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# POINTKNOWN

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## PKNAIL PRO MANUAL

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PKNail for Revit®  
V1.08

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## About

**PointKnown** was founded and PKNail Surveying Software was created for the increasing demand of capturing existing conditions and the built environment in 3D/Parametric Building Environments. It was developed organically from the Architectural Surveying firm Interioreview; founded in 2003 and having surveyed millions of SF. PKNail was programmed to create repeatable workflows, automate rote task and embed our industry leading survey knowledge into a software package that is usable to most anyone right out of the box. PKNail excels in the capturing the built environment whether for use in energy analysis via Revit CEA or the basis of as built documentation from exterior envelope and windows to interior fit outs.

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## PKNail Pro

Thank you for purchasing PKNail Pro Surveying Software. In your hands is a powerful piece of field software that allows you to measure / transfer / build objects wirelessly directly into a Revit workstation. In order to best utilize our software please take a moment to read through this manual to familiarize yourself not only with PKNail but to understand the features of the Leica Disto as well as the methodology of building directly into Revit and in 3D.

Revit, the most important thing to understand about building in Revit is that everything, for the most part, wants to be attached to a level. So if you are working only from the exterior of the building, almost everything will be attached to a 'base' level, most likely the ground floor of the building. If you are also working from the interior of the building, you can add all the levels of the building via the PKNail Levels Wizard of the building and then add features level by level. We have automated ways to add similar features automatically to each level but we will cover that in a later section.

PKNail methodology, in our software, much like everything being attached to a level in Revit, everything is attached or placed via a wall's end point. For example, once a wall is placed it has two end points, left and right, where it either meets another wall or ends. You can place another wall, add a window, door, etc. using the length from either wall end point, it's that simple. Add a wall, add feature(s) along that wall using dimensions transferred wirelessly then add the next wall.

The PKNail dialog accepts information in a certain order. For example, length from basepoint, width, sill height, height, and as data is entered the next dialog is activated, so enter length from basepoint, and PKNail is ready for the width, and at any time the user can choose to 'build' the feature by pressing the right arrow key on the Disto twice. We have found that with similar and repeatable workflows the operation of the software and driving PKNail through the Bluetooth connection and rangefinder becomes second nature to the user

## Disto D8 Key Pad and Features

### Enabled Features for PKNail




\* **Press Twice** – Pressing this button twice is the same as pressing ‘okay’ in the dialog or ‘enter’. For example, if you are in the wall dialog and you want to build a wall using the current information, just press twice and PKNail will build the wall, window, door, etc. No reason to manually hit okay or enter.  
 \*\* In a menu item that has multiple choices, for example, wall angle, you can toggle between the choices (90 degrees, 270 degrees, etc)

## Getting Started

### Connecting the Disto with your Computer/Laptop

In order to take advantage of wireless data transfer you will need to “connect” or pair the disto with your computer. In order to do this you will need to use the Bluetooth manager available in Windows.

If you have not connected or paired your Disto with your computer/laptop you will need to do that now.

1. Make sure the Disto is charged, ready, and that you have pressed the Bluetooth Icon on the Disto Keypad.
2. Click on the Bluetooth Icon  in the Tray of Windows. Typically it is in the bottom right of the computer screen next to the time and date.
3. And in the menu option to the left click “Add a Bluetooth Device” and the Set Up Wizard will start
4. Your computer will search for discoverable devices, and the Disto should show up as a device.
5. Click the Disto Icon in and Click Next. If a “passcode” is required, enter the default passcode of “0000”.
6. After it is paired click the “Open Bluetooth Settings” link which should be available on the left margin in Windows 7. You will see a series of tabs, click on the “Communications Port” Tab. Within this dialog box there will be a COM Port that is assigned a direction, “Outbound”, please write down the COM Port that has been assigned to “Outbound” It should look like COM5 or similar as will need that later.



\*Note: Yes we want to make this easier and are working on it. Fortunately, this only has to be done once during this initial set up.

### Opening the PKNail Template

In order for PKNail to operate you must use the PKNail Template which was installed in the Revit Templates folder when the program was installed. To start a new project make that selection in the Revit Menu by clicking the “R” and choosing open, then choose the PKNail template.

### Setting Tolerances

You can adjust PKNail to close and merge walls as long as they are within a measured tolerance. Additionally, you can ask the PKNail round objects to the nearest measurement. That is a door that is measured at 3'-0.0875 can become a 3' Door. It your choice on how you want the objects created and if you want the values rounded.

## Using Bluetooth

It is essential that you connect the rangefinder via Bluetooth from inside PKNail using the Rangefinder tab. Essentially Bluetooth is like a dance partner and it needs to be partner the Range Finder with PKNail and Revit, if you use Windows, or any other program to pair the Range Finder than essentially you have paired it with that program and not Revit and there will be data transfer issues, and therefore not be dancing.

## Connecting the range finder with PKNail



Turn on the Disto D8, and press the  Bluetooth button, the bluetooth icon should turn on and turn blue on the screen. Then hit the '2<sup>nd</sup>' Key on the KeyPad. The 2<sup>nd</sup> Function enables PKNail to drive certain Revit functions directly from this keypad. After you complete these two steps.

Go to the Add-Ins Tab. IN PKNail you will see a Rangefinder option. Select this option and select "Connect Rangefinder"

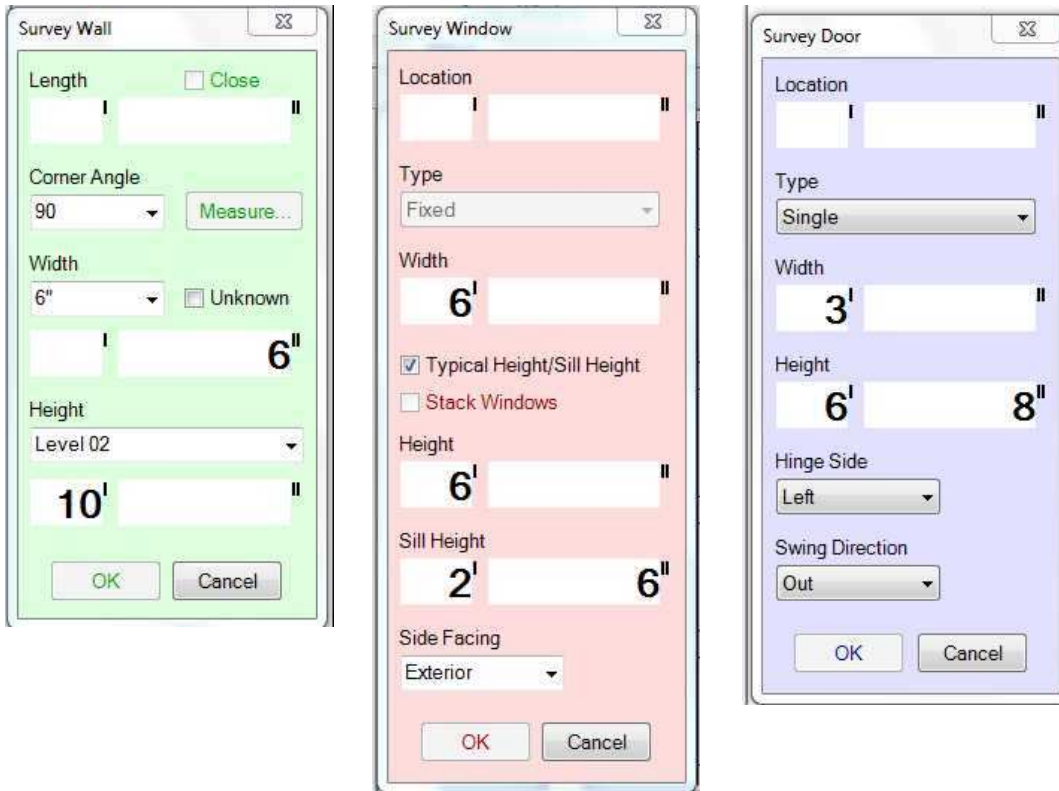
You may need to change "Ports" via the dialog.

Once you have paired the Disto the your computer you will not have to repeat this process.

Commands

While you will be using many of the commands included with PKNail we allowed the activation of the most common ones right from the range finder. Add Wall, Add Door, Add Window, Build, Cancel and Up/Down. While we will go into detail about these commands in the next sections we wanted to point out a couple of things.

The build commands dialog boxes are different colors so you can recognize from a distance. Wall -> Green : Window -> Red : Door-> Blue



Additionally, while you can always activate commands through the disto, you will find that you have to click on the PKNail 'Add Ins' selection on the menu to bring it back on top. This is has nothing to do with PKNail rather than the programming rules set by Revit.

## Whole Building v. Exterior

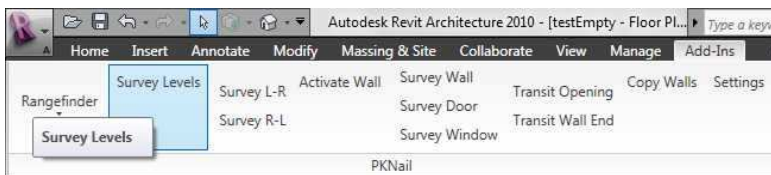
In order to accommodate the widest range of needs in the field we developed 2 distinct workflows. The whole building method allows a surveyor to document each level, set typical window heights and sill heights from the interior and can place partition walls, etc. We also developed an exterior work flow because some surveyors would either be surveying only the exterior of a building or would not have access to the interior.

## Vertical Information

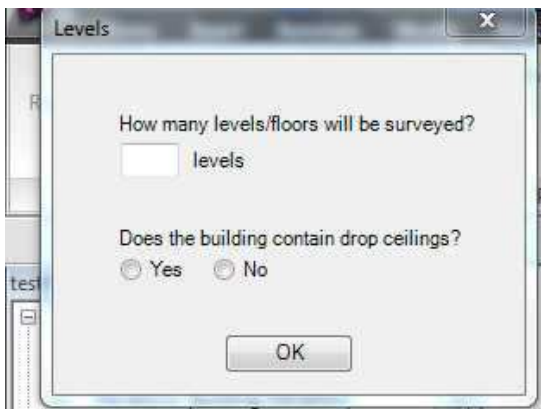
To start any project the user will need to define, at a minimum two levels. This is so the software will know how tall a wall it is building. If modeling just the exterior of the building that may just be the 'base' level and the 'roof' level. However, we do allow the capture of multiple levels, for interiors, as well as 'sill' height and 'head' height of typical windows by level. Setting this type of information or setting Z 'Axis' or Vertical Information about the buildings helps insure the correct capture of information for the model. The first step is to set the Levels.

## Survey Levels

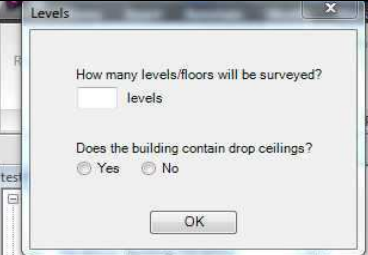
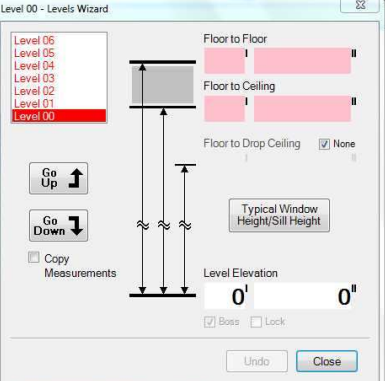
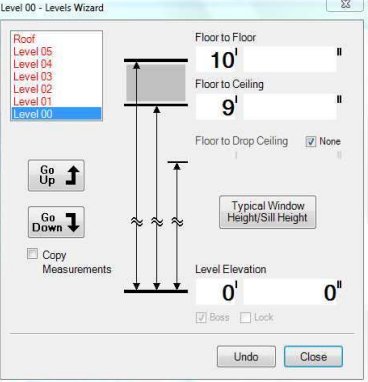
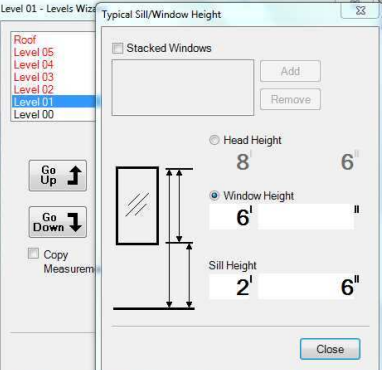
Open the Survey Levels Dialog.



You either set the Levels from the interior by setting the number of levels and adding floor to floor measurements and floor to ceiling measurements, or in the case of the exterior work flow setting the base level and adding levels above it, like the Roof. You need a minimum of 2 Levels to Survey, because you need give a height to anything you are measuring. So almost always you will add (+1) the number of levels you are surveying. One Floor, enter 2 Levels, the Level you are measuring and the top of the wall. For a 5 story building it will be 5 Level + 1, 6 Levels Total with the top level being the Roof, or top of the 6 The Floor Ceiling.

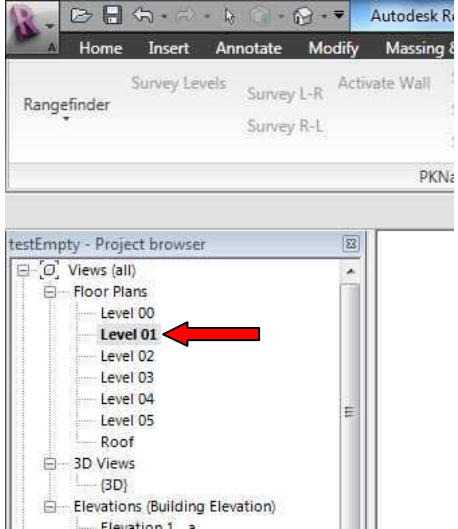
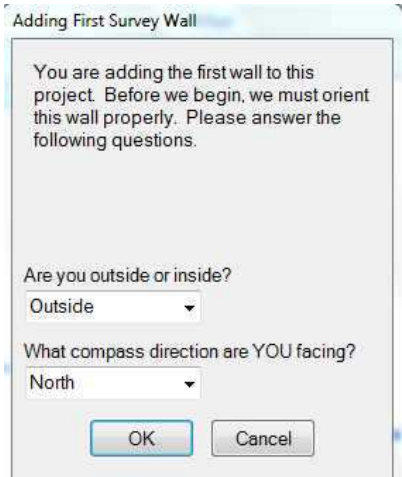


# Whole Building

	<p>Enter the number of Levels you will survey + 1. The dialog will ask you if there are drop ceilings because PKNail tracks this information and their location. The reason for adding a level is you need to add a roof level. <i>(Example: For a 6 Level Building you would input 7 Levels. 6 Levels + Roof. Since the Walls all Level 6 would need to 'attach' to something.</i></p>
	<p><b>Floor to Floor Measurements</b></p> <p>After inputting the Levels the Levels Wizard open ready for measurements. At a minimum you will need to enter floor to floor measurements so PKNail software will know how 'tall' each wall should be based on the level you are surveying. You can also enter floor to ceiling measurements, and if you are entering drop ceilings you can input that measurement. PKNail can use this information in the future to place floor slabs and drop / (ACT)acoustical tile ceilings.</p>
	<p><b>Entering Data / Changing Level Names</b></p> <p>You can also change the name of levels directly in the wizard. Here we changed the top level to 'Roof'. Just double click on the level and enter any name you wish. You will also notice we have placed measurements for this floor.</p>
	<p><b>Typical Sill/Window Height</b></p> <p>Entering these typical measurements by floor allows you to place windows quickly and accurately. When entering this information beforehand it allows PKNail to enter this information automatically when surveying windows. It will also place windows at the correct height when copying features from floor to floor, discussed later in the manual. Here we entered sill/window height for the highlighted level, Level 01. To start just highlight the level and press the "Typical Window" button.</p>

## Adding/Surveying Walls / Windows / Doors

All features are based on measurements from a basepoint. When adding walls they are measured from wall to wall (inside corner) or edge to edge (outside corner), when measuring an outside corner you will have to affix a target to measure it. It is possible to get the length using a range finder mounted on a tripod and this will be discussed in a later section. When adding features to wall they are measured starting with their distance from a wall edge.

 <p>The screenshot shows the Autodesk Revit interface. The top ribbon includes 'Home', 'Insert', 'Annotate', 'Modify', and 'Massing &amp; Placement'. Below the ribbon, there are options for 'Survey Levels', 'Survey L-R', and 'Activate Wall'. The 'Project Browser' window is open, showing a tree view of the project structure. Under 'Views (all)', 'Floor Plans' is expanded, and 'Level 01' is selected, indicated by a red arrow. Other levels listed include Level 00, Level 02, Level 03, Level 04, Level 05, and Roof. Below the floor plans are '3D Views' and 'Elevations (Building Elevation)'.</p>	<p>Double Click in the Level you want survey in the Project Browser, usually located on the left hand of the screen. In this image Level 1 is highlighted. If the Floorplans by Level are not visible, you may need to click the '+' sign to expand the menu. After you double click the Level you are going to start the survey on you are ready to begin.</p> <p>You can begin your survey from either inside or outside the building. If you are starting in the exterior you can place all the wall and objects on the level you are surveying and then we will copy common walls up or down to levels below, such as a basement. At that time you can also copy windows that oriented directly above/below windows that you capture on the level you surveyed.</p>
 <p>The screenshot shows a dialog box titled 'Adding First Survey Wall'. The text inside reads: 'You are adding the first wall to this project. Before we begin, we must orient this wall properly. Please answer the following questions.' There are two dropdown menus: 'Are you outside or inside?' with 'Outside' selected, and 'What compass direction are YOU facing?' with 'North' selected. At the bottom are 'OK' and 'Cancel' buttons.</p>	<p>If this is the first wall you are adding the software will ask if this you are inside or outside as well as the compass direction of the 1<sup>st</sup> wall. If the compass direction is unknown, you can leave it at its default, 'North'. Do not worry if you do not have the compass direction, it will not affect the survey.</p>

## Adding Objects

Objects (Windows / Doors / Walls) will be added from the direction you are measuring. PKNail will add the next object based on its distance from its last known point / reference point. For example, if you are measuring/surveying **Left** → **Right** (clockwise) and have encountered an object you should measure from the closet edge of the object (door jamb/window frame/ etc.) back to last wall intersection to your left. If surveying/measuring from **Right** → **Left** (counterclockwise) then the inverse is true or measure from the edge of the feature closest to the right reference point. The software will always add a feature starting at the next objects closets point to the last known point.

In any case you can always add a feature from either side of the wall. Simply press the “feature” button, and if needed the direction button, that is you are measuring it in the Left -> Right Direction, press the Right Arrow Key, if you are measuring it from the Right\_> Left Direction press the Left Arrow Key. So it would be to press the ‘feature’ button, and then the direction button.



Please note that the right and left arrow keys, as denoted by their blue carats / “arrows” have different uses. If they are pressed first they will build a wall, if pressed after another feature button, such as build window, they will designate which reference point on the active wall you are measuring from. If you are continuously adding/building features in one direction, which is more common than not, PKNail will always assume you are adding features in the same direction so you only need to use ‘direction’ button when you change reference points.

## Feature Buttons



For example, you are in a room and have added a wall, however, because of an interference like a wall column, or bookcase, or simply because you can not get a clean laser shot to one end of the wall, you can move to the opposite end of the wall, press the feature button, and the change of direction button and start surveying objects from the opposite end. This beneficial not only in spaces with equipment and interferences between wall shots but also large spaces where it is more convenient to add features from either end of the wall.

## Sending Data

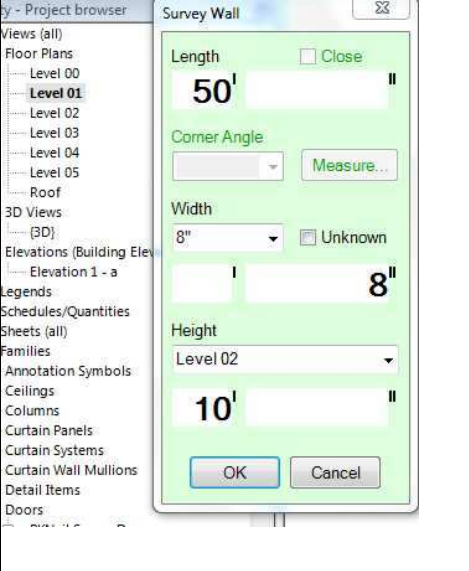





Anytime you press the Bluetooth button  on the Disto PKNail will enter that data and move to the next 'dialog' box. For example, after entering the distance of the object from the last reference point, PKNail is expecting to have the Width entered, after that the Height, etc. so you do not need to navigate between dialog boxes, just measure, enter using the Bluetooth button  and when you are ready to build that feature double tap the right arrow key.



PKNail will also use the last entered width of an object. For example, if you entered a 3' Wide Window last time, the dialog will enter 3' automatically unless you measure a different width. This is helpful when similar object are duplicated throughout a building.

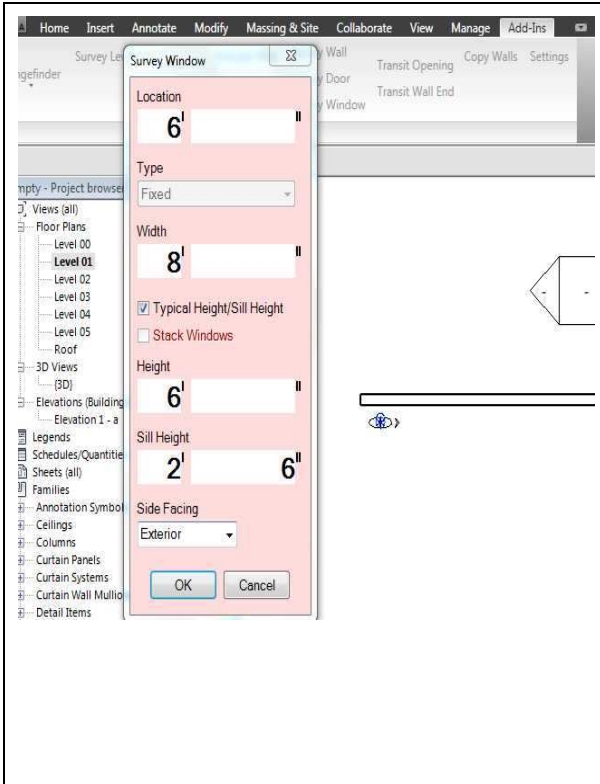
Additionally, if you have entered typical Window Height/Sill Height information this will be added automatically to the dialog as well.

## Add Wall

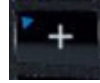
	<p>Press the Right Arrow on the Disto to open up the 'Add Wall Dialog' (See Image 1 at the beginning of this document for button description and navigation of the Disto.)</p> <p>By measuring a length of wall and pressing the  key on the Disto you can send the data wirelessly to our software. Notice we chose the height to the next level, Level 2 and the height has been defined by data we entered previously, of course, you can override the default data if you need to.</p> <p>Double tapping the right arrow will automatically build the wall with the data contained in this dialog. In this case, a wall 50' long, 8" thick and 10' high.</p>
	<p>When the wall is built you will note that a 'surveyor' oriented in the direction you are surveying and measuring is located on the wall. In this image his ready to measure the next feature moving left -&gt; right, however you can add features from either direction.</p>
	<p><b>Single Tap Build Wall from Left to Right</b>  <b>Double Tap – Builds Feature</b></p>
	<p><b>Single Tap - Build Wall from Right to Left</b>  <b>Double Tap – Cancels Current Command</b></p>
	<p>After the wall is put in, the surveyor then places architectural objects as he/she encounters them along the wall. The objects are placed via the end point of either side of the wall. Measuring from the beginning of a feature such as the window back to the basepoint and measure the width, (if using the wizard and typical height measurements the window will be placed with previously entered z axis information) otherwise measure sill height and height.</p>

## Add Window

Windows will be added from the direction you are measuring. For example, if you are measuring/surveying Left to Right, PKNail will add the next object based on a clockwise / left to right measurement. The software will always add a feature starting at the next objects closets point to the last reference point.



To add window tap the 'plus' key. You will also notice a small blue arrow that points up and the left.



Measure the distance from the wall where the window starts and automatically send it to the program by pressing the Bluetooth button.

The cursor will automatically move to the next field after entering data.

The first time measuring the width of a window this field will be blank. Otherwise, it will automatically keep the data of the last measured window. This is helpful in

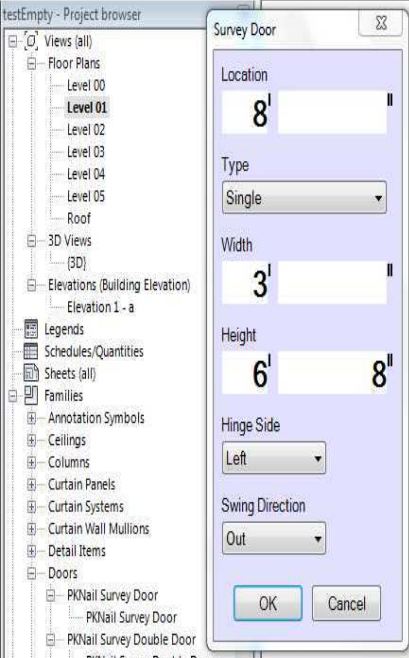





To change the direction you are adding a window, press the "+" button and then the direction button.



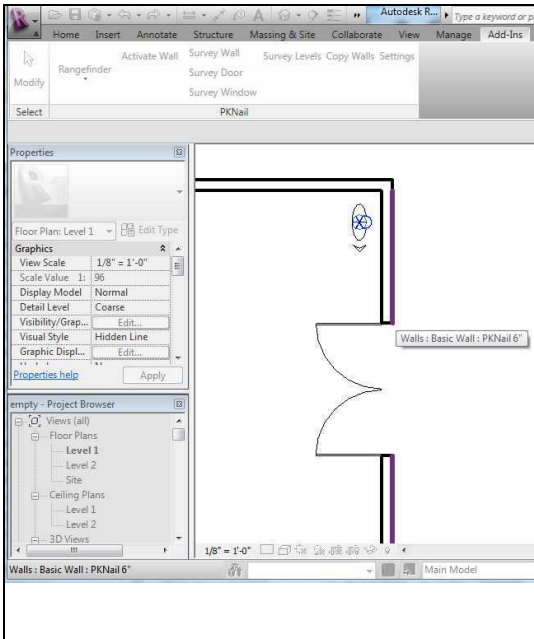
You can then measure the width, add the width by pressing the bluetooth button, and then double tap the right arrow key to build the window.

IF you entered Typical Height / Sill Height Information earlier PKNail has already filled in that information. You can always enter different data.

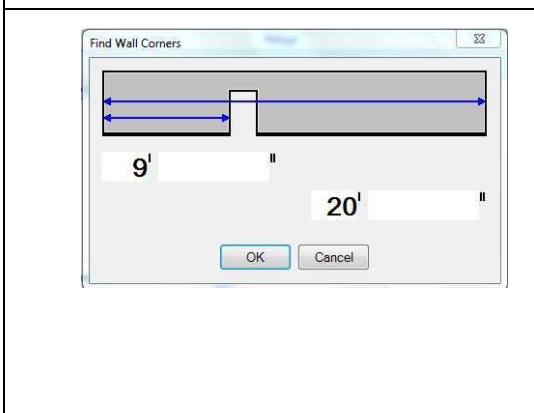
## Add Door

	<p>To add a door tap the 'minus' key.</p>  <p>If you are adding the door in the direction you are already measuring, enter the distance, select the type, enter width, height and choose swing direction/hinge side and when satisfied double click the right arrow key to build. To send any piece of numerical data press the Bluetooth key.</p> <p>Remember to send data, press the Bluetooth key.  To build a feature, double press the arrow key. </p>
	<p>You can then measure the distance from the wall where the door starts and automatically send it to the program by pressing the Bluetooth button </p> <p>You can then measure the width, add the width by pressing the bluetooth button, measure the height, press the Bluetooth button and then double tap the right arrow key to build the door.</p>

## Room to Room / Activate Wall



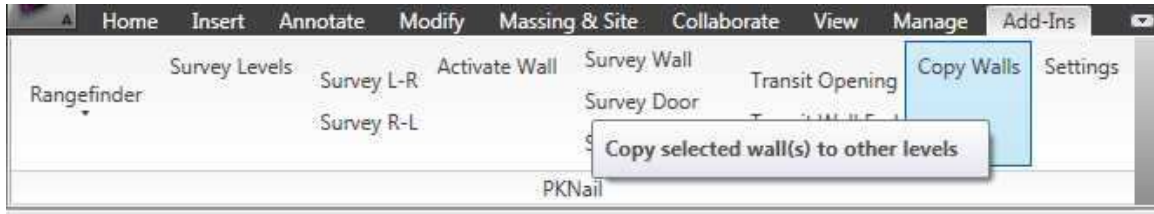
First select the side of the wall you want to be on and the location. You will notice that wall side 'highlights' purple'. When you have clicked the side, if there is an opening in the wall, PKNail will ask that you select the opening you are using to enter the room, more often than not, a door.<sup>1</sup>



A dialog will open asking you to find the wall corners or end points from the 'Opening' you chose and are passing through. It will default to the existing wall end points but new data can be entered. For example, if you have surveyed a single room and are passing into a long hallway, these measurements will be different and will extend the wall to the correct length so you can continue surveying and add features as needed.

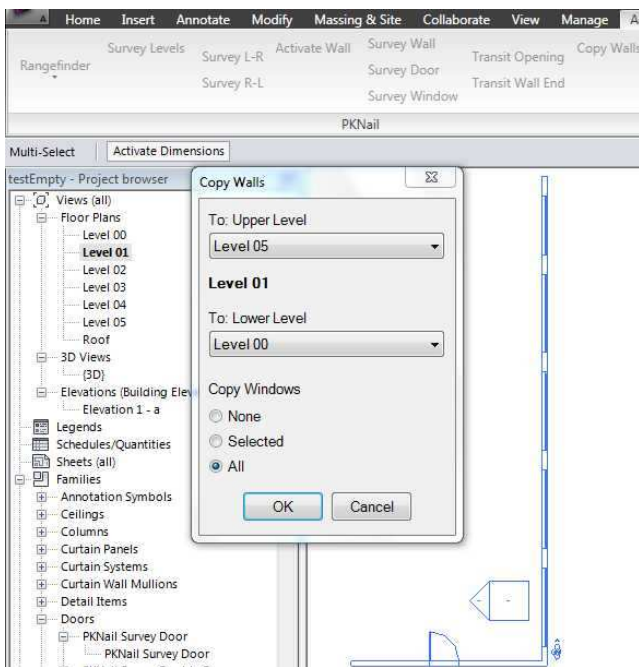
<sup>1</sup> Why do I need to choose a door/opening to go room to room? PKNail operates much the way a building surveyor walks a sight or surveys a building so expects you to take measurements when entering a new space to know the 'extents' of the wall when you place the 'surveyor' on it. And much like when moving from room to room, PKNail expects that you will use the door if there is one in the wall to go the next room. For most of us not named Spiderman, this is essentially true.

## Copy Walls / Windows

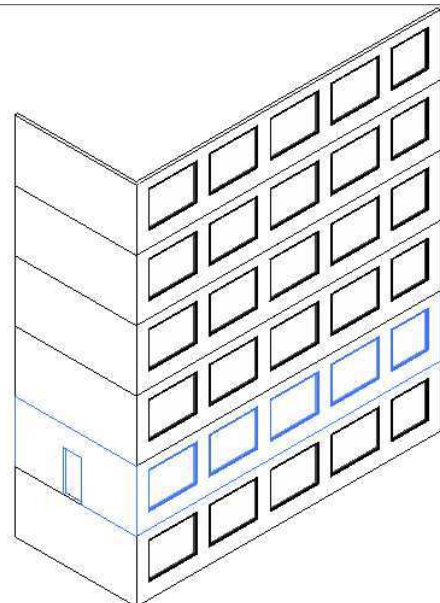
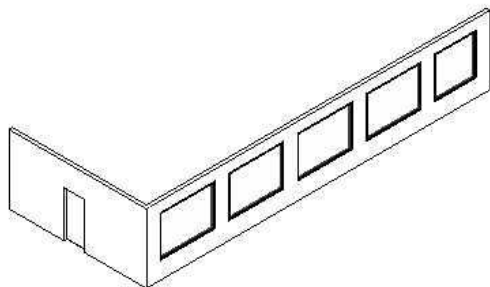


A convenient feature in PKNail is the ability to copy walls / windows from floor to floor. You can define the floors that you want to copy the walls to, and you can also choose the windows you want to copy from floor to floor. These windows will be placed directly above/below the corresponding window but can use the vertical dimensions that were defined by level earlier, if you had put them in.

First select the walls that you want to copy and then choose 'Copy Walls' in the PKNail 'Add ins' Dialog.



In this image you see the Copy Walls dialog open, and the walls that we selected to be copied. Since we started on Level 1 we can chose to go up to Level 5 or anywhere in between and also to copy walls below to the first level, Level 00. You can also choose to copy the windows from the selected walls. Either by selection or choose all. In this instance we selected all. You can see below that all the walls and windows were copied automatically.



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## ***Level to Level Surveying***

Once you have copied common walls from floor to floor, you can move to any Level in the building. For example, copying exterior walls to all the levels will allow the surveyor to move to an exterior wall (interior face) anywhere in the building. Other common walls include those typically surrounding vertical transportation cores, such as stair cores or elevators.

To start surveying on another Level, choose the Level or Floor from the Views Panel in Revit. After you have activated the view for the Level/Floor you want to survey, choose to Activate the Wall the from PKNail Add IN Dialog. PKNail will ask you to confirm the length of the wall that you are on. It may be the same, but more likely then not it will be different due to the differences in interior build outs. Measure the length and begin surveying.

## Surveying Angled Walls

There are two options available to you with the PKNail dialog to capture angled walls. "Close Room" and "Measure".

### Close Room

If you know that your other measurements are correct you can enable the 'close room' function in PKNail. If it is "grayed" out that mean the current geometry is not allowing you to use the function. However, when active you simply have to press the right arrow key once as soon as you activate the build wall dialog to enable it. PKNail will then calculate the length and angle to finish and close the room. Although it says close room you can use it in exterior circumstances to even close the envelope of the building.

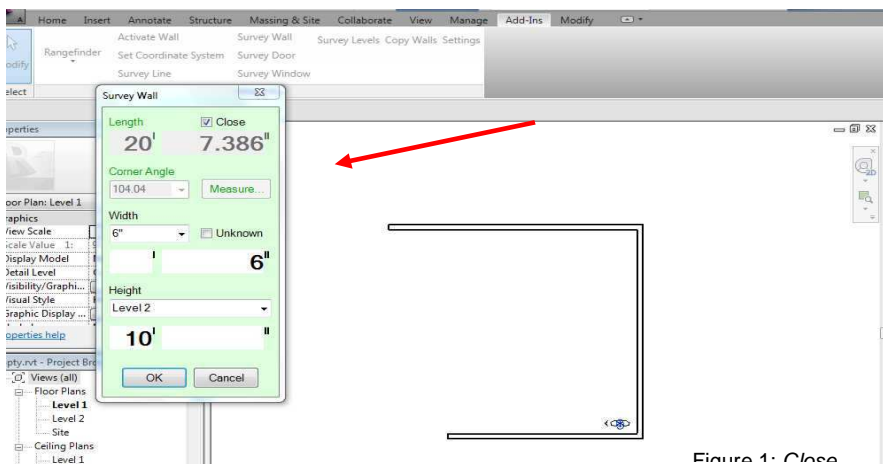


Figure 1: Close

In Figure 1: *Close Room* you can see that after the "Close" box is checked PKNail has created and auto-filled the Length and Angle in order to close the room.

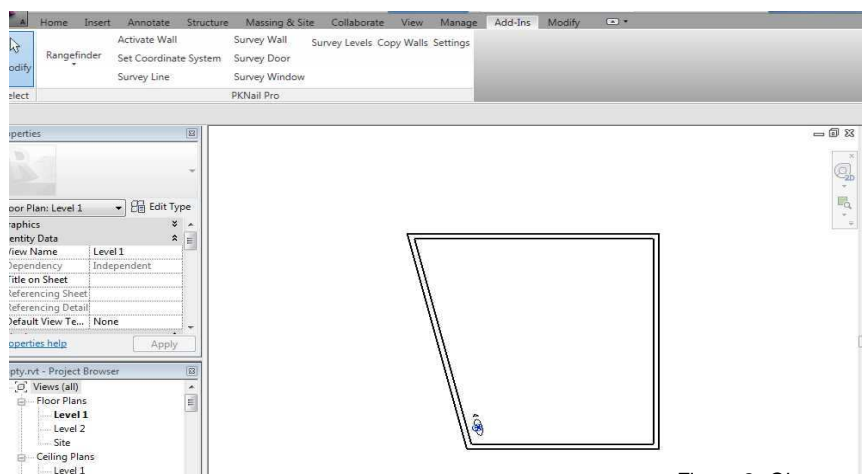
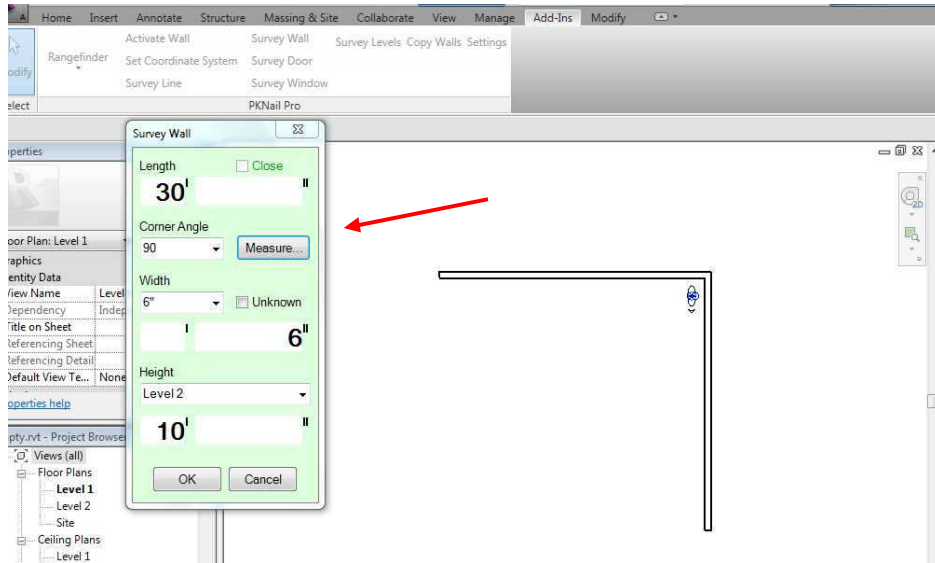


Figure 2: Close

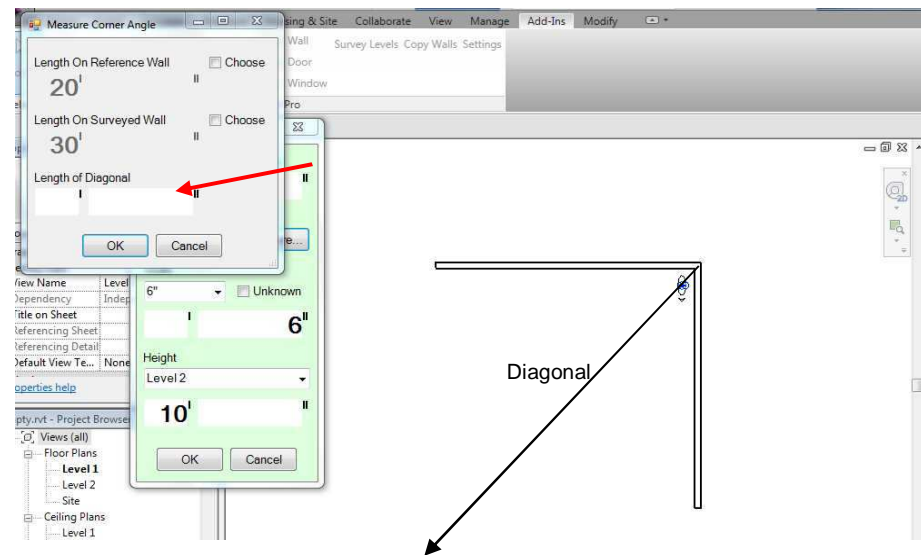
In Figure 2 : *Close Room* you'll see that PKNail has created the wall.

## Measure

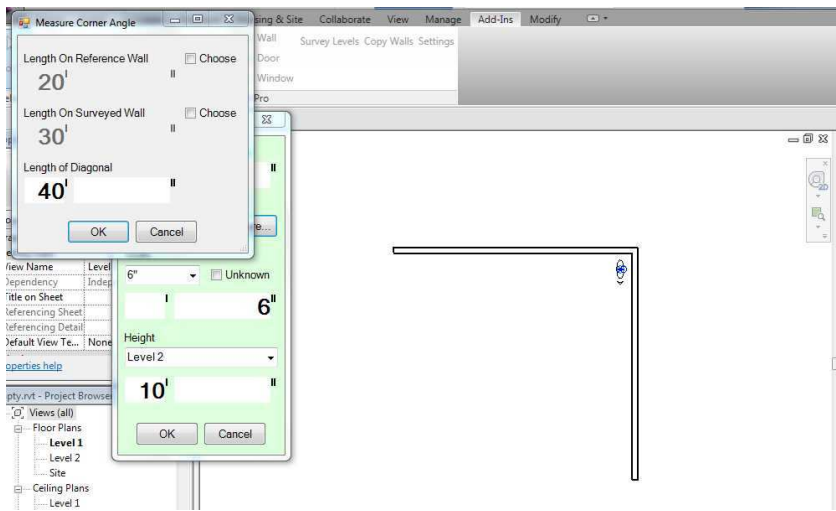
Measure can be used at any time to determine an angle.<sup>2</sup> It uses the two end points of an active wall to triangulate to the end of an angled wall. First, measure the length of the actual wall. Then activate or press the measure button.



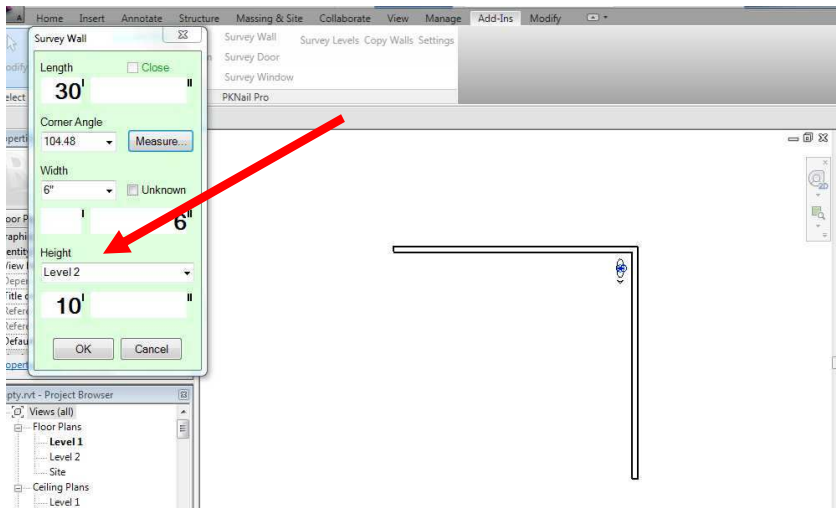
After pressing the measure button, the measure dialog button will appear, asking for the length of the diagonal. This measurement is taken from the beginning of the previous wall.



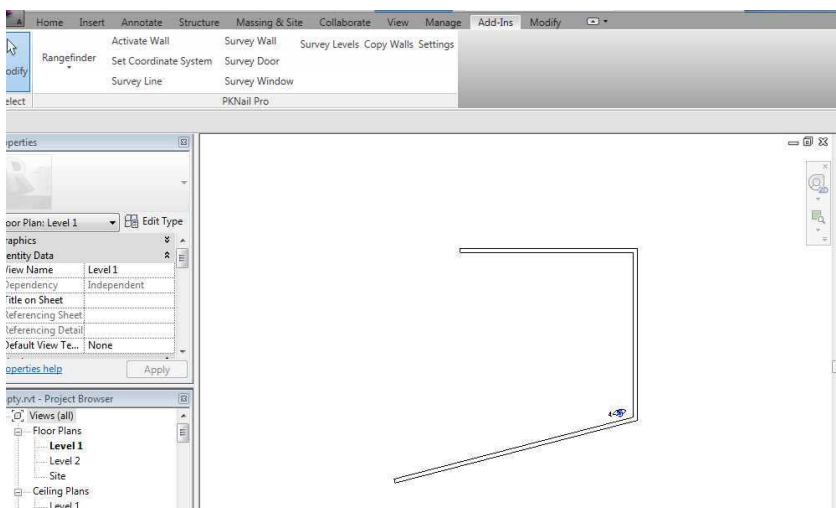
<sup>2</sup> In future release PKNail will be able to mark points for triangulation allowing a surveyor to mark any point within the model.



*Length of Diagonal Inputted to Measurement Box : Example – 40 Feet*



PKNail calculates the angle



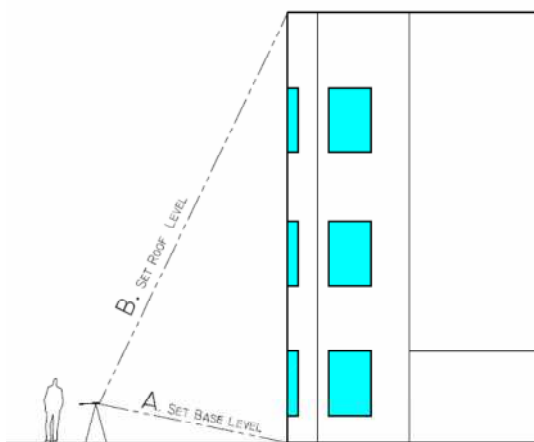
*The wall is 'built' utilizing the field information.*

## Exterior

While we will still use the Levels Wizard to set the levels the way we are viewing the building is differently. Instead of looking at walls and levels by floor we look at the building levels based on exterior features. Additionally, we will be using the Disto Laser Range Finder to assist in measuring above ground measurements.

In this instance we set the base level at the intersection of a concrete pad level with entrance to the building (Base Level) and Vertical face of the building. Setting the level at the intersection of a horizontal and vertical axis of the building allows us to easily measure features on the face of the building using the Disto. We set the measurement at the intersection and the digital angle finder on board lets the Disto to automatically calculate the distance to each level or feature on the façade the laser ‘hits.’

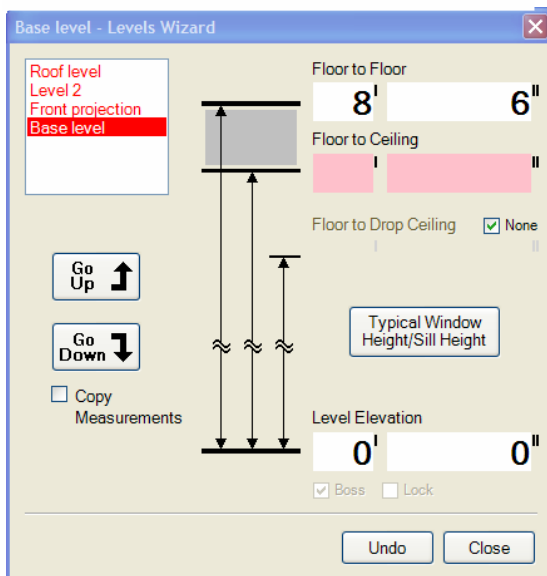
### Adding Levels - Exterior Work Flow



A. SET BASE LEVEL  
B. SHOOT/DETERMINE ROOF LEVEL

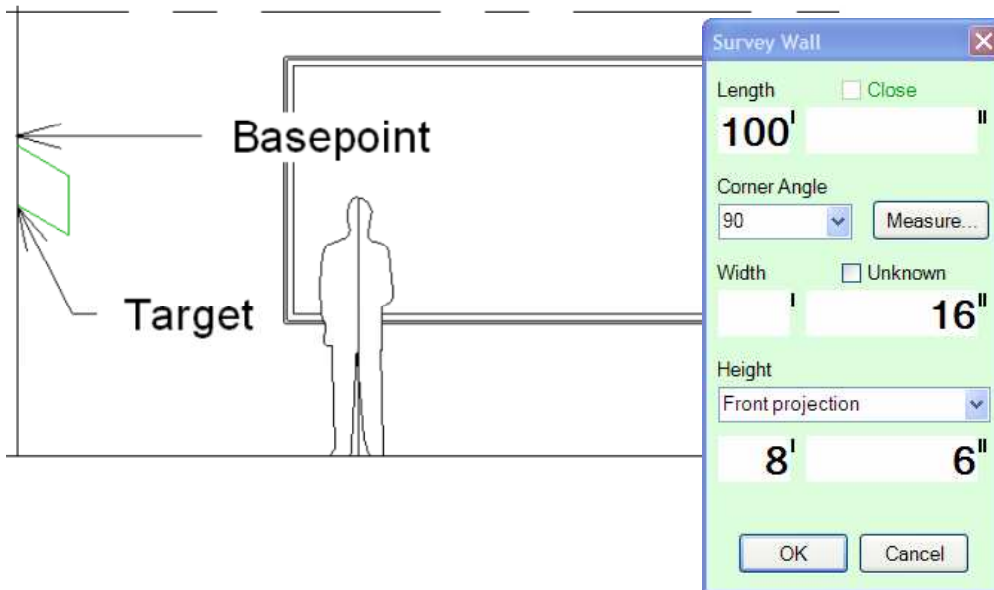
Using on board functionality of Disto D8, the surveyor sets a ‘Base Level’ and measures each relevant point from ‘base’ to enter into the Levels Wizard of PKNail.

While the dialog is the same as the ‘Whole Building’ work flow instead of capturing levels as floors, we’ll be capturing levels of exterior features, such as the base point / ground floor and roof level, as well as any other distinctive features and/or architectural features on the facades, such as a bay window, overhang, or the like.

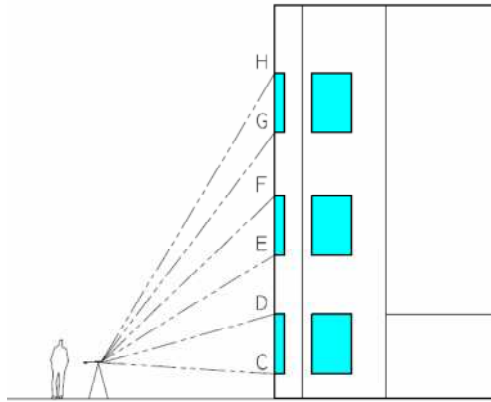


## Adding Walls – Exterior

Once the vertical information is set the surveyor is then ready to start the 'shell' of the building and determine the x/y or horizontal information. On outside corners the surveyors affixes a target. While any rigid flat surface can normally suffice we used the recommended target provided by Leica that has a reflective surface that extends the useable range of the rangefinder and illuminates the laser 'dot' at distance. This was affixed with painter's tape that easily releases from a surface and leaves no mark after removed. The surveyor then measures the length of the building.



## Typical Windows (Vertical Information) Exterior Workflow



C. SHOOT SILL 1 : D. SHOOT HEAD 1  
 E. SHOOT SILL 2 : F. SHOOT HEAD 2  
 E. SHOOT SILL 3 : F. SHOOT HEAD 3

**Survey Window**

Location  
 31' 10 3/8"

Width  
 12' 4"

Typical Height/Sill Height  
 Stack Windows

Height  
 6"

Sill Height  
 2' 6"

Side Facing  
 Exterior

OK Cancel

## ***Surveying Techniques***

**Adding 180 Degree Wall**

**Adding 180 Degree Wall with Inset**

**Mark Points by Triangulation**

**Placing Objects from either side**

**Activating Surveyor**

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**Appendix A : Disto Functions**

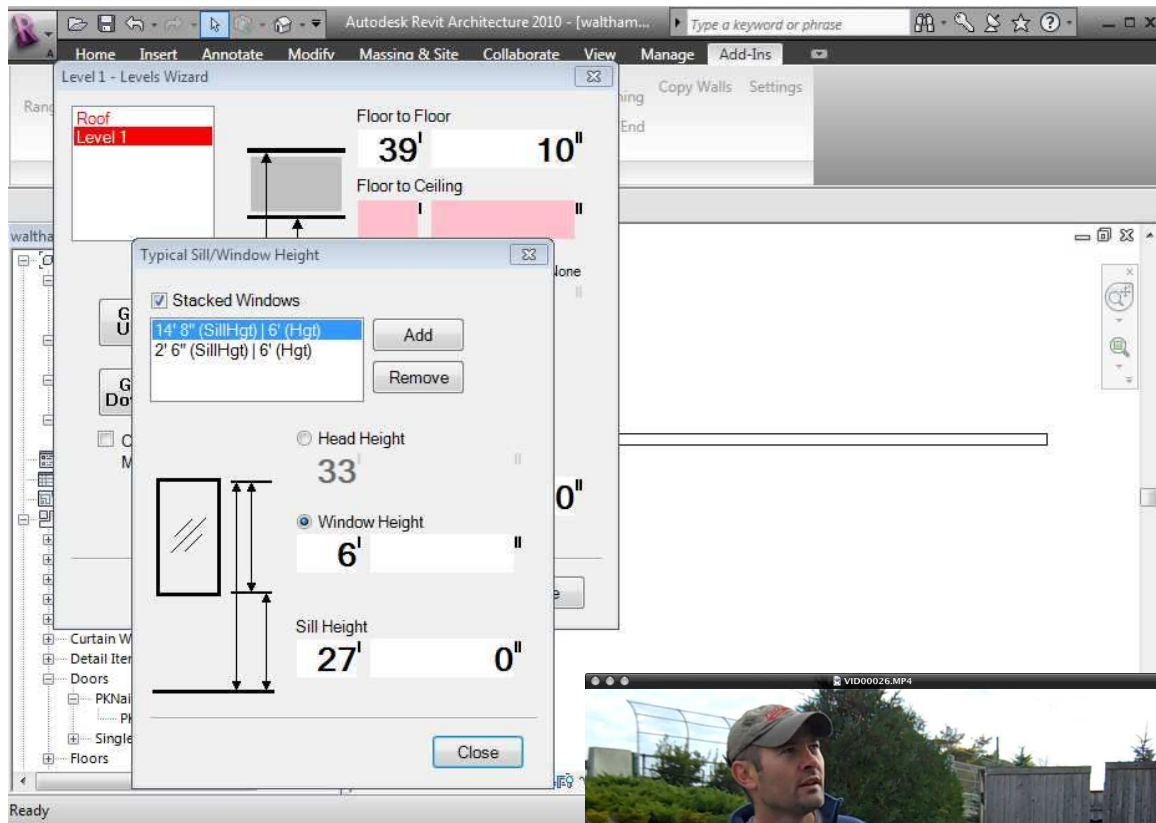


Measuring Points on Vertical Face

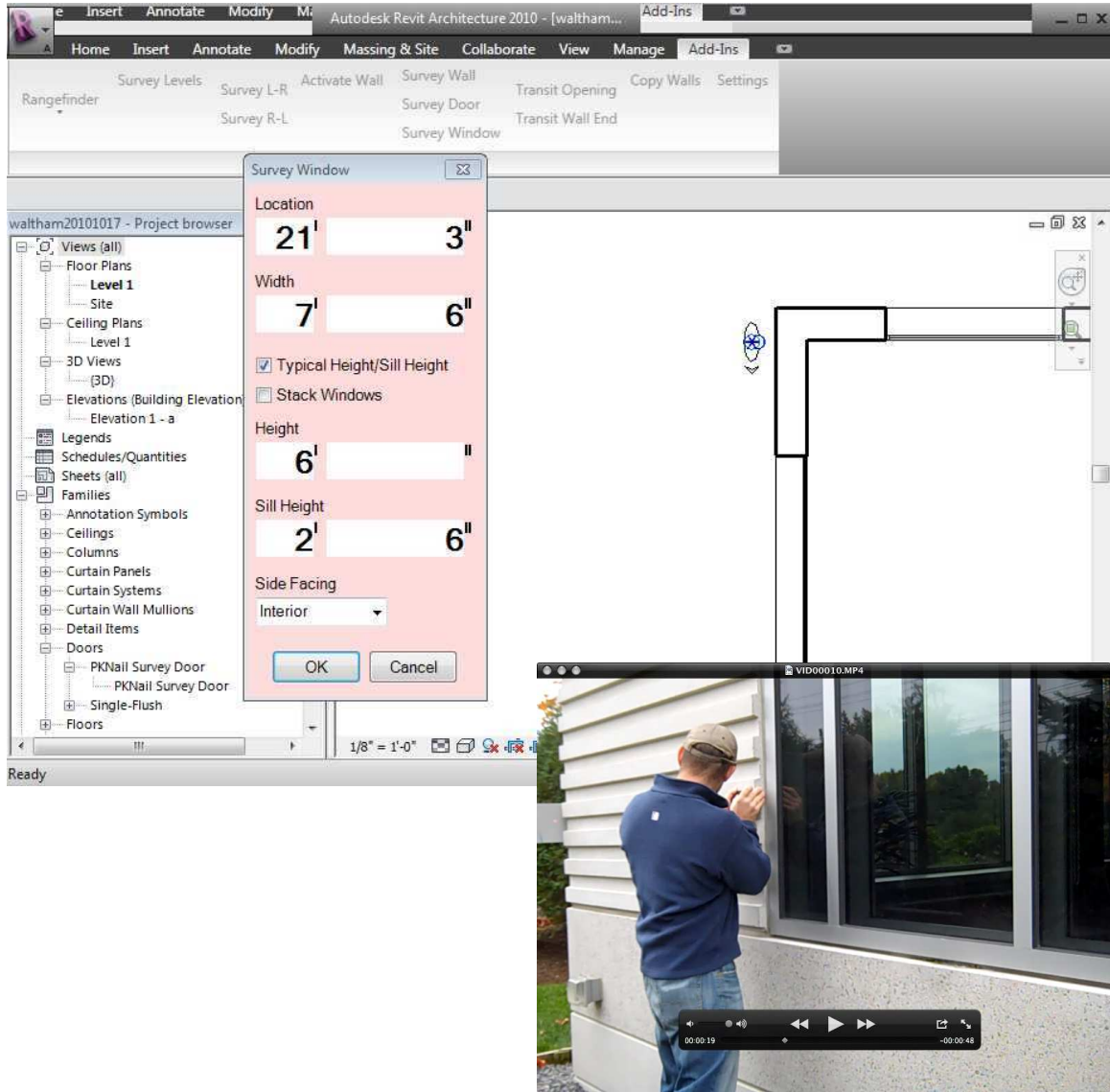
## Appendix B

### Screen Shots

#### Add Levels / Exterior



## Add Window



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Notes:

Typical window sill heights/heights or sill height/head heights are put into the model. This allows the surveyor to automate the entry of height information on each level. Additionally, it automates the placement of windows on each level where windows are stacked on each level. For example, if a building has 6 levels, with stacked windows on all 6 levels, once the surveyor enters the vertical/z axis information for each window, its sill height etc, when the surveyor places each typical windows x/y or horizontal measurements it is replicated across the face of the building where indicated.