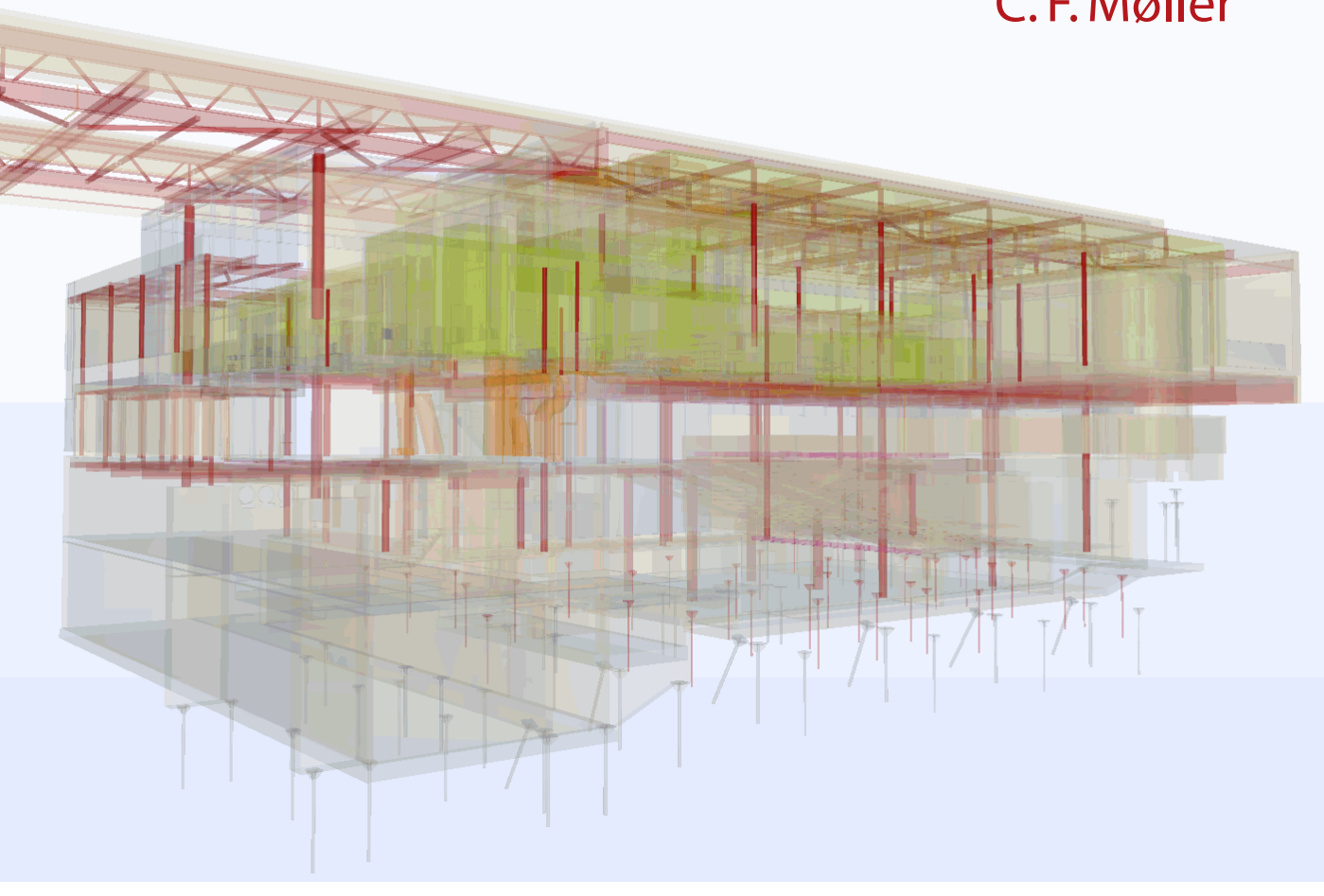
Arkitektfirmaet
C. F. Møller



BIM: BUILDING INFORMATION MODEL

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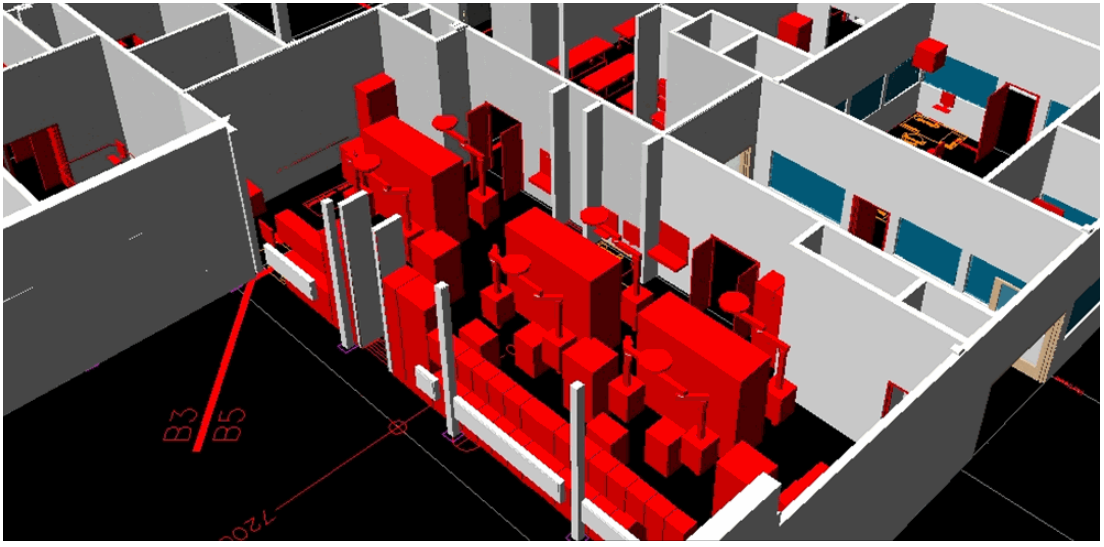
INTRODUCTION

The BIM consist of objects such as spaces, equipment, walls, windows, doors, structures, and HVAC and electrical components. All of these objects can be enhanced with properties such as information about their structure, fire ratings, costs, materials, etc.

In the initial stage of the project the objects will be generic, and alternatives can be tested for cost, functionality, aesthetics, etc. As decisions are made and more solutions become project-specific, the objects are updated to match the actual situation. This way of working ensures that all decisions are documented in one place, and that everyone has access to updated information



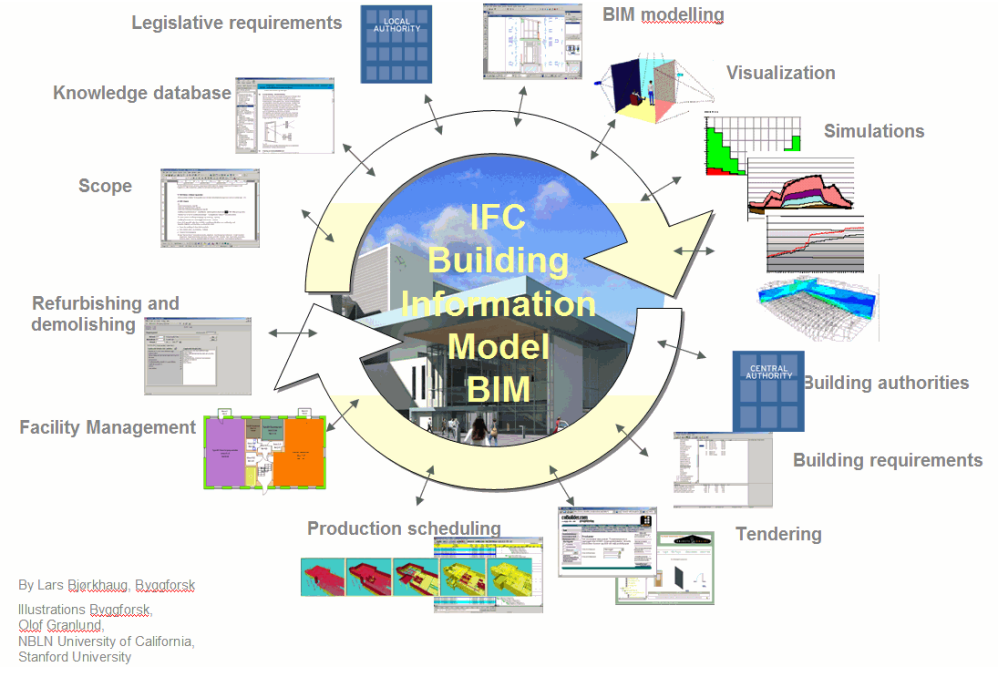
A screen shot of the objects and properties in a building storey..

ABOUT BIM

The last decade has seen the worldwide development of various technologies and methods to improve construction information management. This research has been initiated and managed by the international organization BuildingSMART, and the resultant technologies are called BIM technologies, which stands for Building Information Model.

BIM means Building Information Model.

A BIM is a digital prototype which contains all of the information about a building and the documentation of its design process.



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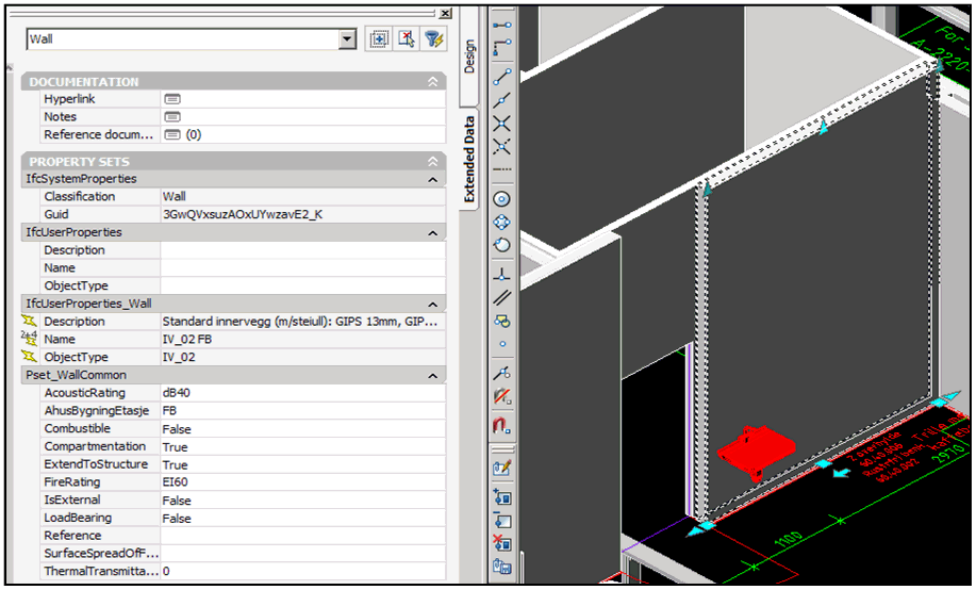
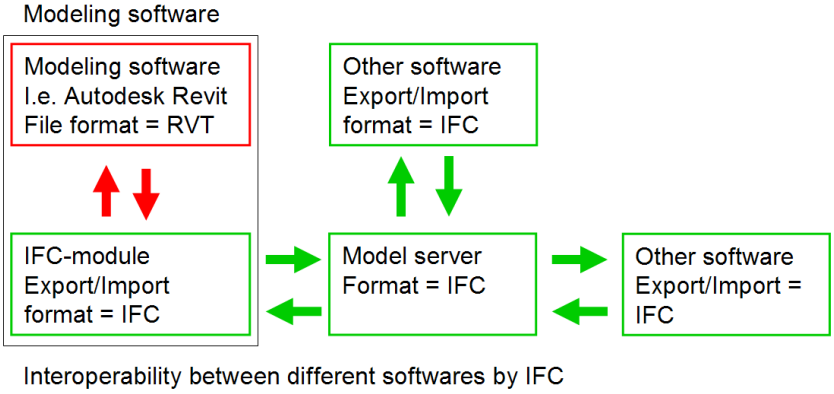


A screen shot of objects and the properties in a building storey

ABOUT IFC

A major advantage of working with BIM is that the information is interoperable between all the project participants, regardless of which modelling software they work with. This is made possible by an internationally standardized classification and data format called IFC (Industry Foundation Classes). All of C. F. Møller's BIM objects and BIM models are IFC-compatible, which means they can be read by any other IFC-compatible software*.



Interoperability between different softwares by IFC

** All leading object modelling and simulation software is IFC compatible.*

BIM POTENTIAL

MODEL SERVER

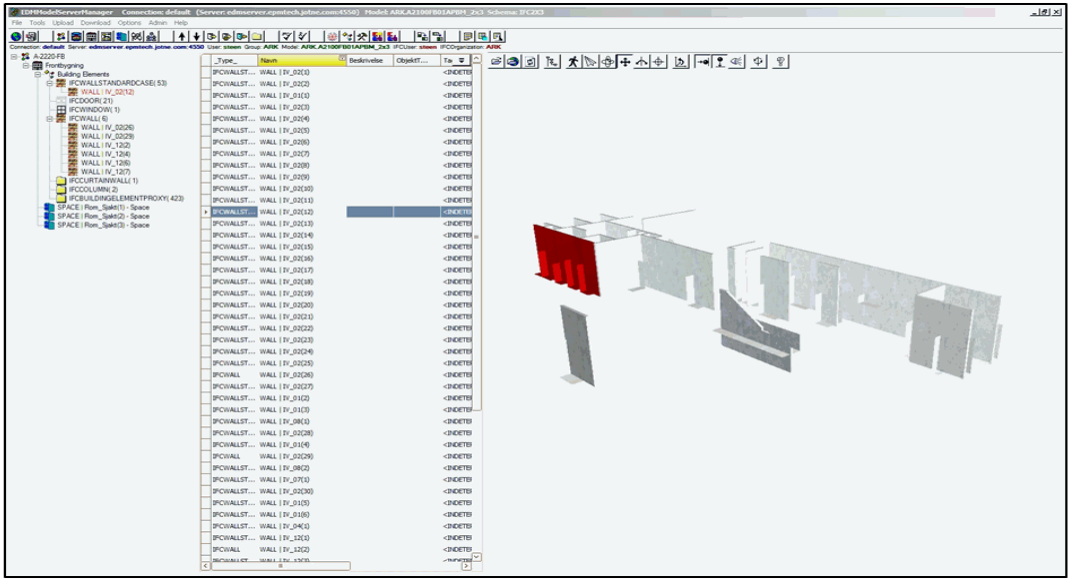
There are various ways of communicating the object models between the architect and the engineers, together with the client's requirements.

The model server makes the BIM online-accessible and editable for all project participants.

The model server is an administrative facility which manages the reading and editing rights of the object models.

It makes it possible for the client to view the model independently of the architects and engineers, and it documents all changes.

The model server is provided by an external company, but C. F. Møller Architects can help the client to define the best way of communicating the data.

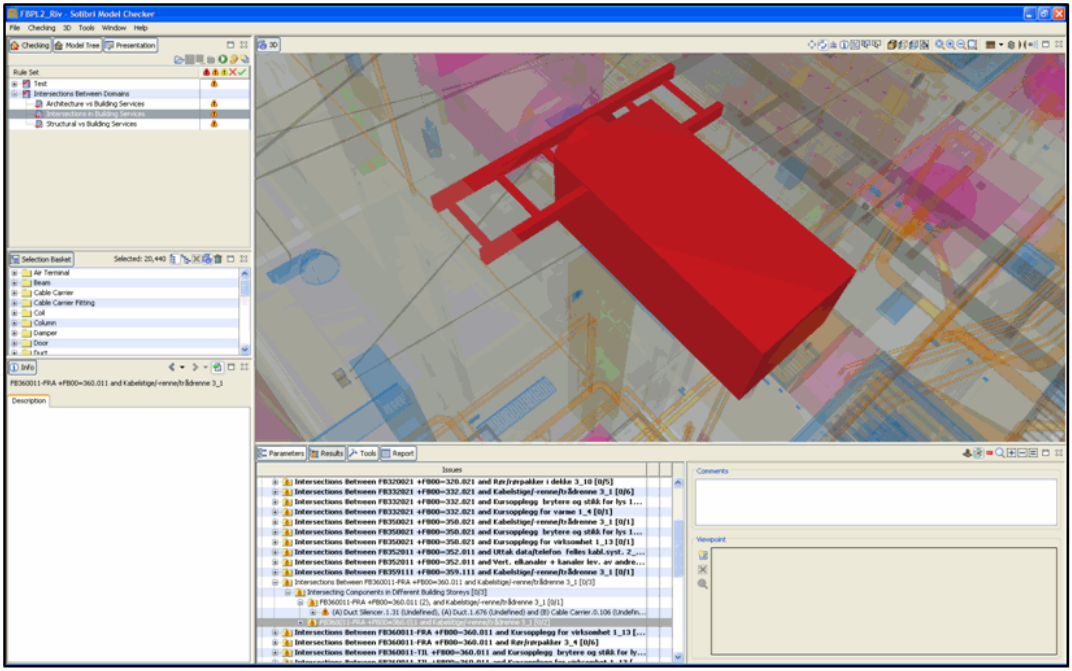


A screen shot of the model server user interface, showing model structure, component type and geometry.

CLASH DETECTION

Making construction changes on-site, due to a lack of co-ordination within the design team or with the contractor, can consume a great deal of time and money.
Using the BIM to identify clashes between objects in three dimensions thereby saves both time and money.

C. F. Møller Architects is experienced in the use of various clash detection tools, and can provide this service in BIM projects. We can also define the requirements for the object models in the project, in such a way that these will support the detection process.

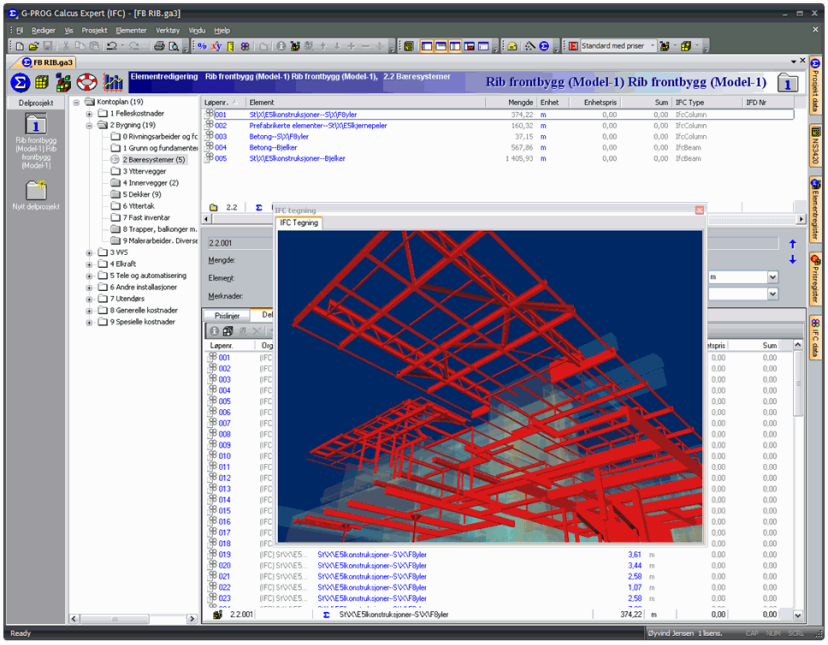


A screen shot of the clash detection software. Two colliding objects are highlighted

COST ANALYSIS

Cost is one of the most important dimensions of a building's properties. It is important to understand the economic consequences of the various alternatives as early as possible in the design process, in order to choose the right concept.

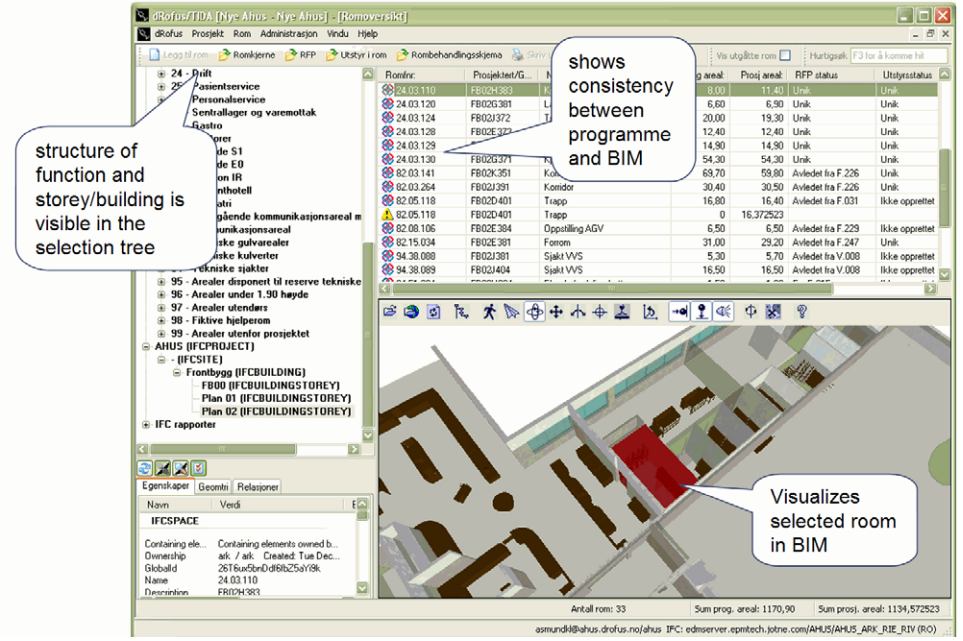
The ability to provide precise cost estimates is one of the most important tools in decision-making.
C. F. Møller provides cost analysis based on updated market prices, linked to the geometrical model. This combination produces the most accurate cost estimate for the least effort*.



A screen shot of the cost analysis tool. Each BIM object is linked to updated local prices.
** depending on the availability of price databases in different countries.*

ROOM AND EQUIPMENT DATABASE

The contractor prices a contract and constructs it on the basis of the BIM, so it is important that all of the requirements of the client, the users and the design team are covered by the design. All of the requirements towards a building's functionality can be documented in a single database, in the form of properties of spaces and equipment objects. These objects can then be linked to the BIM, to check for consistency between the database and the BIM. This is a highly efficient tool for documentation, communication and quality assurance.



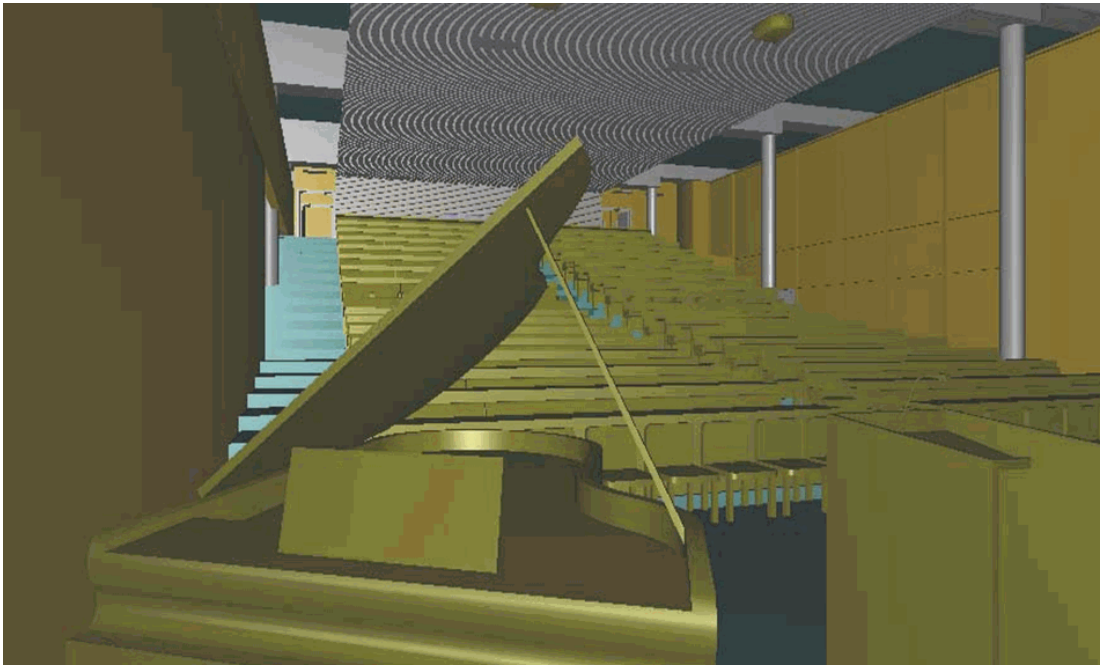
A screen shot of the database, showing spaces, equipment and geometry.

VISUALIZATION

The ability to see the spatial consequences of decisions is an important tool in the design process, both internally, for the designers, but equally in the dialogue with the client and users.

The BIM can be experienced "as is". So when a change is made in, for example, the plan layout or window type, the result can be evaluated visually without the need for extra work.

Visualization has also shown itself to be an important tool in dialogue with the contractor. The better the contractors understand their tasks, the better they can undertake them.



SIMULATIONS

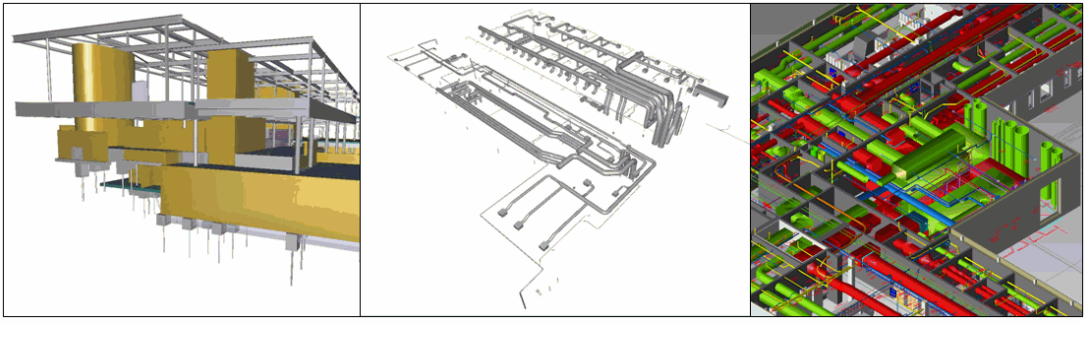
Since the objects possess both a geometry and properties that resemble reality, it is possible to test a digital prototype. The testing is performed by various kinds of software which simulate how the building will function in reality.

Testing buildings through the use of digital models is not a new phenomenon, but it was formerly necessary to build up the digital model in the testing program itself. This was a time-consuming process, and could give rise to errors and misunderstandings.

Using the BIM for testing eliminates the extra time required for modelling, and ensures high-quality model consistency.

Some of the most promising areas of application are:

- Construction/logistics simulation
- Structural analysis
- Energy analysis and HVAC systems
- Electrical systems
- Acoustics
- Escape routes
- Environmental impact

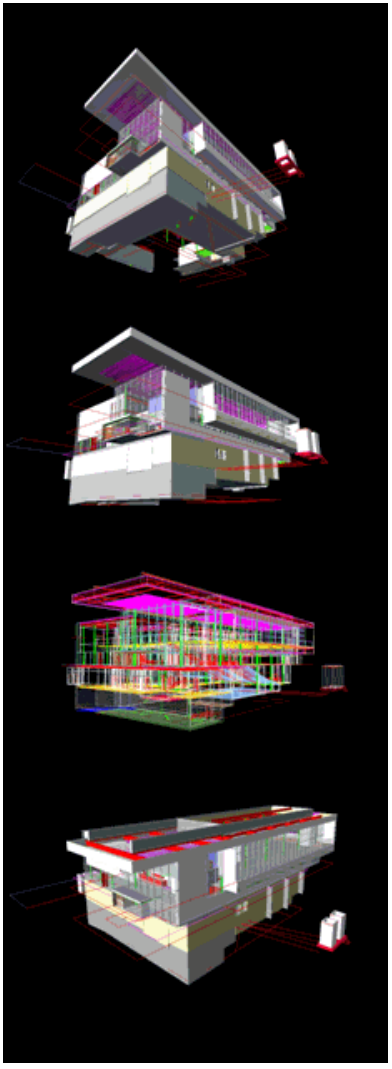


BIM PROJECTS

AKERSHUS UNIVERSITY HOSPITAL

The New Akershus University Hospital project (New Ahus) was established as a complete BIM model by the architects during the design and construction period (2001-2008). Between 2003 and 2007, C. F. Møller Architects undertook project management and design of the BIM project in one of the first real-life implementations of this technology. All of the disciplines helped to establish a complete BIM model in which all aspects of the technology were tested. The New Ahus BIM project gave us a unique understanding of the possibilities and challenges of working with BIM.

Client	Helse Sør-Øst RHF
Address	Oslo, Norway
Area	137.000 m² (118.000 m² newbuild)
Year	2000-2008 (2011)
Landscape	Bjørbekk & Lindheim AS Schønherr Landskab A/S
Collaborators	Multiconsult AS, SWECO AS, Hjellnes COWI AS/Interconsult ASA, Ingemannson Technology, Nosyko/Erstad and Lekven
Prize	1. Prize in international competition, 2000



ÅLESUND HOSPITAL CHILDREN'S WARD

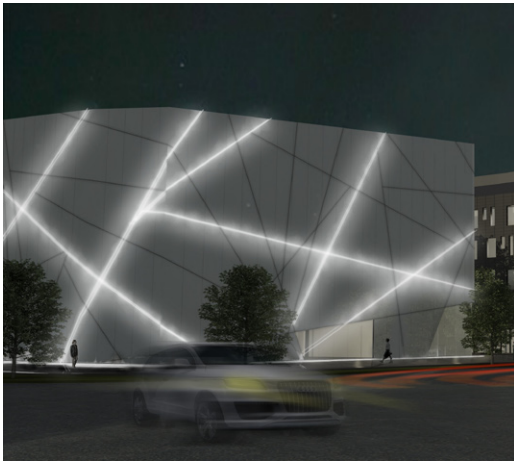
C. F. Møller Architects is currently designing a new children's ward in Ålesund, Norway, which will function on the children's terms. The project will be implemented as a BIM project.

Client	Helse Sunnmøre HF
Area	4800 m²
Address	Ålesund, Norway
Prize	1st prize international competition, 2005

MEIERITOMTEN FØRDE

C. F. Møller Architects is designing a new art museum and office building, plus landscaping of the local surroundings, for the town centre of Førde, Norway. The project is being modelled using BIM.

Client	Futurum AS
Area	9,000 m² museum and offices, 13,000 m² in total
Year	2008-2010
Landscape	Schønherr Landskab
Collaborators	Åsen & Øvrelid, Hjellnes Consult, Sweco AS, Nord Vest Miljø AS
Address	Førde, Norway
Competition	1st prize in architectural competition, 2006



BIM SERVICES

C. F. Møller Architects provides BIM services on five levels.

Strategic BIM counselling

Our strategic BIM counselling is based on our experience with earlier BIM projects. We understand both the potential and the challenges of working with BIM. Some technologies are ripe for implementation, while others are not. Some will have a major positive effect on a project in relation to the effort required – others will not. We can help the client to choose the right technologies and methods for the project in question.

The technology and methods can vary from those focusing on the design process, to a broader perspective which takes account of the entire lifecycle of the building.

BIM project coordination

When the technologies and methods for the project have been decided, we can then help the project manager to manage the BIM information in the design team. Different tasks demands different properties in the BIM. We can define these demands, and help the operational level to implement them. The BIM coordinator will also establish and support technologies and routines for clash detection, cost analysis, consistency checks, etc. The BIM coordinator is an important link between the strategic and the operational level.

BIM project management

Both the software and the concept of modelling BIMs differs from producing digital drawings.

We have experienced staff who are ready to design and document BIM projects.

The BIM manager will ensure the quality of the model and objects.

Our modelling software mainly consists of Autodesk Revit and Autodesk Architectural. For sketching, we use SketchUp.

Object library

Object-based models need objects. Since 2000, C. F. Møller Architects has been building up its own object library, which has been used, evaluated and enhanced over the course of several projects and tasks. Our clients will receive access to this object library, and to the project experience that it represents. In future projects, we do not start from scratch; we produce individual, unique designs enhanced by our experience with earlier projects. This saves time and guarantees high quality.

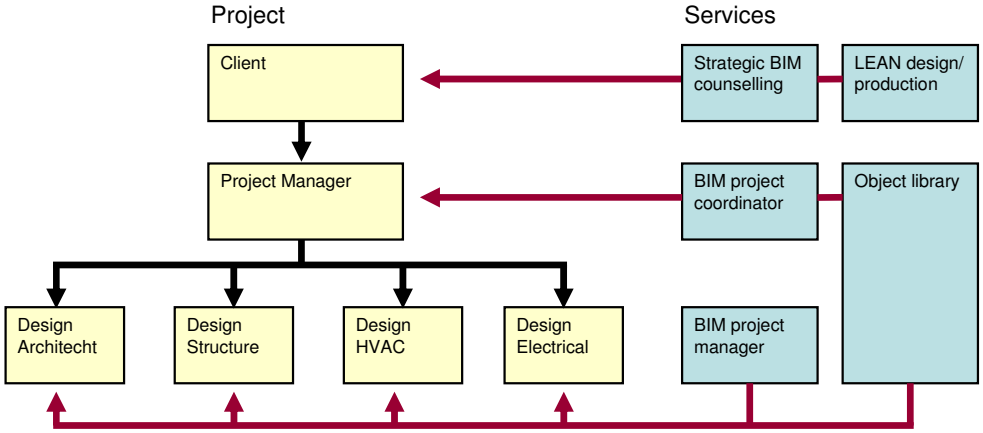


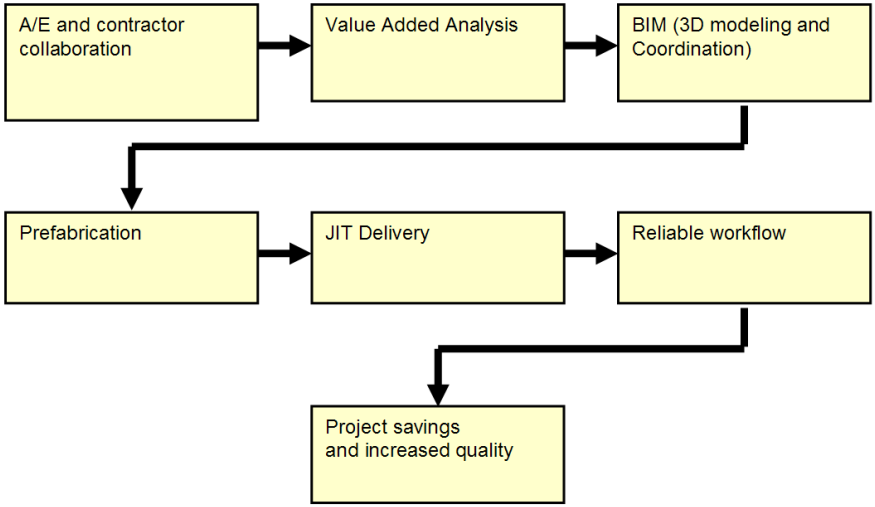
Diagram of C. F. Møller Architects' BIM services, and the level at which the process is supported.

LEAN design and production

In addition to BIM technology, we also provide other services which can reduce costs and improve the quality of the production.

LEAN production is inspired by the automobile industry. Its aim is to identify real values for the client, and then eliminate all costs that do not create value.

This challenges both the design process and the construction methods. In cooperation with the client and the contractor, we perform a Value-Added Analysis which identifies values for the client and the users. We then develop a concept for the design.



Concept for LEAN design and construction