

South-Eastern Norway Regional Health Authority

**High quality health services equal to all,
regardless of age, place of residence, ethnic
background, gender or personal economy.**

A strategy for use of BIM during the assets life cycle & case study from the New Østfold Hospital

**EuHPN Seminar - Building Information Modelling (BIM) for Healthcare
TNO, Leiden (NL), 17.04.2014**

Birger Stamsø

Head of Project Strategies - Buildings and Property

South-Eastern Norway Regional Health Authority

Our mission:

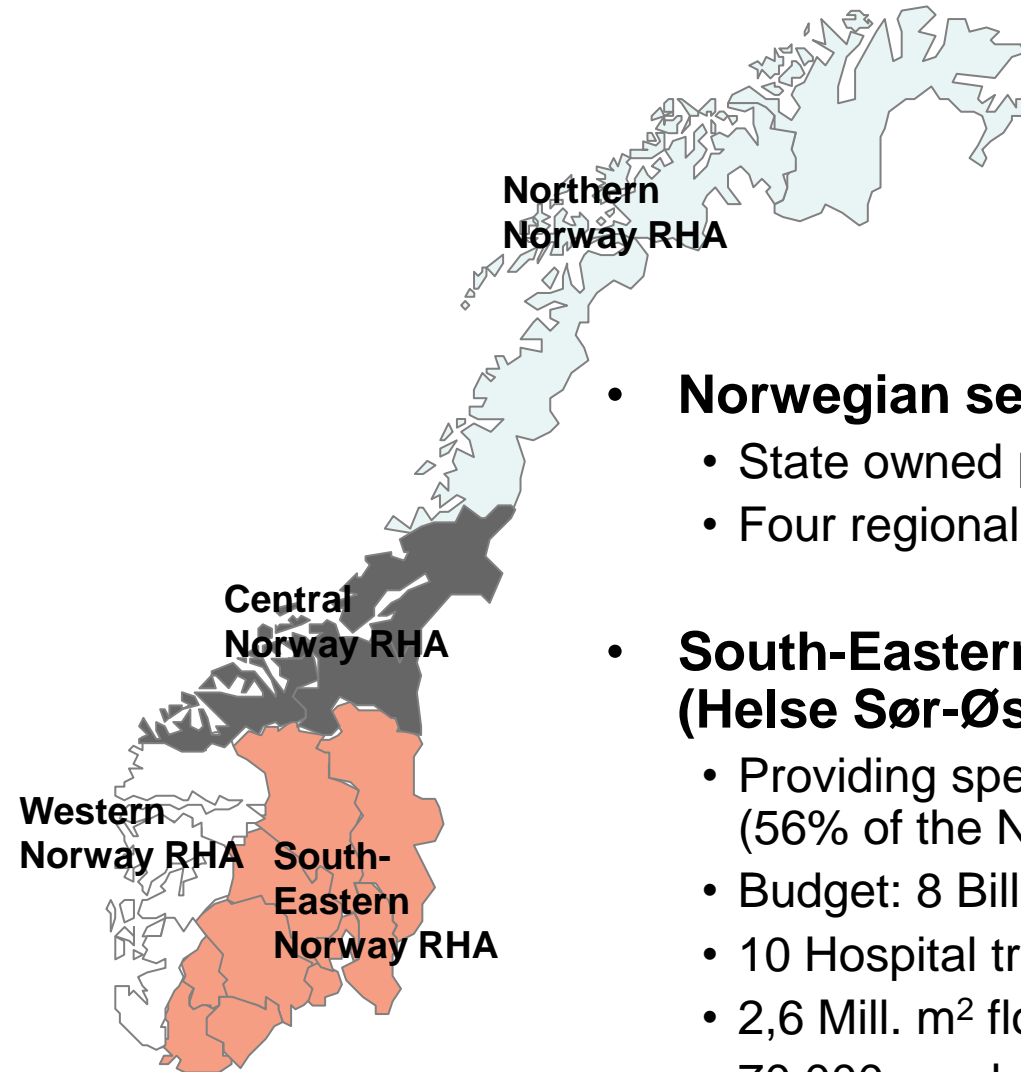
Provide high quality specialist healthcare services to all who need it, when they need it; irrespective of age, origin, ethnicity, gender or financial standing.

- **Norwegian secondary health services**

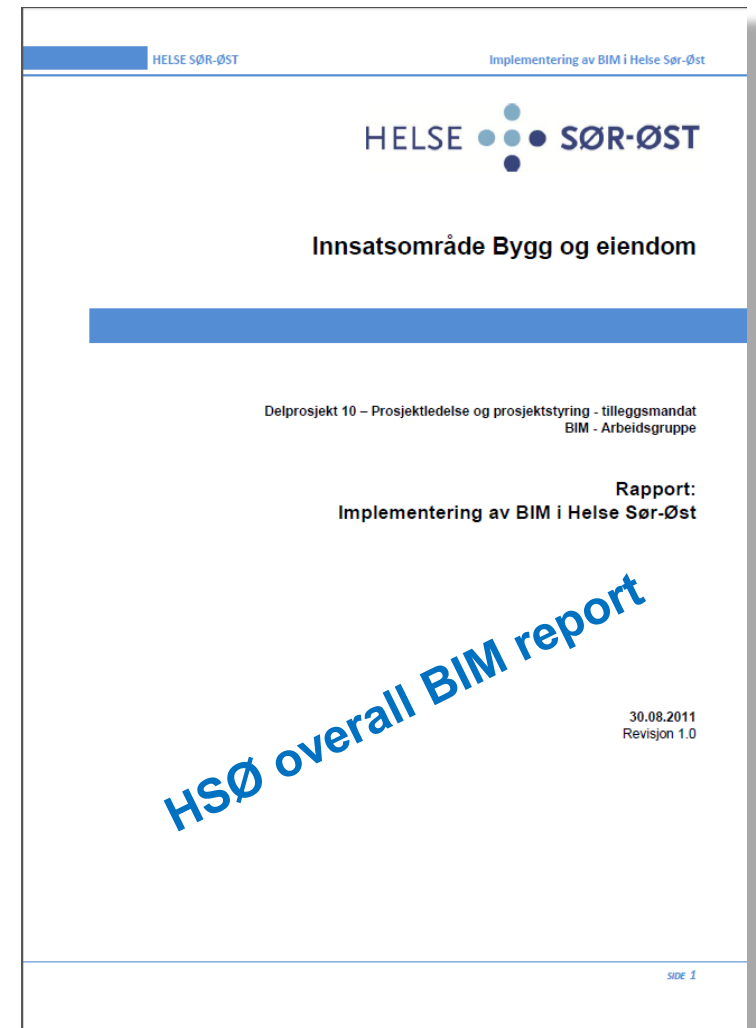
- State owned public funded health trusts
- Four regional health authorities controls 26 hospital trusts

- **South-Eastern Norway Regional Health Authority (Helse Sør-Øst HSØ):**

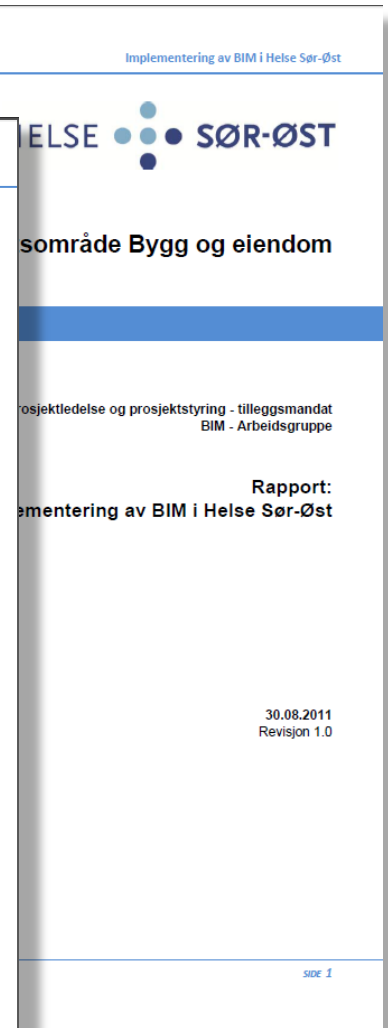
- Providing specialist health services for 2.8 Mill. inhabitants (56% of the Norwegian population)
- Budget: 8 Billion EUR
- 10 Hospital trusts, plus 5 private non commercial hospitals
- 2,6 Mill. m² floor area (excl. private hospitals)
- 70.000 employees



BIM strategy



BIM strategy



HELSE SØR-ØST

Implementering av BIM i Helse Sør-Øst

HELSE SØR-ØST

Prosjektledelse og prosjektstyring - tilleggsmandat
BIM - Arbeidsgruppe

Rapport:
Implementering av BIM i Helse Sør-Øst

30.08.2011
Revisjon 1.0

Side 1

HELSE SØR-ØST

© HSØ 2014 - kib

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The image shows two overlapping document covers. The top cover is white with a blue header bar at the top containing the text 'HELSE SØR-ØST' and 'Implementering av BIM i Helse Sør-Øst'. Below the header, the text 'Helse Sør-Øst' is written in a large blue font, followed by 'sentralt og regionalt samarbeide i bygging og eiendom' in a smaller blue font. The bottom cover is also white with a blue header bar. It features the 'HELSE SØR-ØST' logo on the left and the text 'sentralt og regionalt samarbeide i bygging og eiendom' on the right. Below this, the text 'Prosjektledelse og prosjektstyring - tilleggsmandat BIM - Arbeidsgruppe' is visible. The bottom cover also has a blue footer bar with the text '30.08.2011 Revisjon 1.0' and 'side 1'.

BIM strategy

Forsvarsbygg

The Norwegian Defence Estates Agency

Statsbygg

Public Construction and Property Management

Helse Sør-Øst

South-Eastern Norway Regional Health Authority

Helse Midt

Central Norway Regional Health Authority

JOINT STATEMENT – openBIM

Background

Our organizations have already implemented open international buildingSMART standards in our new building projects. We consider this to be the most future oriented solution for the building industry. Open standards, based on user-driven development of technology, gives the possibility to achieve seamless data exchange between all domains through the whole project/building life cycle. Based on this, our organizations have chosen buildingSMART's openBIM standards as the foundation for exchange (export, import), storage and process of the Building Information Model. We consider the adaptation of open international standards as crucial in order to achieve the goals we have set for our organizations.

Intent

We consider predictability as a major value in our business development plan, and we want to give the building industry a clear understanding of our intentions.

Within 1st of July 2016 we will demand that all software used in our projects in order to create, edit, store or process data from the Building Information Model, shall support complete interoperability, by communicating and sharing building information based on openBIM. This software shall be certified to export, link and import all information in the latest official version of open international format like IFC (ISO 16739) and BuildingSMART International official IDs and Model View Definitions.

Open Signatory Process

Our intention is to add new signatories to this public statement. Signatories are intended to be other construction clients and building owners in Norway. New signatories must approve this public statement and must be accepted by all the existing signatories.

Annual Review

We expect the signatories to conduct an annual review of this Public Statement and revise it - based on consensus - according to new developments, as openBIM is rapidly evolving.

The following signatories agree with the intentions of this Public Statement.

Date: 28.02.2013



Peder Olsen
Chief Executive Officer (CEO)
South Eastern Norway Regional Health Authority

01	For implementering	28.02.2013		
Rev.	Beskrivelse			
Kontraktreferansens tegn:		Bygg nr.	Ekte nr.	Serie
Prosjekt	Kontrakt nr.	Page	Dok.type	Linn
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BIM strategy

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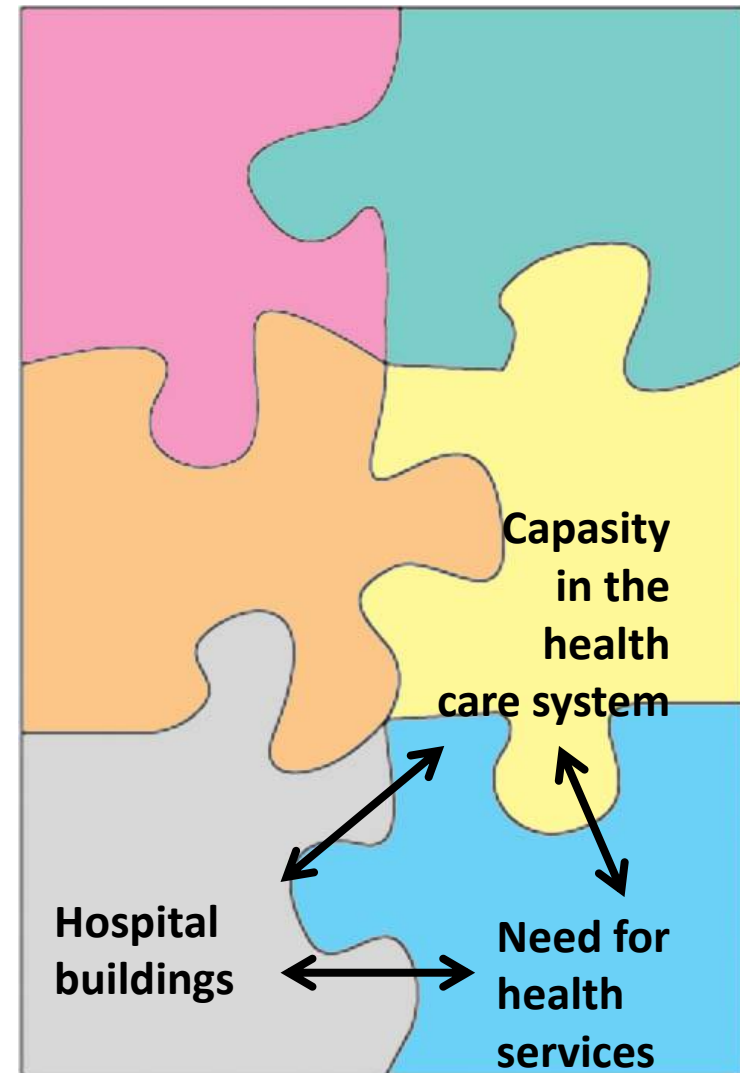
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Hospital buildings – a strategic perspective

- Hospital buildings is one of several pieces in a health care system, where the overall objective is to get better health for the population.
- Hospital buildings is a strategic tool for the production of health services.
- The core business gives the premises for the construction and property management.

Health care system:



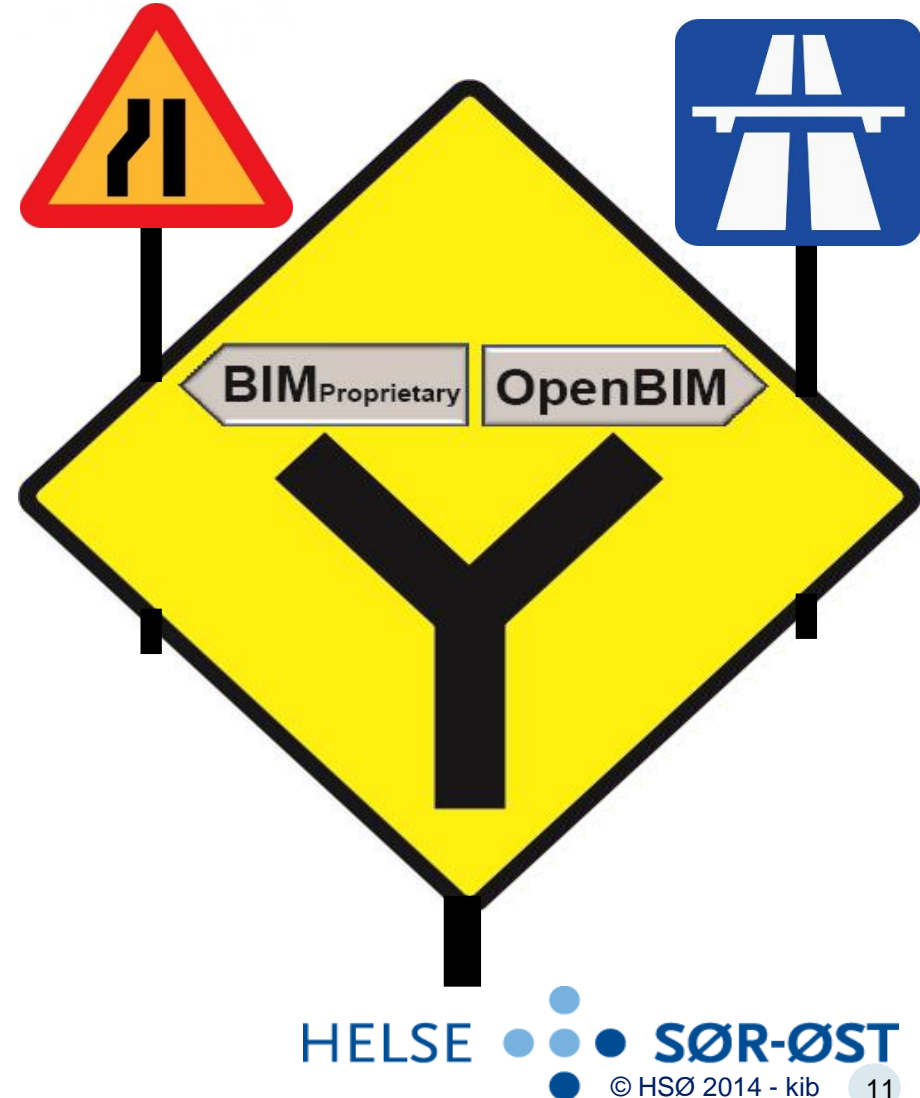
Our BIM vision

- Through BIM, achieving reduced cost and time spent on building projects, and at the same time getting better functional areas – with less faults.
- BIM is the concept and tool to reduce facility management and operations costs during the buildings lifespan.



HSØ overall openBIM strategy

- Adopted November 2011
- Give clear direction to the organization.
- Ensure proper focus from top-level management - throughout the organization.
- Focus on “business objectives” rather than technicalities.
- Give clear signals to the building industry, in relation to where South-Eastern Norway Regional Health Authority is moving.



HSØ overall openBIM strategy

- **openBIM in all new projects**
 - BIM is a strategic element in order to reach the prescribed quality, time and cost.
 - Contribute to a 10 % increase in efficiency within the property area (2010-2015).
- **Our commitment to BIM shall be based on openBIM and guidelines from building SMART**
- **Contribute to the implementation of BIM in the building industry**

URL – South-Eastern Norway Regional Health Authority BIM strategy:

http://www.helse-sorost.no/omoss/avdelinger/bygg-og-eiendom/Documents/BoE%20Vedlegg%203%20-%20BIM-strategi%20for%20Helse%20Sor-Ost_Rev1-0-1.pdf

HSØ overall openBIM strategy

- **South-Eastern Norway Regional Health Authority will optimize the use of openBIM in the organization.**
 - Training and education
 - Focus on the transition between building phases (customer/supplier relationship).
 - Focus on Lifecycle Costs (LCC - included health production cost), rather than investment cost.
 - Exploiting the potential of BIM requires ongoing assessment of the tools and methodologies that will contribute to this.
- **Focus on industrialization in building projects**
- **Securing the property rights**

openBIM strategy: Industrialization

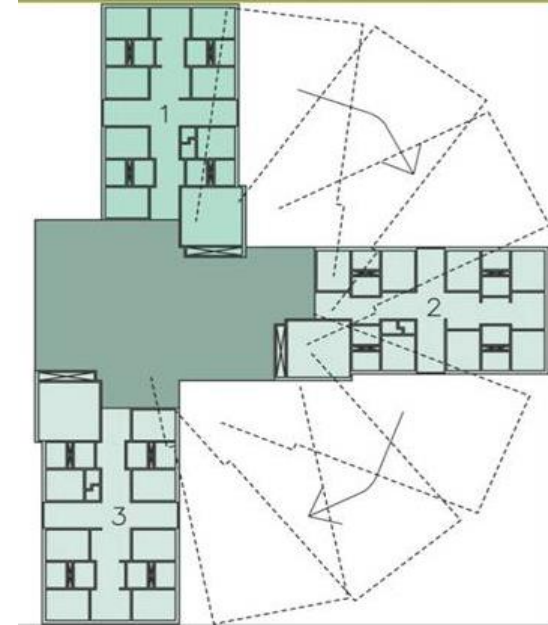
- Standardization of floor lay-out
- Standardization of technical solutions
- Adapting structural design of the building to an industrialized concept
- Cost efficient building process
- Low Lifecycle Cost (LCC)
- Advanced building logistics

We consider BIM as an important element in industrialization of the building process.

Knowledge libraries

Evidence based design

Learning from the last project



*Vestfold Hospital Trust,
Building stage 7.1*

openBIM strategy: Facility Management

Space planning and usage:

- 3D-BIM gives the possibility to plan the usage of the buildings better. Spaces can easily be connected to the functional hospital organization.
- It will be easier to check functional requirements with building attributes, when we are considering a change in the spaces.



Operations:

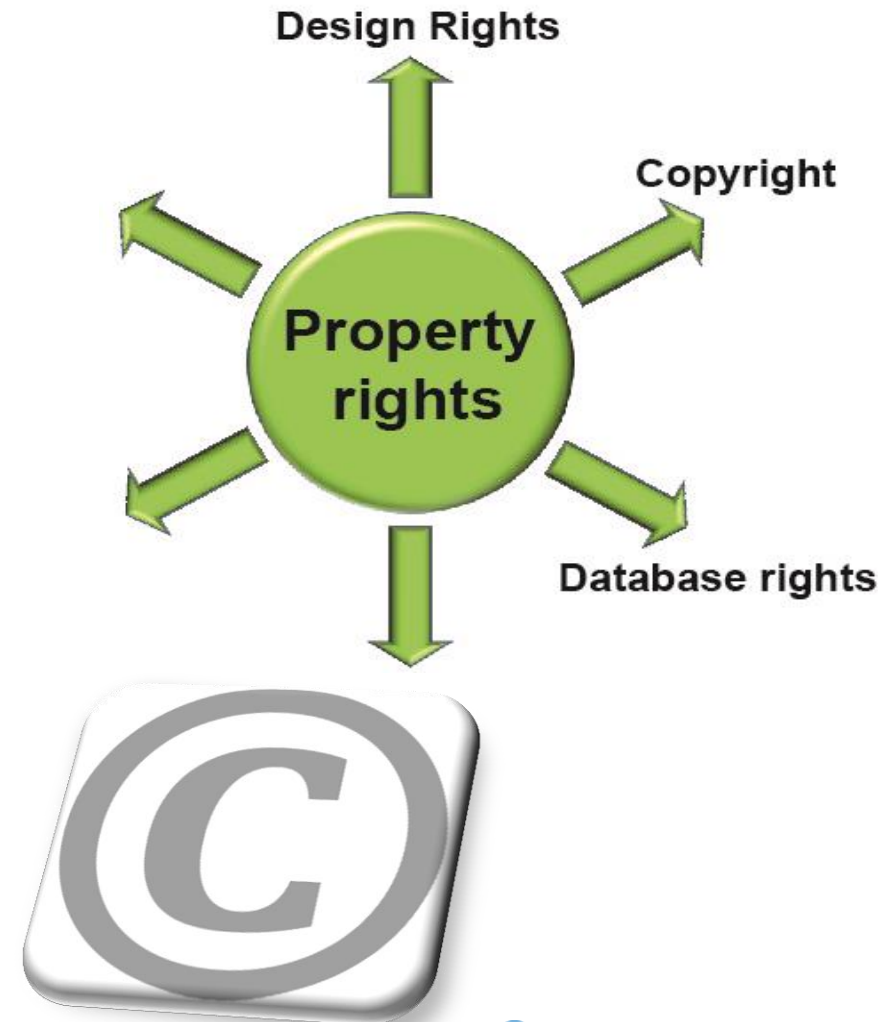
- Establish optimised Facility Management Systems, where the operating personnel (from the engineer to the plumber) have easy access to **all necessary information** in every operating situation.



openBIM strategy:

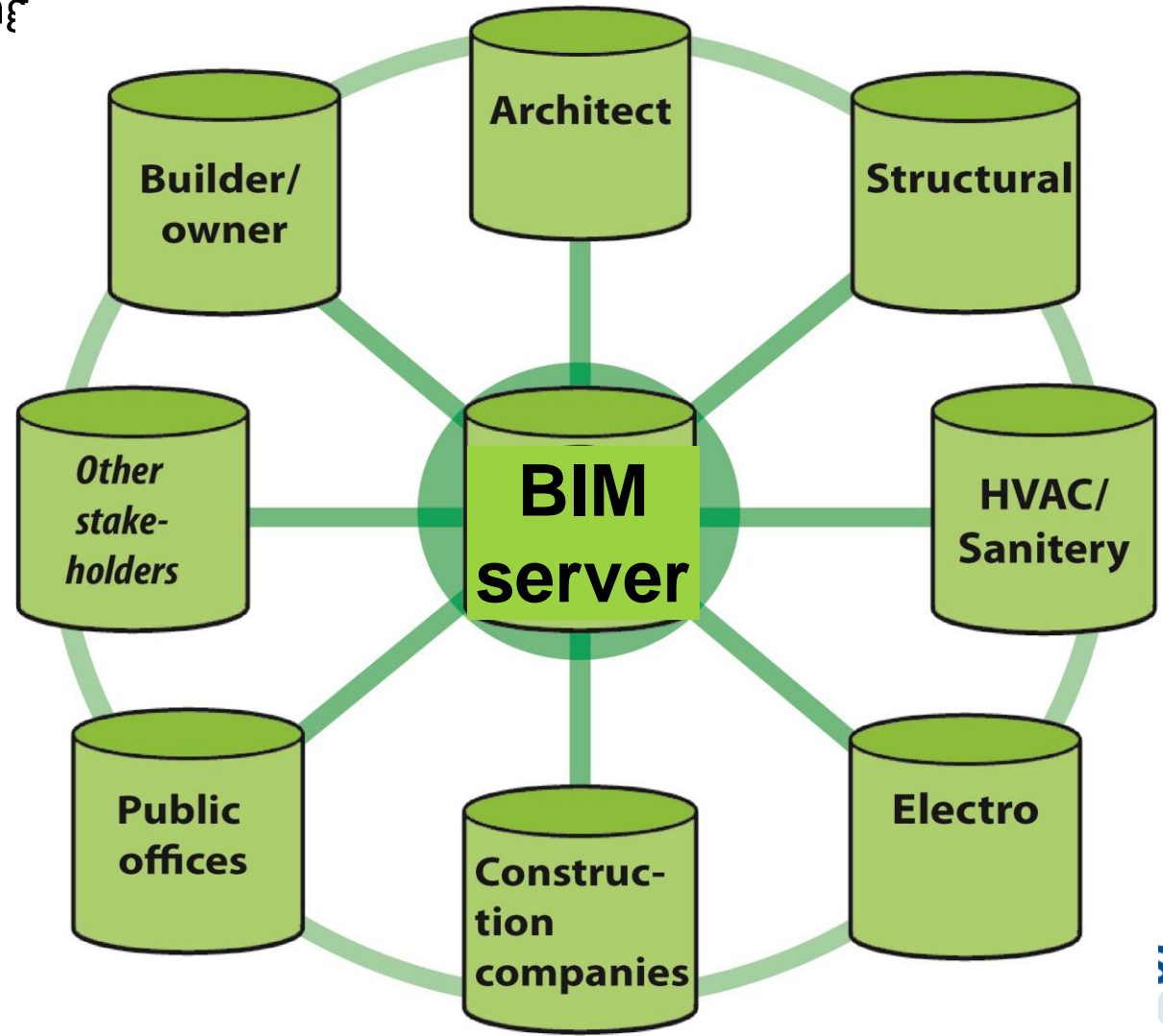
Securing the property rights

- Securing all legal rights to the work done in all new BIM projects, in order to be able to reuse the functional and technical solutions in the organization and other regional health authorities.

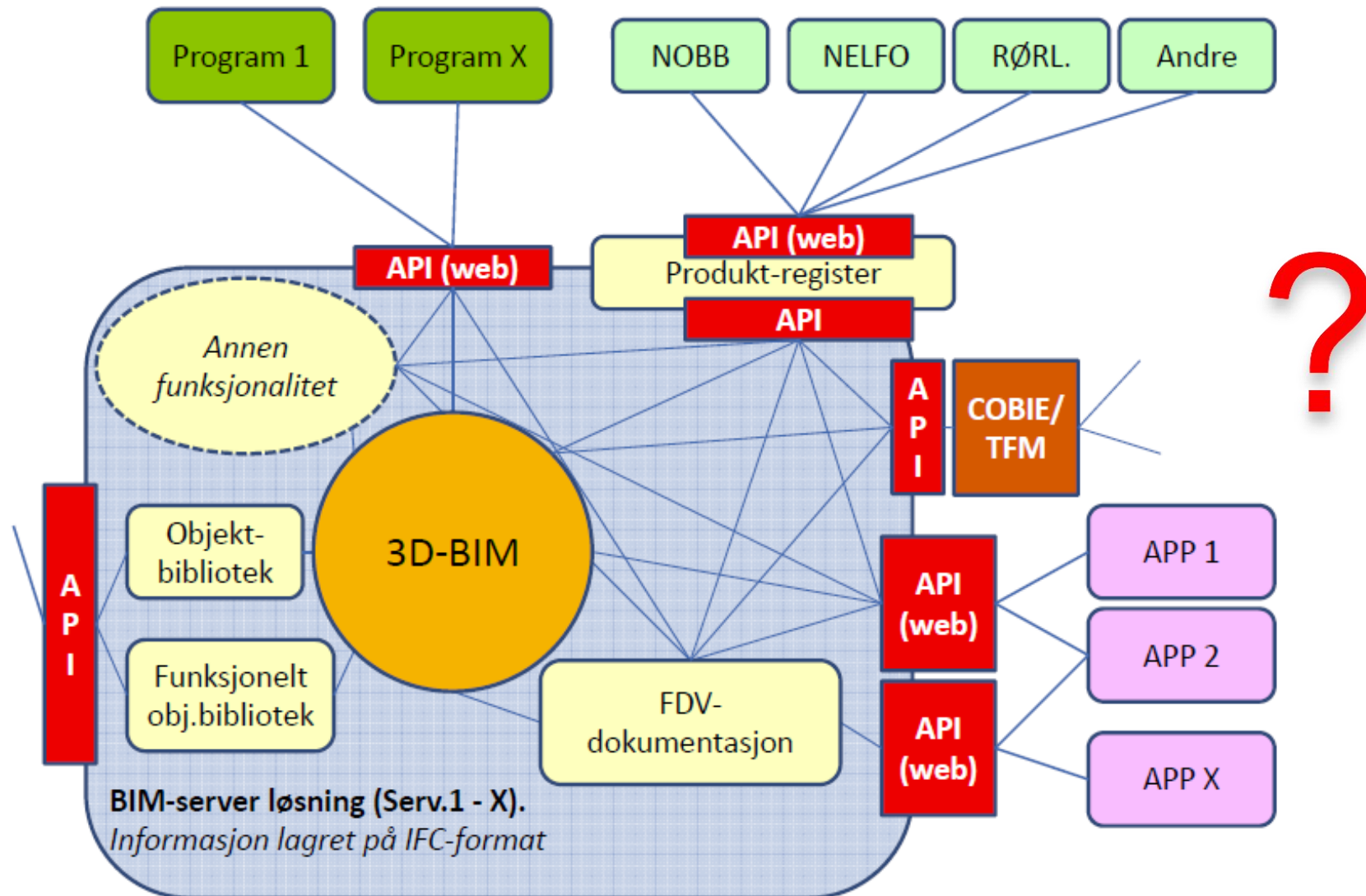


openBIM strategy: Implementation of BIM-server

- BIM-server for both building projects and Facility Management



Another approach



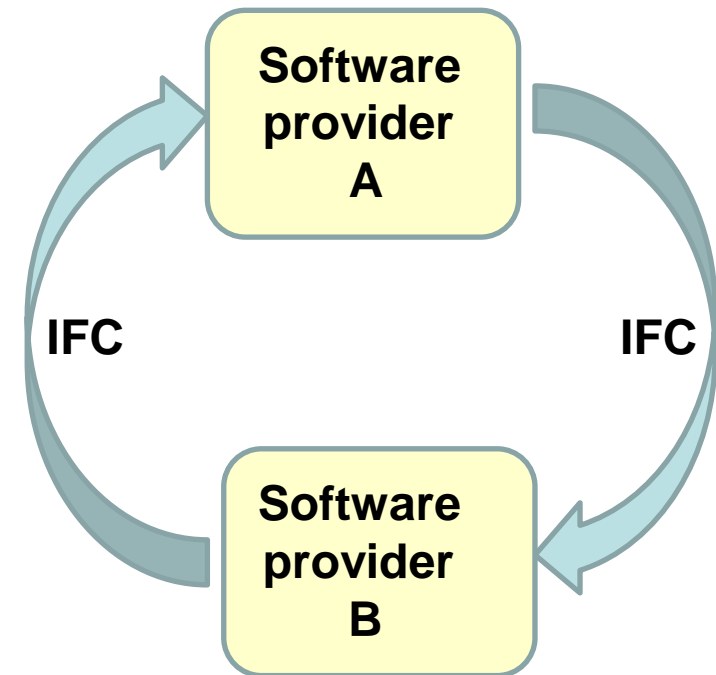
Inge Aarseth, SiV/HSØ, 2011

openBIM strategy:

Requirements to the models and storage formats

- All information in projects to be stored on open international formats (IFC – latest available version)

***From 01.01.2014** the complete information produced by architects, consultants, contractors, etc., in their software applications, shall be exported to openBIM (IFC). All information shall be stored on the latest publicly available version of the openBIM IFC format. Similarly, software applications shall be able to import all the data stored in openBIM (IFC).*



Complete Round-trip

openBIM strategy: Implementation

Our BIM Implementation strategy:

- Divided in eight parts with a list of actions in each part.





Treatment building from north west

New Akershus University hospital

Competition 2000, start building March 2004 - October 2008

Ca. 117.000 m² new construction, 20.000 m² existing, 31.000 m² parking – 1 billion Euro

22 Operating theaters, 17 Diagnostic imaging labs, 615 Beds

Architect and HVAC complete 3D BIM model (Autodesk ADT / Architecture + Magicad)

New Østfold Hospital, Sarpsborg



New Østfold Hospital, Sarpsborg



New Østfold Hospital, Sarpsborg

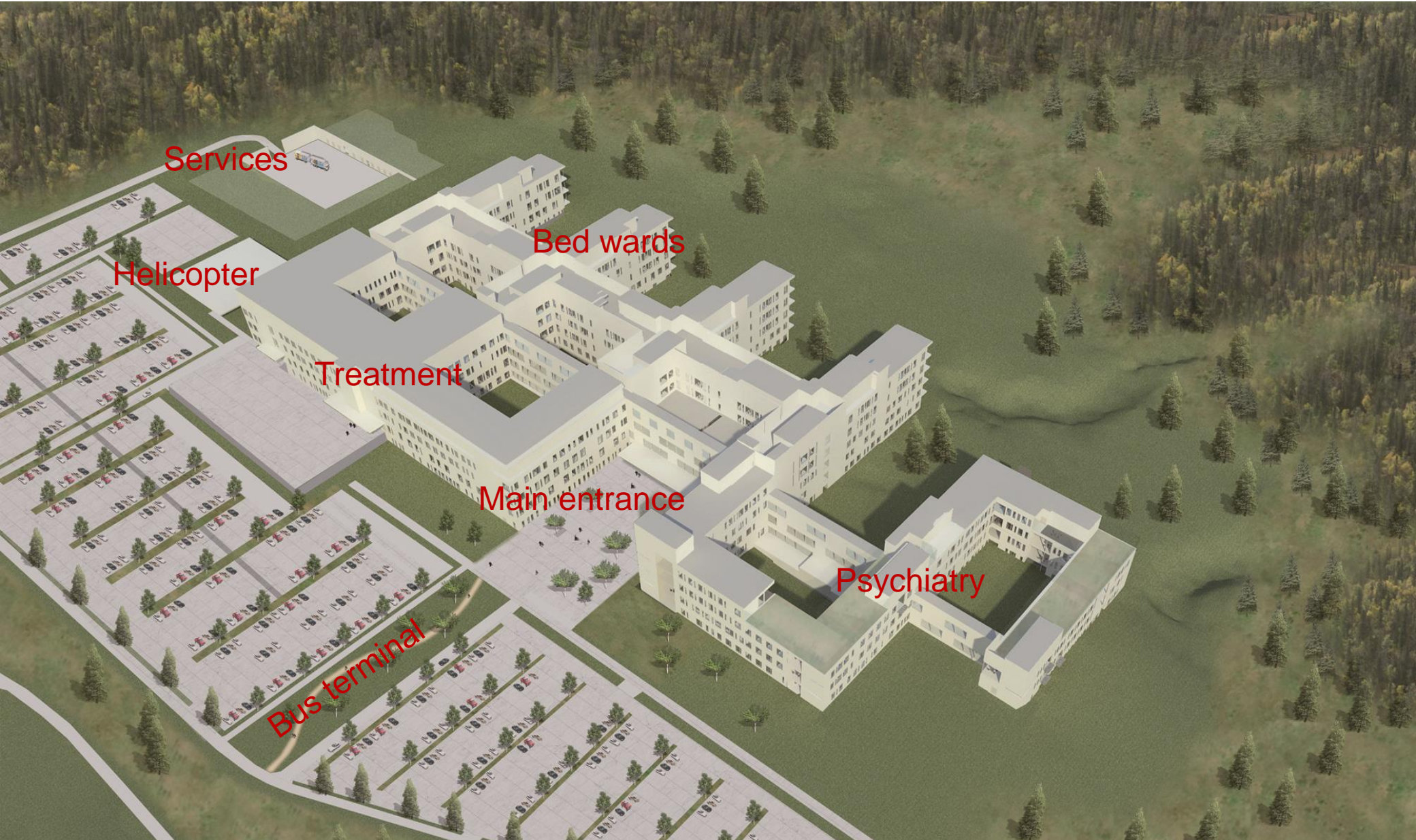


New Østfold Hospital – Project BIM strategy

Use of BIM shall contribute to achieve the project targets:

- Secure good information and basis for decisions
- Show positive and documented effects of the use of BIM and open BIM on costs, time, quality and Safety/health
- Facilitate for cost efficient facility management through the lifecycle of the building
- Carry through and document a showcase for other hospital projects
- Establish systematic procedures for the use of BIM and open BIM which will be of value / a learning case for other projects
- Better quality on the construction documentation
- Industrialization of the construction process
- Less errors on site
- Better user process

New Østfold Hospital – Facts



New Østfold Hospital – Facts

- **Kalnes**

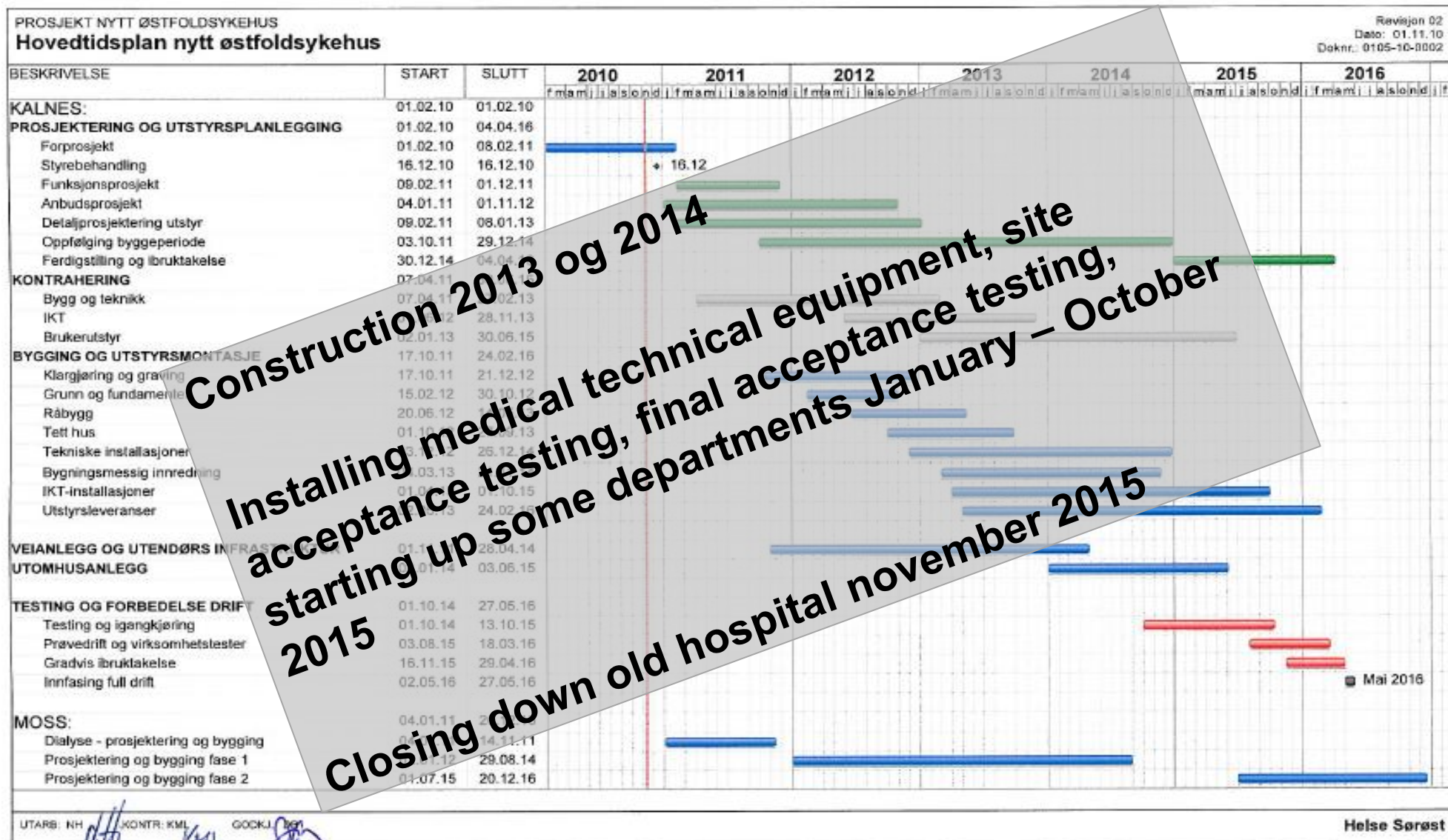
- 85 300 m² gross area
- 3 150 user rooms
- 500 technical rooms
- 620 corridors etc.

- 1 000 types equipment 10 000 instances
- 400 types furniture 10 000 instances
- 2 000 types fixed furniture 15 000 instances
- 1 500 types HVAC/data/lab etc. 10 000 instances

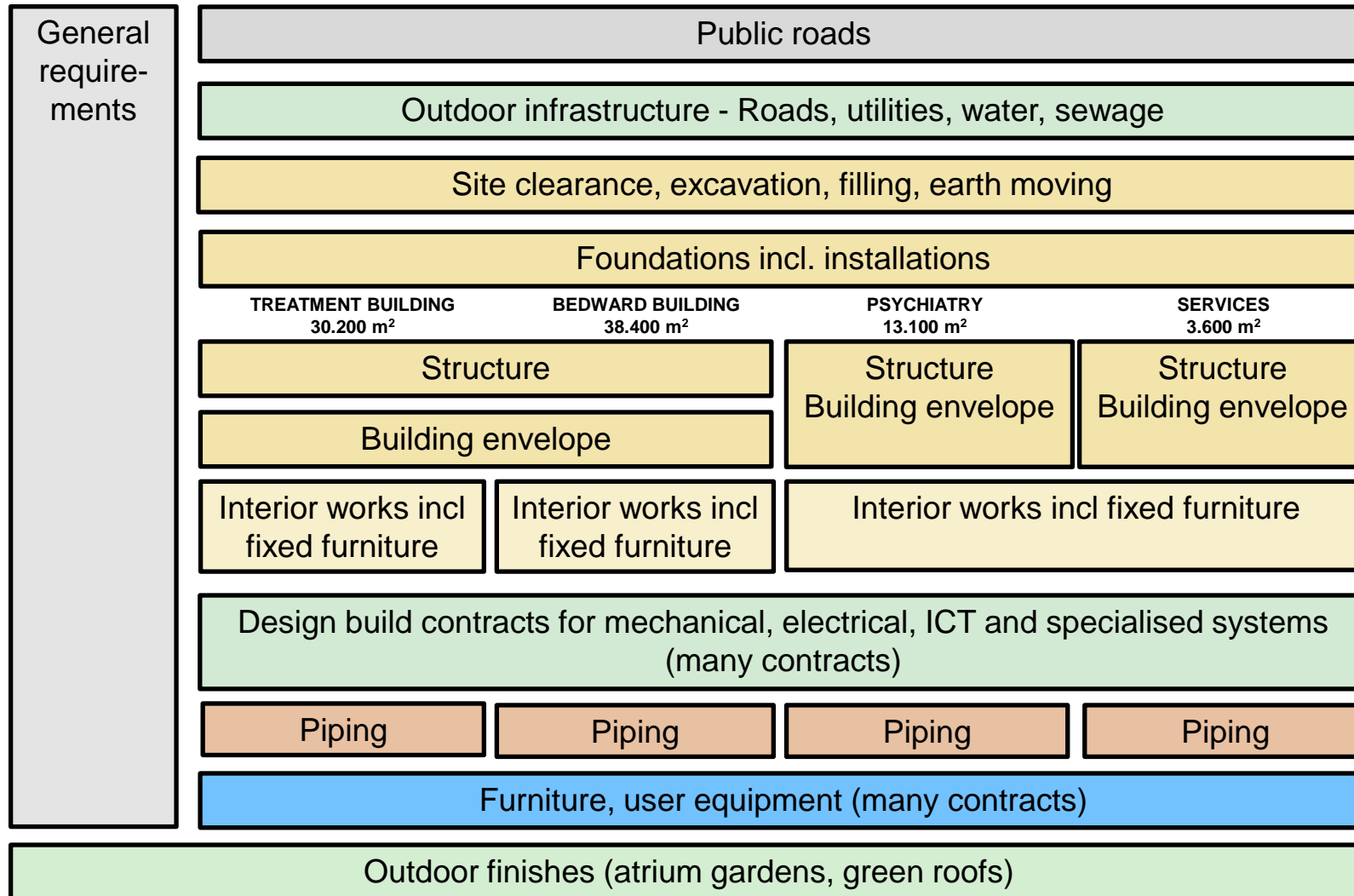
- **Costs** (P50-price level february 2010)

- Total projectcost 5 090 MNOK incl. Equipment and VAT
- Contractors 2 450 MNOK exl. VAT

New Østfold Hospital – Facts

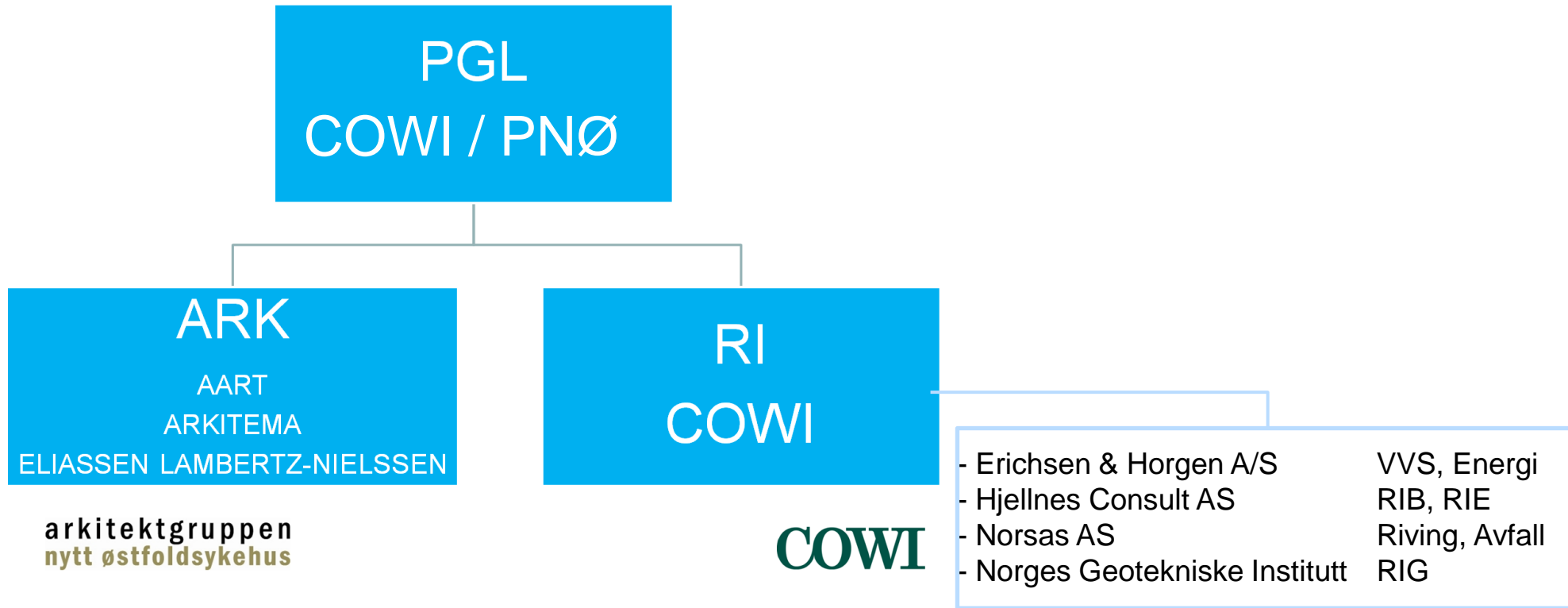


New Østfold Hospital – Contract structure



New Østfold Hospital – Contract design team

Consequently the BIM strategy was made part of the contract with the design team



New Østfold Hospital

Design team BIM authoring tools

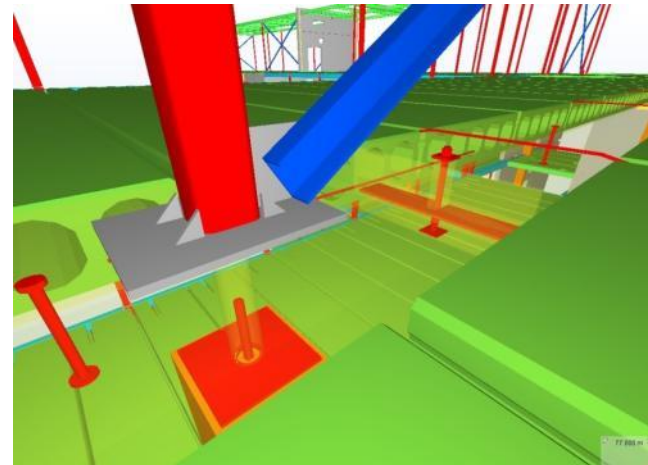
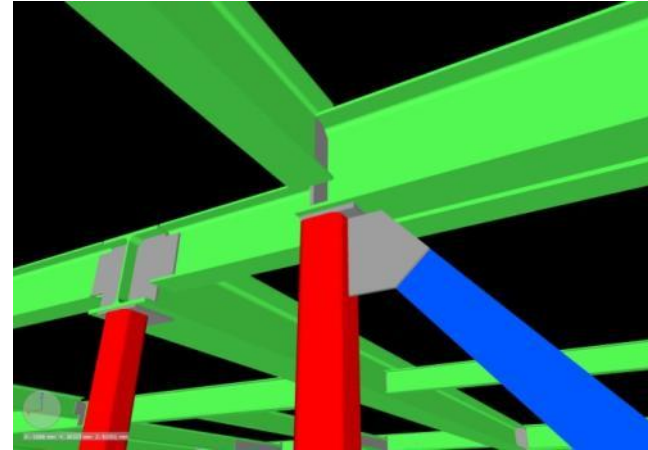
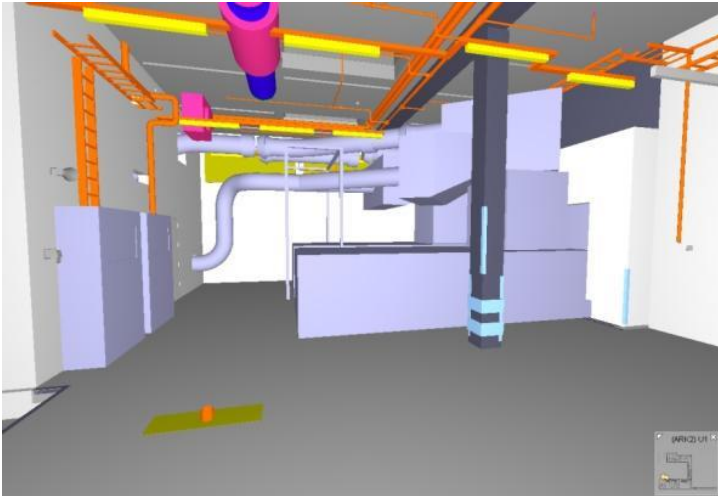
- ARK - REVIT Architecture
 - RIB - REVIT Structure
 - RIE - Revit MEP with CQ tools/Naviate (from ACAD+MagiCAD)
 - RIV - Revit MEP with MagiCAD (from ACAD+MagiCAD)
 - AKU - Revit + Cowi adoption (from ACAD+COWI menu)
 - RIBr - Revit + Cowi adoption (from ACAD+COWI menu)
 - Landscape - Autodesk Civil
-
- QA - Solibri
 - Schedule - Safran -> MS Project + Naviswork

New Østfold Hospital

Contractor and manufacturer design

Basically structure (with Tekla)

- Kynningsrud
- Metacon
- Eleiko
- Husvik



- Very detailed. Decide what to be included in the as built model

New Østfold Hospital

Sharing model data

- The model is available in standard IFC format.
- Open BIM
- All the disciplines export their models to Ifc every Thursday
- The client (PNØ) assembles the models to one model saved in Solibri format
- The assembled model is made available in a project hotel for the design team, the clients team and the contractors
- The model is also uploaded to a central server for streaming to mobile devices

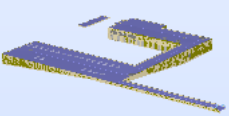
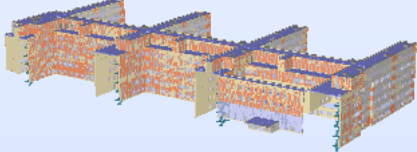
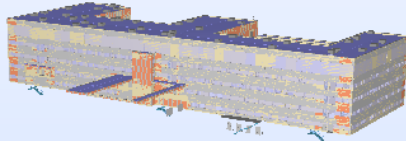
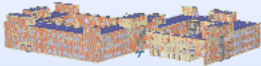

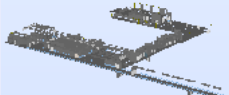
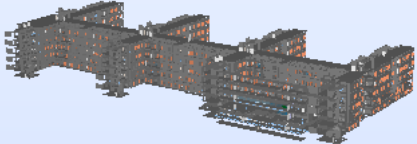

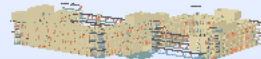
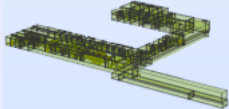
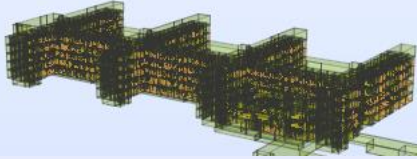
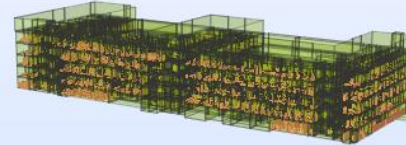
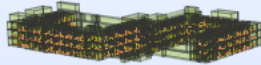
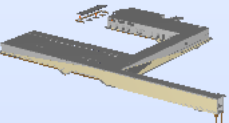
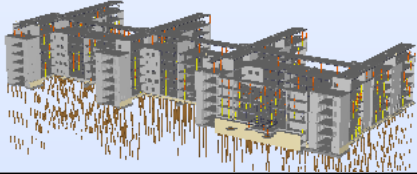
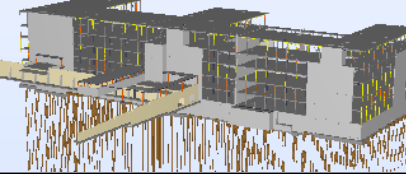
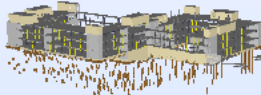

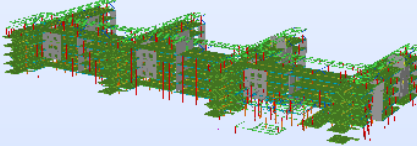
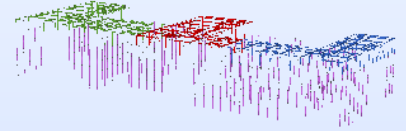
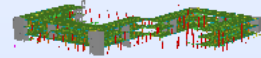
New Østfold Hospital

Export to Ifc

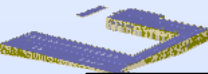
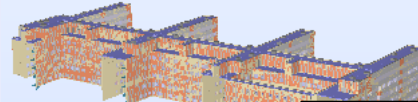
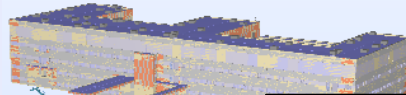
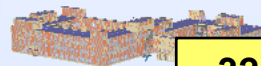


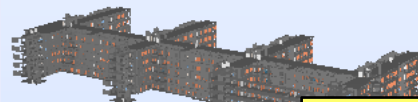
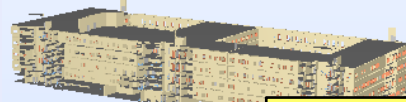
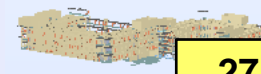
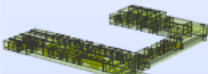

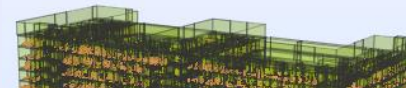


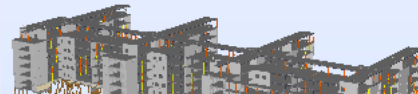
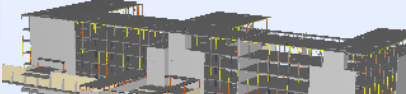


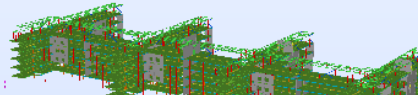
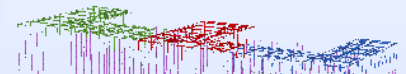
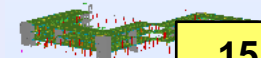
Different export tools gives different Ifc models

- REVIT Architecture Revit, Naviate
- REVIT Structure Revit
- Revit MEP / Naviate (EI) Revit MEP, Naviate
- Revit MEP / MagiCAD (HVAC) Revit MEP, Magicad, Naviate
- Very time consuming (up to 10 hours for a file)
- Ifc 2x3 – Important to get Ifc4 as fast as possible

Model files Architecture and Structure

	Services	Bed wards	Treatment	Psychiatry	Access
A230 Building envelope					
A240 Indoor					
A270 Interiors					
B200 Structure					
X200 Structure Prefab (Tekla)					
X230 Envelope Prefab		Husvik	Husvik		

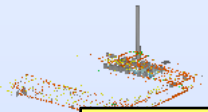
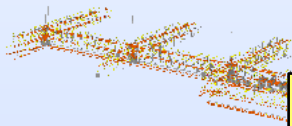
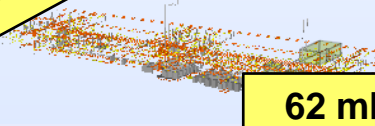


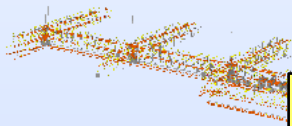
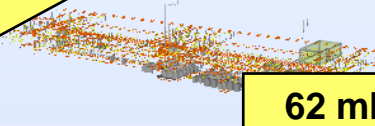
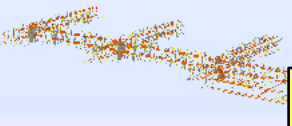
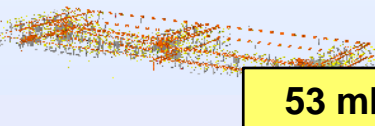
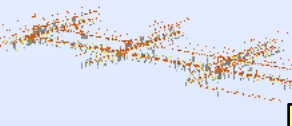
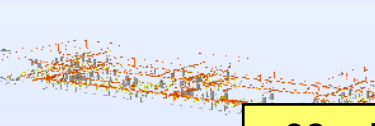
Model files Architecture and Structure

	Services	Bed wards	Treatment	Psychiatry	Access
A230 Building envelope	 5 mb	 73 mb	 31 mb	 32 mb	 4 mb
A240 Indoor	 9 mb	 94 mb	 53 mb	 27 mb	
A270 Interiors	 7 mb	 134 mb	 93 mb	 30 mb	
B200 Structure	 5 mb	 150 mb	 36 mb	 71 mb	 1 mb
X200 Structure Prefab (Tekla)		 7 filer, 68 mb	 14 mb	 15 mb	
X230 Envelope Prefab		Husvik	Husvik		



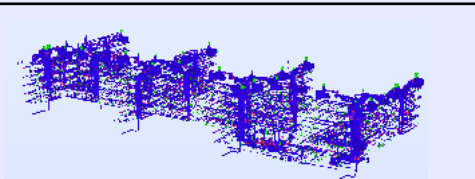
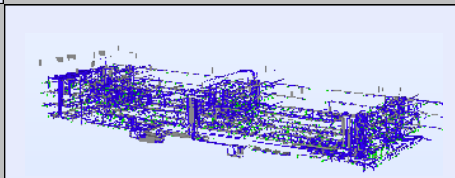
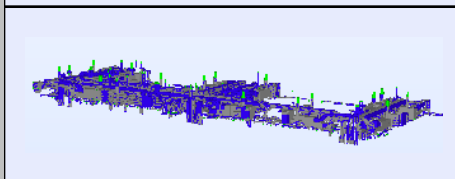

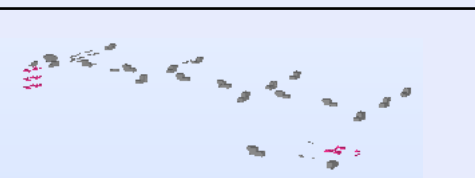
Model files Electro

	Services	Bed wards	Treatment	Psychiatry	Access
E300 Electrical					
E300 Electrical U2, U1, 01					
E300 Electrical 02, 03					
E300 Electrical 04, 05, Roof					

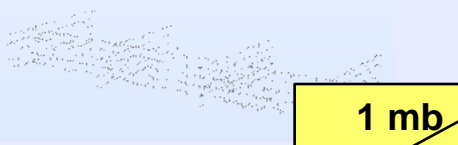

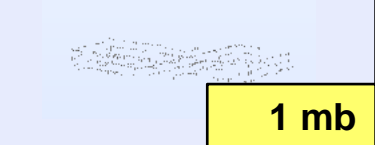
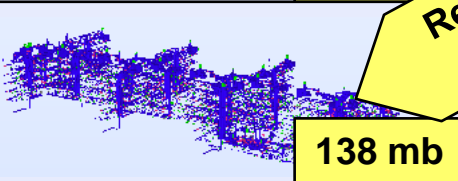
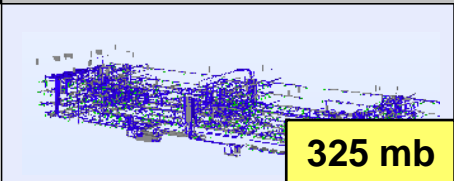
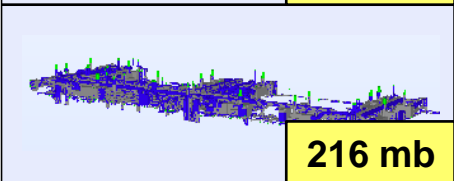
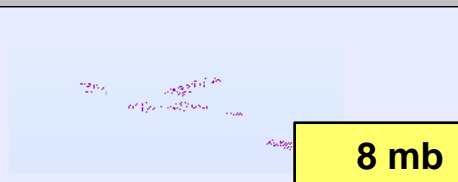
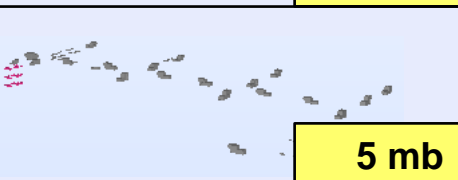
Model files Electro

	Services	Bed wards	Treatment	Psychiatry	Access
E300 Electrical	 19 mb	  Typical export 30 minutes		 64 mb	 1 mb
E300 Electrical U2, U1, 01		 58 mb	 62 mb		
E300 Electrical 02, 03		 55 mb	 53 mb		
E300 Electrical 04, 05, Roof		 46 mb	 38 mb		

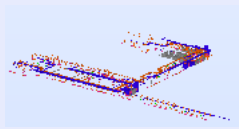
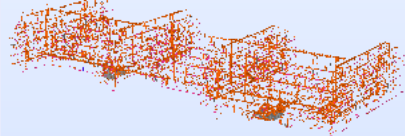
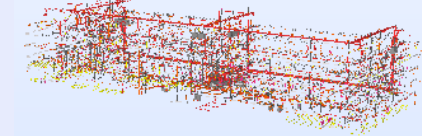
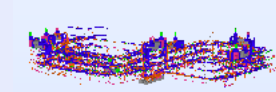

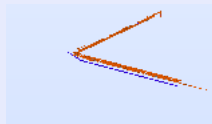
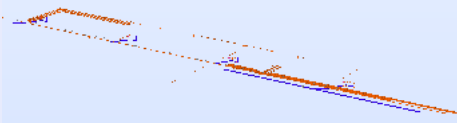
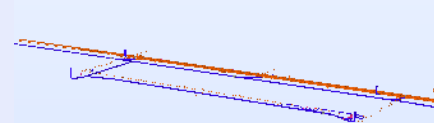
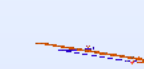


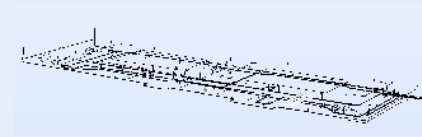


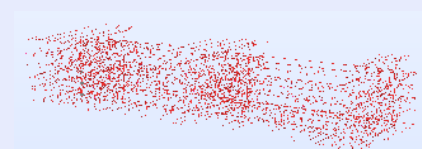



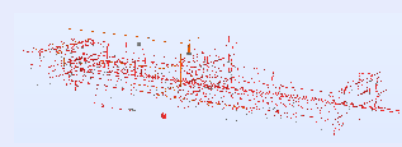


Model files HVAC

	Services	Bed wards	Treatment	Psychiatry	Access	
V200 Carriers						
V360 Air handling						
V360 Air handling U2 - 04 floors						
V360 Air handling 05 – roof						
V320 Floor heating						
V365 Air handling units						

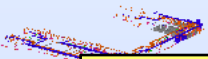
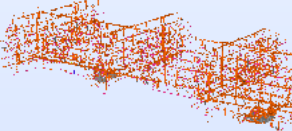
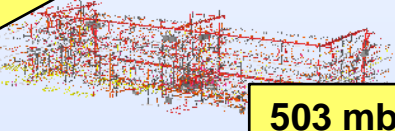

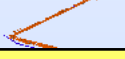



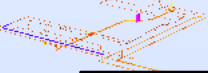

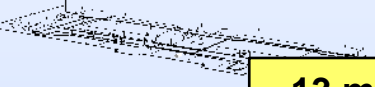

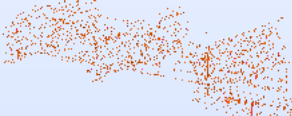



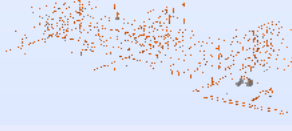
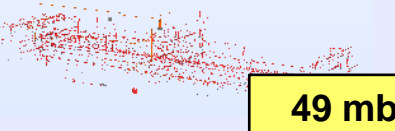


Model files HVAC

	Services	Bed wards	Treatment	Psychiatry	Access
V200 Carriers		 1 mb	 Revit file 120 mb Export 2 hours	 1 mb	
V360 Air handling, tube mail etc		 138 mb			
V360 Air handling U2 - 04 floors			 325 mb		
V360 Air handling 05 – roof			 216 mb		
V320 Floor heating		 8 mb			
V365 Air handling units		 5 mb			

Model files piping

	Services	Bed wards	Treatment	Psychiatry	Access
V300 Plumbing					
V300 Technical culvert U2					
V311 Piping beneath building					
V330 Sprinkler					
V340 Gass & pressurized air					
Pneumatic waste system Eleiko					

Model files piping

	Services	Bed wards	Treatment	Psychiatry	Access
V300 Plumbing	 124 mb	 428 mb	 503 mb	 247 mb	
V300 Technical culvert U2	 12 mb	 11 mb	 12 mb	 12 mb	
V311 Piping beneath building	 4 mb	 8 mb	 13 mb	 14 mb	
V330 Sprinkler		 79 mb	 179 mb	 30 mb	
V340 Gass & pressurized air	 4 mb	 26 mb	 49 mb	 2 mb	
Pneumatic waste system Eleiko	 11 mb				

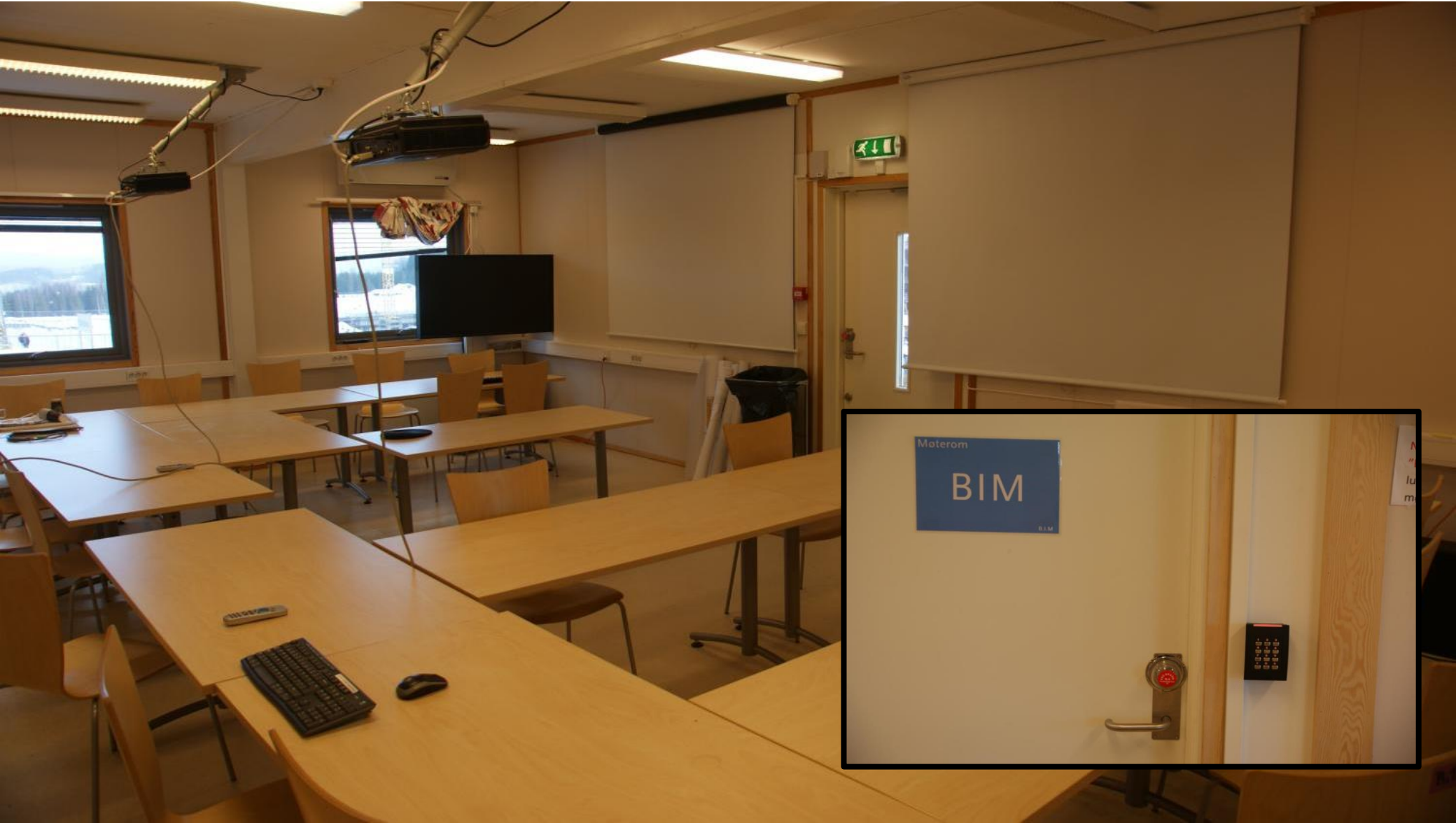
Revit file 252 mb
Export 10 hours

Model files piping

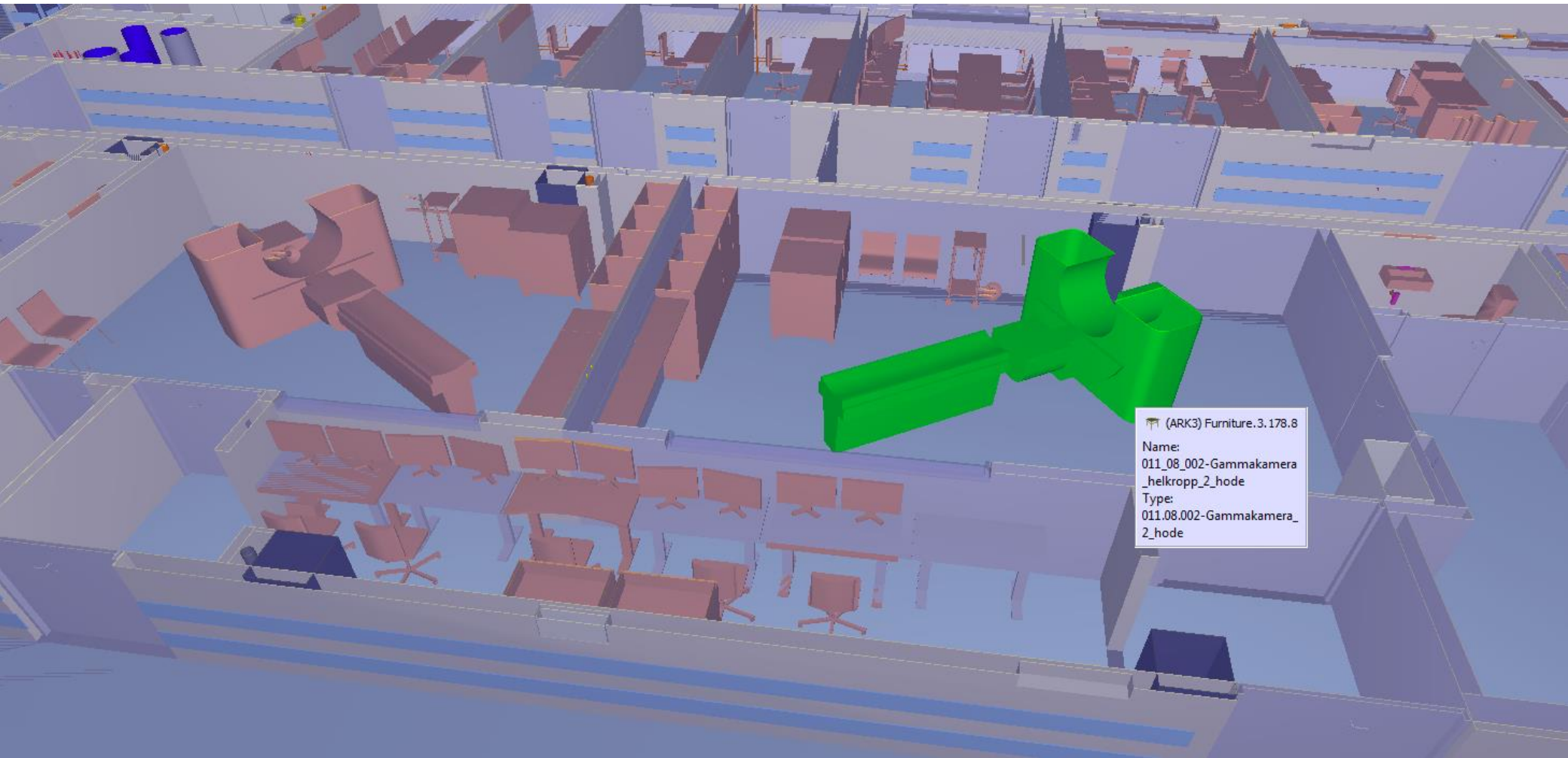
	Services	Bed wards	Treatment	Psychiatry	Access
Area	Services 3.600 m²	Bed wards 38.400 m²	Treatment 30.200 m²	Psychiatry 13.100 m²	Access
Technical culvert U2	12 mb	11 mb	12 mb	12 mb	
V311 Piping beneath building				14 mb	
V330 Sprinkler				30 mb	
V340 Gass & pressurized air	4 mb	26 mb	49 mb	2 mb	
Pneumatic waste system Eleiko	1 mb				
	194 mb	1 318 mb	1 594 mb	531 mb	5 mb

63 model files 3,6-4 gb lfc
Assembled Solibri file 990 mb
Uses 19 gb memory to
generate geometry

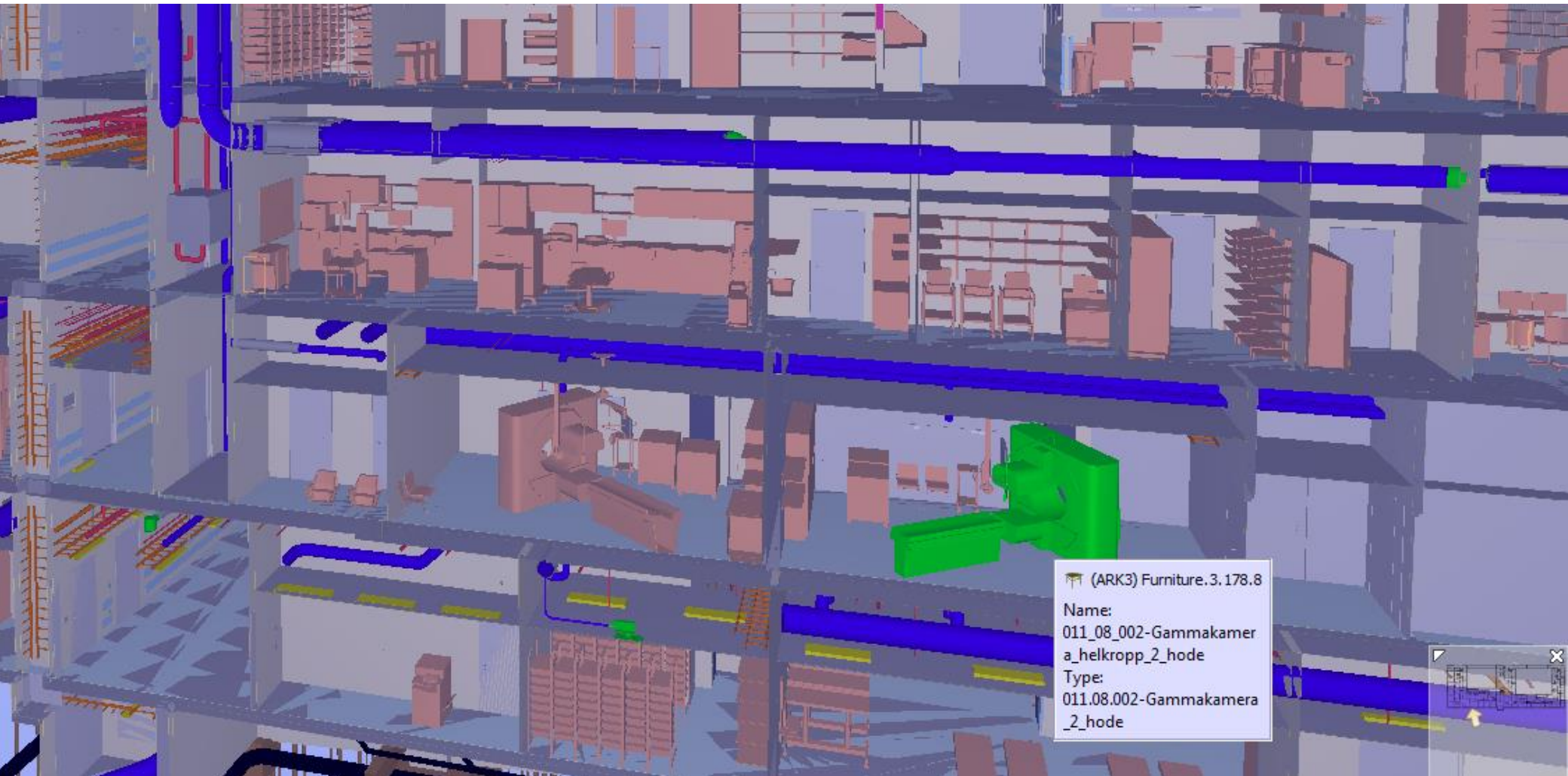
Adoption through challenging and facilitating BIM room on site



Tools – Solibri for clash detection and understanding the project



Tools – Solibri for clash detection and understanding the project



Tools – Solibri for clash detection and understanding the project

**Quantity take of
Plan production and purchasing
Reporting progress??**



(ARK3) Furniture.3.178.8
Name:
011_08_002-Gammakamera
a_helkropp_2_hode
Type:
011.08.002-Gammakamera
_2_hode

Tools – dRofus

Room-, function and equipment database

dRofus [Helse Sør-Øst - Nytt Østfoldsykehus, Kalnes] - [Romoversikt]

dRofus Prosjekt Logg Vindu Hjelp

Funksjoner Grupper

Nytt Østfoldsykehus, Kalnes

- 07 - Prehospitaltjenester, akuttmottak, obs, kort
- 08 - Kirurgi, ortopedi, ØNH
- 09 - Gynekologi og føde
- 10 - Medisin, nevrologi
- 11 - Barn og ungdom inkl. habilitering og skole
- 12 - Operasjon, PO
- 13 - Bildediagnostikk
 - 13.01 - Hovedrøntgen poliklinisk
 - 13.02 - Hovedrøntgen akutt
- 17 - Psykisk helsevern - ungdom
- 18 - Psykisk helsevern - voksne
- 19 - Intern service og administrasjon
- 20 - Sengeområde med hotellfunksjon - UTGÅR
- 21 - Standard sengeområder - UTGÅR
- 22 - Intensiv, intermedier
- 23 - Sterilsentral
- 24 - Kjøkken, kantine
- 25 - Sengeområde
- 26 - Møteplasser, arbeids- og hvileområder
- 60 - Disponible rom
- 70 - Ikke programmet
- 80 - Teknikkarealer
- 84 - Elkraft
- 85 - IKT
- 90 - Trafikkarealer
- 92 - Uterom
- 99 - Hjelpefunksjon
- Project Number
 - Default
 - 8201
 - Default
 - 001
 - Default
 - IFC rapporter
 - Rom kun i program
 - Rom kun i modell
 - Rom i modell med duplikate romnummer

Delfunksjon: 13.03 - Nukleærmedisin

Rom Funksjonsprogram Bilder/Dokumenter Areal

Legg til rom Åpne... Skriv ut Vis BIM Søk

Romnr.	Prosjekt/Ge...	Navn:	Prog areal:	Prosj areal:	RFP status	U
13.03.006	08C01A042	Omkledning	2,00	2,82	Avledet fra SR.004	Unik
13.03.007	08C01B051	Undersøkelse, gammakamera	35,00	39,08	Unik	Unik
13.03.008	08C01B041	Undersøkelse, SPECT/CT	35,00	37,60	Unik	Unik
13.03.009	08C01A041	Undersøkelse og behandling	16,00	14,39	Avledet fra SR.071	Unik
13.03.010	08C01A045	Sjatterom, gammakamera	10,00	17,16	Unik	Unik
13.03.011	08C01A052	Sluse, hotlab	4,00	4,66	Unik	Unik
13.03.012	08C01A051	Hotlab	16,00	17,91	Unik	Unik
13.03.013	08C01A046	Forberedelse, injeksjon	12,00	10,14	Unik	Unik
13.03.014	08C01B061	Hvilerom	5,00	4,43	Unik	Unik
13.03.017	08C01B032	WC, HC	6,00	5,17	Fra SR.043	Avledet fra SR.043
13.03.018	08C01C041	Møte, 8 plasser	15,00	13,84	Avledet fra SR.059	Avledet fra SR.059
13.03.020	08C01A067	Rengjøring	8,00	8,85	Unik	Unik (kopiert fra S...
13.03.021	08C01A054	Lager, utstyr, forbruksvarer	11,00	9,88	Unik	Unik
13.03.022	08C01C051	Kontor, 1 person	9,00	9,13	Fra SR.052	Fra SR.052
13.03.023	08C01B062	WC, pasient	2,00	3,61	Avledet fra SR.050	Fra SR.050
13.03.025	08C01A062	Sluse, cellemerking	3,00	4,61	Unik	Unik
13.03.026	08C01A061	Hotlab, cellemerking	8,00	15,39	Unik	Unik
13.03.027	08C01B033	WC, pasient	0,00	1,71	Avledet fra SR.050	Fra SR.050
13.03.028	08C01A084	WC, personal	0,00	1,98	Fra SR.050	Fra SR.050
13.03.029	08C01B063	Hvilerom	5,00	7,57	Unik	Unik

Check consistence between brief and BIM

Vis utgåtte rom Hurtigsøk F3 for å komme hit

Department three structure

Visualize room in 3D

Antall rom: 25 Sum prog. areal: 244,00 Sum prosj. areal: 272,58

Tools – TIDA Technical information database

Handover documentation

dRofus [Helse Sør-Øst - Nytt Østfoldsykehus, Kalnes] v1.6.4.163 (BETA)

dRofus Prosjekt TIDA Logg Vindu Hjelp

Teknisk informasjonsdatabase - TFM 3451:2009

Ny komponent Nytt system Lagre Vedlikeholdsrutiner Firmaregister Søk Vis 3D viewer

Hurtigsøk: F3 for å komme Visning

Systemer Produkttype Dokumenter

Nytt Østfoldsykehus, Kalnes

- 2 - Bygning
 - 20 - Bygning, generelt
 - 21 - Grunn og fundamenter
 - 211 - Klargjøring av tomt
 - 212 - Byggegrøp
 - 213 - Grunnforsterkning
 - 214 - Støttekonstruksjoner
 - 215 - Pelefundamentering
 - 216 - Direkte fundamentering
 - 217 - Drenering
 - 218 - Utstyr og komplettering
 - 219 - Andre deler av grunn og fundamenter
 - 22 - Bæresystemer
 - 221 - Rammer
 - 222 - Søyler
 - 223 - Bjelker
 - 224 - Avstivende konstruksjoner
 - 225 - Brannbeskyttelse av bærende konstruksjoner
 - 226 - Kledning og overflate
 - 227 - Yttervegger
 - 228 - Utstyr og komplettering
 - 229 - Andre deler av bæresystem
 - 23 - Yttervegger
 - 231 - Bærende yttervegger
 - 232 - Ikke-bærende yttervegger
 - 233 - Glassfasader
 - 234 - Vinduer, dører, porter
 - 235 - Utvendig kledning og overflate
 - 236 - Innvendig overflate
 - 237 - Solavskjerming
 - 238 - Utstyr og komplettering
 - 239 - Andre deler av yttervegg
 - 24 - Innvegger
 - 25 - Dekker
 - 26 - Yttertak
 - 27 - Fast inventar
 - 28 - Trapper, balkonger m.m.
 - 29 - Andre bygningmessige deler
- 3 - VVS-installasjoner
- 4 - Elektrisk
- 5 - Tele og automatisering
- 6 - Andre installasjoner
- 7 - Utendørs

TFM nr Navn Lokalisering Beskrivelse Produktbetegnelse Produsent Lev

+01000=231.080	Bærende yttervegger					
+01000=231.080-AV1347T	Basic Wall:Yttervegg B...					
+01000=231.080-AV1346T	Basic Wall:Yttervegg B...					
+01000=231.084	Bærende yttervegger					
+01000=231.084-AV1359T	Basic Wall:Jordtrykksv...					
+01000=231.085	Bærende yttervegger					
+01000=231.085-AV1611T	Basic Wall:Kulvertvegg...					
+01000=231.085-AV1610	Basic Wall:Kulvertvegg...					
+01000=231.085-AV1362T	Basic Wall:Kulvertvegg...					
+01000=231.091	Bærende yttervegger					
+01000=231.091-AV1379T	Basic Wall:Fundamentv...					
+01000=231.091-AV1378T	Basic Wall:Fundamentv...					
+01000=231.091-AV1377T	Basic Wall:Fundamentv...					
+01000=231.091-AV1376T	Basic Wall:Fundamentv...					
+01000=231.092	Bærende yttervegger					
+01000=231.092-AV1613T	Basic Wall:Kumvegg B...					
+01000=231.092-AV1612T	Basic Wall:Kumvegg B...					

Komponent: +01000=231.080-AV1347T - Basic Wall:Yttervegg Betong 250

Logg Lagre

Komponent Tekniske data Prosjekt Historikk Tilkoblinger Vedlikeholdsrutiner Dokumentasjon

Nr +01000=231.080-AV1347T Typepunkt ☒

Navn Basic Wall:Yttervegg Betong 250 Antall 35 Enhet

Løpenr 1347 Lokalisering

TFM Type AV Beskrivelse

Vegg

Rom

Romnavn

Ansvar

Kontrakt 2202 - Råbygg og Tett Hus Servi Produsent

Status Leverandør

Produkttype

Produktbetegnelse

EL.nr./NRF.nr.

Produsent

Leverandør

Egenskaper Geometri Relasjoner

1/35

Navn Verdi

Constraints

Base is Attached FALSE

Top Constraint Level: 01

Related to Mass FALSE

Unconnected ... 5194.00

Top Offset -250.00

Base Constraint Level: L2

Room Bounding TRUE

Base Extension... 0.00

Top is Attached FALSE

Top Extension ... 0.00

Base Offset -50.00

Location Line 3

Phasing

Phase Created New construction

Structural

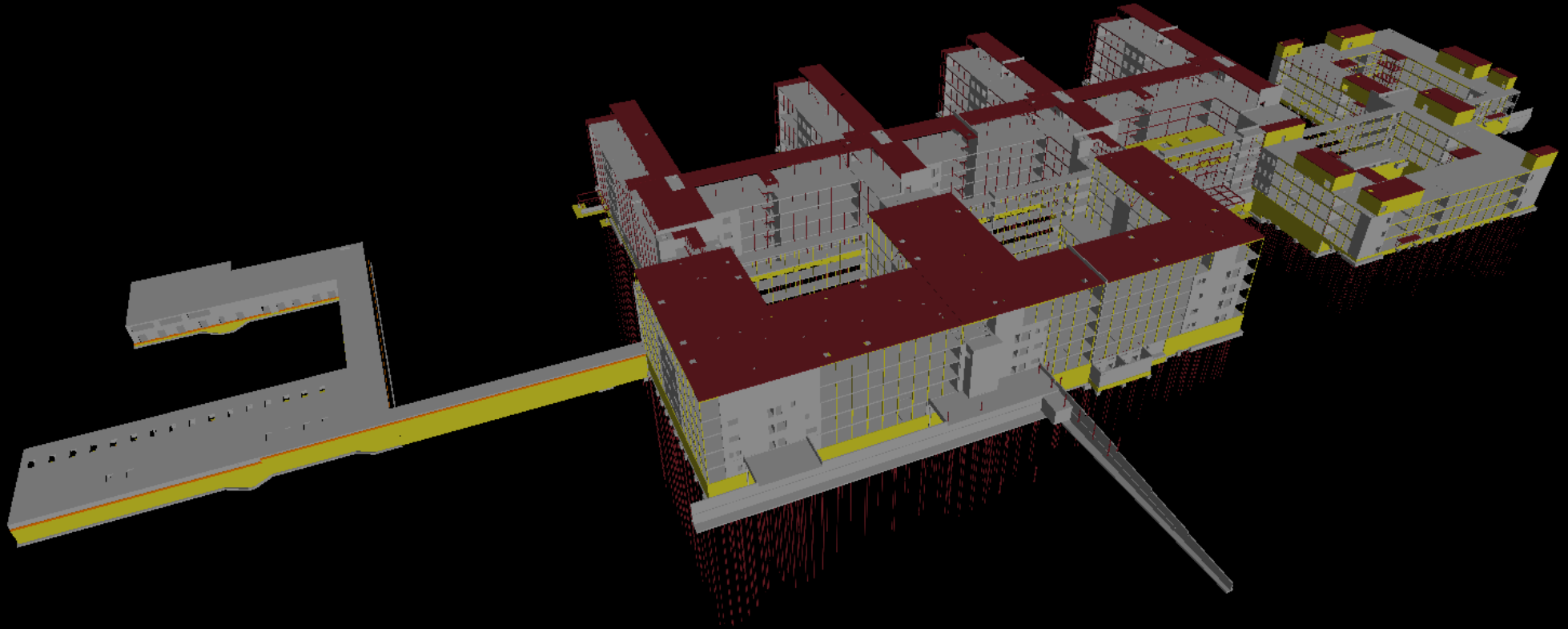
Structural Usage 1

Enable Analytic... TRUE

Rebar Cover ... Rebar Cover Settings: 25mm

Tools – Navisworks

4D simulation



Tools – Tablets



Foto: SWECO fra Nye Ahus

Tools – Tablets, mobile devices

Visualization / communication – On site



Tools – Tablets, mobile devices

Visualization / communication – On site

- Requirements:
 - Assembling all modelfiles to one model
 - Process in central server, too large for mobile devices
 - Stream to mobile devices to avoid administration of model on a large number of mobile devices

Rendra O - www.rendra.no

- 78 users for the time being in test phase
- To be rolled out for broad use in the whole construction organization

Tools – Tablets, mobile devices

Visualization / communication – On site

- No wifi on building site
- Uses 3G / 4G (LTE)
- Telecom providers installed 4 4G antennas on site

