2. BIM SOFTWARE SOLUTIONS

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BLOCK II_COMPUTER TOOLS
BIMVET3 Tutorial No2

Title: BIM SOFTWARE SOLUTIONS

1 - Aims

The objectives of this tutorial are as follows:

- Get to know and be able to adapt different types of software used in the construction sector, at different stages of the BIM life cycle.
- To get acquainted with software for designing virtual and real objects.
- Be able to choose CAD software solutions properly.
- To get acquainted with software for managing the information model of a building.

2 - Learning methodology

- The teacher will provide an explanation of material with examples.

- Students will read this lesson and analyze examples of the video.

- To evaluate the achievements of practical teaching, each student will write short descriptions and answer questions provided.

3 - Tutorial duration

The practice described in this tutorial will be carried out in a computer classroom.
It will last 2/3 teaching hours.

Note: duration of the tutorial depends on teacher professionalism.

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4 - Necessary teaching resources

Hardware requirements: computer room with computers equipped with access to multimedia and internet.

Required software: Autodesk Revit, Autodesk® BIM 360™, BIM 360 COORDINATE, BIM 360 DOCS, BIM 360 BUILD, BIM 360 DESIGN, Autodesk® BIM 360 Plan®,Autodesk BIM 360 Layout®, Autodesk® BIM 360 Ops®.

5. Tutorial Contents

BIM SOFTWARE SOLUTIONS.

5.1 Introduction

BIM Software is a set of programs, procedures and rules for data processing and management. In the construction sector, different types and stages of software are in use. Typical software solutions are presented at a generalized level. The list of software solutions is based on the BIM Handbook, the ISO 19650: 1 standard and expert insights. Software solutions are categorized in accordance with the purpose for which the software is used.

The software is designed to create an informational model of a building. Most versions are highly specialized or used as a set of solutions.

5.2 Analysis software solutions

Software for quality management of a static information model. During the development of the information model, content created by engineers is checked for compliance with the customer's requirements, conflicting engineering solutions are detected.

Autodesk® BIM 360™

Data management throughout the project life cycle.

Autodesk® BIM 360 is a cloud project management and storage platform for construction projects. This set of solutions combines project's documentation, construction processes and information of all participants in real time,

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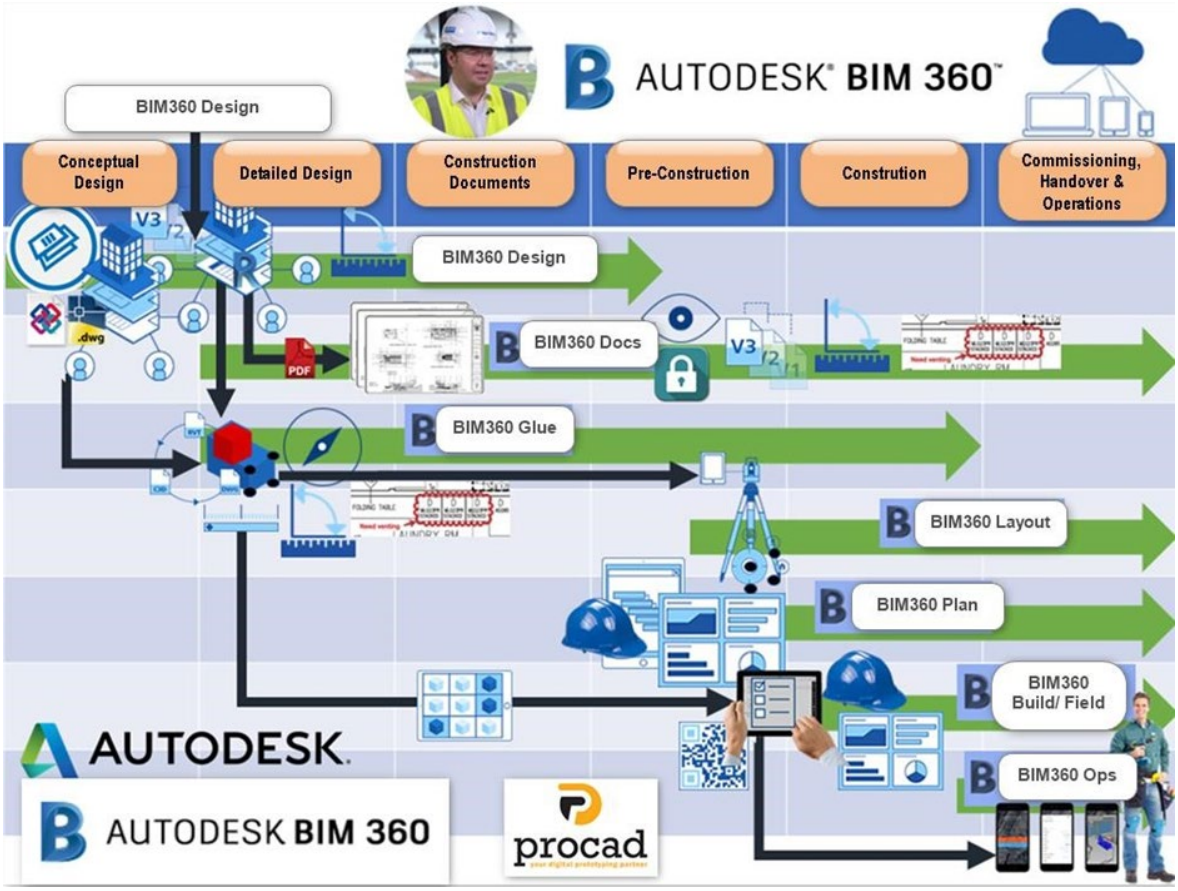
from the concept to the operational stages of the building. BIM 360 helps to share relevant information easily and quickly, without space or time constraints.

Autodesk BIM 360 improves project implementation, enabling project members to anticipate, optimize, and manage all project activities. Communication between all stakeholders ensures greater predictability and profitability.



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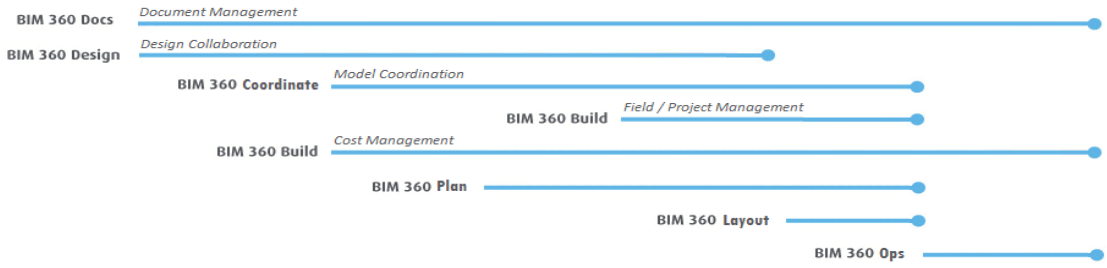
https://construction.autodesk.com/products/autodesk-bim-collaborate/

https://www.youtube.com/watch?v=3GJ7jvC71wA

https://www.youtube.com/watch?v=-yfWU6-Fiks



5.3 Construction and simulation software solutions

Software for automating the analysis of a static information model.

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During development and construction phase of the information model, created content compliance with the standards and regulations is checked, the energy efficiency of a building is measured, and so on.

BIM 360 COORDINATE

Model: **Coordination module**

COORDINATION AND ANALYSIS OF CONFLICTS

Model Coordination provides a coordinated space for uploading, reviewing, and performing collision analysis by comparing the latest project models. A well-coordinated project helps ensure project quality and saves budget funds.

BIM 360 COORDINATE allows to:

- combine models of different disciplines / parts into one coordination space;
- automatically generate a matrix of intersections and analysis between model elements;
- group intersections and send received information to the responsible person for correction;
- upload adjusted models to coordination space - the intersection matrix updates automatically.

Key benefits of BIM 360 COORDINATE:

- collection and analysis of multidisciplinary models in a common coordination space;
- intersection analysis;
- quick bug fixes and updates.

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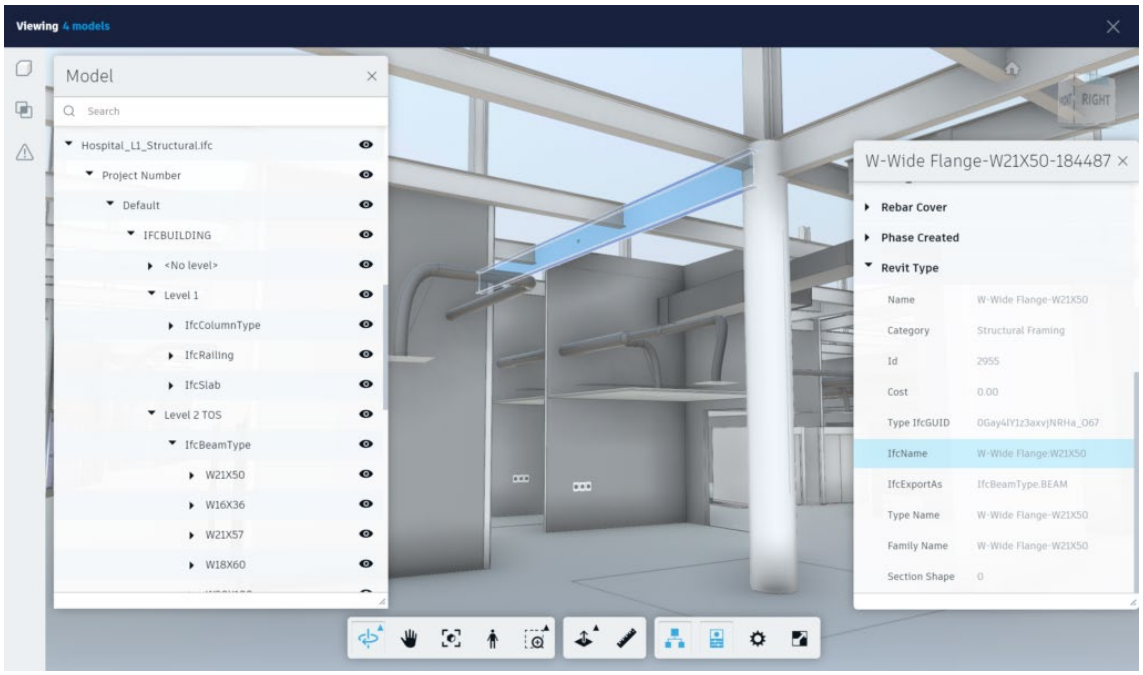

https://www.symetri.co.uk/products/bim-360-coordinate

https://www.youtube.com/watch?v=I2vI28_6z-A

https://www.youtube.com/watch?v=pW1os3csH3E

5.4 BIM Execution Plan (BEP) and Construction Schedule software solutions

Software for developing and managing a BIM implementation plan that defines requirements, project team and customer responsibilities, information validation guidelines, and other management, planning, and documentation procedures and rules. According to the established plan, the processes can be automated later.

BIM 360 DOCS

module: **Document Management**

With the BIM 360 Document Management Module, construction teams can manage drawings, 2D plans, 3D BIM models, and other project documents. The module is designed to simplify document management processes and strengthen communication between different project participants. Combine all your sheets and designs, set up standard templates and workflows to maximize efficiency.

BIM 360 DOCS allows to:

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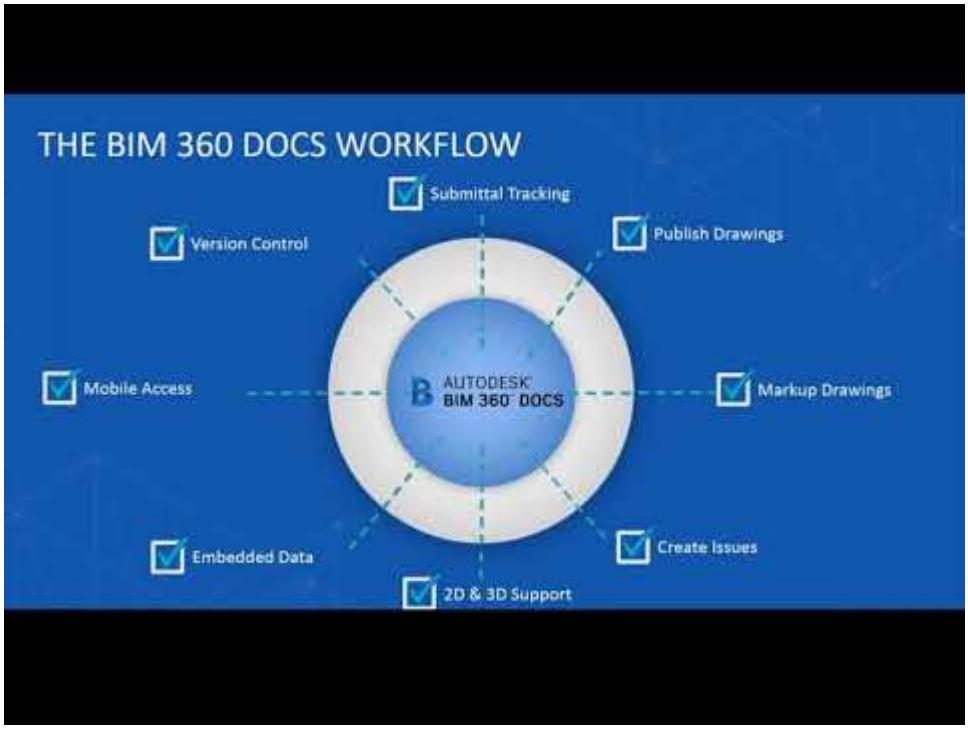
- manage the information of all project participants and their companies;
- create a folder hierarchy and set access / usage restrictions for different participants;
- support 2D and 3D file formats (.png; .pdf; .ifc; .rvt; .nwc, etc.);
- create tags and annotations on 2D and 3D images;
- inform the responsible persons about the problem areas;
- generate automatic hyperlinks to other drawings / images;
- manage versions of documents, view their history, compare versions;

The BIM360 Docs have a simple document issuance and validation work structure „BIM 360 DOCS".



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https://www.youtube.com/watch?v=AL9f5M8E5Uw

https://microsolresources.com/software/autodesk/autodesk-bim-360-docs/

https://www.cadac.com/be-en/news/blog--bim-360-docs-the-new-autodesk--docs-the-differences/

5.5 Project cost forecast and analysis software solutions

Software for determination and calculation of construction project costs. The costs can be planned and managed in an effective manner with the help of a defined construction project schedule.

BIM 360 BUILD

Module: **Cost Management**

The module has very powerful cost control and budget change monitoring functions. It helps teams effectively plan their budget, visually see potential cost risks, and manage order change processes.

BIM 360 BUILD – Cost Management allows to:

- create a flexible structure for budgetary management;
- track and manage order changes;
- create and manage contract and order forms.

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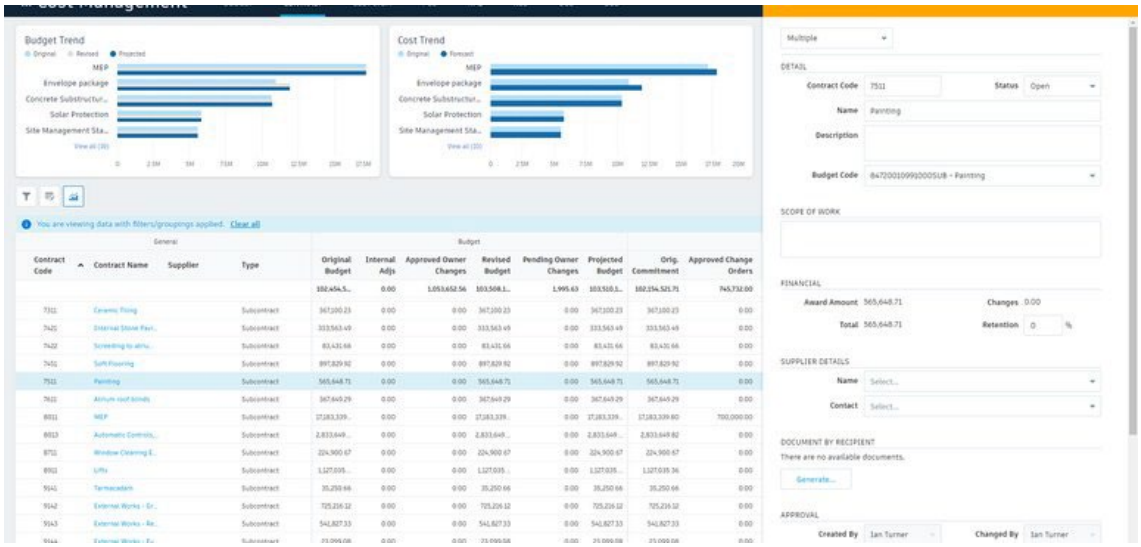
Cost Management key advantages:

- configurable features allow users to customize the software to meet their needs and preferences;
- real-time display of the entire budget;
- effective management of contract and order changes.



https://www.youtube.com/watch?v=9LMHfEJPZJQ

https://construction.autodesk.com/products/autodesk-build/

https://microsolresources.com/software/autodesk/autodesk-bim-360-build/

5.6 Building performance management software solutions.

Software for building operation management. Software solutions are intended for building owners and are used to facilitate/streamline the maintenance phase, to provide relevant information for decision making.

BIM 360 DESIGN

Module: Design Collaboration

BIM 360 Design significantly improves and simplifies the collaboration and work control of multilateral project participants. The access restriction feature allows individual teams to work in their own space and at the same time allows them to collaborate by controlling how other project teams see the state of the project. BIM 360 Design speeds up project delivery, reduces redesigns, and increases productivity.

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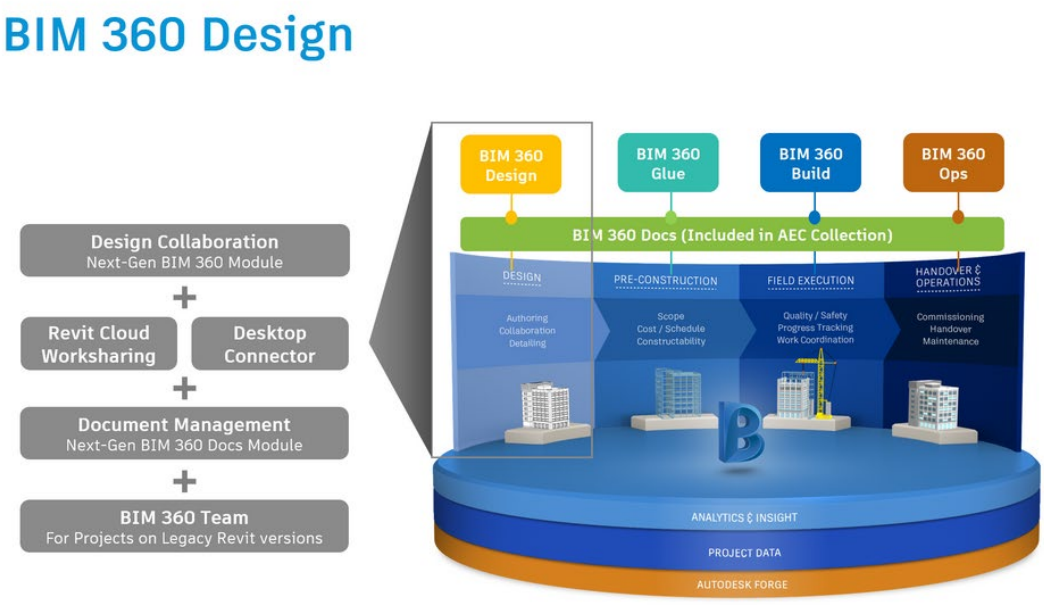
BIM 360 DESIGN“ allows to:

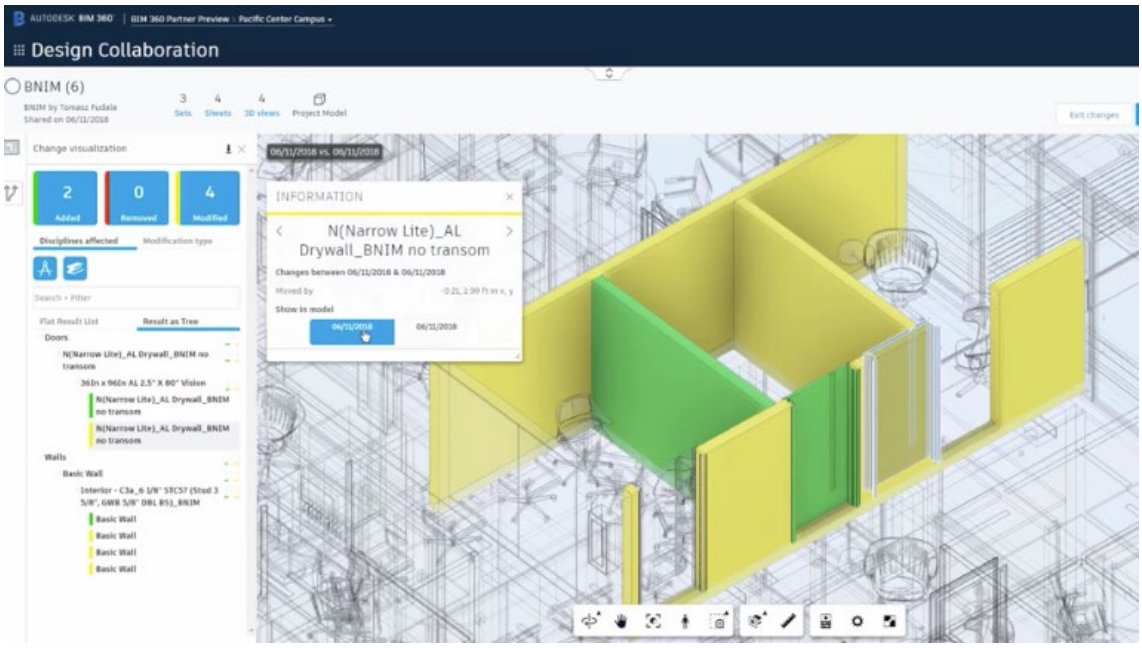
- share project models in the cloud;
- synchronize the central model in the cloud;
- send/communicate change sets;
- navigate the 3D model;
- create and track change history between different project participants;
- interactively review changes;
- perform filtering and searching for changes;
- review the design process, communicate about problem areas.

BIM 360 DESIGN key advantages:

- higher design efficiency and quality;
- better project efficiency by reducing the amount of remodeling work;
- faster project delivery.



2. BIM SOFTWARE SOLUTIONS



https://www.youtube.com/watch?v=mRlfB3BLERA

https://www.youtube.com/watch?v=gkA1K1UuJEM

5.7 Common Data Environment (CDE) software solutions

Software to manage the development of a building information model. Project or asset information is designed to store, manage, and distribute each information container through a managed process. The CDE solution may include both database management tools to manage the information container attributes and metadata, and transmission tools that allow team members to exchange update messages and maintain an information management audit trail.

5.7.1 Collaboration software solutions

Software for managing the collaboration of the project team, the builder and/or other stakeholders in developing a building information model. Software solutions allow users to view and share engineering solutions and easily access relevant information.

5.7.2 BIM content management software solutions.

Most of such software solutions provide libraries of BIM objects, as well as data analysis and report generation functions.

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BIM 360 BUILD

Module: **Field Management & Project Management**

BIM 360 Build - a cloud computing platform for construction site management that combines mobile technologies for on-site data collection with 3D models of buildings and 2D documentation. This module facilitates collaboration and reporting to ensure quality, safety, project control, and delivery methodology.

BIM 360 BUILD – Field Management allows to:

- review and complete checklists;
- create, assign and track problem areas;
- submit reports: send questions and checklist results to subcontractors, staff in the field so that they can take action promptly;
- work on site with your mobile devices.

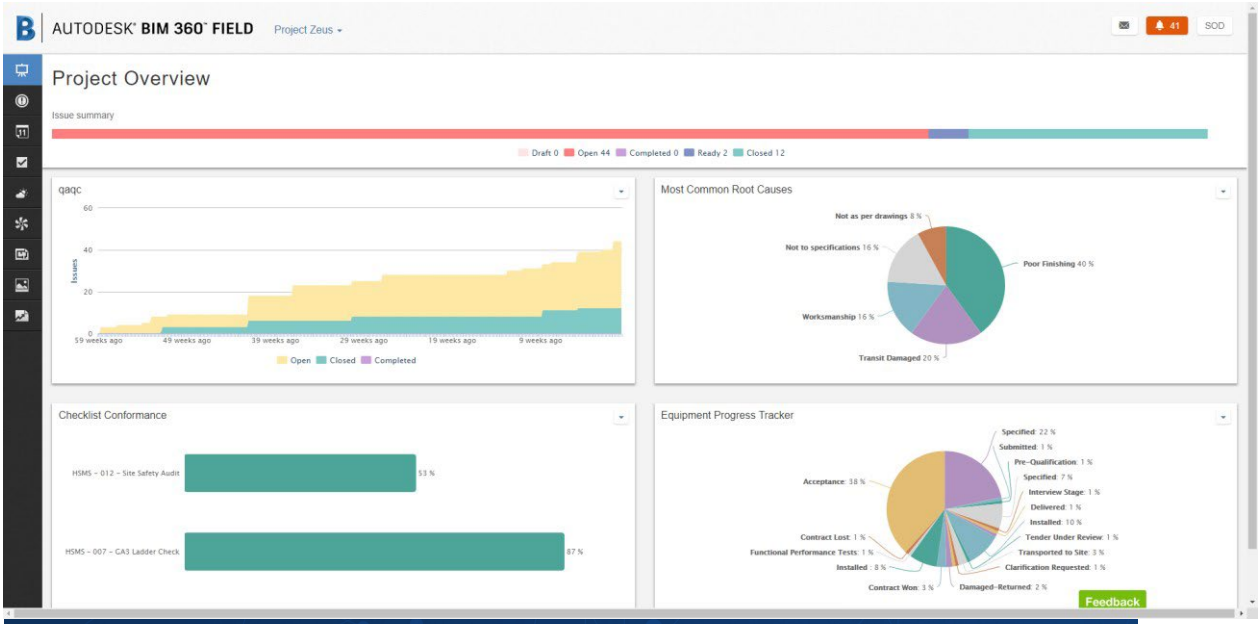
BIM 360 BUILD – Project Management allows to:

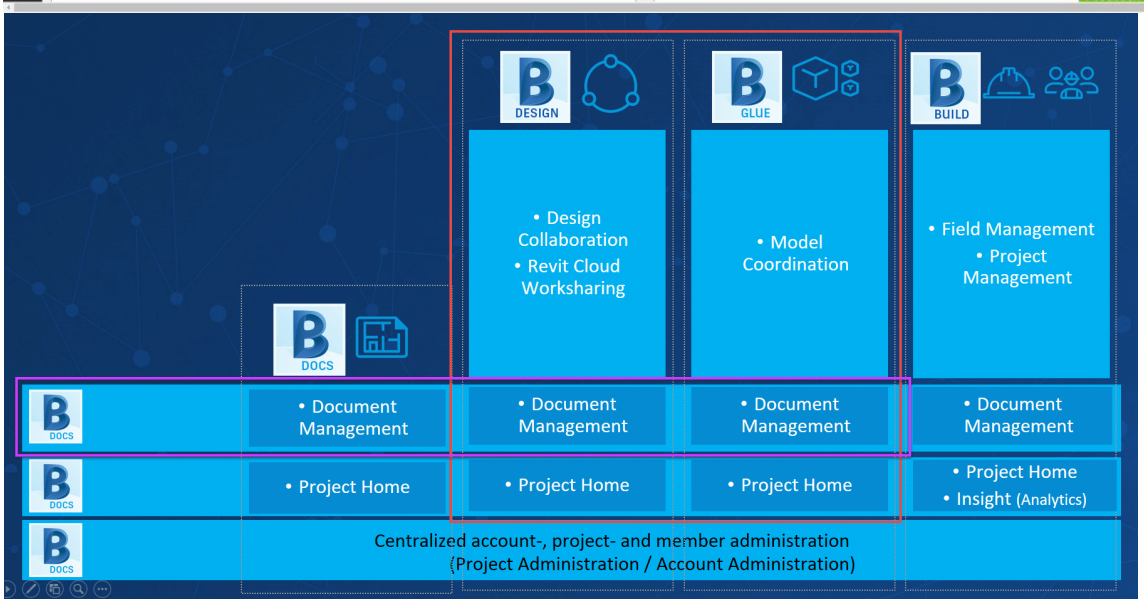
- create and respond to 2D document and 3D model request for information (RFI), monitor workflow configuration options, and project RFI list;
- manage the development, review, and validation workflows for the submitted item and package;
- designate an information exchange workflow.

BIM360 BUILD key advantages:

- quality and safety assurance;
- clear communication and project management;
- commissioning and commissioning.

2. BIM SOFTWARE SOLUTIONS





https://www.youtube.com/watch?v=KRtlkbjxRMc

https://www.youtube.com/watch?v=ZojDtb6dW1k

5.7.3 Building information modelling coordination software solutions

Managing of a building information model. Software solutions provide an environment

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to develop engineering solutions that are integrated into a single information model. Once integrated, the model is submitted for approval. Any conflicts will be detected automatically. The solutions allow to view and analyze the information model without additional software, providing visualizations of the information model. Users can provide comments, observations, approve changes, and more. Such software is used to coordinate and control the development of the information model.

Autodesk® BIM 360 Plan® a cloud-based construction planning that ensures LEAN construction practices.

BIM 360 Plan® the product helps to create reliable plans for project planning, ensuring that there will be no unnecessary work, overuse of inventory, redesign of tasks.

Main BIM 360 Plan® functions:

- Work sequences (Gant chart principle);
- Workflow review and team communication using WEB browsers and mobile devices;
- Customized project plan images;
- Performance monitoring and analysis.

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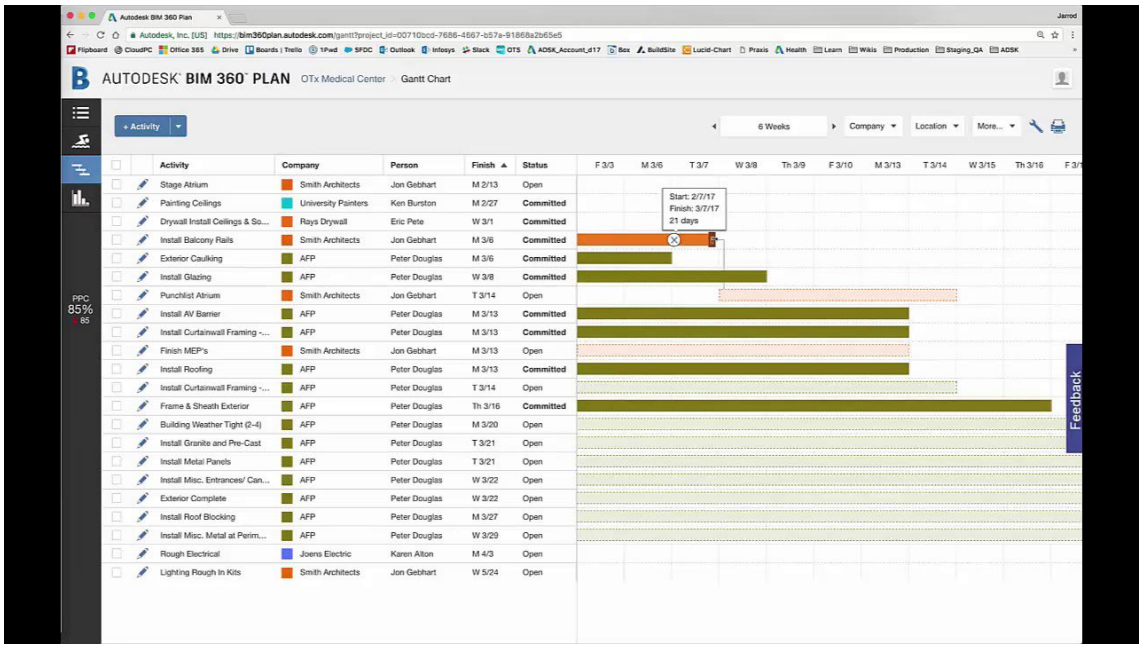

https://www.youtube.com/watch?v=6M3m9trgrtQ

https://www.youtube.com/watch?v=IcLxBgPiV24

Autodesk BIM 360 Layout® a solution based on cloud technologies for model construction and BIM project marking.

One of the most important stages of BIM is to build an object according to the developed BIM model. **BIM 360 Layout®**helps to achieve this.

BIM 360 Layout® allows contractors to combine a coordinated model with the results of demarcation work on a construction site. **BIM 360 Layout®** also helps increase productivity by achieving greater accuracy in marking and installing building components.

BIM 360 Layout® is compatible with most construction tools on the market used for marking.

Autodesk® Layout® works in AutoCAD®, Revit®, Navisworks® software environments.

Autodesk® BIM 360 Ops® enables general contractors and building owners to make effective use of the benefits provided by BIM in the administration of buildings. Autodesk® BIM 360 Ops® enables contractors transform the process of adding buildings using asset data obtained during design and construction.

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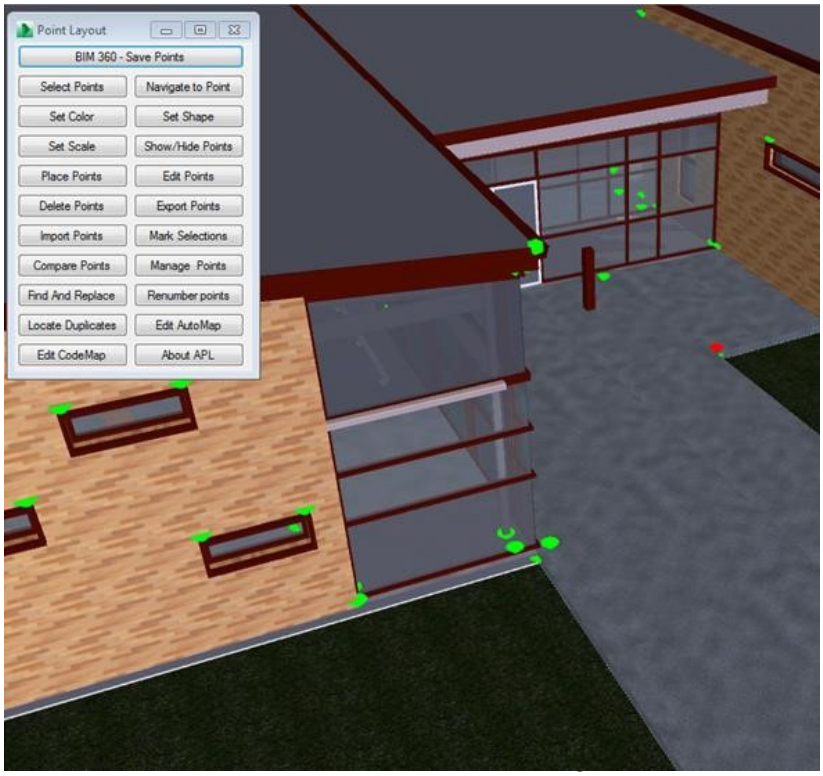
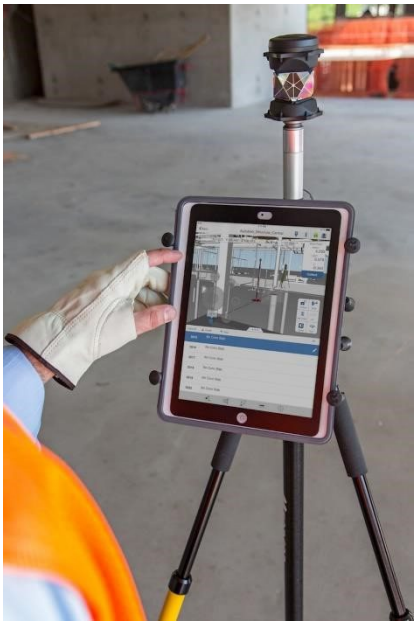
https://www.youtube.com/watch?v=NmwEm0j9VgY





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https://www.youtube.com/watch?v=fOVD5S_lmEg
https://www.youtube.com/watch?v=y2Ish7gJ9ok

Autodesk® BIM 360 Ops® – the first building management system running on mobile devices.

Other **BIM 360 MODULES**

BIM 360 cloud computing software consists of 7 products for different purposes.

Some BIM 360 products has several separate modules.

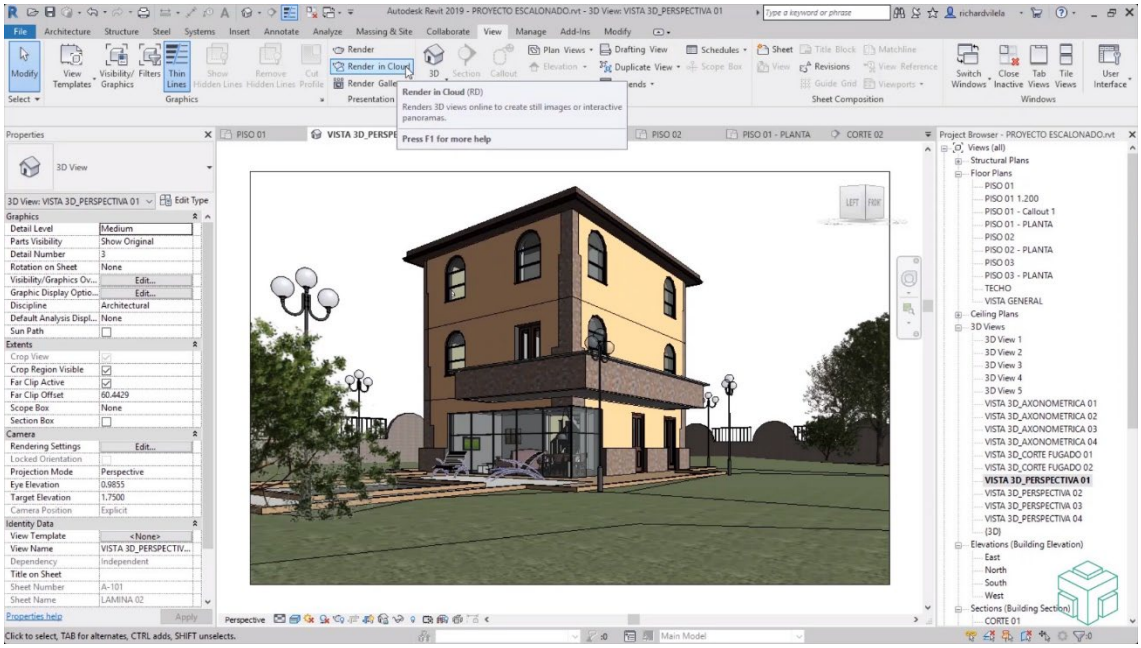
Below, there is a brief introduction to the features of the most popular products: BIM 360 Docs, BIM 360 Design, BIM 360 Coordinate and BIM 360 Build.

- BIM 360 Docs
- BIM 360 Design
- BIM 360 Coordinate (prev. BIM 360 Glue)
- BIM 360 Build (prev. BIM 360 Field)
- BIM 360 Plan
- BIM 360 Layout
- BIM 360 Ops

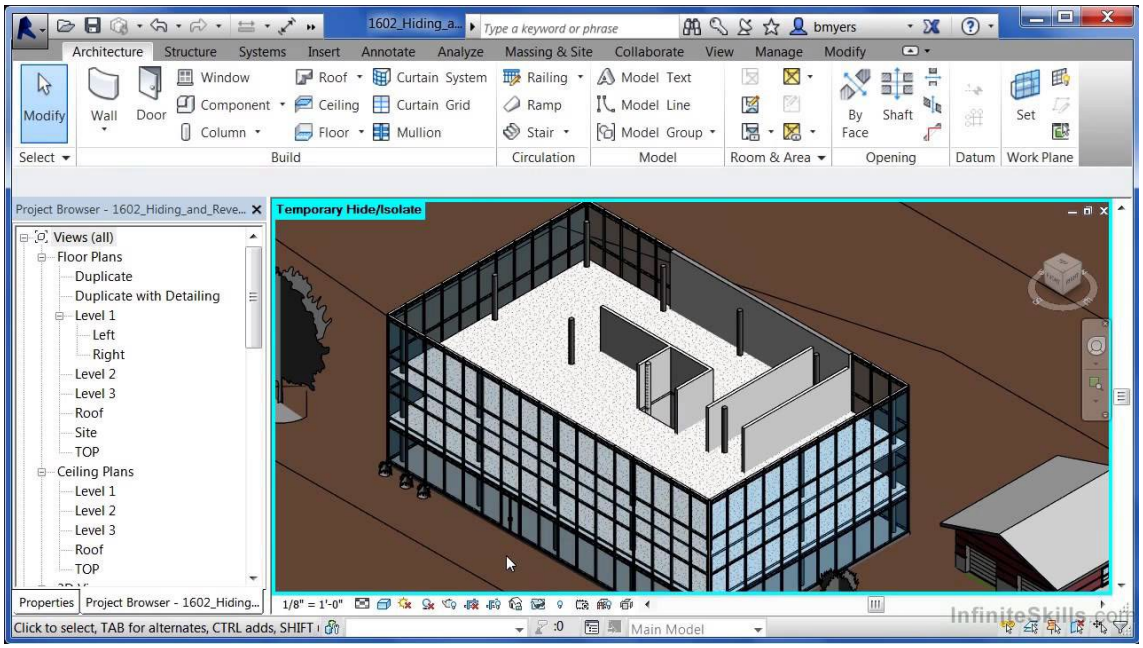
2. BIM SOFTWARE SOLUTIONS

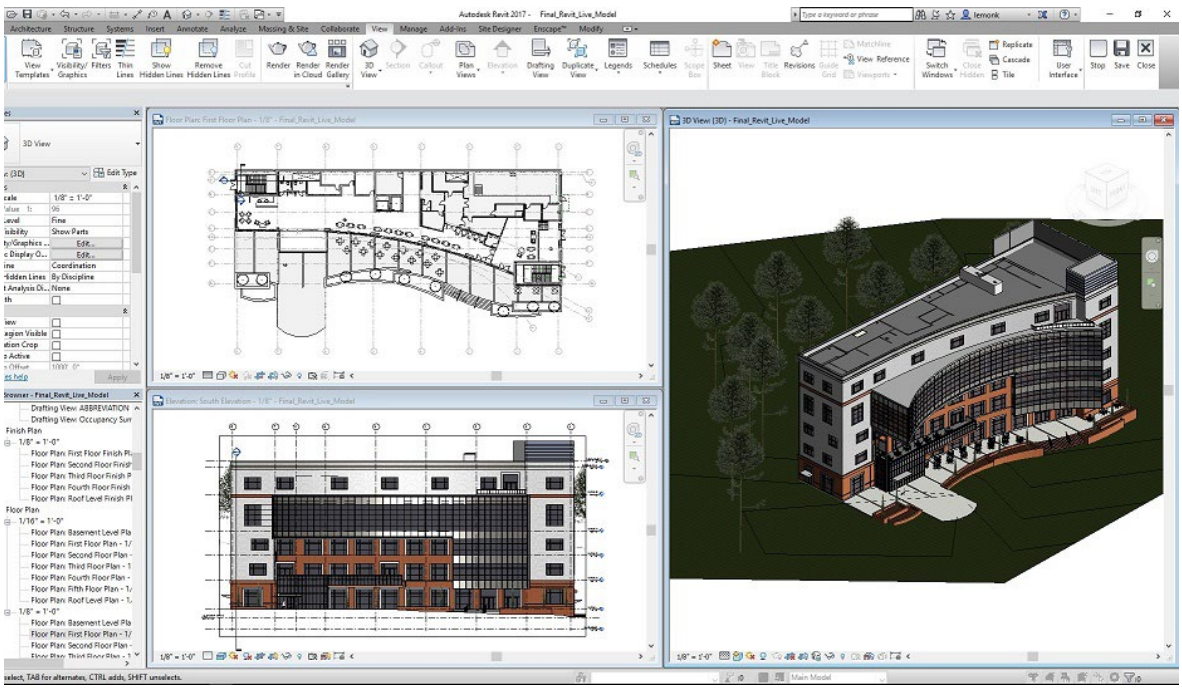
5.8 Autodesk Revit

The most well-known and probably the most widespread BIM modelling software in the world was launched in 2002. Revit software has a well-developed user interface. There is a possibility to create various sets of sheets that meet the requirements of technical and work projects. The formation of drawings is also extremely advanced, dynamically linked to the BIM model and its information. For example: smart footnotes, drawing numbers, corner stamps, notes and etc. are easily implemented with this software. The program supports a unique element categorization system, based on which new elements and components are created, called the Revit Family. The program allows you to connect them together and integrate many components into each other. Revit was originally developed as standalone BIM software, but today it integrates into the vast ecosystem of Autodesk products and is capable of building all key parts of a project, making Revit a comprehensive BIM platform.



2. BIM SOFTWARE SOLUTIONS





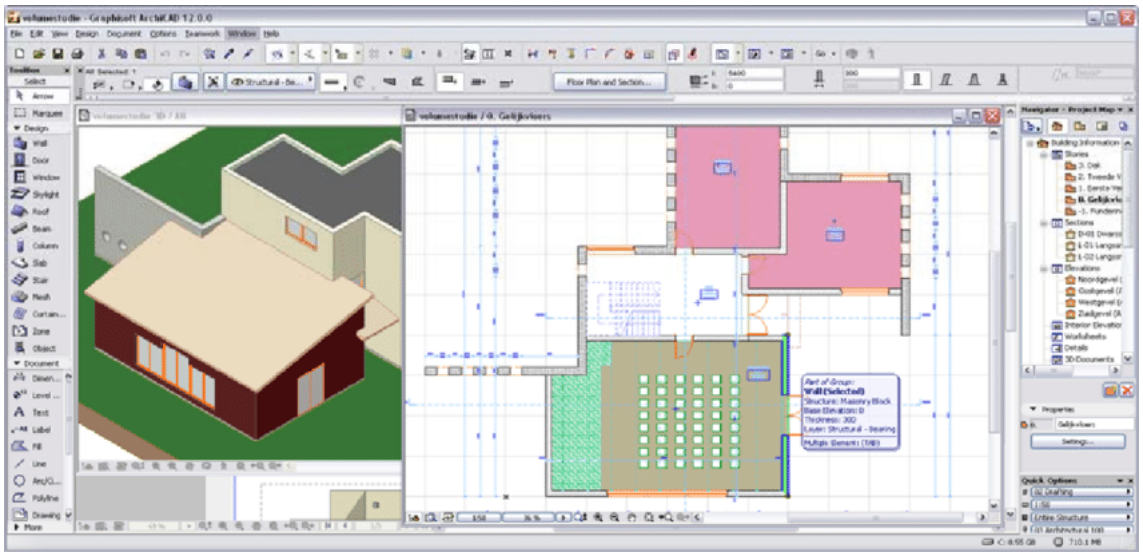
https://www.autodesk.com/solutions/revit-vs-autocad

https://www.youtube.com/watch?v=Nd6U2KgHI6k

2. BIM SOFTWARE SOLUTIONS

5.9 Graphisoft ArchiCAD

The ArchiCAD platform is one of the oldest and most commercially available BIM solutions for architects. The user interface is well developed, adapted for convenient and fast user work. There is a comprehensive equipment to create a variety of geometries, an automatically controlled by the system generation of drawings, directly linking all changes and annotations in the relevant drawings to the model. The program has a wide selection of pre-prepared parametric object structures.



https://graphisoft.com/

5.10 Trimble Tekla

This BIM solution originated in a Tekla Corp company based in Finland. Software started as a solution for the design of steel structures and is still a very popular solution among engineering companies and contractors working with a variety of metal buildings and structures. Today, the possibilities are considerably expanded, the software supports the work with other materials, including the very extensive possibilities to work with reinforced concrete structures, both monolithic and prefabricated. This BIM software is intended primarily for structural manufacturers and designers working with structures and bridges. It also has the potential to plan construction processes. The parameterization and automation functionality is very detailed, although it requires quite good user skills.

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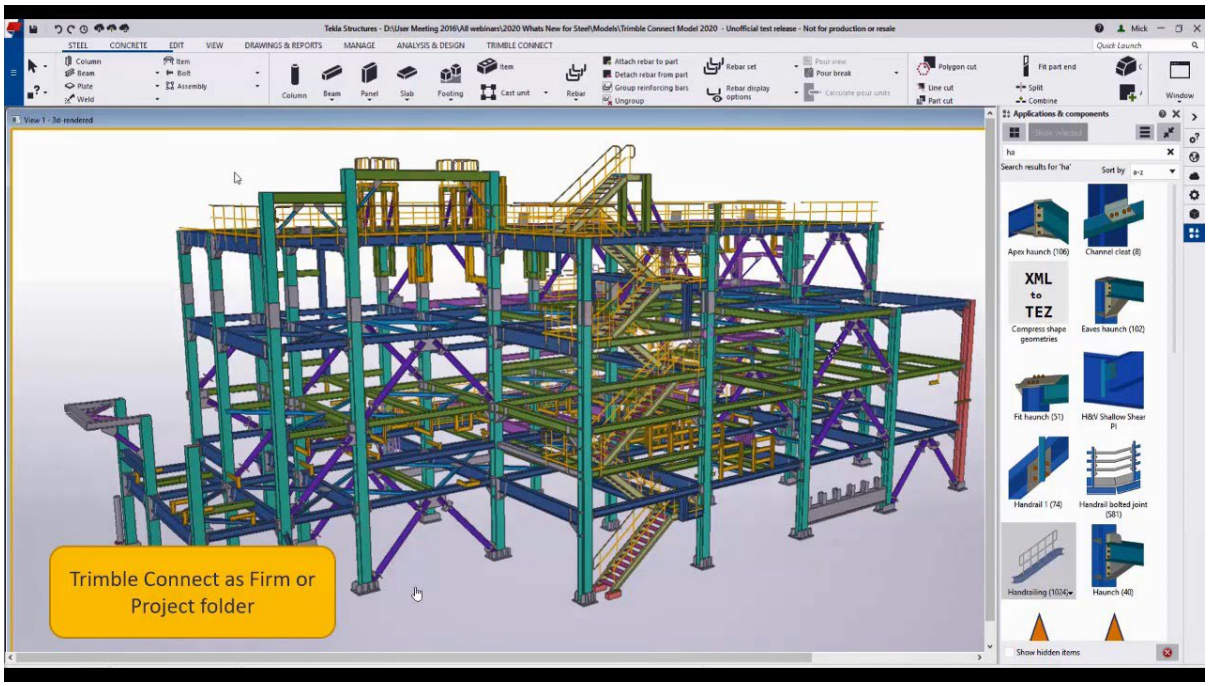
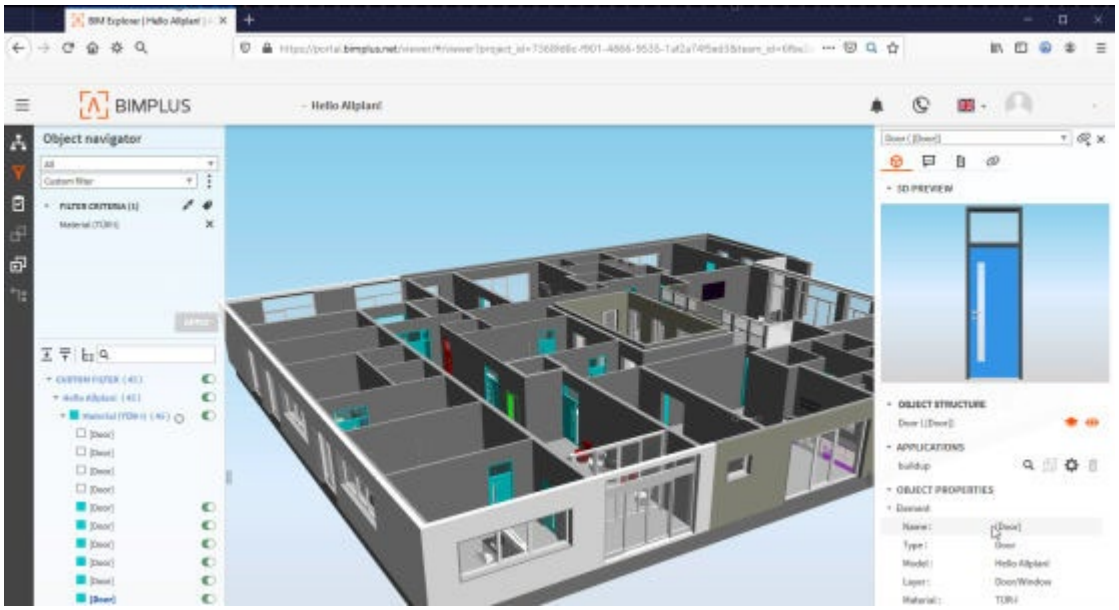


https://www.tekla.com/products/trimble-connect-now-included-with-tekla-structures

5.11 Nemetschek Allplan

Like several other BIM software, this BIM platform consists of separate modules designed to perform specific tasks, working with specific parts of a project and disciplines. The main modules consist of architecture, engineering (structures), bridge modules and etc. Unlike other BIM software, the development of models and elements synchronize both 2D and 3D features. Also, a feature of the program, that we will not find in any other BIM solutions, is the use of layers that hold various 2D information (for example, object cross-sections). Allplan has an excellent geometric 'motor' that allows you to freely create complex geometric shapes NURBS and Bezier using curves and surfaces. Parametric modelling is also highly developed and allows the creation of separate element libraries using the Smart Parts system or using an API based on the Python programming language. Material and quantity sheets can be configured in detail according to the user's needs without much hassle. Despite the fact that the software also applies to architecture, most of its special features focus on reinforced concrete structures.

2. BIM SOFTWARE SOLUTIONS



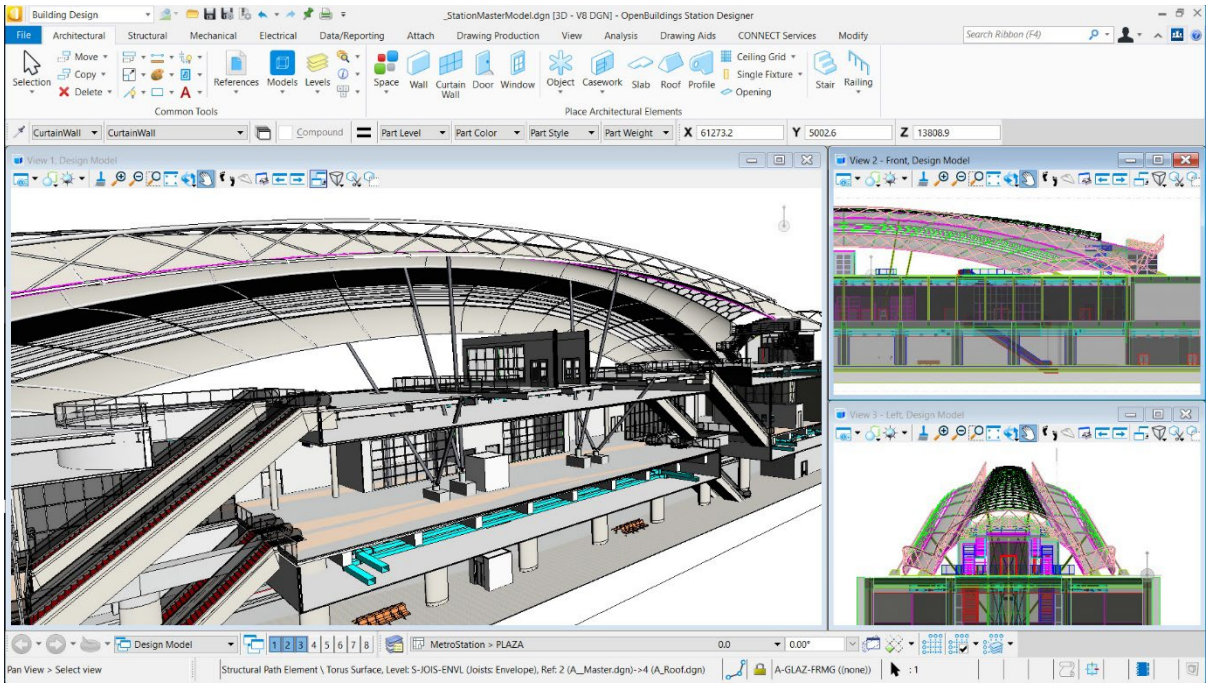
https://www.allplan.com/index.php?id=450

https://www.youtube.com/watch?v=d-fBAzz7KGU

5.12 Bentley Systems OpenBuildings

BIM software focuses primarily on buildings, but Bentley Systems use a modular system as a stand-alone application, similar to other BIM software developers. Therefore, different solutions are adapted to different disciplines, such as OpenBuildings for buildings, OpenRail for railways, OpenRoads for roads, OpenPlant for factories, plants, and so on. Most of the company's products are focused on factories, communications and other civil engineering. BIM software uses parametric objects, depending on the discipline. This provides a high level of configuration functionality because the roads are designed differently than the buildings, just as the rail BIM models differ from the roads. This specialization provides an advantage in specific niches, but makes it difficult for the user to work with multiple disciplines, due to the high learning curve and additional costs for all required programs. Just like in other BIM modelling programs, the 3D model and 2D drawings are automatically merged and all changes take place in both directions. Assigning information to objects is easily controlled by an advanced parameter assignment and control engine. It is a highly capable BIM platform, but due to the very wide range of different tools needed to build a sustainable BIM ecosystem, it is difficult to install and master this software.

2. BIM SOFTWARE SOLUTIONS



https://www.bentley.com/pt/products/product-line/building-design-software/openbuildings-designer

https://www.youtube.com/watch?v=YjJ1tDktEk0

5.13 Autodesk Civil3D

It is a very widely used specialized BIM software for infrastructure design. The software is integrated into the Autodesk BIM ecosystem. Although the software is based on the AutoCAD 'engine', its functionality has been greatly expanded to accommodate communications infrastructure solutions. It is possible to find highly specialized automation tools focused specifically on the efficient generation of roads, road embankments and the generation of ground surface triangulation. Parameter management is extended over typical AutoCAD functionality, but it is not versatile and easily transferable to other BIM platforms. Excellent open BIM format LandXML support. The AutoCAD software base makes it easy to combine CAD and BIM solutions, but makes it difficult to export them seamlessly without splitting them into separate files and maintaining the BIM concept. Extremely fast adaptation and flexible software configuration options allow you to achieve a highly efficient, specialized workflow for communication projects.

2. BIM SOFTWARE SOLUTIONS

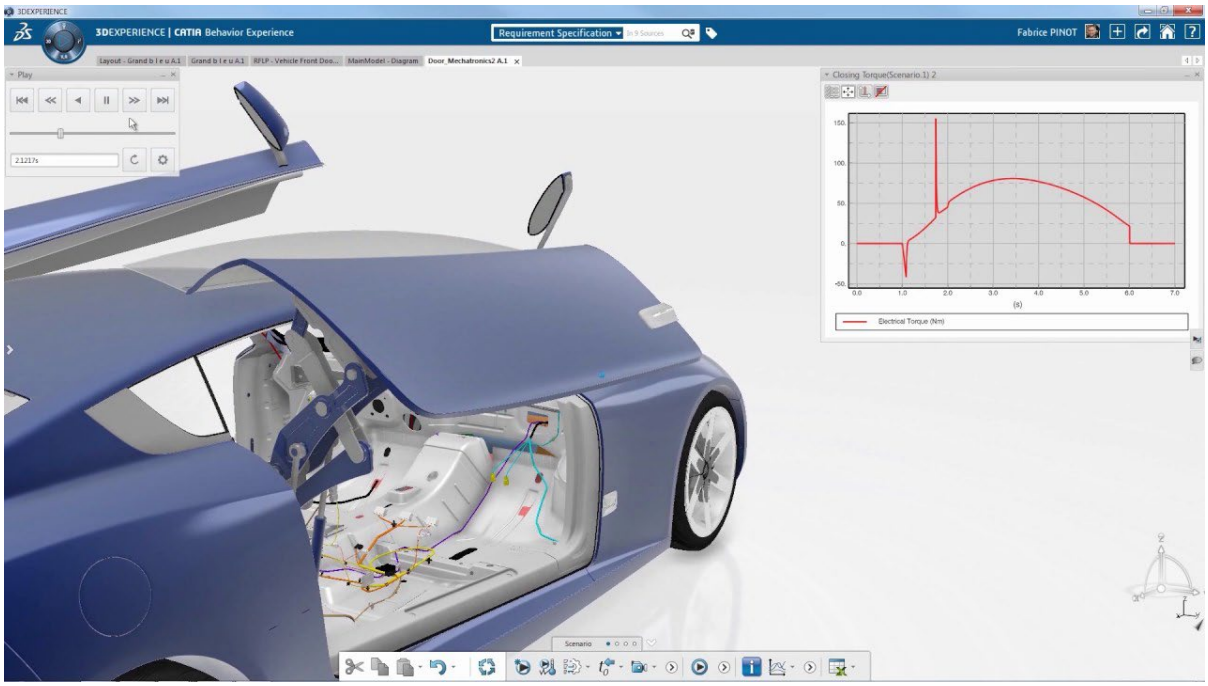
https://www.youtube.com/watch?v=hOnOmpFgyPQ

https://www.youtube.com/watch?v=UxH64u32BPE

5.14 Dassault Systèmes CATIA

This software is considered to be one of the most functional 3D CAD platforms with integrated PLM functionality and excellent integrations focused on modelling objects for production. Gehry Technologies have used this software as a BIM modelling solution. The solution is called the Digital Project, but it has not been updated to date. CATIA software is extremely difficult to master, but its capabilities in developing production-oriented BIM models are the most advanced of all the BIM and 3D CAD solutions mentioned. It is distinguished by the ability to model objects of any curved shape, which can naturally be expected from software, which dominates the automotive and aerospace industries, the sectors, who developed technology and progress from which the concept of BIM emerged. The program supports the open IFC data format and allows the generation of detailed 2D documentation from the generated 3D models. It also has excellent functionality for creating sheets of materials and elements. Together with 3DEXPERIENCE CATIA gives the market an advantage over many other digital twin solutions. One of the reasons is the extensive experience gained in the aviation and automotive industries. An essential feature of CATIA that allows it to function perfectly as a BIM platform - is the division and structuring of objects into parts, components, fully satisfying the principles of object modelling.

2. BIM SOFTWARE SOLUTIONS



https://www.technia.com/blog/what-is-catia/
https://www.3ds.com/products-services/catia/products/stimulus/

6. Deliverables

The student will have to answer the submitted test questionnaires.

7. What we have learned

The student has become acquainted with andisable to adapt different types of software used in the construction sector at different stages of the BIM lifecycle.