Shared Sites

Shared Sites is an often overlooked functionality within Revit. While the tool was probably designed to accommodate the same building on many different sites (e.g. project homes, modular buildings) it can also be used in single site scenarios as a way of controlling the positioning of models when exporting to various formats such as IFC. The following document describes the usage of Shared Site functionality in this scenario.

The Problem:

Unlike Revit, most other commonly used BIM authoring tools do not accommodate multiple coordinate systems. Further, in order to maintain accuracy, many applications require that the project be modelled within a localised grid to ensure model elements remain near to the origin. Many Revit users will have seen the "20 Mile" warning when attempting to import files with large geometric extents, however luckily in Revit there is specific functionality that can be used to overcome this issue.

Ideally projects should be referenced within an official grid system, such as PCG94 (Perth Coastal Grid). In projects where multiple authoring platforms are used (for example Revit, ArchiCAD, Tekla etc.) a common issue is the difficulty of spatially coordinating models referenced to an official grid system in Revit, with those simply referenced to localised grids in the other authoring tools. When exporting from Revit to other file formats, for example IFC, there are often no options to allow the user to specify whether the model will be exported in the local project coordinate system or the shared coordinate system. In the case of exporting IFC from Revit, the in-built exporter (including the extended open-source variant) exports about the survey point. Conversely, the ArchiCAD Connection Add-in for Revit exports IFCs based on the internal project origin (this is not the Project Base Point), in addition to performing a true north to project north correction by rotating about the internal origin. Neither of these results are likely to suffice when attempting to spatially coordinate with models from other applications.

As a work-around to these types of issues, users may compensate for differences in model location by manually positioning the various models in the collaboration/validation software being used. This approach is however error prone and in many cases, must be carried out each time new models are issued. An alternative may be to avoid the use of shared coordinates in Revit and/or avoid referencing the project within an official grid system. These approaches are also less than ideal, often resulting in limitations such as the inability to interface the project with GIS, civil, or survey systems.

The Solution:

While most BIM authoring tools cannot accommodate multiple coordinate systems, Revit can. Where a project uses Revit and at least one other authoring application, Revit can be used to spatially translate models by defining two Shared Sites, one to match the local project grid, and the other to match the official geodetic grid system in use. Once the Shared Sites are defined, the user can in effect reposition the entire project simply by switching between the Shared Sites. This would allow the Revit user for example to work in the official geodetic grid system and coordinate with civil and survey data, then relocate the project to the local grid position when it came time to coordinate with other BIMs. Alternatively, the user could choose to work predominantly in the local grid system, and only relocate to the official geodetic grid when they need to coordinate with civil/survey data. The Shared Site functionality opens up a range of opportunities in Revit, and can solve some of the

major issues encountered in cross-platform model coordination. Following is a step-by-step guide explaining how to define shared sites, switch between shared sites (relocate the project), and how to publish shared sites to linked projects.

Process

Defining Shared Sites

First, specify the Project North rotation and the official grid coordinates (PCG94 in this example) at the Project Base Point. Note that the Project Base Point will be transposed to 0E, 0N in the local grid Shared Site location.

1. Select the Project Base Point and ensure it is clipped (paper clip icon does not have a strikethrough) and enter the N/S (Northing) and E/W (Easting) values in the instance properties palette.

    Note: It is generally advised to use round coordinate values (avoid decimal places) when specifying the location of the project base point. Generally this point will match the main project control point as set-out by a surveyor.

2. To specify the rotation to Project North, go to Manage>Project Location>Position>Rotate Project North.

    <Refer to Video of above steps>

Next we will define the current position as a Shared Site:

3. In the Revit project, go to Manage>Project Locations>Location>Site. If you notice a lag when opening the Location dialogue, this is because Revit is retrieving online maps.
4. On the site tab, the current and only site is named Default, and is set current. Click Rename to rename this Site (for example PCG94).
5. To define the local grid location, click Duplicate to copy the existing Site. Name the local site, for example "Local Grid" and click Ok.
6. Make the new site representing the local grid location current by clicking Make Current.
7. Exit the Location Weather and Site dialogue by clicking ok.
8. The new "local grid" site is now current, however the project is still located in the official grid system (e.g. PCG94).
9. To reposition the project, select the Project Base Point and ensure it is clipped (Paper Clip Icon should not have a strikethrough).
10. Enter coordinate values of 0 for N/S (Northing) and E/W (Easting) in the instance properties palette.
11. The entire project will now relocate based on the Project Base Point shifting to 0E, 0N.
12. Perform a Zoom Extents to show the project in the view window.
13. With the Project Base Point selected, you will notice the Angle to True North remains from the initial shared site. You may choose to keep this rotation in the local grid location and alternate between true north and project north as per normal procedures, or alternatively the rotation can be removed in the local grid location.

14. To remove the rotation, select the Project Base Point and enter a value of 0 in the instance properties palette. (Note this does not remove the rotation from the initial shared site).

<Refer to Video of above steps>

Alternating Between Shared Sites

1. Once multiple Shared Sites are defined, we can switch between them depending on the task in Revit simply by making the desired site current.
2. To do this, go to Manage>Project Locations>Location>Site.
3. Select the alternate Shared Site, then click make current.
4. Exit the Location Weather and Site dialogue. Notice the project is now repositioned (It may be necessary to check the coordinates of the project base point to confirm this).

<Refer to Video of above steps>

Alternating Between Shared Sites when Linked Files exist.

Following the above steps to alternate between Shared Sites when other Revit files are linked into a project will alone be insufficient. If you try this, it will be evident that while the host project relocates, any linked files will simply stay in the position that they were linked to in the original Shared Site. In order to move linked files between Shared Sites, we must first record equal Shared Sites in those links. This process is essentially same as Publishing Coordinates to create a Shared Coordinate System, however it is not achieved using the same tools:

1. Ensure the project is located in the official grid by making the corresponding Shared Site current.
2. Select the Linked File, then click the <Not Shared> icon for Shared Site in the instance properties palette.
3. In the Choose Site dialogue, click the Publish the Shared Coordinate System… option, then click Change.
4. The Location Weather and Site dialogue for the linked file will now open, listing the current Default Shared Site in that file.
5. Click Rename to match the name of the current default site to the current site in the host project. Note that while you can name these sites differently, they will still represent the same position. These sites are not associated as such, they simply locate both projects in the same position. It is therefore suggested to ensure naming is standardised to limit the potential for confusion.
6. Click Reconcile to exit the dialogue.
7. In theory, we could now alternate to the Local Grid position in the host file, move the linked file accordingly and then publish the local position to the link using the same procedure described above. Unfortunately I have found this process to be unreliable and error prone and as such, recommend the following alternative:

1. Exit the project, and click Save in the Location Position Changes dialogue (this saves the current state of the previously published shared site (shared coordinates) into the linked file.
2. Open the linked file.
3. Go to Manage>Project Locations>Location>Site. You will notice the previously published Shared Site is set current.

4. Click Duplicate to copy this Shared Site, and name it to match the local grid position in the host file (Note: as previously discussed, there is no association between local grid Shared Site in the linked file and that of the Host file, rather they are completely separate Sites which happen to position both projects in the same location.)
5. To switch to the local grid location, select the corresponding Shared Site and click Make Current, then exit the Location Weather and Site dialogue.
6. Next, select the Project Base Point and enter values of 0 for N/S (Northing) and E/W (Easting) in the instance properties palette. If required, remove the true north rotation by entering a value of 0°.
7. Save and exit the file.

<Refer to Video of above steps>

8. Reopen the host file. It is generally easier to switch any linked files Shared Sites before switching Shared Sites in the host project.
9. To change the current Shared Site of a linked file, select the link and click Shared Site icon in the instance properties palette.
10. In the Choose Site dialogue, click the Move Instance To Option, and choose the required Shared Site.
11. Click Ok to exist the dialogue, and confirm that the linked file has moved (Note, it will likely not be visible in the view window.
12. Finally, switch the Shared Site in the host project by following Steps 2-4 of the Alternating Between Shared Sites procedure.
13. Once complete, you should notice that the linked file is located in the same relative position to the host project in both Shared Sites.
14. Important Note: Any moves to the linked file will need to be carried out in both Shared Sites if you wish to maintain the same relative position between the host project and link across the Shared Sites.

<Refer to Video>

Suggestions for improvement? Know of an alternative process? Be sure to leave a comment below!