REVIT PURE PRESENTS

PAMPHLETS

ISSUE #9 / SUMMER 2018

COORDINATES

revitpure.com

PAMPHLETS

ISSUE #9 / SUMMER 2018 / COORDINATES

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.

Here are all pamphlets published so far:

Pamphlet #1 - Summer 2016 - **Worksets**
Pamphlet #2 - Fall 2016 - **Schedules**
Pamphlet #3 - Winter 2017 - **Phases**
Pamphlet #4 - Spring 2017 - **CAD**
Pamphlet #5 - Summer 2017 - **Filters**
Pamphlet #6 - Fall 2017 - **Virtual Reality**
Pamphlet #7 - Winter 2018 - **3D Views**
Pamphlet #8 - Spring 2018 - **Plan Notes**
Pamphlet #9 - Summer 2018 - **Coordinates**

Go to revitpure.com to subscribe and receive all pamphlets.

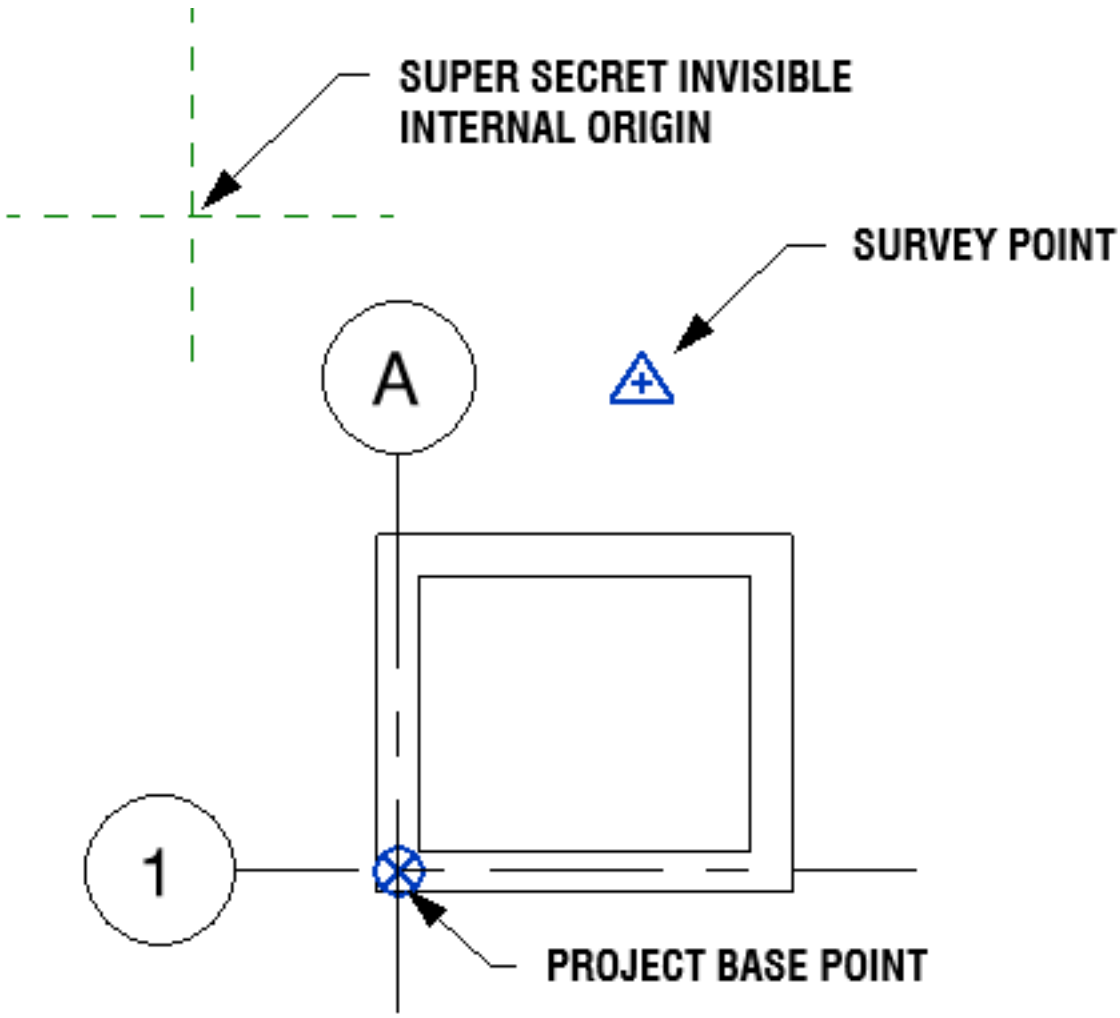
WHY COORDINATES?

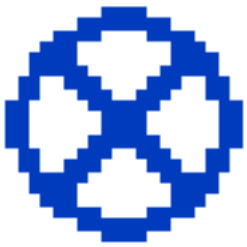
The coordinate system inside of Revit is weird and complicated. Even with 7 years of Revit experience, I had to spent dozen of hours of research and experiments to properly understand how it all works and write this guide. But friend, I've got you covered. You will learn how to place the origins, how to export files at the right coordinates, how to place the north and how to create a shared site. Good luck.

16 TIPS TO UNDERSTAND COORDINATES

1- UNDERSTAND THE DIFFERENCE BETWEEN ALL 3 COORDINATE ORIGIN POINTS

There is 3 different origin points in a Revit project: the Project Base Point, the Survey Point and the secret Internal Origin.





PROJECT BASE POINT: This point is used almost exclusively for internal purpose. It is used to place dimensions relatively 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 the True North and the Project North.

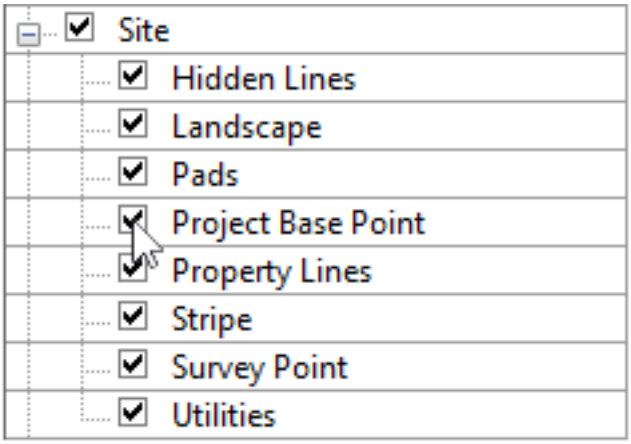
SURVEY POINT: This is used to create a "shared coordinates" system among multiple linked Revit or CAD files. That means it's location is most useful when exporting and importing files. It is usually placed relatively to a real world site element such as the intersection of 2 property lines or a geodetic 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 relatively to this super secret point, therefore confusing many people.

2- LOCATE THE INTERNAL ORIGIN

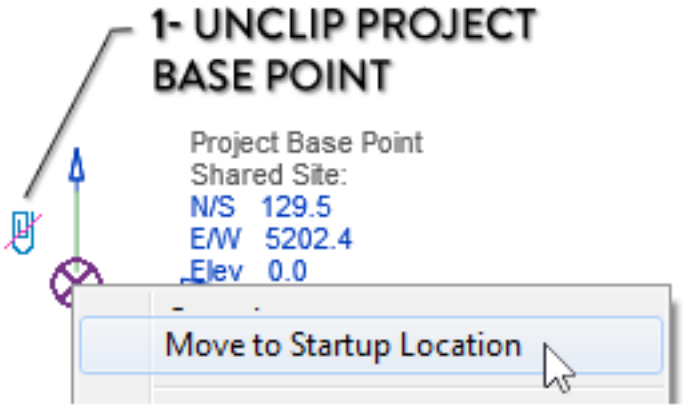
Now that you are aware of this super secret internal origin, you should locate it in a plan view using reference planes. Actually, you should locate it in your Revit Template so you will be able to track it's location for all new projects.

To locate the point, go to your site plan and make sure the Project Base Point is set to visible in the Visibility/Graphics settings.



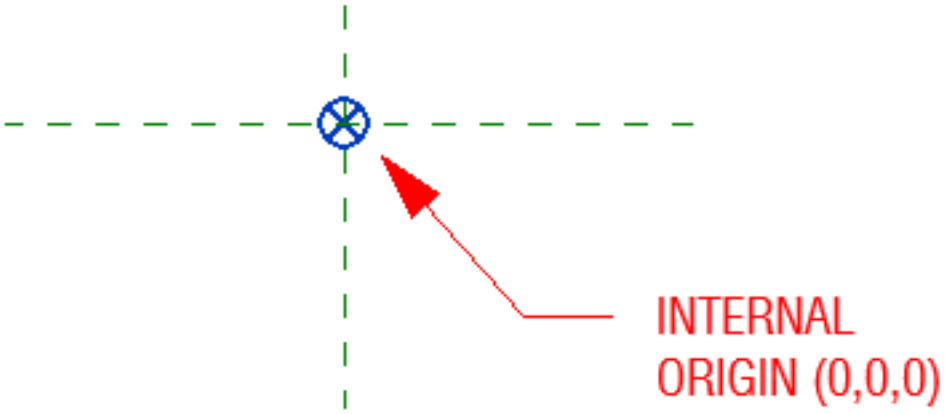
ACTIVATE PROJECT BASE POINT IN VISIBILITY GRAPHICS

The next step is to select the project base point and click on the clip icon. A red dash should appear on the icon. The next step is to right-click on the project base point and select "Move to Startup Location"

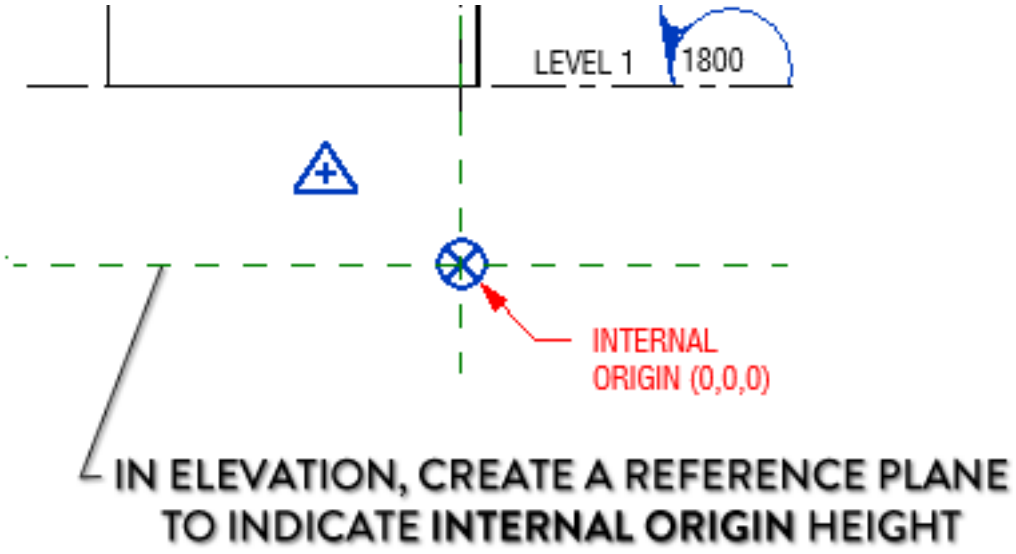


2- OPEN RIGHT-CLICK MENU, USE "MOVE TO STARTUP LOCATION"

The project base point should now be located at the exact same spot as the **Internal Origin**. Mark this spot in the project by creating two reference planes that intersect at the point. You should also add a text note to indicate the location to other users. Make sure to pin the reference planes as well as the project base point.

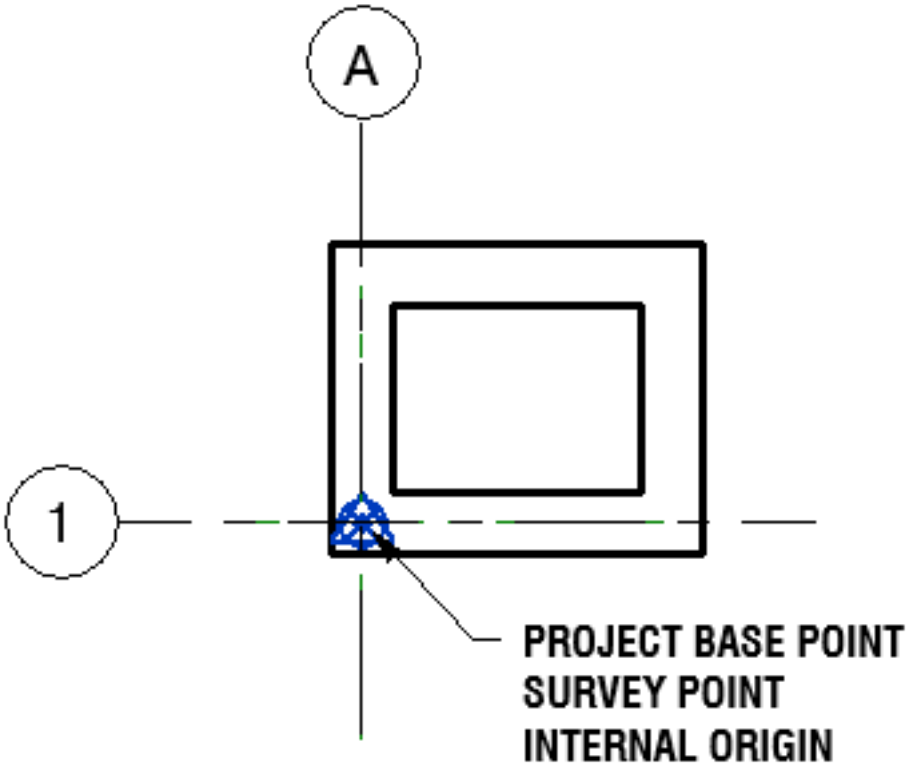


The 3 origin points not only have X/Y coordinates, but also a Z-axis elevation. Therefore, you should open an elevation view and unhide the Project Base Point and Survey Point. Create a third reference plane to indicate the height location of the **Internal Origin**.



3- BY DEFAULT, SET THE 3 ORIGINS AT THE SAME SPOT

In most project, the **Project Base Point**, the **Survey Point** and the I**nternal Origin** can all remain in the same spot without any problem. In your template, make sure they all fit together in a corner of your building, at the intersection of grids A and 1. Make sure to pin all these points, reference planes and grids.



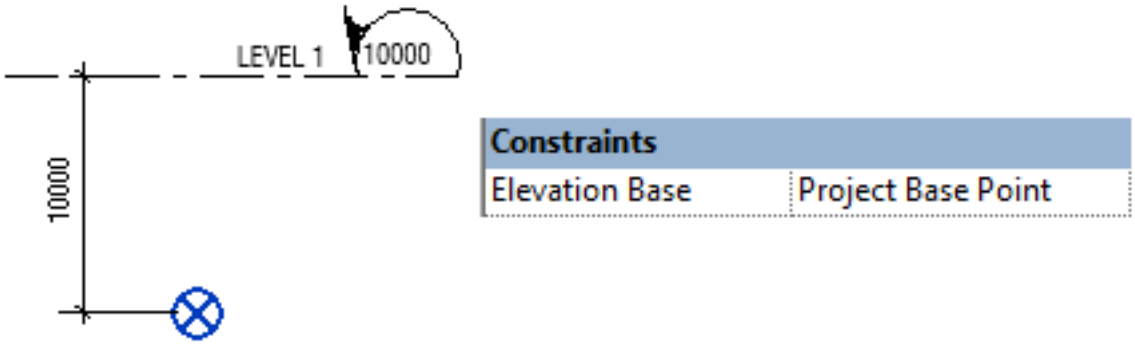
While the default stance is to keep these points together, the next tips will teach you in which case they should be moved.

4- TOPOSURFACE IS RELATIVE TO INTERNAL ORIGIN

The 3 origins points each can have a different elevation value. When creating a toposurface, you have to set values referring to **Absolute Elevation**. This value is relative to the **Internal Origin**.

5- SET LEVELS RELATIVE TO PROJECT BASE POINT

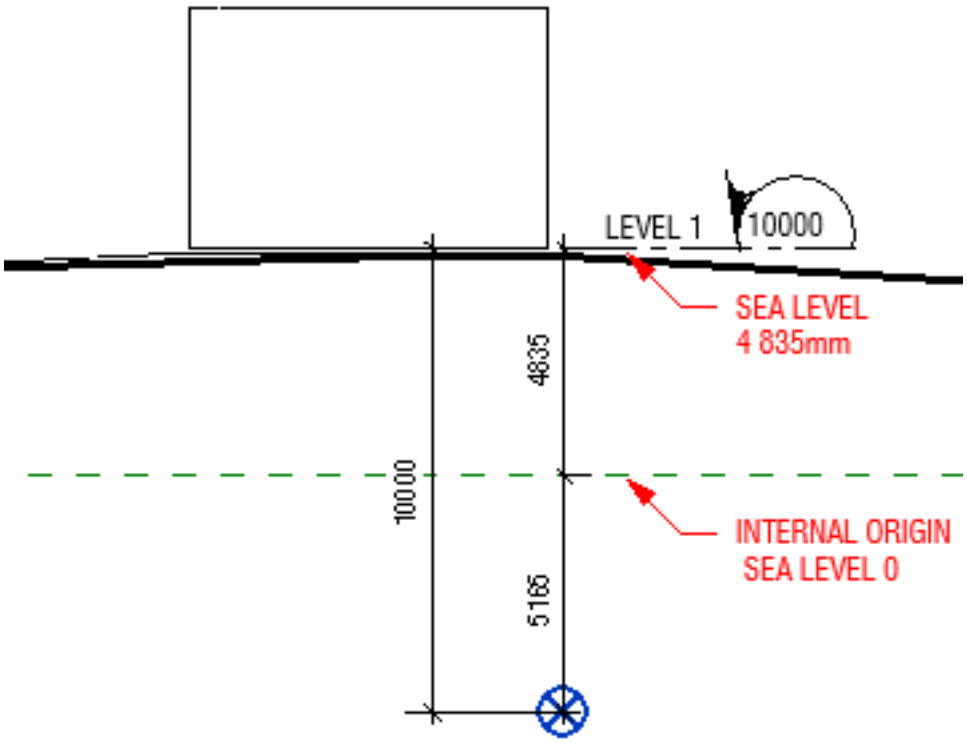
In most projects, it is a smart move to set the project first level at 100'-0" or 10 000mm. This is an arbitrary value that has no relation to the sea level. The best practice is to set this value in relation to the Project Base Point. Select a level, click on Edit Type and make sure that the Elevation Base is set to Project Base Point.



6- USE THE INTERNAL ORIGIN AS SEA LEVEL = 0

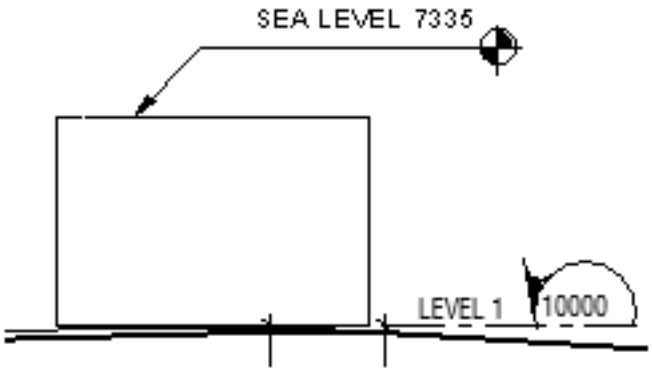
In a project where you want to spot elements in relation to the sea level, you should use the Internal Origin to represent sea level 0.

In this example, the 10 000mm project level fits the 4 835mm sea level. That means we have to move the Project Base Point so it is 5 165mm below the Internal Origin base elevation.



If you want to spot any element in your project in relation to the sea level, create a new Spot Elevation tag that use **Relative** as the **Elevation Origin**.

Elevation Indicator	SEA LEVEL
Elevation Origin	Relative



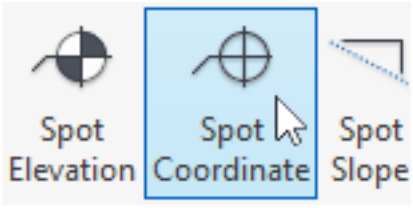
CREATE "RELATIVE" SPOT ELEVATION TO INDICATE SEA LEVEL ELEVATION

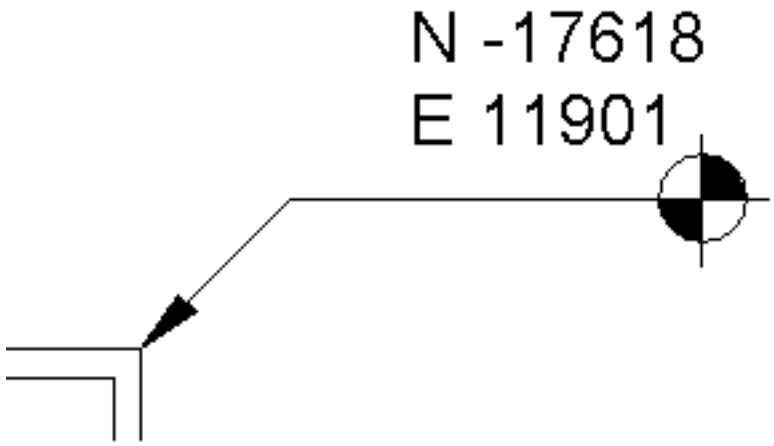
Placing the Project Base Point relatively to the Internal Origin should be your first move when starting a project. Else, you won't be able to model the site using the sea level elevation values.

In a project where the site and project are already modeled without using the sea elevation, the solution is to use the Survey Point as the sea level origin.

7- CREATE A SPOT COORDINATE FOR EACH ORIGIN

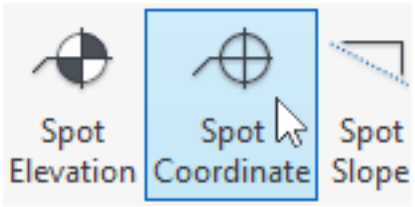
The Spot Coordinate tool is used to specify coordinate relatively to one of the 3 origin. You can find this tool in the **Annotate** tab.

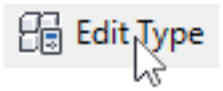




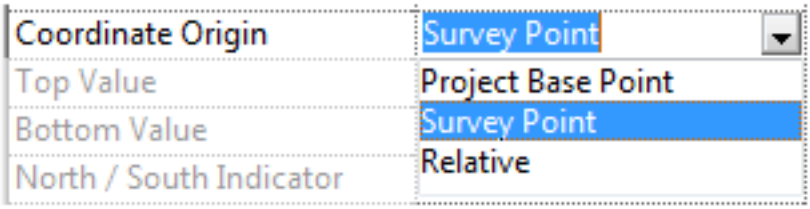
USING THE SPOT COORDINATE TOOL

In your template, it is a smart move to create a Spot Coordinate for each of the 3 origin type. Edit the type of the spot coordinate and use the duplicate tool. Scroll down the settings options and will see the **Coordinate Origin** parameter. Create a different tag for all 3 origins (Survey, Project Base and Internal). Relative refers to the Internal Origin of the project.



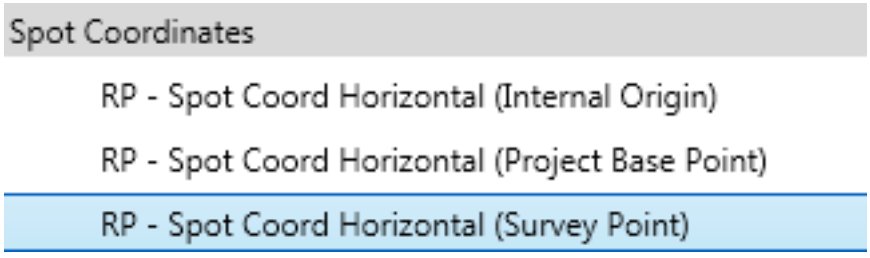


CREATE A NEW SPOT COORDINATE AND CLICK EDIT TYPE

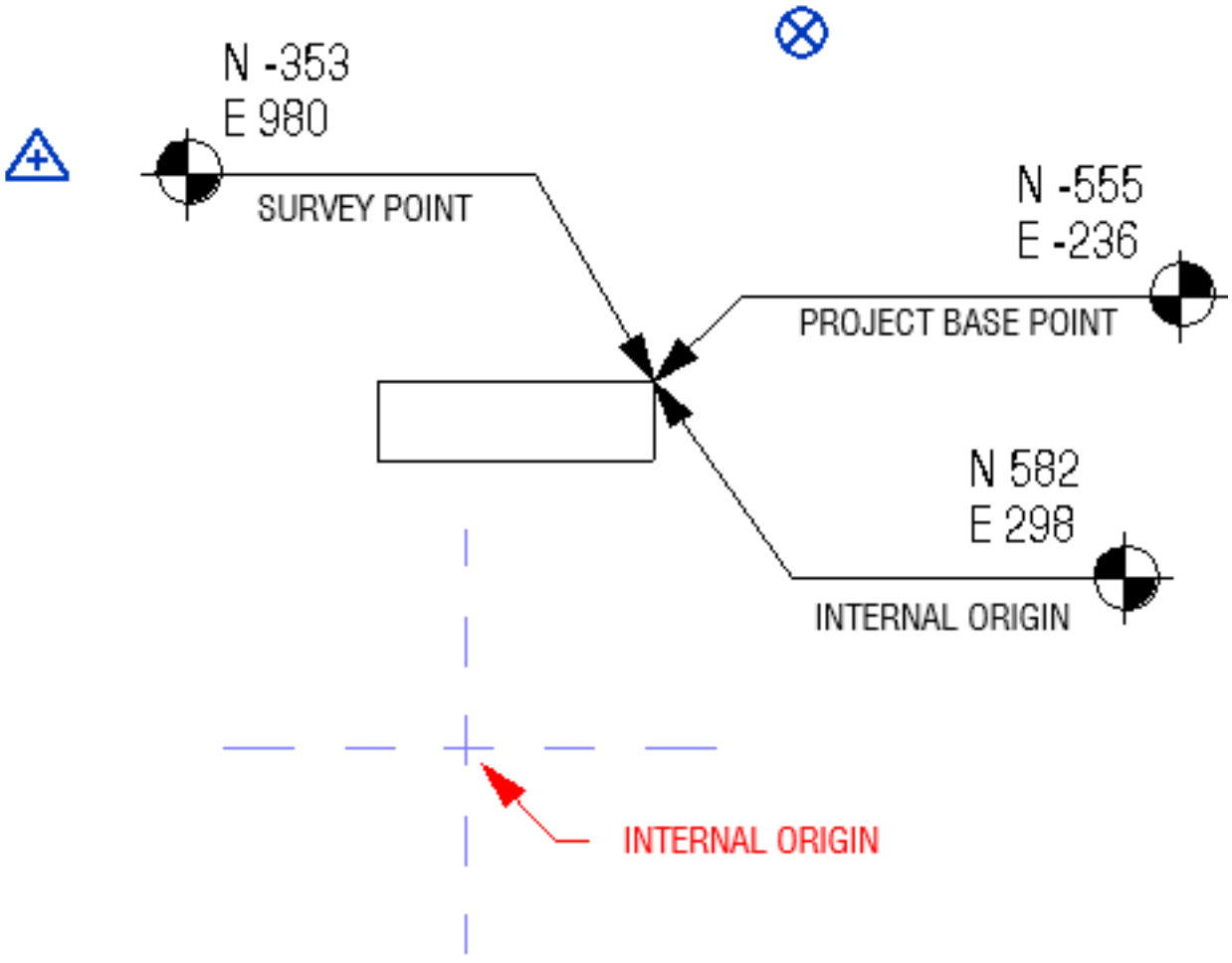


CREATE A TAG FOR EACH COORDINATE ORIGIN

Once you are done, you should have 3 different Spot Coordinate types like in this image.



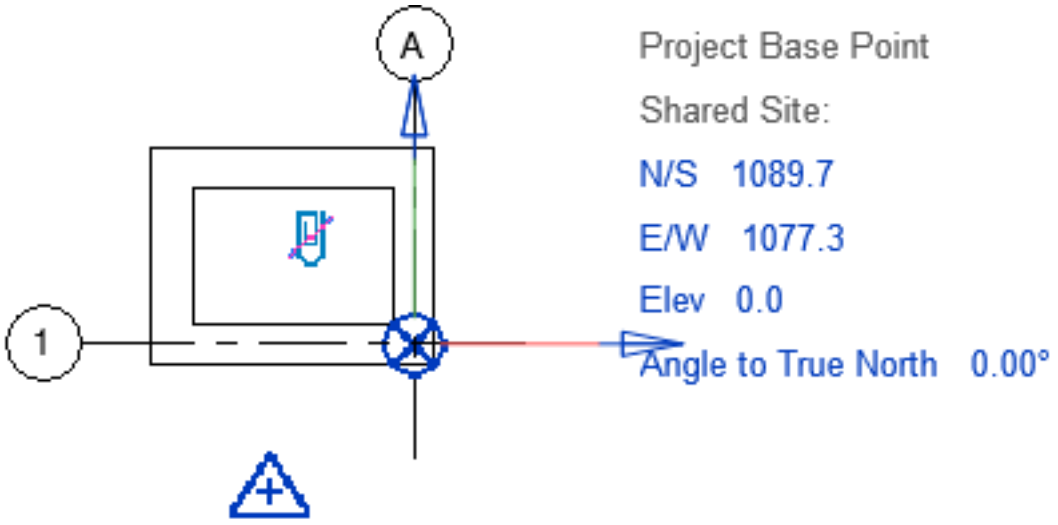
As you can see in the image below, each spot coordinate are used to spot the same element. However, they indicate different data since they each refer to a different origin. These tags can be useful when you are confused about the location of the origin or of a specific element.



8- UNCLIP PROJECT BASE POINT BEFORE MOVING IT

If you want your project base point to be in a different spot than the internal origin, you can move it. However, if you try to move it, everything in the project will also move except the survey point.

To avoid this issue, unclip the project base point first. Move it to the proper emplacement, then clip it again. As you see, the coordinates will be changed: the N/S and E/W coordinates are always relative to the Survey Point.



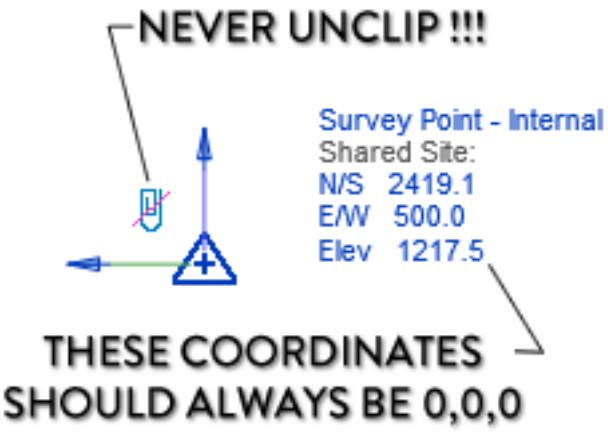
UNCLIP AND MOVE PROJECT BASE POINT

9- NEVER UNCLIP THE SURVEY POINT

While unclipping the project base point is the standard procedure before moving it, you should never unclip the Survey Point. If you unclip and move the Survey Point, you will cause a lot of pain, horror and confusion for people working in your model.

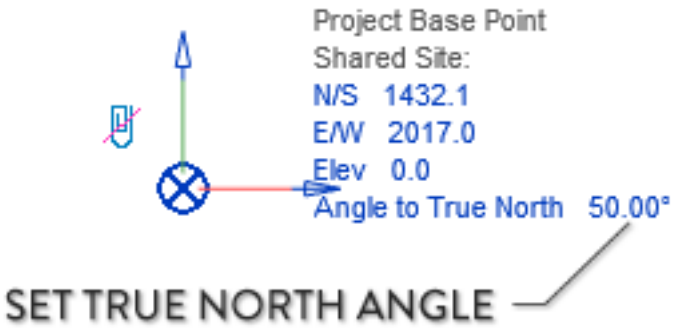
The only thing that moving an unclipped survey point will do is to move the icon representation of the survey point, not the survey point itself. There is absolutely no reason to ever make such a move.

If you click a survey point and you see something else than 0,0,0 coordinates, that means someone messed up and decided to move an unclipped survey point. Simply change the values back to 0,0,0.

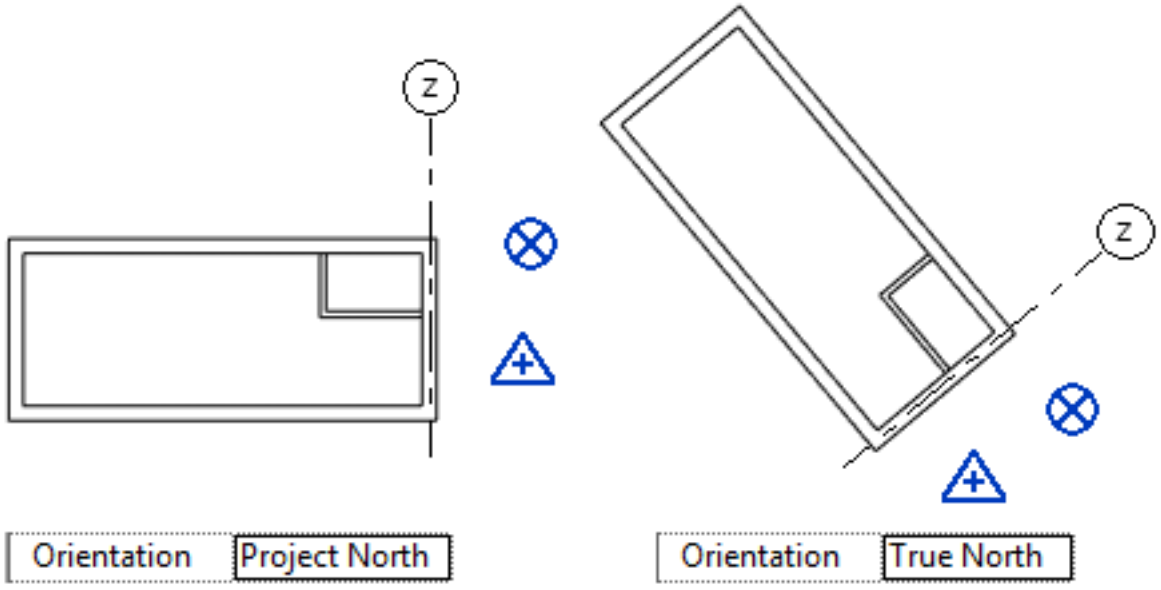


10- USE PROJECT BASE POINT TO SET THE TRUE NORTH

Each project contains a **Project North** and a **True North**. The Project North is a virtual orientation used to model your project so it is orthogonal to your screen. The True North is a real-world north used to properly locate the orientation of your building. To set a True North value, select the Project Base Point and enter the angle.



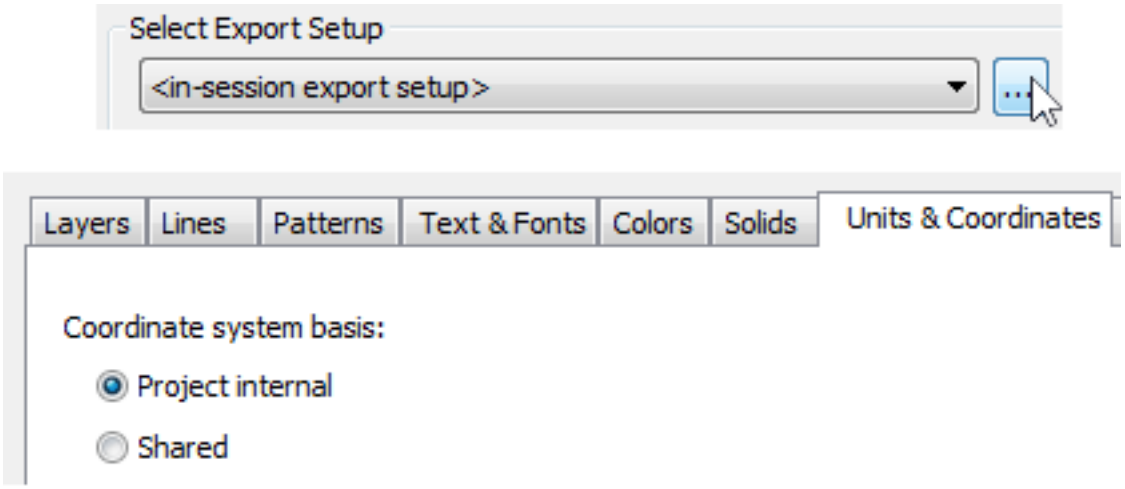
In the view properties of each view, you can specify the orientation you want to use. In almost all cases, Project North will be used.



Revit weirdness alert: although the True North value is set in the Project Base Point, the value is actually embedded in the Survey Point. Even weirder :you can have multiple Survey Points in a project. That means you can have many multiple True North value in a single project... Yes, that's weird. See tip #15 to learn how to create multiple survey points.

11- SET THE CAD EXPORT COORDINATES SETTINGS

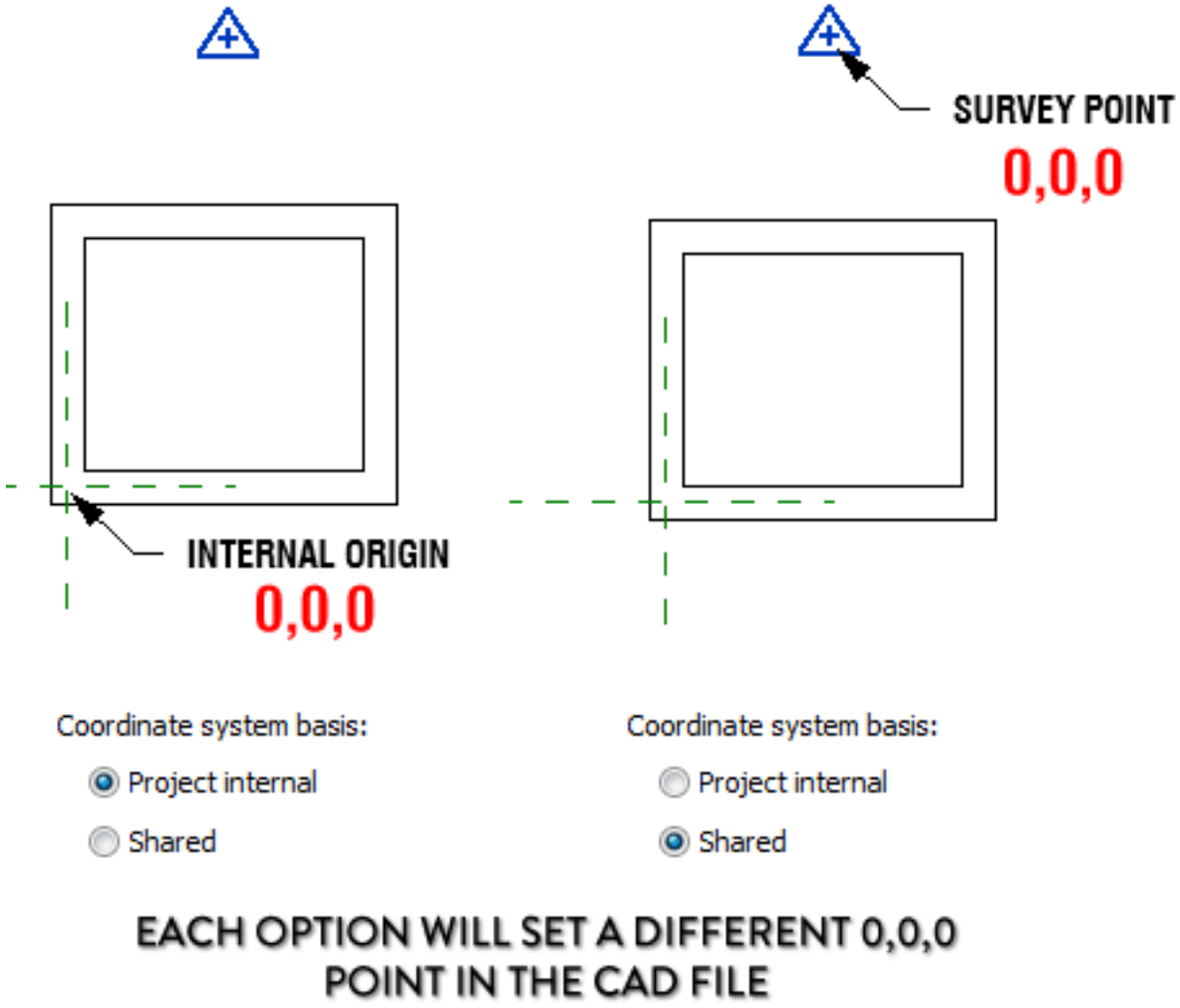
Most users are confused about the project origin when exporting to CAD. The reason is that the Internal Origin is used by default. You can access the exportation options by going to File/Export/CAD Format and by clicking the 3 small dots next to the Select Export Setup menu. Go to the Units & Coordinates tab.



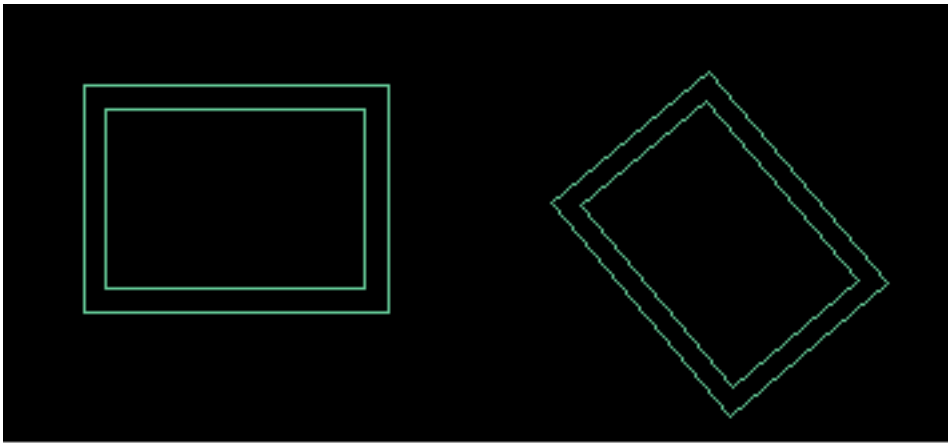
ACCESS COORDINATES OPTIONS IN THE EXPORT SETTINGS

If you export a Revit view to DWG, the default setting is **Project internal.** That setting will use the **Internal Origin** as the 0,0,0 point location in AutoCAD.

The other option is called **Shared**. This will use the **Survey Point** as the 0,0,0 point in AutoCAD.

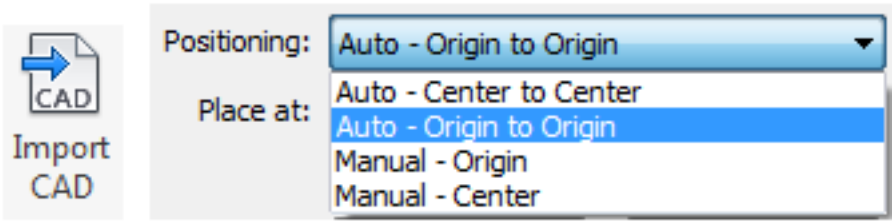


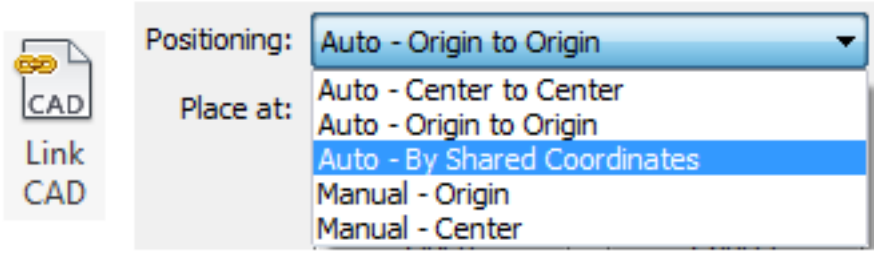
Watch out: If you are using the Shared setting and you entered an angle value for the True North, the project will be appear rotated once opened in AutoCAD. To avoid this issue, export the sheet where the view is placed instead of exporting the view. The shared site coordinates won't be used when exporting a sheet.



12- USE LINK CAD TO SET THE SURVEY POINT AS THE ORIGIN

The Link CAD tool has more positioning options available than Import CAD. If you want to use the Survey Point as the origin for the CAD file, you have to use **Link CAD** and select **By Shared Coordinates**. Else, the **Origin to Origin** option will match the Revit file Internal Origin to the DWG 0,0,0 point.

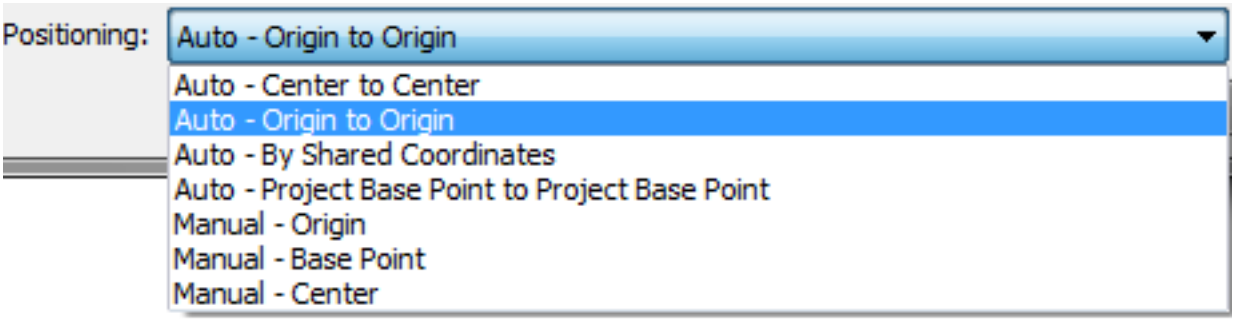




USE "LINK CAD" TO PLACE A CAD FILE ORIGIN TO THE SURVEY POINT

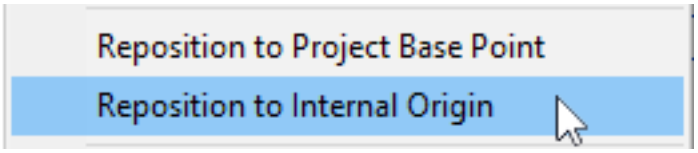
13- USE "ORIGIN TO ORIGIN" WHEN LINKING REVIT FILE

Revit offers a fancy "Shared Site" and "Shared Coordinates" system to link Revit files... but the truth is that you don't need to use these feature in 90% of projects. The **Origin to Origin** tool works perfectly fine. This option will match the models Internal Origins.



POSITIONING OPTIONS FOR LINKED REVIT FILES

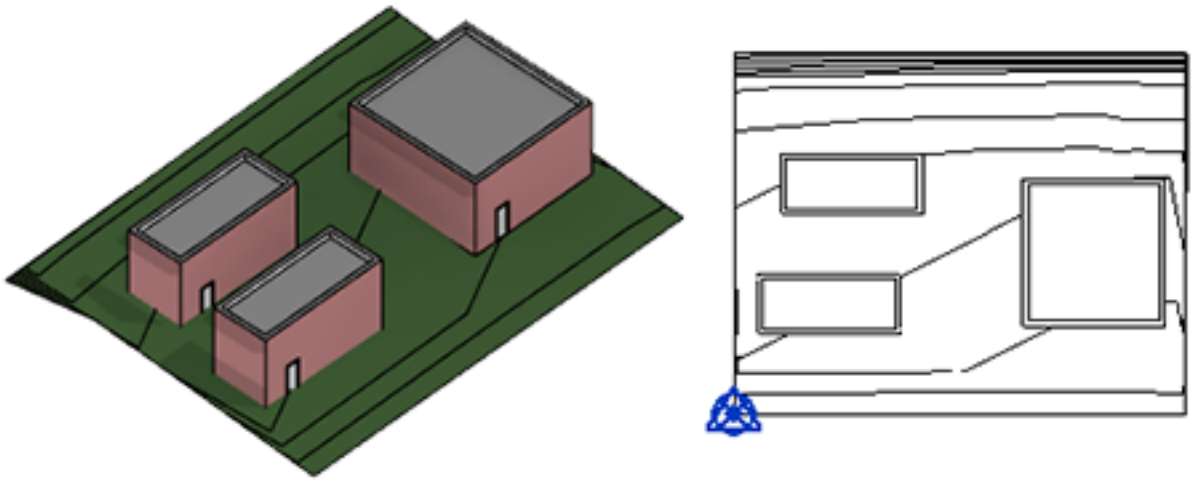
When linking a model, it is a wise move to PIN it immediately. If it moves around by mistake, right-click the model and use the "**Reposition to Internal Origin**" tool.



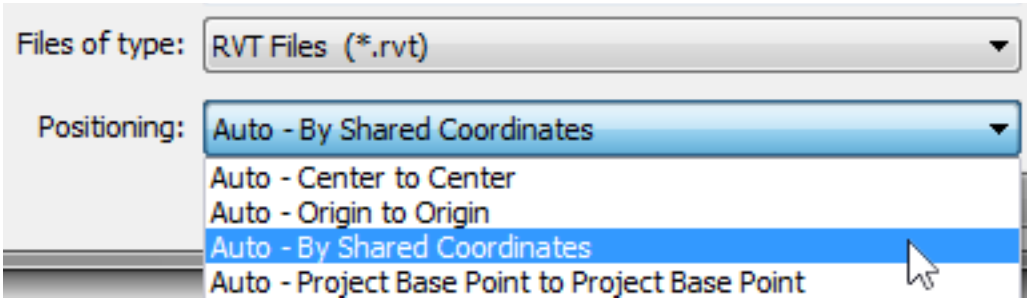
There is a few cases where you might want to use the Shared Coordinates system when linking Revit models. The next tips should help you.

14- WHAT THE HELL IS A SHARED SITE????

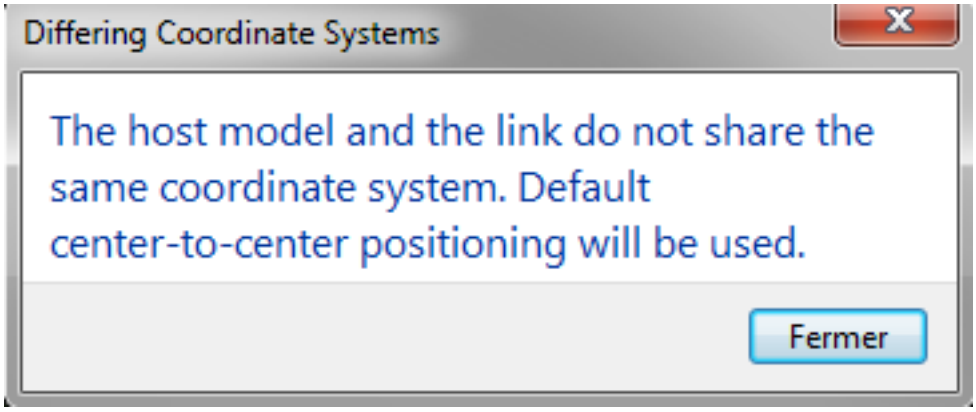
A shared site basically means a **Survey Point** that is shared among multiple models. Why would you use this "shared site" feature? In a case where you want the survey points and the coordinates to be the same on multiple models. In the example below, we have 4 Revit models: a site model, a big house model as well as 2 instances of a smaller house model.



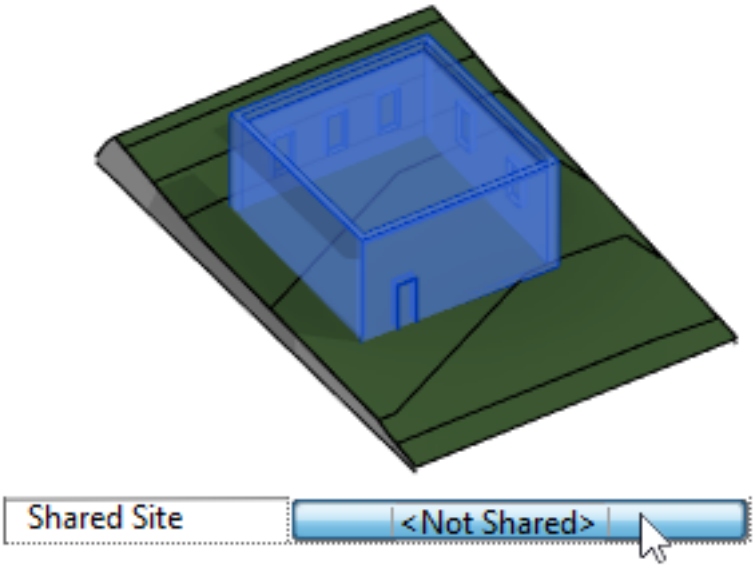
In this case, we want all the houses model to acquire the coordinates from the site model. First, link one of these model inside the site model. You can pick the **Shared Coordinates** option if you want, but since the models are not coordinated yet, you will receive a warning and the center to center option will be used anyway.



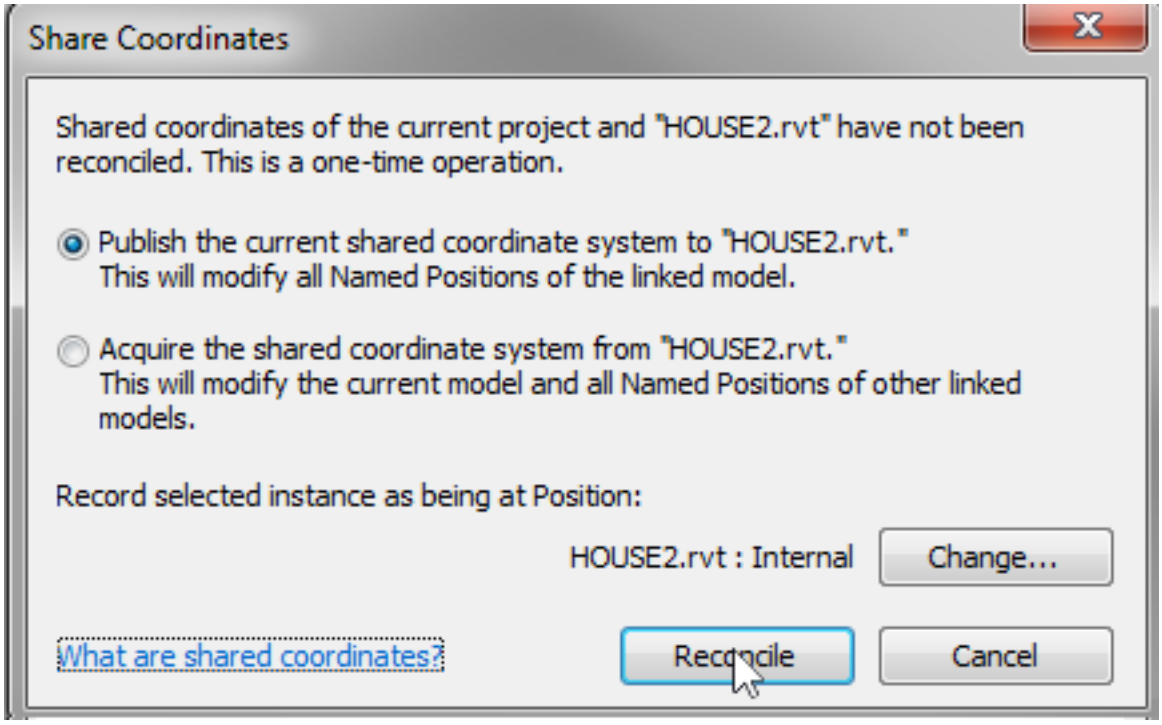
Below is the warning you receive by default. This Shared Coordinates positioning option is basically useless, you can assign the shared site with any other positioning option later on anyway.



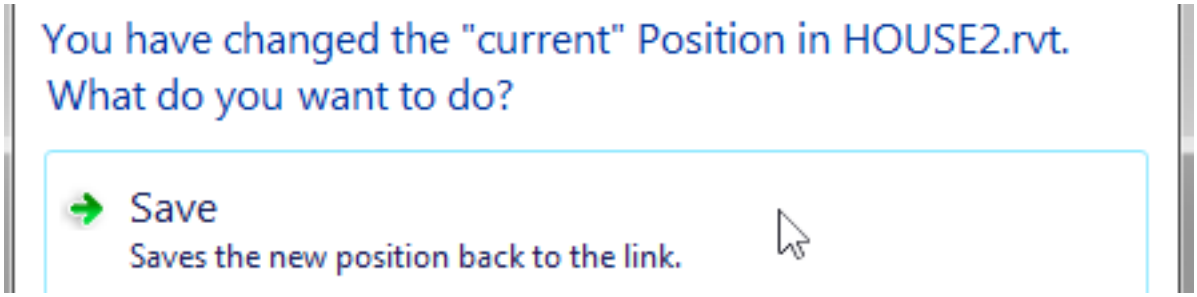
Find the proper position you want for your linked model inside the site model. Pin your model. Once it is done, select the linked model and click “Shared Site” in the properties.



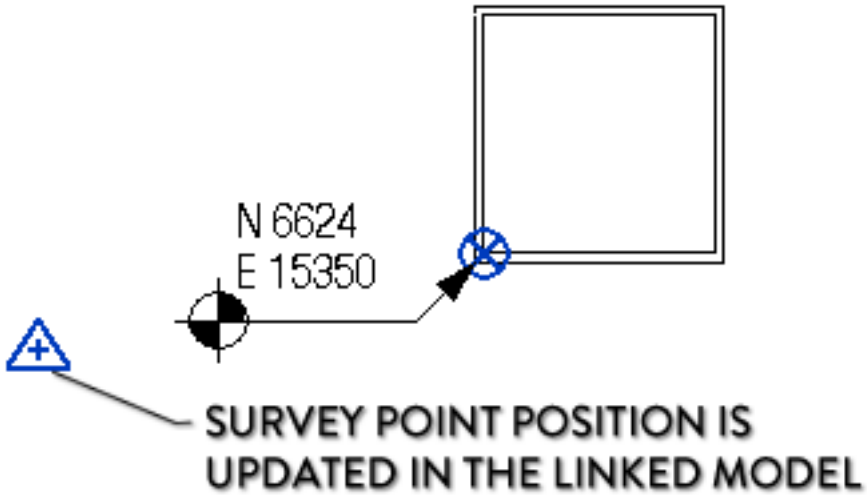
When clicking Shared Site, here are all the options available to you:



In this case, you should pick the first option: you want to publish the coordinates from the **Site** model to the **House** 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, which will update the survey point in the model.

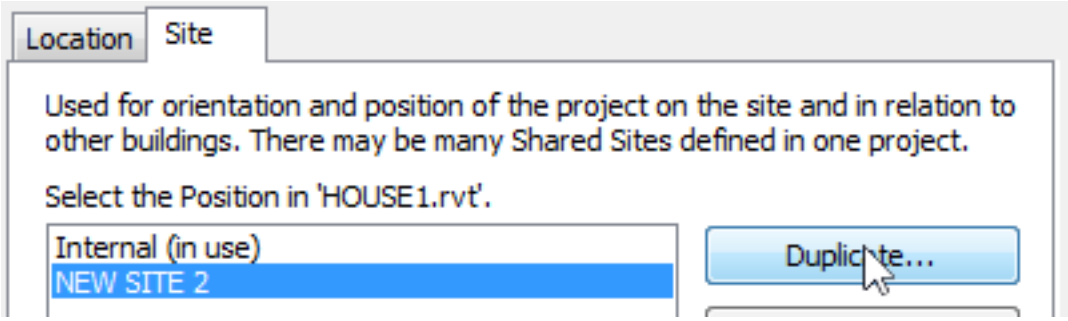


Try opening the house model: the survey point position will be updated to fit the same position as in the site model. That means you can use the spot elevation and spot coordinates tool (with the survey point option) that will match the linked site model.

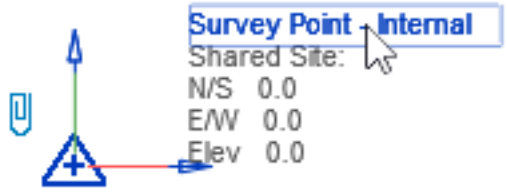


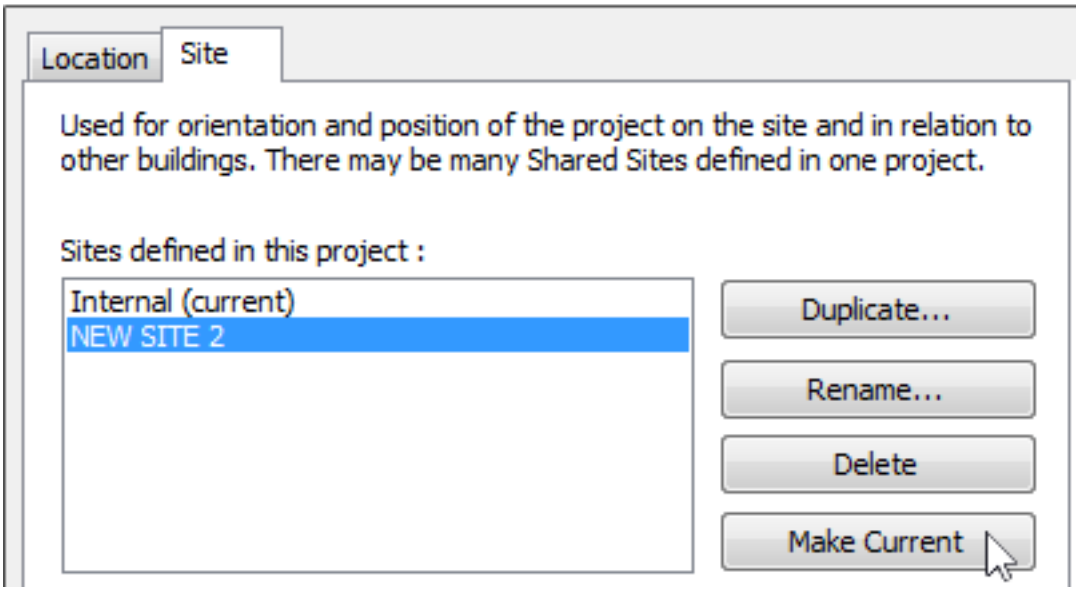
15- CREATE MULTIPLE SHARED SITES IN A MODEL

Let's say you are pre-fab house manufacturer and you plan to use a house model in many site models. Revit gives you the ability to use multiple Shared Sites within the same model. When publishing coordinates from the site plan to the house model, click duplicate to create a second site.

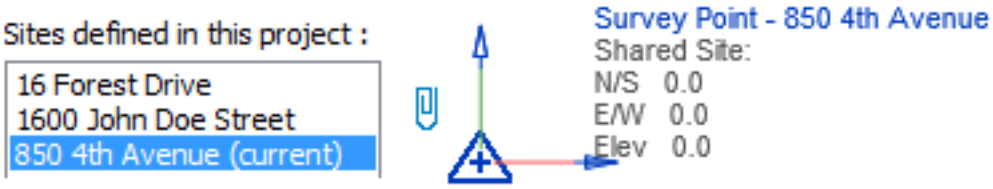


Save and close the site model, then open the pre-fab house file. Find the Survey Point and double click on the blue text "**Survey Point - Internal**". Select the site you currently wish to use and click "**Make Current**". The survey point location in the file will move to the correct coordinates.





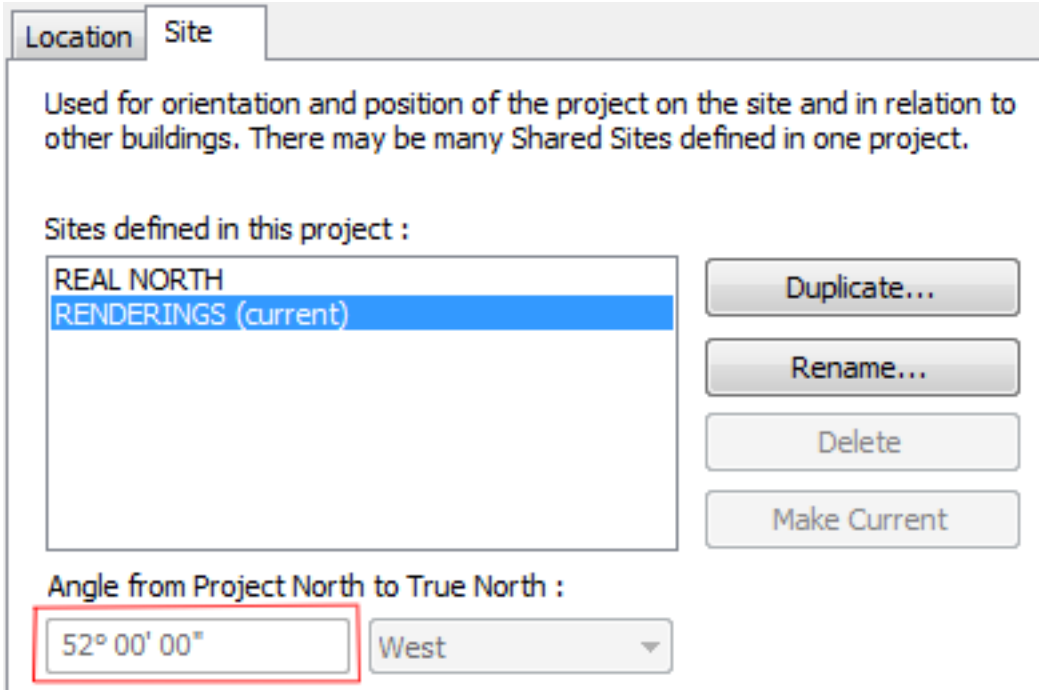
In the end, you could have a pre-fab house model with 200 associated sites that you can activate whenever you want. In the example below, we have multiple address. The survey point indicate the current active one.



16- CREATE A MODEL WITH MULTIPLE TRUE NORTHS

As mentioned in tip #10, the true north value is changed in the Project Base Point, but is actually embedded in the Survey Point. That means you can have many true norths for the same project. This can be useful if you want to create renderings using a certain north for lighting that is different from the real world north.

In this case, create a second site in your survey point menu. Change the true north value in the Project Base Point. As you can see below, each site has it's own angle from Project North to True North. When creating renderings, activate "RENDERINGS" site. When printing the plans to PDF, use the "REAL NORTH" site.



THANKS FOR READING !

If you've read everything up to this point, you are a warrior. This pamphlet has been the most complicated one I've created so far. This topic is really complex and making it simple for readers was a gigantic challenge. I hope you learned a lot.

We are still working really hard on the DESIGN PACKAGE. At this point, I have no idea when it is going to be released.

Here is some good news: the Revit Pure BASICS template will be released as a standalone package on **June 21st 2018**. This template has been reworked and greatly improved. Check it out here:

revitpure.com/template

As always, send your thoughts at nick@revitpure.com