CES322600

Improved Collaboration with Revit and BIM 360 Design

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Learning Objectives

- Learn how to publish 3D models from Revit to BIM 360 Design Collaboration
- Learn how to use the timeline in BIM 360 Design to consume and create packages to share with other design teams
- Learn how to use BIM 360 Docs to track changes in models and drawings, and how to use them to communicate
- Learn how to create issues in BIM 360 Docs to add tasks to project members

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Description

The BIM 360 next-generation platform has been a revelation in one of Norway's biggest engineering companies. Using Revit software as the main design tool, Norconsult are implementing cloud worksharing with BIM 360 Design software in more and more projects. Designers and contractors now have a common communication platform where models are been used instead of drawings to make the decisions. Join us in this session to discover an ongoing project, performed by Norway's two biggest companies, as an example to show how BIM 360 Docs software and BIM 360 Design are being used to communicate and collaborate in the cloud.

Speaker(s)

Marius is currently working as a structural engineer and BIM-Coordinator in one of Norway's biggest engineering companies. He has over 13 years of experience in the construction industry and have worked with everything from small projects to large multidisciplinary projects. Revit has been his main tool since 2007 and he is constantly seeking new methods to maximize the workflow efficiency. Marius has been using BIM 360 since it's early days and is now a specialist coordinating teams in cloud collaboration. BIM 360 Design Collaboration is his preferred tool for optimizing the design workflow in projects.

Introduction

The Autodesk BIM360 product has been on the market for a while in different versions. Norconsult has been using the cloud software since the early days when the product was called BIM360 Teams and Collaboration for Revit (C4R). Going from local storage of the Revit central files, to a cloud service which connected the files on the same platform was a breakthrough. Not only could you link Revit files from other disciplines directly into you project, but designers, contractors and building owners now had a common data platform to communicate in models and drawings directly. The only thing you needed was a web browser.
BIM360 Teams then changed to BIM360 Design and was built on the next-generation platform so it could communicate with the other BIM360 products. With BIM360 Design you have more control of all BIM-models in the project, and you can go through changes in models from other disciplines before the new updated models are brought into your own project-model.

In this session we will go through two main products in the BIM360 family, BIM360 Design and BIM360 Docs, while we are using an ongoing project in Norway as an example. The project consists of 5500 square meters of indoor water park and 4000 square meters of residential building, currently being built in the middle of a crowded old town in Norway. Designers and contractors are using BIM360 Design and BIM360 Docs to communicate and collaborate in the cloud.

A BIM360 overview

BIM360 is a unified platform connection project teams and project data in real time. The platform is built on Autodesk Forge and have BIM 360 Docs as a foundation. Other modules can be added to the project, depending the project phase and tasks. Below you can see how BIM 360 are structured, and which products are used in different project phases.
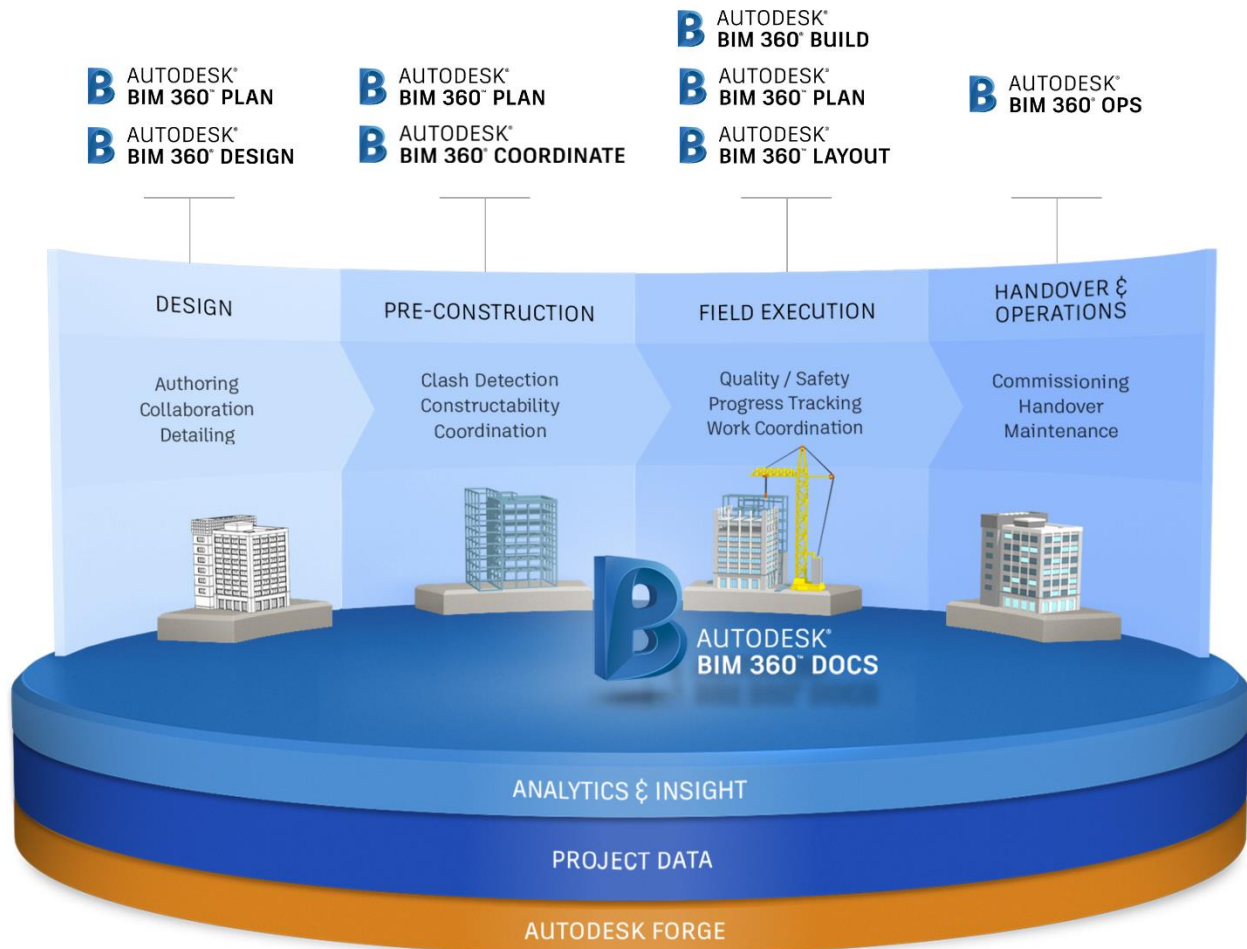
For more information visit the Autodesk BIM 360 website

https://www.autodesk.com/bim-360/

Revit Cloud worksharing

Revit Cloud Worksharing allows architects, engineers and contractors to collaborate on Revit models in the cloud. This gives the ability to publish Revit models and views/sheets directly from Revit to BIM 360 Design. Your company must subscribe to the Revit Cloud Worksharing service to use this feature.

To get access to Revit Cloud Worksharing you'll need the following:
- Revit subscription (Revit 2017 or later)
- BIM 360 Design Subscription
- Access to Revit Cloud worksharing service
- A BIM 360 Docs account
- Invitation to at least one BIM360 Docs project

For more information about Revit Cloud worksharing and how to get access to the service, please check out the Autodesk knowledge network on the link below.

Revit Cloud Worksharing

Save Revit models to the cloud

To start collaborating in the cloud it's necessary to save the Revit model to the cloud. The process can be a little different depending on which version of Revit you are using. If you are using Revit 2020, it is possible to save both non-workshared and workshared models by using "File→Save-as→Cloud Model".
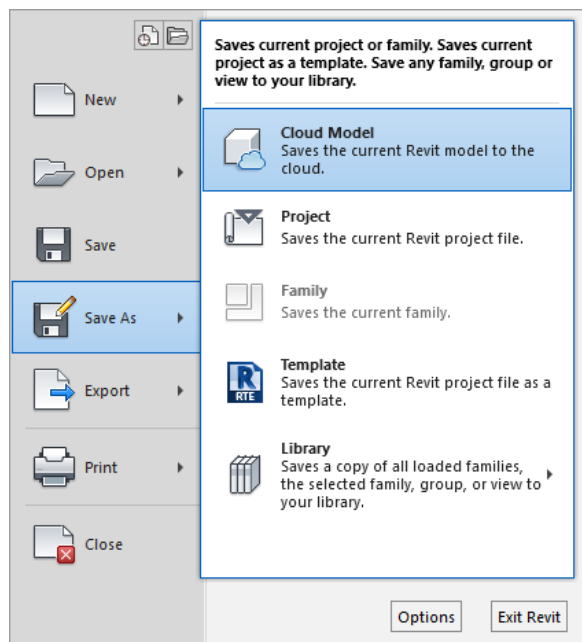
A new window will appear, and you will now have the opportunity to choose a BIM 360 project and where you want to save the file.

Tips to project administrators: Make a subfolder in "Project Files" where each Team (discipline) have their own folder where the central files are stored. This minimize the amount of root folders.
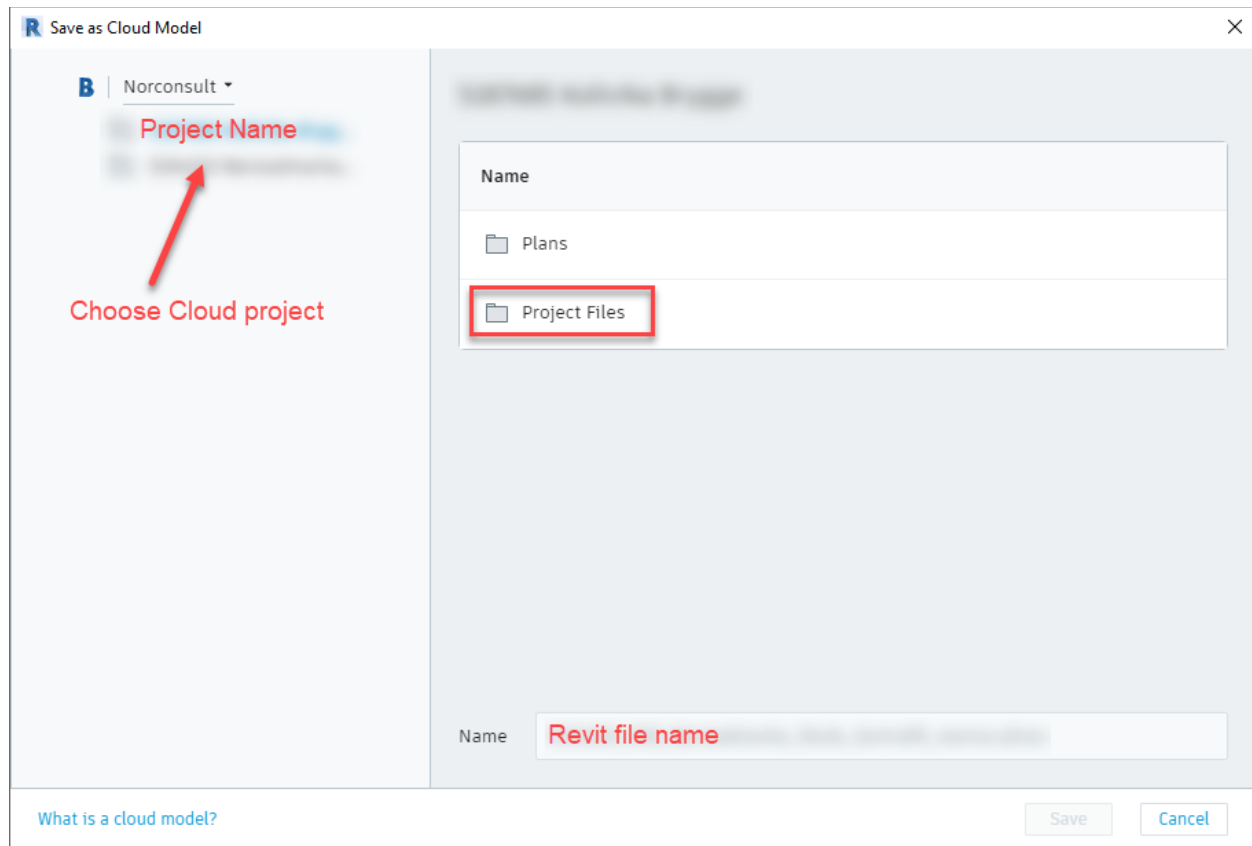
In Revit 2019, this option is only available for non-workshared models. If you want to save a 2019 workshared model to the cloud, you'll need to go to the Collaboration tab and choose "Collaborate in the cloud" and follow the dialog boxes which appear. Navigate to the Project Files folder and store the file in a preferred folder.
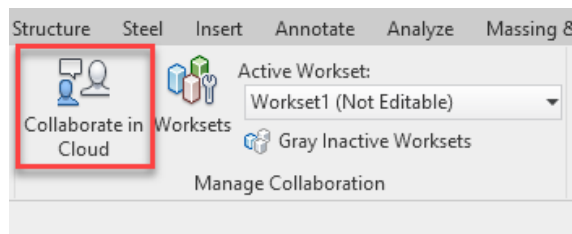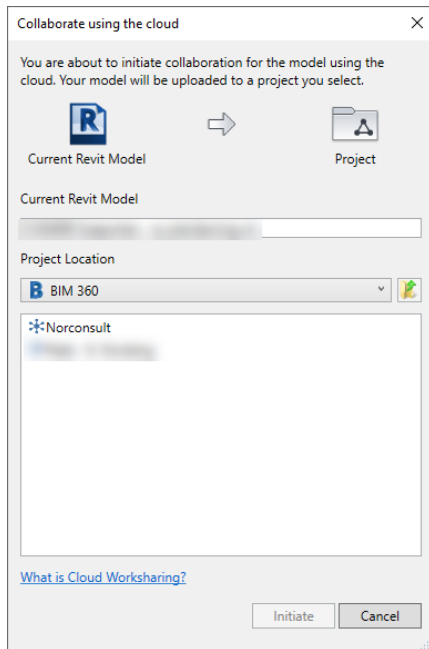
It's also possible to save the Revit model as a cloud file the first time you activate worksharing. You will then be prompted to choose either local worksharing or Cloud worksharing in BIM360.
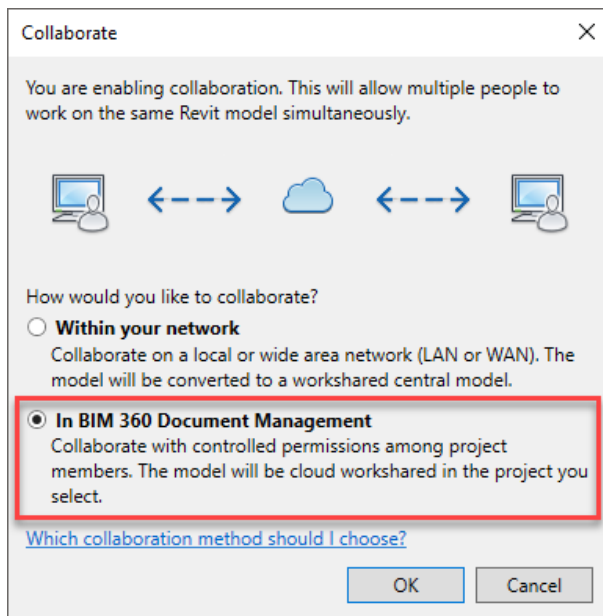
BIM 360 Design Collaboration

Teams in BIM 360 Design

In BIM 360 Design Collaboration the administrator(s) of the project will set up the teams in the project. One team is typically architect, another one is structural engineer, MEP engineers, and so on. To set up teams in BIM 360 Design Collaboration, go to the admin menu, by clicking the 9 dots on the top left corner in BIM360, and choose Project Admin. If you don't see the Project Admin picture, it means that you are not an admin of the project.
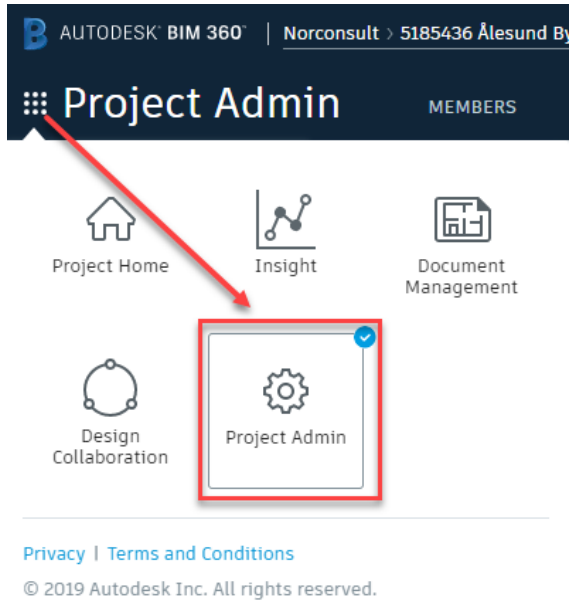
When you are in the Project Admin page, make sure you have chosen the Services tab, and click on Design Collaboration on the left sided menu. Here you can add teams to the project.
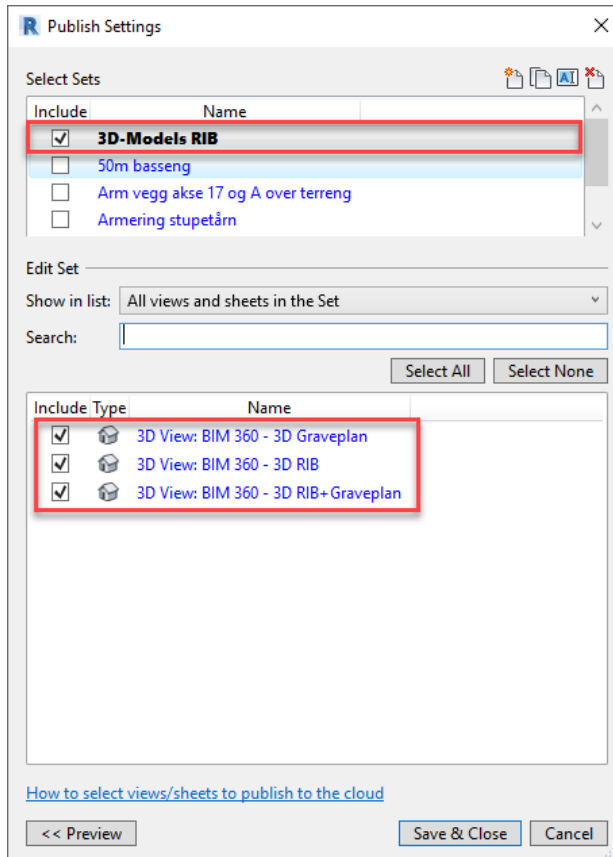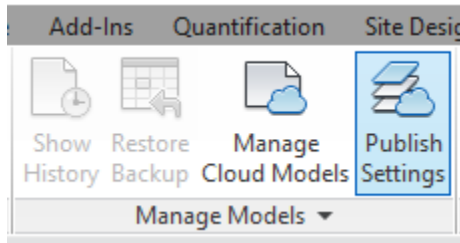

Publish model and views from Revit to BIM 360
Now that you have set up cloud worksharing and have established project teams, you are ready to start publishing models and views to the BIM 360 Design module.

The first thing you want to do is to arrange some views you can publish to the cloud with the model itself. Add at least one 3D-view which shows all the geometry of the model. This view will be used to track changes in the model each time it's published to BIM 360. It's recommended also to add plan views and some sections which can be very helpful to use in the collaboration with others. Group the views under the same category in Revit and add view templates to them, so if you for example want to change the layout for a plan view, the changes will be applied to all the plan views which has that template active.
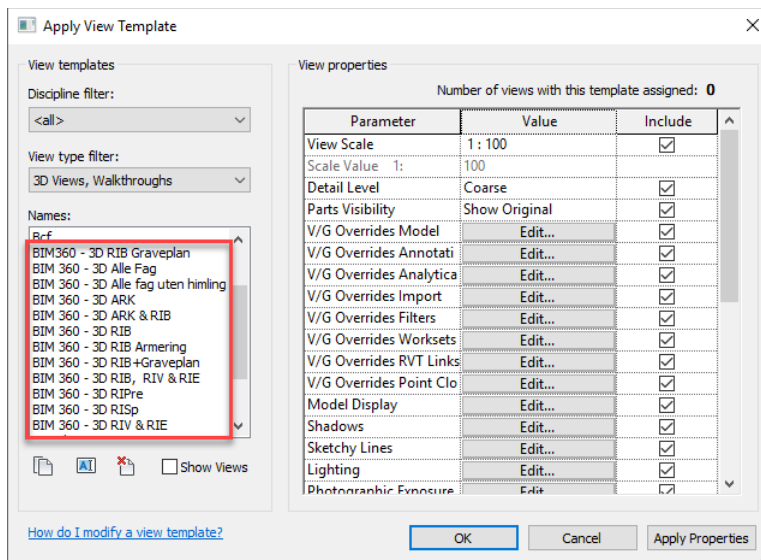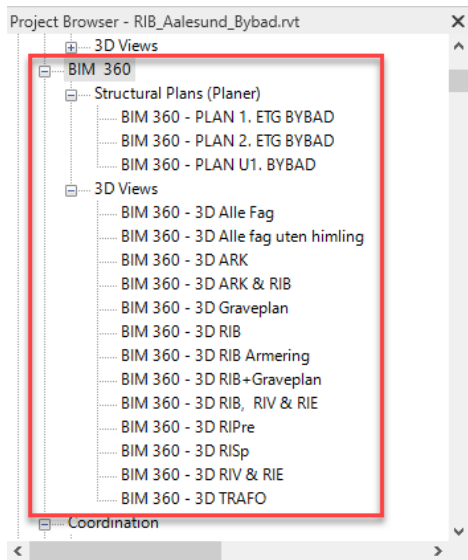
After the views have been set up, click on the publish settings under the Collaborate tab. Here you can add different sets and choose which views to be included in the sets.

It can be useful to publish views which contains multiple disciplines to illustrate a specific problem. To publish views containing other Revit links, the link files needs to be saved in BIM 360 and worksharing must be enabled to be shown in the published view.

When the MEP models are linked into a Revit file, pipes and ducts are often shown I grey with some color lines by default. To get these objects to be shown with colors patterns the same way as they show up in the MEP engineer's model, set the Revit link to "By linked view" and choose a view in the list. It's a good idea to contact the MEP engineers and ask them to set up the views with the right settings in his model, before "borrowing" the views. The view can now be published to the cloud with a much more visualized effect than it would have been by default.
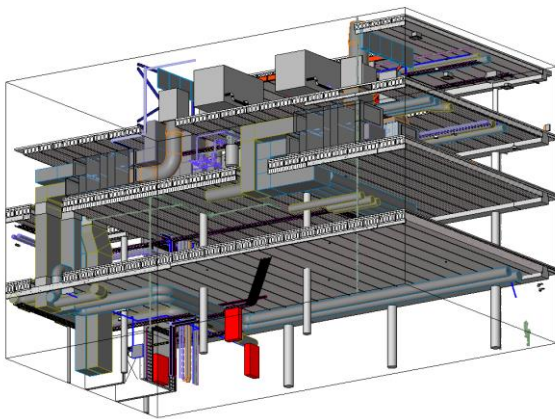
Default   By linked view
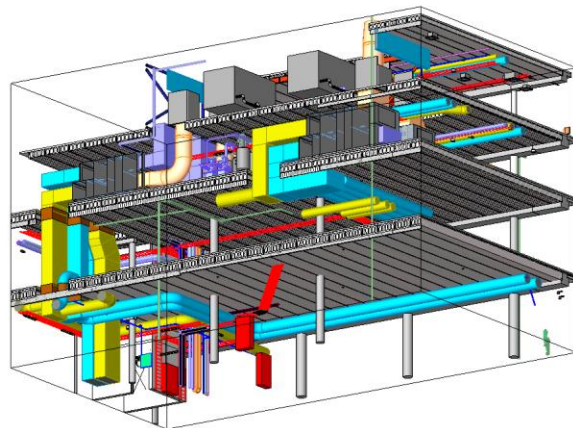
It's also possible to crop 3D-views using the section box. Complex details are great to include as 3D-views, which gives contractors a totally different overview and insight of the detail.
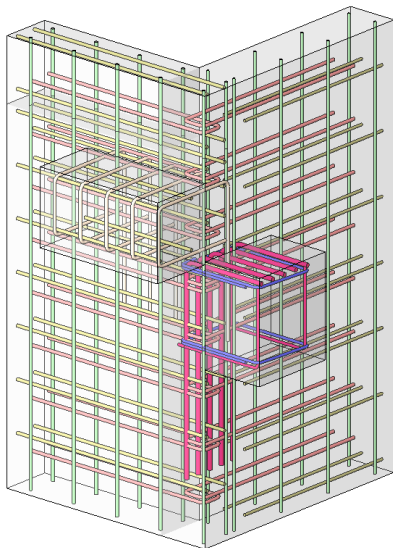
Now that the views are in place, the last step is to publish the model and views to BIM 360. This is a very simple process and the best part is that you don't have to wait a single second for the views to be published.

Important:
The Revit model must be synchronized to central after you have made changes to the publishing sets in the publish settings. If this is not done, the old published set will be published again.

Click the Manage Cloud Models under the Collaborate tab and choose which project the drawings should be published to.
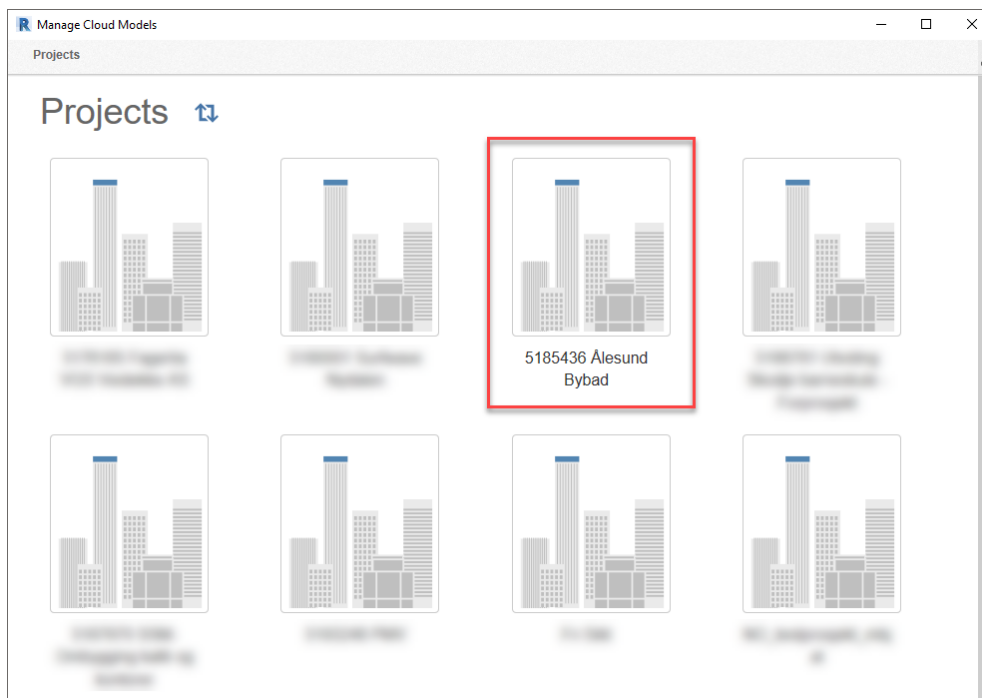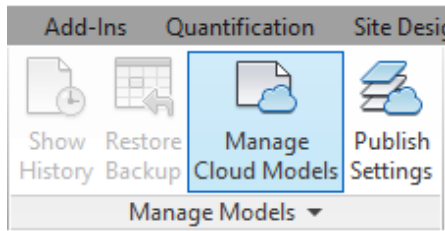
After choosing the project, locate the file you want to publish (usually the one you have open and are working in) and click on the publish icon. You can now close the window and continue your work right away.

The picture shows all models you have access to. Admins have access to all models.

After the publishing process, the published views will be visible in both BIM 360 Document Management module and the BIM 360 Design module. For now, we will focus on the BIM 360 Design module.

Share a published model with the rest of the teams
After the model has been published to the cloud, it will show up in your team page. There will be an overview that shows the time of the published model, the name of the set(s) in the model, and the number of sheets and views that follows the published model.

Either click on the set you want to explore, or click on the Set, Sheets, 3D-views tab to explore the sets in your team space.

Click on a view in the content browser on the left side, and the view will show up in the viewer. If you want to see the changes in the model, click on the Show changes button in the top right corner.
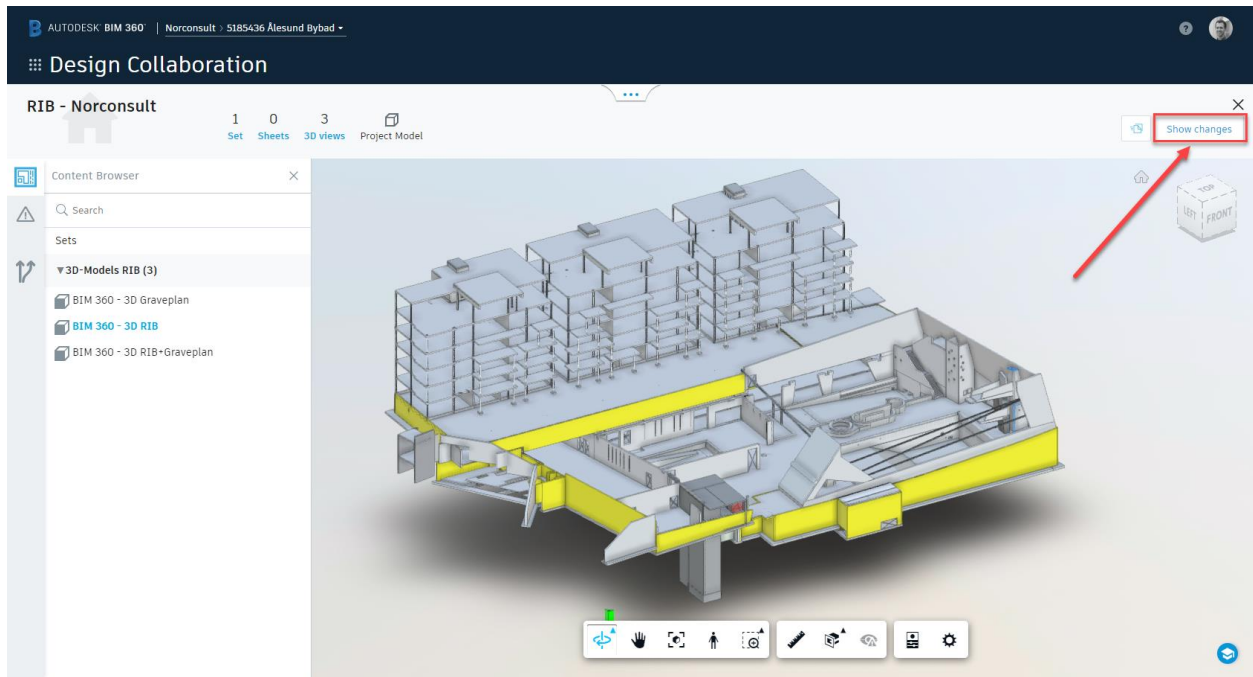

The changes from the last shared model and the last published model (the one you are about to share) will be shown.
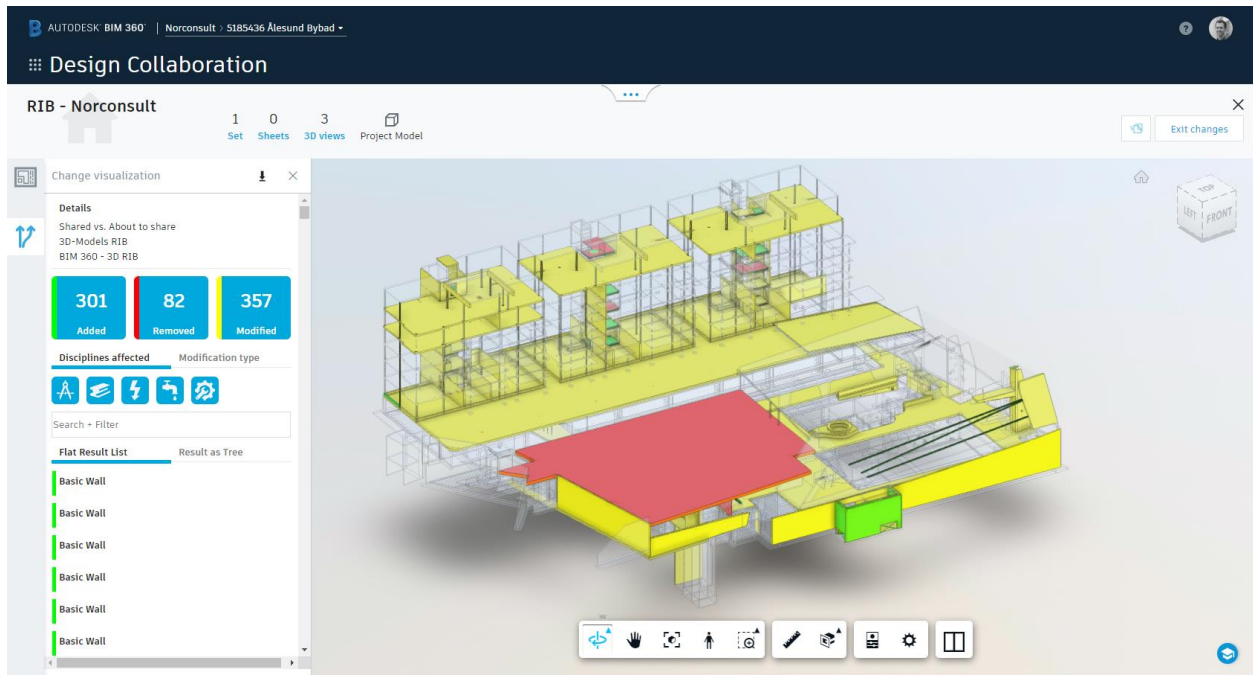
Only members in your team can see the published model. This gives your team the opportunity to explore the model and to do quality checks before it gets shared to the rest of the design team.

To share the published model and views to the other teams, we need to take a closer look on the timeline in Design Collaboration.

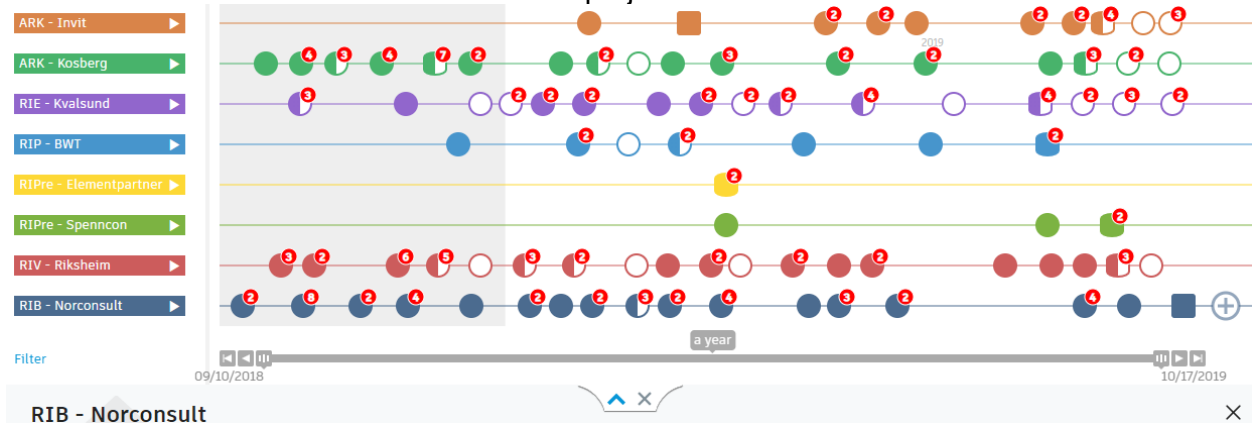To open the timeline, click on the symbol in the top middle of the screen.
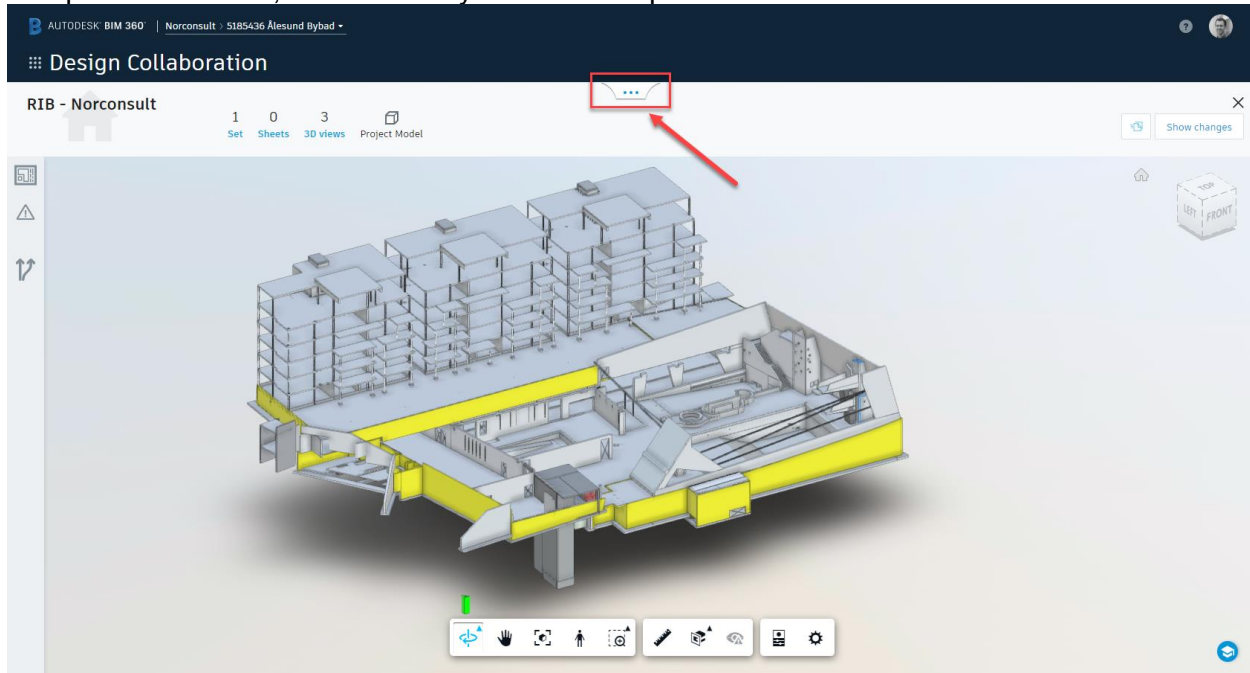
The timeline is shown with a "shared" line and a line for your team.
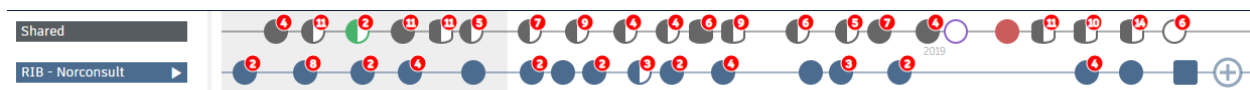
The timeline can be expanded to one more level. To do this, slick on the down arrow.

The timeline then shows all the teams in the project.

A description of the timeline symbols from the Autodesk knowledge network. [Timeline Symbols](#)

| Node Type	Description
◯	An empty circle on another team's line represents a package that has been shared, but not consumed by your team.
▬▬▬•	A filled circle on another team's line represents a package that your team has consumed.
▬▬▬•	A filled circle on your team's line represents a package you have shared.
○	A dotted-line circle on your team's line represents the start of a new package that you haven't shared yet.
◉³	A numbered badge with a circle represents a cluster of packages. The two-tone color means some have been consumed, some have not. Click or zoom to expand the cluster.
◯²	A numbered badge with an empty circle represents multiple packages that haven't been consumed. Click or zoom to expand.
●⁴	A numbered badge with a filled circle represents multiple packages that have been consumed. Click or zoom to expand.
■	A square represents a model uploaded to the team folder in Document Management.
◼²	A numbered badge with a square represents a cluster of models. Click or zoom to expand.
◼⁸	A numbered badge with a hybrid square and circle shape represents a cluster of models and packages. Click or zoom to expand.
◼⁸	A numbered badge with a hybrid square and circle shape represents a cluster of models and packages. The two-tone color means some have been consumed, some have not. Click or zoom to expand the cluster.
⊕	The plus node allows you to create a new package to share your team's work.

The project timeline has a filter which can be used to show or hide models
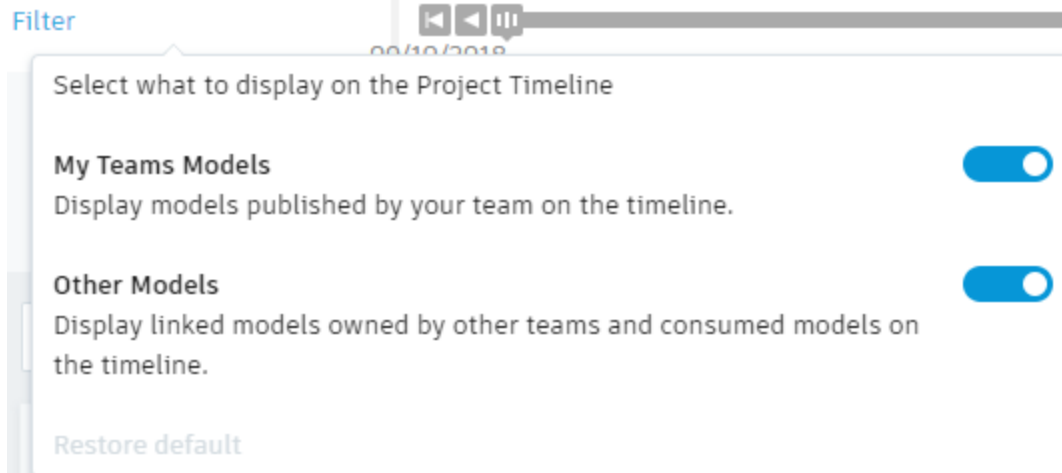
To share our model and views with the other teams, we will have to make what we call a package. To do this, we need to click on the + symbol all the way to the right in our team timeline. A dotted-line circle will the show up on the timeline, and you can select which sets and models the package should contain.
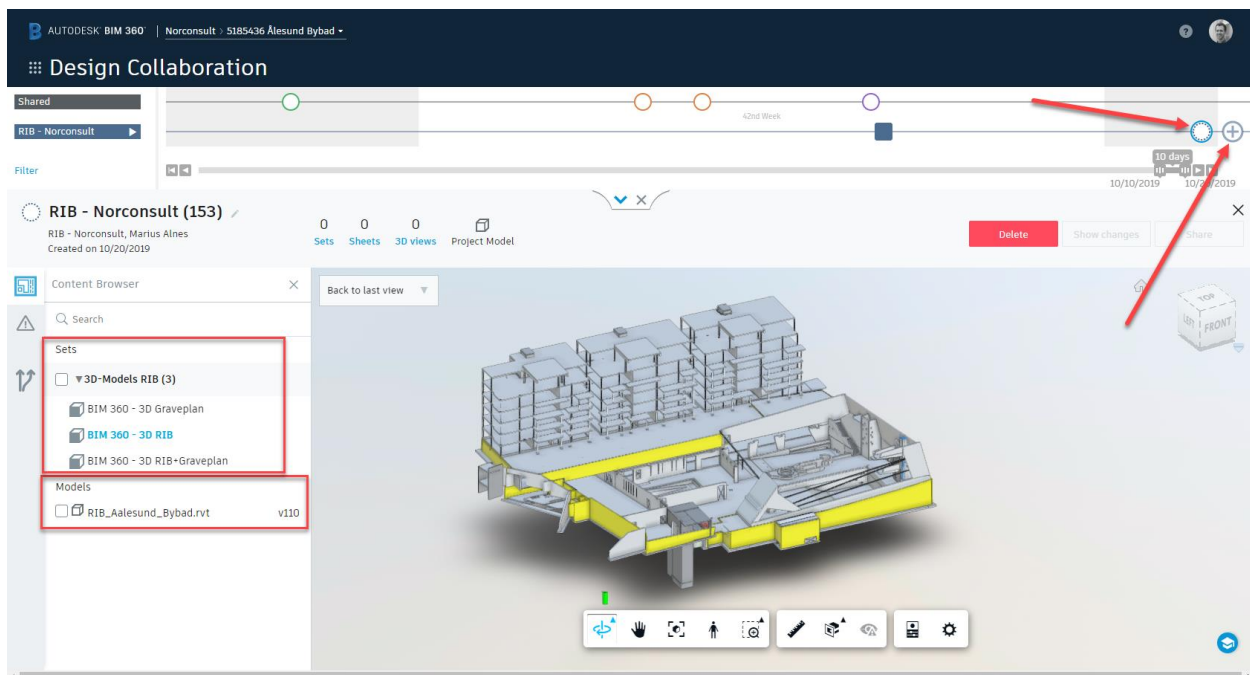
Then click save in the content browser.
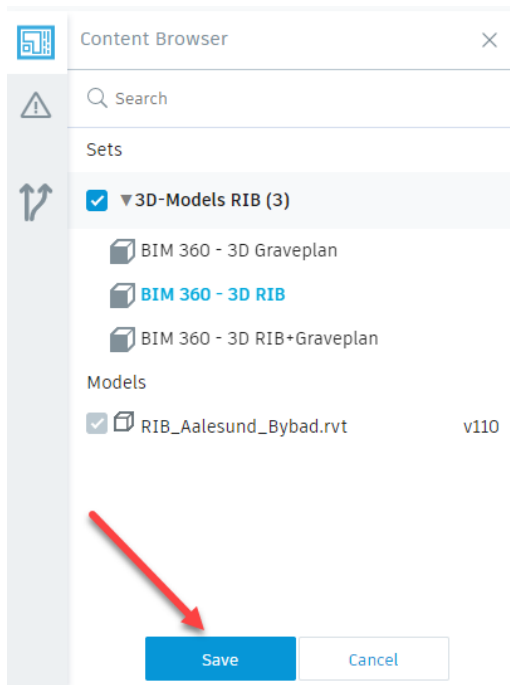
Click on the share button in the top right corner of the window.
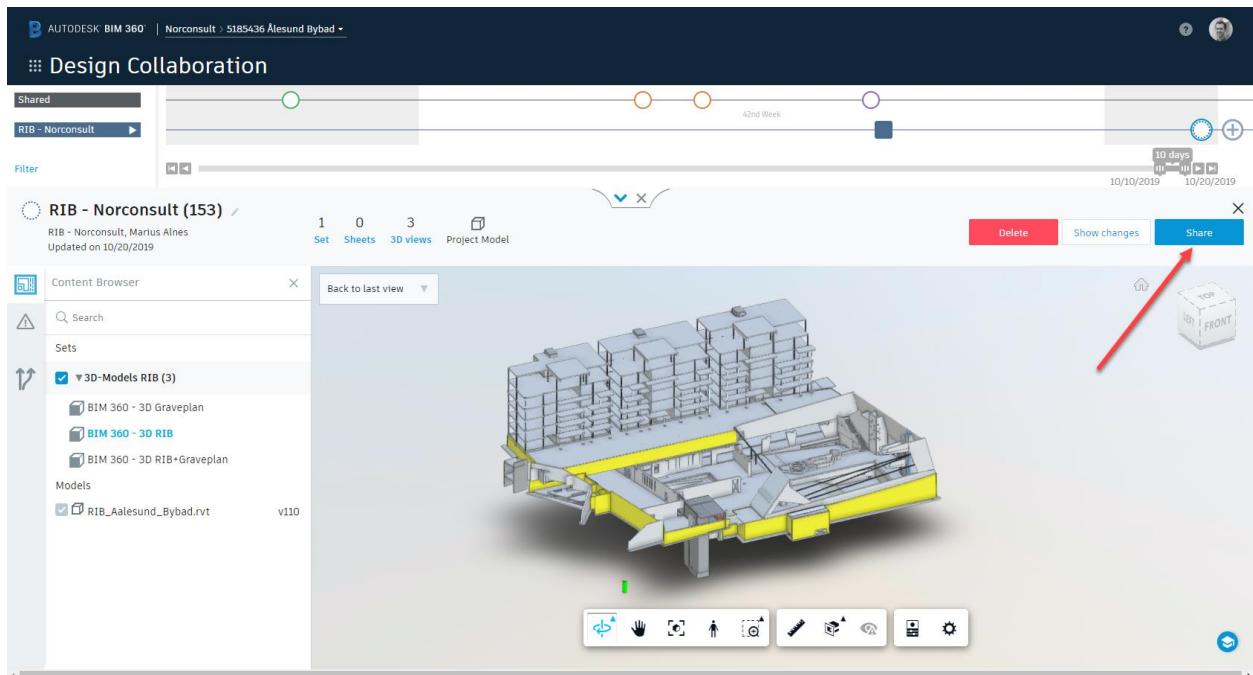
And add a package name and package description. The name and description will be visible for the teams that view the package and is very helpful to identify the changes in the model.

The package has now been shared with the rest of the teams and will be visible for them in the timeline.
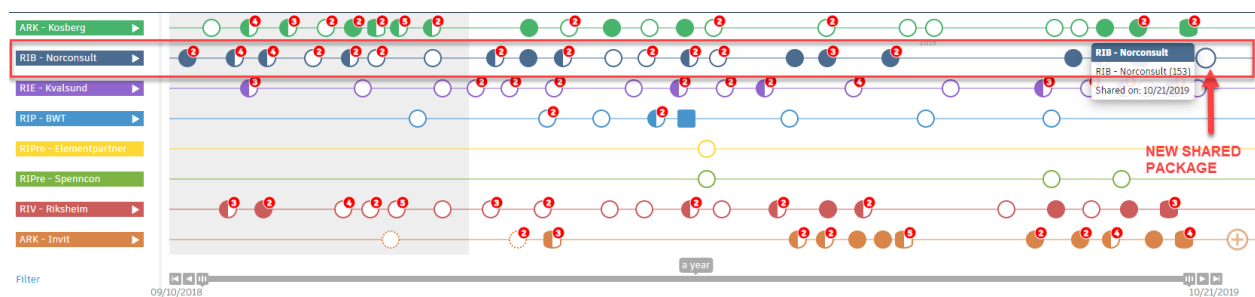
Workflow for sharing IFC-files

In some projects we exchange file-types as for example IFC files. The workflow to get the IFC-models to the timeline and share them with the rest of the teams are done by the project BIM-Coordinator and are done like this:

1. Add a team in BIM 360 Design to have a folder to store the model in.
2. Open the IFC-file in Revit.
3. Check the file for errors.
4. Activate worksharing of the model and save it to the team folder in the cloud.
5. Go to the Design Collaboration module and create a package and share it on the timeline with the rest of the teams.

6. When an updated IFC-model are received, the central file in the design folder must be deleted before repeating point 2-5.
7. The files in the Shared Folder will be updated, so the version history of the model will be taken care of.

Consume packages

When a package is shared, other teams can view and explore the shared package. They can also show changes in the model, if the team has published the same view as the last shared package. Therefore, it's important to establish some views in Revit that follows the published models.

If a team wants to bring the new shared model into their own Revit project, they can consume the package. To consume a package, click on an empty circle on another team's timeline, and then click on the consume button.
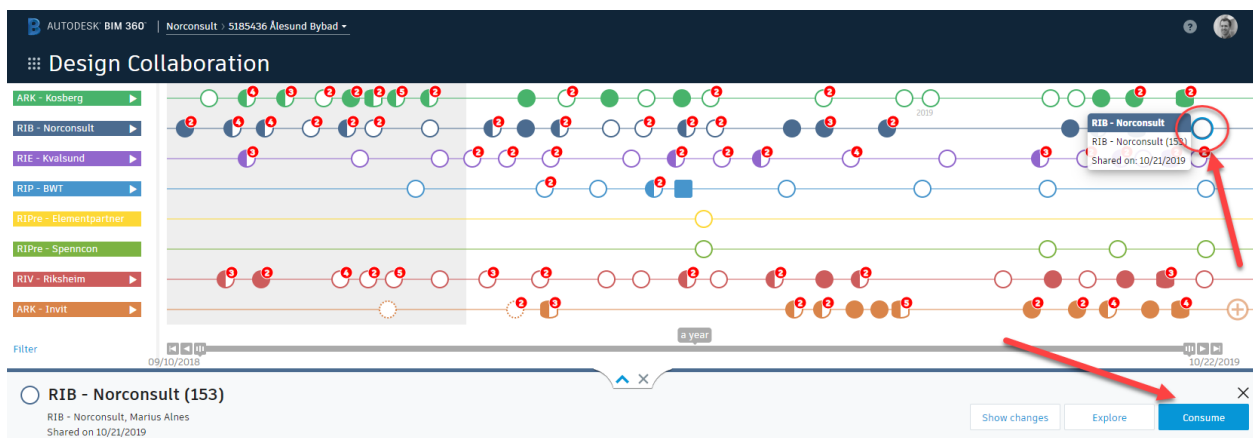

You have now successfully consumed a package from another team.

P.S. Remember to click on the Manage Links tab and reload the link, to get the new updated model.

Linking models to a Revit project

To link the consumed models to you Revit project, the process is almost the same as linking local Revit files. BIM360 project administrators have given access to a team folder in BIM 360 Document Management. In the team folder, there is a folder named "Consumed". The models you are consuming in the BIM 360 Design Collaboration module is placed in in the consumed folder under subfolders for the different teams.
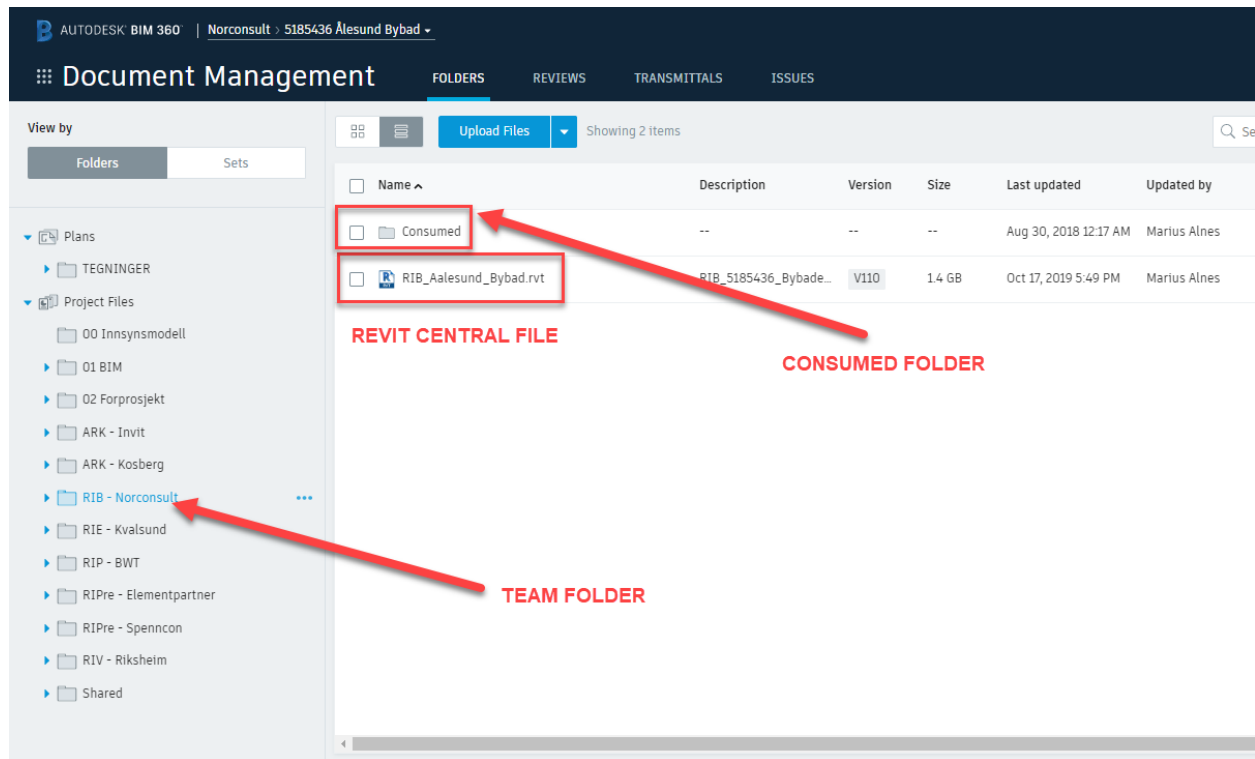

To link Revit models, you need to browse to the consumed folder in BIM 360. Click Insert → Revit Link, and choose External Resource in the top left corner. Then click on the BIM 360 symbol, choose the project folder, and then the project files folder. Then you will have access to your team folder and can choose the consumed folder to link in consumed models from other teams.
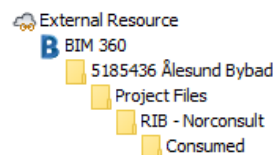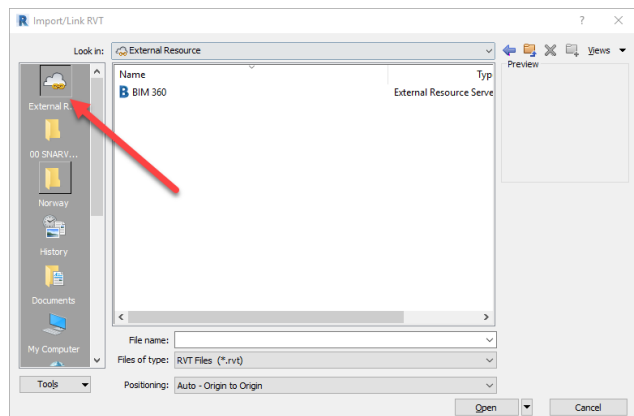
BIM 360 Design Collaboration – Project model
Every team has its own project model in BIM 360 Design Collaboration. This is a model containing of your teams last published model, and the latest models (packages) you have consumed from other teams. This is basically your team's coordination model updated on the go!
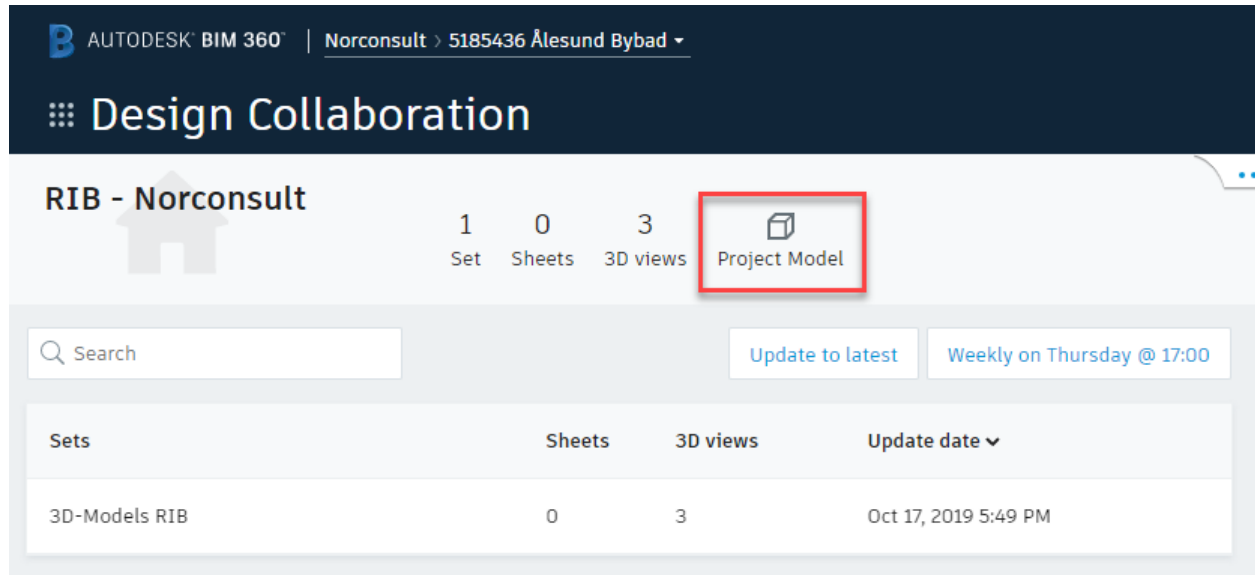

In the project model you can hide and show the team models, choose to show only a specific level in the model,
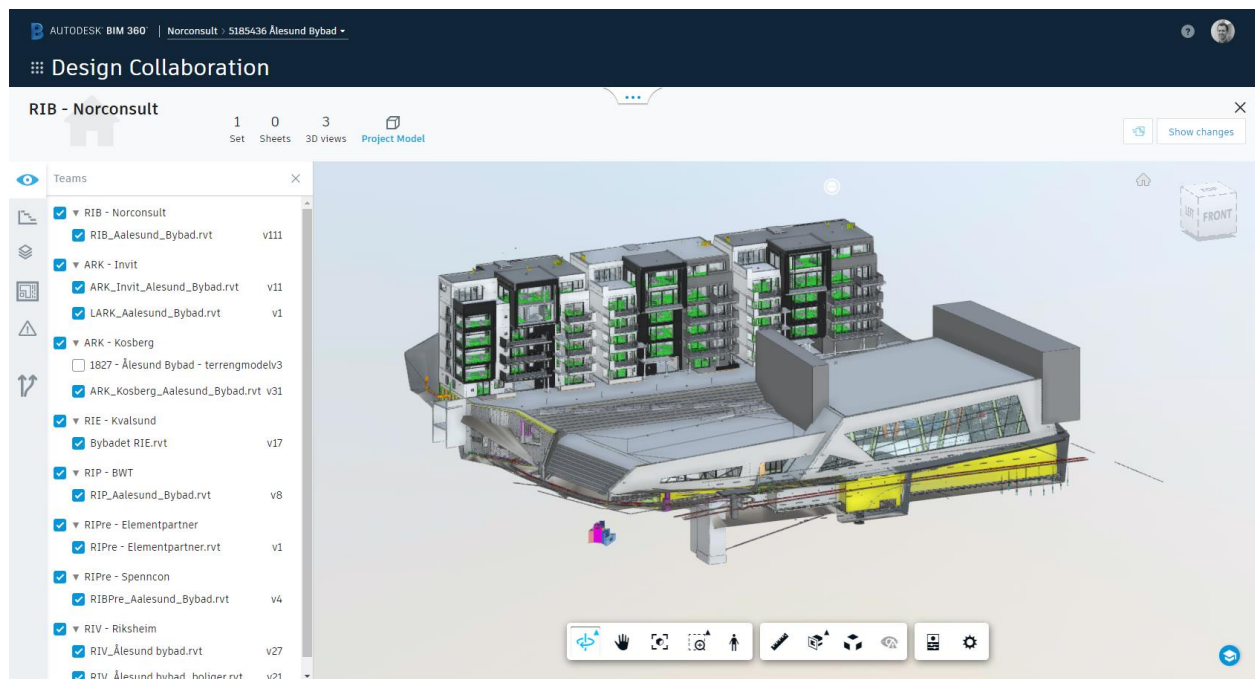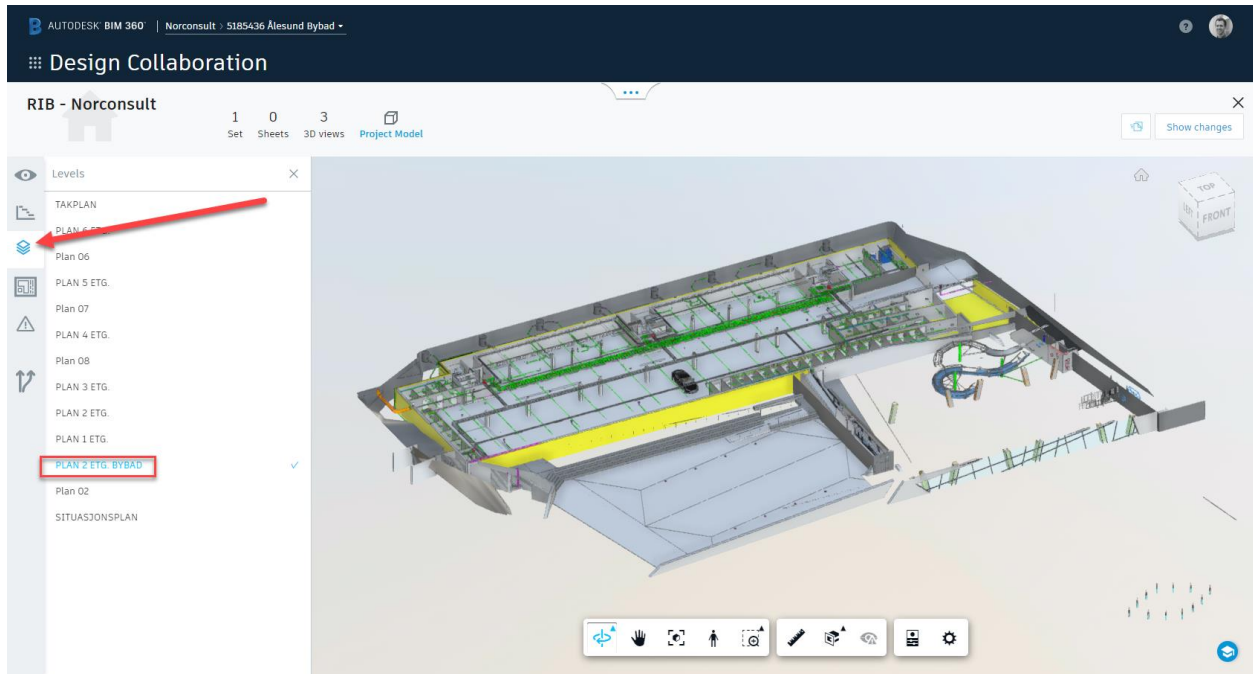
It is very important that all team models are published with the same location in Revit. If one or more models are published with another site, those models will not match the other team models in the Project Model. If the distance between models are very long, it will lead to graphical errors when viewing the project model.

Quick tips – BIM 360 Design Collaboration
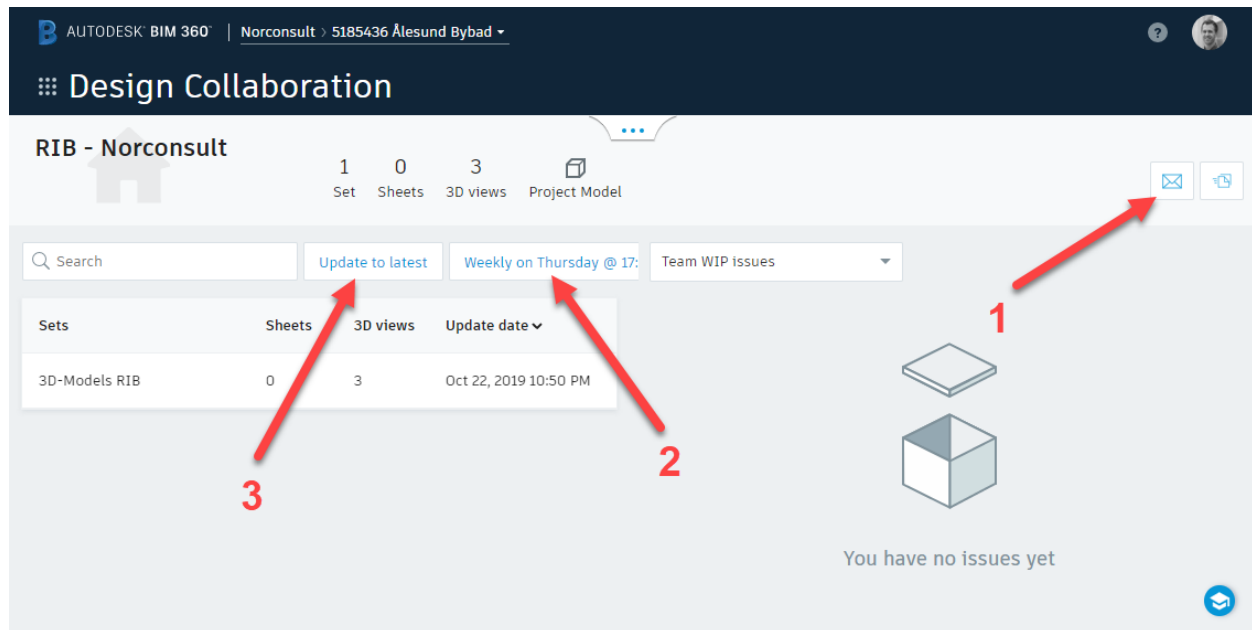
1. **E-mail notifications**
It is possible to et e-mail notifications when a model is published and consumed. To do this, activate the notification on the e-mail symbol on the right side in your team space.

2. **Schedule publishing of models**
In BIM 360 Design it is possible to schedule a regular publishing of your models. For now, only weekly publishing is available.

3. **Update the team space with the latest content**
Persons in your team, who don't have Revit installed, can update the team space directly in BIM 360 Design. This means that the latest synchronized modes in Revit are being published to BIM 360 when running this.

BIM 360 Document Management

BIM 360 Docs is the foundation in the BIM 360 platform. The big amount of file types that can be viewed directly in the browser, and ability to communicate and collaborate directly in models and other documents is the reason that this is an ideal platform to unify the project teams.

BIM 360 Docs folder structure
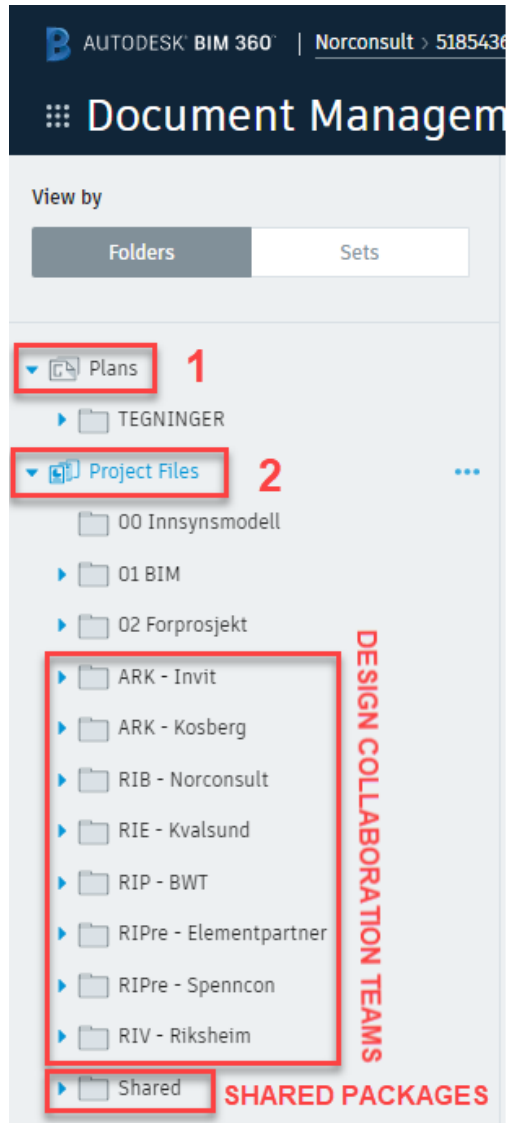
Bim 360 Docs are divided into two main folders called "Plans" and "Project Files" as default names. The two folders have some differences, and are described very good in the Autodesk BIM 360 Help documentation:

[Plans and Project Files](#)

Plans Folder:

Use the Plans folder to manage, download, review, and publish the latest set of construction documents in both 2D and 3D formats. This is the digital equivalent to the printed set of contract drawings for the project.

When uploading drawings to the plans folder you will get up some instructions to follow. One of the differences between the plans folder and the project files folder, is that the plans folder scans the title blocks for sheet numbers and names.

The first time you are uploading drawings you need to create a layout template, so that BIM 360 knows where to find the sheet number and name in the title block that you have in your drawing. The design of the title block can be different for each project team, and this means multiple templates can be used in the project.

When uploading a pdf-file containing multiple pages to the plans folder, BIM 360 Docs will split the pages and create one file for each page.
If you want to upload a Revit file to the plans folder, BIM 360 Docs will search for publish sets in that file and split views and sheets to single documents.

P.S. Workshared models should not be initiated to the plans folder!

<u>Project Files folder:</u>
Use the Project Files folder for any project document, including design data and all other document types. For example, photos, reports, schedules, budgets, requirements documents, etc.
This is also the folder we add Team folders and use in Design Collaboration.

The folders for the Design Collaboration teams could be placed in a main folder as subfolders instead of directly under Project Files.

Folder permissions
Before project members get access to folders, administrators must set up folder permissions. This is done by choosing the folder you want to give access to and click on the three dots to the right. Click on permissions.
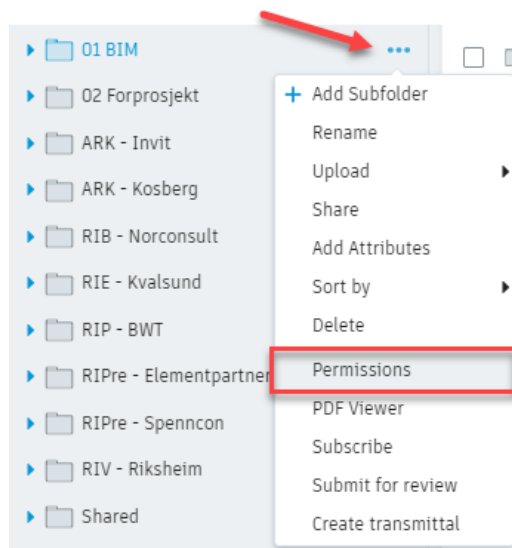
Now you can either choose members, roles or companies and address the permission level they should have. When you give members permission to a folder, they will automatically have access to that folders subfolders. So be organized how you set up the folder structure.

A common Project Coordination model

BIM 360 has its own product for model coordination called BIM 360 Coordinate. This module can bring together multi discipline models in shared coordination spaces and run clash detection test on them. You can also add coordination issues to the clashes you have found.
Read more about the product [HERE](#).

The need for a Coordination Model in the project is always needed, and with BIM 360 this model is great to communicate and collaborate in. Here all the stakeholders can address issues to project members to solve the difficult tasks. This is also a great place to track changes in the model in the project design period.

To make a Coordination model directly in BIM 360 Docs, without using the BIM 360 Coordinate module, you can follow these steps:

1. Make a new empty Revit file.
2. Activate cloud worksharing and save the file in an own folder under Project Files in BIM 360 Docs.
3. Link all the Revit cloud files from the project teams in the file you just created. When linking the Revit files, do it from the Shared folder. This way the link files in the Coordination model will be updated when a team share a package.
4. Set up some publishing views in the Coordination model.

5. When updating the Coordination model open it and synchronize to central before publishing it to the cloud.

This procedure is typically performed by the projects BIM-Coordinator.

The model can now be used as a main model to track changes for all disciplines together and add design issues to it.

Track changes in models and drawings

In BIM 360 Docs it's possible to track changes in most documents. This can be pdf-files, 3D-models, dwg-files etc. This gives the ability to easily see what objects have been added, removed and modified in 3D-models. To compare versions, choose the icon in the bottom toolbar shown with two arrows.
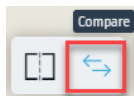
The changes will the be shown as the picture below.
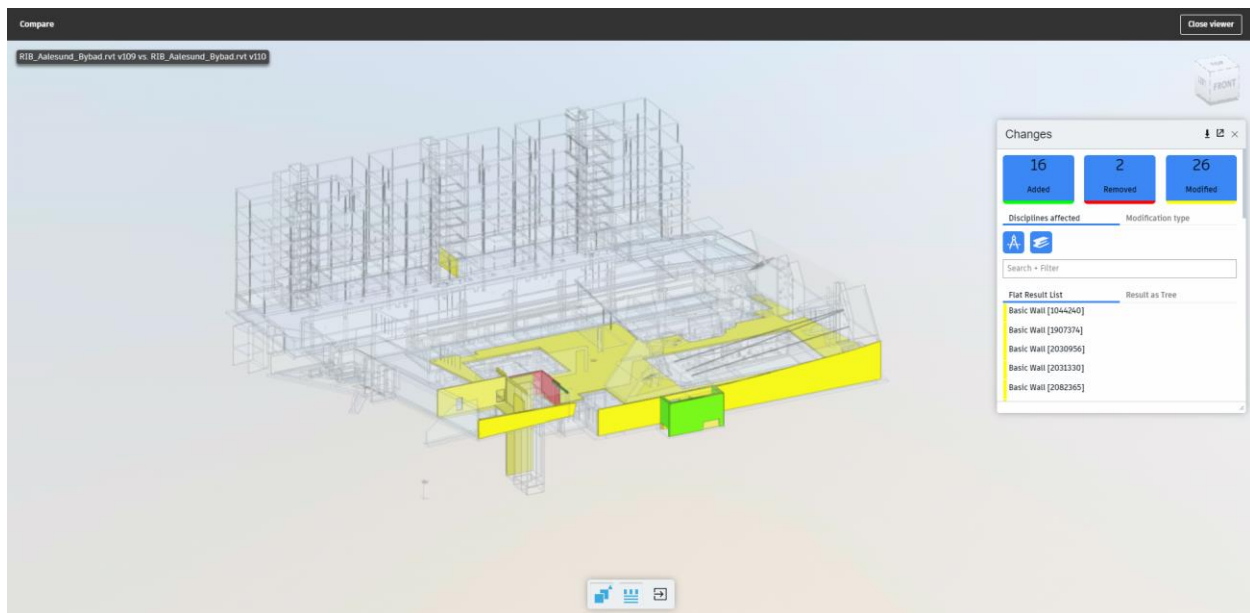
This can also be done with drawings in pdf-format! This is especially useful for the contractor on site.
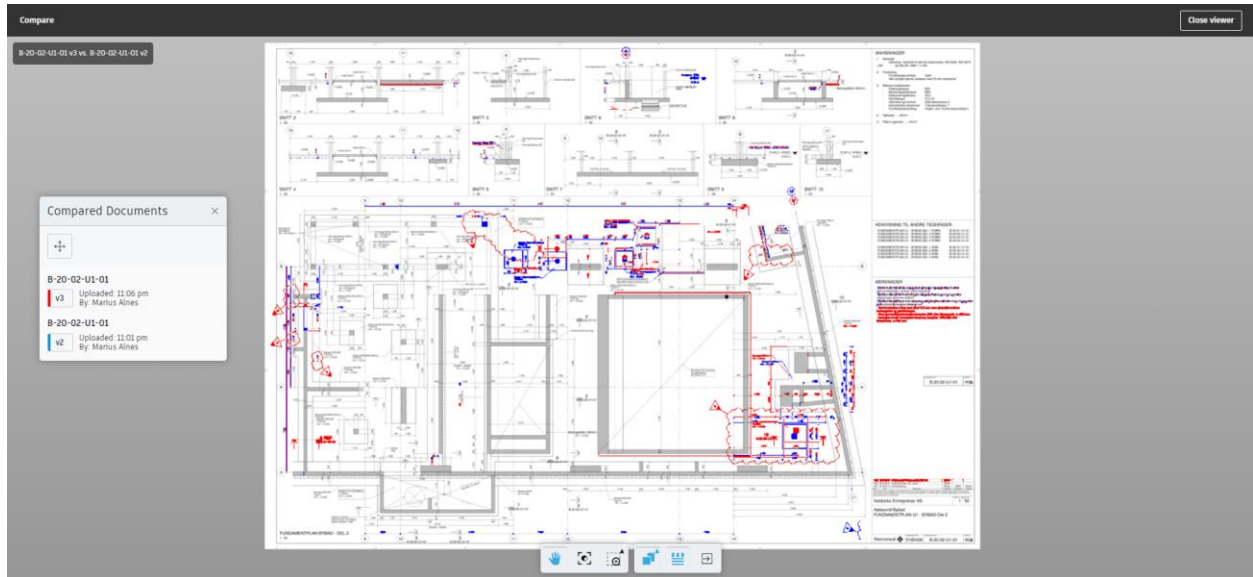
Communicate in documents with markups

Markups can be made in all documents that can be viewed in BIM 360 Docs. The markup can either be private or be public and shared with the rest of the project group.

To add a markup in the document you are viewing, use the markup tools on the right side of the window.
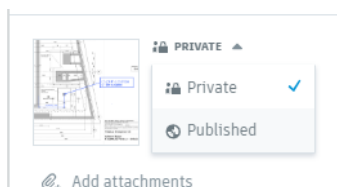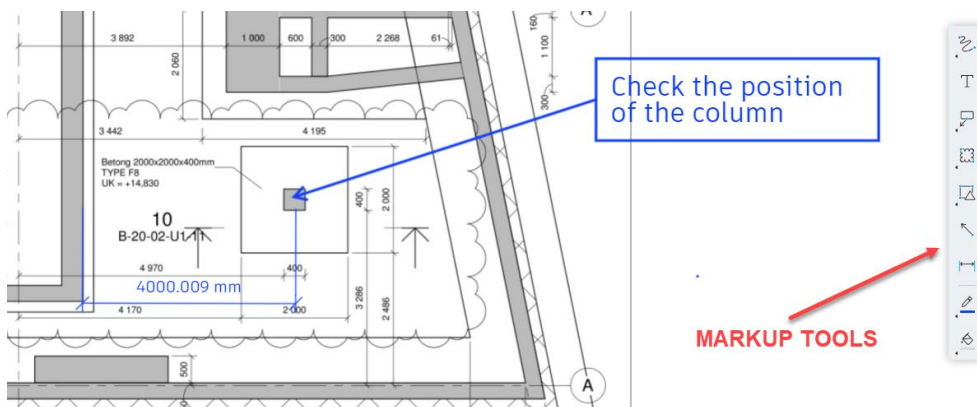
Using issues

This might be the best tool in BIM 360 Document Management. This tool will help the project group to minimize the use of e-mails and structure the project cases in e very efficient way.

BIM 360 project admins can set the permission levels for members, companies and roles. When setting permission level to issues, you can control which project members should be able to see or to make issues in the project.

Issues permission levels

Issues can be created in a document or can be created in the issue tab in the Document Management. Issues can be applied in different models and you will always have a list of the issues under the issues tab in Docs, so no need for looking into the documents to navigate through the issues. A link to the document where the issues ha been created will be visible in the issue.

For simplicity we usually use a common coordination model to create the issues in, so it's easy for project members to explore the model and check out the project issues at the same time.

Issues have a unique number. When an issue is created, it will be stored in the project and there are no options to delete it. Issues can be assigned to members or companies, and there is the opportunity to set a due date for the issue. Attachments can be added to an issue, and you have total control of the activity in the issue with the own activity tab.

When the assigned person/company has answered the issue, it's important that the status of the issue is changed from open to answered. This is done by clicking on the button in the top right corner of the issue.

To search for issues in the project, use the search tool on the top left when you are in the issues tab in BIM 360 Docs. Remember to use the filter to narrow the search.


Project managers can create reports of issues in pdf or csv format. The reports can be filtered to companies, project members etc. using the same filter button.

Click on the Export button in the top right corner to make a report. The report will be sent to you by e-mail-
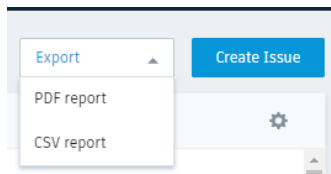
Desktop Connector

The desktop connector is a small program that gives you a BIM 360 drive on your desktop that is synchronized to the cloud. When adding or removing documents to your project folder on your desktop, this will be updated in the cloud.
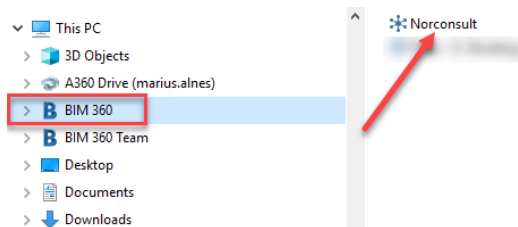
Desktop connector can be used to link non-Revit files into your Revit project, that has been uploaded to the cloud. This helps all designers to work on the same updated link files.

Desktop Connector can be downloaded for free:

https://www.autodesk.com/bim-360/desktop-connector/