centered on CONCRETE

Quantifying the Forming and Pouring of Concrete Columns per Count Method

Concrete takeoff is an intuitive process. Quantifying the various elements of a Concrete project requires the ability to manage multiple items valued in different measures all at the same time. Even different aspects of the same job present unique requirements of quantification. Slab on Grade is significantly different than a Metal Pan takeoff. Post Tensioned Slabs are different than the Flatwork portrayed on the Site Plan. And in that vein, quantifying Columns presents its own set of challenges.

Quantity Survey Options

Columns are normally quantified in one of two ways: 1) a simple linear calculation (Length per Side X Height) applied to the Total Count of Columns or 2) the **"Each"** Count method. The more preferred and common method for Concrete Columns is the **"Each"** Count method. It is considered to be more efficient and effective.

To begin, the various Column-types (sizes) within a project are determined. For example, 2' X 2' X 10' high columns would be counted separately from 4' X 4' X 12' high columns. Each Column-type (size) is then further evaluated by its components. These are each measured (priced) differently from one another. Formwork is typically priced by the Linear Foot (LF) or Square Foot (SF). Rebar by the Ton. Concrete is typically priced in Cubic Yards (CY). And finally Labor for each component is also rated differently for each Column.

Formwork

Within the different elements of each Column-type, the first is Formwork. For the 2' X 2' X 10' high Column-type in this example, the perimeter square footage is 80 SF. This total might be adjusted by a percentage to cover waste, such as a 10% waste factor. The new total square footage of the form materials would then become 88 SF. This factor must then be priced by whatever formwork product is to be used.

Columns are formed with various materials such as reusable plywood and timber forms, plywood forms with adjustable steel supports, throwaway Oriented Strand Board (OSB) forms with timber supports for smooth concrete finishes or company owned or rented steel forms. For this illustration, throwaway OSB forms and timbers are used because a smooth surface is required after removal of formwork.

Each 2' X 2' X 10' high Column-type in this model requires 88 SF of OSB forms. The framework for the forms is constructed of vertical 2X4 timbers at each corner and at the center of each side and diagonal 2X4 timbers as ties around the OSB, 2' on center and at the top and bottom of the form. Each diagonal tie timber is counted as 3' long to allow overlap at each corner for fasteners. Also needed are 2X4 timbers for diagonal bracing. The quantities will therefore be 88 SF of OSB, 120 LF (10' sticks) of timber for vertical bracing, 132 LF (12' sticks) of timber for horizontal ties, and 48 LF (12' sticks) of timber for diagonal bracing. This totals 300 LF of timber and if a percentage of additional material is added for waste, such as a 10% additional, the total timber quantity is 330 LF for each Column.

Chamfer strips might be added at this point, but for this exercise, will not be used.

Rebar

After Formwork quantities have been determined, the Reinforcement Bar (rebar) needed in the Column sampling is quantified. Looking at the Column detail in the structural plans, a #5 rebar is depicted at each corner and another at center points of each column side. An extra foot of rebar is also detailed above the top of the column to act as dowels when the concrete beam is poured at a later time. This totals 8 pieces of rebar at 11' long or 88 LF of rebar for each column. Again, a waste factor (such as 10%) might be added to these materials. Primary material quantity plus waste now totals 97 LF (rounded up) of #5 rebar per column.

> "...A CONVERSION FACTOR MUST BE APPLIED TO MODIFY LINEAR FOOTAGE TO WEIGHT OF MATERIALS."

Since rebar is typically quantified and priced by weight, in tonnage, a conversion must be applied to modify linear footage to weight of materials. Finding that there are 95.8 LF of #5 rebar per ton, a formula that divides 97 LF by 95.8 LF/Ton will calculate that each of this Column-type will require 1.01 (rounded) tons of rebar. Next, #5 rebar stirrups at 12" on center vertically up each column are needed. These stirrups must also be quantified by weight. One stirrup is approximately 96" long, allowing for overlap of the ends for wire tying. There are 11 stirrups for each 2' X 2' X 10' high column, allowing the

first piece at the bottom of the column, nine more to fill the space to within 1 foot of the column top and the additional piece to cap the column rebar cage. Eleven pieces X 96" long is 1056" or 88' of rebar for stirrups. Primary material quantity plus waste now totals 97 LF (rounded up) of #5 rebar for stirrups. Applying the weight/linear foot factor, an additional 1.01 tons of rebar is needed for stirrups, totaling 2.02 tons of rebar per column.

Concrete

The final material quantification is the Concrete itself. Knowing that the column is 2' X 2' square and 10' tall, a quick calculation shows that 1.48 CY of concrete material are needed to fill a single form. Waste is typically not a factor in Column construction so none is added here. Since this is a structural column, when applying cost to this yardage, the Industry standard of a 5000 psi mix should be used.

Labor

With all materials quantified, a Labor component must now be calculated for each element of the Column construction.

> "...A LABOR COMPONENT MUST BE CALCULATED FOR EACH STEP OF COLUMN CONSTRUCTION."

Labor for the construction of the formwork is typically calculated by one of three methods: 1) by the action of construction - constructing forms per side, standing forms & installing timber ties, and installing bracing; or 2) by square footage of form materials, or 3) by a cost per column count.

According to historical data, no one method is more right or wrong than the others. For this example, the Formwork Labor cost is determined by method 2) square footage of form materials used.

Next, a labor cost must be calculated for the reinforcement cage build. This is derived by applying a rate to either the linear footage of the rebar used or to the tonnage used.

Lastly, labor to pour the concrete needs to be calculated. Pouring of Columns can be performed by several means with a different labor component for each method. It must be determined if the Columns will have the concrete pumped into the forms; filled with the bucket from some type of equipment, such as a front end loader; or bucketed up by hand. For this example, the forms will be filled by pumping from a pump truck which will require a premium on the Concrete cost. This completes the cost of a single unit of each Column-type and this value is ready to be applied to all quantities of a specific Column-type.

Total Column Count

The final step is simply to count all Columns per Column-type (size) and apply the appropriate costing factor as determined by this exercise.

Whether an Estimator uses a Columnar Pad, a Spreadsheet Program, or an advanced, electronic Quantity Survey and Estimating Solution, such as On Center Software's On-Screen Takeoff® and Quick Bid, the values of each Column-type (size) can now ideally be taken off separately.

Digital Solutions

While the traditional approach to quantify and price Columns has been to use a columnar pad or spreadsheet, more and more companies are turning to automated, electronic software applications like On Center Software's On-Screen Takeoff® and Quick Bid solutions.

On-Screen Takeoff and Quick Bid display all takeoff that is performed in a graphic manner from either a desktop, laptop, or tablet. With the digital plans in the background, this allows an Estimator the assurance that every Column has been counted and quantified. On-Screen Takeoff quantifies each of the necessary measurement units with a mouse click and displays the related totals an Estimator needs for quantifying and pricing. The Estimator then adds the labor and material items that have been built and stored in a reference database into the pricing portion of the software. This automatically updates pricing without the need to build a new spreadsheet for each new job.

Modern database driven software solutions reduce time spent and increase the accuracy of a bid exponentially. With preset Assemblies and 'on-the-fly' ability to change Production Values and/or Pricing Units, an Estimator (or Project Manager) has full control of a project while cutting the Quantity Survey timeframes by significant margins. The accuracy and time gained by leveraging automated solutions allow the Estimator and Project Managers to spend more time evaluating the correctness of the Materials, Labor Applications, and Unit costs.

An Estimator or Project Manager's time is valuable. The more time spent evaluating the correctness of the Materials, Labor Application and Unit Costs the more accurate and profitable the Project. Leveraging automated solutions delivers exactly the confidence needed for the right people to focus on the right tasks.

***Image A** is an example of a single column detail. Costs are broken down for each column size.*

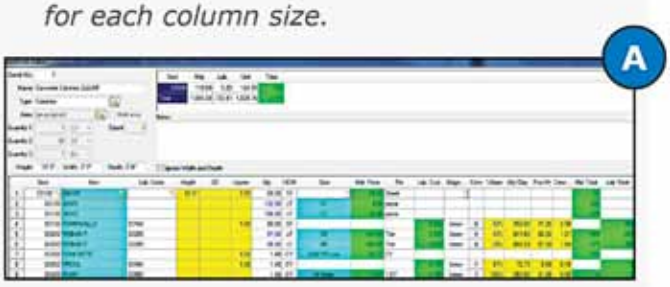
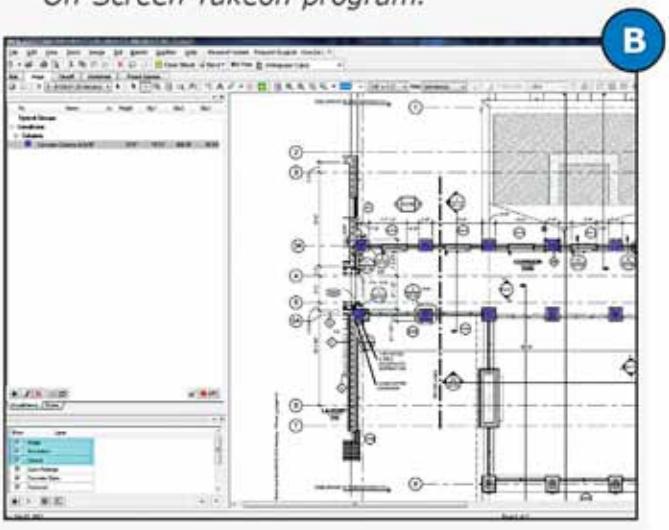


***Image B** is an example of a concrete takeoff measurement within the On-Screen Takeoff program.*



On Center Software, Inc., is a privately held company providing software and training to construction industry professionals for over 24 years. Located in The Woodlands, Texas, the company's mission is to transform the takeoff, estimating, and labor-tracking experience with comprehensive software solutions that turn winning bids into profitable projects. On Center Software solutions include On-Screen Takeoff®, Quick Bid, and Digital Production Control™. Customers in the United States, Canada, Australia, New Zealand, United Kingdom, South Africa, and 60 other countries around the world leverage On Center Software's internationally recognized solutions. For more information about On Center Software, call 866.627.6246 or visit www.oncenter.com.