REVIT PURE PRESENTS

PAMPHLETS

ISSUE #14 / FALL 2019

SHARED SITES

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by: Nicolas Catellier, Architect

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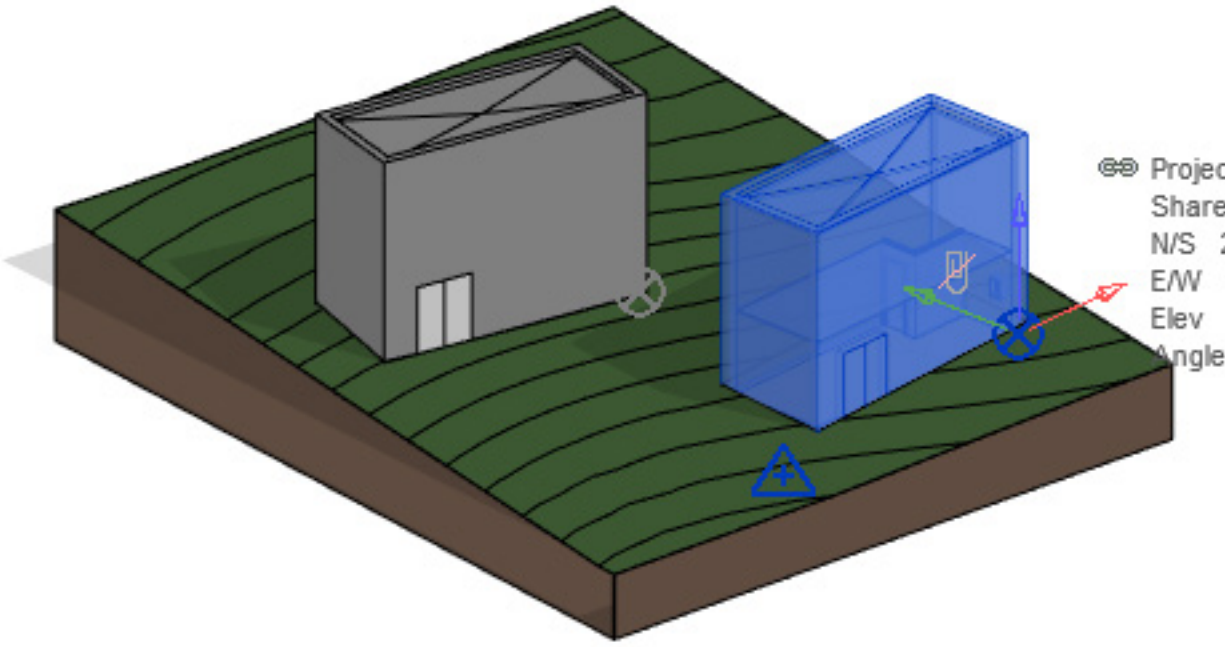
WHAT IS THIS *PAMPHLET* ?

Revit Pure Pamphlets are published 4 times a year by email. Each edition covers a very specific Revit theme. We like to pick themes that are complex and confusing. Our job is to make these topics simple for you.

WHY SHARED SITES

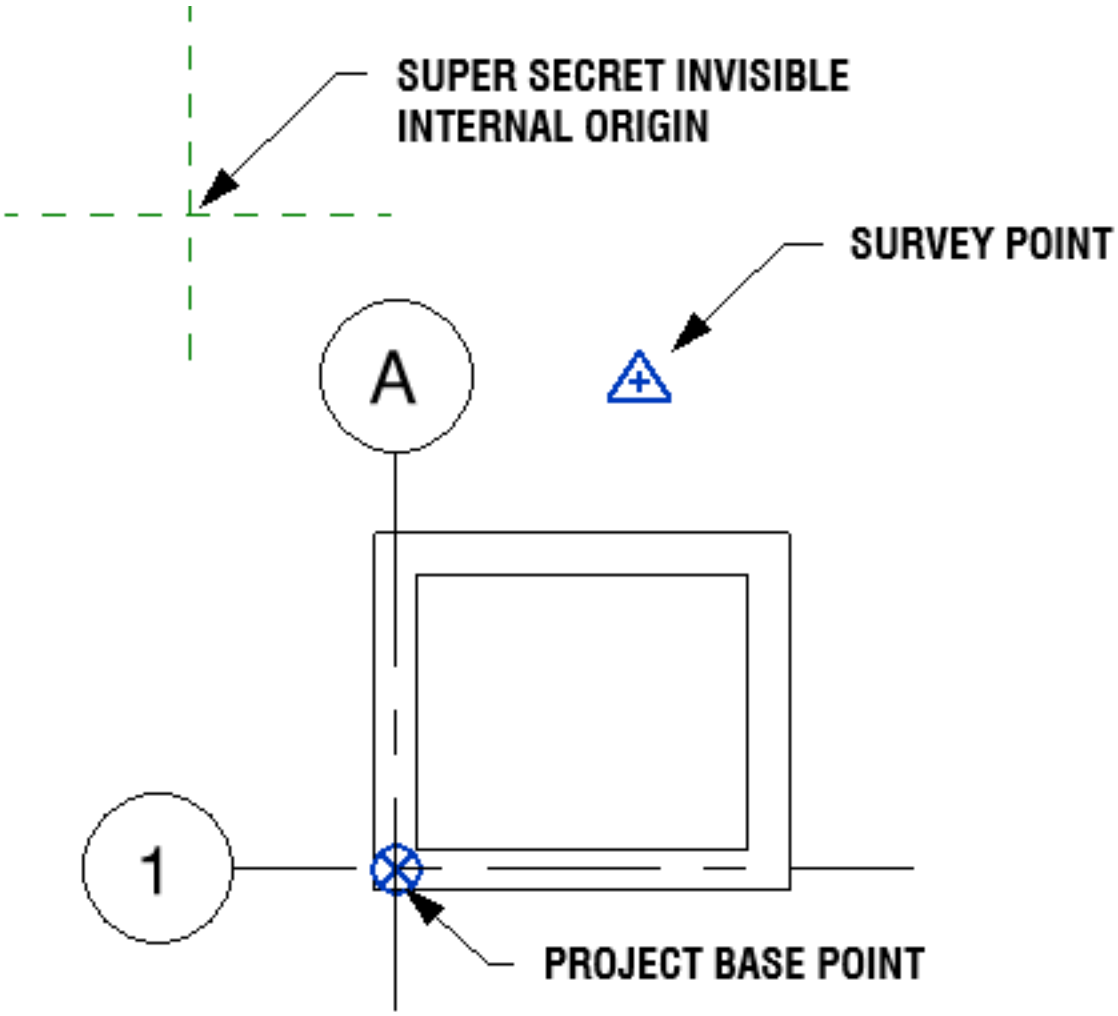
In Pamphlet #9, we covered the basic notion of Revit's strange coordinate system. In this issue, we'll push further and explore how to properly use the Shared Site feature. Shared Sites are used in order to have multiple linked Revit files using the same site coordinates.

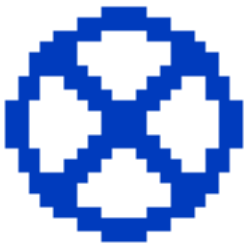
Before diving deep into these topics, we'll go through a small recap of the major things to know about coordinates.



UNDERSTAND THE DIFFERENCE BETWEEN ALL 3 COORDINATE ORIGIN POINTS

There are 3 different origin points in a Revit project: the Project Base Point, the Survey Point and the secret Internal Origin. The next page features a short description of each point. To learn more, make sure to read Pamphlet #9.





PROJECT BASE POINT: This point is used almost exclusively for internal purposes. It is used to place dimensions relative to the **building**. It is represented by a blue circle with a cross in the middle. It can also be used to set the angle difference between True North and Project North.

SURVEY POINT: This is used to create a "shared coordinates" system among multiple linked Revit or CAD files. That means its location is most useful when exporting and importing files. It is usually placed relative to a real-world site element such as the intersection of 2 property lines or a geodetic marker.

INTERNAL ORIGIN: This is the tricky one. This point is invisible and cannot be moved. Most users don't even know it exists. By default, importing or exporting a CAD or Revit file will be made relative to this super-secret point, therefore confusing many people.

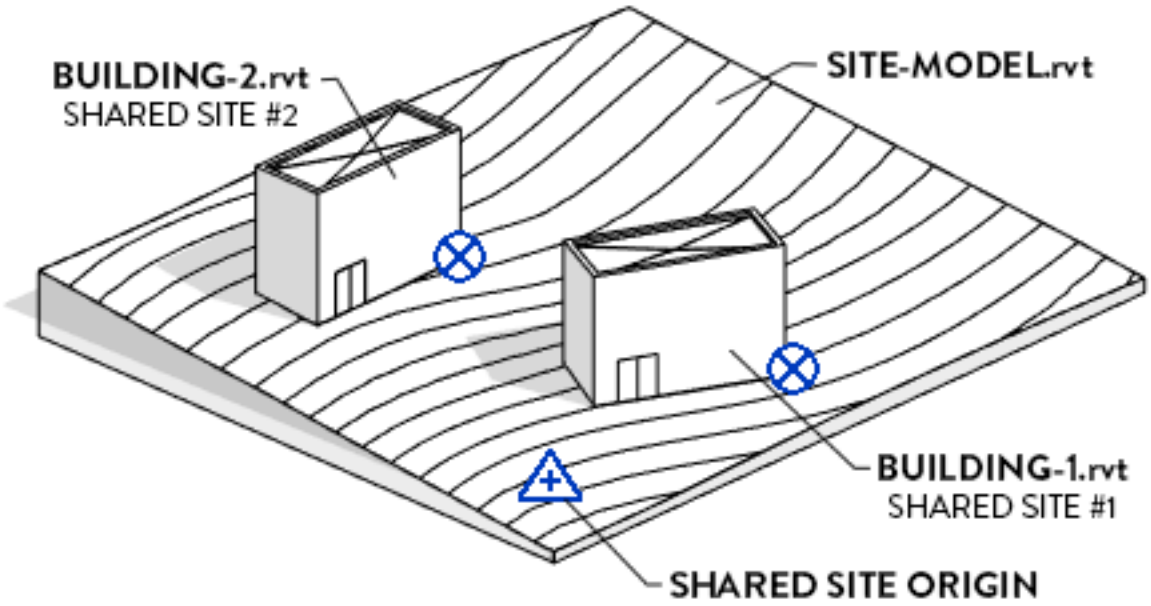
THE MYSTERIOUS SURVEY POINT

There are multiple ways to use the Survey Point. The way we recommend is that you always keep it **clipped.** This way, it will always match the **Shared Site origin** of the project. If you move an unclipped Survey Point, you will probably cause confusion in your project.

WHY USE SHARED SITES?

Have a look at the image below. There are 3 different Revit models: two building models and a site model. Each building has a specific local Project Base Point and Internal Origin, most likely located at the same location.

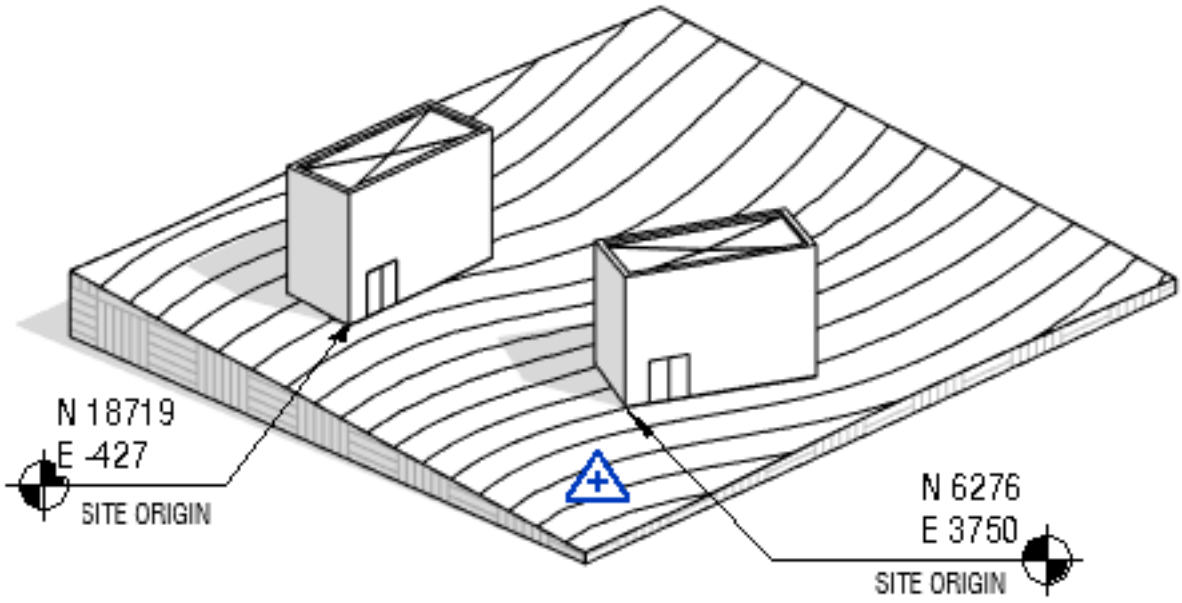
The shared site origin position is set in the site model and represented by the Survey Point. Then, each building model is positioned and the shared coordinates are acquired from the site model.



Why would you use this Shared Site feature? The next pages will explain the benefits.

BENEFIT #1: Spot coordinates refer to the same point on all models

In the image below, we use the **Spot Coordinate** tool, located in the Annotate tab. It will indicate the X/Y distance from a point to the Shared Site Origin, which is represented by the Survey Point.

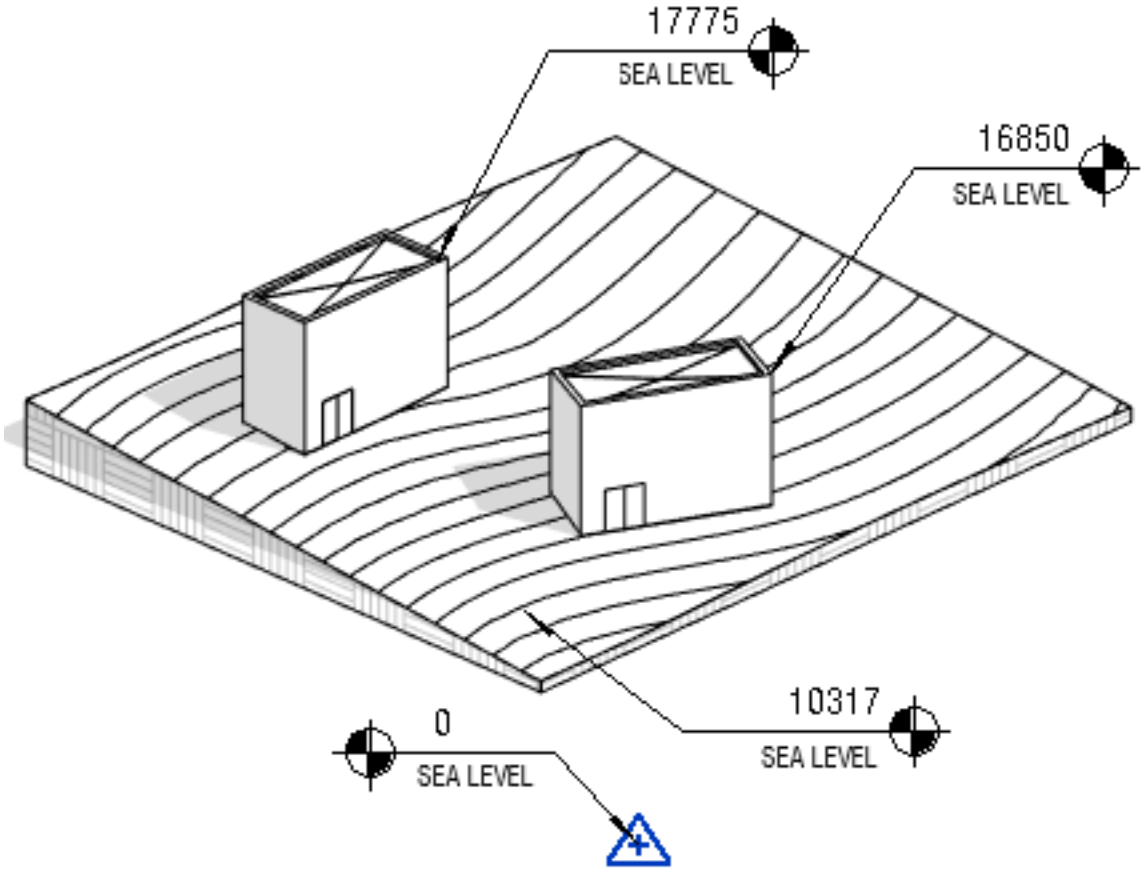


When the **Shared Coordinates** are spread among all the Revit files, the spot coordinate tool can be used in any model and still refer to the same origin point.

Be careful: there can be multiple types of Spot Coordinates. In the type properties, make sure that the **Coordinate Origin** is set to **Survey Point**.

BENEFIT #2: Spot elevation refers to the same height on all models

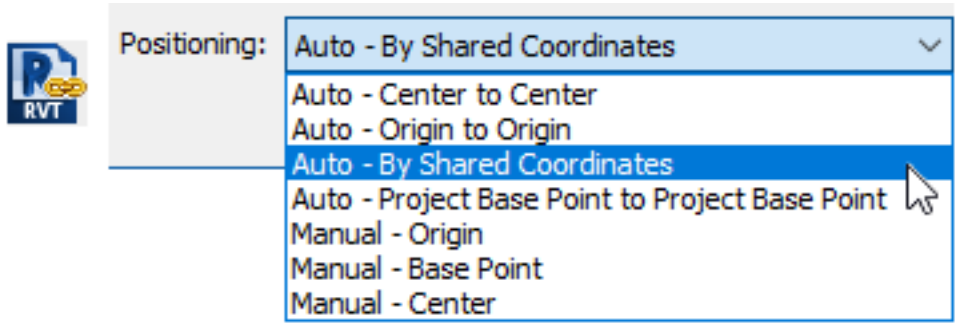
It is helpful to spot the elevation of a building element in relation to the site. In the example below, we place the elevation value of the Shared Site Origin (represented by the Survey Point) at Sea Level = 0. This way, we can use the Spot Elevation tool to indicate the height of any element in relation to the sea level. Spread the Shared Coordinates to all Revit files and you'll be able to use this feature accurately on any model.



Like with the Spot Coordinates tool, make sure to use Survey Point as the **Elevation Origin** in the Spot Elevation type properties.

BENEFIT #3: Revit models and other external files can be linked using “By Shared Coordinates” positioning

You can think of the **Shared Coordinate** system like a virus that spreads around. The virus starts from the linked Revit site model. It then spreads around to the architecture model, to the structure model, to the linked CAD files, etc. Once the virus is fully spread, you can link any file together and they will automatically position themselves if you use the **Auto - By Shared Coordinates** positioning option.

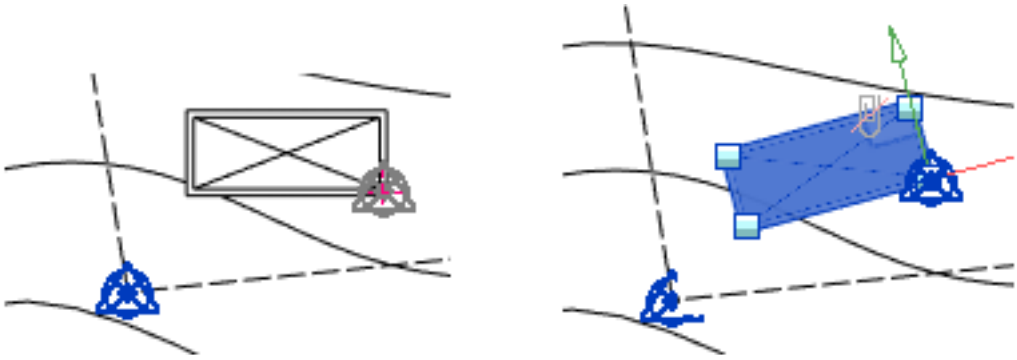


Again, this positioning option only becomes available when the files have been synced using Share or Publish Coordinates. That’s what you will learn in the coming pages.

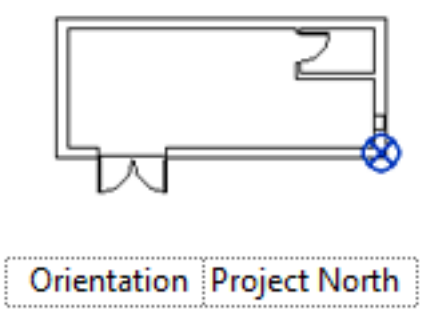
BENEFIT #4: The "True North" of a building can be adjusted in the site model by using the rotation tool

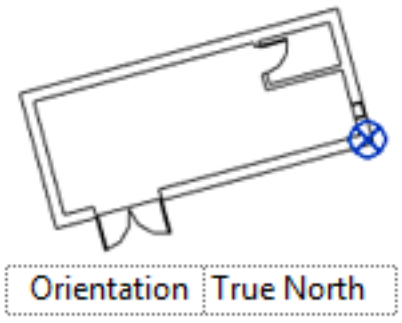
All Revit projects contain two norths: first, the Project North, which is used to orient view in a convenient way in relation to the sheets. The True North represents the real north in relation to the site.

The most common way to set the True North value is to manually set a rotation angle value between the True North and Project North. However, there is a simpler way to do this: you can link your architecture project on the Revit site model, rotate it and publish the coordinates.



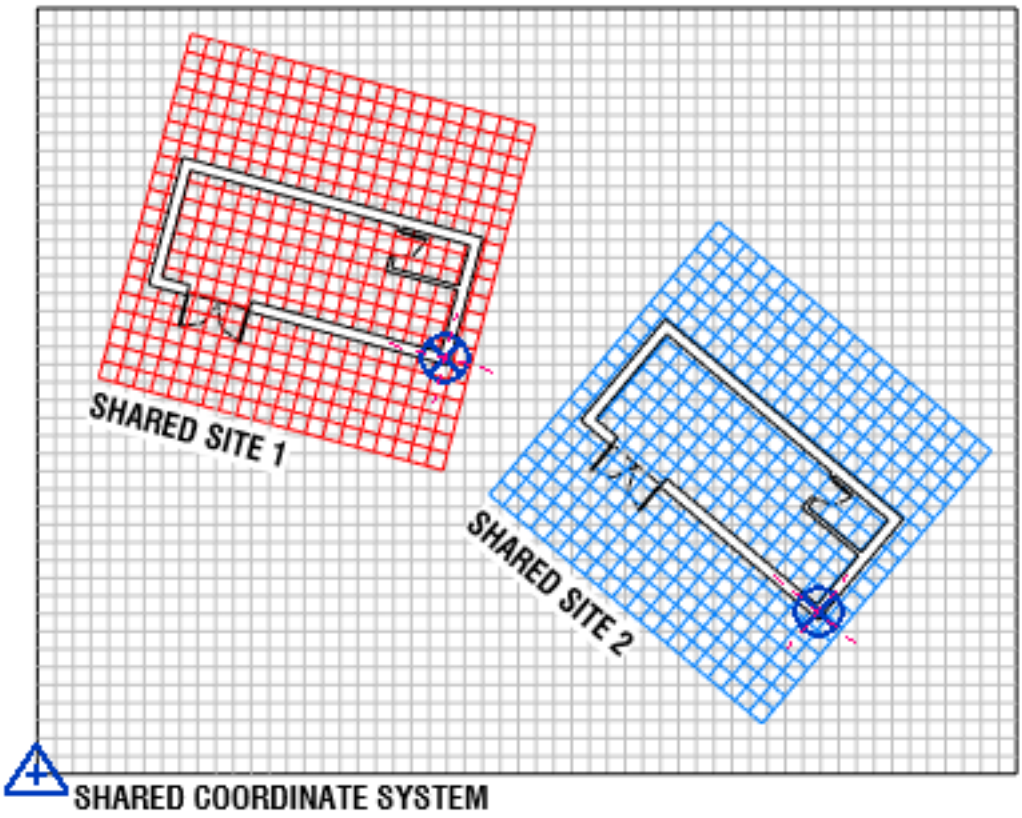
When coordinates are shared, you can go back to the Architecture model and adjust the Orientation parameter in the instance properties of a plan view. Pick between **Project North** and **True North.**



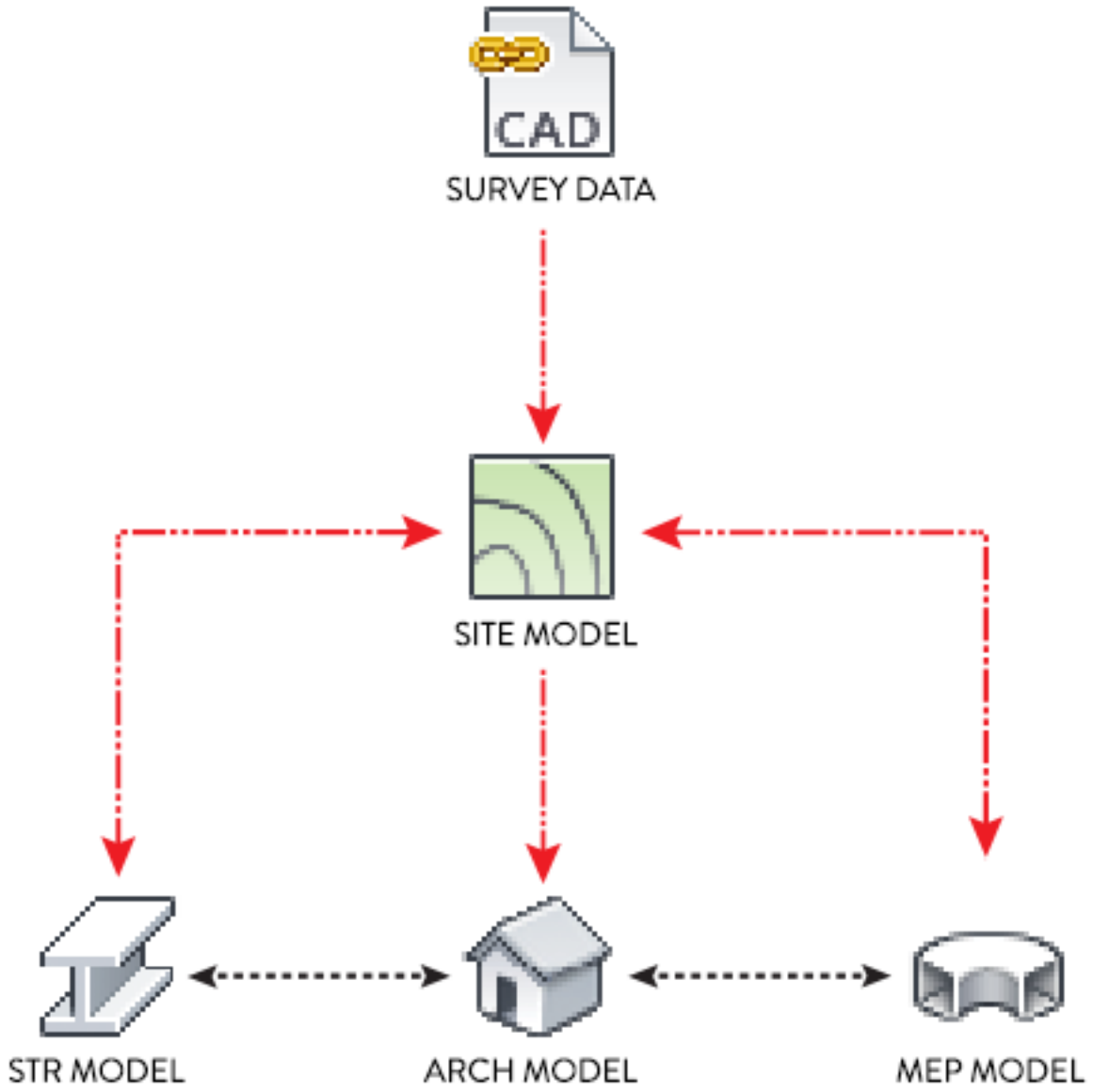


THE DIFFERENCE BETWEEN SHARED COORDINATES AND SHARED SITES

Shared Coordinates and Shared Sites are not the same thing. In the image below, there is a site model and 2 instances of a building model. Each of these files is using the same **Shared Coordinate System**. However, each instance of the Revit building model has its own **Shared Site**. Basically, all files have a common Survey Point but they also have their own personal Project Base Point and Internal Origin.



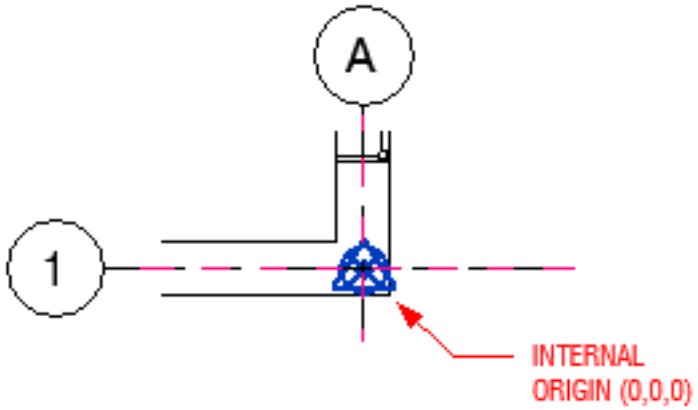
12 STEPS TO CREATE SHARED SITES IN REVIT



1- CREATE ARCHITECTURE MODEL, LOCATE INTERNAL ORIGIN

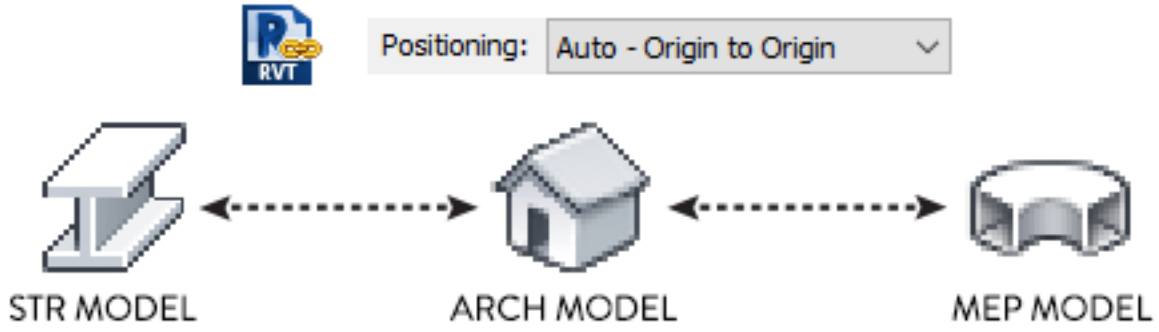
The first step is to create the main architecture model. Orient the views for convenience and ignore the True North for the moment.

Make sure to place the building in relation to the internal origin. Usually, that means at the corner of your building, where two major grids might intersect. Don't mess up this step. You cannot relocate the internal origin of the project.

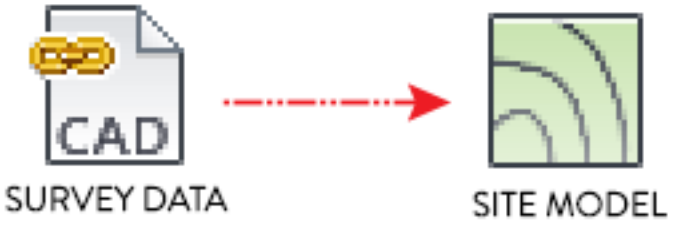


2- LINK REVIT MODELS FROM ALL DISCIPLINES USING "ORIGIN TO ORIGIN"

If you have MEP and Structure models ready, you can link all the Revit files together. Use the **Auto – Origin to Origin** option. Always use this option and you will never have positioning problems when linking multiple disciplines. Don't worry about shared coordinates for now.

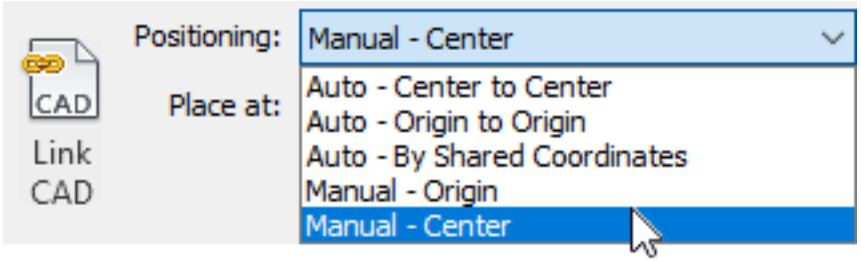


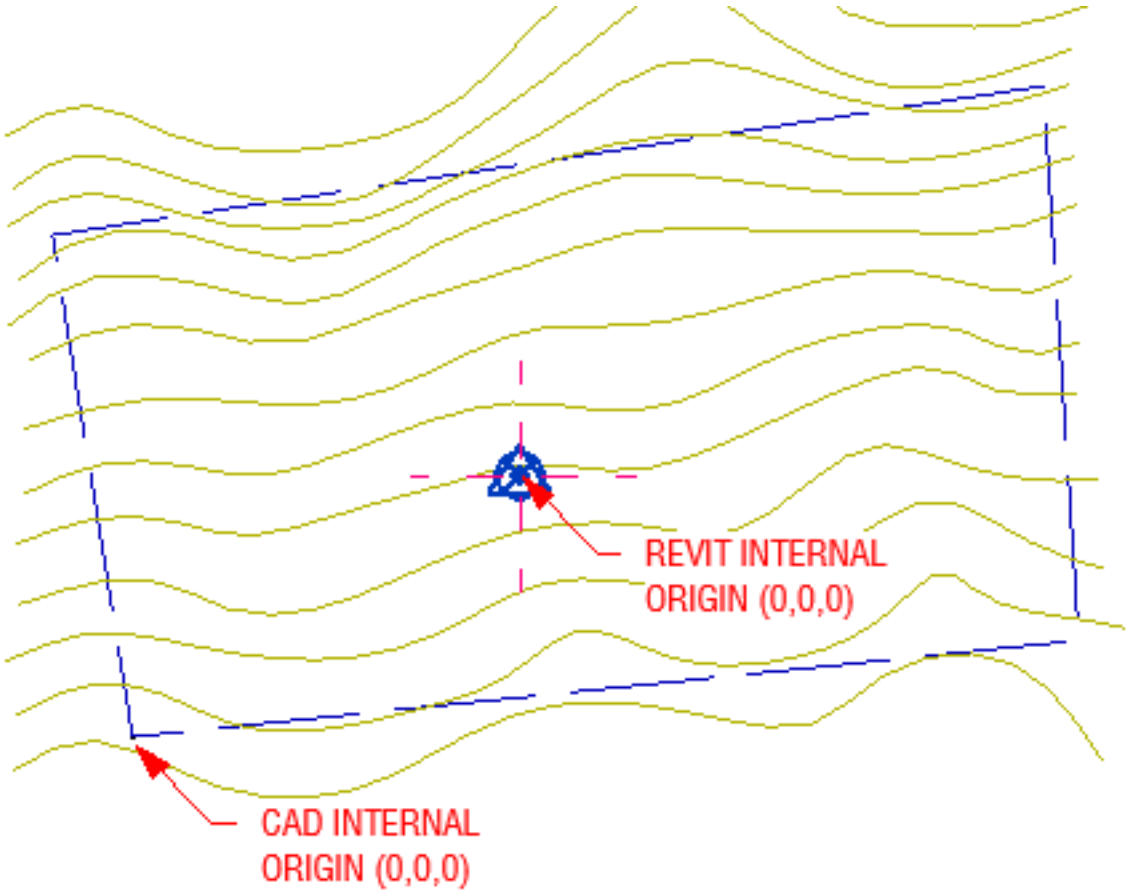
3- CREATE SITE MODEL AND LINK CAD SURVEY DATA



Once you have the Survey Data from your civil engineer or surveyor in hand, create a new Revit site model. Make sure the origin in the CAD file containing the survey data is where it needs to be. In this example, we will use a 2D CAD topo file, although sometimes you might receive 3D files.

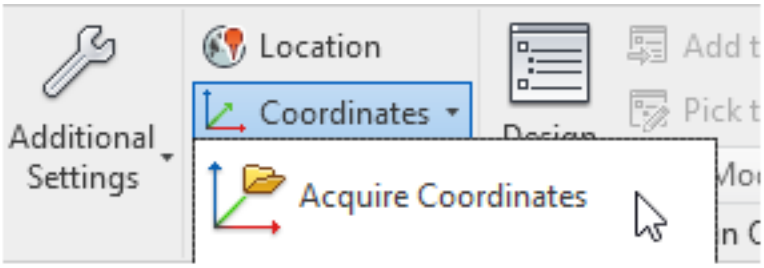
In this surveyor DWG file, the origin (0,0) is located at the corner of the property lines. This is the agreed location of the shared site origin. The default Revit origins are all at the same spot. Then, use the **Link CAD** tool and use **Manual - Center** positioning option. Click to place the DWG file.





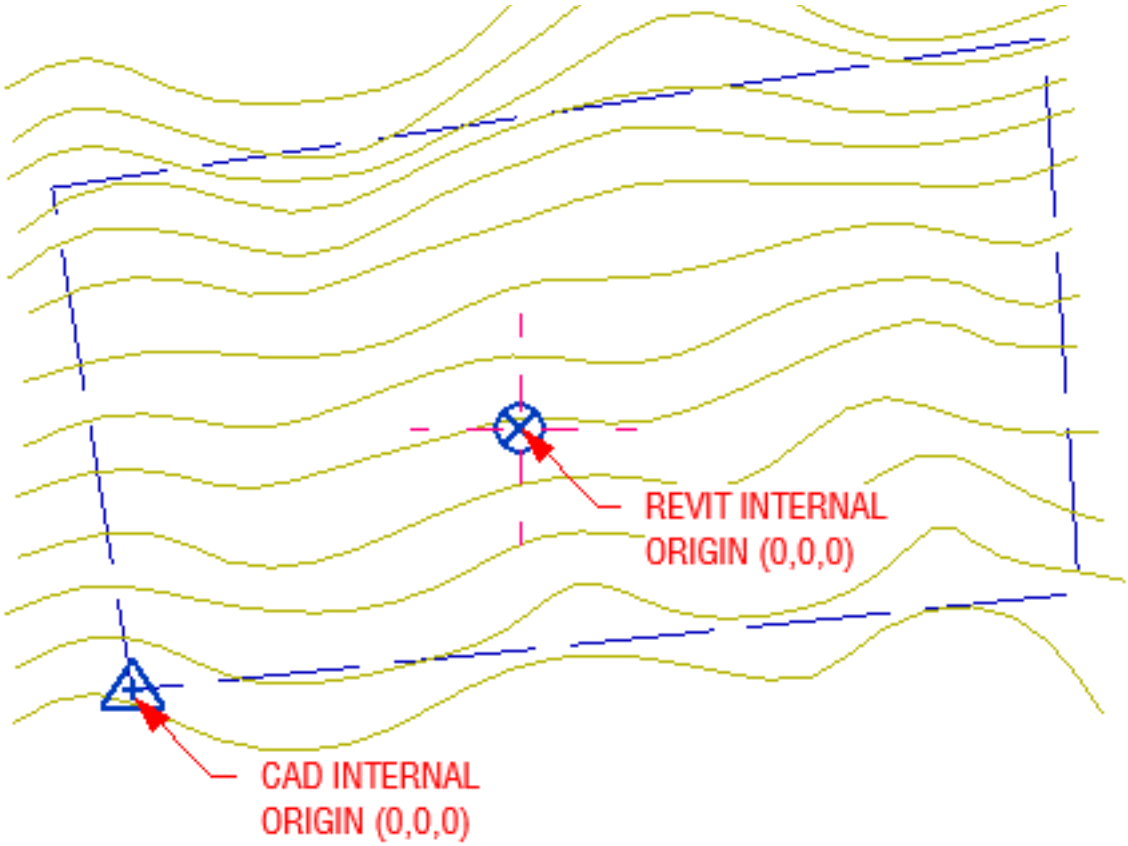
LINK CAD INTO REVIT FILE

Now, go to the manage tab, click on the Coordinates icon and select the **Acquire Coordinates** tool.



CLICK ON "ACQUIRE COORDINATES" IN THE MANAGE TAB

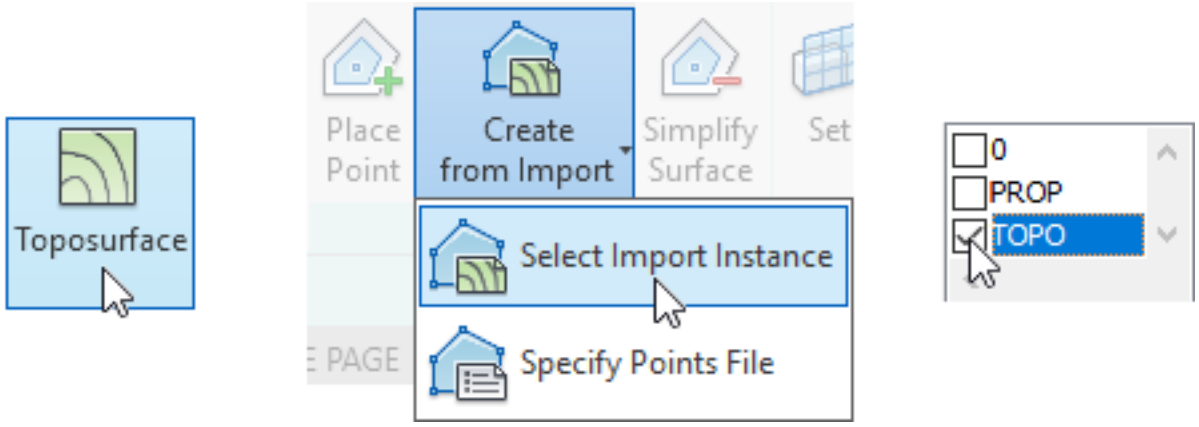
Then, click on the CAD link. As you can see, the **Survey Point** of the Revit site model is automatically moved to match the CAD file origin.



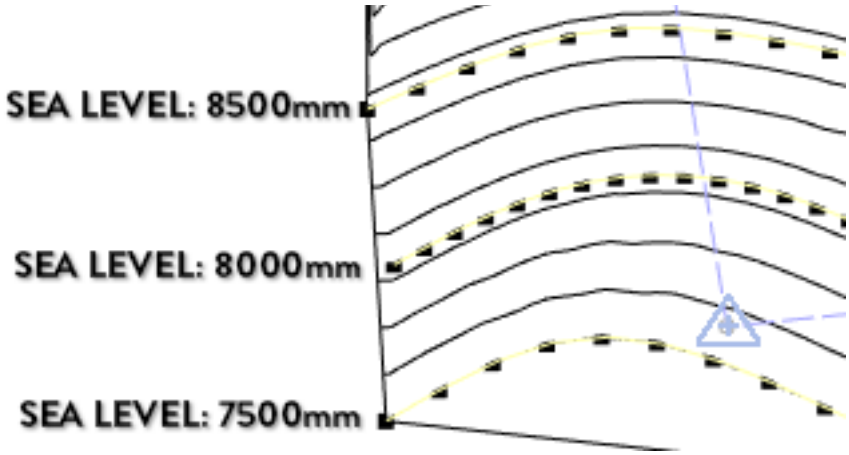
THE REVIT SURVEY POINT IS MOVED TO THE CAD ORIGIN

4- MODEL TOPOSURFACE USING CAD FILE

Now, let's model the topography of the site using the **Toposurface** tool, located in the Massing & Site tab. Click on the **Create from Import** tool and select the CAD file. Select the correct CAD layer. In this case we know it is layer TOPO.



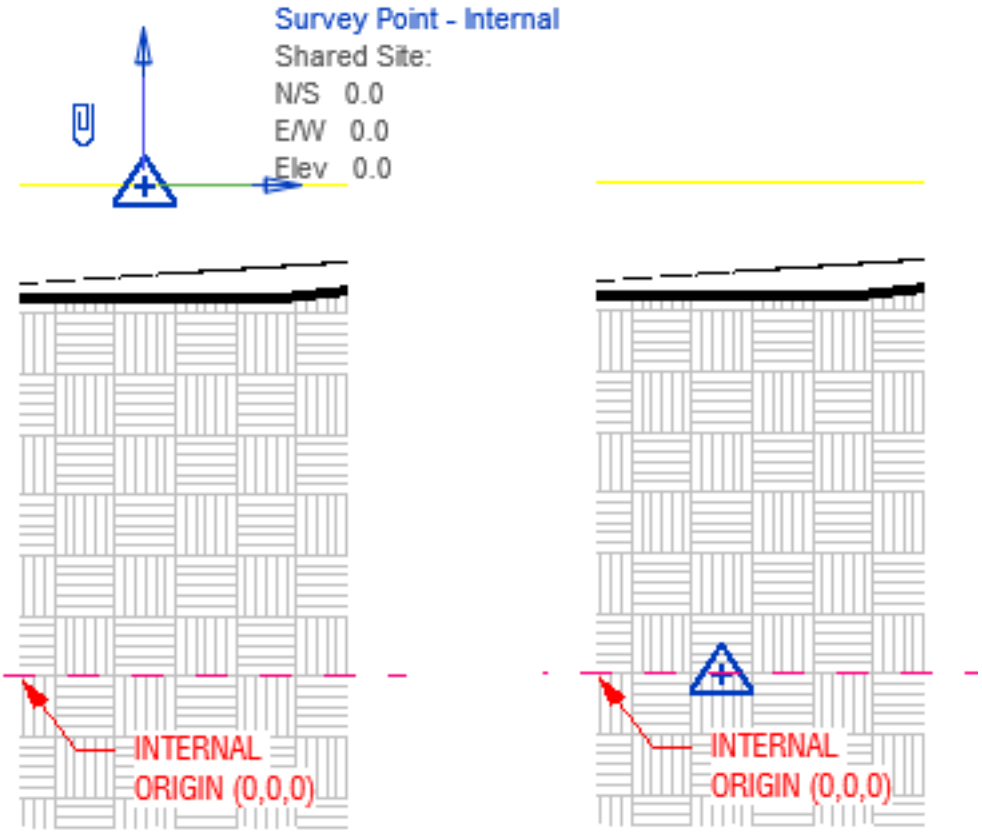
Thousands of points will be automatically created. In this case, this is a 2D CAD file, which means you still have to manually set the height of all the points. Use the sea level information to set the proper height to the points on each curved line.



5- SET SURVEY POINT TO ELEVATION = 0

In most cases, you want the Survey Point height to be set to level 0. This way, you can use it to indicate the Sea Level elevation of any point. In your Revit site model, go to any elevation and uncrop the view. Activate the Survey Point visibility in the **Visibility Graphics** menu, under the Site subcategory. Select the Survey Point and make sure it is clipped. Move it to Level 0. Make sure you don't modify the X/Y coordinates of the point.

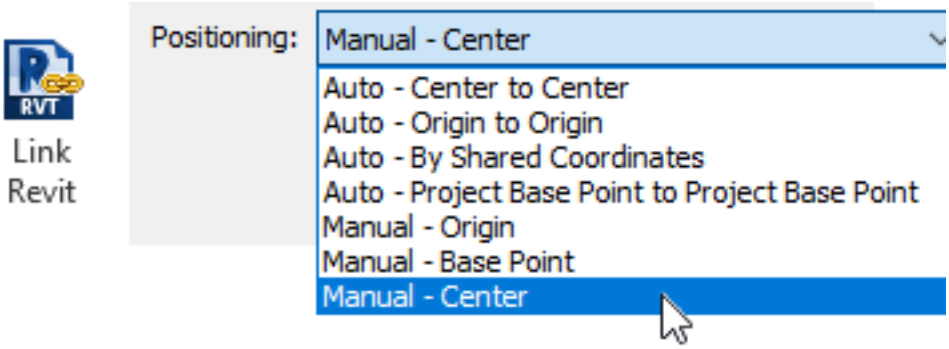
Depending on how your Revit template is set up, the Survey Point might already be set to Level 0. It should match the **Internal Origin** elevation.



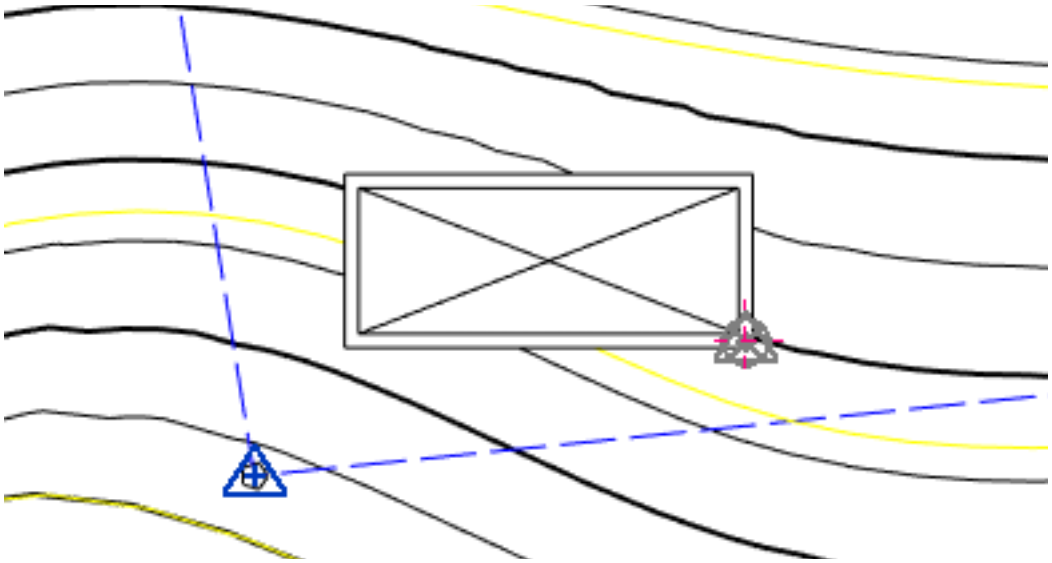
MAKE SURE SURVEY POINT IS SET AT LEVEL = 0

6- LINK AND POSITION THE ARCHITECTURE MODEL

Use the **Link Revit** tool in the Insert tab. Select your architecture model and use the **Manual - Center** positioning option.

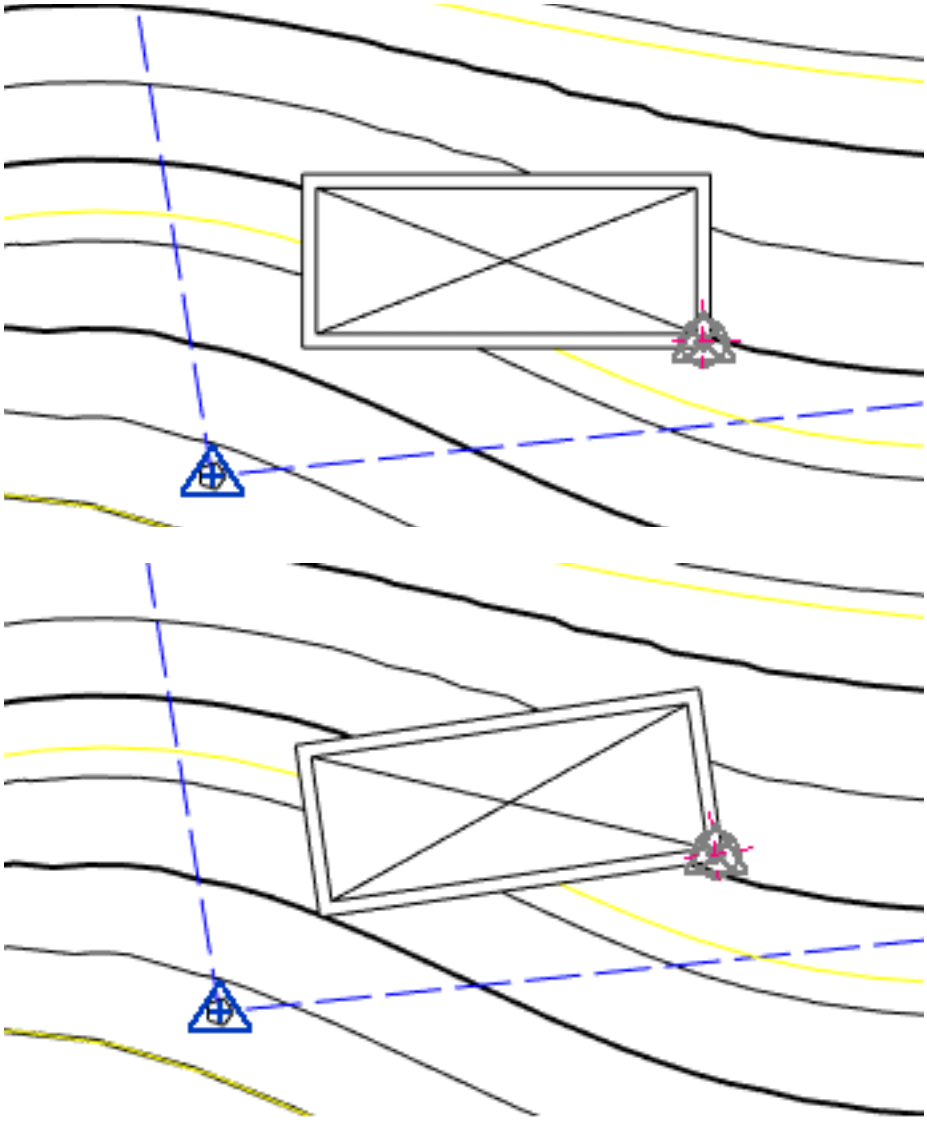


Now, manually position the building on the site model.



7- ROTATE THE ARCHITECTURE MODEL IF NECESSARY

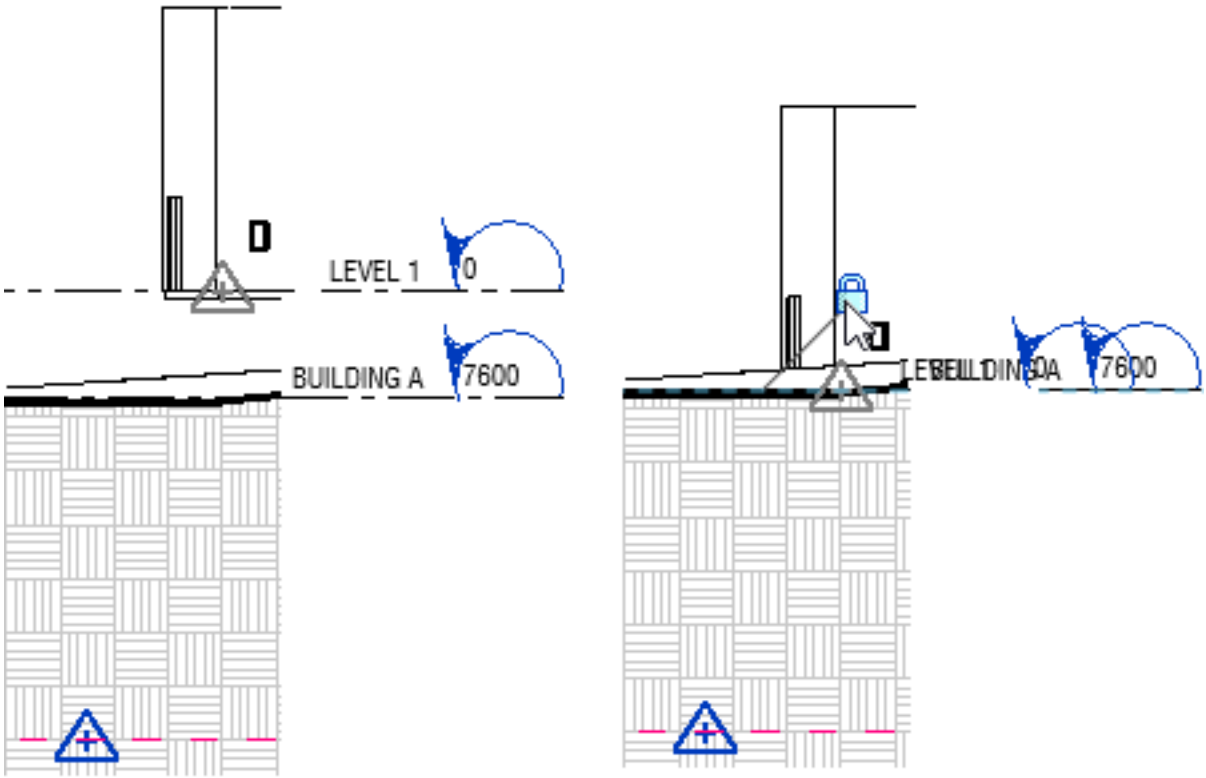
In page 11, we've talked about how you can set the True North of a project using the rotation tool inside the site model. It is now time to rotate your model if necessary.



ROTATE ARCHITECTURE PROJECT

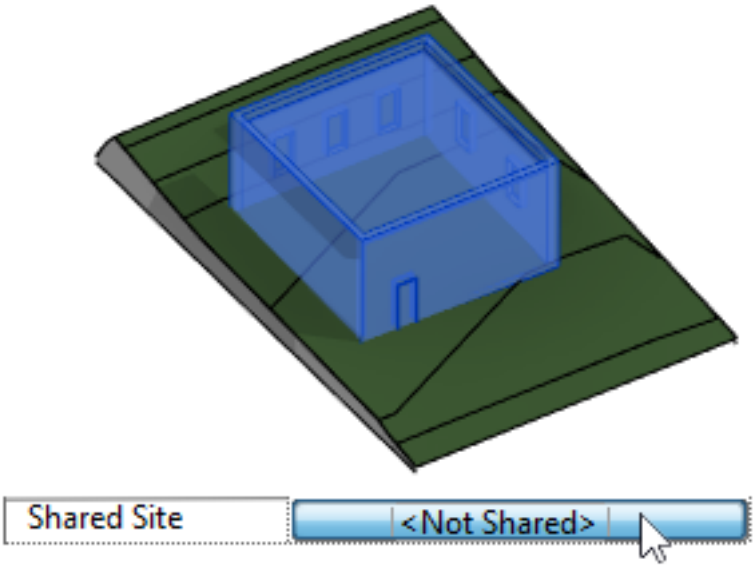
8- ADJUST THE BUILDING VERTICAL POSITION

Go to an elevation view. Figure out what Sea Level elevation will match the Level 1 of the architecture model. Create a new level in the site model and call it "Building A." In the example below, we know Level 1 = Sea Level 7600mm. **Align** and **lock** the architecture model Level 1 to this new level. With this technique, adjusting the building height in relation to the site becomes pretty easy.

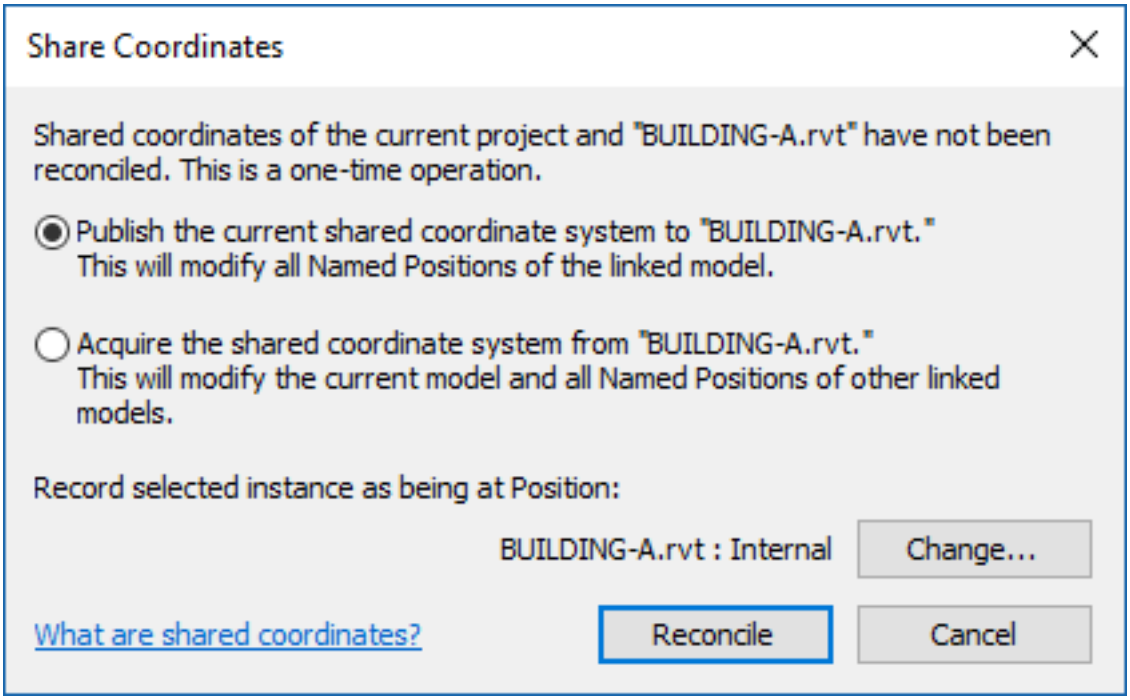


9- PUBLISH COORDINATES TO ARCHITECTURE MODEL

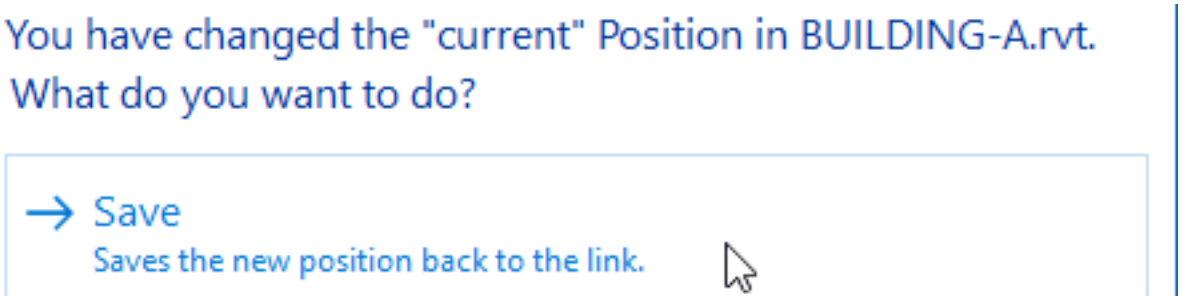
You have linked an architecture model, properly positioned it on the site and adjusted the rotation value. Now, it is time to **Publish** the coordinates from the site model to the architecture model. Select the linked architecture file. In the instance properties, you will find the Shared Site parameter. Click on it.



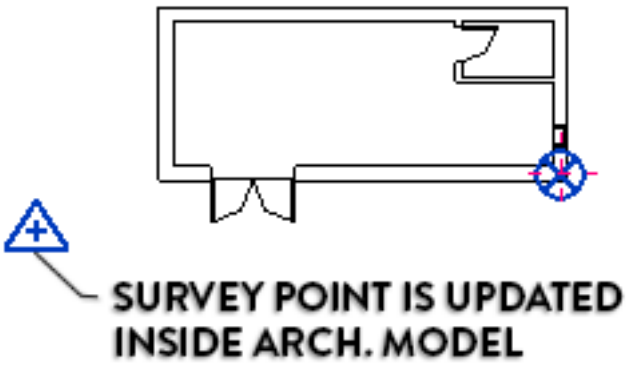
When clicking Shared Site, here are all the options available to you:



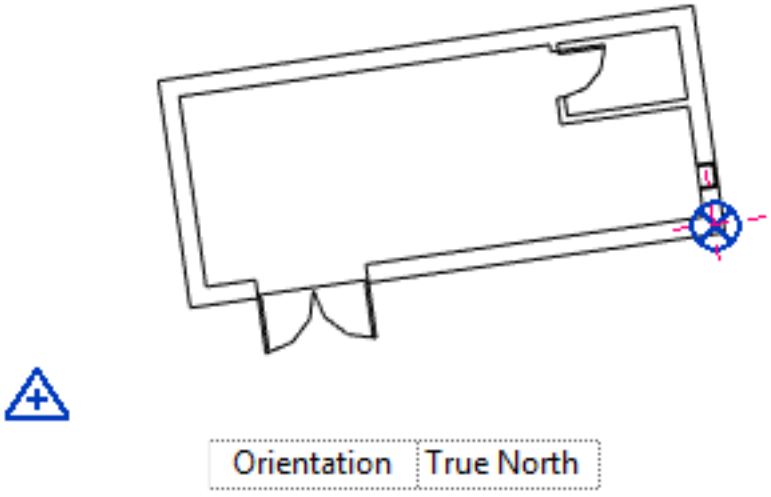
In this case, you should pick the first option: you want to publish the coordinates from the **Site** model to the **Architecture** model. Basically, this will move the survey point in the house model to be in the same position as the site model. The operation will only be complete once you close the site model: you will be asked what to do with the linked house model position. Select the first option.



It's a good idea to verify if the publish coordinates tool worked as intended. Open the architecture Revit model. Normally, the Survey Point has been moved to reflect the position in the site model.

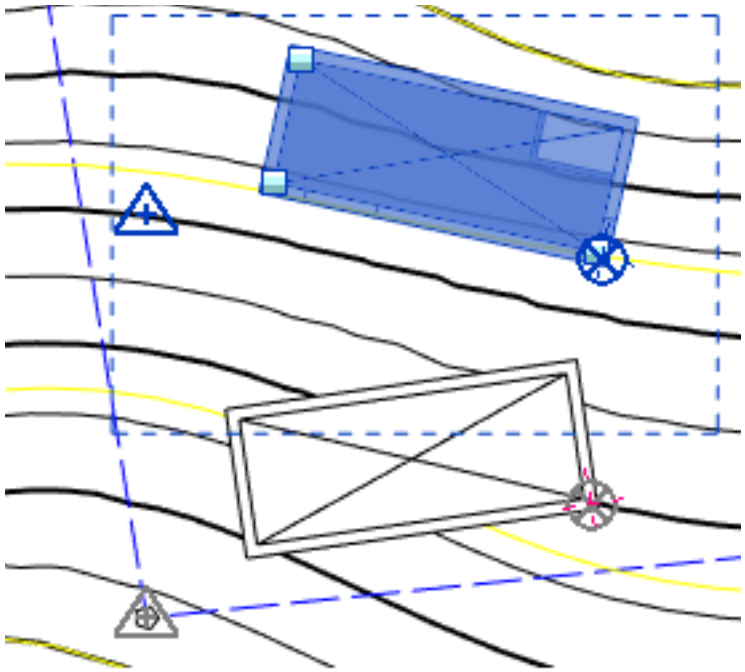


Try to set the view orientation to **True North**. It should match the north you've set with the rotation tool in the site model.



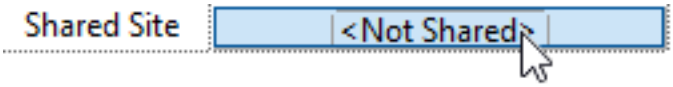
10- OPTIONAL: CREATE MULTIPLE INSTANCES OF THE SAME ARCHITECTURE MODEL

You can have multiple instances of the building on the same site. In the Revit site model, copy and paste the building instance. Adjust the position, both in plan view and in elevation.

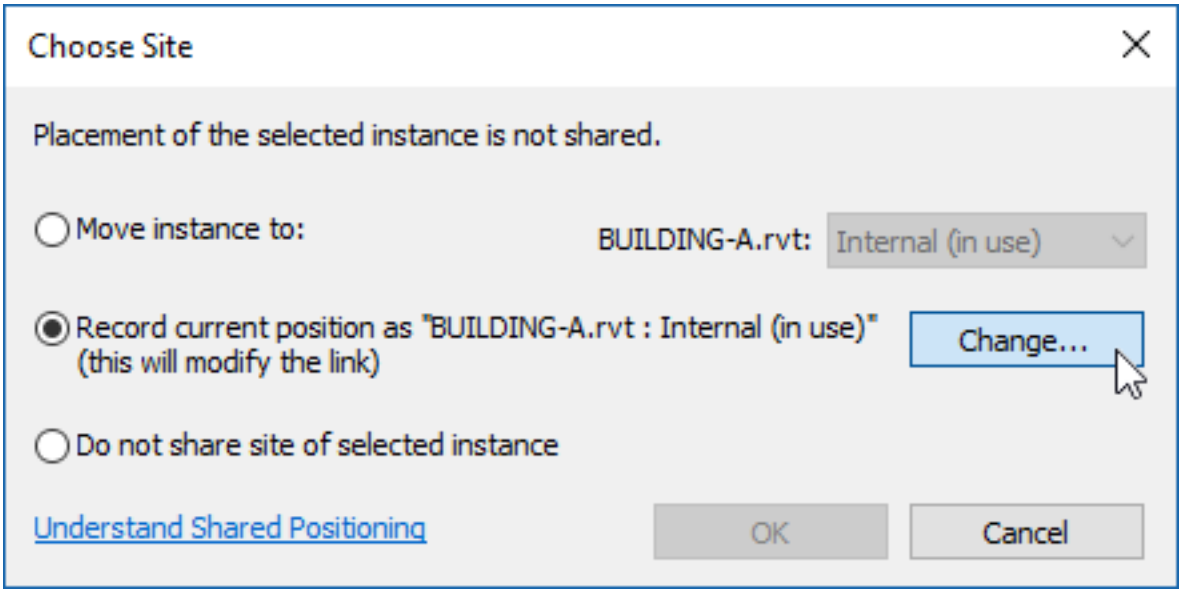


COPY AND PASTE BUILDING INSTANCE

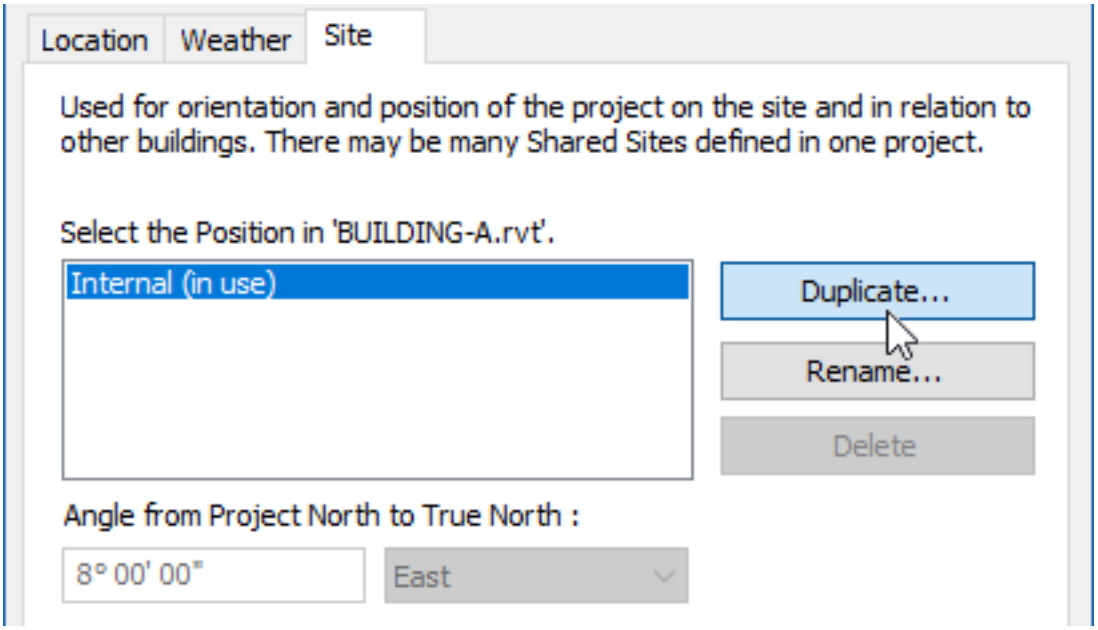
Now, you have to create a new **Shared Site**. Click on the Shared Site button in the instance properties of the linked model.



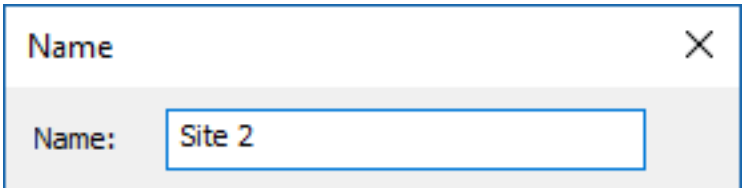
Use the *Record current position...* option and click on *Change...*



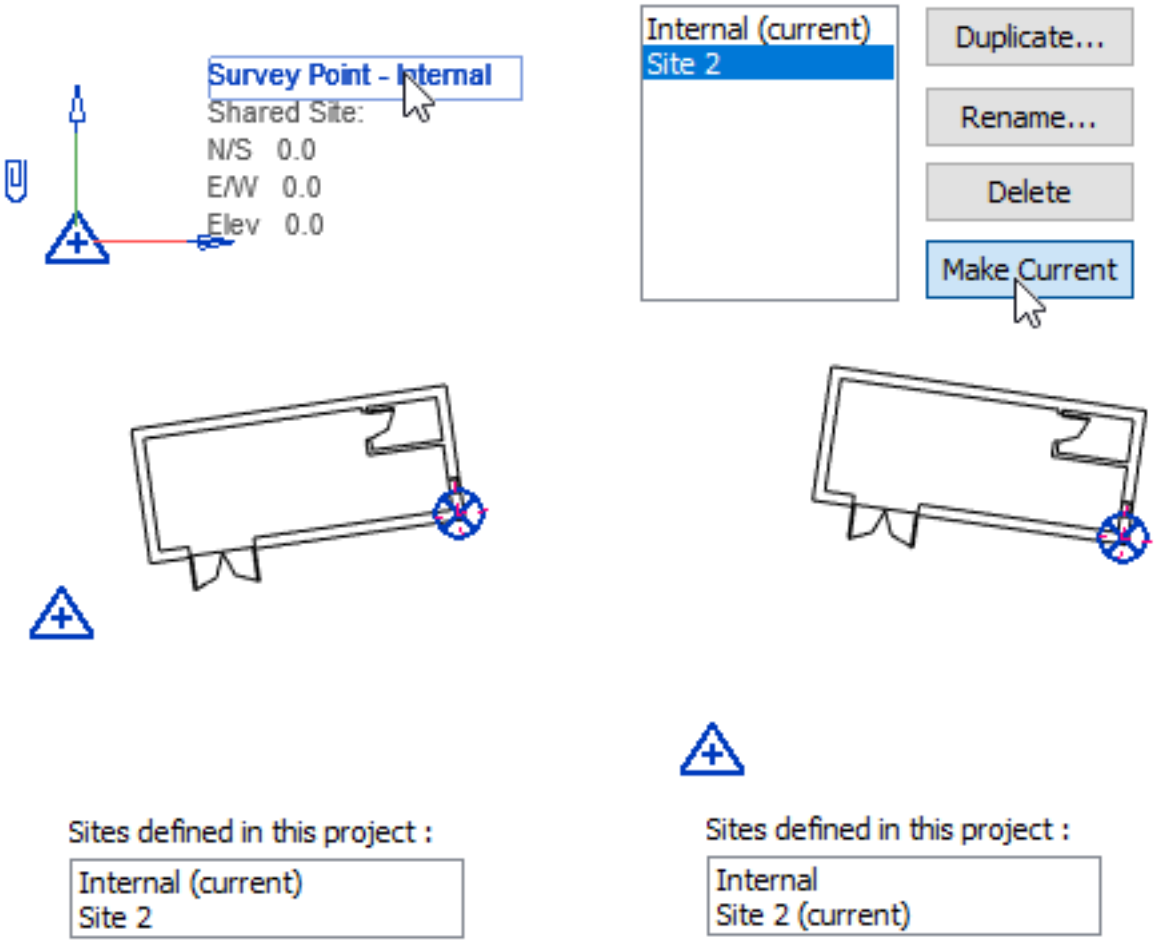
You now have access to the Site menu of the linked architecture model. Click on **Duplicate**.



Enter a name for the new Shared Site. Click on OK.



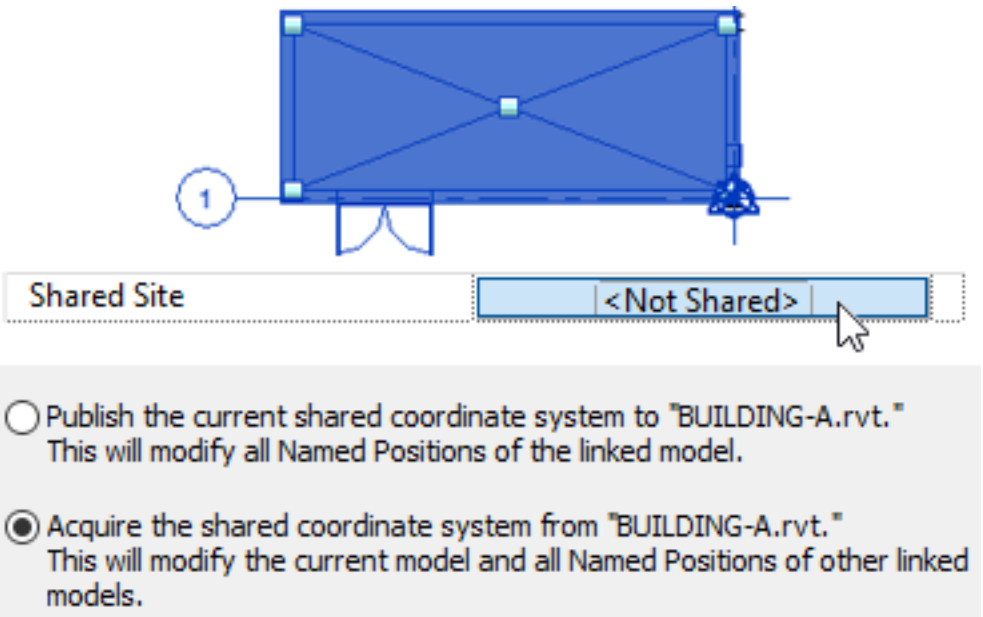
To verify everything is correct, open the architecture file. Select the **Survey Point** and click on the blue text **Survey Point - Internal**. There will be a list of multiple sites. Select "Site 2" and click on Make Current. The position of the Survey Point and the True North angle will be updated to reflect the position you have set in the Site Model.



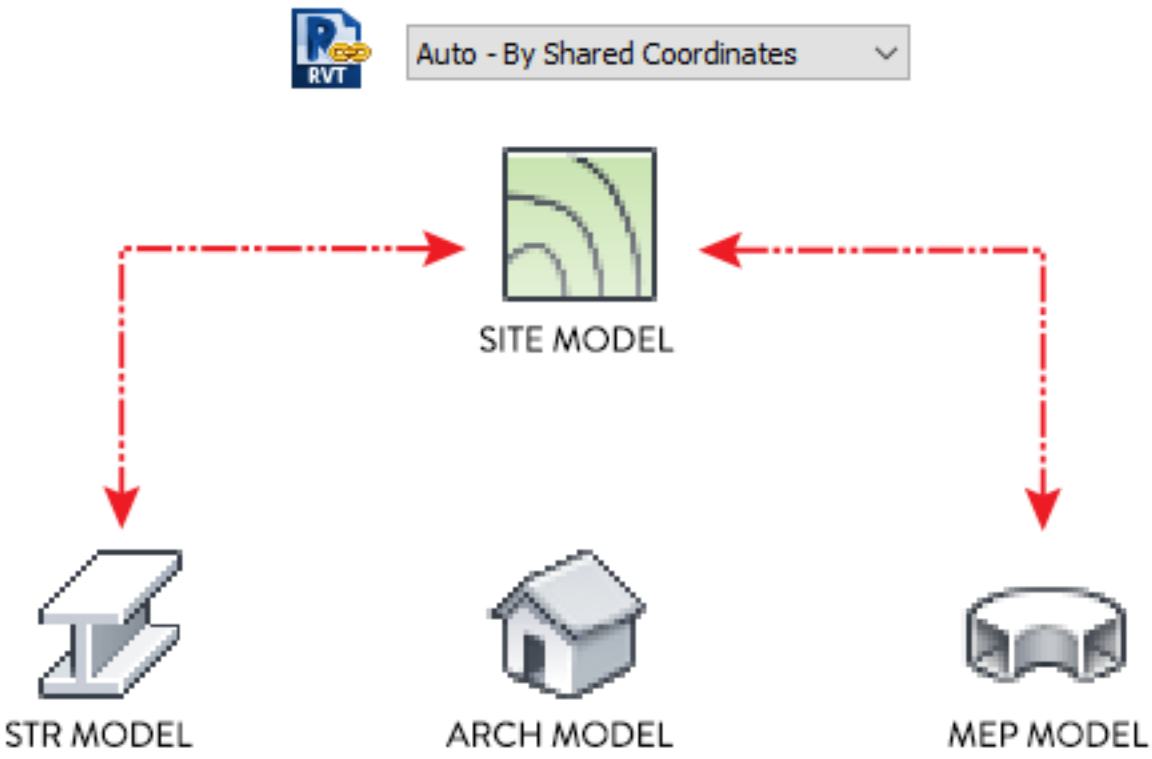
11- STRUCTURE AND MEP MODELS ACQUIRE COORDINATES FROM ARCHITECTURE

Now, let's acquire the coordinates from the Architecture model to the Structure and MEP models.

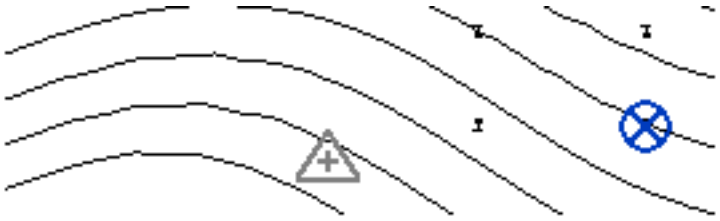
In the example below, you are inside the structural model. The Architecture model is already linked inside (using Origin to Origin positioning option). Select the Architecture model and click on the Shared Site parameter in the instance properties. This time, you have to use the **Acquire** option instead of Publish. You want to acquire the shared coordinates system of the Building-A architecture file.



12-LINK SITE MODEL INTO STRUCTURE AND MEP MODELS USING "BY SHARED COORDINATES" OPTION

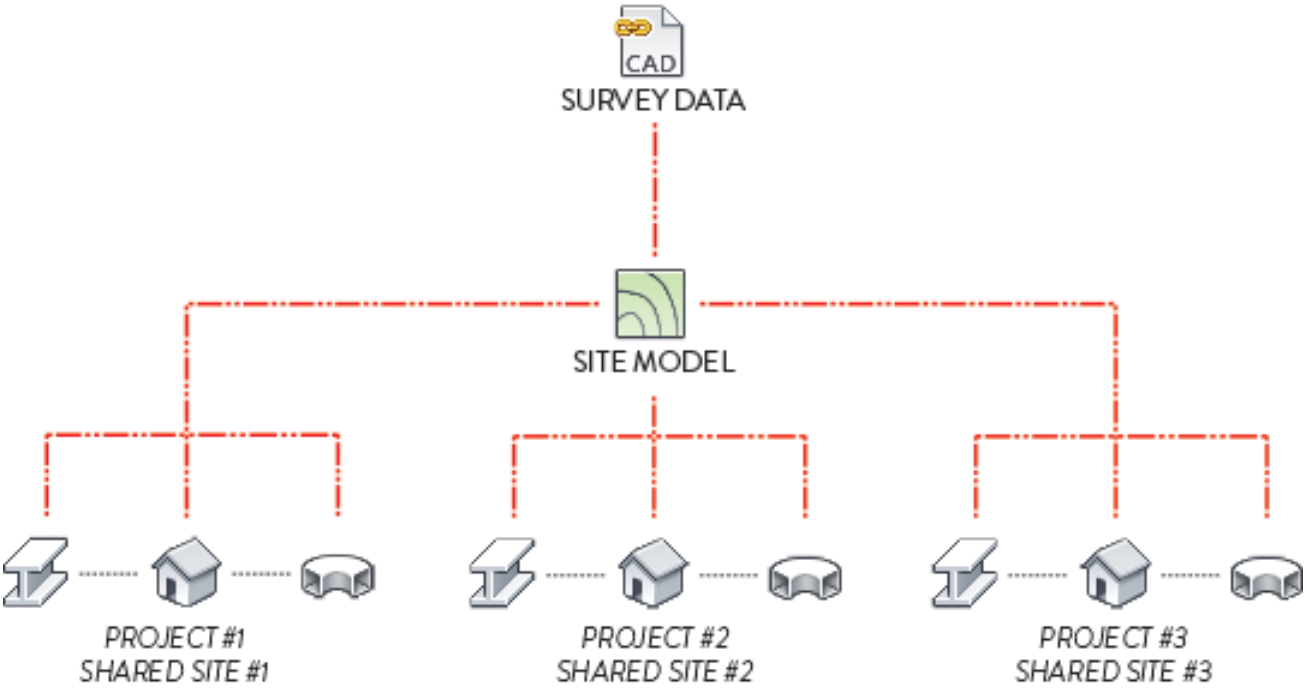


Congratulations, all the Revit models are now using the same Shared Coordinate system! That means you can link any of these files together using the **Auto - By Shared Coordinates** positioning option. In the image below, you can see our Structural model with the linked site model.



SITE MODEL LINKED INSIDE STRUCTURAL MODEL

SITES WITH MULTIPLE BUILDINGS



Sometimes, you might have a site that contains multiple buildings. The workflow remains similar:

1- Create the architecture project.
2- Create a site model, set shared site origin and model toposurface.
3- Link the architecture model inside the site model.
4- Manually position the building inside the site.
5- Publish the coordinates from the site to the architecture model.
6- Spread the coordinates from the architecture file to the other disciplines. Link all files together using **Auto - By Shared Coordinates**.

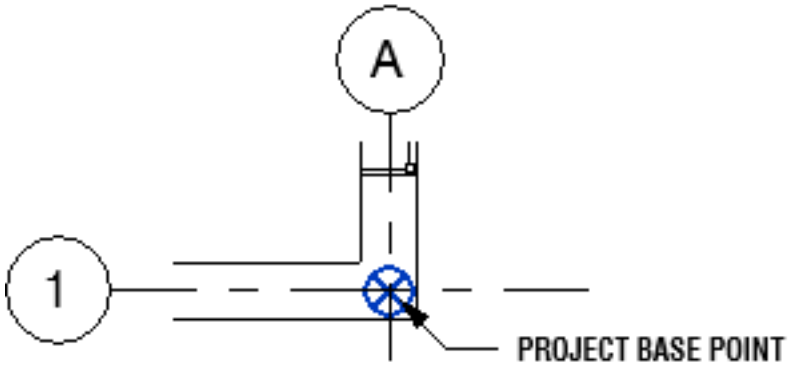
Repeat these steps for all buildings. Each building has a unique shared site.

BIM EXECUTION PLAN

When writing a BIM execution plan, you should list all the important coordinate points and include a screen shot. Make sure to list the internal origin, the project base point and the survey point of the linked site model (if applicable). Make sure to also indicate the elevation values. It should look like this:

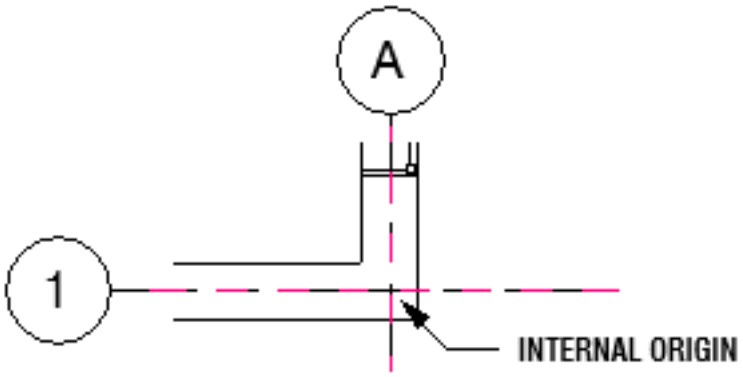
PROJECT BASE POINT:

The project base point of the architecture model is located at the intersection of grids A and 1.



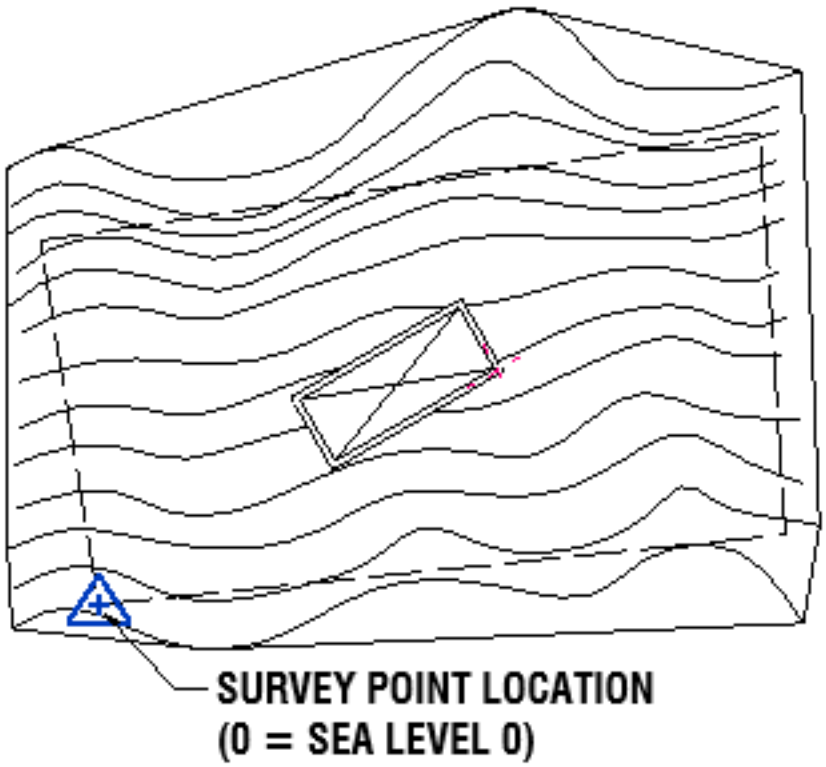
INTERNAL ORIGIN:

The internal origin is also located at the intersection of grids A and 1, intersecting in height with level 1.



SURVEY POINT:

The survey point of the linked Revit site model is located at the south-west property line intersection. The elevation at height 0 refers to the sea level.



After setting up these coordinate points, they should be pinned and never moved again.

THANKS FOR READING!

As always, send your thoughts at nick@revitpure.com. I read and answer all emails. Let me know if you loved or hated this pamphlet.

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