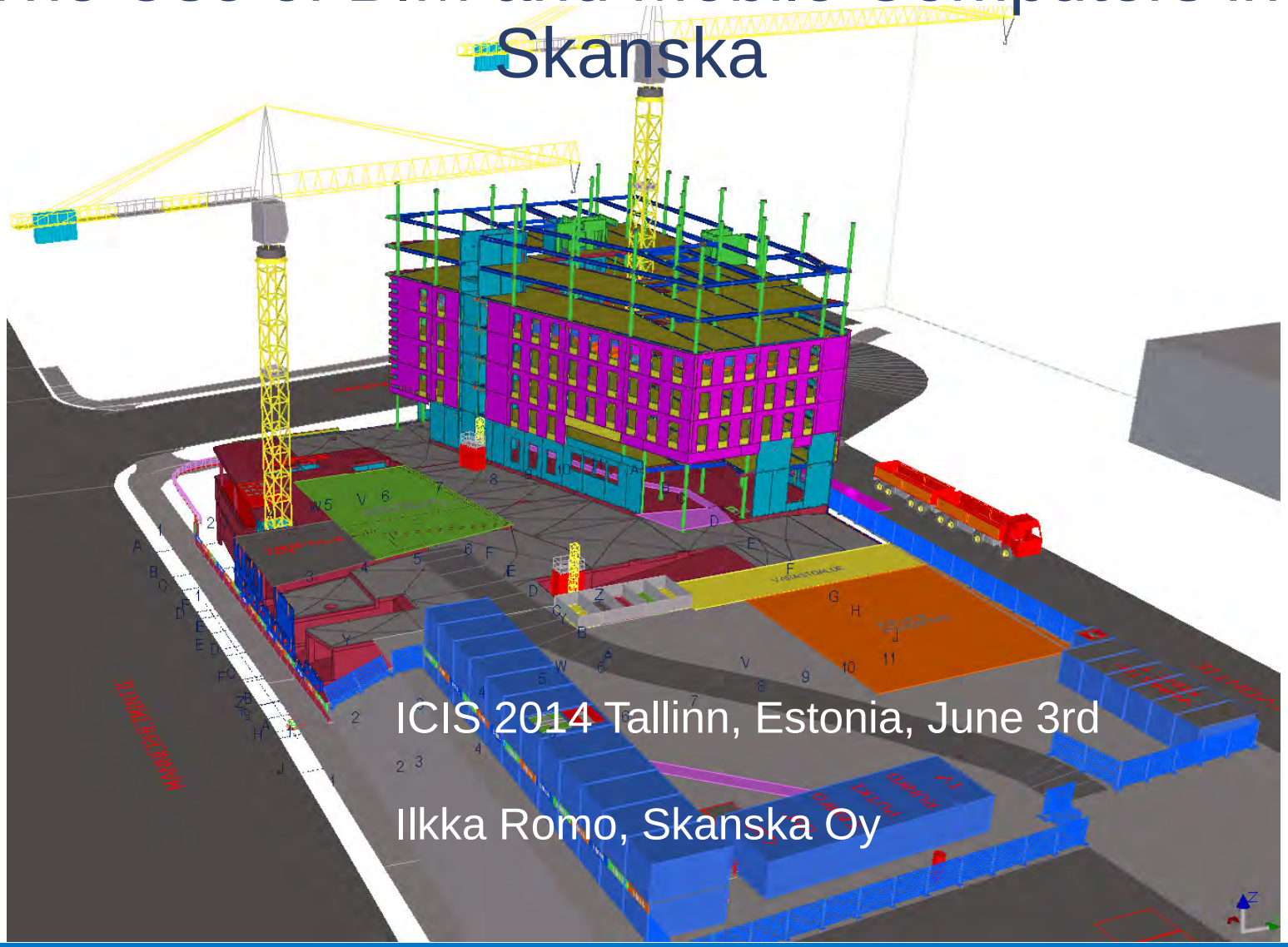
SKANSKA

# The Use of BIM and Mobile Computers in Skanska



ICIS 2014 Tallinn, Estonia, June 3rd

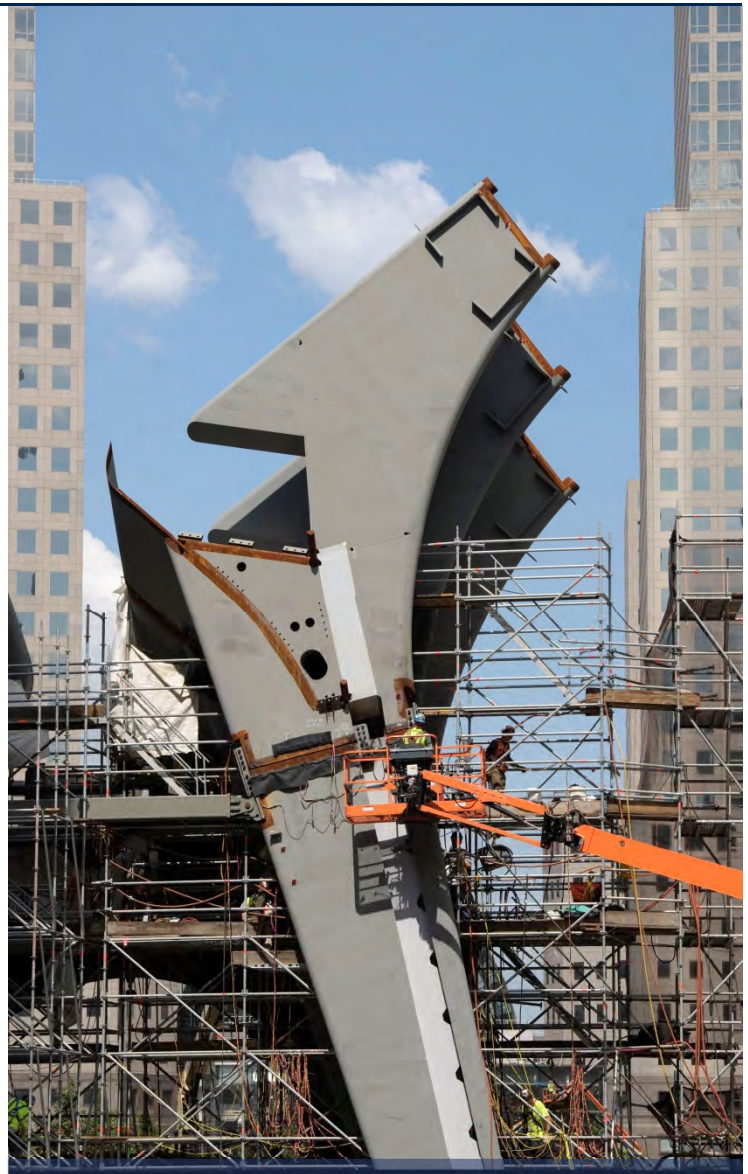
Ilkka Romo, Skanska Oy

# Presentation content

- Skanska Introduction
- BIM in Skanska Finland
  - Early phase design
  - Visualizations
  - Design coordination
  - Site area planning and safety
  - Construction planning
  - Pre cast elements – prefabrication
  - Mobile tool applications
  - FM / Maintenance
  - Future development
  - Video of Site BIM

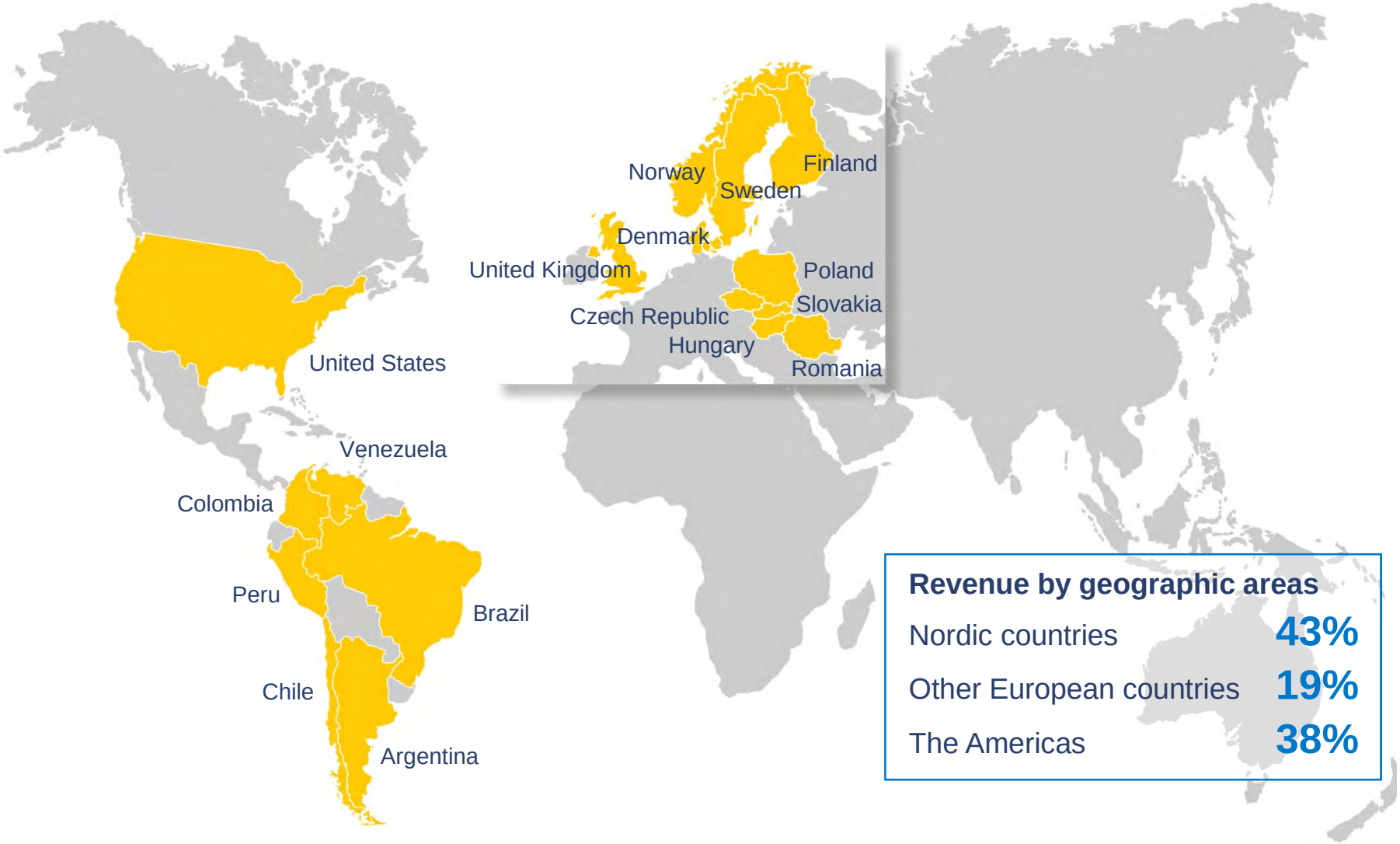
# Skanska in short

- Founded 1887 in Sweden
- International business since 1897
- Listed on the Stockholm Stock Exchange
- 2013 revenues: SEK 136 billion
- 10,000 ongoing projects
- 57,000 employees
- A Fortune 500 company
- Member of UN Global Compact



WTC Transportation Hub Oculus, New York, U.S.

# We are active in selected home markets




**Revenue by geographic areas**

| | |
|---|---|
| Nordic countries | **43%** |
| Other European countries | **19%** |
| The Americas | **38%** |

# BIM is globally used in Skanska

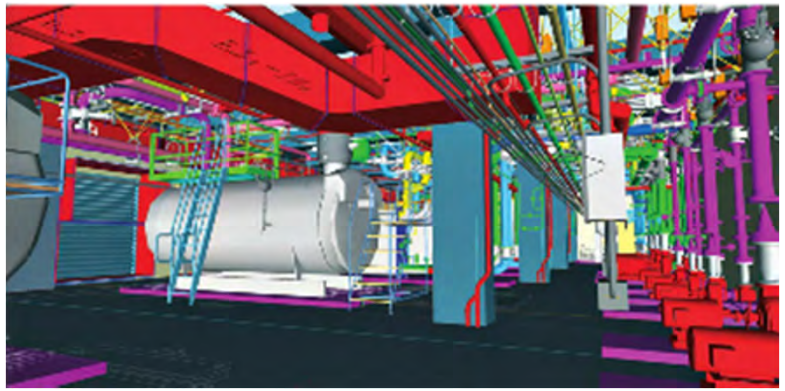
*”We at Skanska have conducted extensive work in developing BIM with all of our global business units.*

*BIM is changing the construction world, get ready  to take advantage of all the benefits if offers – let´s do it together”*

**Johan Karlström**

President and CEO, Skanska AB

New Karolinska, Solna



Catskill and Delaware Water Treatment Facility
Westchester County, New York

# Better BIM tools for projects through global collaboration

Share and develop best practices:

**Preliminary design**
- Daylight and shadow studies
- Energy zoning
- Initial energy analysis
- Initial carbon footprinting

**Design**
- Detailed energy and lighting analyses
- Carbon footprinting

**Construction**
- Supply chain interaction
- Customer interaction

**O&M (Operation and Maintenance)**
- Verification of performance
- Effective asset management
- Plan facility improvements and renovations

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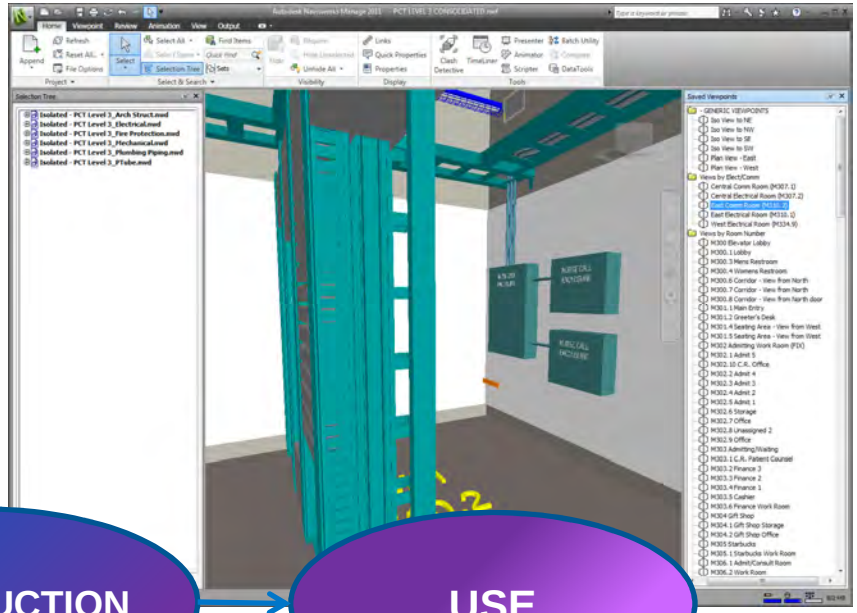
Green BIM Innovation at Skanska

We have long been an industry leader in adopting BIM for managing project cost, schedule and quality. With the arrival of Green BIM we can now optimize the environmental performance and life cycle cost for our customers using the same information. This is a welcome tool to progress our journey to Deep Green™ and better serve our customers.

# AM information is created during design and construction

Produces informations in correct format and systematically named/coded

Spaces, systems, equipment, requirements, locations



**DESIGN** → **CONSTRUCTION** → **USE**

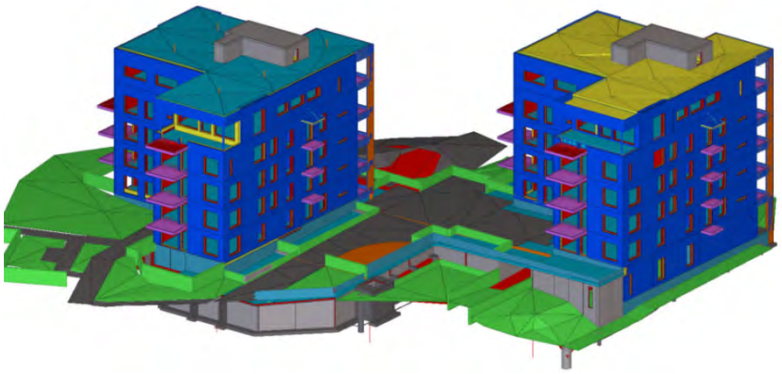
Product data, final locations, equipment numbers, warranties, manuals, spare parts

Uses and maintains information

# BIM in Skanska Finland

- The majority of Skanska´s residential and commercial development projects are modeled completely by designers
- Architectural, structural, MEP and increasingly geotechnical models
- Skanska is using models through different business processes, estimation, scheduling, purchasing, and construction
- More than 200 BIM projects during last years

Skanska house, Helsinki



As Oy Espoon Kelloseppä
Skanska Kodit

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# BIM Steps in Skanska Finland

The first BIM project

BIM Group

BIM roadmap

Completely modelled residential projects

Implementation in commercial projects starts

Final breakthrough with clear business benefits

- Model coordination
- Estimation & tendering
- Sales and marketing
- Site, logistics & safety
- Mobile tools in use

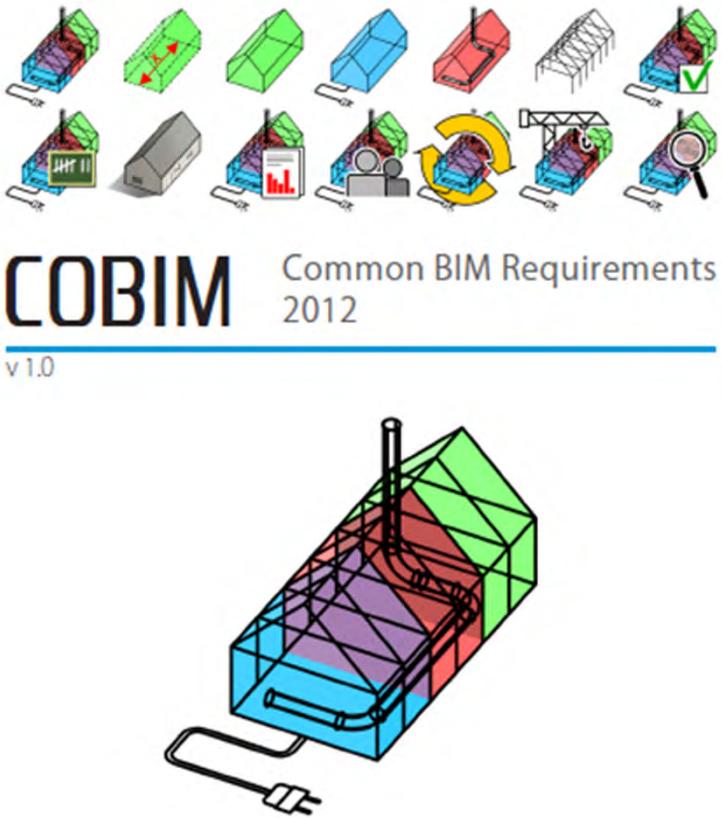
2005 → 2006 → 2007 → 2008 → 2009 → 2010 → 2011 → 2012 → 2013

Global Skanska BIM Competence Center 2009-12

Residential BIM → Commercial BIM → Collaborative BIM

# Common Bim Requirements 2012

buildingSMART Finland




Series 1: General part

Series 2: Modeling of the starting situation

Series 3: Architectural design

Series 4: MEP design

Series 5: Structural design

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

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# BEC - Precast Concrete Modeling Guidance

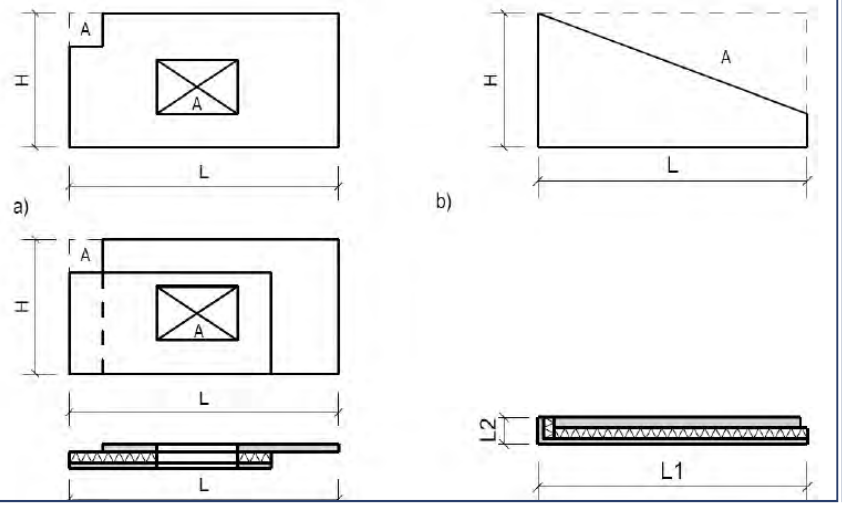
**Betonikeskus ry** 9.12.2011

**Betonisten seinäelementtien määrälaskenta 2011**

Ohjeen tavoite on yhdenmukaistaa seinäelementtien määrälaskentaa suunnittelussa, tarjoustoiminnassa ja betonisten seinäelementtien toimitussopimuksissa sekä ohjeistaa laskenta- ja suunnitteluohjelmien tuottamaa informaatiota. Ulko- ja väliseinäelementtien lisäksi ohjetta voidaan käyttää myös muille tasomaisille elementeille, kuten porrashuonelaatat, parvekelaatat, -kaiteet ja -pielet, sokkelielementit sekä tukimuuri- ja melueste- elementit. Ohjeen ulkopuolelle on rajattu kaarevat ja tilaelementit sekä 2- tai 3 tasomaista osaa sisältävät elementit ( esim. hissikuilu- tai parvekelaattaelementit, joissa on kaide valmiina).

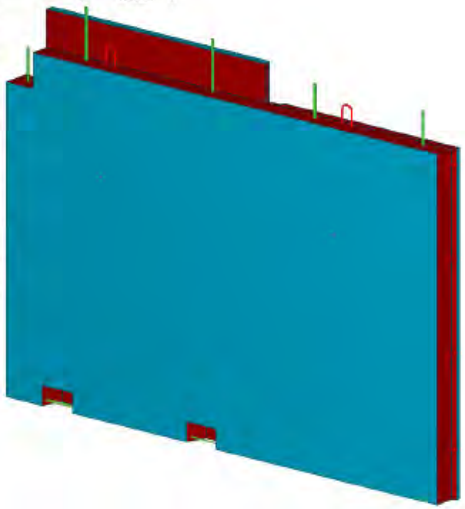
Suunnittelu-, määrälaskenta- ja hinnoitteluohjelmissa käytetään elementtien ja aukkojen lukumäärän lisäksi seuraavia seinien määrätietoja:

1. Seinäelementin **bruttoala A1** (m2). Kyseessä on kuvan mukainen pinta- ala L x H suorakaidelaatikolle, jonka sisälle seinäelementti mahtuu. Pinta- ala rajautuu elementin ulkopinnan mukaisiin linjoihin, jolloin elementtien välisten saumojen pinta-ala ei ole mukana neliöissä. Kuvan c) bruttoala on sandwich- elementin projektiopinta-ala L x H. Ulkoseinäelementtien hinnoittelua varten laskettavat julkisivuneliöt sisältävät aina kääntyvän nurkan pinta-alan, joten bruttoalaa laskettaessa mitta L = L1 + L2.




BEC 2012

| TARVIKE (TYYPPI,KOKO,LAATU) | MÄÄRÄ | YKS |
|---|---|---|
| BETONI C25/30 | 1,3 | m3 |
| BETONI C30/35, SÄÄNKESTÄVÄ | 2,6 | m3 |
| EPS150 | 3,6 | m2 |
| OL-E-240 | 5,8 | m2 |
| SBKL 150x150 | 1,0 | kpl |
| AEP400 PA | | |
| NEOPREENINAUHA 20x10 | | |
| NEOPREENI 200x300 | | |
| NEOPREENI 8 mm | | |
| Tappi T16 L=1200 A500HW | | |
| VAKIOTERASPUTKI 100X80 S | | |
| TW25 l=1800 M24-170 | | |
| PUUTAVARA 50X100 SAHAT | | |
| KIERRESAUMAPUTKI D150 L | | |
| PUTKILÄPIVIENTIVARAUS P | | |
| S-PISTEKOLO | | |
| SEWATEK-LÄPIVIENTI | | |
| NOSTOLENKKI JB20 | | |
| NOSTOLENKKI PB16 LISÄTA | | |
| TERÄSVERKKO 8-150 B500K | | |
| LEIKAVERKKO L18/10 B500 | | |
| KIERREHAKA K7 750x750 60 | | |

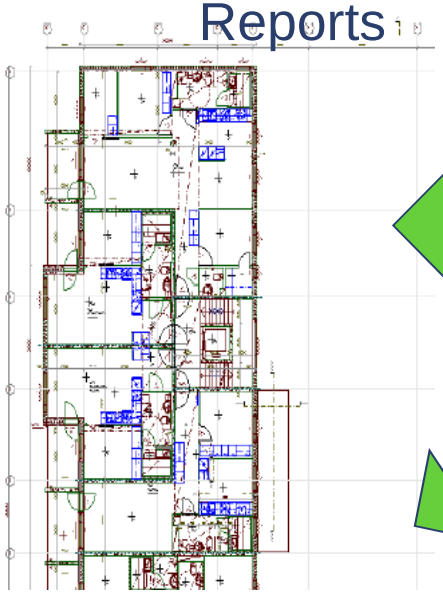


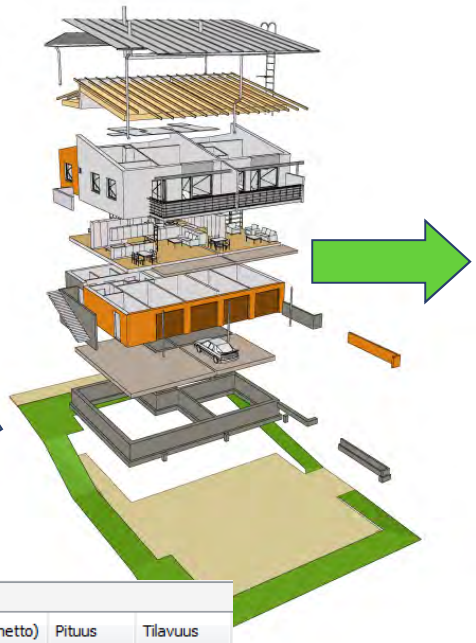
**Elementtisuunnittelun mallinnusohje**
Version 1.0

# BIM – information is essential

2D drawings
Reports

**BIM Model**





Informaation talteenotto

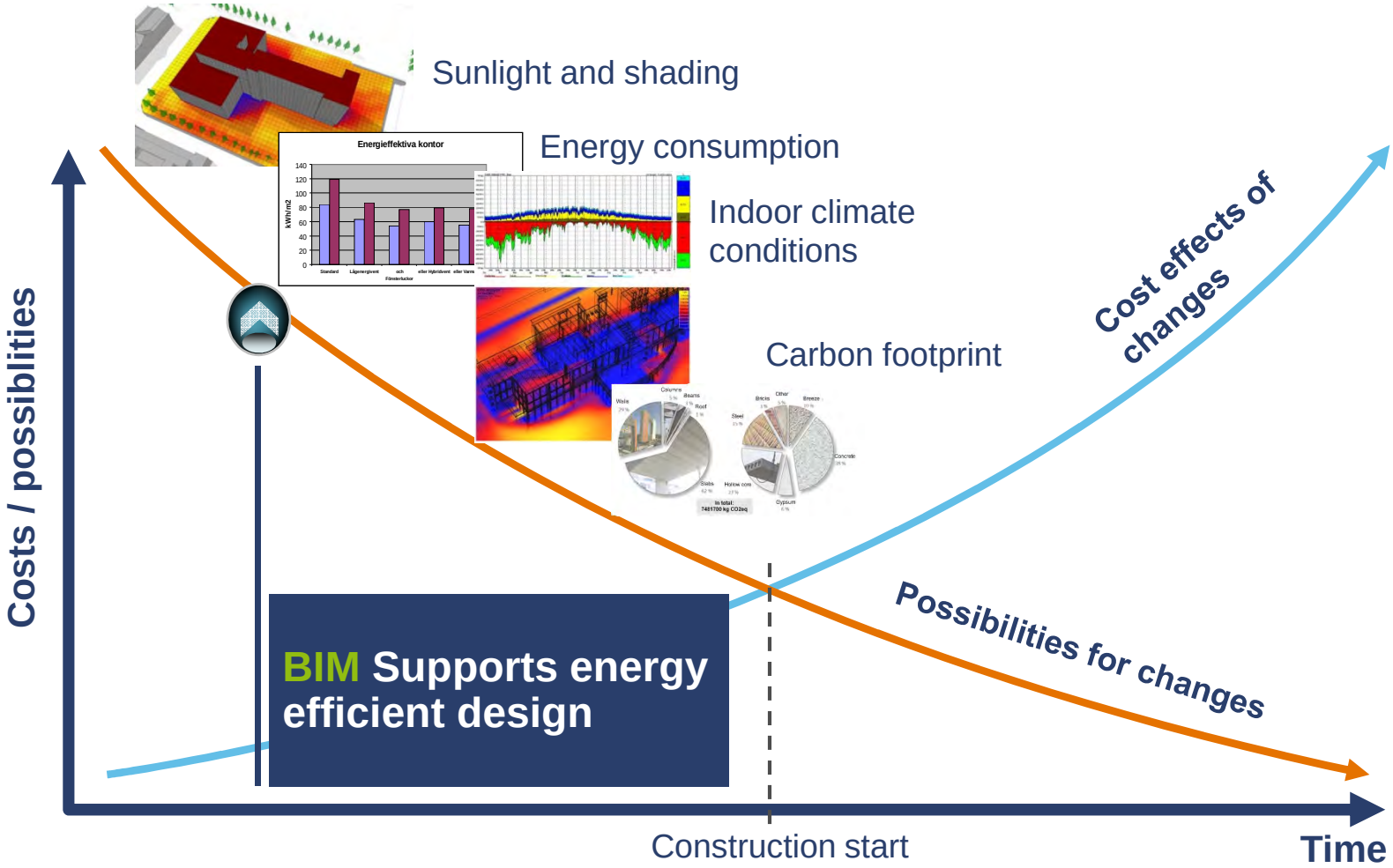
| Rakennusosa | Tyyppi | Pinta-ala (netto) | Pituus | Tilavuus |
|---|---|---|---|---|
| 1.3.1.1 Väliseinät | Basic Wall:VS01a Betoniseinä 150, kantava. | 181,39 m2 | 148,61 m | 27,21 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS01a Betoniseinä, kantava. 2 | 136,46 m2 | 43,32 m | 20,47 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS02 Muurattu tiiliseinä, taystiili 1... | 85,52 m2 | 34,13 m | 11,11 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS03 Teräsrankaseinä, ei kantava... | 1 039,04 m2 | 483,56 m | 95,57 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS03a Teräsrankaseinä, ei kantav... | 12,78 m2 | 4,42 m | 972 l |
| 1.3.1.1 Väliseinät | Basic Wall:VS03b Teräsrankaseinä, ei kantav... | 54,72 m2 | 20,78 m | 6,46 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS05a Kuusipaneli, SPU-eriste, Te... | 189,38 m2 | 72,82 m | 25,92 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS05b Kuusipaneli, SPU-eriste, Te... | 86,17 m2 | 32,81 m | 9,57 m3 |
| 1.3.1.1 Väliseinät | Basic Wall:VS05c Kuusipaneli, SPU-eriste, Ter... | 73,99 m2 | 44,90 m | 8,95 m3 |

Information of components and spaces

- Identification
- Quantities
- Spaces
- Materials
- Locations
- Properties

**•IFC standard enables the use of information in different phases**

# BIM enables quick analyses for supporting early decision making



# BIM visualizes projects

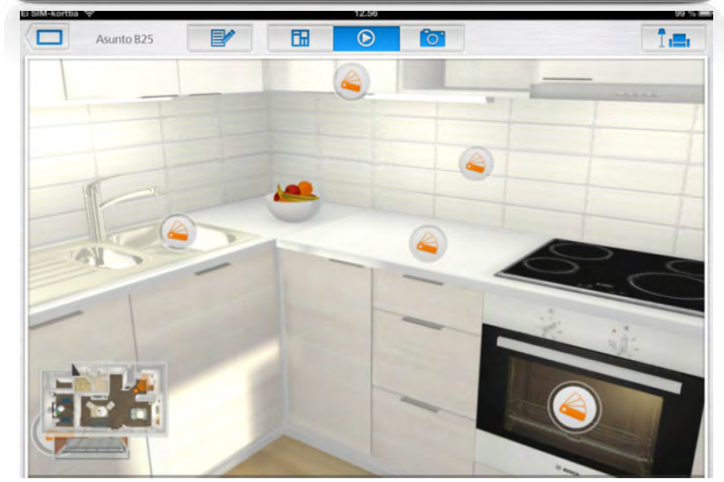
BIM based visualization brings new buildings, spaces and areas into life

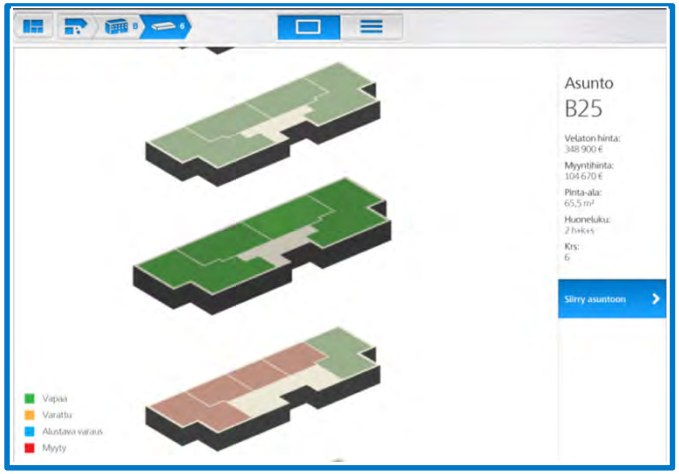
- Visualizion is based on the architectural model, completed with information from structural and MEP models, selected materials and surrounding environment
- Still pictures, animations, virtual tours, stereo 3D presentations
- Visualization supports strongly customers' decision making, giving realistic impressions of alternatives.

As Oy Järvenpään Saundi

Koy Helsingin Talisman

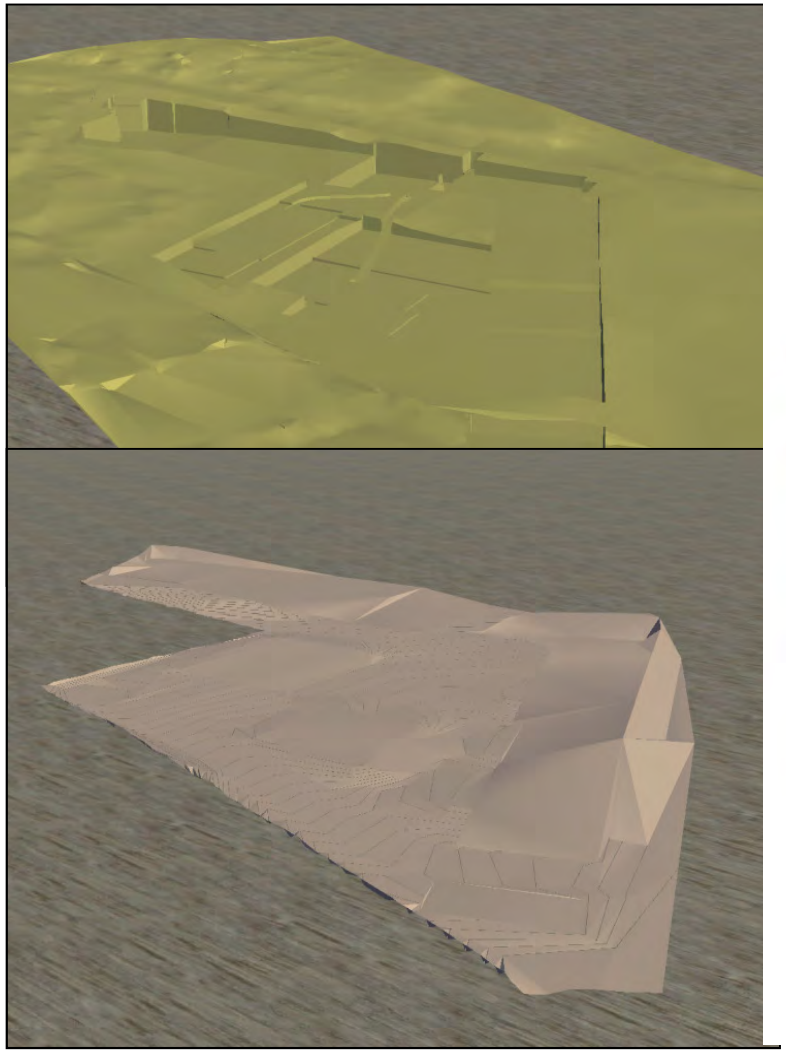
# Ipad Apps – Skanska Kodit

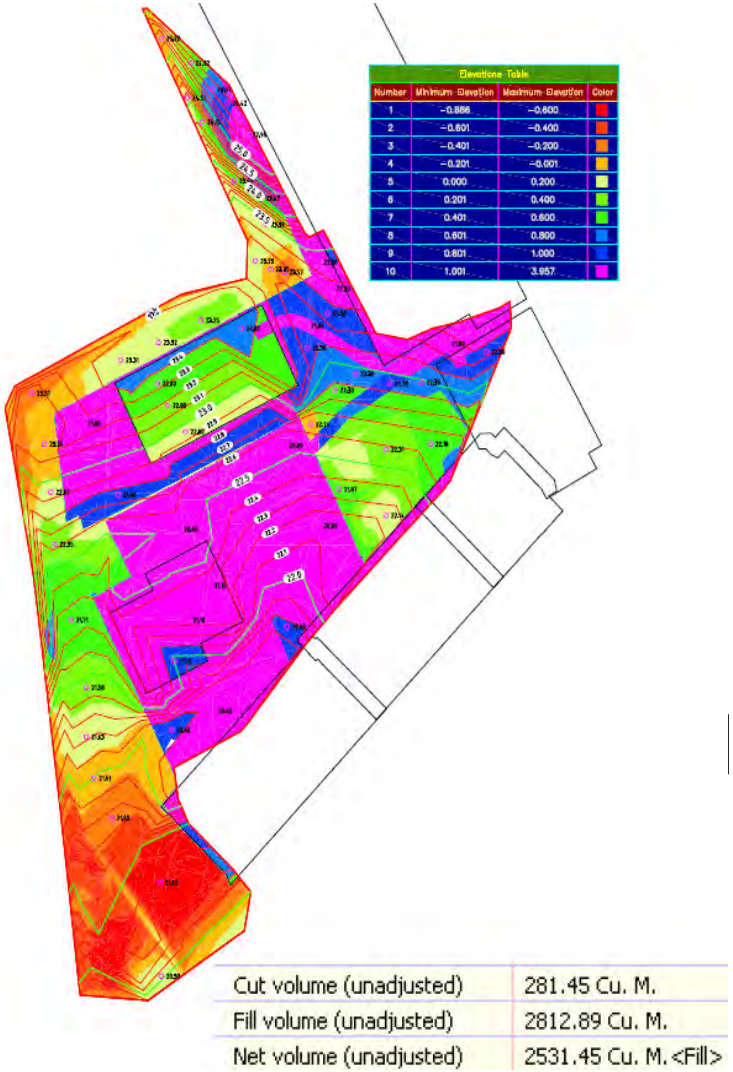



Available in Appstore

# Starting with geotechnical design

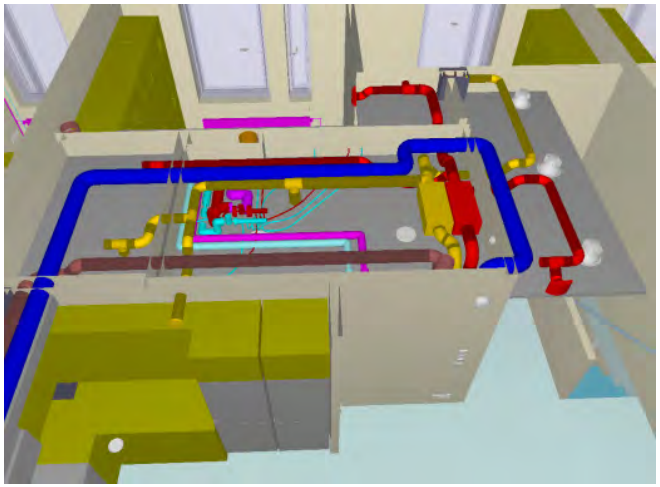




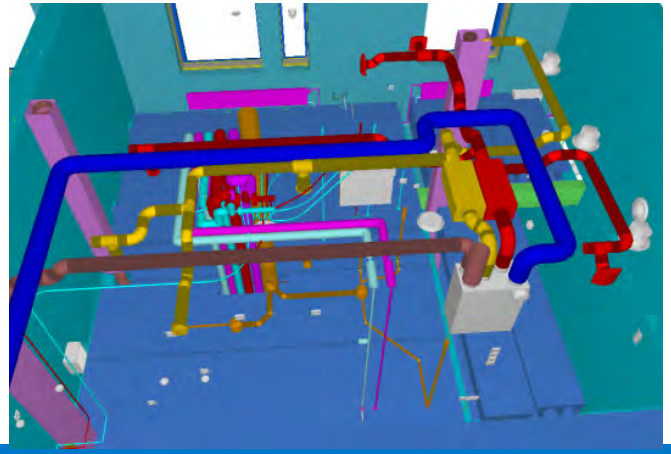
# BIM improves design quality

BIM based design coordination reduces errors and improves collaboration among the design team

- Constructability analyses
- MEP equipments coordination
- Reservations for piping
- Tracking down missing or wrong-sized openings
- Model checking and clash detection is an essential part of the design process
- Solibri Model Checker tool based on the IFC standard

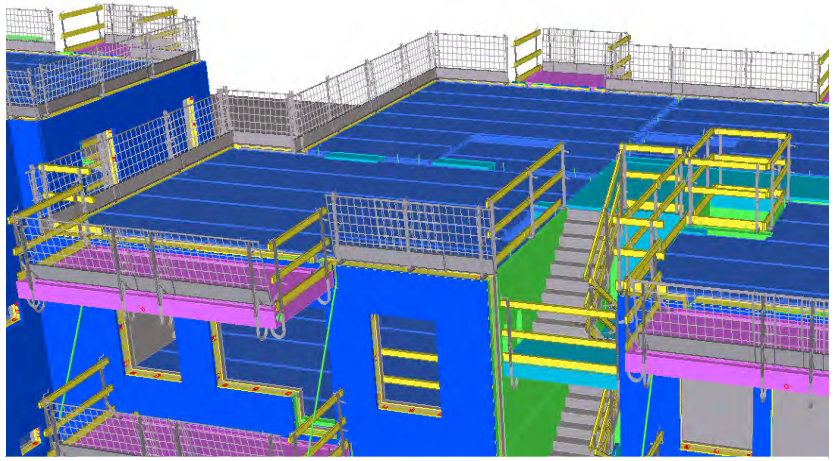


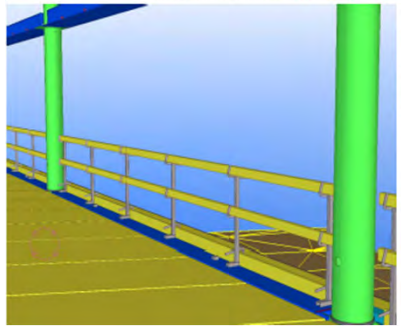
As Oy Helsingin Esmeralda

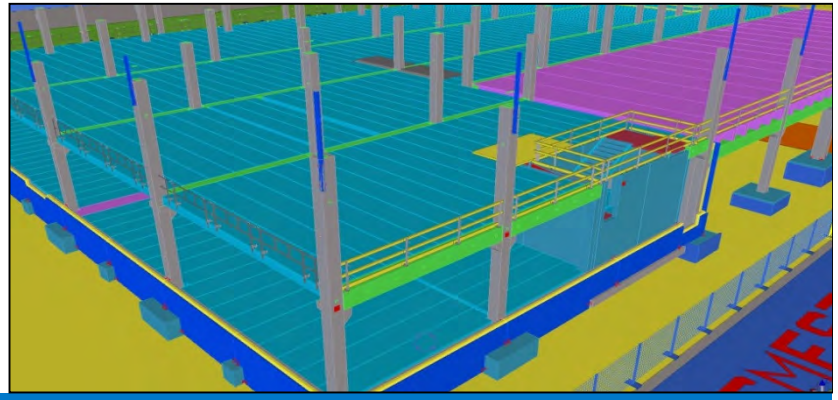


# Fall protection planning with BIM

- Falling is one of the most important reasons for fatal accidents
- Fall protection can be planned with BIM:
  - Type of safety equipment
  - Locations
  - Quantities
  - Installation order







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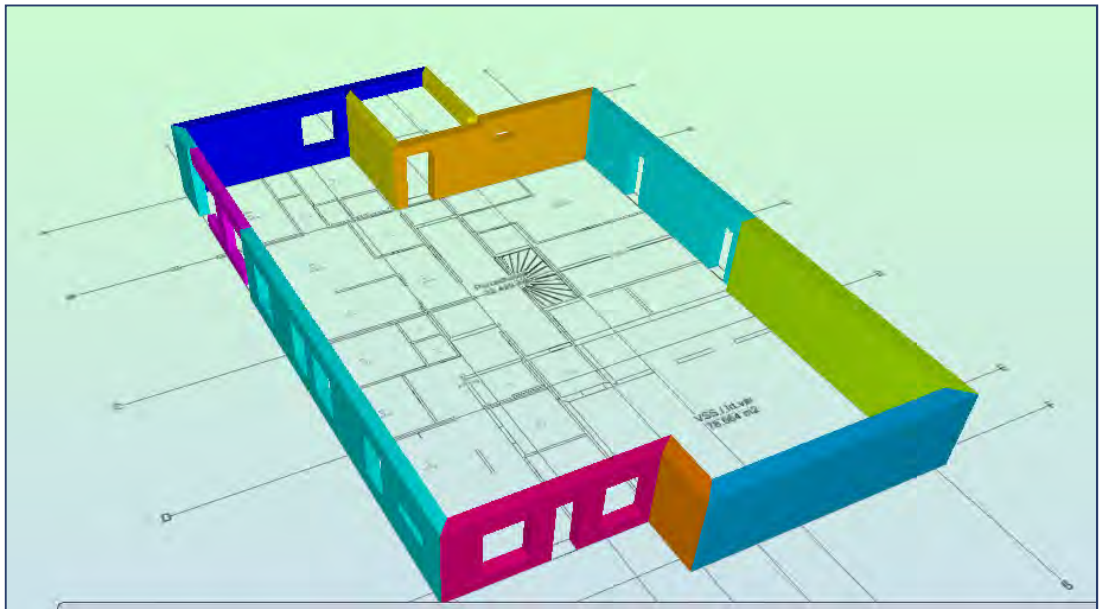
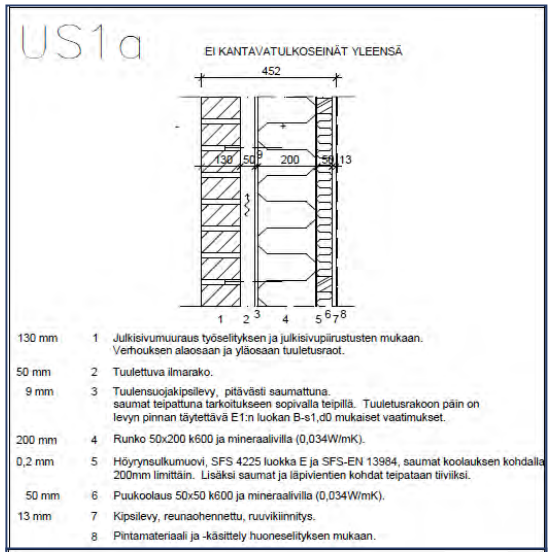
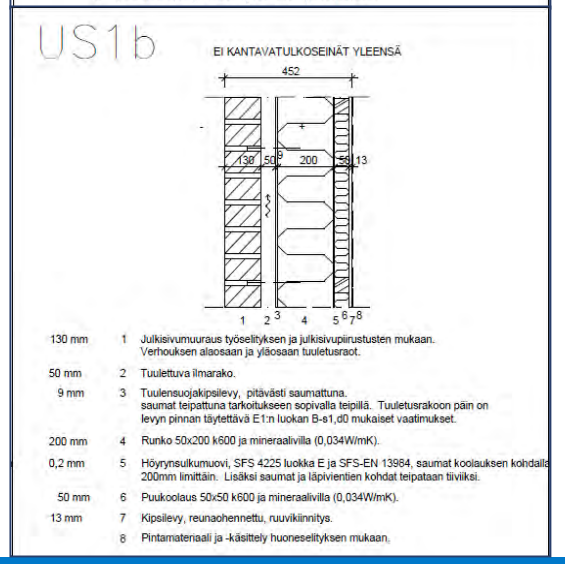
# Estimators tool



Informaation talteenotto

| Kerros | Tyyppi | Bruttopinta-ala | Ikkunoiden pinta-ala | Ovien pinta-ala | Väri |
|---|---|---|---|---|---|
| 1.krs | US1a Tiiliulkoseinä punatiili 452 ei-kantava 452 | 16,190 m2 | 0,000 m2 | 0,000 m2 | |
| 1.krs | US1b Tiiliulkoseinä valkotiili 452 ei-kantava 452 | 89,052 m2 | 9,282 m2 | 3,780 m2 | |
| 1.krs | US2 Puuverhous 345 ei-kantava 345 | 18,900 m2 | 6,482 m2 | 4,140 m2 | |
| 1.krs | US3a Tiiliulkoseinä-punatiili 550 kantava 550 | 25,776 m2 | 2,560 m2 | 0,000 m2 | |
| 1.krs | US3b Tiiliulkoseinä-valkotiili 550 kantava 550 | 27,862 m2 | 0,320 m2 | 2,760 m2 | |
| 1.krs | US4 Puuverhous 482 kantava 482 | 23,256 m2 | 5,581 m2 | 2,070 m2 | |
| 1.krs | US5a Tiiliulkoseinä punatiili VSS 700 700 | 29,949 m2 | 0,480 m2 | 0,480 m2 | |
| 1.krs | US5b Tiiliulkoseinä valkotiili VSS 700 700 | 32,460 m2 | 0,000 m2 | 0,000 m2 | |
| 1.krs | US6 puu-ulkoverhous VSS 632 632 | 6,708 m2 | 0,000 m2 | 0,000 m2 | |
| 2.krs | US13 Puuverhous 532 kantava 532 | 6,708 m2 | 0,000 m2 | 0,000 m2 | |
| 2.krs | US1a Tiiliulkoseinä punatiili 452 ei-kantava 452 | 14,700 m2 | 0,320 m2 | 0,000 m2 | |
| 2.krs | US1b Tiiliulkoseinä valkotiili 452 ei-kantava 452 | 101,112 m2 | 14,402 m2 | 0,000 m2 | |
| 2.krs | US2 Puuverhous 345 ei-kantava 345 | 39,300 m2 | 12,963 m2 | 8,280 m2 | |
| 2.krs | US3a Tiiliulkoseinä-punatiili 550 kantava 550 | 53,694 m2 | 7,201 m2 | 0,000 m2 | |
| 2.krs | US3b Tiiliulkoseinä-valkotiili 550 kantava 550 | 16,800 m2 | 2,720 m2 | 0,000 m2 | |
| 2.krs | US4 Puuverhous 482 kantava 482 | 33,306 m2 | 8,461 m2 | 4,140 m2 | |
| 3.krs | US13 Puuverhous 532 kantava 532 | 6,708 m2 | 0,000 m2 | 0,000 m2 | |
| 3.krs | US1a Tiiliulkoseinä punatiili 452 ei-kantava 452 | 14,700 m2 | 0,320 m2 | 0,000 m2 | |



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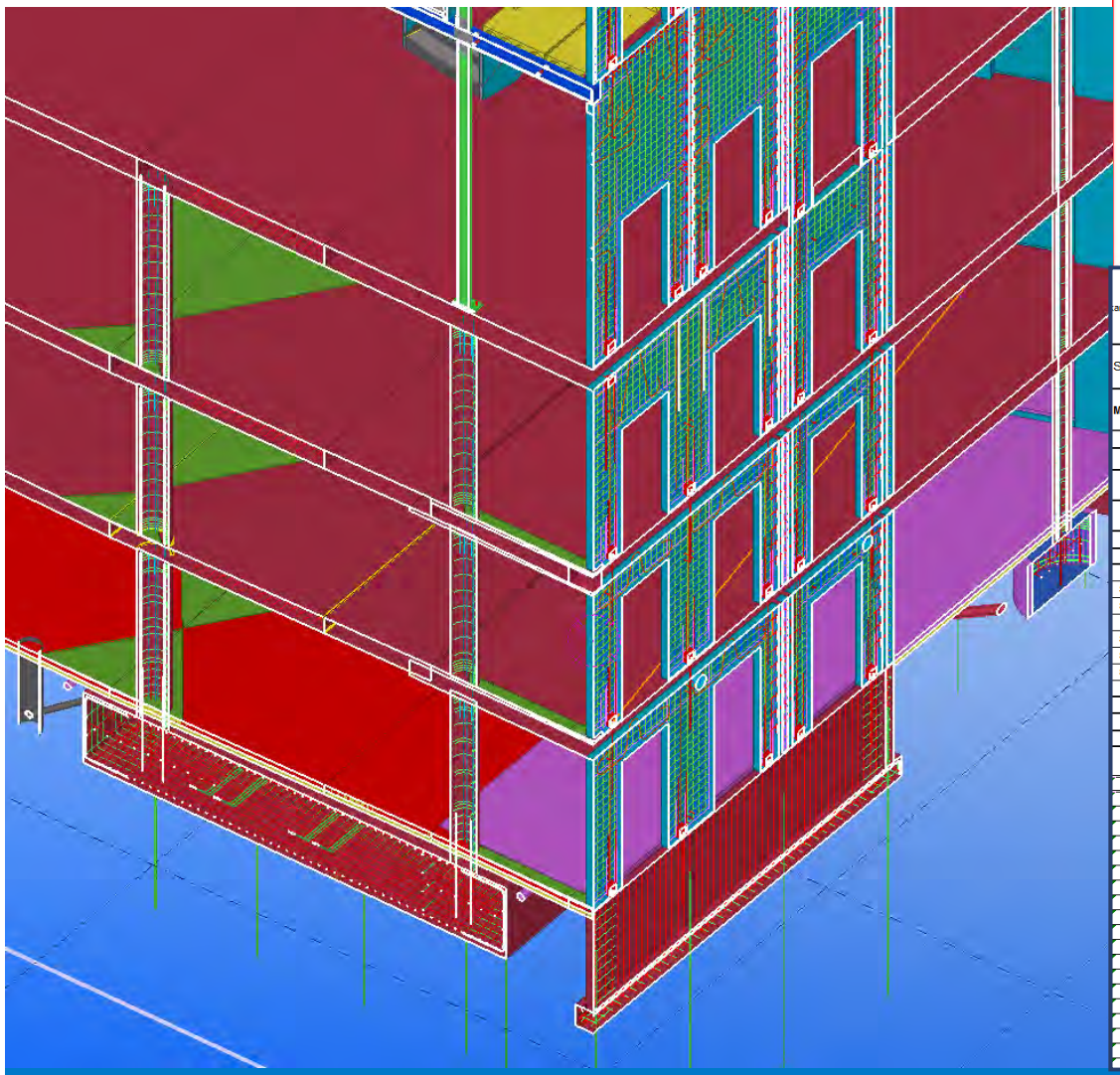
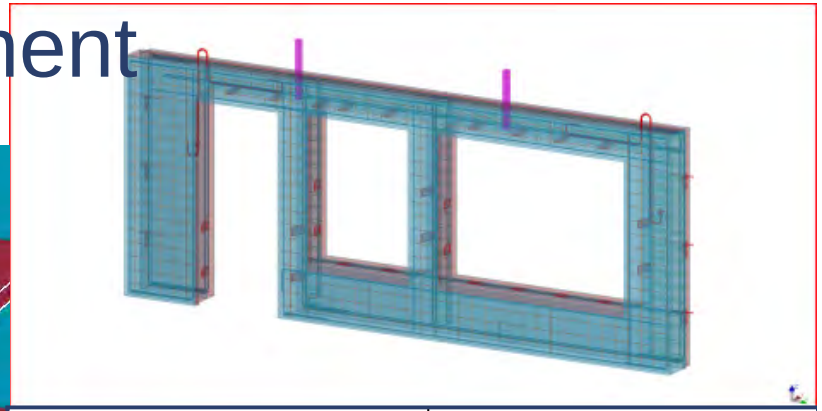
# Quantities for procurement





**SKANSKA**

Skanska Talonrakennus Oy, Paciuksenkatu 25, 00100 Helsinki
Puh. 020 719 211
Sähköposti: etunimi.sukunimi@skanska.fi

**CAST UNIT CONTENT**

| | | | |
|---|---|---|---|
| Skanska Ruskeasuo | Project number: | 6604 | |
| **Mannerheimintie 117 00270 Helsinki** | List date: **25.05.2011** | Revision, date: | |

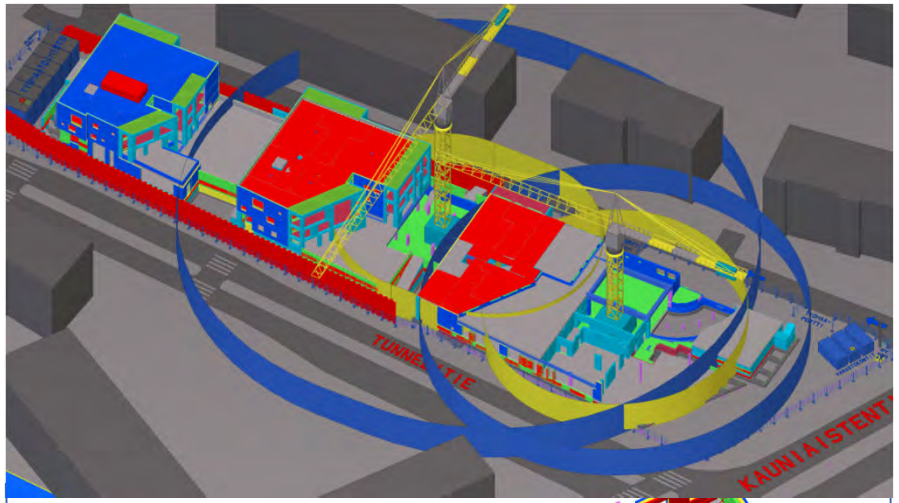
| **KV-94** | | **Määrätiedot** | | | **Sijainti** | | |
|---|---|---|---|---|---|---|---|
| Materiaali | Mitat | Ala [m2] | Tilavuus [m3] | Paino [kg] | Kerros | Lohko | Tuoteryhmä |
| K40-1 | 200x3815x4440 | 16.94 | 2.12 | 5356 | K_7.KERROS | | |

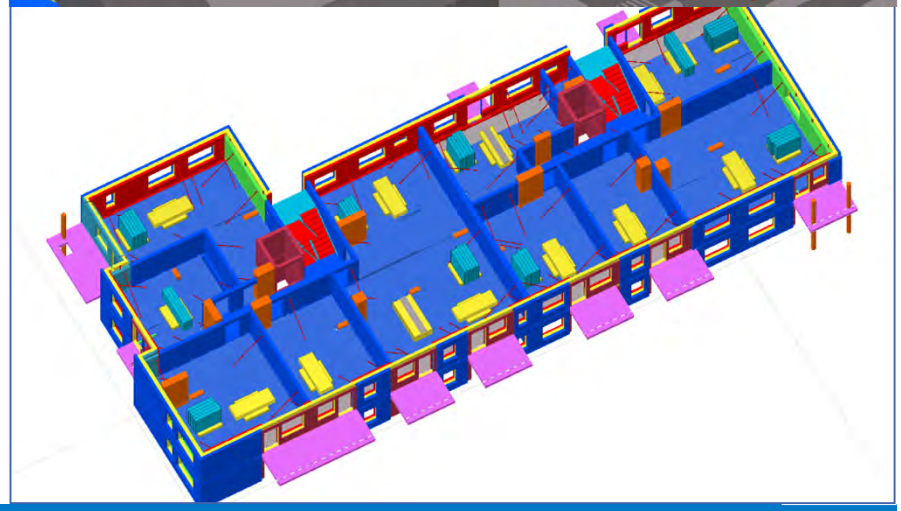
| | **Määrätiedot** | | |
|---|---|---|---|
| Materiaali | Mitat | Paino [kg/kpl] | Paino |
| Steel_Undefined | | 1.30 | 27.60 |
| Steel_Undefined | | 1.00 | 4.00 |
| A500HW | | 6.20 | 12.50 |
| Steel_Undefined | | 9.00 | 26.90 |
| Steel_Undefined | | 3.80 | 7.50 |
| Steel_Undefined | | 4.30 | 4.30 |
| S235JR | | 0.00 | 0.50 |
| | | **Yhteensä:** | **83.3** |

| | | | | | | **Taivut** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pos | Lkm | D [mm] | L [mm] | ΔL [mm] | Paino yht. [kg] | a | b | c | d | e |
| 204 | 53 | 8 | 880 | 0.00 | 18.50 | 401 | 122 | 401 | | |
| 699 | 6 | 16 | 3420 | 0.00 | 32.40 | 3420 | | | | |
| 878 | 4 | 12 | 940 | 0.00 | 3.40 | 500 | 500 | | | |
| 1972 | 10 | 16 | 3600 | 0.00 | 56.90 | 3600 | | | | |
| 3711 | 4 | 12 | 1420 | 0.00 | 5.10 | 702 | 85 | 702 | | |
| 3773 | 7 | 10 | 3600 | 0.00 | 15.50 | 3600 | | | | |
| 3774 | 3 | 10 | 1260 | 0.00 | 2.30 | 1260 | | | | |
| 3779 | 15 | 10 | 1070 | 0.00 | 9.90 | 1070 | | | | |
| 3781 | 1 | 10 | 10 | 0.00 | 0.00 | 13 | | | | |
| 3902 | 2 | 12 | 1850 | 0.00 | 3.30 | 451 | 1017 | 451 | | |
| 3903 | 25 | 8 | 860 | 0.00 | 8.60 | 401 | 106 | 401 | | |
| 3922 | 2 | 12 | 4210 | 0.00 | 7.50 | 4219 | | | | |
| 3972 | 2 | 12 | 1760 | 0.00 | 3.10 | 702 | 425 | 702 | | |
| 4069 | 2 | 8 | 860 | 0.00 | 0.70 | 401 | 106 | 401 | | |
| 4355 | 27 | 8 | 860 | 0.00 | 9.30 | 401 | 106 | 401 | | |
| 4365 | 2 | 16 | 3600 | 0.00 | 11.40 | 3600 | | | | |
| 4468 | 15 | 10 | 340 | 0.00 | 3.20 | 344 | | | | |
| 4469 | 19 | 10 | 1260 | 0.00 | 14.80 | 1260 | | | | |
| 4501 | 16 | 10 | 3600 | 0.00 | 35.50 | 3600 | | | | |
| 4553 | 2 | 12 | 1140 | 0.00 | 2.00 | 451 | 307 | 451 | | |

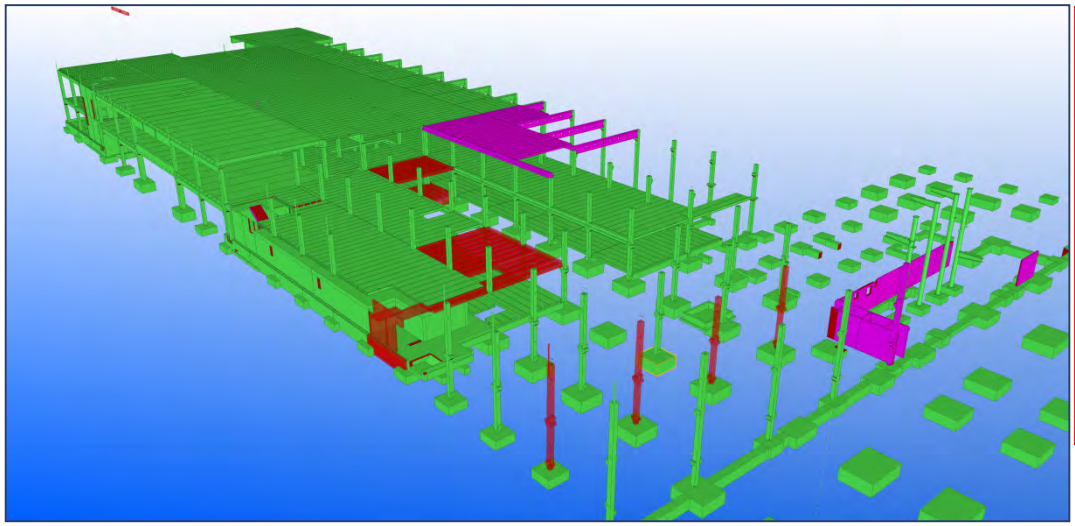
# Site area planning

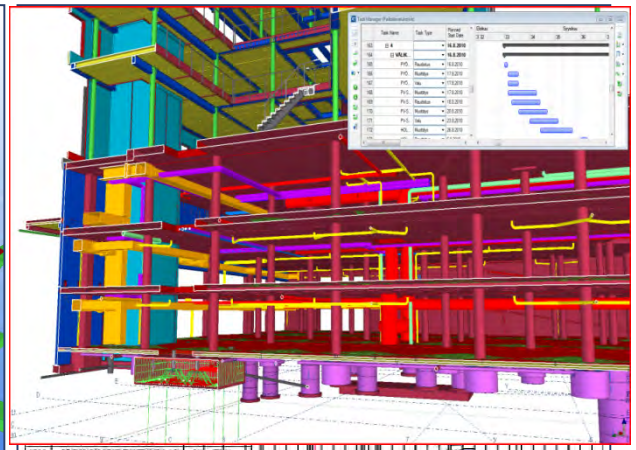
- Updated area plans
- Storage
- Logistics
- Cranes
- Lift plans for materials
- Introduction for workers and visitors
- Dangerous areas

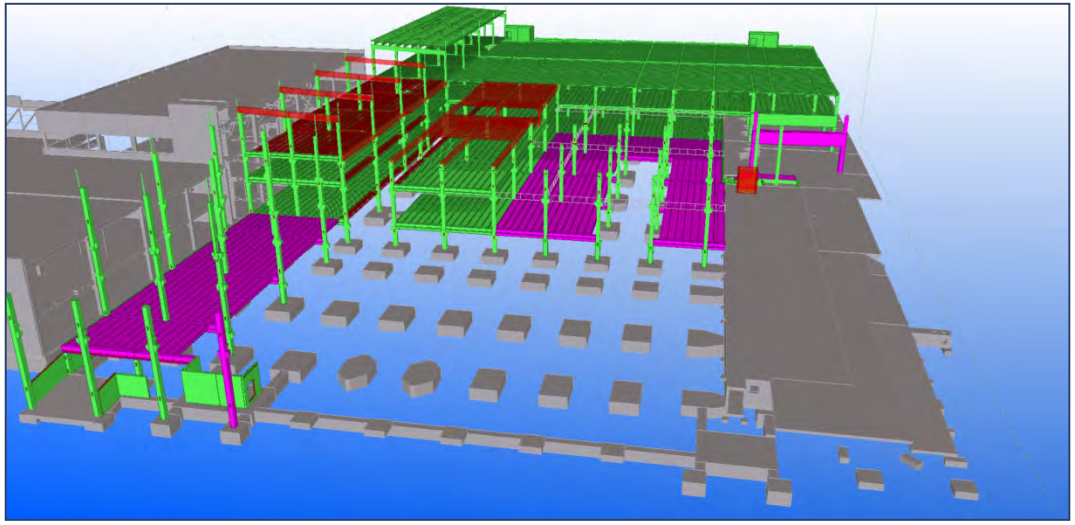


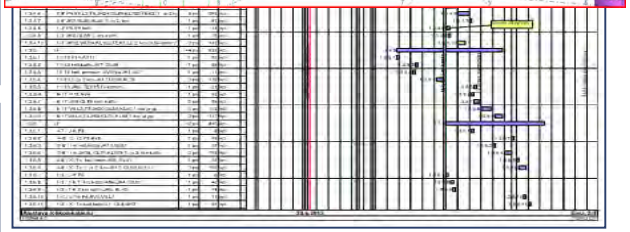


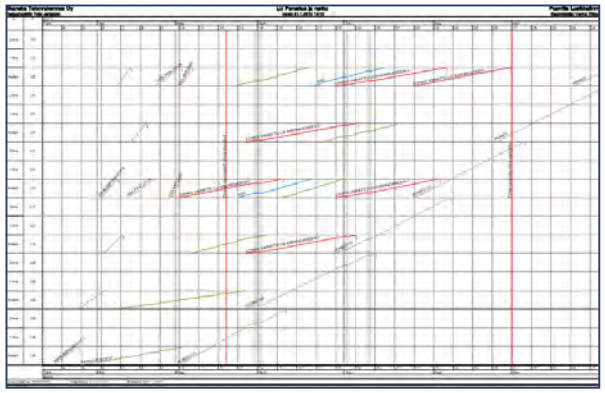
# Schedule planning and control



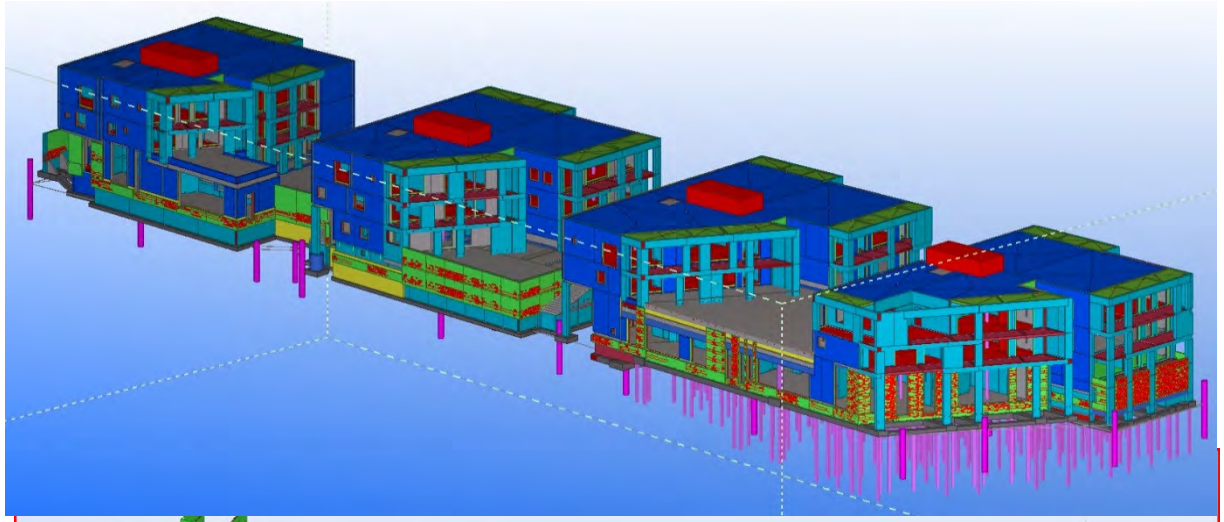


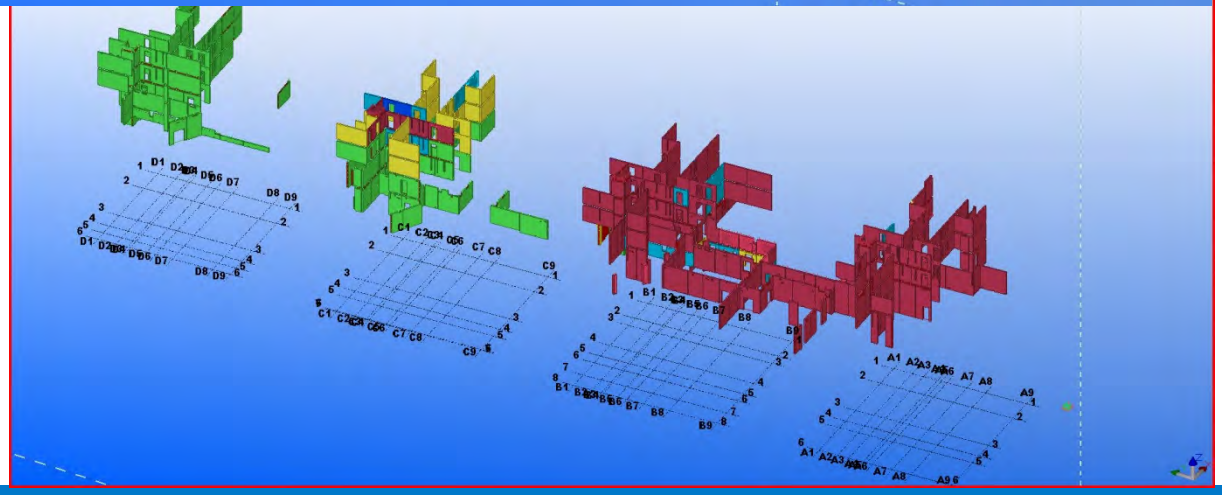




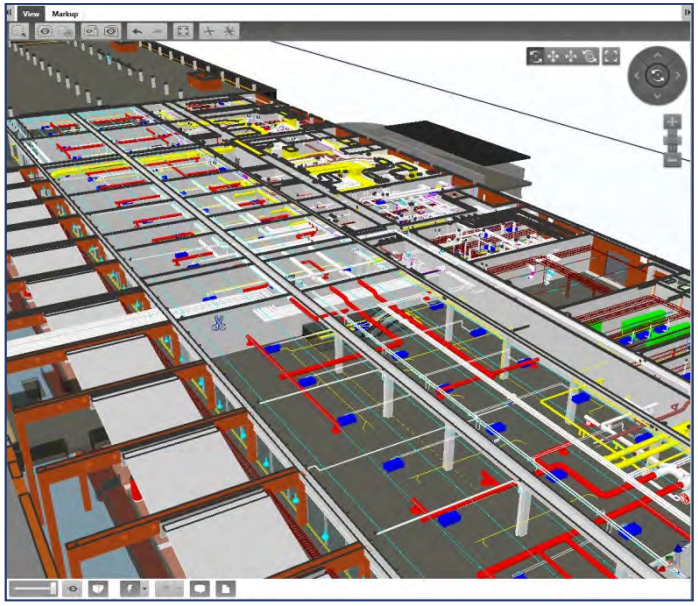


# Follow up / control of precast concrete element schedule by using BIM



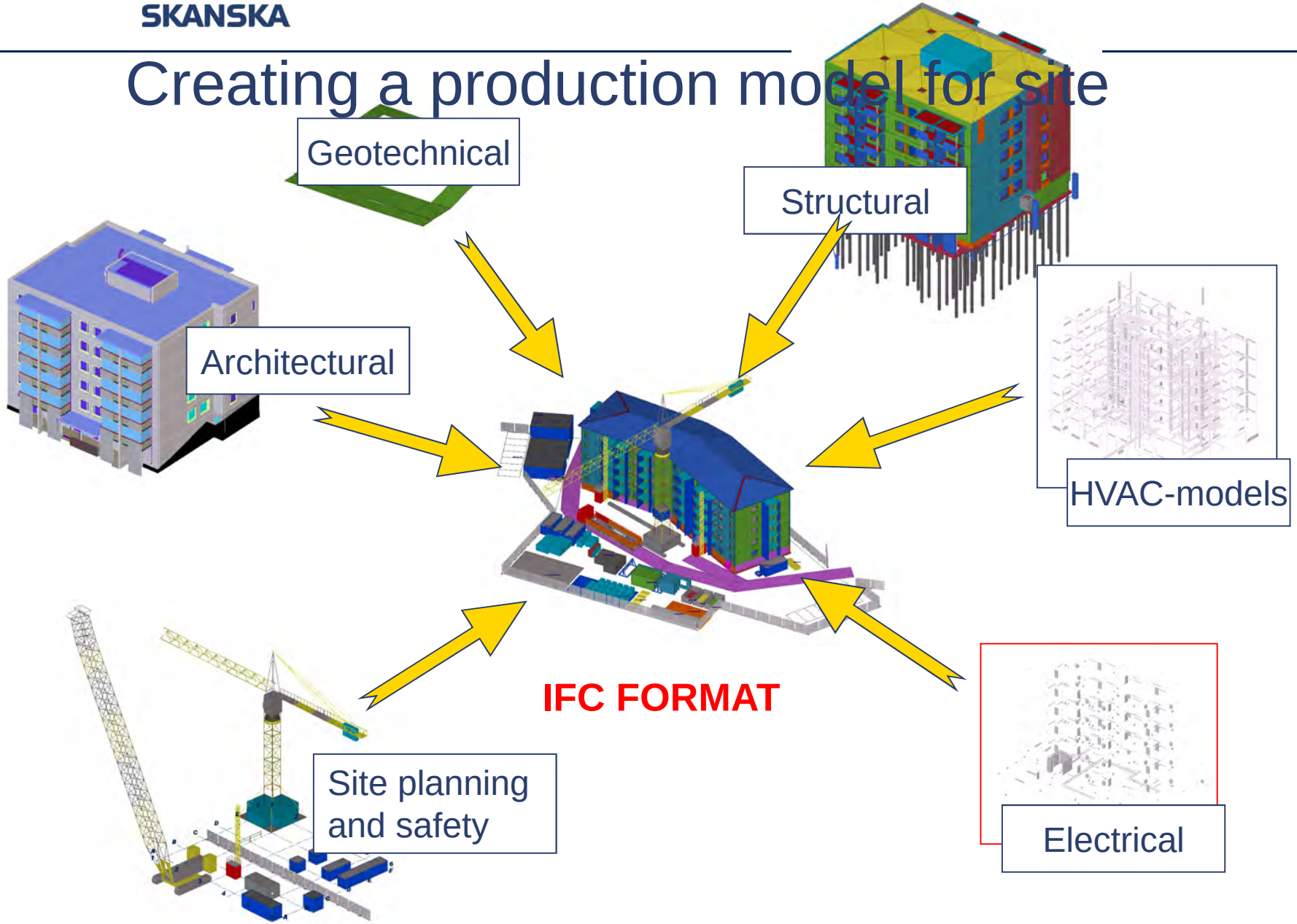


# Design, planning and production collaboration



SKANSKA

# Creating a production model for site



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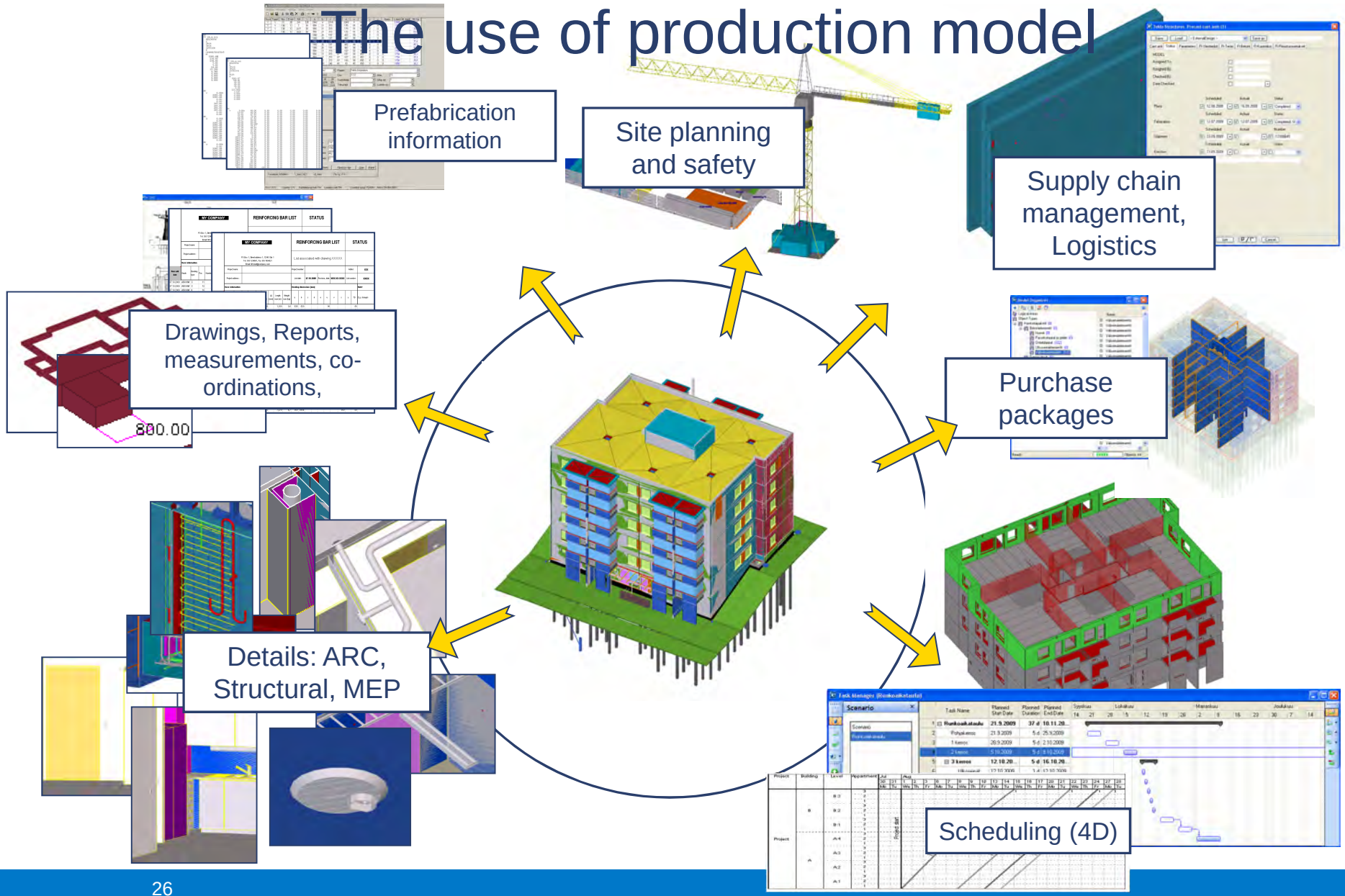
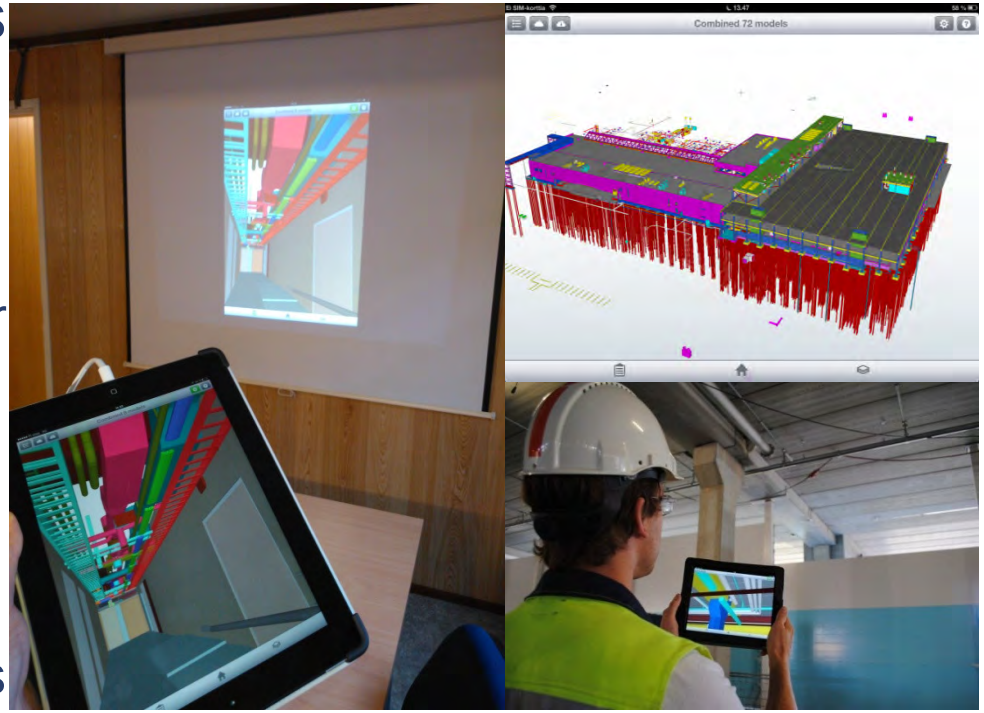
# The use of production model



# Mobile 3D models (Field 3D -software)

Supervisors, subs, clients surveyors

- Viewing 3D details with subs and blue-collars
- Solving installation order
- Getting information of components
- Quality and safety checking
- Measures and quantities
- Improved communication

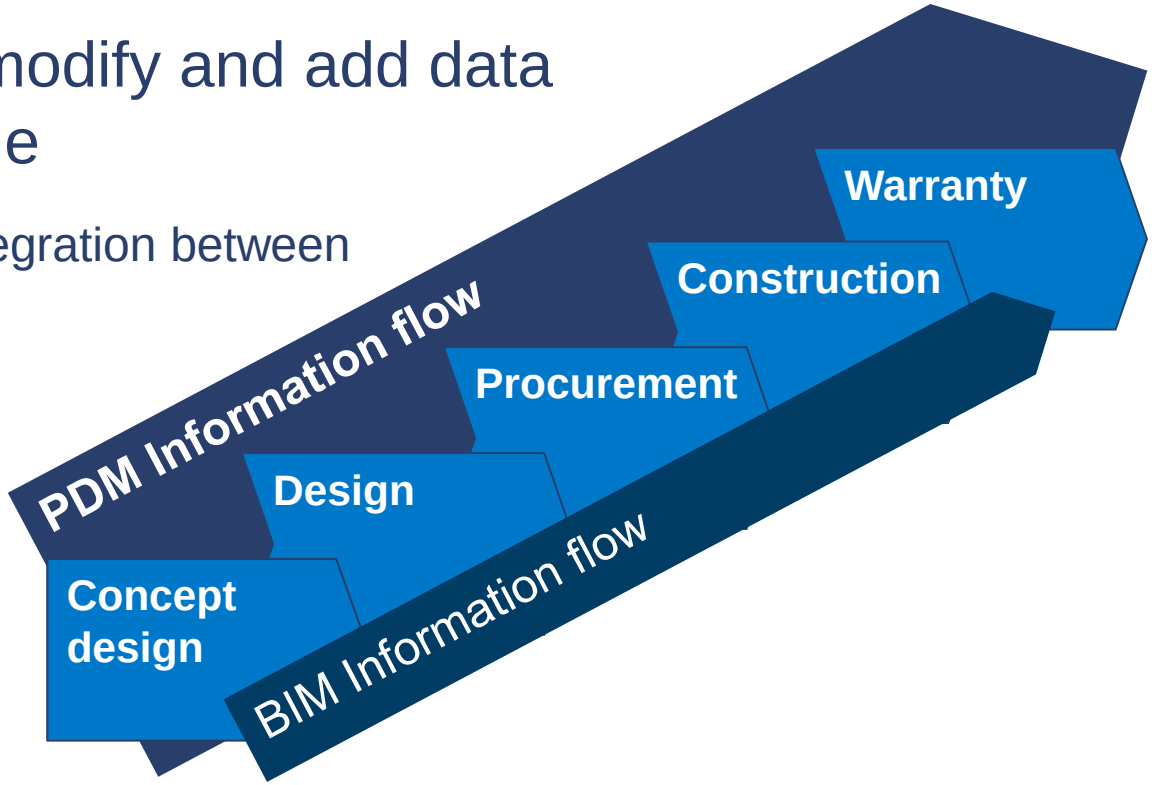


# Future with BIM

- Paperless process
- Better communication
- Whole supply chain connected
- Shorter project delivery times
- Improved productivity

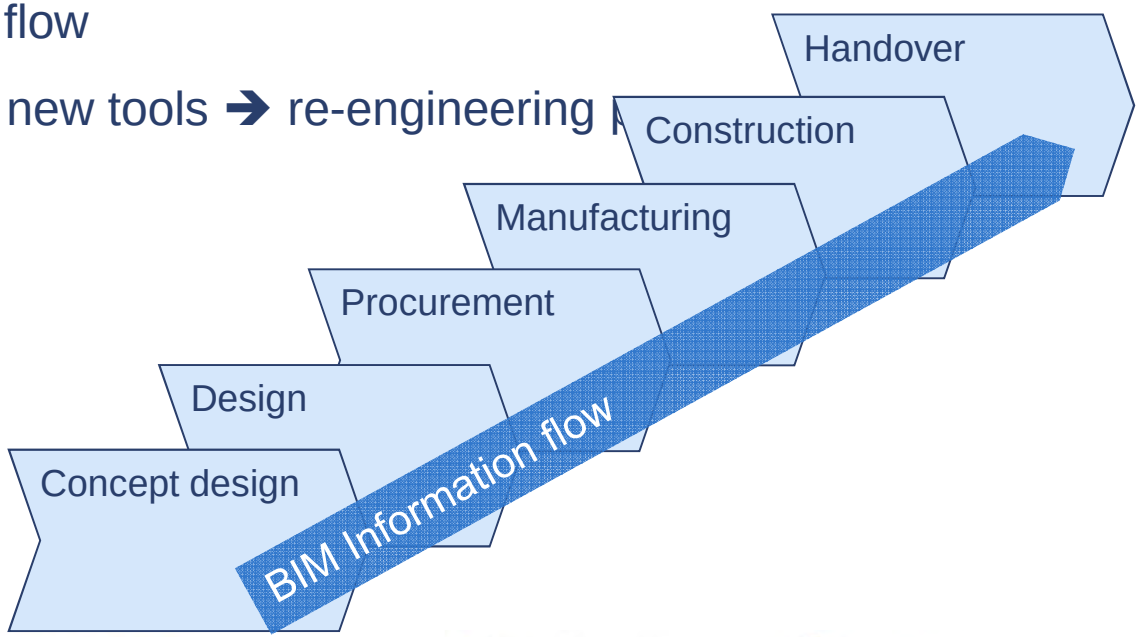
# Increased use of IT on sites sets demands on processes and systems

- Improved user experience & ease of use
- Mobility – use, modify and add data with tablet/mobile
- Better information integration between the systems



# BIMCON Research Goals

1. BIM (Building Information Model) -based information flow through project phases and between participants in construction
2. Procedures and tools for contractors and suppliers to integrate product and production data into this flow
3. Take a full advantage of new tools ➔ re-engineering



# Further information of BIM

## RYM PRE research Program, BIMCON working package leaded by Skanska

Goal:

The first research program of RYM Oy is the PRE (Built Environment Process Re-engineering) program to be implemented in 2010-2013. Its aim is to create totally new procedures and business models for the real estate, construction and infra sectors. They will be more user-centred and supported by product model-based data management over the entire life cycle of the real estate, infrastructures and communities in question. The adoption of new business processes allows a significant increase in productivity and quality.

Results: http://rym.fi

## BIM in Skanska:

Skanska has been developing BIM globally together with all business units. More information about BIM in Skanska: http://skanska.com/BIM

# Build it first virtually!

## Thank you for your attention!