Take your Building Surveying to the Next Level by Capturing Measurements On-Site Directly into Autodesk® Revit® Architecture

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AB5915-V Real estate owners need to have accurate building measurements to calculate leaseholder partitioning of costs. Building project managers have the need to take control measurements before the prefab concrete beams or windows arrive at the building site. In both and many other cases, the building surveyor comes to the rescue, using a measuring tape and paper drawings. What if he could capture the measurements on-site using an infrared measuring device and transfer them directly into Autodesk® Revit® on a tablet PC? This class gives you background information about the business case and shows a solution that uses a building surveyor application in Revit Architecture. The application also available in AutoCAD®.

Learning Objectives
At the end of this class, you will be able to:

• Understand the business case about the importance of reliable building surveying.

• Know about a solution to equip the Building Surveyor working onsite.

About the Speaker
Henny is an independent Consultant from The Netherlands, working in the GIS & BIM environment for more than 30 years, with focus on Autodesk software (AutoCAD Map and Revit Architecture). At present frequently involved in projects at municipalities and provinces concerning the implementation of the new Large Scale Base Map of The Netherlands. Also working on software development projects - one is for example about Building Surveying (an application in AutoCAD and in Revit).

Henny has worked at Autodesk for more than 10 years. In one of his roles he served as GIS technical sales manager in the European-team. Part of his activities where - among other things - responsible for EMEA technical trainings, techcamps and presenting at international events (for example Autodesk University in 2004 & 2007).

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Class Summary
Real Estate owners need to have accurate building measurements. Building Project managers have the need to take control measurements. In both and many other cases the Building Surveyor comes to the rescue, using measure tape and paper drawings.

*What if he could capture the measurements onsite using an infrared measuring device and transfer them directly into Revit on a tabletPC?*

This class give you background information about the business case and shows a solution using a Building Surveyor application in Autodesk Revit for Architectural Design.

Introducing the landscape
Today we experience a rapid digital awakening in the world of construction and real estate development. Besides that, there is an increasing uncertainty due to lack of transparency. Square meters (and of course footage) now become the safe standard for measuring and valuating existing property worldwide.

*It leads to a serious need for fact-based tools.*

The current method of measuring leaves room for many mistakes. After measuring, both analog and digital, the data are usually penciled down and entered into the system afterwards. Human errors are then easily made.

*There is a need to a highly accurate way of transmitting and processing measurements.*

The business case
It started with a phonecall …

I got a phonecall from a manager, working for a Building Surveying company;

- they surveyed for Real Estate owners
- they traveled to a site with two surveyors, paper drawings, a measure tape and pencil
- they penciled down the measurements

and came back to the office …
… trying to re-create the building in AutoCAD® using the measurements;

- sometimes missing a specific distance …
- sometimes questioning; was this corner square?
- how was this wall situated?
- what is behind?
- was this really the distance to the exterior wall?

etcetera

The proposed solution using Autodesk® Revit®

What if the Building Surveyors could capture the measurements onsite using an infrared measuring device and transfer them directly into Revit on a tabletPC?

- they could go in one man teams
- they could check their measurements before leaving the site
- they could work more efficient

and using Autodesk® Revit® makes it part of BIM. ¹)

The preconditions

The Building Surveyor should use the old construction drawings as backdrop. These drawings should be loaded into Revit and take onsite on a tabletPC. The tabletPC should be connected with a infrared measuring device (using BlueTooth).

An application should support the Building Surveyor onsite with project and measurement functions.

The potential users

Building Surveyors who need to measure existing sites for Real Estate owners who need to calculate lease holder partitioning of costs.

Building Project managers who have the need to take control measurements before the prefab concrete beams or windows arrive at the building site.

Architects, Interior Designers, Engineering and Construction professionals, Project Developers, Facility Managers etcetera

¹ Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of a facility. The resulting building information models become shared knowledge resources to support decision-making about a facility from earliest conceptual stages, through design and construction, through its operational life and eventual demolition.

The project administration functions

The projectstart function
The projectstart function lets you specify a new Project File, based on the application template. This new project is stored under the application projects folder in the current users myDocuments. The new project will be opened in the Revit Editor.

*The application template has specific walltypes, views and schedules defined.*

The projectdata function
The projectdata function lets you specify project details and client contact information. This is the standard Revit project information wrapped in a small user friendly form.

FYI: the standard Revit project information can be found under the Manage ribbon => Project Information button, in the Project Properties screen.

The levels function
The levels function starts with showing an overview of the existing levels. This function offers the option to specify new levels, with their corresponding elevation. And gives the user the option to import background drawings per level.

An easy to use interface to quickly define the building levels and to attach old construction drawings to each level.

In preparation for a measurement, existing drawings are obtained and examined on usability.

The preference is naturally given to Revit.RVT project files. But it is also possible to use AutoCAD DWG or MicroStation DGN files as a base to work.

*The measurements functions ask for basepoint and directions to pick on the reference drawing.*
The measurement functions

Introduction to the measurement functions
The Building Surveyor has to determine the accuracy of the existing drawings and whether they can be used. A number of control measurements need to be taken; from corner to corner along the walls or diagonal etcetera. The measurements are presented using support lines or arcs on the control points.

_The Surveyor will use this to determine the accuracy of the drawings._

Other measurement functions support extending the building model with newly created constructions. One of these functions asks to pick two points on an existing wall as measurement baseline to measure the new construction orthogonally. Another function requires to pick two diagonal points on a rectangle and asks to measure the vertical and horizontal distances of the sides to calculate and draws the rectangle.

All measurement points have to be picked on the reference drawing. For example the intersection of the interior wall or corners of structures etcetera. When the application is expecting measured distances, they may be transferred wireless from the Leica Disto and they will appear in the corresponding input textbox, or they can be typed manually, when measured with a tape measure.

These measurements result in supporting linework, using Revit ModelLines or ModelArcs. On top of this linework, the operator can create Revit Walls afterwards by snapping. It looks like an extra step, but drawing Walls directly would force the Surveyor in a certain measurement sequence which isn’t always logical.

_This approach gives the Surveyor more freedom._

The Leica Disto connection
All measurement functions expect points to be picked on the reference drawing and measured distances to be transferred from the Leica Disto. A specially developed .NET Disto interface module takes care of the BlueTooth communications with the Leica Disto.

This Disto interface module can connect to the Leica Disto using BlueTooth, via a virtual comport. If the Disto is not connected at the expected comport, the interface module can try to find it, by polling all available comports. When succesfull, the comport is saved into a config file for further use.

The measured distances can be trasferred one-by-one, when the measurement function is asking for it. Or multiple distances can be stacked and the measurement functions can pop them from the stack when needed. The measured distances is always the calculated horizontal distance, so the Surveyor doesn’t have to hold the Disto exactly horizontal when measuring.
The distance function
The distance function measures distances from one corner to other corners in a room, parallel to the partition walls or diagonal. This function will ask to pick a beginPoint and endPoint on the reference drawing, waits for the measured distance from the Disto and draws SurveyLines at the endPoint. By repeating this measurement at other corners you will get a good sense of the accuracy of the reference drawing.

This functionality is using the distance form as a modeless popup window. While the modeless window is open, the user can pick the beginPoint and endPoint. When the second point is picked; the distance is calculated and displayed and the line between begin- and endPoint is drawn as ModelLine.

The function keeps asking for endPoints; the corresponding distance is calculated and the line is drawn. When the user clicks Esc; a new beginPoint may be picked etcetera.

While the line between begin- and endPoint is drawn, the dialogbox is waiting for a measured distance from the Leica Disto. As an alternative, the user can enter the measured distance by keyboard. When the draw-button is clicked; a small control arc is drawn as ModelArc, using the measured distance as radius.
The offset function

The offset function uses a taken distance to draw a small line in parallel of a wall. For example; if you take the distance from a corner of a structure somewhere in a room perpendicular to one wall, this function will draw a small SurveyLine in parallel to that wall at the given distance. If you take a second distance from that same corner perpendicular to another wall, the two small SurveyLines will fix the corner of the structure in the room.

This functionality is using the offset form as a modeless popup window. While the modeless window is open, the user can pick the beginPoint and endPoint of the wall. When the second point is picked; the distance (= length of the wall) is calculated and displayed. Then the user can pick a corner of a structure for example and the distance perpendicular to the baseline is calculated and displayed.

After the offset point is picked, the dialog box is waiting for a measured distance from the Leica Disto. As an alternative, the user can enter the measured distance by keyboard. When the draw-button is clicked; a small line is drawn as ModelLine, in parallel of the baseline on a distance equal to the measured distance.
The rectangle function

The rectangle function uses two measured distances to draw a rectangle in parallel to the screen. Rooms can often be divided into multiple rectangles. This function will ask to pick two points, diagonal to each other and will take the beginPoint to fix the first point of the rectangle.

The second or diagonalPoint is used for the direction of the rectangle. The two measured distances from the Disto will be used as vertical and horizontal sides of the rectangle drawn as SurveyLines.

This functionality is using the rectangle form as a modeless popup window. While the modeless window is open, the user can pick the beginpoint and diagonalpoint. When the second point is picked; the vertical and horizontal distances are calculated and displayed.

After the diagonalpoint is picked, the dialogbox is waiting for two measured distances from the Leica Disto. As an alternative, the user can enter the measured distances by keyboard. When the draw-button is clicked; a rectangle is drawn as a collection of four ModelLines, in parallel to the screen.
The proposed solution using Autodesk® Revit®

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What type of professionals use this solution?

Anyone with CAD experience is able to capture the measurements inside buildings easier and more efficient. This solution is especially designed for different fields of application such as:

- Building Surveyors, Building Project managers, Architects, Interior Designers, Engineering and Construction professionals, Project Developers, Facility Managers etcetera

Why professionals use this solution?

It makes the measurement process at least 50 percent more time effective. It is more accurate, so less chance to make mistakes. It works directly in AutoCAD and Revit, no separate connection software needed.

Fast connection

It connects your Disto via Bluetooth to your PC once and it will always find your Disto. If you are out of reach via Bluetooth just walk back, press reload and the connection is made within 3 seconds.

A specially developed .NET Disto interface module takes care of the BlueTooth communications with the Leica Disto.
About YuZu
Our breakthrough application is called Yuzu; smart software that captures existing measurement conditions into the AutoCAD® and Autodesk® Revit® environment with the use of Leica Distometers using Bluetooth. It allows you to draw while you measure. And Yuzu is not just more accurate, but also 50 percent more time effective.

Download YuZu
You can download YuZu today and testdrive yourself with a 30 days free trial (full version). YuZu is also available in the AutoCAD and Revit App Store as freeware (distance function only).

About Picard Innovations
YuZu is brought to you by Picard Innovations.

Picard Innovations develops and builds software applications to make the construction process more effective and efficient. We improve the rate of accuracy and the ease of measuring surfaces and spaces.