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Reaping the benefits of the cloud

Marius Alnes

Norconsult

Learning Objectives

- Discover best collaboration practices in large-scale multidisciplinary projects
- Learn how to identify the potential of BIM 360 Teams, and how it transforms the traditional designing process
- Understand how to tap into the cloud with help of Forge 360
- Learn how to drive innovation and save money simultaneously

Description

Tired of waiting for the architect or the structural engineer to send you the last updated model so you can continue your work? The waiting time is over—and it's called Collaboration for Revit cloud service. This session will demonstrate how architects, engineers, and contractors have been using the cloud to communicate and collaborate in designing and currently building Norway's biggest shopping center. Using collaboration for Revit software, BIM 360 Team software, and the Forge platform to view 3D models, it has been possible to identify and solve problems more quickly than in a traditional design process. Workflows, tips, and tricks will be essential in this lecture.

Speaker(s)

Working as a structural engineer and BIM specialist for Norconsult in Norway. Passionate about Revit and are constantly seeking new ways and methods to maximize the workflow efficiency. Have over 10 years' experience from the structural engineering and construction industry. As a Revit certified professional I am gladly sharing my knowledge with others.

Introduction

Architects and engineers wanted a more seamless workflow in Revit before they started on the extension of a shopping center in the west coast of Norway. The task was to design and build 35.000 m2 in less than 2 years and connect the new building to the existing shopping center, making this Norway's biggest shopping center with 137.000 m2 in total.
They narrowed it in to two options; Revit server, and a quite new thing called Collaboration for Revit.
Some of us have had experience with Revit server, so that would have been the safest option. But the excitement of trying something new and exploring the possibilities of collaboration in the cloud with help of BIM360 Teams and viewing 3D models with the forge platform made us choose differently. We chose Collaboration for Revit! Architects, engineers and contractors where gathered on the same platform and where ready to nail it!

Collaboration in the cloud

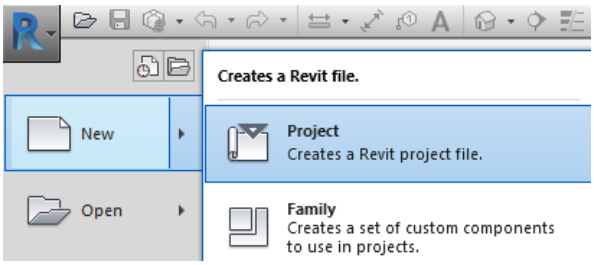
Collaboration for Revit and BIM360 Teams are services that needs to be purchased in additional to the Revit subscription. Before the collaboration in the cloud can start, contract Managers or Software Coordinators have to subscribe to the Collaboration for Revit service. They also must assign the purchased contract to a BIM 360 Team hub, and invite users to the Team hub. The last step is to create a project on the Team hub.
For more information about purchasing the service and how to set up access for Collaboration for Revit service, visit these two sites:

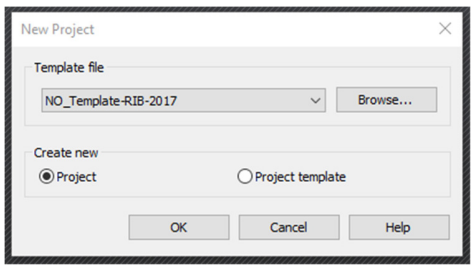
https://www.autodesk.com/products/collaboration-for-revit/overview

https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/CloudHelp/cloudhelp/2016/ENU/Revit-CAR/files/GUID-DDA936BE-E9C2-497A-9692-109ECC419692-htm.html

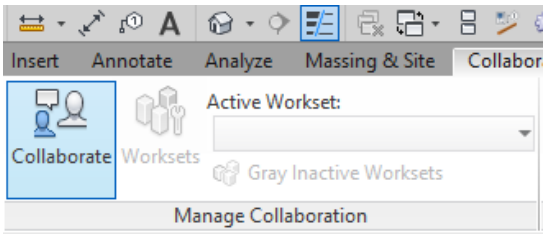
Create a cloud based Revit project file

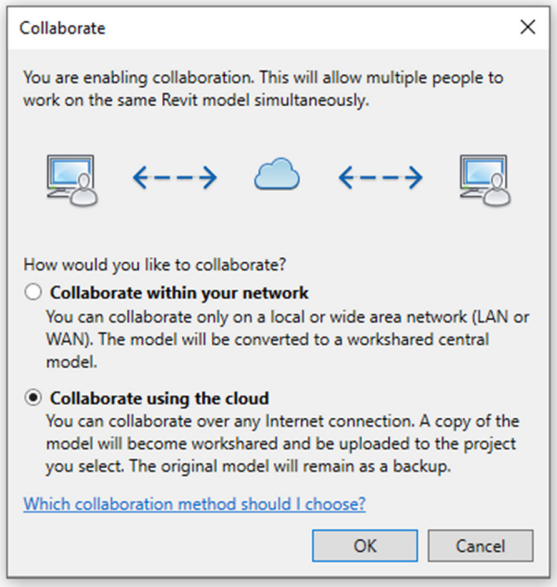
It's very easy to start a cloud based project. Create a new Revit project from a template file.

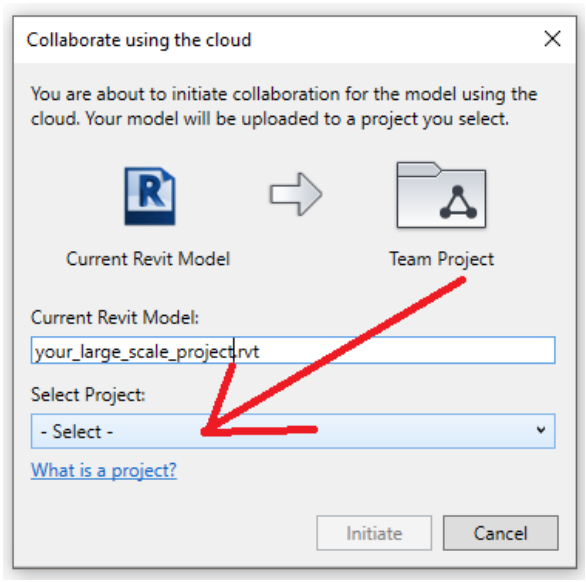




When the project opens, save the Revit file locally and click Collaborate in the Collaborate tab. Choose Collaborate using the cloud, and select your cloud project from the drop down menu. The Revit file are now stored in the cloud and are showing in the BIM 360 Team webpage.







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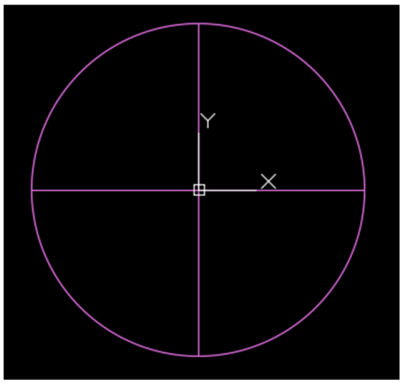
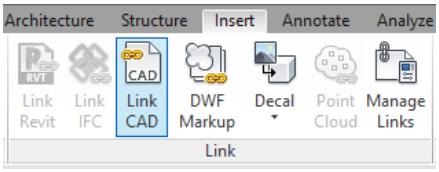
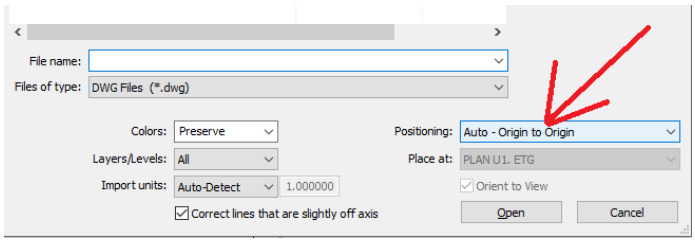
Project «zero-point»

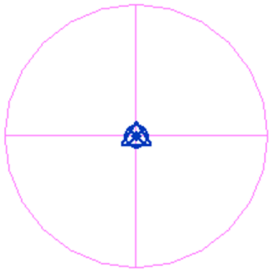
I think this is the most important thing to start with in any project, not just the big scale projects. It is crucial that this is determined from the very beginning, and before anyone starts drawing. If you get this wrong, everything can go wrong. My advice is to use origin as the project zero point. In Revit you have all kinds of possibilities to set the zero point to whatever you want. Project base point, different survey points etc. But why make this more difficult than it needs to be?
Open Autocad and draw a circle with center point in 0,0. Draw two lines in the circle so the intersection of the lines is placed in 0,0. Save the file and name it ZERO_POINT.dwg.



Link the dwg file into Revit and use Auto – Origin to Origin as positioning. You have now defined your project zero-point in Revit.

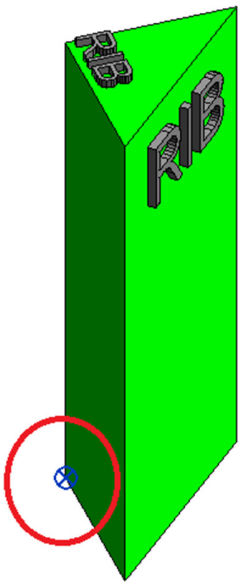


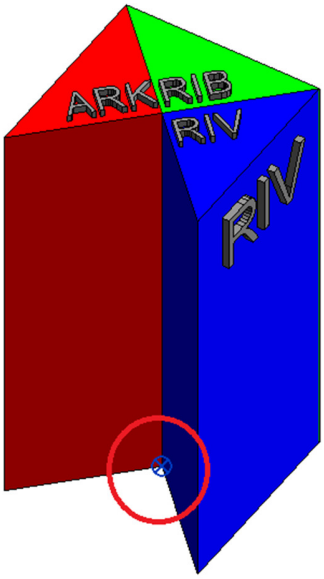


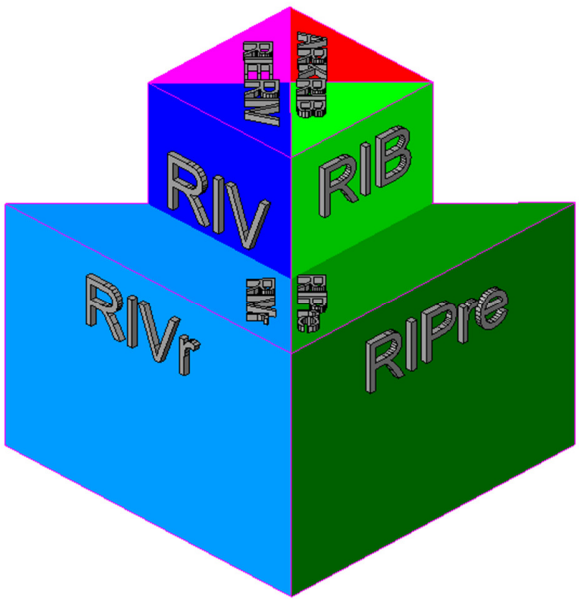


Zero point in Revit

To make the zero-point more visible for everyone in the project, I recommend placing a 3D object in the zero-point. This can be done by making a generic model for each discipline in the project. The design and placement of the object should be determined by the project BIM-Coordinator.
In this project, we made 3D-triangles of each discipline where one edge where placed in the zero-point (origin). It was now easy to see if each discipline had their model placed at the right position when the models where linked together.

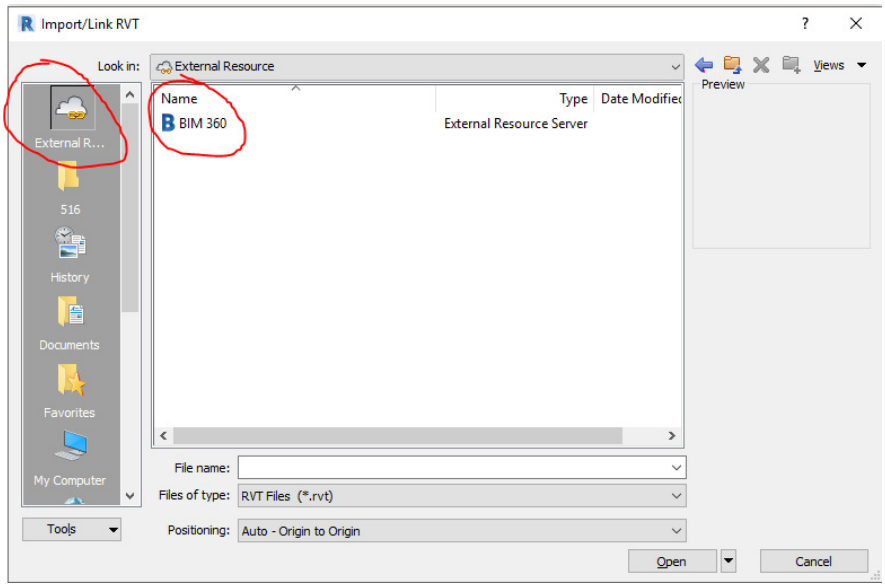


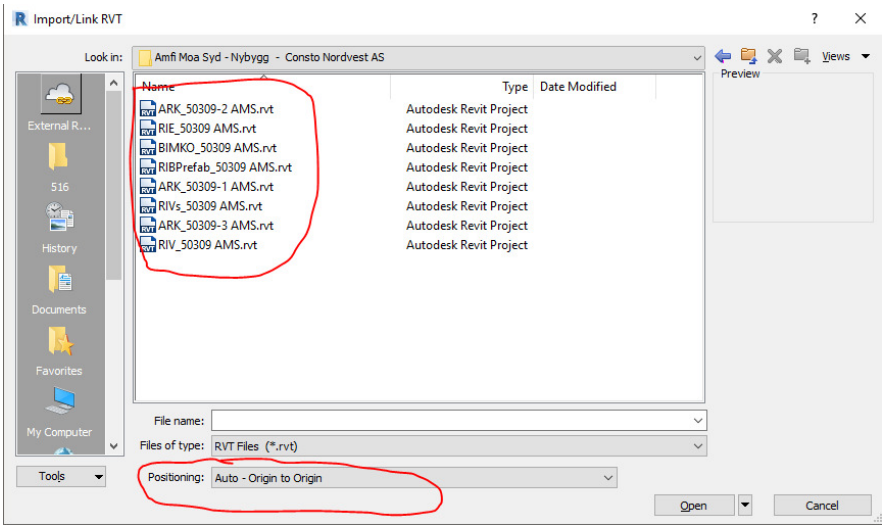




Linking the disciplines together

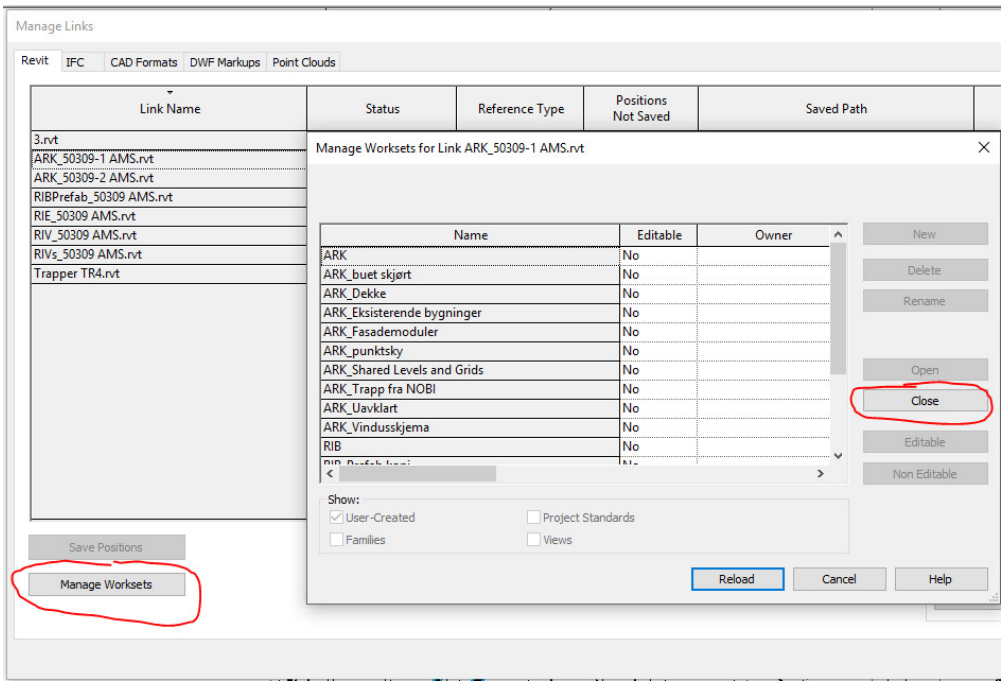
When the project zero point is in place it's time to link the project disciplines together. Each discipline has their Revit project stored in the cloud, and the linking process is the same as always except from the folder you choose the link files from. This is done by clicking the top left cloud symbol named External Resource and choose BIM 360. Then click the project folder and choose the file(s) which should be linked in the project. Remember to use Auto – Origin to Origin positioning!



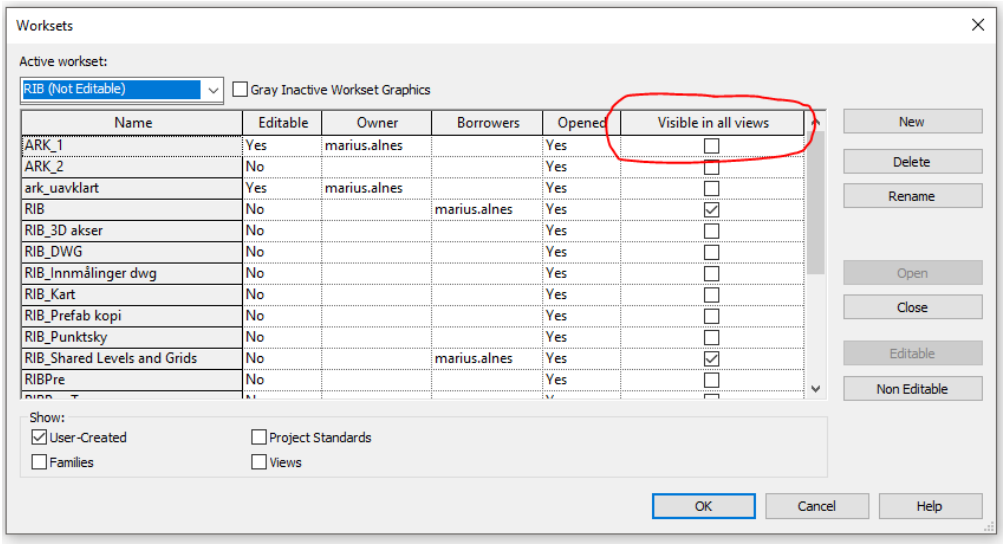


Using worksets

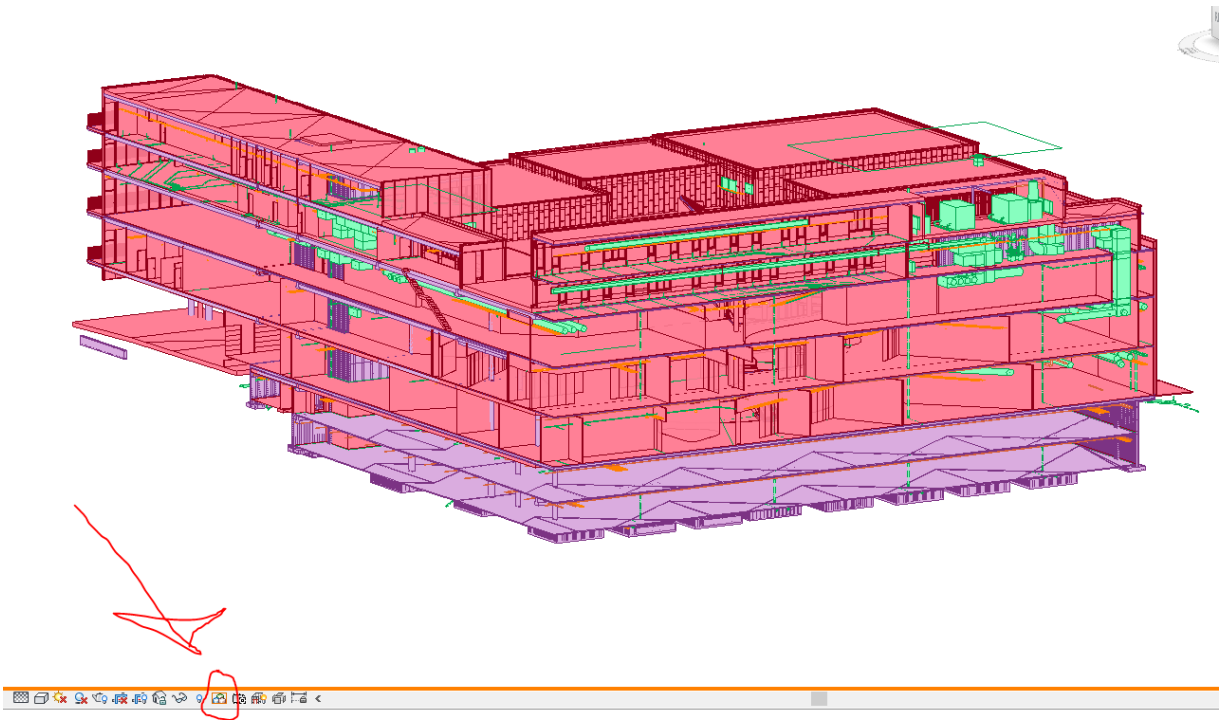
I recommend creating a workset for every linked model in the project. This allows simplified controls of the linked files and gives the ability to close worksets in linked files from the manage worksets menu under the manage links tab. This speed up the performance and keeps unwanted links out of the project.



It's also great for not showing links in multiple views by unchecking the "visible in all views" option.



Another great potential putting links in worksets is using worksharing display to visualize the different disciplines very easily.



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Multiple objects…… or not?

When linking the different Revit models together, the question of multiple objects on the same location should be asked. Is it necessary to have one column in the Architect model, one column in the structural engineer model and the same column in the precast engineer model? No, it's not, and it shouldn't!

The workflow:

1. The normal situation is that the Architect have "all" the objects in his model before the structural engineer starts his work. The structural engineer starts copy/redrawing the structural elements from the architect model.
2. When the structural engineers have finished one area in the model (could be a story or a part of a building), they notify the Architects and tell them to check the structural elements in the structural engineer model.
3. When the elements are correct, the Architects remove **ALL** the structural elements from their model. It's a good idea to have a meeting to go through the model together on a big screen before the elements are removed.
4. Changes in these elements from now on will have to be made by the structural engineers, and the Architects must notify the engineers about the wanted changes.

If the project has its own precast engineer model, the same workflow (point 1-4) should be used between the structural engineers and the precast engineers.

Since the structural engineers often uses precast elements in the analytical model, the solution would be not to delete the elements, but to move the elements to a different workset which should be hidden by default.

By having none multiple objects in the model, it's a lot easier to draw correct details and it gives the designers more confident that the objects are in the right position and have the right dimensions.

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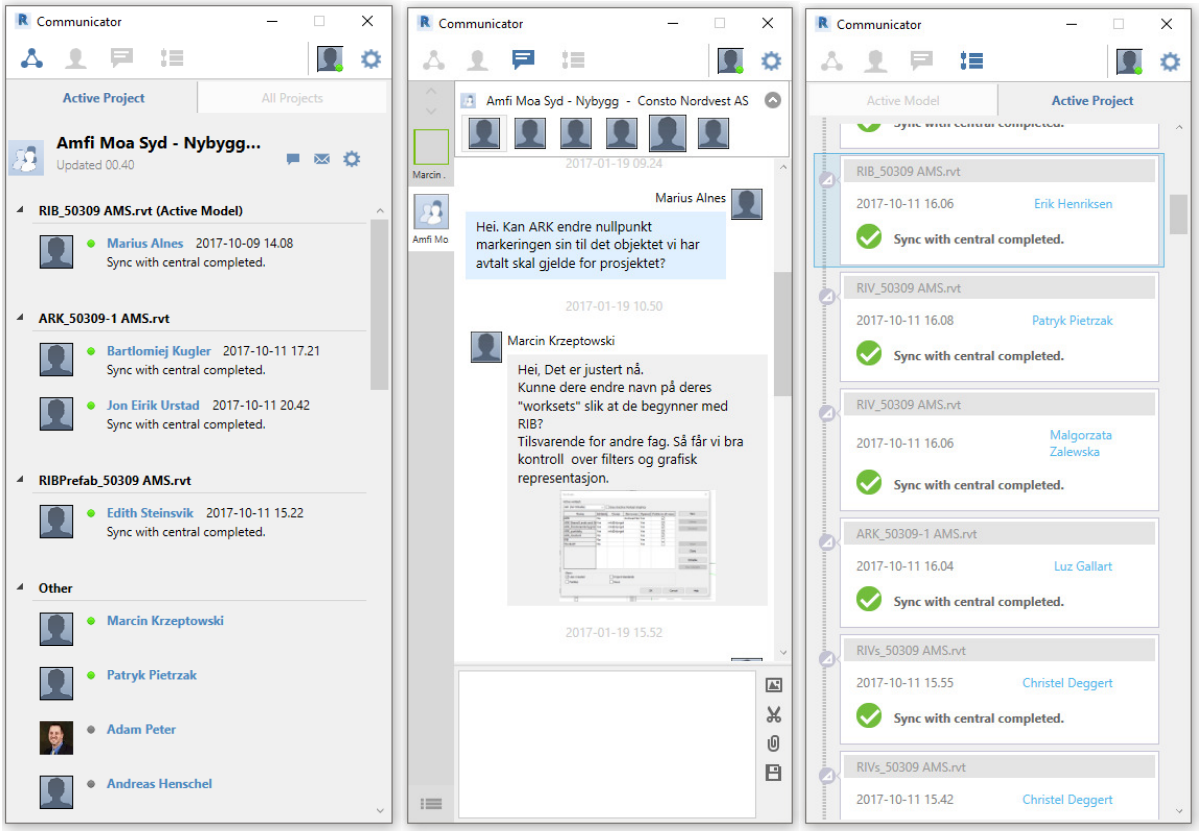
Drawing Live in Revit

The main thing about Collaboration for Revit is that everything is up to date. You draw something, you synchronize, and everyone sees the changes instantly. You don't need to wait for somebody to send you the last updated model, just so you can see that everything you have been working so hard to get done is wrong… But there is something to keep in mind when everything is made live.

The key for a good collaboration is a good communication. This is essential when using Collaboration for Revit and all the disciplines are drawing and planning at the same time. Autodesk have thought about this and made a Communicator tool within Revit which are used in cloud based projects.

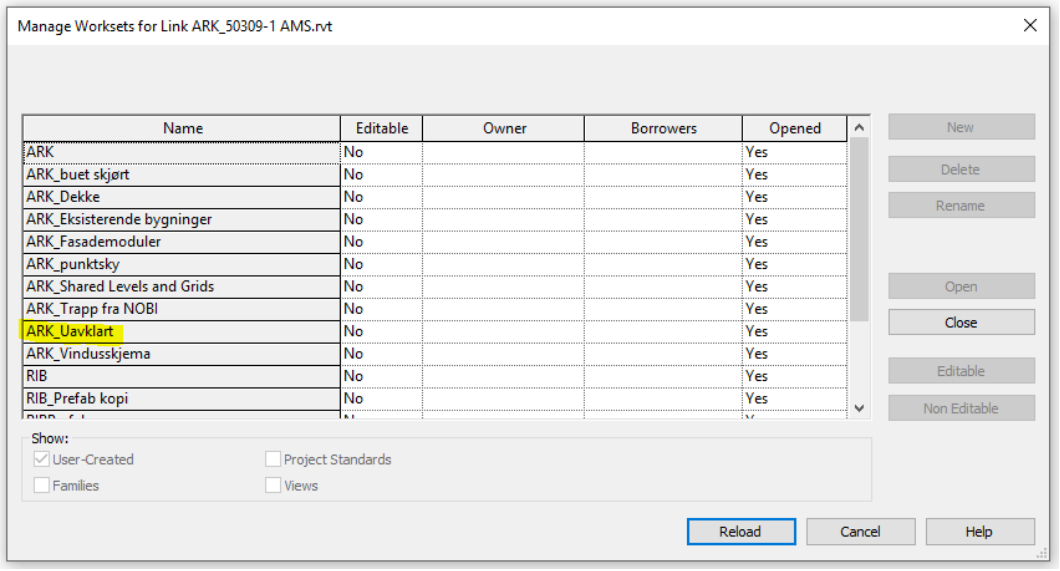


With this great tool it's possible to have an overview of all the project members, send instant messages to the project so all the project members are notified, chat with project members, and see if the different models are up to date and when they have been synchronized the last time.

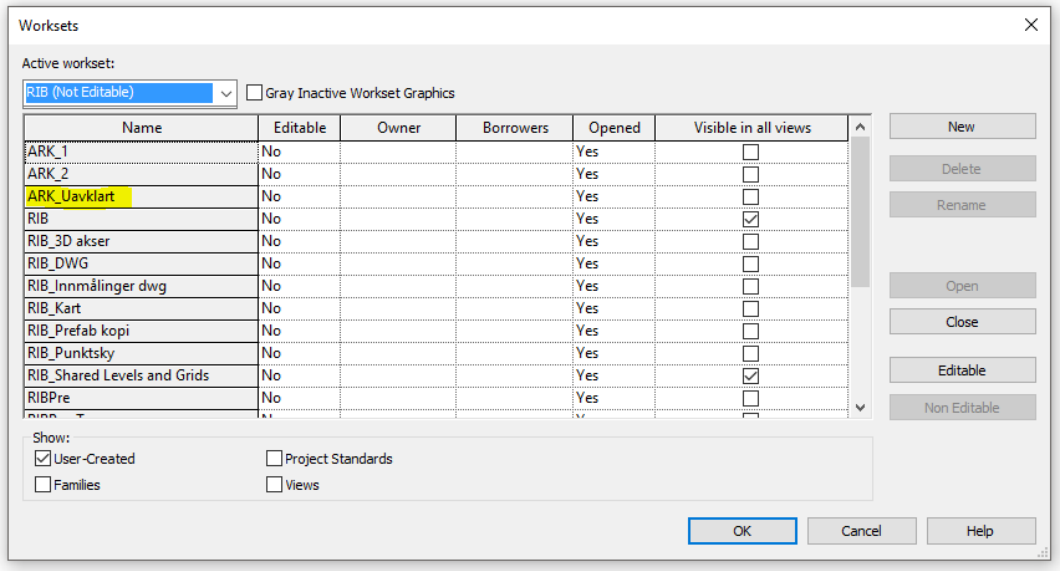
We need good communication in effective projects, and sometimes it's also great to visualize this on the screen. Architects are artists and they may have to look at several different design options before the final conclusion are made. How do we manage this when every change in the model are made instantly?

One solution is worksets and color filters. Another solution would be to add a status parameter to the objects, and to use color filters to match the status. I prefer to use worksets and color filters because it's very easy to hide/show the objects in different views.
Each discipline can have one or more worksets in their model marked as "discipline"_temporary or "discipline"_unresolved. When someone from another discipline want to highlight these objects, a workset with the same name as in the linked file must be made in the model.

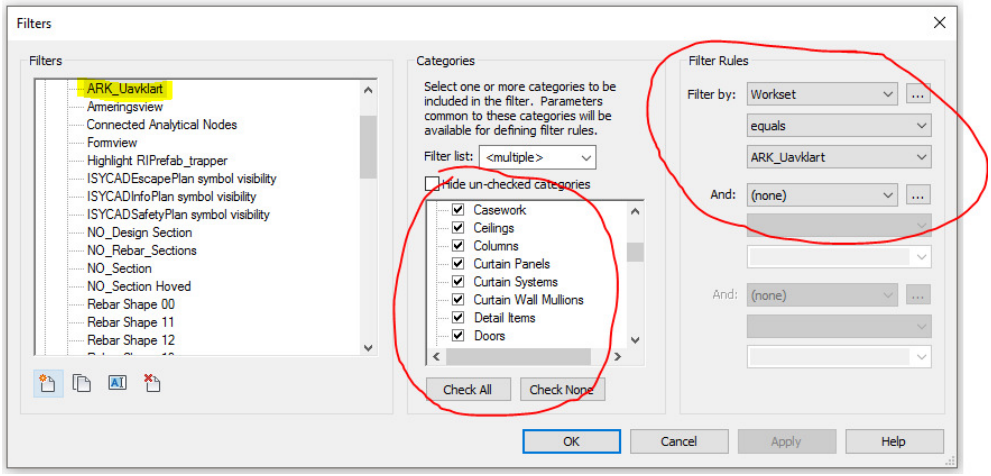
Unresolved workset in the linked Revit file:



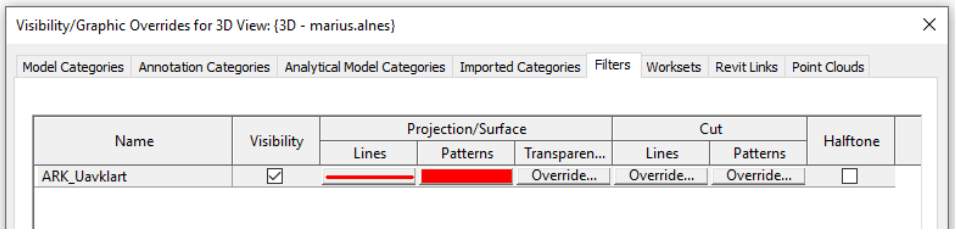
A workset with the same name as in the linked file is made in the model:



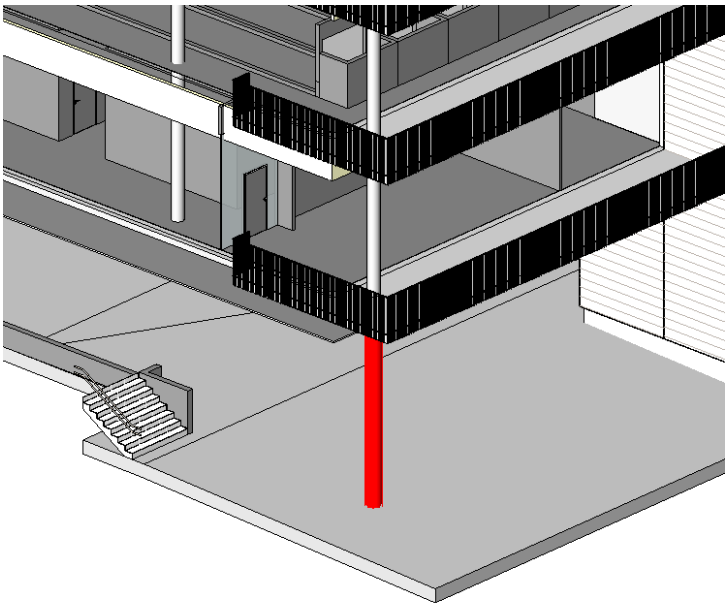
Make a filter:



And add the wanted colors to it:



The result:



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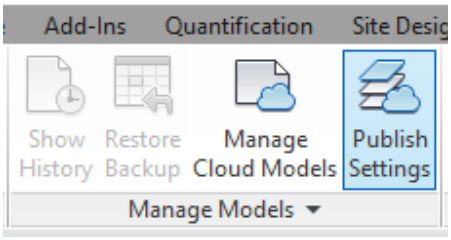
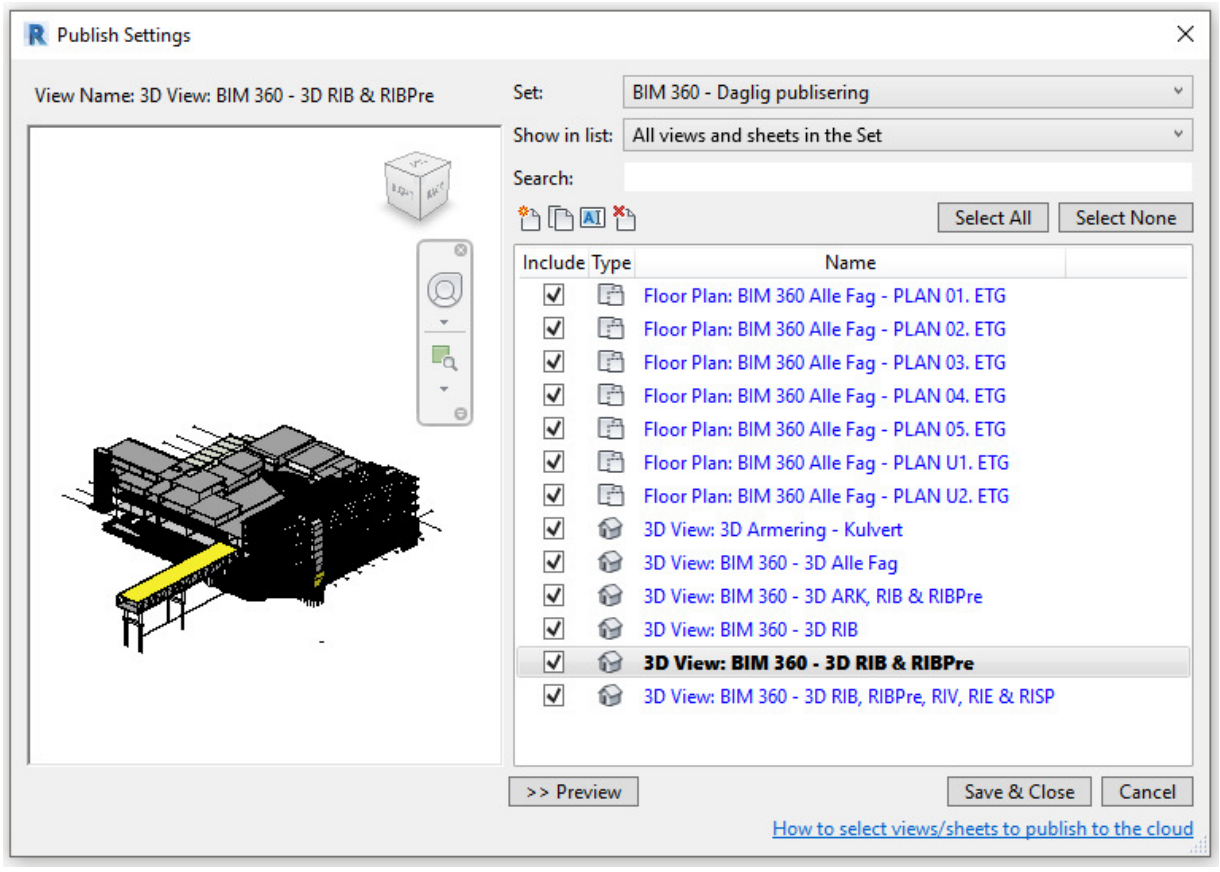
Publishing views/sheets from Revit to the Cloud

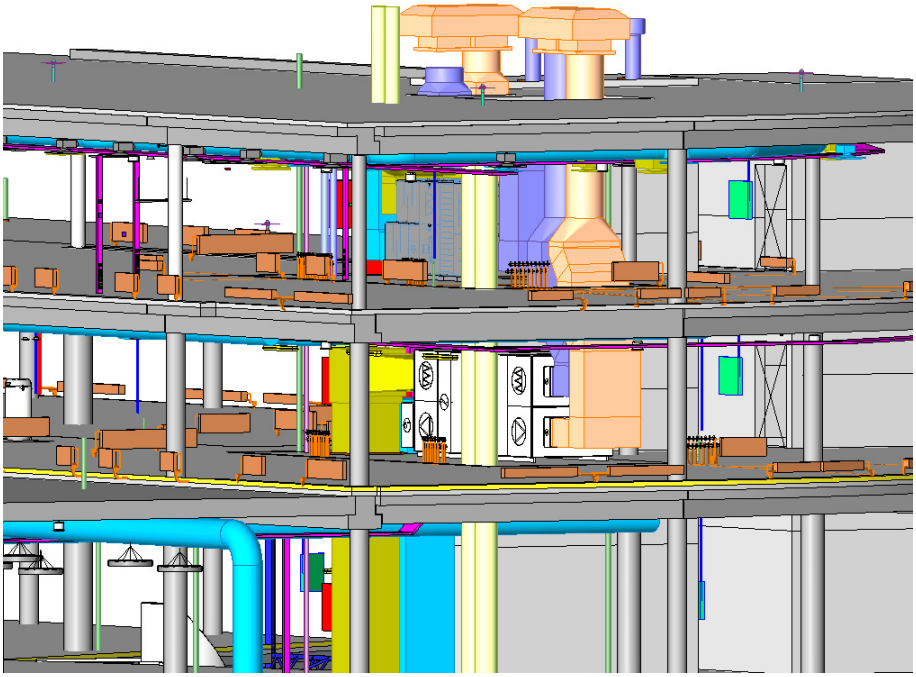
One of the real benefits by using Collaboration for Revit, is the possibility to publish any view/sheet in the Revit model to the Cloud and make it available to all the project members in a few seconds. By a few mouse clicks 3D-views to finished 2D-Sheets are sent to the Cloud with no need to generate pdf's, IFC's or dwg's and upload them separately.
The publish settings menu gives the ability to make different drawing sets and choose which drawings to be published to the cloud.





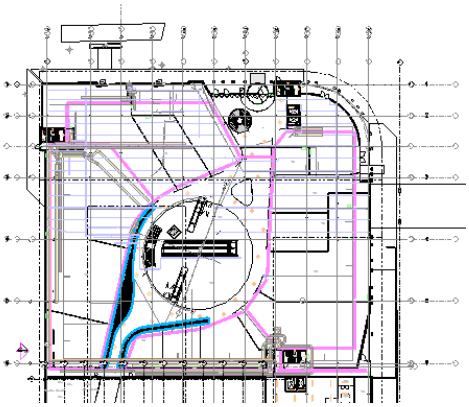
DON'T FORGET TO SYNCRONIZE THE PROJECT TO CENTRAL BEFORE PUBLISHING THE SET.

I would recommend making a standard set of 3D-views including different combinations of the project disciplines. For example, a view of the structural engineer model, the precast model (if this is a separate model) and all the technical disciplines. By only having the structural elements in the 3D view and not include the Architect model, it's a lot easier to locate the need for duct openings etc. in the structural elements.

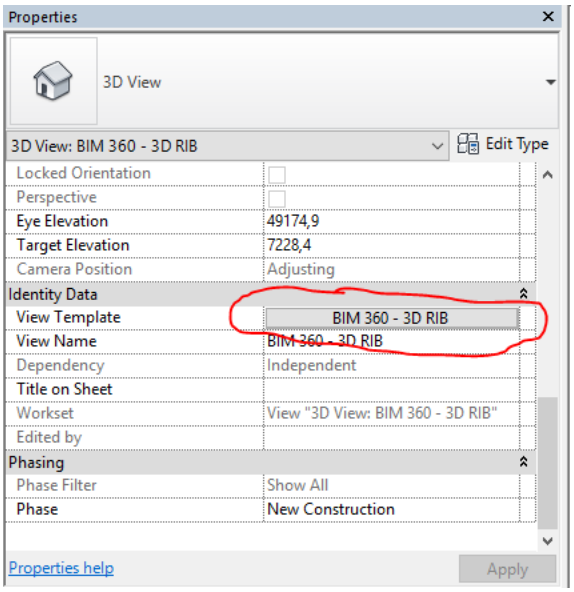


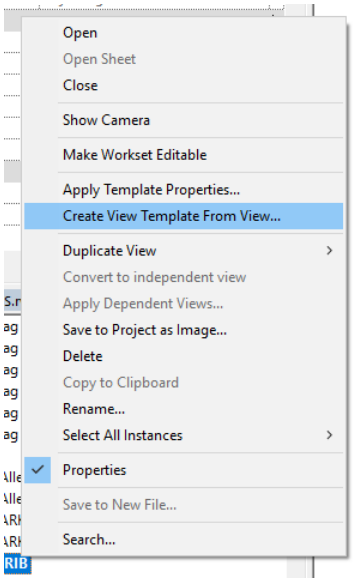
It's also important to have a view where all the disciplines get included. This is a great view to go through the model with the first-person tool in the BIM 360 Team service. We will get back to this tool a little later.

Plan views can be wise to include in a set to support the 3D-views when commenting and having discussions in the BIM 360 Team platform.

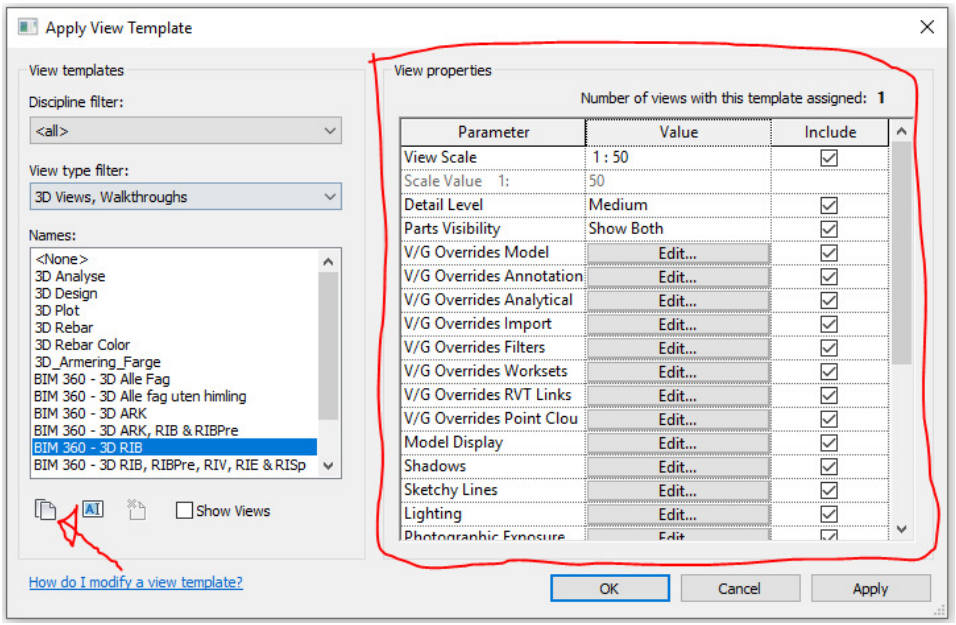


When setting up all the different views don't forget to use view templates! By doing this you will save a lot of time if or when you want to change the layout of the views from time to time. The view template menu is located under properties and Identity Data. If the view are already shown just the way you want it, it's possible to right click on the view and choose Create View Template from View.

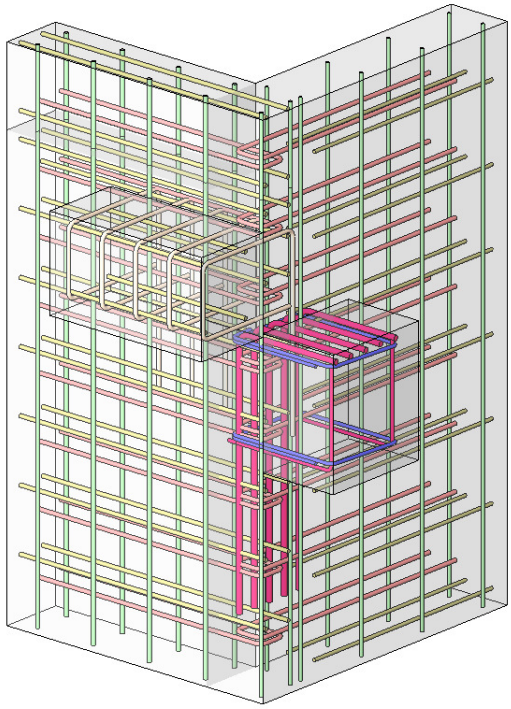




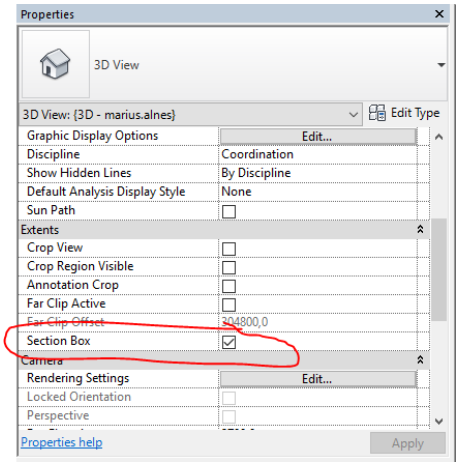
To make changes in the view template, use the menu in the right side of the Apply View Template Toolbox.

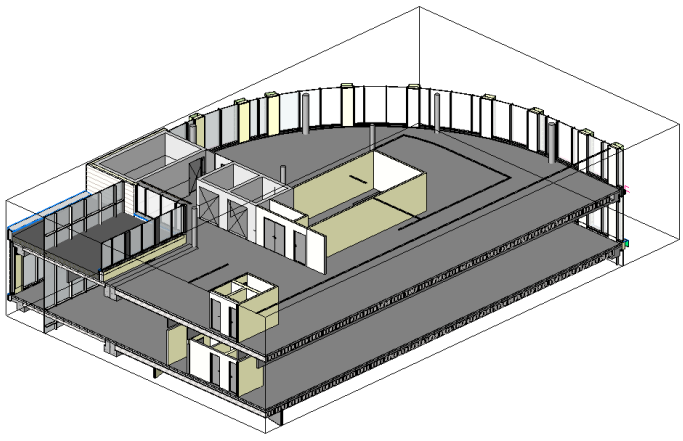


Complex details are great to include as 3D-views, which gives contractors a total different overview and insight of the detail.

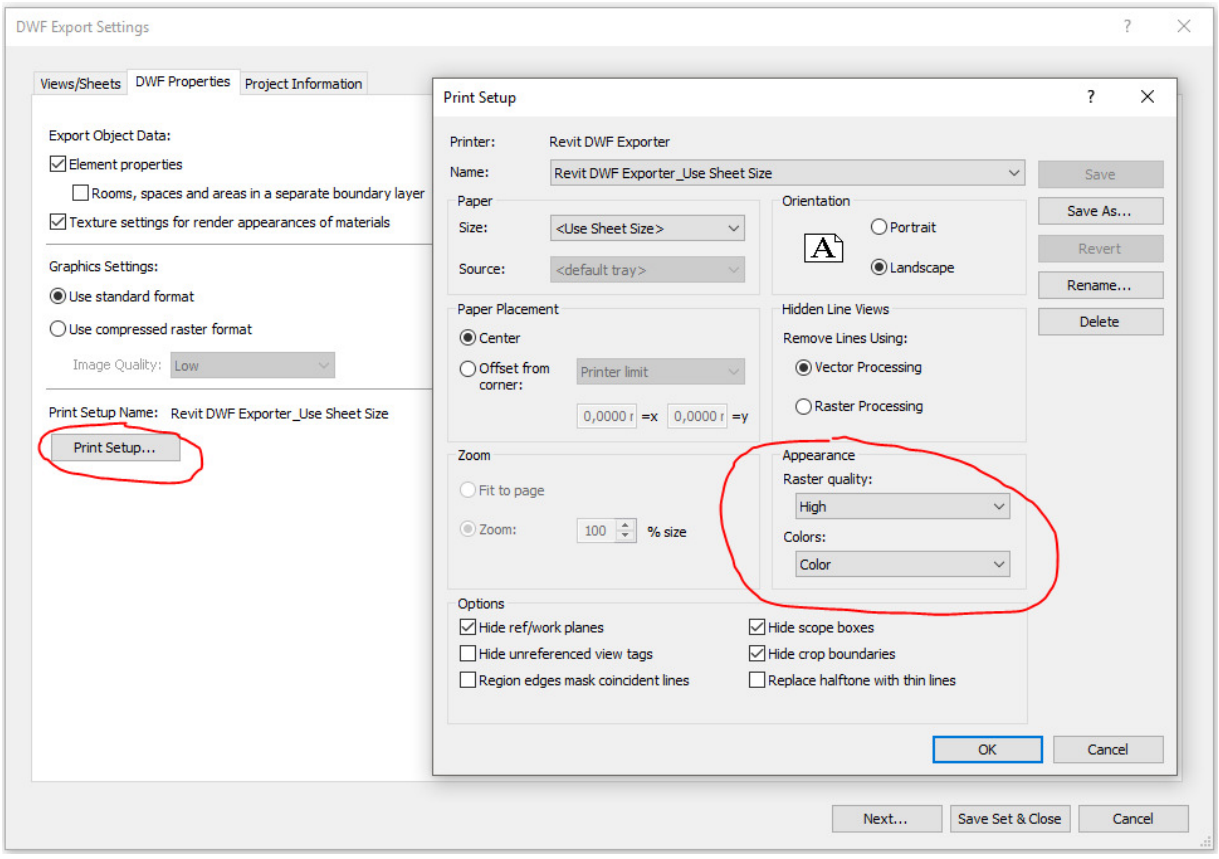


To make it very easy for the project members to navigate and to locate an area in the model after the view are published, it's a good idea to use the section box tool in Revit to make 3D-views of defined areas.



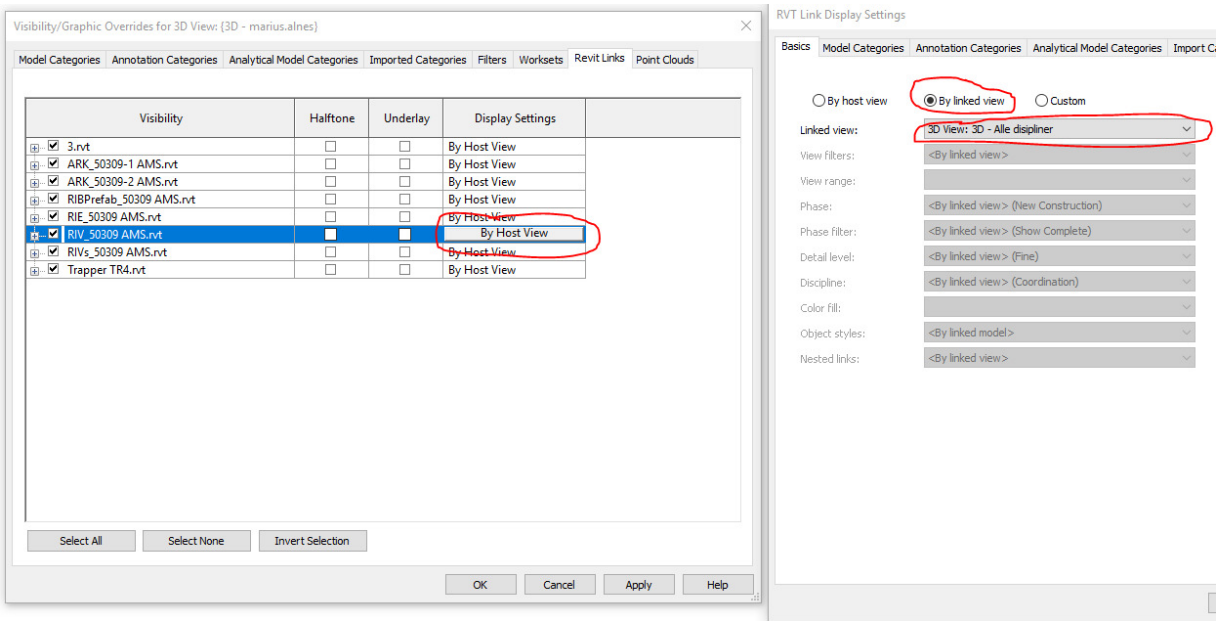


Revit seems to use the DWF export settings when publishing views and sheets to the cloud. Keep that in mind if the 2D views gets all blurry and black and white, when the view in Revit are fine with colors.

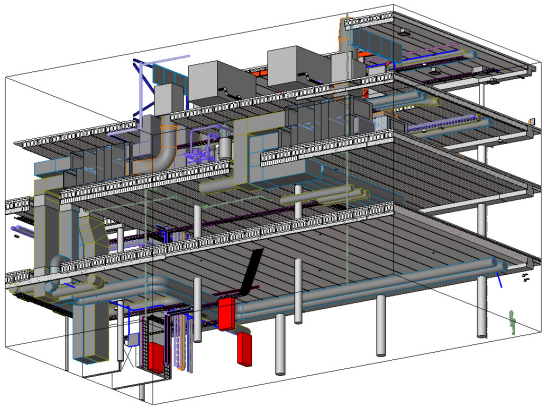


We had several hours of troubleshooting of how the 2D views where shown in BIM 360 Teams before we figured that out….

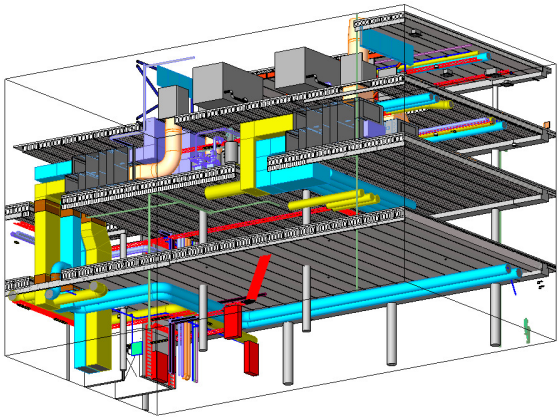
When the models of the technical disciplines are linked into a Revit file, pipes and ducts are often shown I grey with some color lines by default. To get these objects to be shown with colors patterns the same way as they show up in the technical engineer's model, set the Revit link to "By linked view" and choose a view in the list. It's a good idea to contact the technical engineer and ask him 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

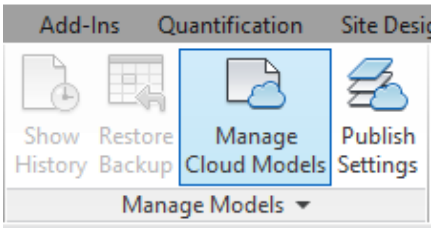


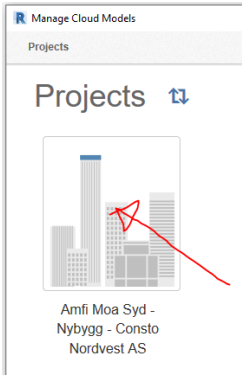
By linked view



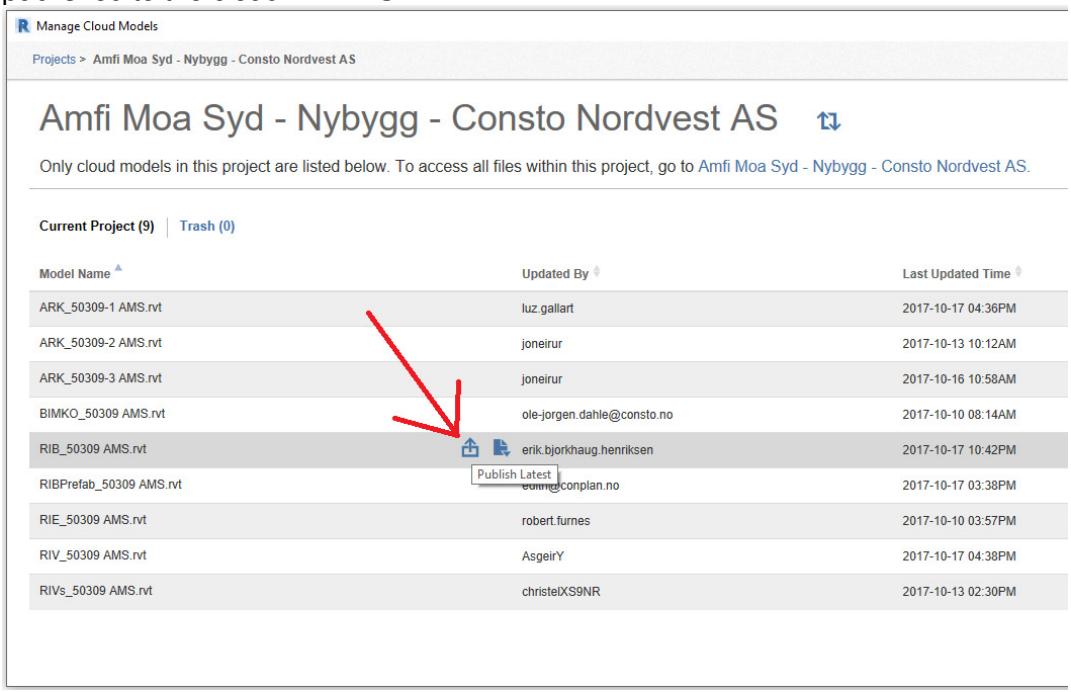
The last step is to publish the views and sheets to the cloud. This is incredible simple and the best thing is that you don't have to wait a single second for the views to be published.
The Revit model must be synchronized to central after you have made changes to the publishing sets in the publish settings. If this is not done, the old published set wil be published again.

Click the Manage Cloud Models under the Collaborate tab, and choose which project the drawings should be published to.





Then click on the publish latest button, and all the views and sheets in the user defined set are published to the cloud. THAT'S IT!



After the drawings are published to the cloud, it can take several minutes before the views and sheets are ready for viewing. The good thing is that it's possible to continue working in Revit because the publishing process are running in the background. No more waiting time for the IFC export!

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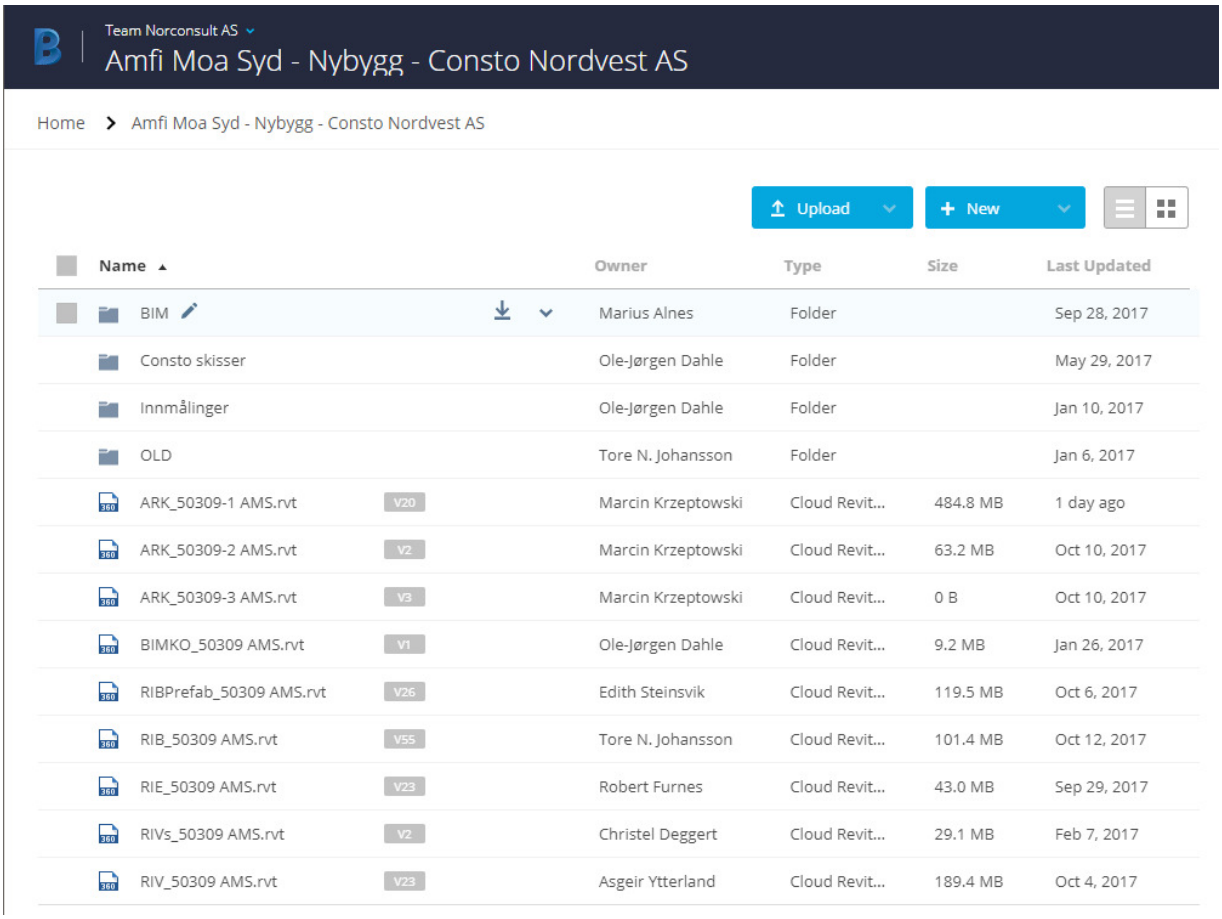
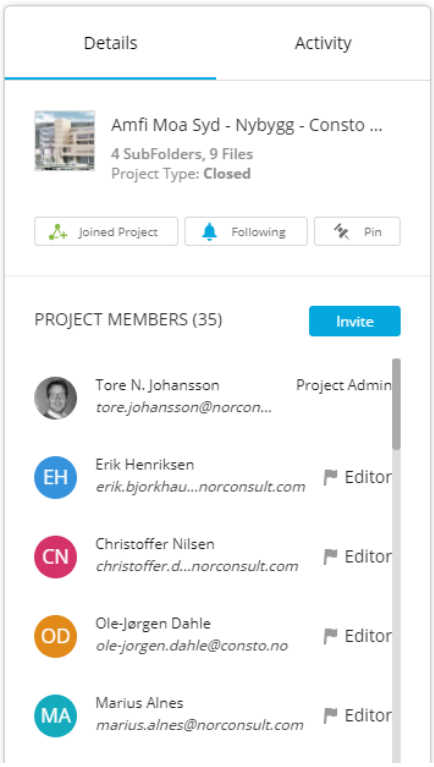
BIM 360 Team dashboard

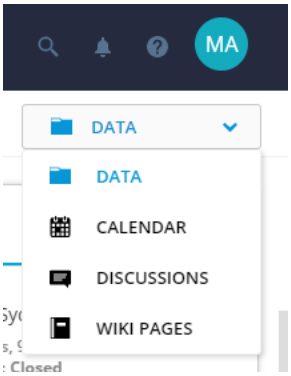


The Cloud Revit Models are located in the BIM 360 dashboard. Here it's possible to get an overview of the latest published version and when the model was last time updated.
In the dashboard it's possible to upload any type of files and also to create folders to organize the files in.

The dashboard shows a list of all the project members with contact information and have an activity tab which shows the latest movement in the project.

From the dashboard it's also possible to add meetings etc. to the calendar, have discussions and to create wiki pages.

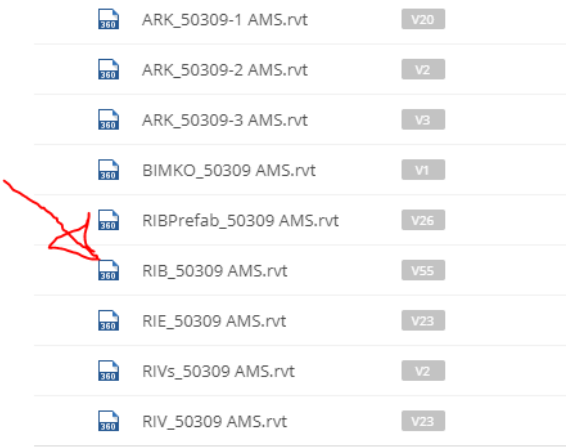


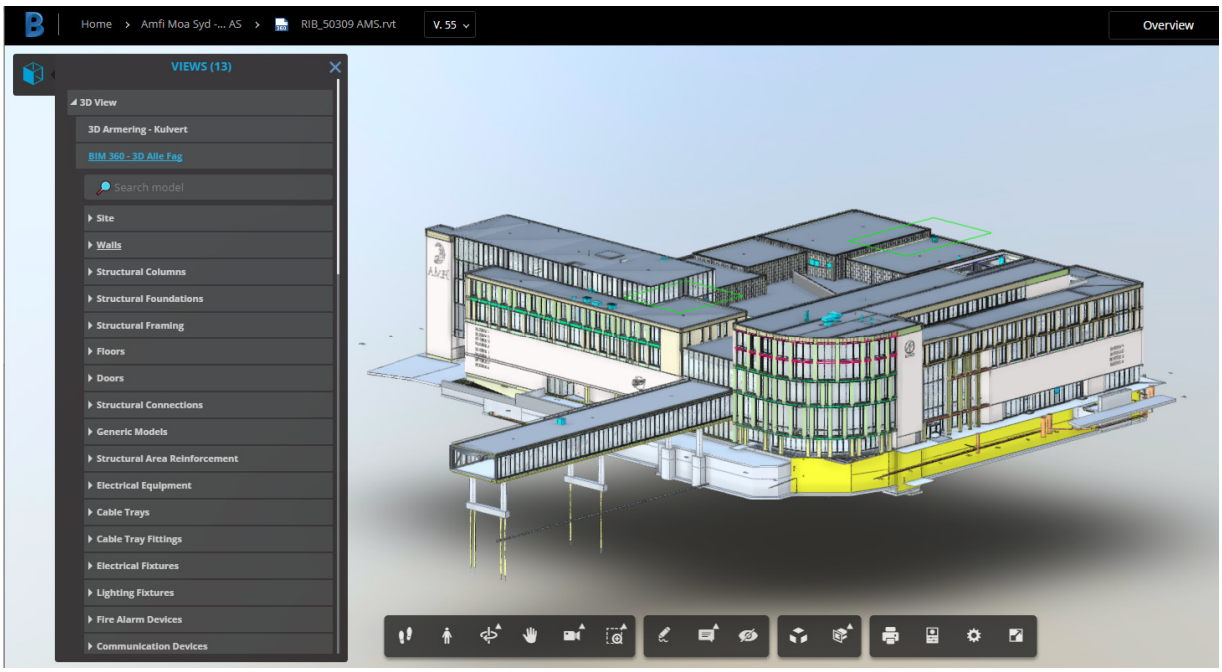


The Forge viewer

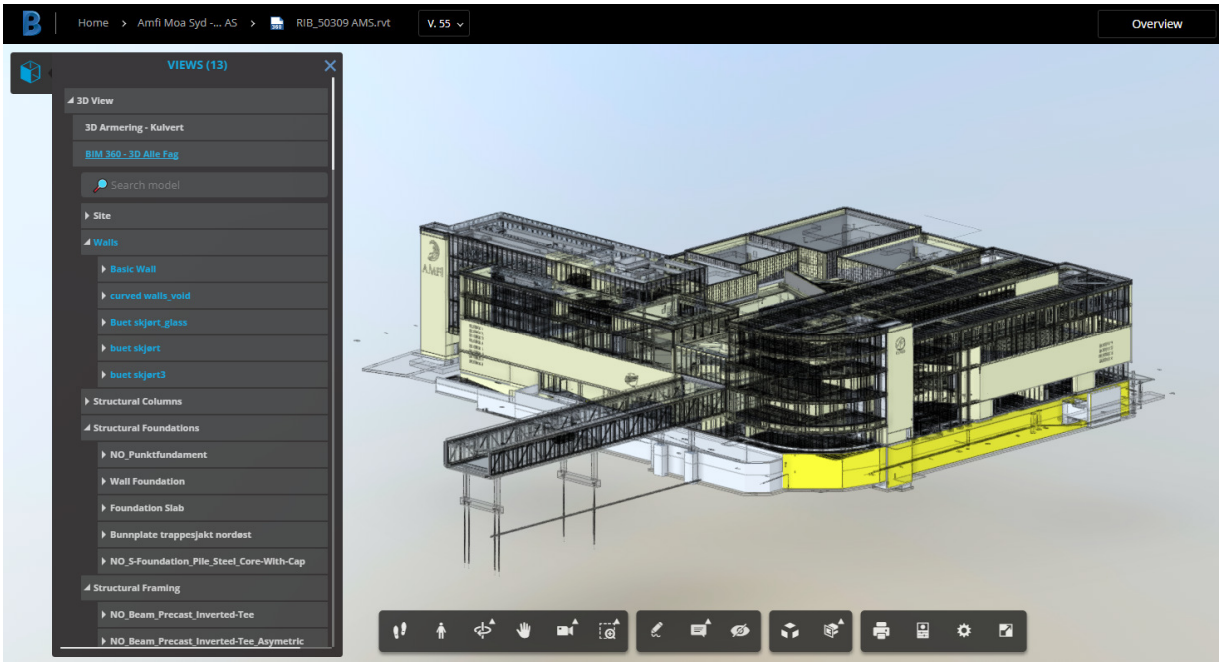
All the published views can be shown with the Forge viewer which is built in the BIM 360 team software. This is a very powerful viewer which can show multiple different 2D and 3D drawing formats.

To view the published views/sheets click on the Cloud Revit model in the BIM 360 dashboard.

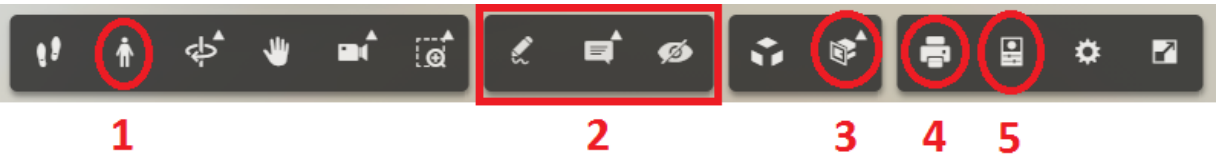




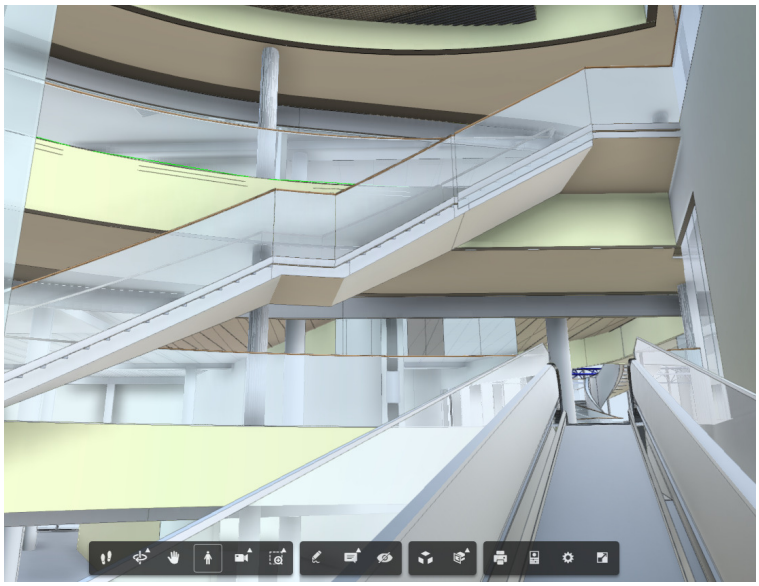
One of the published views will show up on the screen. In the menu to the left it's possible to switch through the different published views, and to get object categories and even objects highlighted in the model by clicking on them. This function works best when you have published views that includes a limited amount of disciplines.



The viewer has multiple tools to view and explore the model.



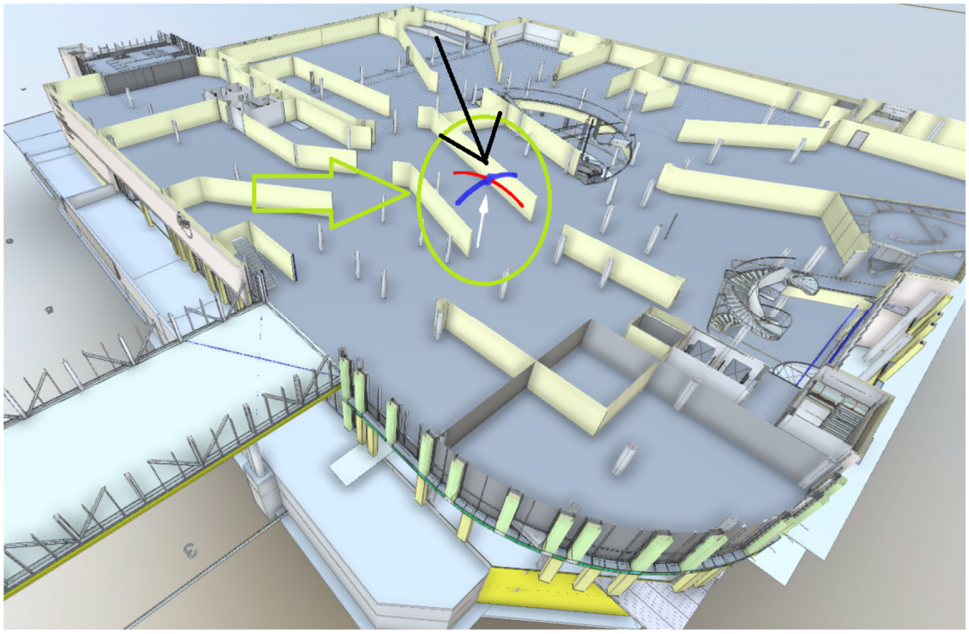
1) First person (or the new first person)
This tool is great for walking around the model to get a very realistic view of the design and to explore the model. This is also a very good tool for presenting the model to the building owner. It's possible to walk around with gravity (the new first person), or to fly around the model (first person). Speed can be adjusted with the + and -.

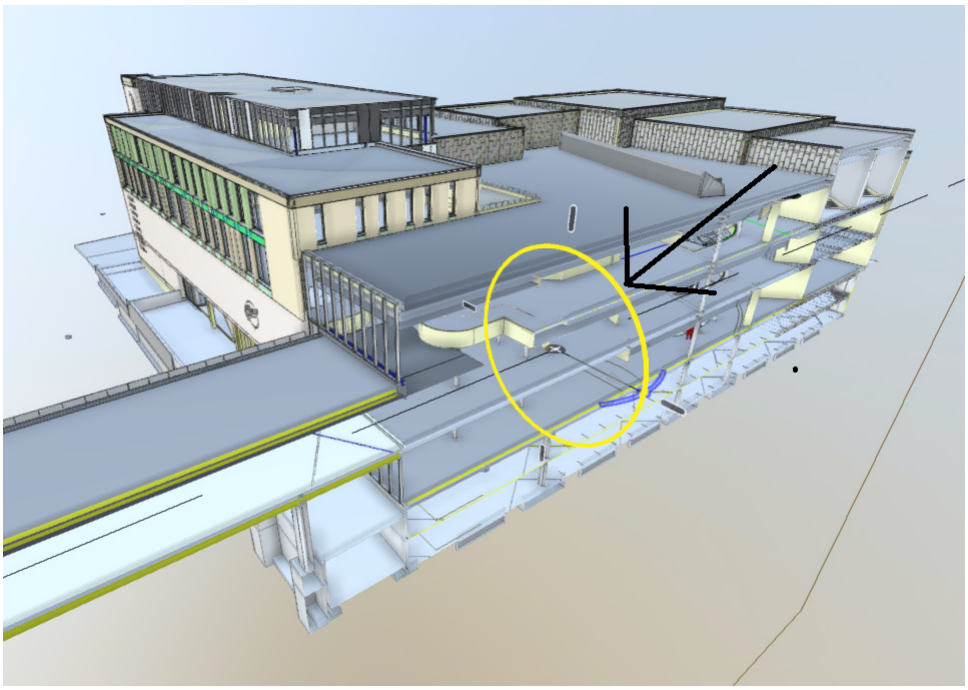


2) Markup and comments
This tool is the most important tool in collaborating and communication in the cloud and is the MAIN tool to use in BIM 360 Team. It's possible to make markups anywhere in the model and add comments to a point or object in the model. We will get back to this tool in the BIM 360 Team chapter.

3) Section analysis

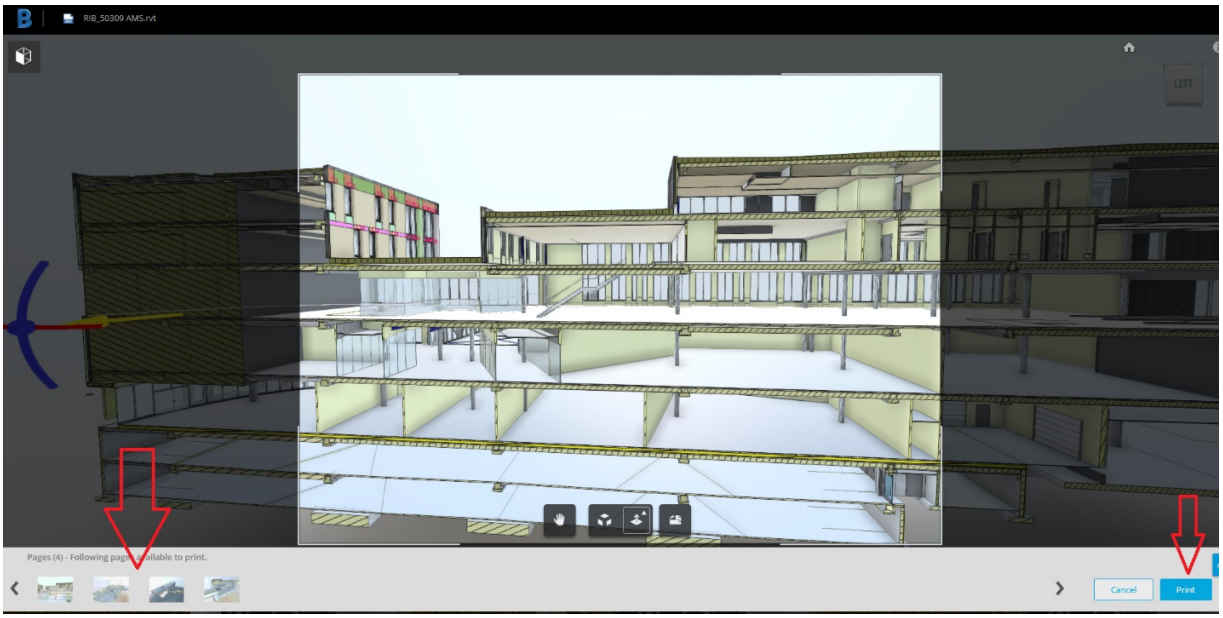
The section tool is a valuable tool when looking at the model and to highlight the different areas. The section tool in the Forge viewer can be a little different from the section tool in Revit and other programs. With this tool you can cut first in the Z-direction, and without changing the section direction in a toolbar, it's possible to turn the section with the arrows (blue and red) so you have a section in the x or y direction.

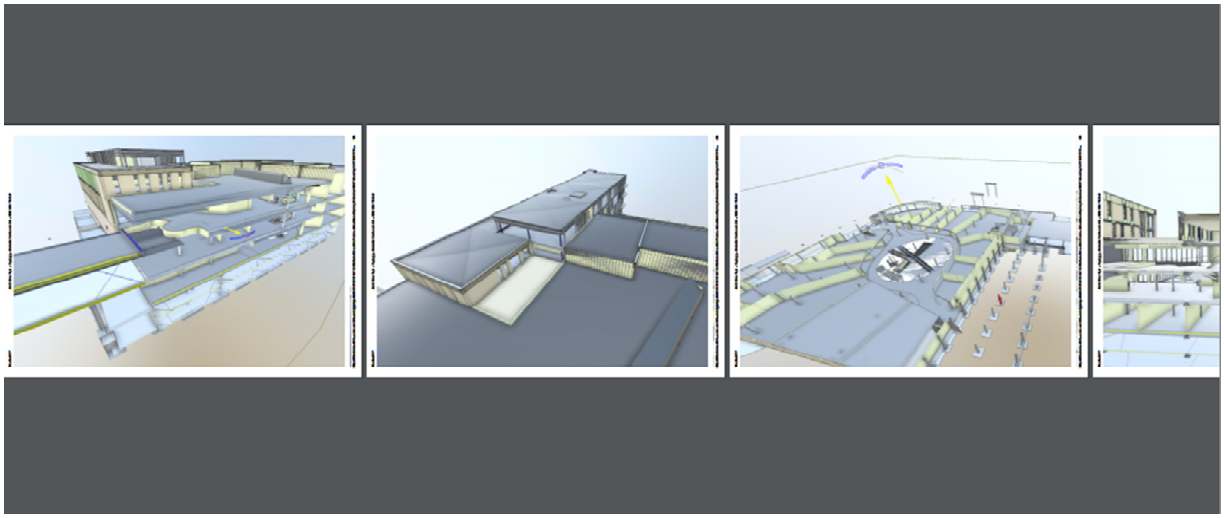




4) Print

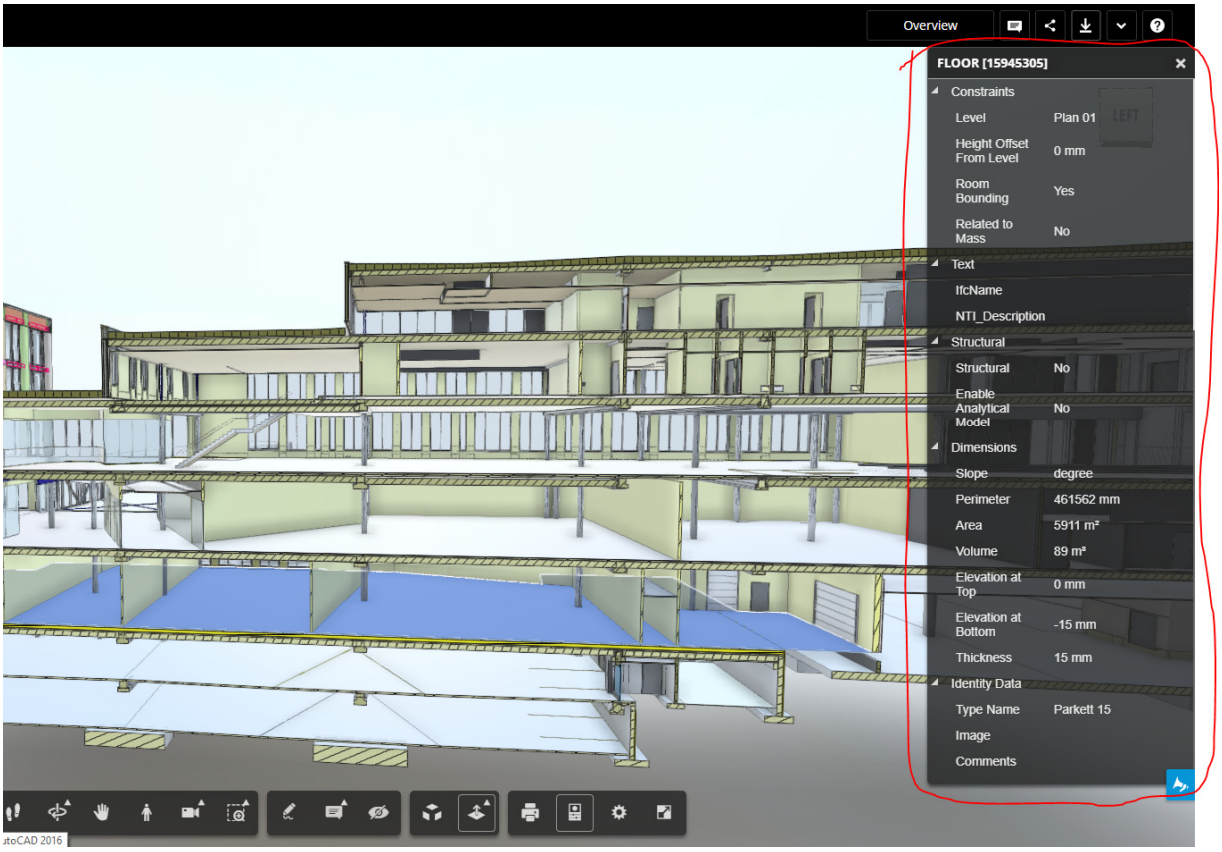
With this tool you get the ability to take screenshots of the model when using for example the section tool. The screenshots get stored in the toolbar at the bottom, and when the print button is pushed, it generates the screenshots and organize them ready for you to print or to save them as a pdf file.





5) Properties

When taking full advantage of BIM, it's crucial to put information in the model objects. To see this information, use the properties button or mark the object and right click.



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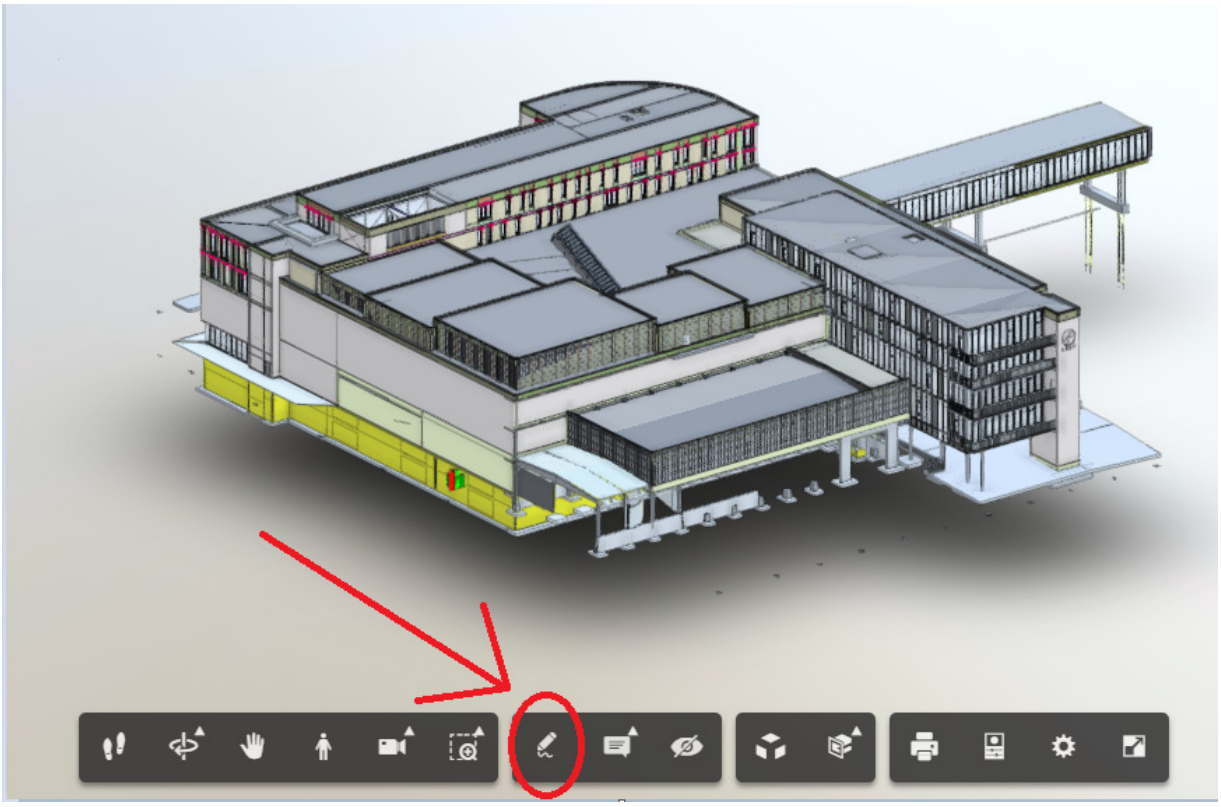
Using BIM 360 Team

Collaborating and communicating in the cloud with your team is what BIM 360 Team is all about. This software unites the team members on the same platform and gives the ability to add markups and to add comments in 3D models and 2D drawings in a total new way.
The typical traditional design process is that all the different disciplines have their models with the linked files and when something needs to be communicated to other disciplines, a screenshot or a pdf of the area are sent by e-mail to the team. This can result in some long e-mails with a lot of correspondence, and you don't need too many of those before it gets a little complicated.

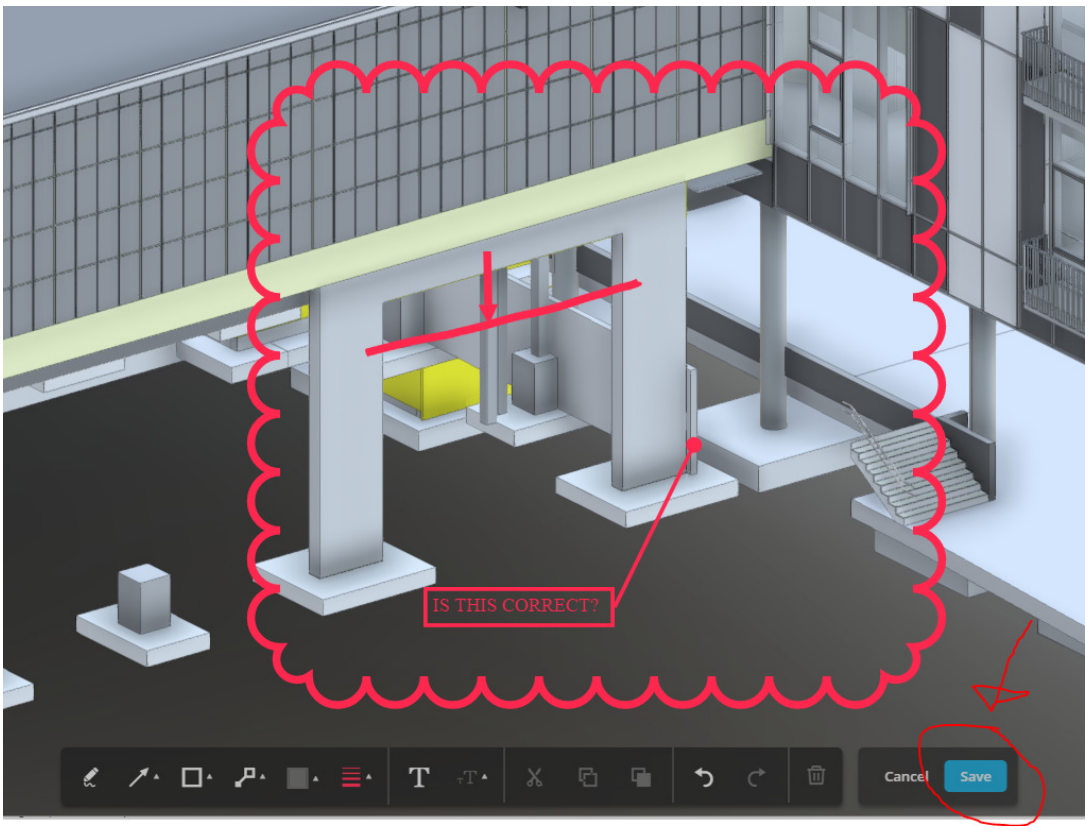
The BIM 360 Team way, is that this communication is happening in the cloud where all the project members are gathered and where the models and drawings are accessible anytime from anywhere! A much easier way to see the whole picture of a problem or a challenge.

While using the Forge viewer, comments can be added in 3 different ways.

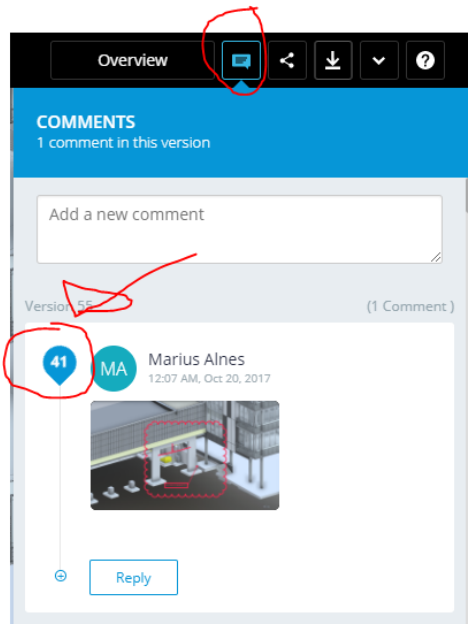
Adding comment using the markup tool:

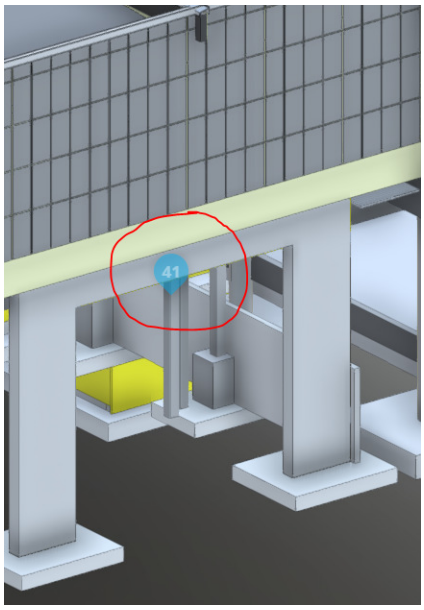


The markup tool is located at the toolbar in the bottom of the viewer. When clicking the icon, you get multiple tools available. Add the symbols that is necessary to describe what you want and click the save button.



Note that the comment is added to the comment list and that this comment gets a blue marker point in the model. Also, be aware of that the markup tool is a still picture. It's not possible to navigate in the model when this is active.

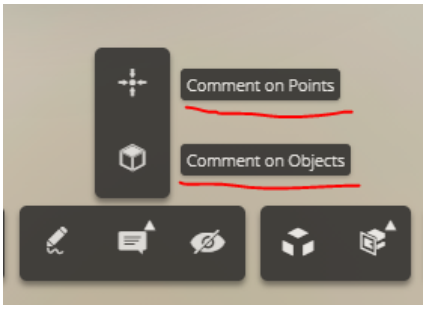




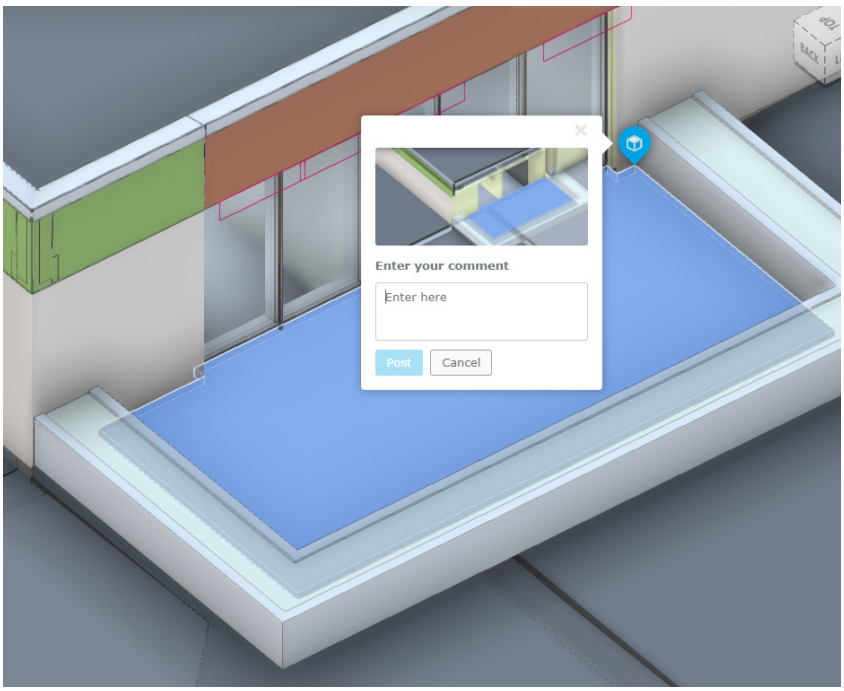
When navigating in the model and a blue marker is shown, you can click on the marker and you will get directed to the location of the comment. It's also possible to click on the comment in the comment field on the right side in the viewer.

Adding comment using the comment tool:

The comment tool is located next to the marker tool in the bottom of the viewer. By using this tool, you can add comments to objects or to points. This is an effective tool if there are specific objects og areas that needs attention.



Similarly to the markup tool, this tool also leaves blue marker points when adding comments. When adding a comment to a point or to an object, a dialogue box opens where the comment can be written.

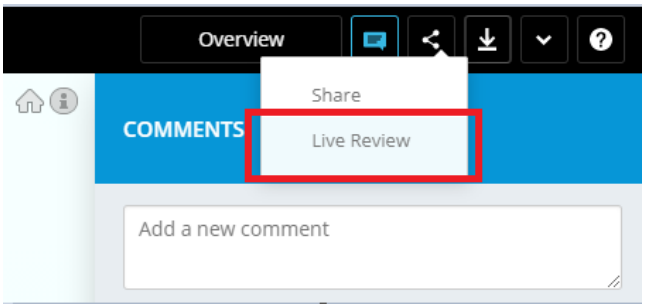


The last method is just to leave a comment in the comment field in the right side of the viewer. When navigation in the model and you start to write a comment in this field, a single screenshot of what you are seeing is added to this field automatically.

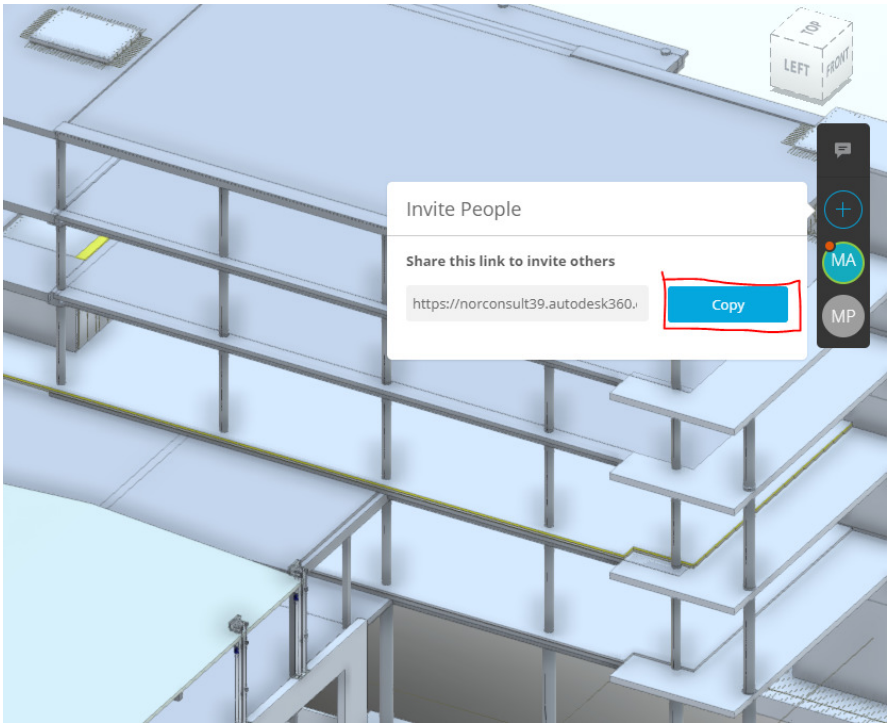
Live Review

Have you ever wanted to show the contractor on the building site the picture of the model you have on your screen while discussing a problem over the phone? Well, this is exactly what Live Review can do for you. Sure, there is plenty of other programs and services that can share your screen with others, but what makes Live Review quite unique is that this can be done on almost any device, such as smart phone, tablet etc., without having any programs installed! It gives also the ability to have multiple participants in the review, and everyone could control the model on the screen.

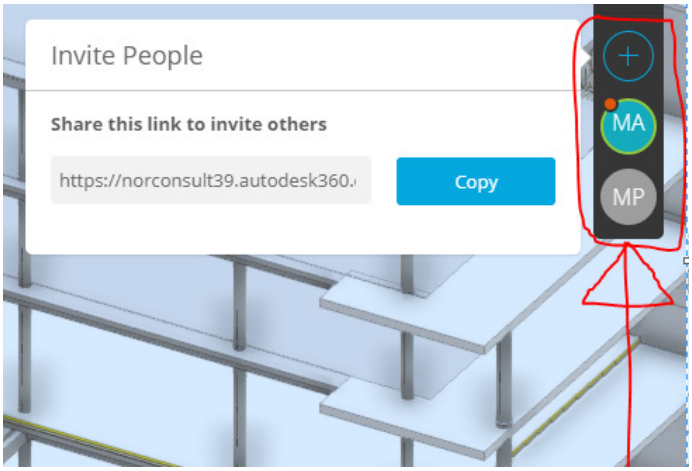
The Live Review are located on the top right corner in the Forge viewer. A model will have to be opened before the Live Review can be activated.



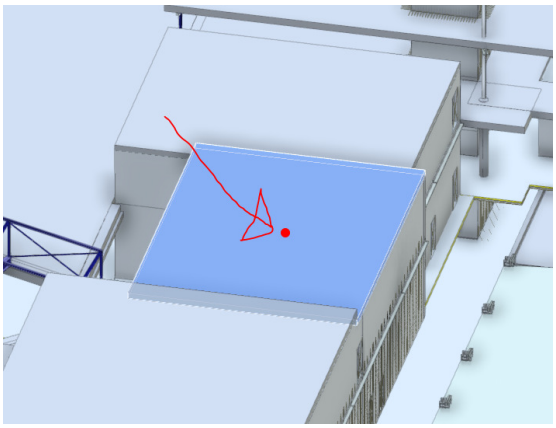
When the Live Review are opened it generates a link that can be sent by for example e-mail to all the involved parties.

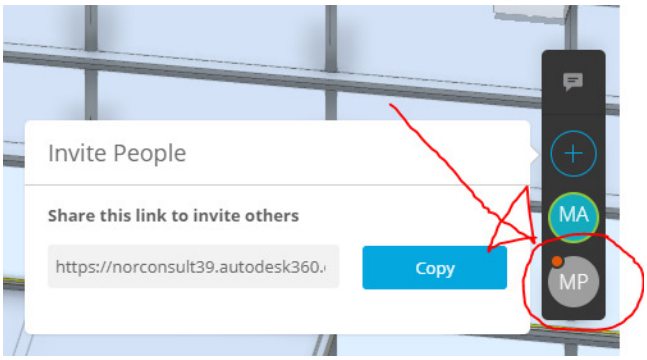


The people who receive the link click on it, and they will show in the list when they are connected.

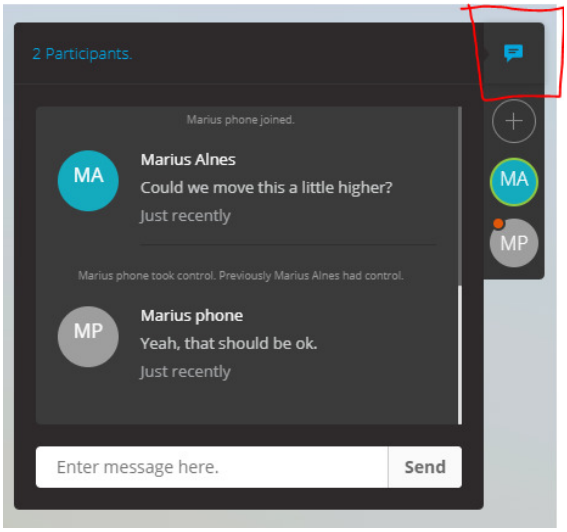


When the different participants are controlling the model, a red dot mark the area on the model where they are pointing, and an orange dot mark which one who are controlling the model.



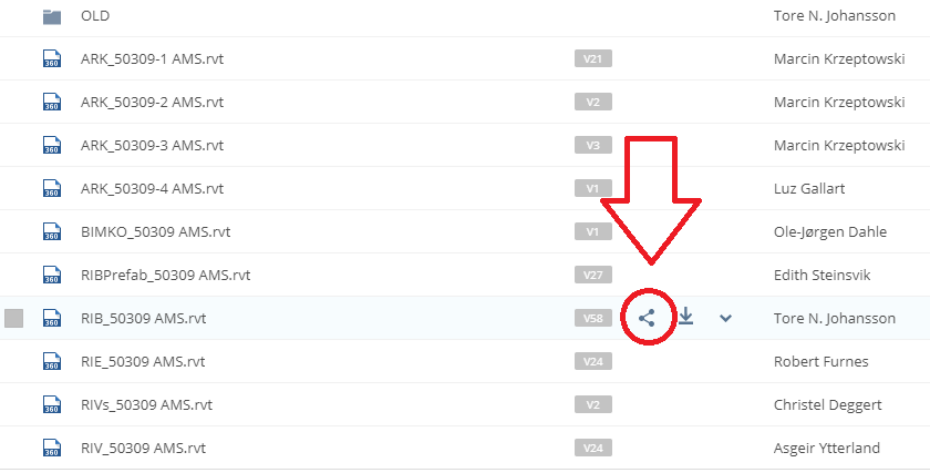


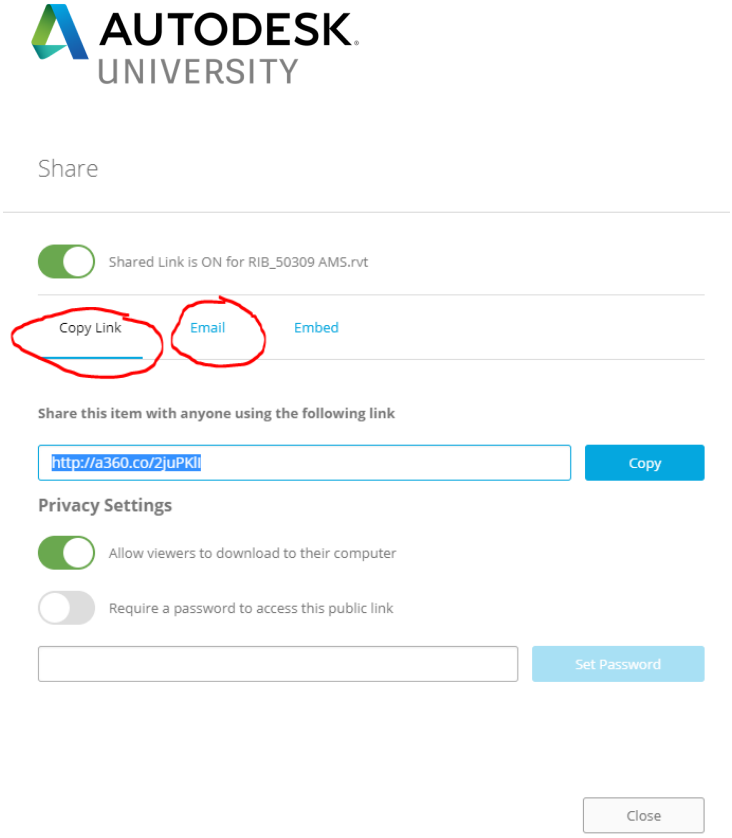
The Live Review has also a built-in chat function where participants of the session can write messages. It also keeps a log of who are controlling the model, if participants are joining or leaving etc.



QR Codes

If you have a phone or a tablet connected to the internet, QR codes are awesome!
All the models with published views will have a unique web address. From the BIM 360 Team dashboard this address can be copied, or sent directly to people using e-mail addresses. To do this click on the share icon (3 dots and 2 lines), and then choose which method that works for you. It gives also the ability to password protect the link, so only users with the password can open the file.

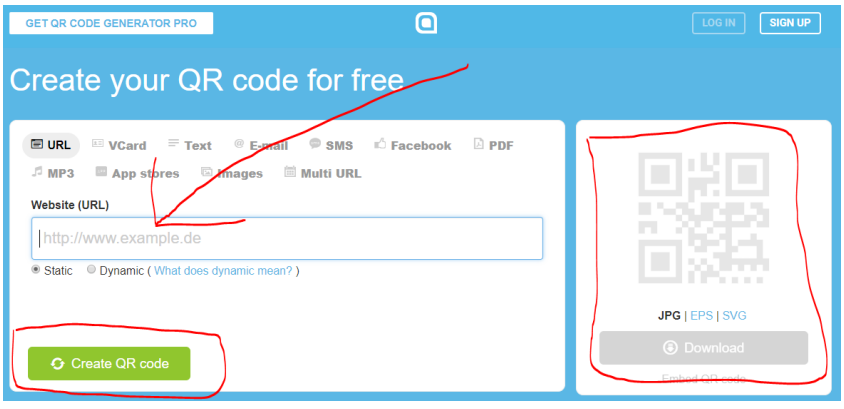


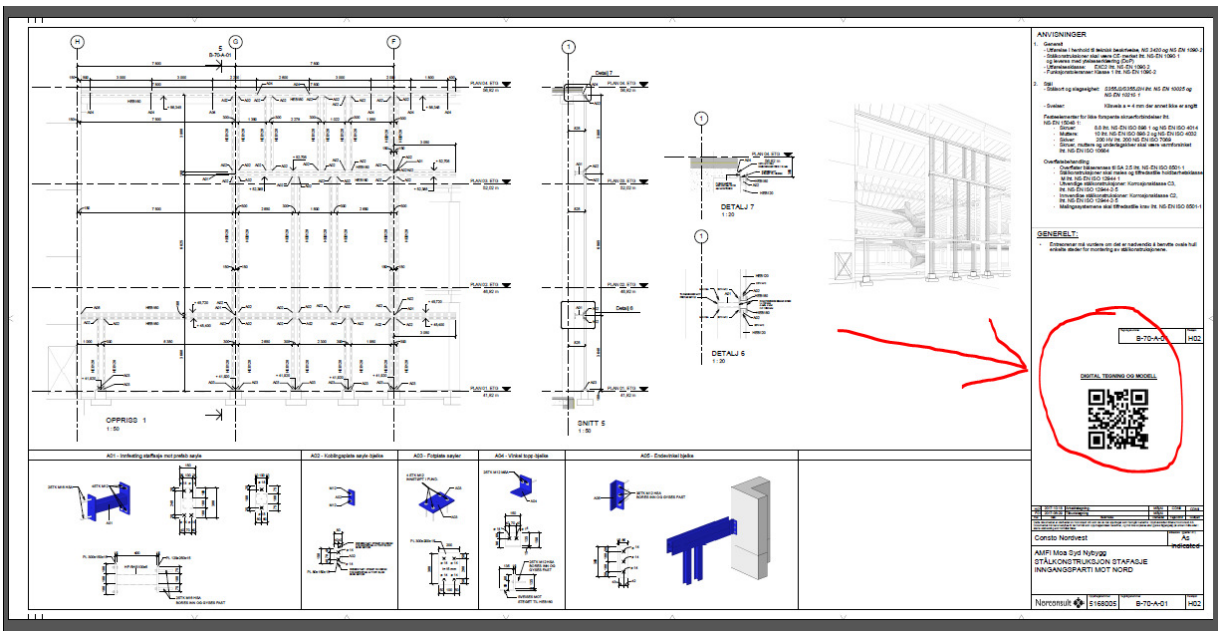


The share icon will show up when the mouse cursor is held over any types of files in the BIM 360 dashboard.

Let's take this a step further and get those QR codes!
We all know that most people have a smart phone or a tablet these days, and most likely the workers on the building site have this too. Why should complex drawings be sent out without letting the workers see things in 3D as you do?

Export a dwf-file or publish a view using the Collaborate tab in Revit where the view shows the same area as you have on a drawing. Get the file uploaded or published to the BIM 360 Team project. Copy the link and use a free QR code generator to generate a QR code picture to insert on your drawing. The people on site can now use their mobile devices to look at a 3D model instead of only having a 2D drawing.




OPPRISS 1
1 : 50
SNITT 5
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DETALJ 7
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DETALJ 6
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ANVISNINGER
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indicated
AMFI Moa Syd Nybygg
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INNGANGSPARTI MOT NORD
Norconsult
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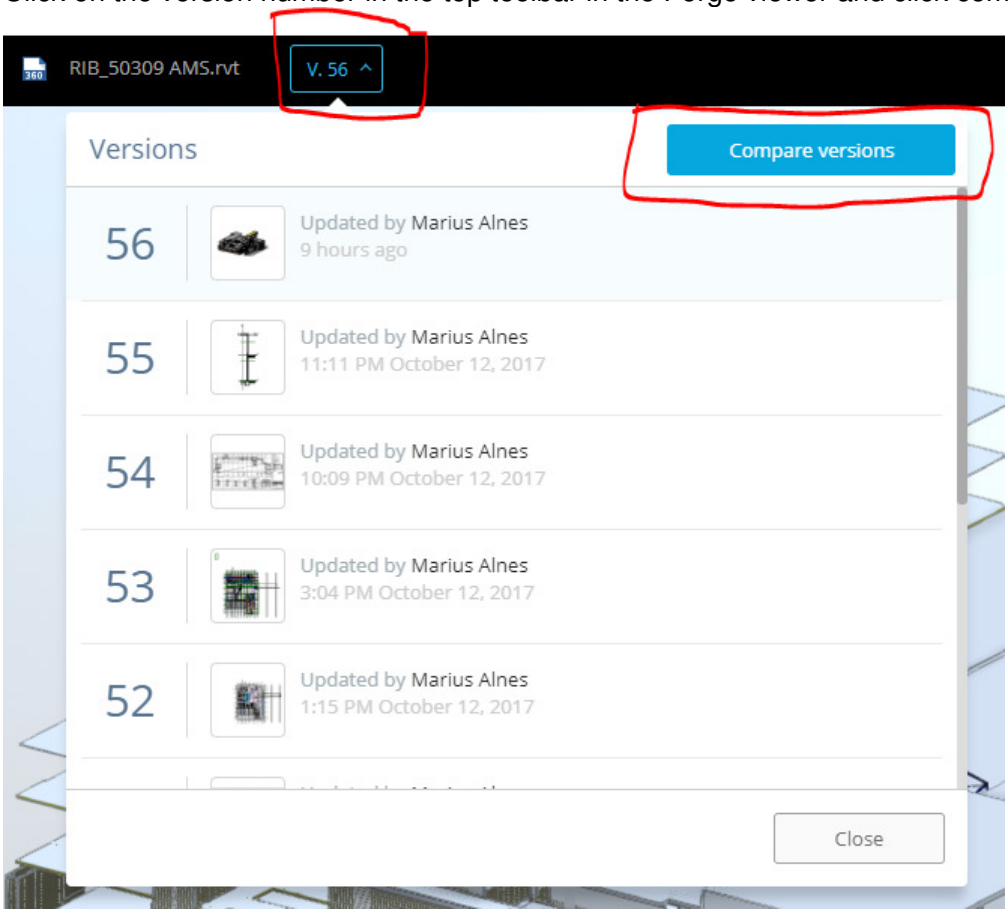
H02

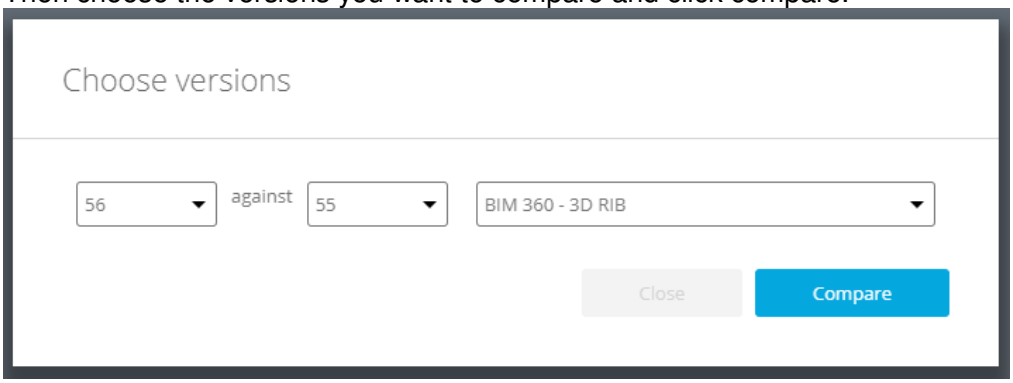
Compare versions

Another useful tool in the BIM 360 Team software is the ability to compare model versions. This helps team members to track the changes in the models and highlight deleted objects, modified objects and added objects.

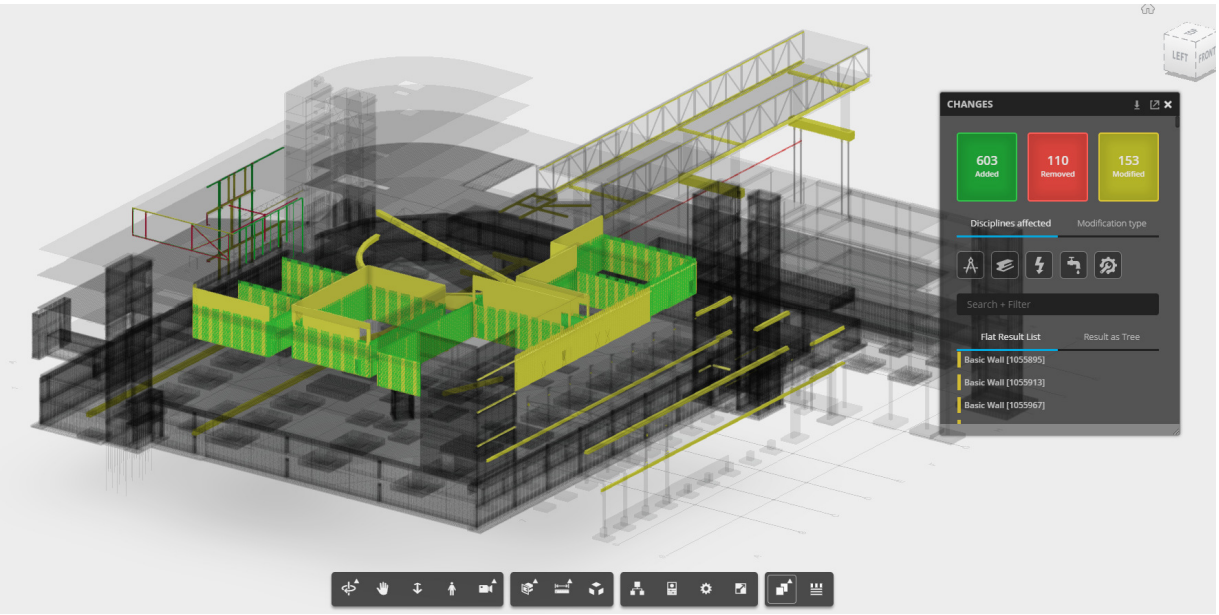
Click on the version number in the top toolbar in the Forge viewer and click compare versions.



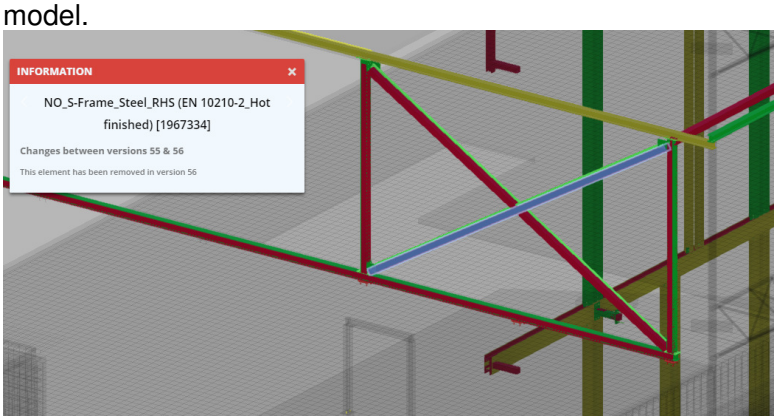
Then choose the versions you want to compare and click compare.

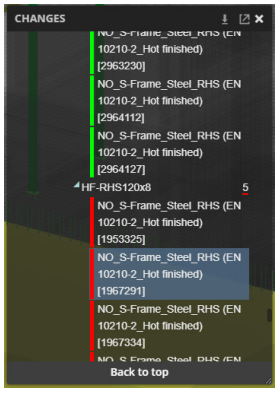


The viewer will then highlight the elements which have been added, removed or modified in the model in different colors. The changes menu provides the opportunity to show or hide the tree different categories, so it's possible to only look at the added elements, or the removed elements, or the modified elements at a time. The menu also gives the ability to hide and show different disciplines.



Click on an element in the model, or from the changes menu, to see what have happened to the element from one version to another. An information box will then appear on the screen. If an element is selected in the changes menu, the viewer will zoom to the selected object in the model.



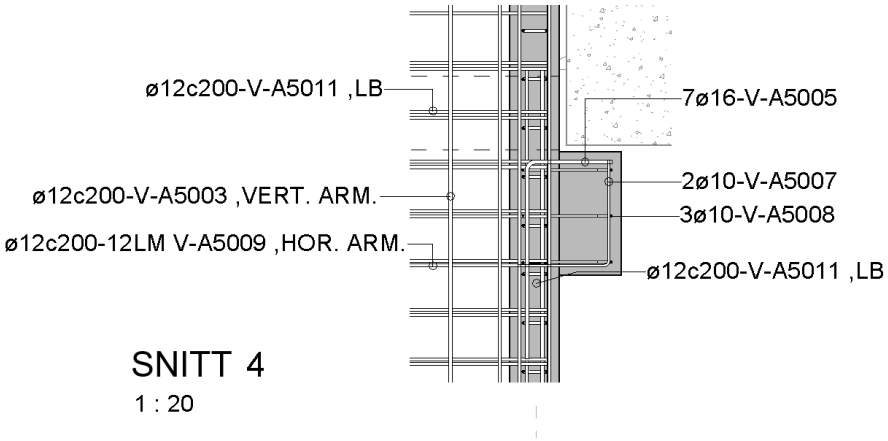


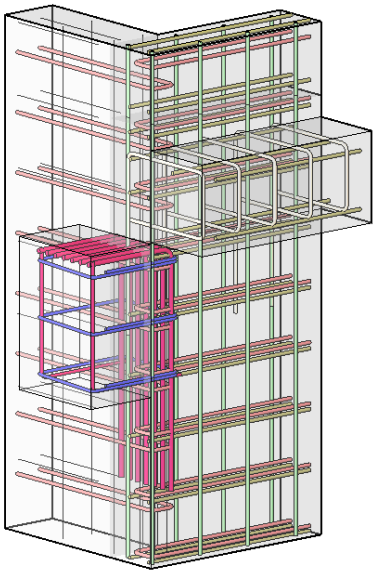
This tool gives a very graphical presentation of the changes in the model to keep everyone informed of what's going on.

What happens in the future?

There is a lot going on with the technology innovation, and it's likely that the construction industry has seen just a little part of what we can expect in the next couple of years. How can we as a team communicate and collaborate to build better buildings at lower costs? Do we still need the paper drawings, or can we get rid of them? We are modelling in 3D, produce drawings in 2D, and build in 3D. Do we really need the 2D part?

A good example I reinforcement drawings when modelling the rebars in 3D. The shape and length are generated in schedules which can be sent directly to the rebar manufacturer. The placement is set in the 3D model and all the needed information are in the object. To make 2D drawings of complex reinforcement can be a time-consuming process. The rebars are already in the model, so why bother making drawings?





And what about VR on the building site? Could the concrete workers put on their VR glasses to see where to put the different rebars or to control the rebar positions?

Keep on communicating and collaborating!