



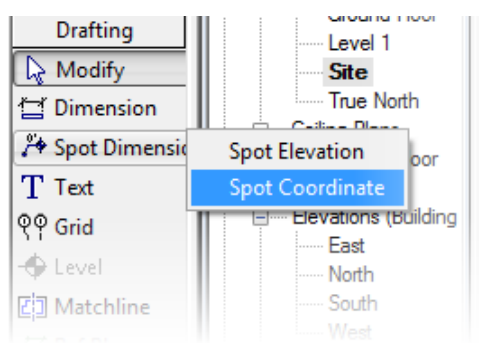
This Month:

Coordinates & Survey Data

Welcome to **INFOCUS**, C3 Consulting Solution's Monthly Newsletter. This month, we continue our look at Coordinates and Survey Data.

In our [last edition](#) of INFOCUS, we looked at how to prepare a survey file for importing into Revit, and how to place it into the model. We determined how to check that the vertical position of the imported data was correct. We must now reconcile the survey's lateral position and the position of any existing Revit model geometry, as well as create the site toposurface.

You can reconcile the *lateral* position of the site by specifying the coordinate values for the E/W and N/S figures. Use **Tools|Shared Coordinates|Specify Project Coordinates**, and enter the coordinates from the nominated site datum (the start point of your reference line). These should reflect the X & Y displacements from the WCS origin of 0,0. They are the same figures by which you moved all objects in the survey file to get them from their original position back to the WCS origin. (Note, however, that you may need to remove the preceding minus symbols.)

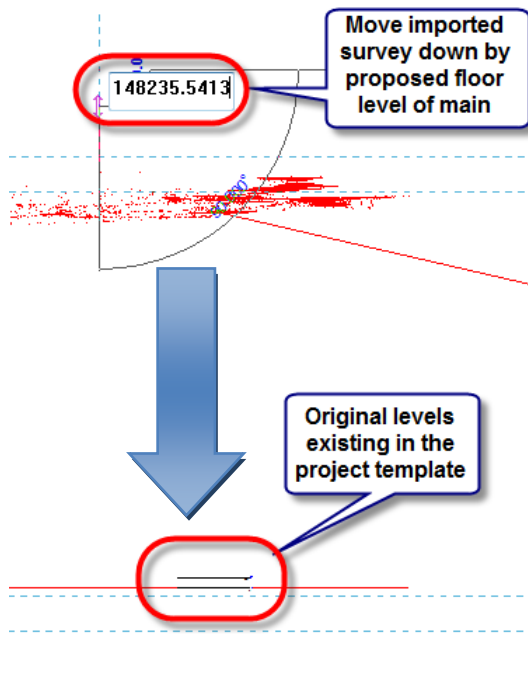
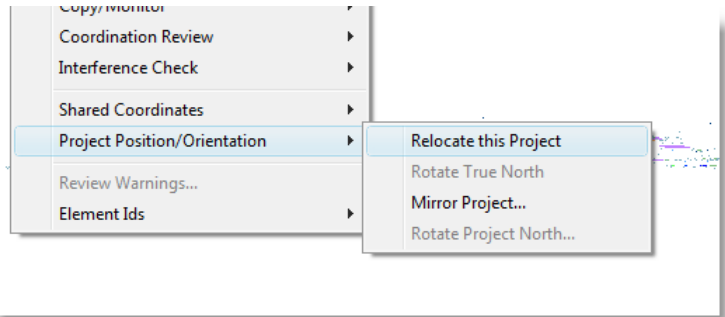


In completing this process, the linked DWG instance should remain fixed (it is pinned automatically when you select the origin-to-origin import method), but the Revit shared coordinates origin itself (which is invisible) has moved relative to the project.

You can test this by either reporting Shared Coordinates at this point once more, or by adding a spot dimension in the appropriate location.

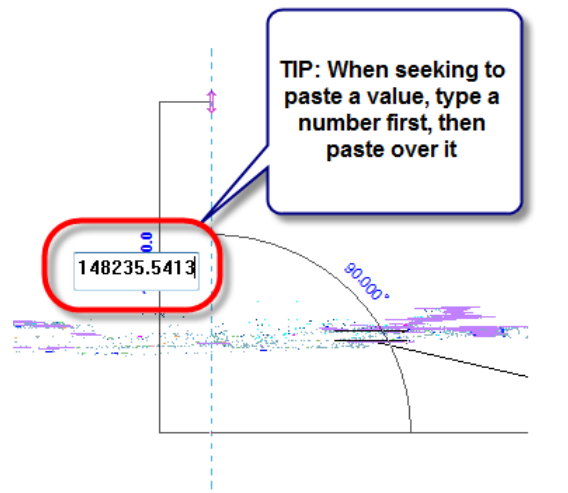
A *Spot Coordinate* will display the E/W and N/S coordinates (X and Y displacements respectively), while a *Spot Elevation* will display the elevation at a given point (Z displacement from 0).

It will be plainly obvious, especially in a 3D view that the site is located much higher than the levels that already existed in the model. This will need to be reconciled before you can continue to model your project.

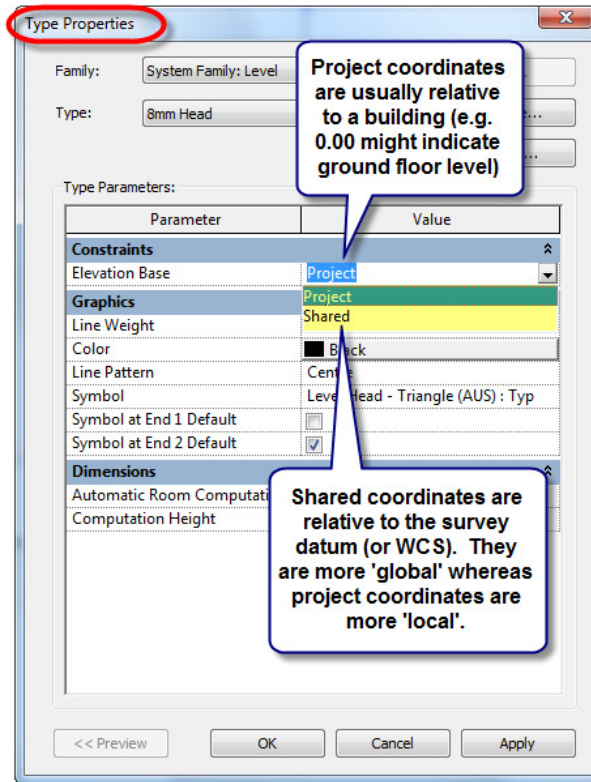


In an elevation or section view, first unpin the imported site topography, and move it and the toposurface down by the proposed (or known) floor level of the (main) building, (expressed relative to the survey height datum of 0). Remember to enter this in millimetres (or follow the number of metres with an 'm' – Revit will understand this to mean metres). Then, still in an elevation or section view, use **Tools|Project Position|Relocate this Project** to move it back up again by the exact same distance. This reconciles the height difference between the site surface and the project levels. Both the building model and the site should now be in their correct vertical positions.

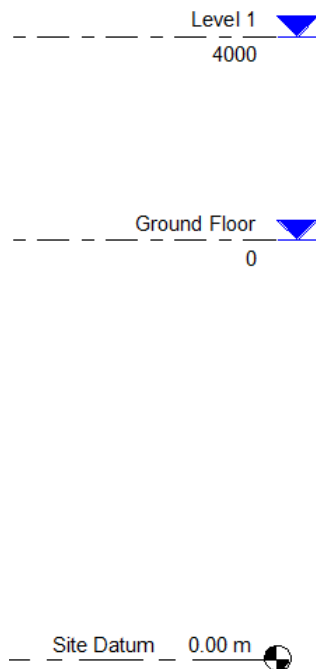
The Revit level onto which you inserted the site survey in the first place (originally – or hopefully – at an absolute height of 0.00) has now been relocated to become the proposed floor level of your main building (now at some height above 0.00). For any future DWGs that you might wish to insert, you may be well served to insert another level at a *Shared* level height of 0 (not a *project* height of 0). Levels in Revit have a type parameter that allows the level to display in **shared** or **project** coordinates.



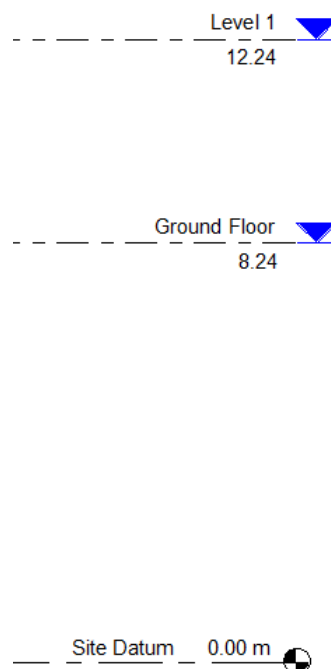
You can set which coordinate system is displayed as shown in the image above. Note this is in the **type** properties, not **element** properties of the level. You may also choose to create a level in your project template as a datum, and to distinguish it physically and visually from your Ground Floor level. You may also choose to pin it in position to protect it from accidental movement.



Levels displaying **Project** Coordinates (units shown in millimetres).



Levels displaying **Shared** Coordinates (units shown in metres).



In both cases, the Site Datum (target symbol) is displaying Shared Coordinates

Family: System Family: Import Symbol Load...

Type: X - SITE3D.dwg Edit / New...

Type Parameters: Control all elements of this type

| Parameter | Value |
|---------------------|------------|
| Dimensions ^ | |
| Import Units | millimeter |
| Scale Factor | 1.000000 |

Instance Parameters - Control selected or to-be-created instance

| Parameter | Value |
|------------------------|----------------|
| Constraints ^ | |
| Base Level | Ground Floor |
| Base Offset | -148235.5 |
| Dimensions ^ | |
| Instance Scale | 1.000000 |
| Identity Data ^ | |
| Name | X - SITE3D.dwg |
| Other ^ | |
| Shared Location | <Not Shared> |

OK Cancel

| Parameter | Value |
|----------------------|----------|
| Constraints | |
| Base Level | Datum |
| Base Offset | 0.0 |
| Dimensions | |
| Instance Scale | 1.000000 |
| Identity Data | |

Your imported file will be relative to a particular level from your model. You can edit this reference level, and any associated offset levels. The images left demonstrate a swap from one reference level to another, with no physical movement of the position of the imported file.

Before we finish up this month, a couple of other pointers that may be useful:

Multiple Buildings

In the case of multiple buildings, use the proposed floor level of any building, and add other levels as required for each of the other buildings. You can make minor alterations to levels later if required. You can also select all levels for a given building and move them together to perform a small-scale adjustment of a building's position. You may, however, face other required adjustments depending on the detail and accuracy of your model.

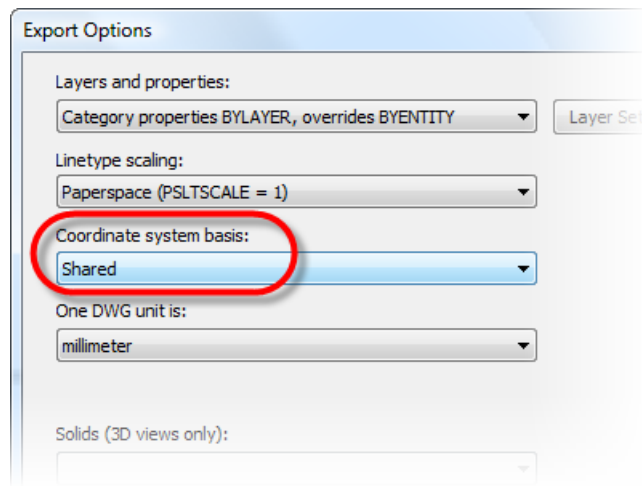
TIP: Scope boxes may be useful for controlling extents and visibility of building-specific levels.

The same technique for importing DWG files as outlined in this newsletter can be used to bring in the 2D survey, which would typically include features and other graphic information such as site and/or adjacent building outlines, landscaping elements etc. This should be aligned perfectly upon insertion (if inserted origin-to-origin), but may need to be inserted on a plane or location *higher* than the highest point on the site, in order to view this information 'over' the site. If the toposurface obscures the 2D survey information, it's likely that the latter is located beneath the former. To *temporarily* 'see' the toposurface *and* the 2D survey information (in a plan view), switch the model graphics style in the view to 'Wireframe'.

Coordinates and File Export

When the Revit Model is set up correctly, CAD file exports can be set to **shared** coordinates, which eliminate the need to move exported geometry back to a real-world (non-local) origin.

A script file or lisp file can be used to automate the reconciliation of displacement between origins.

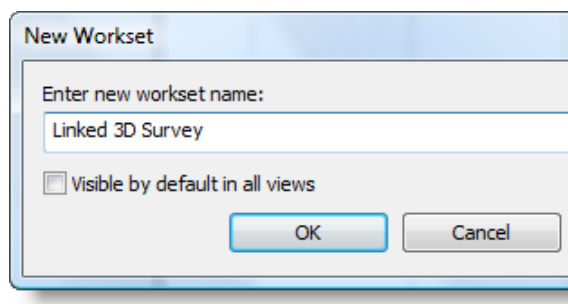


When the exported DWG file is complete, it includes a custom User Coordinate System (UCS), named "**REVIT60-Internal**". It would appear that this is supposed to match project north, to allow work to continue on the exported DWG file with a convenient orientation. However, while it is built in to the exported file, this custom UCS is not applicable or has no apparent impact when exporting DWG files to *Shared* Coordinates.

"REVIT60-Internal" UCS instead only applies when exporting to **Project** coordinates, and is usually (for some unknown reason) created 'backwards' from Project North. This needs to be reversed after export to be effective or at all useful.

Workshared projects

As with all projects, it is good practice to import 2D or 3D survey using origin-to-origin method, but in addition to this, consider the following:



Import into own workset and/or 'current view only'. Ensure this user-created workset is created to be invisible by default, requiring users to manually make its contents visible.

This avoids unnecessary graphic effort and processing of the DWG instance, as all elevations, sections and 3D views will also 'see' this data (which will, in turn, impact negatively on your computer's performance, particularly during graphic regeneration and printing).

These steps and descriptions should give you a better understanding of coordinates and how to work with survey files. Once you are familiar with the processes, they become so much simpler than you might think based on the pages of preceding notes. To summarize, a list of simplified steps are listed overleaf.

You may want to add your own pointers to this list, and use it each time as guide during the process the next time you insert a survey.

That's all for this month's edition. Stay tuned for next month's!

SUMMARY OF STEPS

1. Prepare CAD file, reconciling:
 - Units (scale up to millimetres)
 - Position (move all objects from new site datum to WCS 0,0)
 - Delete or move any erroneous geometry
2. Isolate layers that contain 3D point data (and any reference geometry)
3. Insert onto Site level, and offset downwards by the proposed floor level (e.g. -150000).
4. Relocate project upwards (in elevation or section view) by the same number (though not negative). Project levels and survey levels are now reconciled.
5. TIP: If you can't see the survey, alter your view range to suit (e.g. lift from 100000 to 200000mm from associated level).
6. *Report Shared Coordinates* (to double-check coordinates) and then *Specify Project Coordinates* to reconcile E/W and N/S values.
7. Create toposurface, remembering to *exclude* the layer that contains reference object (if it should not become part of the site geometry)
8. Insert and link the 2D feature survey offset **above the site** (for graphic representation).

TIP: Sometimes in order to display the site and building plans together correctly, use composite views.

9. When the toposurface has been created, you should be able to rid the project of the 3D survey CAD file.

Remember to trim the toposurface to the site boundary to eliminate the interpolated surface area. Do this by using Split Surface.

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