

Risk in Construction Estimating

By: Robert N. Kennedy, P.E.

MDC Consulting Engineer

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The Definition of Risk in Estimating

es·ti·mate [éstə màyt]

1. (v) to calculate something roughly: to make an approximate calculation of something

2. (n) rough calculation: an approximate calculation

By definition, an estimate is an *approximate calculation*. This inherently infers that there is a certain amount of risk involved with any estimate. The risk will vary depending on the quality and the detail of the estimate and on the detail of the design information available at the time the estimate is prepared.

The quality and detail of an estimate is usually defined in the requested scope of services. An estimate can be an *opinion of cost* or a *detailed estimate*. The *opinion of cost* is an estimate prepared based on a professional's best approximation of what a project will cost. It may take into account some basic parameters such as the type and size of the project or the expected product output from the project. It may even delineate some categories of construction following the CSI MasterFormat or UniFormat outlines. The *opinion of cost* is what was typically included in a standard AIA or NSPE contract. There is greater risk in an *opinion of cost* than in a *detailed estimate*. The *detailed estimate* is prepared based on a quantification of all items identified on the design documents at the time the estimate was prepared. It is then supplemented with parametric quantities for items not yet identified in detail on the design documents. The preparation of a *detailed estimate* is usually an additional scope of service. There is less risk in a *detailed estimate* than in an *opinion of cost*.

The design/construction process helps to define the amount of risk associated with the project estimate phase. There is more risk within an estimate that is prepared during the concept/program phase than the subsequent phases of schematics, design development, construction documentation/bid, and construction. The risk will lessen as the design reaches the completion of each phase and the project is re-estimated. As a design progresses, more information concerning the details of the design become apparent and the estimate should become more accurate, thus less risk.

Estimating, from its very basic definition, is not a factual scientific engineered calculation. It is, at best, one's best educated guess of the cost of a project. It will always have risk inherent in the numbers that compose the total.

Impact of Risk in Estimating

Estimating risk can have an impact on the design of a project. If an estimate is prepared in the early phases of a project and not updated during the subsequent design, there is the possibility that enhancements and changes to the design may outstrip the measures taken in early estimates to mitigate the risks (mostly cost overruns). When this happens the project can either try to secure additional funding (most unlikely) or change the design (most likely). Changes to the design to reduce cost are aesthetic, functional, or programmatic. Although the aesthetic changes to the design are the most visible, they often have the lowest impact on the overall cost of a project. The functional changes to the design (VAV vs CV HVAC system) have a moderate impact to the project costs but may also change how the project is operated when complete. The programmatic changes to the design have the largest impact on the costs, but also have the largest impacts to the end-users (i.e. less square foot per person, no cafeteria, etc.). With appropriate professional estimating at the start of the project and throughout the design phases, much of the risk and associated impact can be accommodated in the project budget.

Estimating risk can have an impact on construction. Field conditions such as rock excavation, poor soils, or inclement weather may expend the entire estimate risk buffer (construction contingency) early in the project. Subsequently, there may not be sufficient buffer in the later stages to lessen or mitigate the impact of additional field conditions. When this happens the project can either try to secure additional funding or change the design in the field to reduce the budgets yet to be expended. If it is a renovation project, then a larger than usual buffer should be carried in the estimate for unforeseen conditions.

Value management can help lessen the risk of an estimate by creating options that can increase the value or lower the cost of a design. This process allows an owner to get the optimal design for the optimal cost. This process has the greatest effect on the project costs and reduction of risks during the early stages of the design of the project. As the project progresses through the construction phase, the Value Management process has less of an impact on the overall costs and the reduction of risks to a project.

Identifying Risk

The accuracy of an estimate is dependent on two parameters – the type of estimate prepared and the amount of information known at the time the estimate is prepared.

The chart in Figure 1 shows the typical accuracy of an estimate during the various phases of design of a project. This accuracy is relative to the bids that may be obtained utilizing the documents at hand for each phase. One can see that the accuracy varies at each phase based on the type of estimate prepared.

Estimating Accuracy

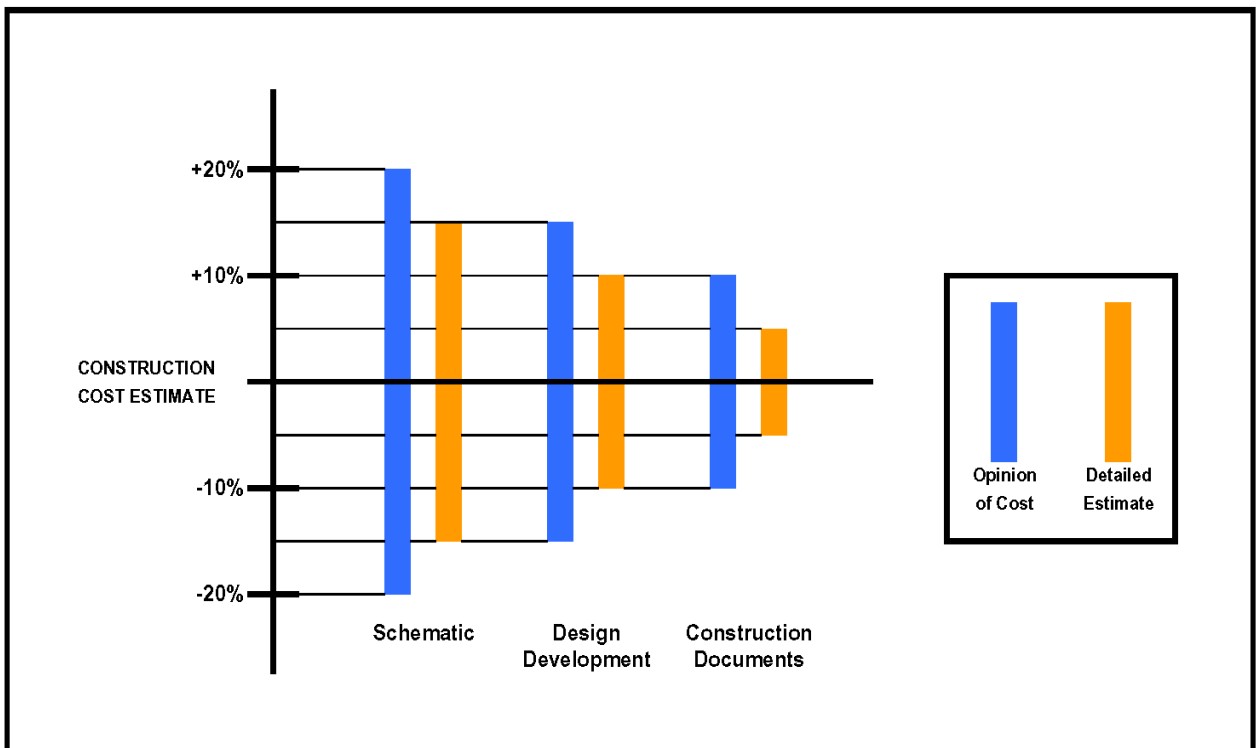


Figure 1

The most common way to identify the risk of an estimate is how much contingency has been applied to the total calculated cost. Figure 2 exhibits the level of contingency that is normally applied to an estimate at various stages of design. This chart represents a normal ground up construction project. If the project is the renovation of an existing facility, is located on brownfield site (an existing campus with aged infrastructure), or is a potential hazmat site, then additional contingency (risk abatement) should be considered.

Estimating Contingency

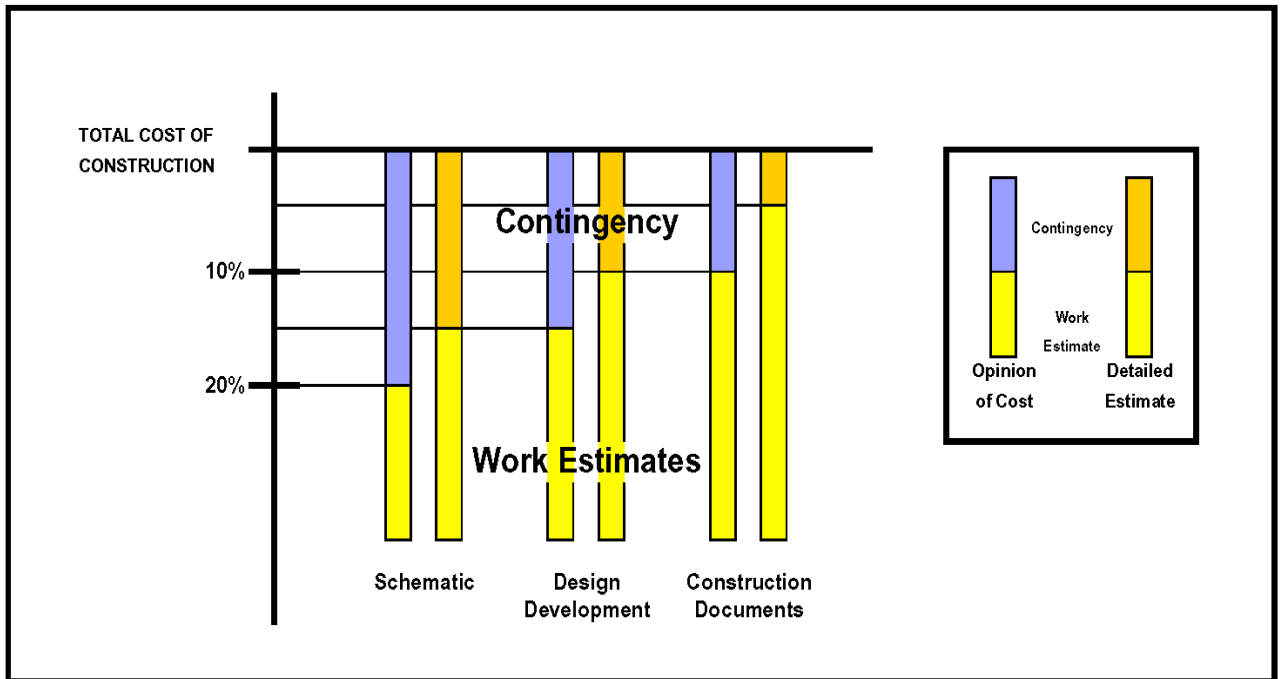


Figure 2

A good methodology for assessing how much contingency (risk mitigation) should be applied to an estimate is the use of a Monte Carlo based simulation program. These types of programs assess the risk and probability of success of each estimate component, as well as the schedule's impact on the estimate. This gives the decision makers intelligent choices and project principles reasonable confidence that their costs will fall within an acceptable range of their corporate standards based on the recommended and applied contingencies. This is essentially their calculated risk factor.

How to lessen the risk to an estimate

The most obvious way to lessen the impact of estimating risk is to apply a sufficiently large contingency. A contingency that is too large could over-inflate the budget cost of the project to make it infeasible. A large contingency may leave extra money at the end of the project. Senior management may then question why the company needlessly committed too much resource, when the money could have been used elsewhere. The use of the risk simulation and analysis is an excellent method to define proper contingency.

Being able to defer final funding until later in the project can also help lessen the risk to an estimate. If final funding is not approved until the start of construction, with bids received and contracts negotiated, then the project is more likely to finish within required budget parameters. If final funding is required early in the project, then the use of appropriate contingencies, bid options, and value management techniques can lessen the risk.

When forced to use early estimates for the basis of funding, it is recommended to use a professional trained in the development of capital cost projects. They can assist in developing the appropriate contingencies, bid options, and value management items. Additionally they can prepare early cost models based on the project definition and benchmark these cost models against other projects of similar scope. These benchmarks are adjusted for location, timeframe, size and scope of project to allow comparison to the cost model being prepared.

By following some of these guidelines one can mitigate much of the risk apparent in the development of an estimate.