Coordinates in Revit

Zsolt Varga
Technical Support Specialist | Autodesk GmbH
Overview

Why is this topic crucial and scary to customers?

- Because the position of our BIM model is **important**
- …the functionalities to define it in Revit are rather **complex** (more flexibility = more chance for confusions)
- …users don´t get to **practice** this feature very often

This presentation clarifies the logic, how the model position is defined in Autodesk Revit; it highlights correlations between the most important tools and terms and it helps to prevent misunderstandings, so that the users can enjoy the complexity and the flexibility of the features offered by Revit for working with the coordinates.
Aim of the presentation

- Understanding the concept
- Explaining/refreshing terms and definitions
- Project Base Point & Survey Point: Powerful Tools in Revit
- Showing an optimal Workflow with Shared Coordinates
- Clarifying misunderstandings / Dos & Don’ts
1. Challenges
Abstraction – Illustrating Reality in a virtual Space
Challenge No.1

The universe is BIG

The Model Space is SMALL
Challenge No.2

Plan coordinates

Survey coordinates
Challenge No.3
Different Reference Systems in Surveying & Mapping
2. Basics & Terms
How does Revit deal with these challenges
Answer no.1. – Size of the Model Space

20 Miles Rule in Revit

Model elements need to reside inside of a 20 Miles (33 km) Cube of Model Space

If not > Revit give a Warning

If ignored > Issues:
- Performance
- Graphics Display
- Object snap
- View display (empty views)
- Errors with Energy analysis
Answer no. 2-3 – Different Reference Systems

Reference System for the own virtual Space of Revit

Reference System for Designers

Geographic Reference System for Surveyors

Internal Base Point
+ X-Y-Z Achsen

Project Base Point
+ Project North

Survey Point
+ Geographic North

Position of the Project Site on the Map

Project Location:
Manage > Project Location > Location
Fundamental Terms

- Project Base Point (PB)
- Internal Base Point
- Survey Point (SP)
- N: Project North
- N: True North

- Project Base Point
  - Shared Site:
  - N/S: 0.0
  - E/W: 0.0
  - Elev: 0.0
  - Angle to True North: 45.00°

- Survey Point - Intom
  - Shared Site:
  - N/S: 0.0
  - E/W: 0.0
  - Elev: 0.0
Project Location

Define Location by: "Get Location from Survey Point" function available in the latest Revit releases, but not the other way around… > You CANNOT get shared coordinates by manually defining Project Location!

Not to mistake it for Project coordinates or Shared Coordinates!
Tagging: Point Coordinates

To tag Project Coordinates

To tag Survey Coordinates

The values will get updated automatically
Flexibility
What is that all good for?
Free Time
3. Praxis – Project Position

Using the Project Base Point & Survey Point as powerful tools
Adjusting Project-Base Point location

Moving the Project Base Point **UNCLIPPED**
We move the Project Coordinate System in relation to the Model Geometry and the Survey Coordinate System im virtuellem Raum

- **Project Coordinates** of the model elements **are changing**
- **Survey coordinates** of the same elements **stay the same**
- The project keeps its position in Revit’s virtual space
Redefining the Survey Point location

Moving the Survey Point **UNCLIPPED**
A new Point in the same Survey Coordinate System will get marked

- Project coordinates of the model elements **stay the same**
- Survey Coordinates of the model elements **stay the same**
- The Project keeps its position in the Virtual Model Space
Moving the project – I.

Moving the Project Base Point

Our Project will be moved in relation to the geographic coordinate system.

- Project-Coordinates of the model elements **stay the same**
- Survey-Coordinates of the model elements **change**
- The Project **keeps its position in the Virtual Model Space**
Moving the Project – II.

Moving the Survey Point **CLIPPED**

The Survey Coordinate System gets moved in relation to the Project Coordinate System

- Project coordinates of the model elements **stay the same**
- Survey coordinates of the model elements **change**
- The project **keeps its position in the Virtual Model Space**
AVOID IT AS MUCH AS POSSIBLE
Changing the project position by selecting and moving model elements

- Model elements may accidentally get left hidden in a wrong position
- Losing model element references and connections
- Labor intensive, error-prone process

Moving the Project – III.
4. Shared Coordinates
The Concept of Shared Coordinates

Host Model / Masterplan

Linked Models

Survey Point (SP)
Sample Workflow - Aim

Survey DWG with real coordinate values

Building Revit Projekt

3D Layout Plan
Creating the Layout Plan
https://autode.sk/2ULWNpA
Defining Building Position

https://autode.sk/2EwzVFk
Working in Subproject files

https://autode.sk/2zVrCPt
5. General Advise
**Common Misunderstandings**

<table>
<thead>
<tr>
<th>Misunderstanding</th>
<th>Correct Answer</th>
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<tbody>
<tr>
<td>Project location affects shared coordinates</td>
<td><strong>✗</strong></td>
</tr>
<tr>
<td>After DWG Export, the Project Base Point becomes the 0,0,0 point in AutoCAD</td>
<td><strong>✗</strong></td>
</tr>
<tr>
<td>The Survey Point (SP) should never be further than 20 miles (33 km) from the Project Base Point</td>
<td><strong>✗</strong></td>
</tr>
<tr>
<td>Linked DWGs know the difference between Project North and True North</td>
<td><strong>✗</strong></td>
</tr>
<tr>
<td>It doesn´t take care of the Shared Coordinates</td>
<td><strong>✓</strong></td>
</tr>
<tr>
<td>Not necessarily – It is always the Internal Base Point (original origin) of Revit, which becomes the 0,0,0 point in the exported drawing</td>
<td><strong>✓</strong></td>
</tr>
<tr>
<td>The 20 Miles (33 km) Rule applies ONLY to GEOMETRY – only to drawing or model elements</td>
<td><strong>✓</strong></td>
</tr>
<tr>
<td>Reload linked DWGs only after setting back the view orientation to the state where the DWG was first loaded</td>
<td><strong>✓</strong></td>
</tr>
<tr>
<td>Dos</td>
<td>Don´t</td>
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<tr>
<td>Change the project position using the Project Base Point or the Survey Point</td>
<td>Don´t try to change the project position by moving model elements manually</td>
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<td>Having a rectangular system of model geometry try to best draw it oriented to the Project North</td>
<td>Don´t draw or load model elements oriented to True North, while keeping the view orientation set to Project North</td>
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<td>Use the view orientation set to Project North when drawing</td>
<td>Drawing elements in a view oriented to True North</td>
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<td>When using Shared coordinates – export drawings directly from the model space</td>
<td>Don´t export views with Shared Coordinates from a Revit Sheet</td>
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<tr>
<td>Respect and consider the warnings of Revit – Take your time to understand the correlation between the warnings and your steps</td>
<td>Don´t ignore the warnings, when Revit is trying to help</td>
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