

Estimating with Computer Generated Quantity Data

As estimators move from traditional methods of quantity calculations to widespread adoption of new technology, some words of caution are required. Typically estimators followed certain “rules of the road” when generating quantities of materials or systems as part of formulating cost estimates. These rules often followed old and trusted formulas that trade estimators adopted as standard computations when generating a quantity-based cost estimate.



Today there is a wide range of computerized estimating software programs available which estimators have used quite successfully over the last decade. These systems are based on unit prices stored in a database. After the estimator familiarizes himself with the unit prices and how the costs are compiled, the estimator can quite successfully adapt these database systems into the production of a cost estimate. The estimator will know what factors to use to adjust the unit price up or down depending on the specifics of the project being estimated. The key here is to understand the basis and fundamentals of the database unit price and adjust the price, or “tweak it” accordingly. Now, with the use of electronic files and automatic quantity generation technology, the estimator must understand what quantity is being generated and what needs to be adjusted to reflect an accurate cost estimate.



In addition to the unit price based estimating software programs commonly available, the estimator can now very easily have at his disposal a computerized quantity generation program. Although digitizers have been around for years, the estimator can now simply upload quantities from the electronic drawing files that are available from the design team. The process of generating quantities has been made much more efficient over the last five years and is now quite commonplace when preparing cost estimates. The timeframe expected to produce a cost estimate these days now requires the estimator to adopt whatever tools are necessary to get the job done accurately within a very short time frame. As with the adoption of any new technology or process, some giant leaps of faith are sometimes taken. The writer attempts to focus the reader here on some words of caution that must be heeded when accepting cost estimates generated using the latest technologies. Do not accept generated quantities without understanding the basis of the quantity and what needs to be adjusted to bring the quantities to an acceptable basis for including in a cost estimate.

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Three examples will get the point across here

- 1) **Estimating exterior skin packages:** Even early in the design process, the Architect can now very easily produce the building form and massing with the aid of Computer Aided Design and Building Information Modeling tools and systems. These designs are now typically produced earlier in the process to show clients form, massing and in some cases material selections. They are also typically the basis of a preliminary or conceptual design model. By the time the project is 50% designed, the skin detailing and solution can and are typically far more advanced. As the estimator generates his



cost estimate and quantity information is obtained automatically from the electronic design files, the estimator must stop and ponder how appropriate the quantity information is.

An example here would be if the exterior masonry was skin or stone. How appropriate is the self-generated quantity. Consider the application of punched windows. Here a masonry subcontractor would add back a percentage (typically 20% of the neat openings) to allow for the labor to construct the opening and the jambs. In some cases, the openings would not even be deducted by the masonry subcontractor if the openings were small in nature. Large openings would

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be deducted in full, but jambs would need to be added back in and masonry tucked below grade would be added to the quantities; though this may not be shown on the

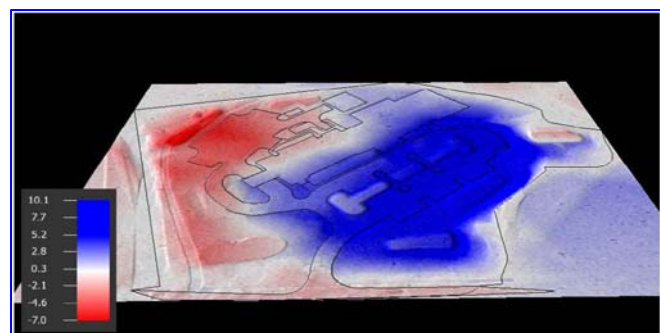
computerized elevations and possibly not accounted for in the quantity generated from the electronic files. As you can see, the base data from the electronic files would be in error if the quantities were not adjusted by the estimator. The exterior skin can account for 15-40% of the cost of a project, so if the estimate quantity is low by 10% then the overall estimate accuracy is in question.

- 2) **Waste factors:** The quantities generated via electronic means are typically neat quantities. No allowances for waste or added complications during construction have been made. In sheet goods this can be 5-10% and in concrete and masonry, 2-5%. Steel connections (typically detailed in the shop drawing phase and therefore not even existing on the structural engineers’ drawings) can easily add 10% to the tonnage of a steel job. Earthwork quantities can be off by 15-20% depending on soil types and bulk factors that must be applied. Complicated details or shapes can drastically

increase wastage quantities for all material types and systems. Unless the estimator accounts for these added quantities in the estimate, then again, the accuracy is in question.

A manufacturer preparing a quote for a sheet metal panel system on an exterior skin will undoubtedly disregard any window openings (in most configurations) as the sheet metal cut out to create the opening becomes waste and must be accounted for in the cost of the system. Precast panel systems are typically priced by the manufacturer on the basis of formed surface area taking into account the actual shape and contours of the panel systems including finished ends and sides. The quantities generated from electronic files may be far from the actual quantity where precast panel systems are concerned. Some precast elements may be generated in the wrong unit of measurement for accurate pricing. For example rather than SF or LF of a precast element, the estimator must be able to adjust the quantity into pieces to allow the true cost of crane and labor time to be evaluated and priced up in the estimate report.

3) **Earthwork quantities:** In addition to Architectural design software, there are many civil engineering packages that provide assistance to the estimator in generating cut and fill quantities. A



comparison of the existing grades to the final grades to generate bulk excavation quantities can be extremely misleading and prone to error. Typically an understanding of the actual construction sequencing and process to be adopted is required to generate the true quantities. To complicate this even further, the soils report may indicate that the material excavated may not be suitable to be



reused as fill-material and in that case, simply comparing the existing with the final quantities to arrive at the bulk excavation quantity is truly erroneous. Also, pricing needs to account for the distance earth has to move and how that will be done. Other common miscalculations are as follows: not making adjustments to the final grade data for paving and sidewalk systems including sub base details, not allowing for the stripping and replacing of topsoil, not including slope back



provisions for basement excavations and utility trenches, and not allowing for sheeting and shoring that may be required. Without dwelling too much on the details, it can easily be seen that the estimator

needs to know what he is doing when taking electronic information in terms of quantities to provide the basis of an earthwork estimate.

Summary

It can be seen that if data generated via electronic means is to be used accurately in the development of cost estimates, then the estimator must be aware as to what modifications are required to the quantities. These modifications are required to adapt the raw data to usable quantities when pricing the cost estimate. Without modification, the estimate accuracy must be brought into question.