

Using On-Screen Takeoff in Construction Cost Estimating

Russell McElreath

ABSTRACT: The use of On-screen Take-off® and similar tools has benefited the estimating process in increased productivity, enhanced tracking of quantity changes, and defensibility of estimate quantities. In order to fully benefit from the use of the tool, it is imperative that the estimator have management support, the correct equipment, a structure for the organization of the quantity data, and clear and rigorous processes for on-screen take-off and for interpreting and transferring the data to estimating systems. In this article, I will outline a successful approach to effectively using the on-screen take-off tool in conjunction with MS Excel spreadsheets and Success Estimator to fully benefit from use of the system. Topics that are covered and illustrated through example include an overview of on-screen take-off, basic advantages, and key features to using OST, a look at the data selection and organization processes, hardware and software requirements, and finally outputting data from OST software for cost estimating software.

KEY WORDS: Construction, cost estimating software, productivity, take-off, and tracking

Editor's Note: Some readers may find this article to be commercial. For peer reviewed journal articles, commercialization is not permitted. However, guidelines for certification articles state: "We recommend that your technical paper topic be something with which you are already familiar, such as a project you have done at work. The chosen topic is not as important as your ability to communicate through your paper. Be sure to follow the "outline" described in the Certification Brochure the structure does count toward the final grade of your paper." This article scored in the upper 10 percent category which qualified it for publication as an example of an acceptable certification paper. Reader's should view this as a product review.

Throughout history there have been numerous medians used to quantify construction materials. From the ruler, scale, and measuring tape, to the planimeter, and the digitizer, quantity surveying tools have changed with the technology of the time.

There is no exception presently with the invention of fast-paced computer generated design applications and fast-track more efficient construction practices. The birth of a computer-based quantification tool was inevitable. In the market today, there are a plethora of computer-based quantity survey software programs, but the one that seems to be gaining control is On-screen Take-off by On Center Software Inc.

On-screen Take-off software has been around since 1995 [1, 2]. This is the software that my company and I use to quantify our projects. We implement this software whenever digital copies of drawings are available, which is about 99.9 percent of the

time in today's market.

Since implementing this software, the speed and accuracy of my quantity takeoff has increased nearly 50 percent, because of the functions and features of this product. Some of these features include: the use of digital or soft copy drawings, the ease of organizing and tracking information into an individual data set, the ease of comparing the same drawings at different stages of design, and effortless QA/QC checks on quantity surveys.

I have gotten so dependent upon these features that I dread using a typical digitizer and hard copy drawings to do my quantity surveying. This software limits mistakes by decreasing the number of moving parts, per say, when quantifying construction documents by storing and compiling takeoff data within a project. This data can then be exported to a spreadsheet or reported through a built in report writer. With this export feature the possibilities are endless on what the user can do with this software.

My company is currently developing an integration tool to link On-screen Take-off's output with Success Estimator®, their cost estimating software program. I can only imagine the time savings this will have when preparing a cost estimate.

The first and obvious difference between a traditional digitizer and the OST software is that OST is the only one that can use both a hard copy or soft copy of plans to gather quantities. OST has a feature to allow a user to input a digitizer into the software. This feature may be useful in times

where digital drawings are unavailable. It uses a hard copy of the drawings to quantify a project instead of using a digital copy, but still uses the organizational features that OST offers.

There are several formats of soft copy or digital file formats OST accepts. The recommended format from On Center is the tiff format, but it also works well with .cal or PDF formats. It can view .DWG files, but there are some times sizing errors that occur when importing the files into OST.

The use of these digital documents makes On-screen Take-off extremely mobile in that there is no need of hauling around bulk drawings. An estimator only needs a laptop, and an acceptable copy of the digital plans, to integrate with the OST software. The estimator can take their quantity takeoff anywhere.

Advantages and Key Features

One of the basic advantages of OST is the ability to zoom in and out of the drawings. This takes the place of a magnifying glass needed for full size drawings and saves the estimator's eyes. OST allows the user to zoom in on the whole document or a specified place on that document.

OST also has an integrated magnification tool that can zoom in certain sections of the drawings without zooming in on the whole document. This is especially helpful when reading key notes, but it still allows the user to see the whole floor plan.

A greater advantage that OST has over a standard digitizer is that the software will allow you to look at the detail or section cut simultaneously when looking at the drawings. This can be achieved in two different ways. First, the user can open up a second viewer screen and select the sheet number that the detail is found on. This is probably the simplest way a user can view the detail.

The second way is to create a hotlink. A hotlink is a way of connecting the detail or section cut on a floor plan to the actual detail on the detail page. The hotlinks are more time consuming to use, because you have to set them up first, label them, and then create a link to the detail by placing a hotlink symbol on it. This works well when working with structural drawings that have a lot of section cuts on the foundation plan, (see figure 1).

Another unique feature that OST offers is the function of being able to calculate and change the scale of the takeoff, along with

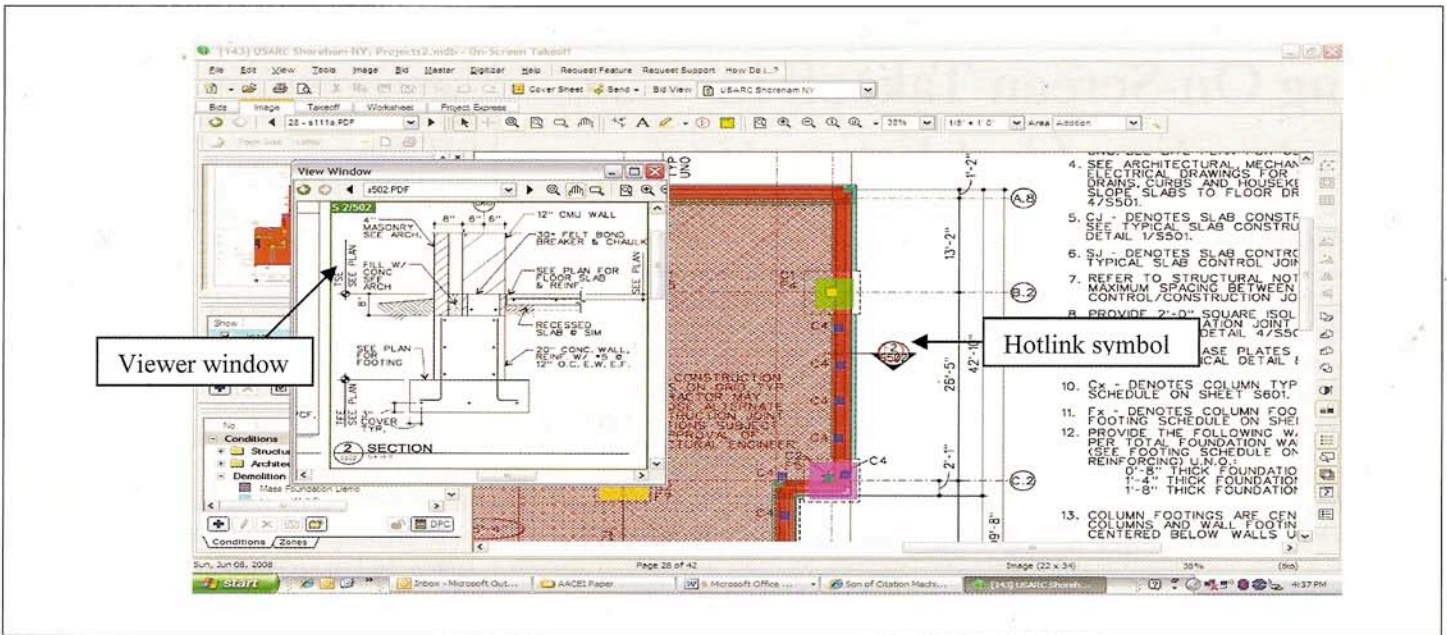


Figure 1— Hot Link Feature

the ability to change back and forth from US Standard to the Metric system. This feature makes fixing incorrect scales a one-touch fix.

OST has a drop down menu located on the toolbar for changing the scale of the user's quantity takeoff. It is just as simple to modify the unit of measuring system with OST. The user can do a takeoff in metric, then change the settings in OST to output the quantities in the US Standard and vice versa. Both of these functions saves the user from redoing their takeoff or applying a multiplier to it.

OST has a feature integrated into it that

allow the sharing of information from one person or party to another easily. This feature allows the user to send project files through e-mail with the touch of one button. This is a great idea when multiple users use the project.

OST allows a single user to set up an estimate file and preload all the drawings and or conditions needed to do a quantity survey of the project. That user can then e-mail the entire package, including the drawing files, to other users that need to work on the estimate. This is helpful when you have multiple discipline estimators working on the same project. This can simplify the

QA/QC process for the quantity takeoff of the estimate.

One of the biggest advantages to using OST, when performing an estimate, is that the software allows the user the advantage to verify and defend quantity takeoffs quickly and easily.

Since the OST uses digital drawings, its files can be transferred via e-mail and can be implemented by use of a laptop, which makes an estimate totally portable. This can be very advantageous when questions arise at a meeting. Having access to this estimate backup can be invaluable for the credibility of the estimate.

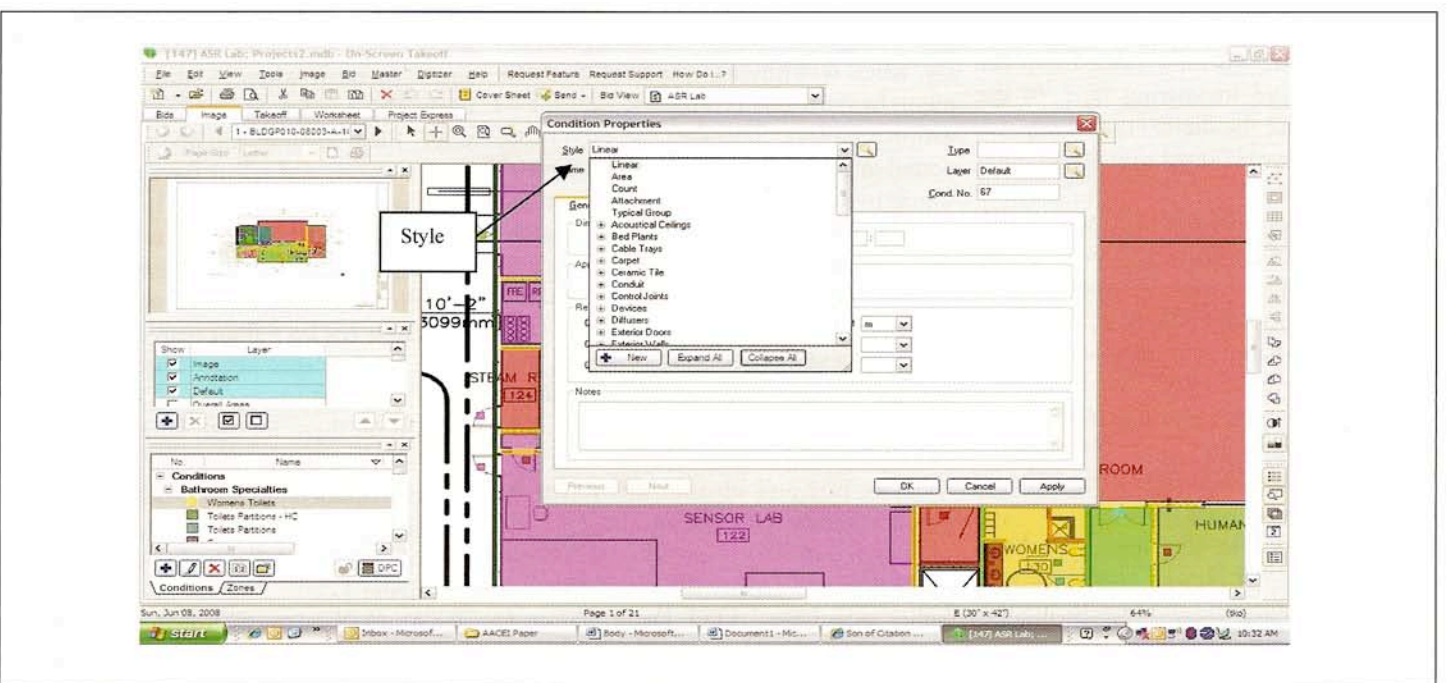


Figure 2— Style Condition Feature

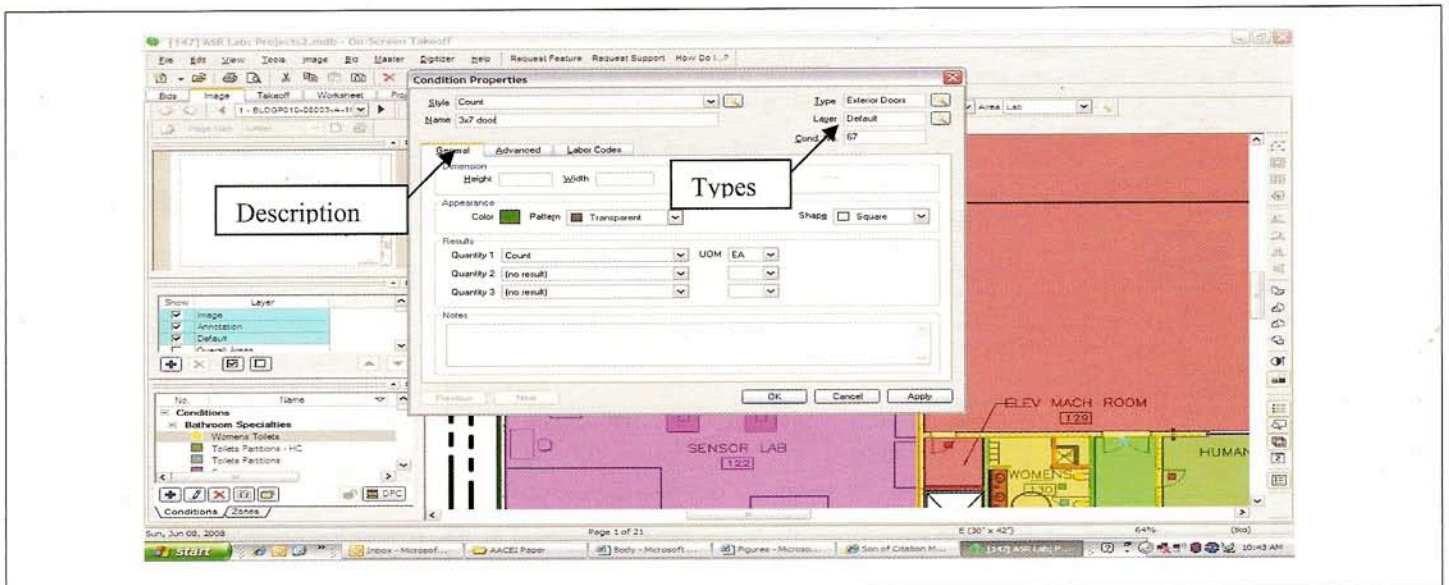


Figure 3— Description and Types Input Location

Data Selection and Organization Processes

When building an estimate, it is important to have a good work breakdown structure or WBS. This also holds true for building an estimate using OST.

OST offers the ability to track the quantities gathered from the construction documents by the using condition types. Condition types are a way that OST labels and organizes the data gathered into categories. These categories can be as broad or

as narrow as the user likes. These conditions can be structured as the estimator's WBS, for the estimates to not only keep good structure, but to make transfer of output quantities and cost as well.

Quantified conditions in OST can be represented by different colors and/or patterns to distinguish them and further keep them organized. Condition types can be preloaded and set into a master library, or they can be created by the individual user to fit a certain project.

Three units of measure can drive these condition style types: area, liner, or object count. For example, if a user is quantifying a building or a structure, and wanted to quantify the number of doors on the project, that user would use a count condition. If a user wanted to quantify the building slab area, they would choose a predefined "area" condition type, or create a new one and modify it under the conditions properties menu (see figure 2).

Under this condition property menu,

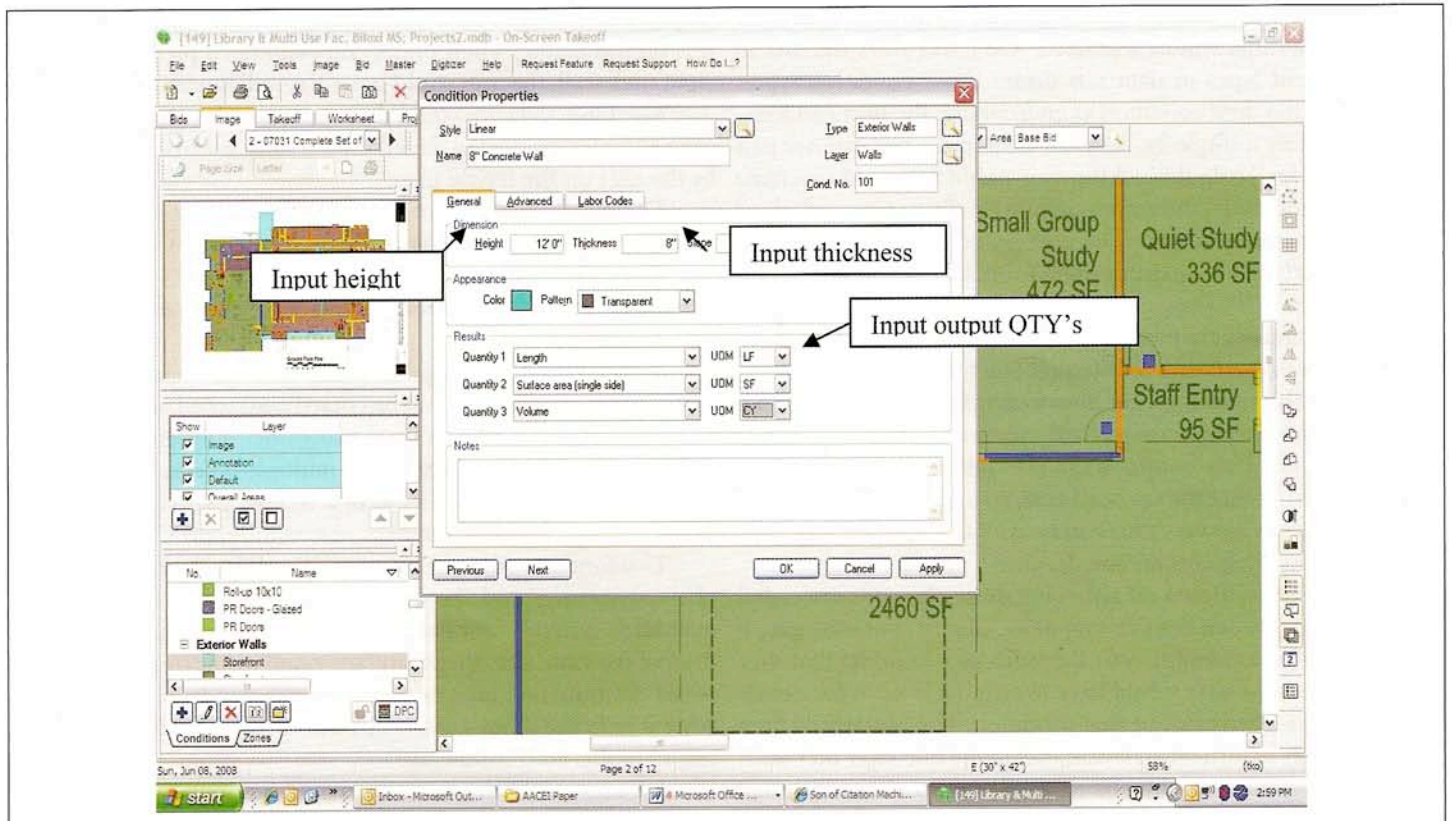


Figure 4— Condition Factors

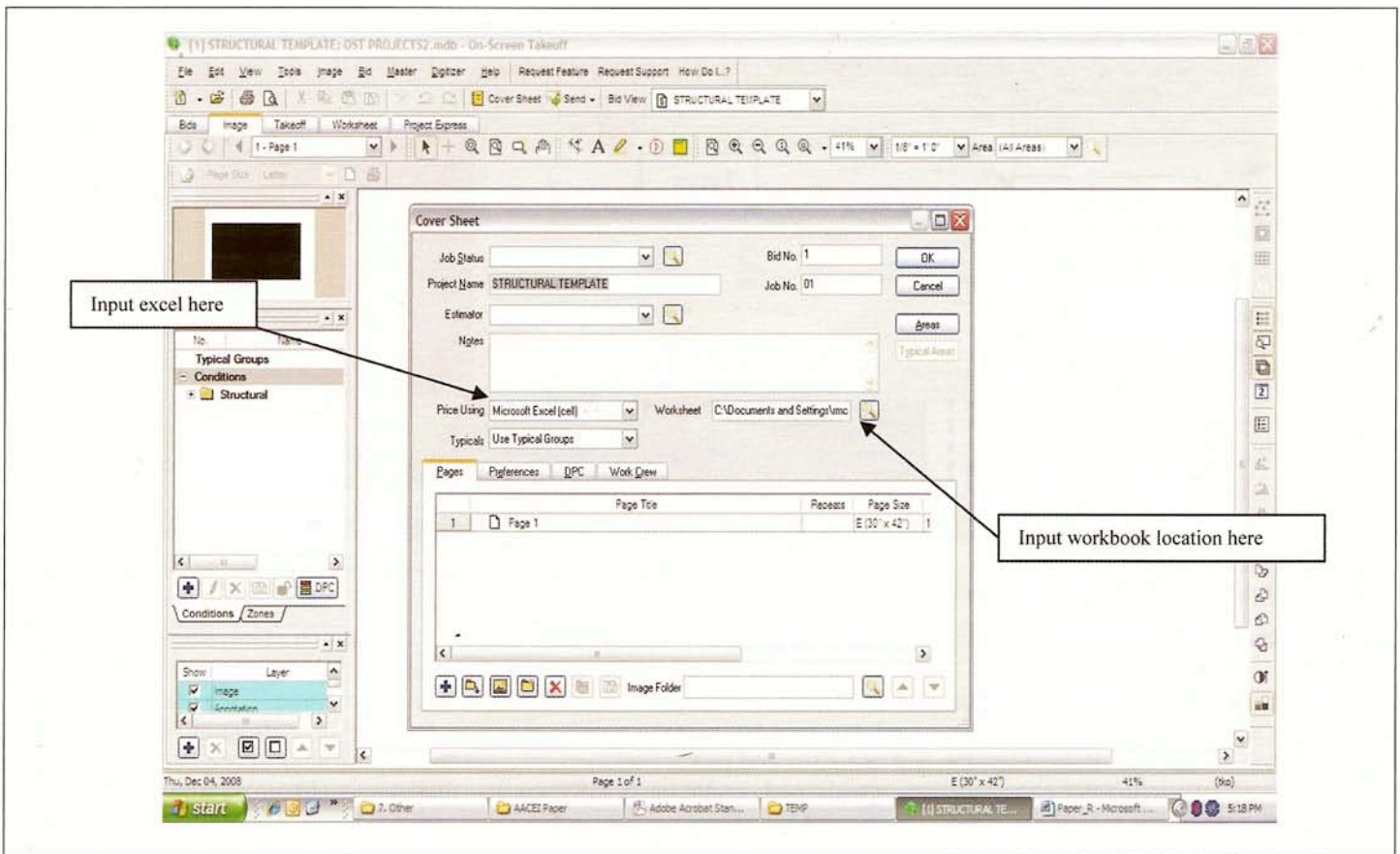


Figure 5— Excel Workbook File Locations

OST will allow a user to further define the individual condition and group information. Using doors as an example, a user might want to separate exterior doors from interior doors to follow the Unifomat work breakdown structure. To do this, all the user would have to do is create a condition type for each style of door and those quantities will be separated. OST will allow the user to create different types of data sets under those condition types. Again, using the door condition as an example, the user can identify and quantify a single 3x7 exterior door and a 6x7 exterior pair door separately. To do this, all the user would have to do is create a new condition under the corresponding condition type and adjust the description accordingly. The user would then select the condition they wanted and quantify them from the drawing (see figure 3).

These features help the estimator track and organize the quantity takeoff so that it is easy to interpret and follow.

To keep the OST drawing from becoming too cluttered with conditions, the user can assign their created condition types into different layers. This feature is similar to the layers feature on a CAD program in that the user can turn on and off different quantified elements at a time. This can be useful if the user is quantifying numerous elements on one drawing.

A layer can be turned off removing those elements associated with it, in order to see the drawing more clearly. For example, if the user wanted to identify only the walls of a building that they had quantified, the user would have to assign a layer in the condition properties when creating that condition. The user would then have the ability to turn off all layers, except the one layer they want to see. This reveals only the quantified items associated with that layer, which in this case would be walls. This feature greatly im-

proves accuracy of a quantity takeoff and insures that all the parts and pieces are captured.

OST allows each condition created to capture up to three output quantities. Using an eight-inch thick concrete wall as an example, a user could have a liner condition set for this to trace where it is on the plans. Then under the conditions properties of that eight-inch wall, the user could input the wall thickness and height.

The OST software could then calculate the area and the volume of concrete needed, based on the liner measurement, traced by the user on the digital plans.

There are many output quantities that can be calculated depending on the style set a user selects (see figure 4).

The ability to quantify up to three output results with one condition type saves the estimator valuable time when performing takeoffs.

An additional advantage of using OST for quantity takeoff is that quantified conditions can be copied and pasted onto a drawing, just like words can be in a word processor. This can be done in OST by selecting a single object or multiple objects at once, highlighting those objects by means of a mouse and copy/paste those objects using Windows-based key commands (ctrl C and ctrl V).

This function gives the estimator the ability to quantify a piece of a system once and then make multiple copies based on that quantified systems. For example, if a building had multiple windows of the same size, shape, and surrounding pieces, the estimator could quantify that area or pieces of one window and copy and paste it onto the other windows of the same type, while keeping a record of this on the drawing.

Another use of this function would be when a building or a structure has multiple floors that are the same or that are similar.

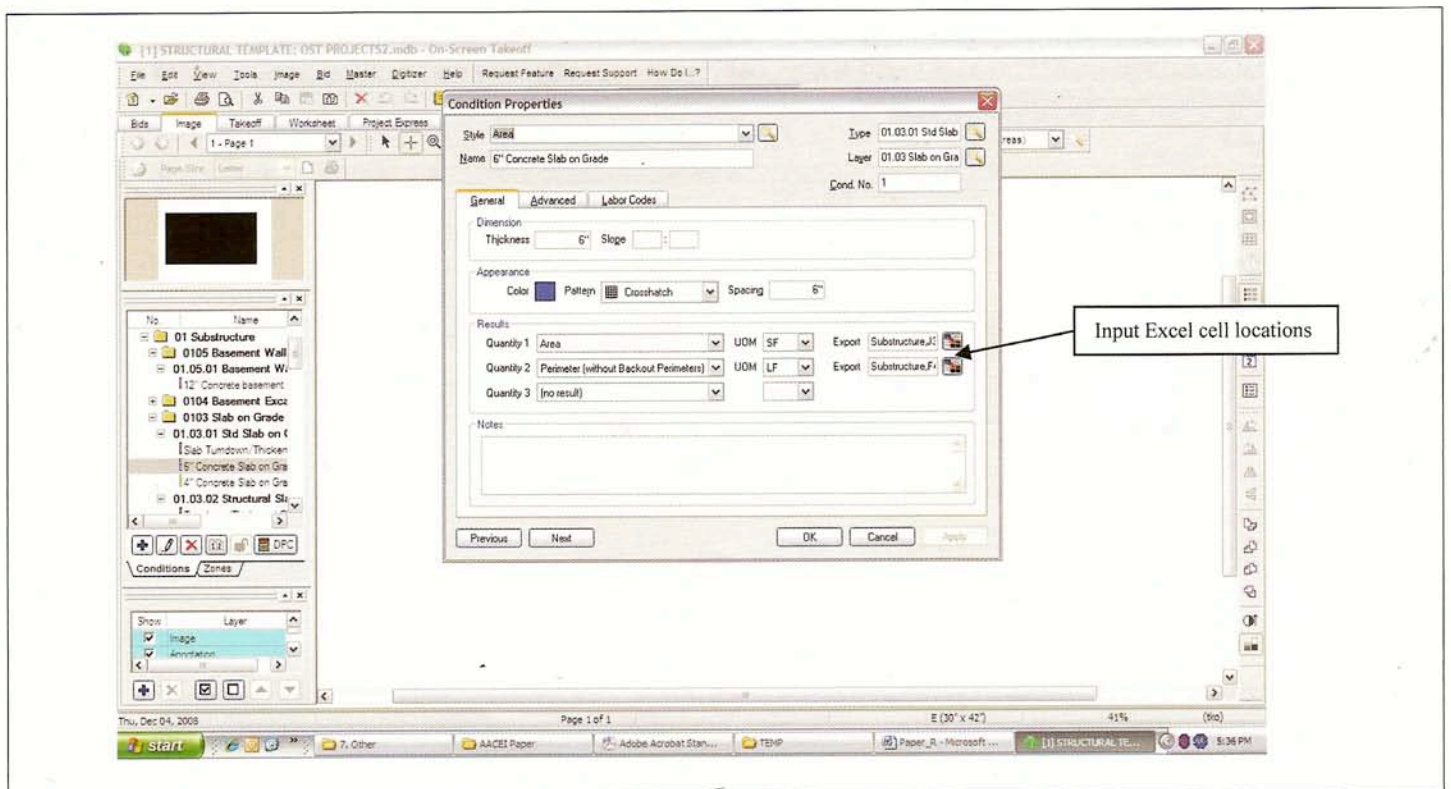


Figure 6— Input Cell Destination

The estimator could do a detailed quantification on one of those floors, select all the systems on that floor, copy them, and then paste the copied quantities to the corresponding sheets that are similar to the original. This not only saves the estimator a tremendous amount of time, but it also cuts down on the tediousness of certain takeoffs.

Outputting OST Information for Cost Estimate

After the entire takeoff is performed, there are two main reporting methods that OST makes available to the user. The first is to export the data collected to a .csv file, which can be converted easily to a excel file.

The second and most popular of our group is to print a hard copy or a digital copy of the quantity takeoff using the built in Crystal report.

In either case, the user can choose to report the data by number of deferent groupings. The first is to report each quantity by condition type. This is the standard way of grouping quantities for reporting purposes.

The next way of reporting is to group them by the page from which it was quantified. Reporting by the area is another key way to report. OST allows the users to assign certain portions of the take off to certain grouping areas.

For instance, if a building project has an option or an add alternate, the user could separate the quantity of that area by assigning it to a certain area. When running the reports, the quantities would be divided up and reflect the corresponding area. The user can then take this data and input it into cost estimating software for pricing purposes.

OST also allows its users to export an individual output quantities to an excel spreadsheet. This feature has vast possibilities. It can be used to drive countless quantities if exported to excel. For instance, OST currently does not have a built in function to cal-

culate slab reinforcement. This is not a problem because using the export features in OST, and a little knowledge of Excel, allows a user to calculate this quantity.

Exporting quantities from OST to an Excel spreadsheet is a simple process, but requires some practice and knowledge of how OST works. To export quantities, simply have an excel worksheet predefined on your computer with a cell specifically assigned for the OST output quantity. Then assign your OST file to that spreadsheet by selecting the "Microsoft Excel" dropdown in the Coversheet screen in the field "price using." Next, select the worksheet to be linked in the "worksheet" field. The OST file is now linked to that particular spreadsheet, (see figure 5).

To assign a condition to a specific cell in that workbook, simply select the condition to be linked, open the condition properties menu, and click on the export field next to the quantity. This should automatically open the Excel file the estimator has assigned to the OST file.

Finally, double click the cell in the workbook that quantity needs to be exported to. That is it. The two are linked. The workbook sheet number and cell number should be listed in the "export" field in the conditions properties screen. Anytime the estimator updates a quantity in OST, it will update the quantity in the excel file by simply pushing the F9 key. By being able to export a quantity such as the area of a slab to an Excel spreadsheet, the estimator has the power to build a data set that can calculate this slab tonnage.

The exported area calculation can be used as an assembly level quantity in this manner, driving the lower level data categories. This output can then be tied to an Excel costing database for an easy way to build a cost estimate. This export feature has inspired our software division to team up with On Center to create a bridge between OST and Success estimator.

US Cost is currently developing a link that, upon completion,

Row	Description	Units	Width	Depth	Quantity	Unit Measure
382						
383	.01 .03 Slab On Grade				0	SF
384						
385	.01 .03 .01 Standard Slab On Grade				0	SF
386						
387	.01 .03 .01 .01 Slab On Grade (6" Thick)				0	SF
388	HIDE THIS AREA					
389	Slab				0	SF
390	Area				0	SF
391	Slab Thickness				6	inches
392	Aggregate Base				6	inches
393	Sand Base				0	inches
394	Soil Poisoning				0	SF
395	Fine Grade				0	SF
396	Aggregate Base	0.00	1.00	0.50	1.00	0 CY
397	Sand Base	0.00	1.00	0.00	1.00	0 CY
398	6 Mil Vapor Barrier				0.00	CSF
399	WWF 6x6 w' x w'	0.00			1.10	0 SF
400	Concrete Slab 4000psi	0.00	1.00	0.50	1.03	0 CY
401	Finish To Slab					0 SF
402	Curing					0 SF
403	6" Edge Formwork	0.00			1.00	0 LF
404	Saw Joints	0.00			1.00	0 LF
405	7" Keyed Control Joints	0.00			1.00	0 LF
406	Expansion Joint	0.00			1.00	0 LF
407						

Figure 7— Condition Output Location

would allow the quantities generated using OST to drive the assembly levels within US Cost's cost estimating software Success Estimator. This bridge would simplify the transfer of information from one area of estimating to another, further limiting the amount of mistakes that may be made in the process, see figures 6 and 7.

On-screen Take-off software is a valuable tool in the cost estimating process. From its reporting feature to exporting feature, OST increases the productivity of the user. Using its overlay tool, OST can track design changes quickly. Organization of a cost estimate is simple when using OST's limitless conditions feature. Finally, OST transforms the takeoff into a portable entity with its ability to use digital documents in conjunction with a laptop. This portability adds more credibility to an estimate. On-screen Take-off truly is a vital tool in today's fast pace digital construction world. ♦

REFERENCES

1. "More About On Center Software : Revolutionizing takeoff." On Center Software. 2007. 8 Jun 2008 <<http://www.oncenter.com/about/more.html>>.
2. "More On-Screen Takeoff Capabilities." On Center Software. 2007. 8 Jun 2008

<http://www.oncenter.com/products/ost/more_capabilities.html>.

MOCA SYSTEMS
Expertise. Technology. Results.

Reduce Risks

Capital Programming and Budgeting
Sustainable Planning and Design
Program and Construction Management
Capital Asset Management

Baltimore Boston Richmond Houston San Antonio Salt Lake City Honolulu
www.MOCASystems.com