

1- Measurements, Quantities & Pricing

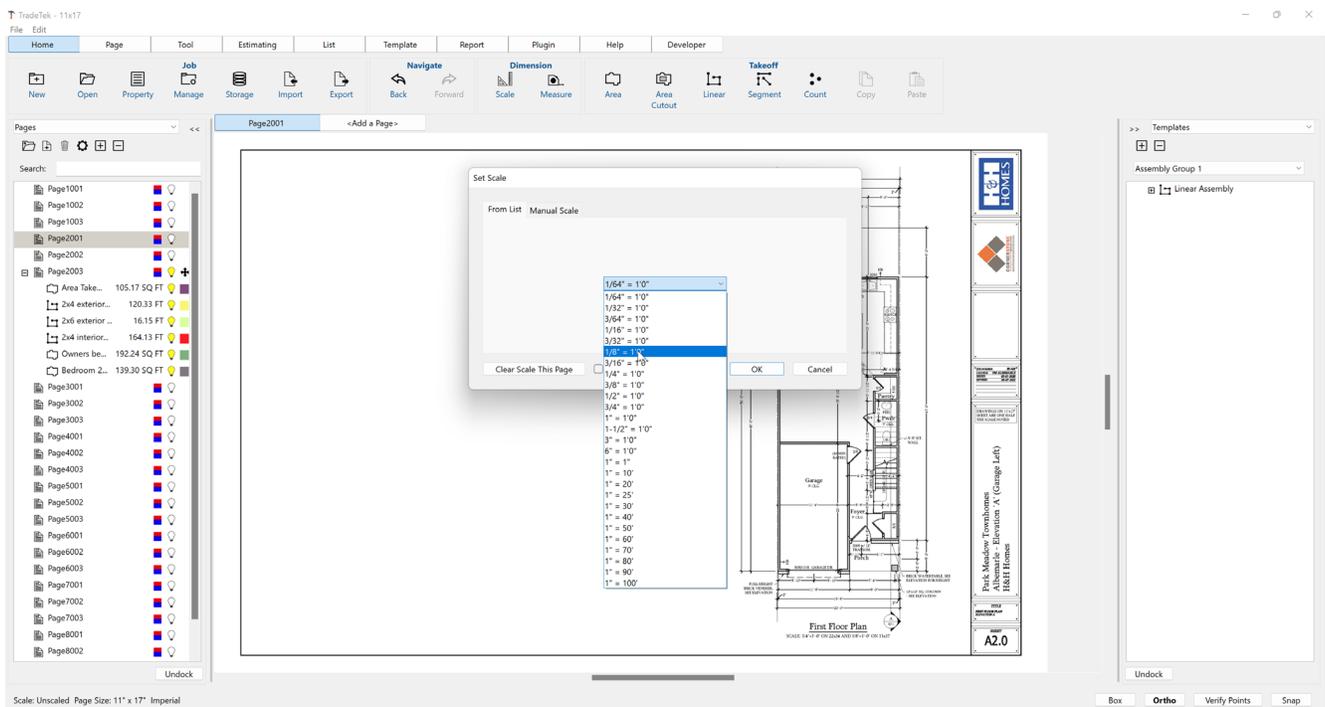
Although there are many different trades in the construction industry that all have their own unique attributes, the pre-construction process of generating a bid for a potential project regardless of your trade is typically very similar. The ability to generate accurate project cost estimates to submit quality bids for potential projects is vitally important for every construction company and is one of the key components that will determine its overall success.

The first step in generating an estimate for a potential project is performing the appropriate takeoff for the work that you will be performing. The word takeoff typically represents the process of measuring areas of work that you will either be applying pricing to directly or indirectly by generating material, labor, and other quantities from the measurements, then applying pricing to those line items.

In the past, takeoffs were performed by using printed sets of plans that an estimator would measure by using a scale (a type of ruler) to measure areas of work. They would typically use several different colors of highlighters to mark the page once a measurement was obtained for a specific area, then all the measurements would be written down on a note pad. If those measurements needed to be converted to material, labor, or other quantities, all those calculations would be performed by hand with a calculator. Obviously, this process was very tedious, time consuming and prone to human error.

Today there are software applications that make the estimating process for construction companies much faster and more accurate. In this book, we will be using a modern takeoff & estimating software application to demonstrate how to perform digital takeoffs, generate line items with quantities and pricing, and generate multiple reports that are necessary to create a successful estimating process.

To be able to perform your takeoff in the software, you will need a digital copy of the plans for the project. Typically, these files will come in the form of PDF files. The plan files will be imported into the new job that you have created in the software. Once the scale is set on each page, you are now ready to begin the takeoff process in the software (see below).



2- Takeoff Types & Properties

There are four takeoff measurement types that are used to generate measurements and quantities from: linear, segment, area, and count. Linear generates a linear foot measurement with multiple segments between points per section. Segment generates a linear foot measurement but only contains 2 points and one segment per section. Area generates a square feet measurement and contains multiple points around the perimeter of the measured area and count simply generates a count of items.

Each of the four takeoff measurement types has its own takeoff tool in the software. Each takeoff tool allows you to launch it and perform a digital takeoff over the plan page. The tools measure as you perform the takeoff and highlight the area with a color as you go. Each takeoff tool has measurement properties that it records related to each type of takeoff measurement that can be useful to you in various calculation formulas. Custom properties can be added to each takeoff tool that will add efficiency to your process.

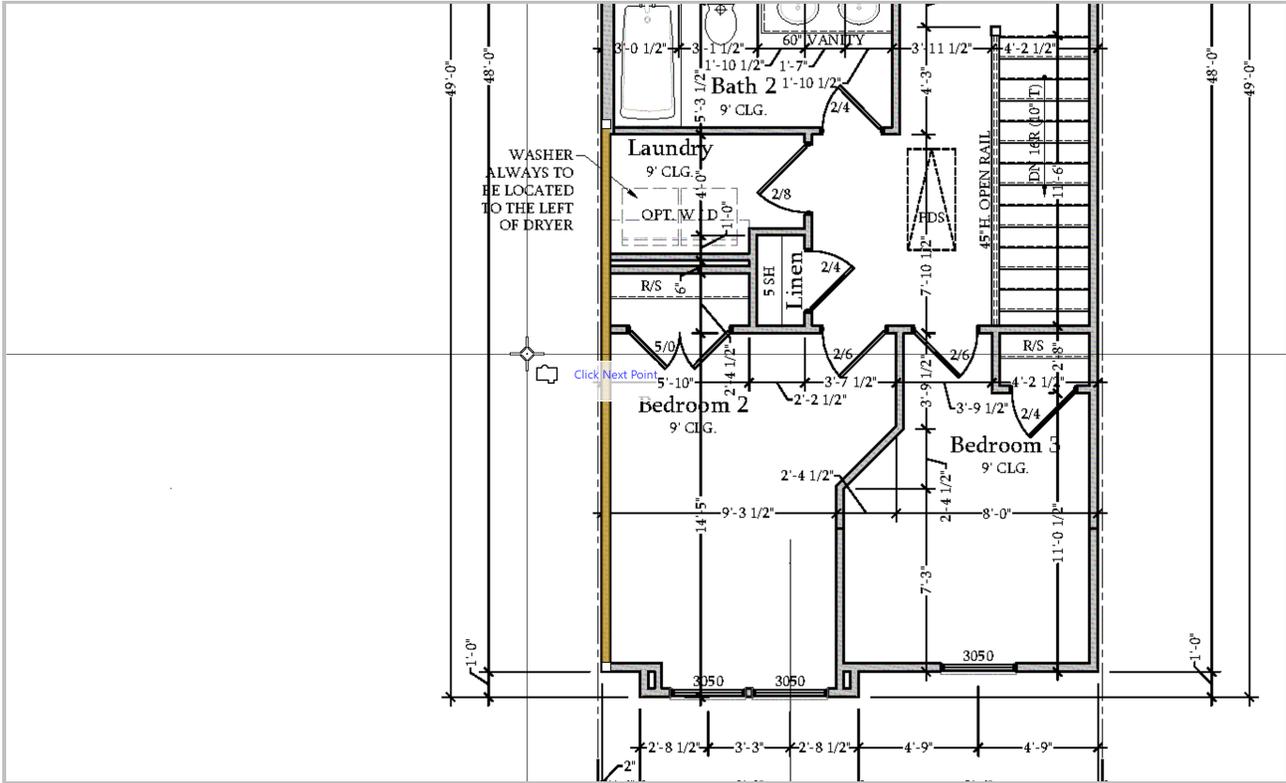
Most takeoffs will be performed on the floor plans, elevation plans, and roof plans of the project plan set. Floor plans are an overhead view of a floor level in a building (*on a 1 level building, imagine removing the roof and ceiling and looking down at the tops of all the walls and floor area*). Elevation plans show the exterior view of the building, as if you were standing outside looking at one side of the building. Roof plans are an overhead view of the roof of the building, looking straight down at it. When takeoffs are performed on a roof plan, the appropriate roof pitch factor must be applied to the measurements and are determined by the roof pitches (thankfully, the software takes care of this for us). When thinking about the approach of how you are going to perform each part of the required takeoff, it's important to decide which plan pages that you will perform the takeoff on to most accurately capture the measurements that you need.

For example, a painting contractor may need to determine the total square foot area of exterior wall surface on a building to be painted. One approach would be to use the Area takeoff tool and perform a takeoff of all wall areas shown on all of the applicable elevation plan pages. Keep in mind, with most buildings there are inset exterior walls who's surface areas are not shown on the elevation pages. Another approach would be to add a "Wall Height" property to the Linear takeoff tool and perform a linear feet takeoff of all the exterior walls from the applicable floor plan pages. A takeoff quantity formula can be set up that would take the wall height in feet that you enter for the "Wall Height" property value and multiply times the linear feet measurement generated from the linear takeoff that was just performed. The quantity formula result would be the total wall area that you were able to determine by performing a linear takeoff rather than an area takeoff. The work that you are performing as well as personal preference will factor into the decision making process on how you want to set up the software tools to perform the different types of takeoffs that you will be tasked with.

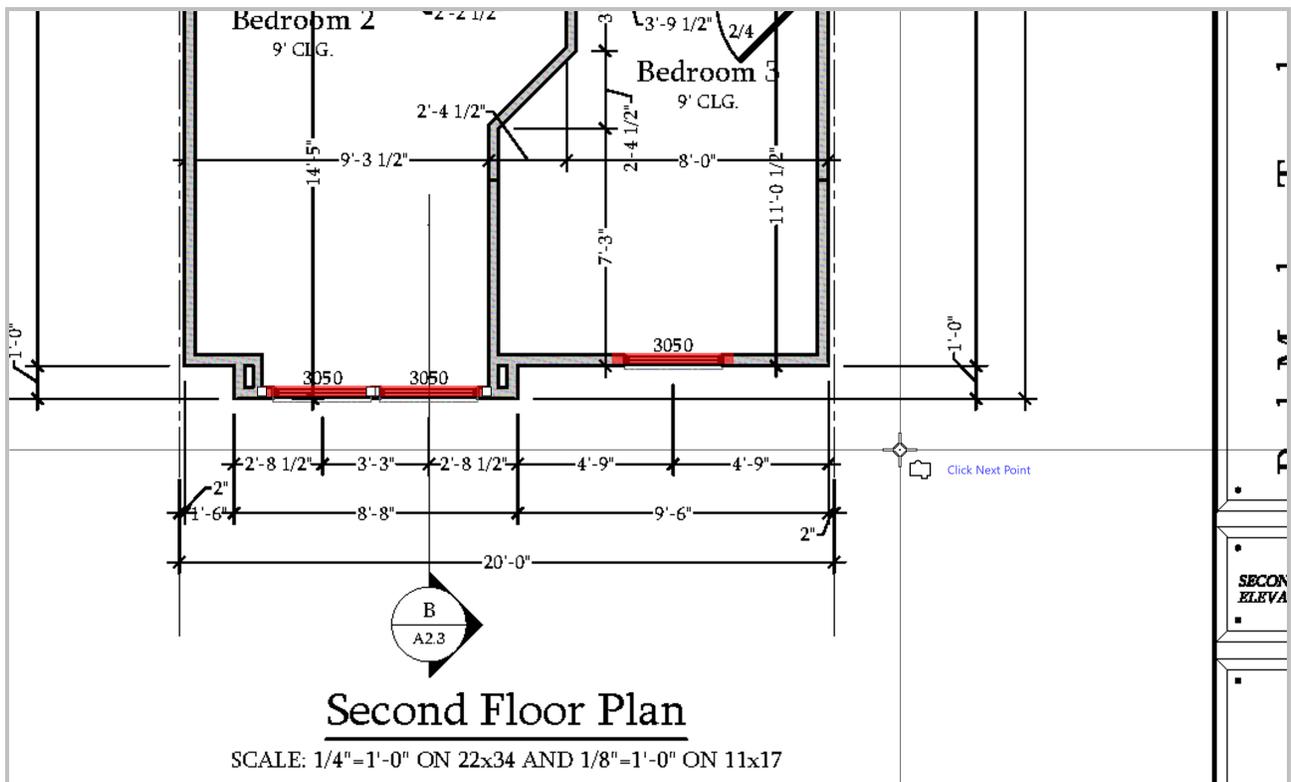
Often, it will make sense to set up more than one takeoff tool to perform takeoffs for the same item. In the examples above, it might make more sense for one project to use the area takeoff tool on the elevation pages to measure the total wall area, and for another project it might be more accurate to use the linear takeoff tool with the "Wall Height" property to determine the total wall area. Setting up your takeoff tools ahead of time will save you time on each takeoff that you perform with those tools from that point forward.

Prior to starting the takeoff of a project, it's important to think about how you want to organize the takeoff overall. Most often, depending on the type of work that you are doing you will want to organize the takeoff by building, level, area, room or maybe CSI (Construction Specifications Institute) division. You may also want to have nested levels of grouping to organize your takeoffs most accurately. You can add nested folders in the takeoff software that will organize your takeoff items by folder name. For example, you may have a "Kitchen" folder that's inside of a "Level 1" folder that's inside of a "Building 1" folder. You can also add properties to the folders in the software whose values can be inherited by all the takeoff items inside of that folder.

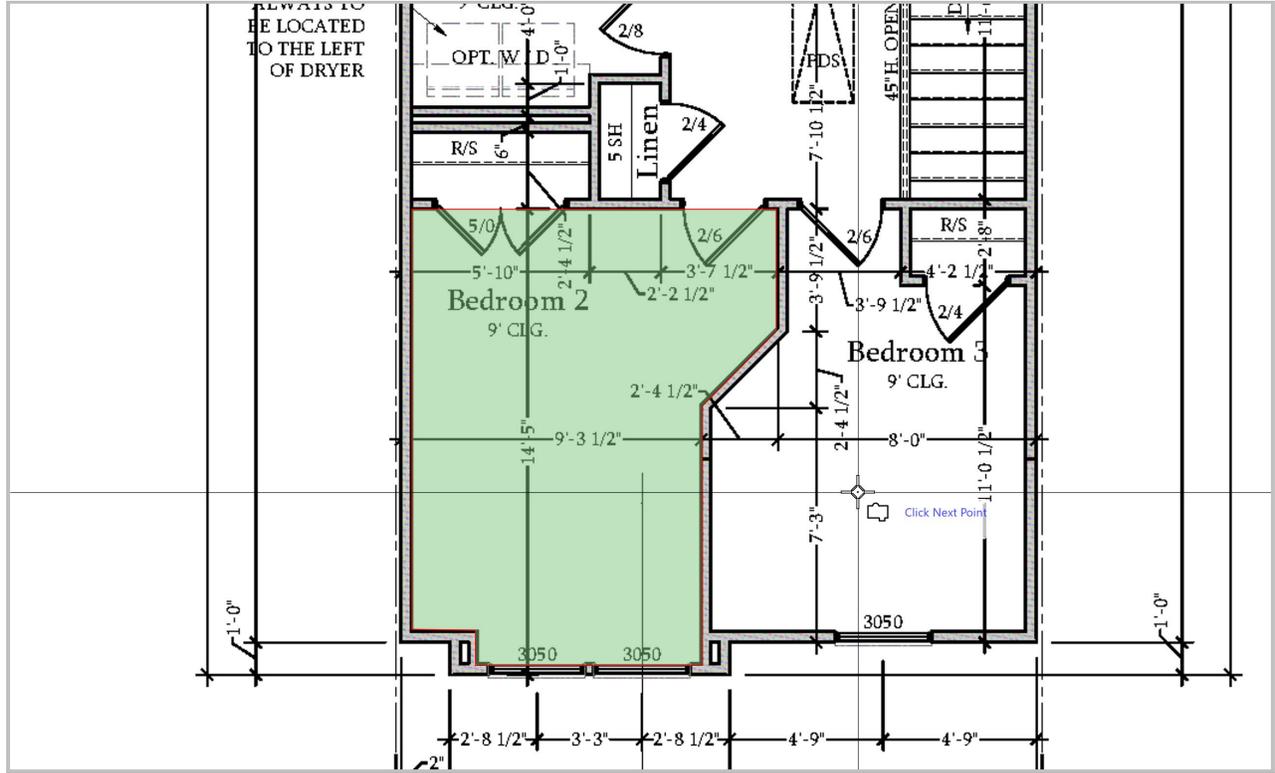
Linear Takeoff Example



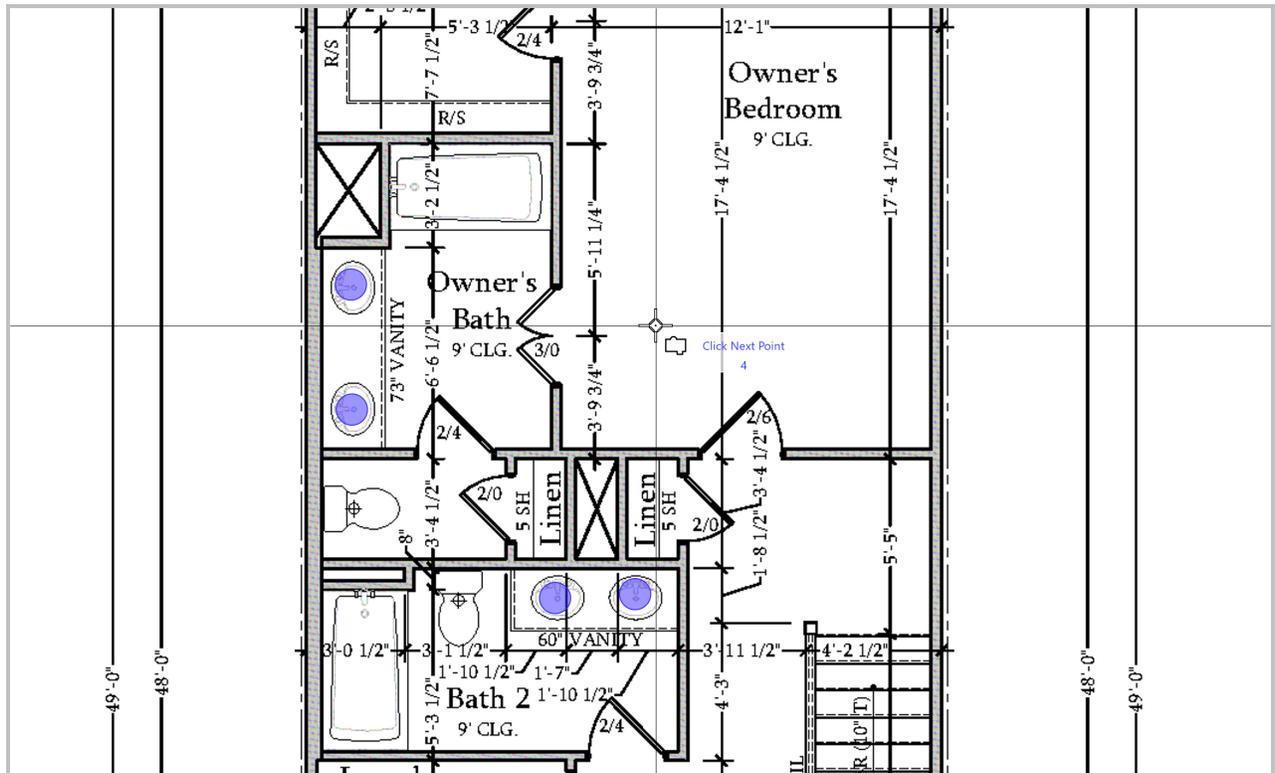
Segment Takeoff Example



Area Takeoff Example



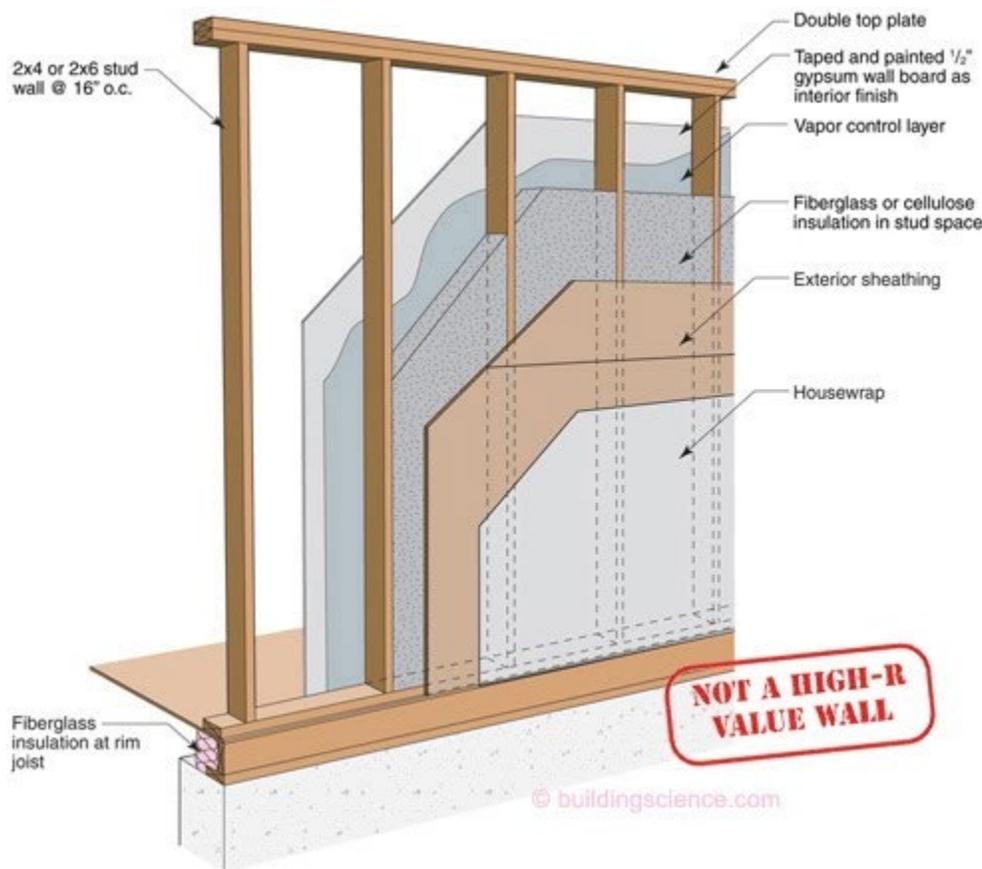
Point Count Takeoff Example



3- Assemblies and Sub-Items

The fastest way to perform most takeoffs is by utilizing assemblies. In the context of takeoff software, an assembly is created from one of the main takeoff tool types, but also contains sub-items or parts. This allows you to generate quantities for as many different items as needed related to a single takeoff. For example, a framing contractor might create a linear wall framing assembly that will allow them to perform linear wall takeoffs from floor plans. They could add several sub-items to that assembly, each one representing an item that is part of the process of building that wall, all with their own unique set of user added properties. In the software that we are using for demonstration, you can also add database lists that each assembly sub-item can be connected to, so that if you update pricing in your lists for example, the updated data filters through to your sub-items (we'll discuss lists in the next chapter).

In the linear wall framing assembly example above, the framing contractor might add wall studs, top plates, bottom plates, horizontal blocking, wall sheathing, house wrap and framing labor sub-items. The image below is a visual example of a wall assembly:

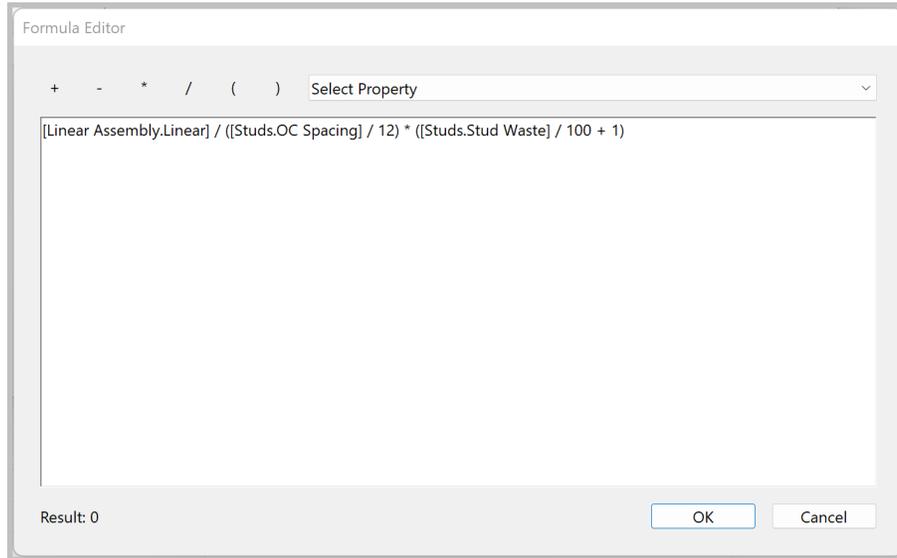


Each sub-item will have its own formula to calculate the quantities based on the linear feet measurement generated from the takeoff. Each sub-item can have its own group of properties whose values can be referenced in the quantity calculation. For example, the wall studs sub-item may have user added properties like "O.C. Spacing" and "Stud Waste %" whose values can be changed from one takeoff to the next. In this example, one linear takeoff will generate quantities for eight different items simultaneously.

Assemblies can be set up and stored in the software so that they are ready to use for all your takeoffs from that point forward. This allows you to configure your assemblies exactly the way that you want them ahead of time. Having these assemblies ready to go will help you to complete takeoffs faster. Having pre-built assemblies also helps to ensure that you don't forget something at takeoff time. Any sub-items that exist in an assembly that you don't need for a particular takeoff can be turned off and will not be included in that takeoff. So, you can create assemblies with everything that

you could possibly need to capture for that takeoff item and simply turn off the items that you don't need from one takeoff to the next.

In the software used for this text, quantity calculations are written from left to right in a linear fashion and utilize the standard order of operations, much like writing a formula in Microsoft Excel. The formula editor in the software makes it simple to write equations because it allows you to select property values from a drop-down list to insert into the equation. A quantity calculation typically consists of multiple property values with operators in between. Below is an example of a quantity calculation to determine the quantity of studs needed in a wall:



While this might seem complicated at first, within a short amount of time of using the software you'll be able to easily write complex formulas to accurately calculate the quantities for all your items.

Below is an image of the wall framing assembly from the example above with all its sub-items:

Set Default Property		Assembly Group	Assembly Group 1
Name	Description	Cost Each	
[-] [+] Exterior Wall Framing Assembly			
[-] 2X4 104-5/8 SPF STUD GRADE	Studs	5.48	
[-] 2X4 12' SPF #2&BTR	Top Plates	7.35	
[-] 2X4 12' P.TREATED SYP #2&BTR	Bottom Plates	9.88	
[-] 2X4 12' SPF #2&BTR	Horizontal Blocking	7.35	
[-] 7/16" 4'x8' OSB	Wall Sheathing	7.35	
[-] 10'x100' Tyvek Housewrap	House Wrap	185.00	
[-] Wall Labor per LF	Wall Labor	3.75	

Below is an image of the **Studs** tab in the wall framing assembly showing the properties used in its quantity calculation:

Linear Assembly

Info Takeoff **Sub Item** Studs Rename Delete

Name 2X4 104-5/8 SPF STUD GRADE Units ea

Quantity [Exterior Wall Framing Assembly.Linear ...] 0.00 Color

Type Material Off

Description Studs ...

Cost Each 5.48 ...

OC Spacing 16 ...

Stud Waste 20 ...

Add Property Add Sub-Item Connect To List

Refresh OK Cancel

Once you have created a new assembly, added all the necessary sub-items, sub-item properties and sub-item quantity calculations you're ready to use the assembly in a takeoff. In the wall framing assembly dialog above, to the right of the **Sub Item** tab is shown the sub-item that is currently displayed (**Studs** is displayed). Here, you can change the values of properties if needed for the particular takeoff that you are getting ready to perform. If you don't need this sub-item included in this takeoff instance, check the **Off** check box and the sub-item will be turned off in the assembly.

Below is an example of the assembly being used to perform an exterior wall takeoff:

Estimating

Page2001 <Add a Page>

Search:

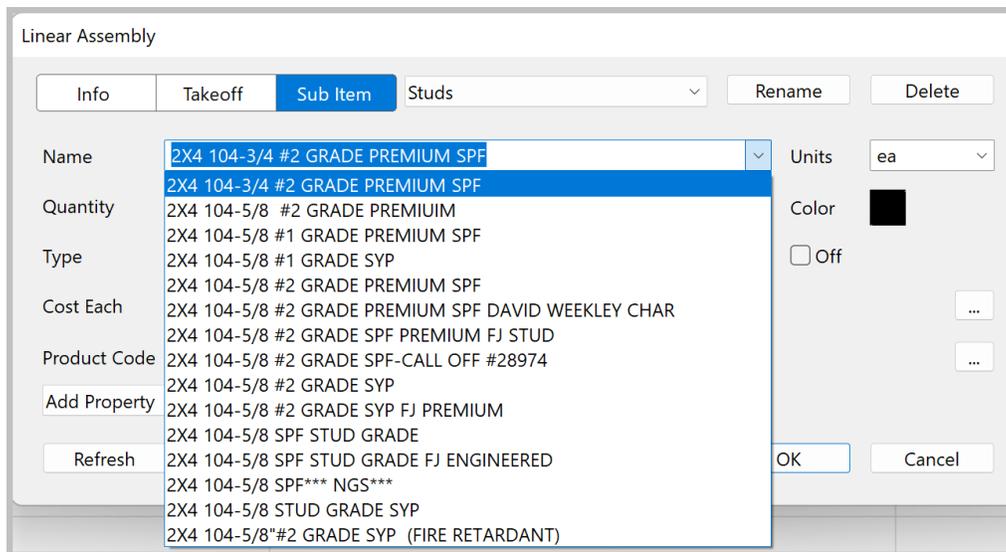
Exterior Wall Framing Assembl...	134.26 FT	🔦	🔴
2X4 104-5/8 SPF STUD GRADE	9 ea		
2X4 12' SPF #2&BTR	23 ea		
2X4 12' P.TREATED SYP #2&BTR	12 ea		
2X4 12' SPF #2&BTR	23 ea		
7/16" 4'x8' OSB	38 ea		
10'x100' Tyvek Housewrap	1.21 ea		
Wall Labor per LF	135 ea		

4- Lists

Most companies that are bidding on a project will develop their bid pricing by using a database of items and costs. In the software used for this text, lists can be created with multiple columns which allow you to set up a database in the software that assembly sub-items can be connected to. A typical list may have a “Name” column displaying the item name in each row, a “Cost Each” column containing the cost for each item, a “Units” column displaying the unit of measure for each item and possibly a “Product Code” or “Item Number” column. You can also create an external list that is imported into the software from an outside source CSV, Excel or other database file that remains linked to that file. When updates are made in the source file, the list in the software is also updated.

In the past, once a list of items with quantities was generated for a bid, the estimator would have to manually find each item in the database list to get the cost, then input the appropriate cost into each line item. Obviously, this would get very time consuming, especially on large projects. One of the most advanced features of this software is the ability to connect assembly sub-items to a list. Once a sub-item is connected to a list, when a new item is selected from the list, all the desired values for that item from the list are updated in the sub-item such as its “Cost Each” value or “Product Code” value. This automates the process of matching the item with its cost, product code, item number or any other value that you need updated for each item. With those updated property values in the sub-items, calculations including those values can be performed automatically, displayed in reports or can be included in calculations at the report level.

The images below show an assembly with a sub-item connected to the “Name” column of a list. When the desired item is selected from the “Name” column, any property values that have been added to the sub-item that match a column name will automatically be updated from the list:



Linear Assembly

Info Takeoff **Sub Item** Studs Rename Delete

Name 2X4 104-3/4 #2 GRADE PREMIUM SPF Units ea

Quantity 0 ... 0.00 Color

Type Material Off

Cost Each 7.25 ...

Product Code 2041047501PS ...

Add Property Add Sub-Item Connect To List

Refresh OK Cancel

The image below shows a portion of a database list in the List tab of the takeoff software:

Row	Name	Units	Cost Each	Product Code
1	2X12 10' P.TREATED SYP #1&BTR	ea	10.99	21210051
2	10x10 10' P.TREATED #2	ea	0	10101005
3	10x10 10' SYP #2	ea	0	10101003
4	12x12 10' P. TREATED #2 SYP	ea	0	12121005
5	1X2 SYP PT LF	lf	0	10205
6	1X6 SYNERGY T&G NICKEL GAP #2 PO...	lf	3.25	106S
7	1X6 SYNERGY T&G V-JOINT#2 SOUTHE...	lf	0.38	106SV
8	2X10 8' FIRE RETARDANT #2&BTR	ea	16	2100809
9	2X10 8' M-29 PREMIUM JOIST	ea	10.3133	21008M29
10	2X10 8' SPF/HF #2&BTR	ea	15.2	2100801
11	2X10 8' SYP #1	ea	25.6	21008031
12	2X10 8' SYP #2&BTR	ea	10.66	2100803
13	2X10 8' SYP #3#3#3#3	ea	7.92	2100803#3
14	2X10 10' FIRE RETARDANT #1&BTR	ea	15.38	21010091
15	2X10 10' FIRE RETARDANT #2&BTR	ea	15.38	2101009
16	2X10 10' M-29 PREMIUM JOIST	ea	11.3269	21010M29

5- Reports

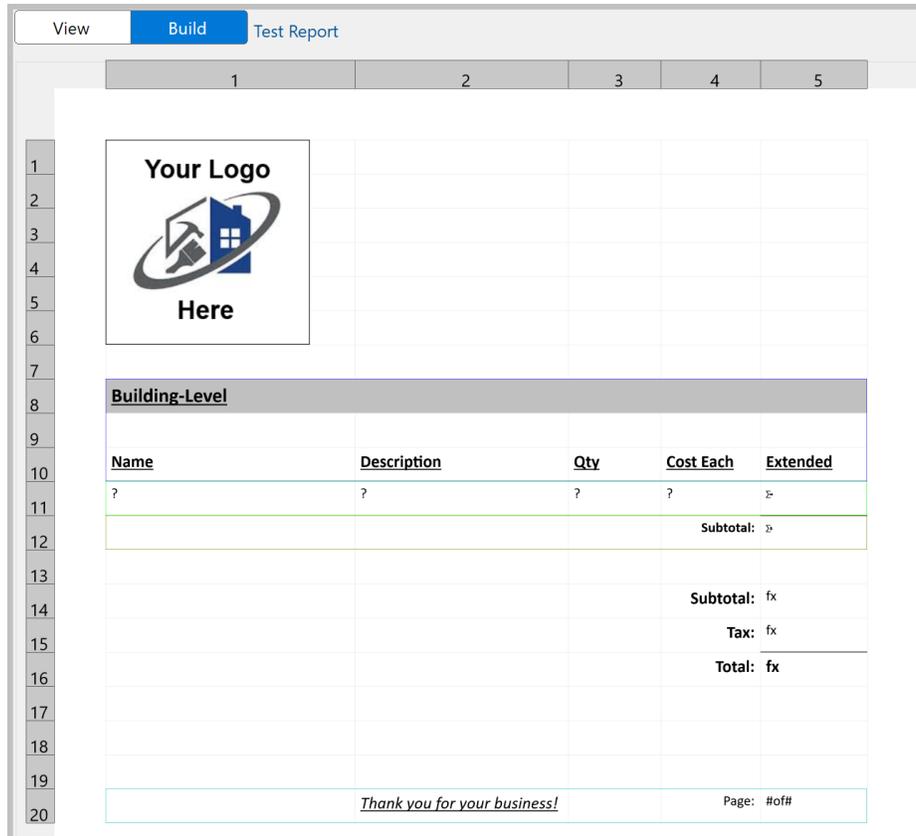
Generating takeoff reports is the final step in the estimating process. As with the previous steps, without modern takeoff and estimating software this process can be very time consuming. Most estimators have created Microsoft Excel workbooks over the years that allow them to input their takeoff measurements and the formulas that they have created will generate the item quantities. Depending on the reporting requirements, they might also have to create separate Excel or Word report documents for internal use or to send out to vendors or customers.

Thankfully, with the right modern software all the different variations of reports needed can be set up in the software once and re-used to generate reports for your projects. The reports are completely automated. This allows you to simply perform the required takeoffs for a job, click on the desired report to generate it and export it out of the software to a CSV, Excel or PDF file. Not only does this automated process save a significant amount of time in the overall

estimating process, but it also virtually eliminates the possibility of human error which could prove costly when submitting a bid for a large project.

Most reports consist of a header area which may include your company logo, contact information and project information. The main body of the report is the data group which displays the line items contained in the report. The footer area may contain summary information, sub-totals and project totals and page footers which contain information that is displayed at the bottom of each page.

In the software used for this text, the Report tab allows you to create, view and export reports. The Build tab is where each report is created. The image below shows a report in the Build tab that includes a header logo, group header information, group body information, a group sub-total setup and sub-total information at the bottom of the report:



The image below is what the report above looks like in the View tab when exporting it as an Excel file:

View		Build	Test Report		
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Your Logo</p>  <p>Here</p> </div>					
Building 1-Level 1					
Name	Description	Qty	Cost Each	Extended	
2X4 104-5/8 SPF STUD GRADE	Wall Studs	104	\$5.48	\$569.92	
2X4 12' SPF #2&BTR	Top Plates	24	\$7.35	\$176.40	
2X4 12' P.TREATED SYP #2&BTR	Bottom Plates	12	\$9.88	\$118.56	
2X4 12' SPF #2&BTR	Horizontal Blocking	24	\$7.35	\$176.40	
7/16" 4X8 OSB SHEATHING	Wall Sheathing	39	\$16.70	\$651.30	
			Subtotal:	\$1,692.58	
Building 1-Level 2					
Name	Description	Qty	Cost Each	Extended	
2X4 104-5/8 SPF STUD GRADE	Wall Studs	4	\$5.48	\$21.92	
2X4 12' SPF #2&BTR	Top Plates	11	\$7.35	\$80.85	
2X4 12' P.TREATED SYP #2&BTR	Bottom Plates	6	\$9.88	\$59.28	
2X4 12' SPF #2&BTR	Horizontal Blocking	11	\$7.35	\$80.85	
7/16" 4X8 OSB SHEATHING	Wall Sheathing	18	\$16.70	\$300.60	
			Subtotal:	\$543.50	
			Subtotal:	\$2,236.08	
			Tax:	\$156.53	
			Total:	\$2,392.61	

The report builder allows you to group the takeoff items in reports with up to 3 levels of nested grouping. In the report above, the level 1 grouping is by building and the level 2 grouping is by building level. You can also set up horizontal calculations in the group body that allow you to display calculated values in a column, such as an extended cost (quantity x item cost). The Formula button allows you to add a calculation formula in a cell in the footer area of the report such as an overall calculated subtotal, tax calculation and an estimate total as shown in the generated report above.

When exporting a report to a CSV file, report formatting is not applicable. This is simply used to get the report data into a file that typically is used to import into another software application that will use the data to generate a quote, or something similar.

The image below is what the report above looks like in the View tab when exporting it as a PDF file:

Your Logo



Here

Building 1-Level 1

<u>Name</u>	<u>Description</u>	<u>Qty</u>	<u>Cost Each</u>	<u>Extended</u>
2X4 104-5/8 SPF STUD GRADE	Wall Studs	104	\$5.48	\$569.92
2X4 12' SPF #2&BTR	Top Plates	24	\$7.35	\$176.40
2X4 12' PTREATED SYP #2&BTR	Bottom Plates	12	\$9.88	\$118.56
2X4 12' SPF #2&BTR	Horizontal Blocking	24	\$7.35	\$176.40
7/16" 4X8 OSB SHEATHING	Wall Sheathing	39	\$16.70	\$651.30
Subtotal:				\$1,692.58

Building 1-Level 2

<u>Name</u>	<u>Description</u>	<u>Qty</u>	<u>Cost Each</u>	<u>Extended</u>
2X4 104-5/8 SPF STUD GRADE	Wall Studs	4	\$5.48	\$21.92
2X4 12' SPF #2&BTR	Top Plates	11	\$7.35	\$80.85
2X4 12' PTREATED SYP #2&BTR	Bottom Plates	6	\$9.88	\$59.28
2X4 12' SPF #2&BTR	Horizontal Blocking	11	\$7.35	\$80.85
7/16" 4X8 OSB SHEATHING	Wall Sheathing	18	\$16.70	\$300.60
Subtotal:				\$543.50

Subtotal: \$2,236.08**Tax:** \$156.53**Total:** **\$2,392.61***Thank you for your business!*

Page: 1 of 2

6- Conclusion

A construction company's ability to generate accurate project estimates is vital to its success. While the core concepts of how construction estimates are generated haven't really changed over the years, the processes that we use have advanced through the use of modern takeoff and estimating software. Designed to make every facet of the takeoff and estimating process faster and more accurate, it's a vital tool that all construction companies must utilize in today's world to ensure that they remain competitive and successful. Whether you are a one person operation or a large company, today's software is designed to work extremely well in both scenarios.

We hope that this text has been helpful in providing an introduction to the benefits of using modern takeoff and estimating software. Our goal is to aid in the success of everyone in the construction industry, helping to increase efficiency and accuracy in the estimating process.

The examples and images used in this text were generated from TradeTek Takeoff & Estimating Software, TradeTek Software – www.tradeteksoftware.com.

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