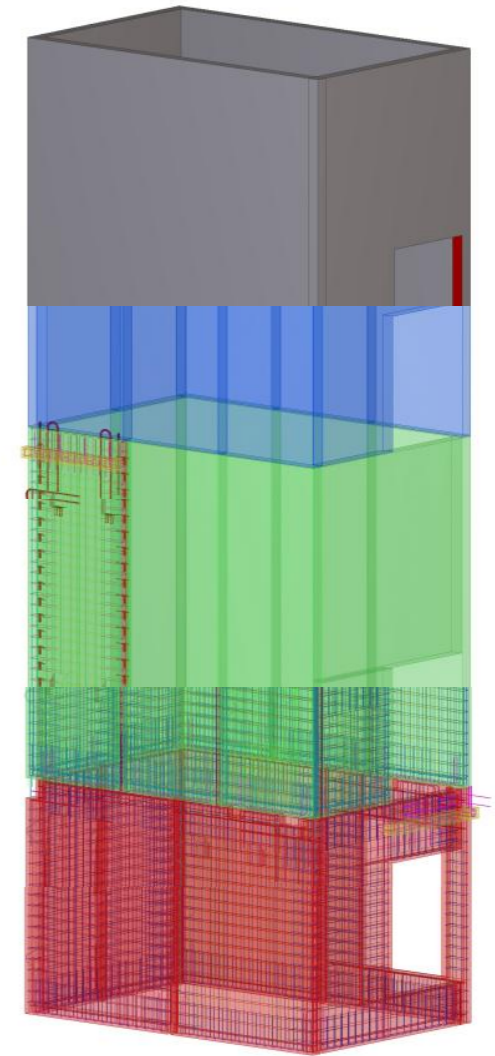
Granlund Oy

Author: Tero Järvinen, Insinööritoimisto Olof Granlund Oy



SERIES 5 : STRUCTURAL ENGINEERING

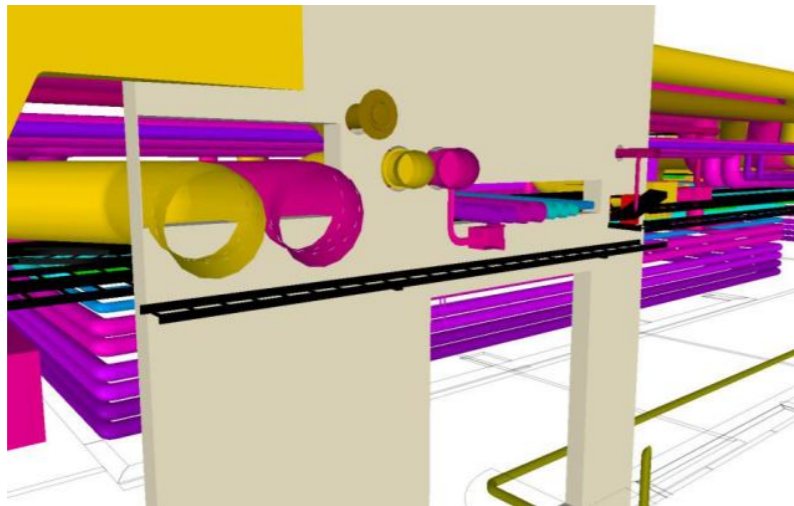
- Scope of modeling, precision and schedule-based level of details determine the usefulness of the structural BIM
- The requirements have been broken down into planning different design phases, each containing a list of BIM tasks and description of level of detail.
- The other design team parties have been taken into account more than previously in the scope of modeling.
- The goal for the Structural design requirements update was to clarify the existing guidelines and make the requirements easier to adopt.



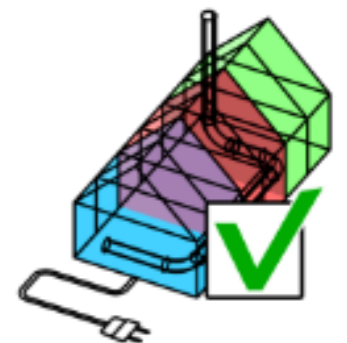
Author: Tero Kautto, FMC Group

SERIES 6 : QUALITY ASSURANCE

- The viability of BIMs depends on the appropriateness and reliability of their contents. The quality assessment part goes into methods by which the BIM contents described in the other parts can be put into a format which is usable and meets the requirements.
- This part consists of **self assessment** done by the information producers, mostly designers, before delivering the information to other parties for use as initial information, of **coordination of information during design**, and of **final check** of the information model of certain phases.
- The part contains practical guidelines about how to avoid problem point and as well as **check lists for each party** for a more profound assessment.



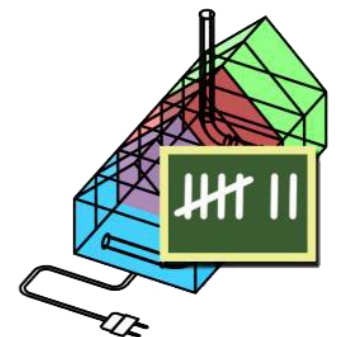
Author: Heikki Kulusjärvi, Solibri Inc



SERIES 7 : QUANTITY TAKE OFF

- Part 7 describes essential BIM requirements and guidelines for quantity take-off.
- It is possible for building owners and clients, designers, contractors and product fabricators to utilize quantity take-off in completely new ways and from new perspectives.
- Measuring quantities manually from drawings is replaced by computer-assisted measurement from a BIM. **New competence is required when performing BIM-based take-offs.**
- Quantity take-off sets **specific requirements for modeling.**
- Modeling should be done according design discipline requirements, in logical and consistent manner to given level of detail so, that the **identification of building elements and building system parts is possible.**

Author: Matti Tauriainen, FMC Group

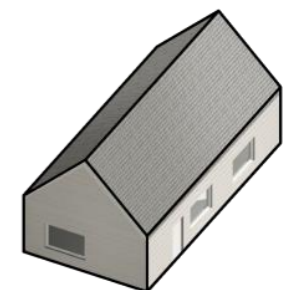
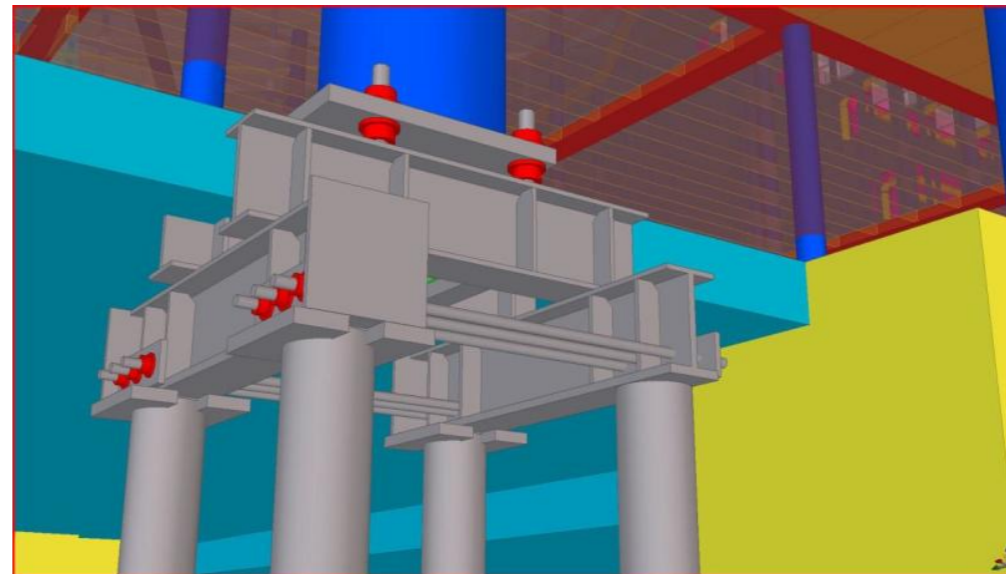


SERIES 8 : VISUALIZATION

- Visualization can be divided into two main forms.
- The first is a traditional **photo-like rendering**, which describes the designer's vision of the design solutions.
- The second form is a **technical illustration**. It serves as the communication tool for the design team, client, project management and construction site. The key advantages of utilizing the BIM-based visualizations are the quality assurance of the design, easy comparison between different design alternatives, improved communication and support for the development and marketing.



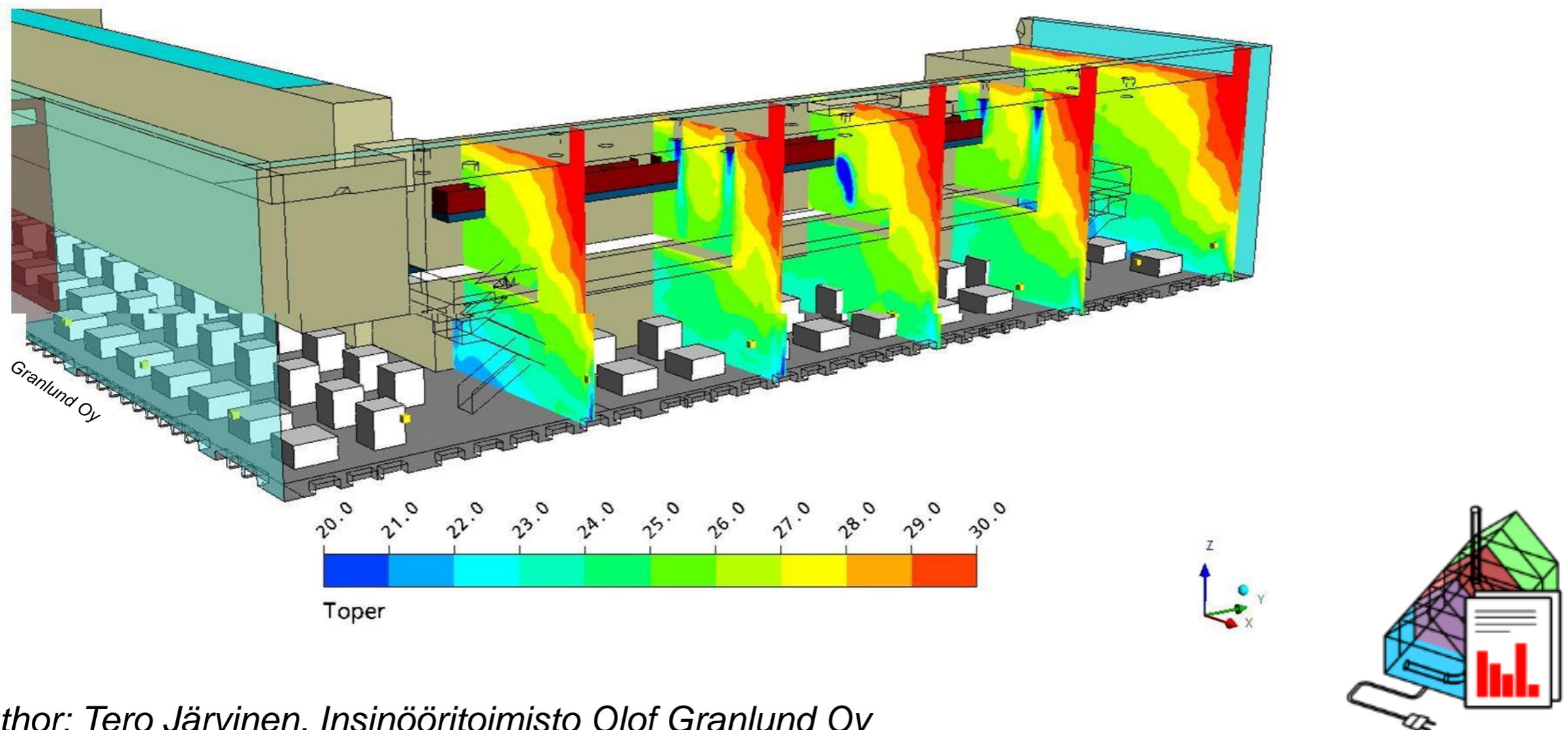
Arkkitehtitoimisto Hannu Jaakkola Oy / Tietoa Visualisointi



Author: Tomi Henttinen, Gravicon Oy

SERIES 9 : HVAC ANALYSIS

- Part 9 describes possibilities brought into BS analysis by modelling.
- Pictures with examples of various analyses have been added and differences between lighting calculation and lighting analysis have been clarified.



Author: Tero Järvinen, Insinööritoimisto Olof Granlund Oy

SERIES 10 : ENERGY ANALYSIS

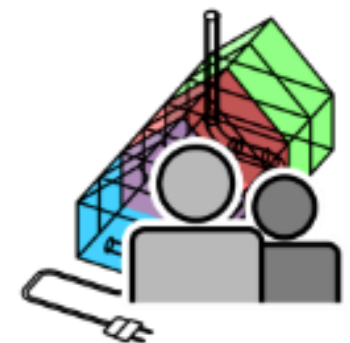
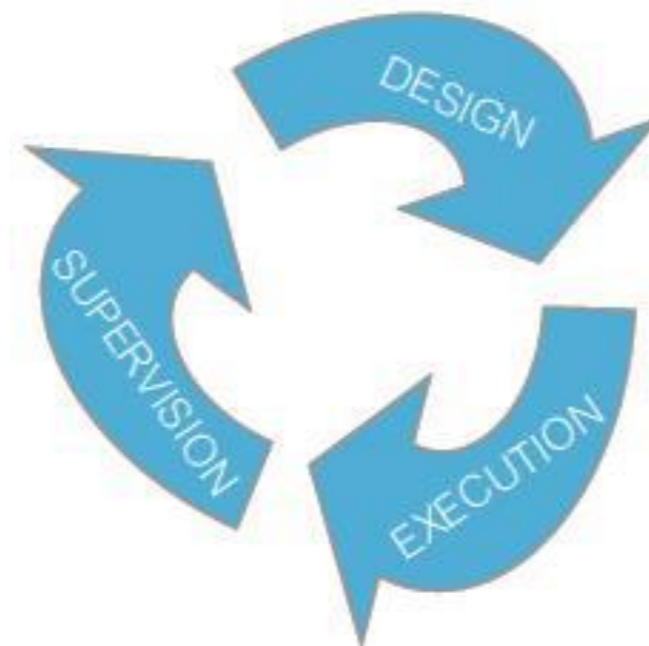
- The importance of energy efficiency management has been emphasized by giving **the energy analyses a specific part in the requirements**.
- Part 10 describes tasks during design and construction that are essential from the viewpoint of **management of energy efficiency and indoor climate**, as well as **use and maintenance**.
- Utilization of **BIMs enables a more systematic and transparent**, and in most cases **more efficient, means to steer the energy impact** of design than can be achieved by traditional methods.
- **The most important benefit of BIM is that it makes clear that the information is used in the calculations is correct.**
- The requirements support the implementation of the new Finnish 7/2012 energy regulations. In addition to tasks related to the building permit, requirements are set for utilization of BIM in energy analyses all the way from the early project stages down to the building being taken into use.



Author: Tuomas Laine, Insinööritoimisto Olof Granlund Oy

SERIES 11 : MANAGEMENT OF BIM PROJECT

- Part 11 deals with project management, and utilizing BIM from the client's point of view.
- BIM tasks of project management are described as procedures as well as planning, implementation and control measures.
- Modeling tasks are divided into different stages according to the general project management task list.
- BIM deliverables and analyses that are used to support decision-making on a project-specific basis have been described at each stage of the project.



Author: Elina Mäkelä, Pöyry CM Ltd

SERIES 12 : USE AND MAINTENANCE OF BUILDINGS

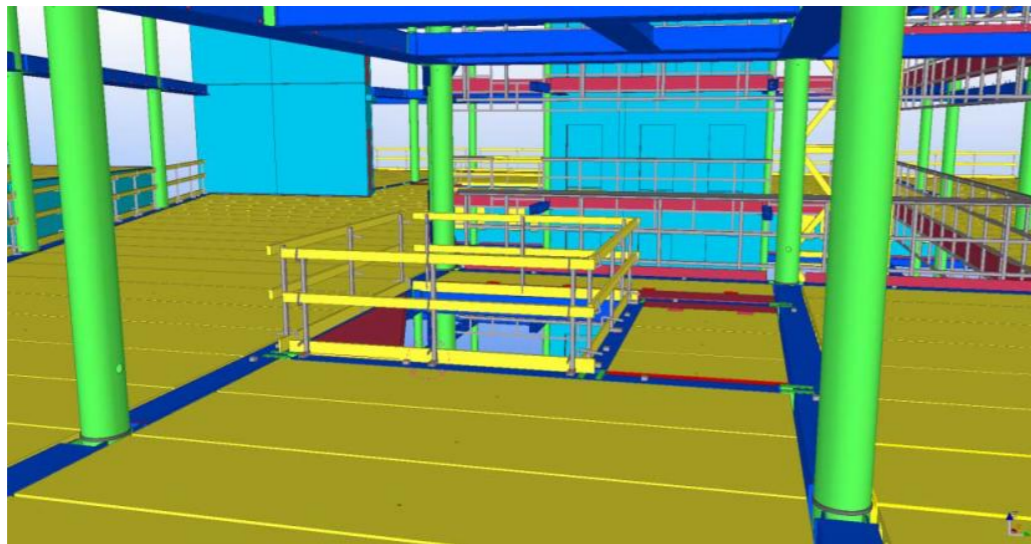
- Part 12 describes requirements and potential areas for **utilization of BIM during the use and maintenance phase** of the construction process. It offers illustrative examples of the utilization potential and the benefits of BIM as support for facility services processes.
- It describes the **information management process throughout the whole construction value chain**, and it sets **minimum requirements for the update and quality assessment methods** of BIMs for the use phase.
- The requirements include IFC based data transfer, but other data transfer standards for the use phase (COBie) are dealt with as well.
- Even if the requirements now set, they are modest compared to the utilization potential, this part has an important position since it provides an analysis and paves the way for a growing use of BIM as integral part of the facility services processes.



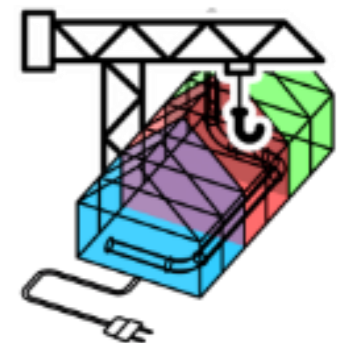
Author: Tuomas Laine, Insinööritoimisto Olof Granlund Oy

SERIES 13 : CONSTRUCTION REQUIREMENTS

- Part 13 describes the BIM requirements and the utilization of BIM during the construction phase, and tasks for the contractor to deliver information for the as-built model.
- There is a need to make the models from the design phase available for production planning and coordination. The requirements of construction and BS contractors for the BIM are presented as options to be agreed on separately in every project.
- Contractors are to deliver information for the as-built model to the client about adjustments and changes that are agreed on and have taken place during the construction phase.



Authors: Markku Kiviniemi, VTT, employed by Skanska



FROM CONCEPTUAL DESIGN TO MAINTENANCE

- **Design phases**

- In the conceptual design phase BIM is used for requirement setting, energy and comfort simulation, alternative design studies and area based cost management.
- In the Design Development phase BIM serves mainly the AEC group in collaboration and design information sharing.

- **Procurement**

- In procurement phase BIM is utilized in several ways: visual checking, mass and quantity take-offs, construction schedules and production planning.

- **Construction**

- Construction phase uses BIM in many ways: the minimum level is visual support for the installation order planning, but in some cases the site has utilized the BIM for whole construction management such as schedules, prefabricate design and delivery and sub-contract purchases.
- BIM is utilized also in renovation projects.

- **Maintenance**

- BIM is not adapted in management and operation yet, but this may change in the near future as more models and BIM based FM solutions become available.
- If we look at the big picture, design and construction are just minor phases in the whole life cycle of the building. FM and PM management with BIM will be the next big thing.

SOFTWARE

- **BIM is IFC**
 - In Finland BIM equals to IFC. It is not real BIM, if its not IFC.
 - Other formats are also used in parallel with IFC.
- **Architects**
 - ArchiCAD, Revit Architecture or AutoCAD Architecture (ACA).
- **Structures**
 - Tekla, in some rare cases also Revit Structure and Nemetschek Allplan.
- **Mechanical**
 - HVAC and electrical use mainly MagiCAD products, which are developed in Finland.
 - Another local product, CADS, has a minor base in smaller consulting companies.
- **Simulations and Quality Assurance**
 - For energy simulations the most common products are RIUSKA (aka MagiCAD Comfort & Energy) and IDA Indoor Climate and Energy by Equa. No other options at the moment.
 - Solibri Model Checker, visual checking also with Autodesk Navis and Tekla BIMsight.
- **Construction site**
 - Schedules and quantities are handled by Tekla Construction and Vico Office.
 - Tocosoft has popular BIM based tools for quantity take-offs and cost management.
 - Solibri Model Checker is sometimes used for quantity take-offs.
 - Tekla BimSight is becoming popular on construction sites.

KNOWLEDGE

- **AECs**
 - AEC companies train their personnel trying to make BIM as their competitive advantage.
 - On international level, the general level of knowledge among AECs is rather good.
- **Clients**
 - Clients are ordering BIM design in projects, but only a few of them understand the potential.
 - There is a lack of knowledge especially in the project management level which can lead to poor result or total failures.
 - Clients are at the moment the weakest link.
- **Construction companies**
 - Some of the larger construction companies have understood the benefits of BIM.
 - They also have a vision how to carry out this strategy in all levels, even though the project management is a big challenge for them as well.
 - Good result have been achieved by taking account the whole process, not only bits and pieces from here and there.
 - The outcome is better quality and less alterations during the construction phase.
- **Training**
 - Currently there is no organized or certified BIM training network.
 - Universities are getting more active in teaching BIM

NEW ROLES

- **Design practices**
 - The younger generation becomes a modeling expert but don't get the design experience. That is a challenge for the future.
- **BIM managers in organizations**
 - Large consulting offices have internal BIM managers
 - smaller companies have to decide whether they will handle this by themselves or acquire the service from a special consultant.
- **Project BIM manager**
 - Supervises and co-ordinates the BIM work in projects.
 - BIM manager in projects is certainly a new and needed role, and it is now described in the COBIM requirements.
 - It is still little bit unclear who is responsible of this role.

CHALLENGES

- **Documents vs. BIM**

- Currently we need both documents and BIM.
- BIM process vs. document based process is an interoperability challenge.

- **The common approach is to solve problems with technology**

- Typically new technology generates new challenges.
- If the process is not revised, we might just create new problems.

- **Transformation**

- Transformation is a big challenge, since the roles and practices haven't really changed.
- Moving from CAD to BIM is a revolution compared to change from blueprints to CAD.
- It is not only BIM that is changing the process, there are several other factors linked to this.

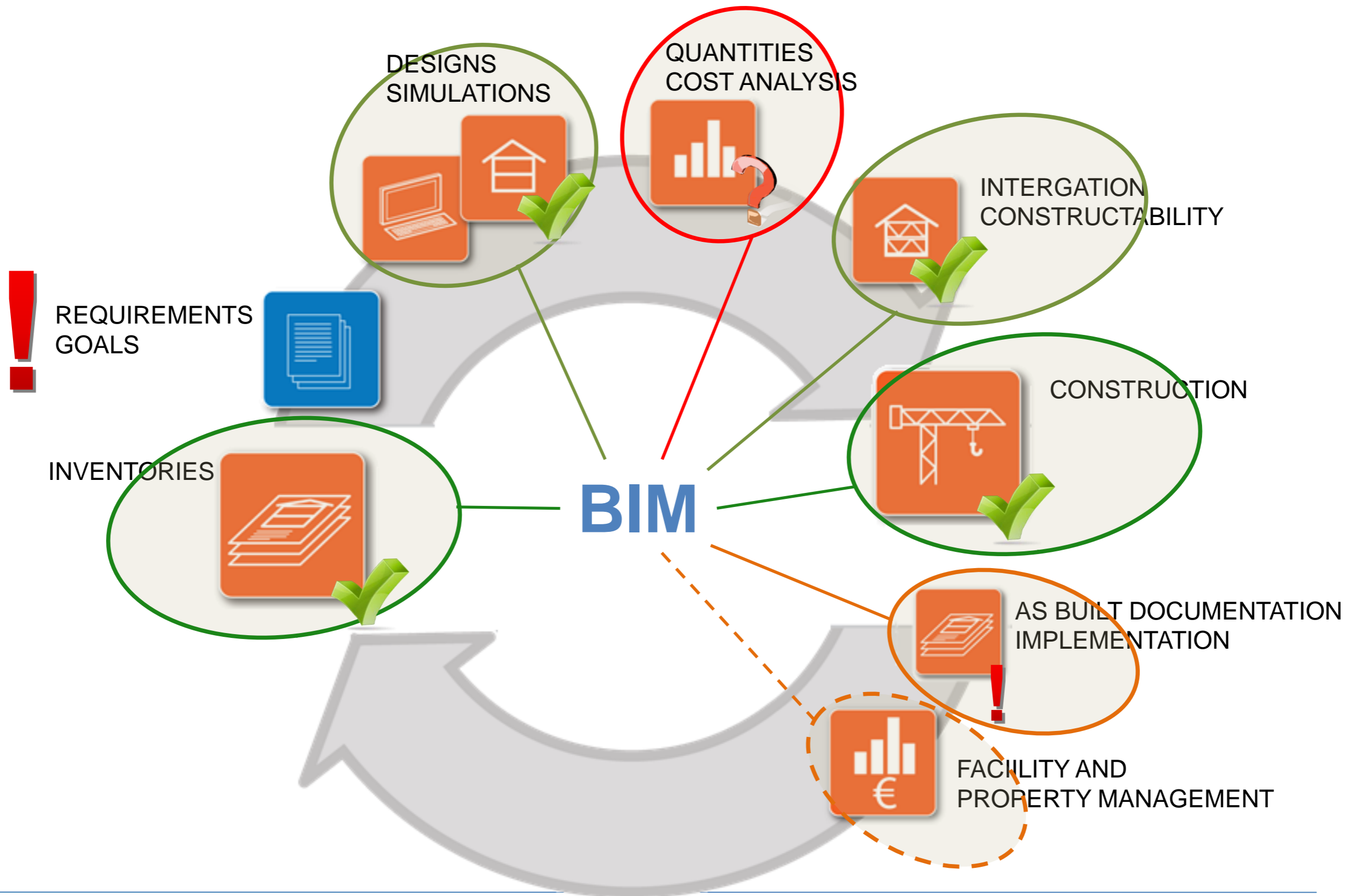
- **Project Management**

- The benefits of BIM are not clear enough for the project management.
- There are no meters to measure the achievements..
- It is expected, that AEC group will automatically generate results without any supervision.
- Poor BIM management lead to unrealized results

- **Unrealistic goals**

- By setting the goals too high, there is a risk that you fail to achieve them.
- By setting the goals so that they can be achieved, the experiences would be more positive.

BIM IN REAL LIFE PROJECTS IN FINLAND



DOES IT WORK?

- **YES, AFTER ALL IT WORKS**

- BIM has become an everyday routine in many projects
- Interoperability thru IFC works as long as you know what you are trying to achieve.
- Standards, such as BCF and IDMs, are improving collaboration.
- Thru best practices you can solve most of the problems in the everyday work.
- Software are getting better and better all the time.
- Common knowledge and skills are improving rapidly.
- More ways to utilize BIM are found all the time.

- **STILL NEED TO IMPROVE**

- Even though we have moved a good distance from theory to practice in utilizing BIM, there is still a lot of things that we need to do before BIM becomes mainstream in projects.
- There are still limitations in the technology and you should be aware of the them.
- Currently there are not very good meters to measure the results.
- In order to get to next level, we need better understanding how BIM will effect to our traditional routines and project phases.

Thank You

TOMI HENTTINEN
M.Sc. (Archit.) SAFA
Gravicon Oy, CEO
buildingSMART Finland, Chair