Cost Estimates, Project Budgets, and the Structural Engineer

By David J. Hatem, Esq. and David M. Ponte, P.E.

Your clients, whether private developers, public owners, lead architects, or design-build constructors, rely on construction cost estimates prepared by a design professional to establish project budgets and plan future work. Structural engineers rarely find themselves in a lead role for these project documents but, nevertheless, need to understand the significance of these documents and their implication for the structural engineer's scope of services.

The design and construction industry generally agrees that the risk of inaccurate or defective budgets is born by the project's owner. While not the norm, under certain circumstances the design professional's contract will require it bear the costs of redesigning to bring the project back within budget. This understanding is memorialized in design professional agreements such as AIA B-101's § 6.2 which, after discussing the scope of the design professional's cost estimating services, provides: "Accordingly, the Architect cannot and does not warrant or represent that bids or negotiated prices will not vary from the owner's budget for the cost of the work or from any estimate of the cost of the work prepared or agreed to by the architect." Those same AIA documents, however, require that the design professional revise and redesign the project – at no additional cost to the owner – in order to bring the cost within budget. § 6.5 of AIA B-101 provides that the "Architect, without additional compensation ...shall modify the construction documents as necessary to comply with the owners budget." Many design professional agreements from public owners contain similar provisions.

The Massachusetts state legislature has recently indicated a divergence from this generally understood maxim by statutorily requiring that 90% of its bridges be repaired or rebuilt under a special accelerated bridge program on time and within budget. The engineer's performance on those projects will be measured against that engineer's cost estimate prepared at the 75% design submittal. While the stage is now set for a showdown on these cost estimating issues in Massachusetts, it is unclear how they will be resolved. The industry will need to keep its eyes on Massachusetts to see whether this attempt to hold the designer responsible for its cost estimate is successful or merely an expensive experiment. If the program's benefits are deemed worth the added costs in terms of overall project management, then we should expect this initiative to be adopted by other states.

The more typical claim against a design professional comes in the form of an unrealistic initial budget. Often it is a case where the design professional provides an estimate (against his better judgment) that turns out to be overly optimistic. Despite the design professional's admonition that the estimate is based on certain assumptions that are presently indeterminate, the owner embarks on the project based on that estimate. When the owner subsequently learns that the more expensive final project is unaffordable, allegations of bad advice are often leveled at the designer, insinuating that the project should never have been undertaken given the economic loss. Alternatively, the owner publishes an assumed project budget and the design professional makes no representation, or provides only a mildly guarded opinion, that the project can be accomplished within that budget. The claim against the design professional is the same; "…but for your failure to warn me, I never would have gone forward and my financial loss or cost overrun is your responsibility."

"The appropriate estimate type depends on when, during project development, the estimate is required."

Similar tension arises on publicly funded municipal projects. Consider for example a state DOT that provides funding for a project's construction based on an estimate prepared at the 60% design stage. During design development, omissions are detected in the 60% design that result in cost growth that the municipality is now forced to bear. While these omissions may very well represent non-compensable betterments, the municipality, with no alternate source of funding, is forced to pursue the engineer to make up the difference.

On design-build projects, the structural engineer may be called upon to provide takeoffs that the contractor can use to solicit firm prices from subcontractors. If, for example, the amount of structural steel increases from conceptual to final design and the subcontractor's price increases commensurately, then the design-build contractor will often seek recovery of those increased costs from the structural engineer. Unfortunately, existence of an insurance policy to cover these alleged errors makes that engineer a particularly attractive target.

There are several types of construction cost estimates: preliminary or ballpark estimates, intermediate estimates, engineer's estimates (sometimes referred to as the owner's estimate), and the contractor's bid estimate. The appropriate estimate type depends on when, during project development, the estimate is required. For planning and budgeting purposes, estimates are prepared during the early stages of the project life cycle, particularly the design phase as well as during the procurement phase.

Design phase estimates include preliminary and intermediate estimates. The preliminary or "ballpark" estimate is done at the very beginning of a project and is useful in helping the owner to establish either the scope or the magnitude of the project. As the name suggests, these estimates have very little basis in hard data and a high degree of variability. This category of estimate typically relies on "rules of thumb" or is based on a similar, recently-completed project.

The intermediate estimate is performed during the design phase and typically matches the design schedule, such as the 30% or 70% design submittal. As the design progresses, information available to the estimator becomes more reliable, thereby increasing the estimate accuracy. At the 30% submittal stage, the structural engineer will have very little detail to provide other than a concept of the structural systems intended, such as a steel vs. concrete framing system, the lateral bracing system, or the flooring system. As the design progresses and the structural system becomes more defined, the estimator will expect to be able to quantify various aspects of the design.

There are two procurement phase estimates: the engineer's estimate and the contractor's bid estimate. The engineer's estimate is the final estimate prepared by the design professional once the design is complete, but before the project is released for bidding. This estimate is the most complete and, if developed properly, should be within the lowest and the highest contractor bids. The structural engineer will be expected to contribute not only final quantities, such as weight and member sizes of structural steel including connections and volume of structural concrete, but the structural

engineer must convey any particular construction sequencing or other potential restrictions which could impact the cost of construction to the estimator.

The structural engineer can avoid many problems by simply confirming with the client that both parties have a similar understanding of the type of estimate at issue, and their respective expectations as to how that estimate will be used. This discussion should happen prior to providing any cost estimating services. The context of, and any limitations to, cost estimating input should be documented by way of a brief notation included with the actual data provided.

Preparation of Construction Cost Estimates

Cost estimating, particularly in the construction industry, is not an exact science. A qualified cost estimator, well versed in appropriate estimating techniques, can reasonably be expected to determine what the work, as defined in the contract documents, should cost. In addition to having a thorough understanding of the contract documents, and any unique project characteristics, there are several other factors that the estimator should consider when preparing a construction cost estimate (Ref. 1). These cost factors include: fluctuation of costs; traffic conditions; restrictive work hours or method of work; small quantities of work; separated operations; handwork and inefficient operations; accessibility; geographic location; construction season; and material shortages. Of these, the structural engineer needs to be cognizant of cost fluctuations, geographic location, construction season, and material shortages when preparing or contributing to cost estimates.

Determination of a Project Budget

Upon completion of an estimate, the Project Owner will use that information to develop a project budget; however, the construction cost estimate is just that, an estimate. The owner must also account for "unknowns" such as bid climates, differing site conditions, or other change orders. This is done through the use of contingency funds. The amount of contingency funds will vary not only from project to project but also from one estimate to the next; i.e., from a 30% estimate to a 50% estimate to the final engineer's estimate. As the project design progresses, the amount of the contingency should be reduced. For a 30% design estimate, the contingency should be 25-30% of the estimated construction cost, while for a final design estimate the contingency should be only 5-10% of the estimated construction cost.

For traditional design-bid-build projects, contingencies for the structural aspects of the project should be a minimum. Structural quantities are well defined and contingencies would only be necessary to address any potential volatility in the market place. However, in a design-build project, where the design-builder needs to establish a budget/proposal prior to completion of the design, it is imperative that the structural engineer be assured that an adequate contingency has been established based on the status of the design at the time of the proposal. This contingency should account for potential variability between the proposed and final quantities, which for the structural engineer would include those things discussed above; i.e., weight and member sizes of structural steel, including connections and volume of structural concrete.

Conclusion

Design Professionals engaged in development of construction cost estimates for their clients should understand not only the project for which they are providing design services, but also the external environment in which that project will be constructed. This additional insight into the various external nuances of a project will enable the design professional to select the best method, or combination of methods, to adequately develop the construction cost. Avoiding claims and managing risks to your firm also requires frank discussions with your client to assure that there is a meeting of the minds regarding what the cost estimates represent and their associated limitations. Equally important is the ability to deliver the "bad news" of actual or anticipated budget problems as soon as you are aware of them and, hopefully, concurrently proposing the solutions and constructive alternatives to abandoning the project.▪

David J. Hatem, PC, is a Founding Partner of the multi-practice law firm, Donovan Hatem LLP. He leads the firm's Professional Practices Group. Mr. Hatem can be reached via email at ***dhatem@donovanhatem.com****.*

David M. Ponte, P.E., is a Senior Claims Consultant with DH Consulting Group, LLC, a subsidiary of Donovan Hatem LLP. He is a licensed Structural Engineer in two states, and has memberships in the American Society of Civil Engineers and the Structural Engineering Institute. David can be reached at ***dponte@dhcboston.com****.*

References

Engineer Estimating Guidelines for Roadway Construction Projects, County of Riverside, State of California, January 29, 1999.