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MPS

Cost Estimating Guidance for Construction Projects

Version 1.0

March 2020

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1.0 Purpose

This purpose of this manual is to provide guidance on the standards for the preparation of cost estimates in support of capital projects conducted by MPS. The Architects estimate is a critical part of the scoping and development process for each project.

The estimate serves as basis for probably construction costs, confirms the project budget, supports decision making on project scope and serves as a guide to evaluate the bidder's proposal. Since estimates are provided at various times throughout the design process, the estimate is also used to revise scope to ensure projects, when bid, can be completed with the funding allocation.

Accurate estimating is an important component each project conducted by MPS and is an important decision-making tool for the design team in its selection of systems and materials.

2.0 Application

This guidance shall be used on all capital construction project at MPS above \$500,000. A basis of estimate report shall be provided at specific milestones in the project as detailed in Exhibit B to the AIA B101 contract. An updated estimate will be required for change orders that includes revised designs and/or specifications that significantly impact potential construction costs.

All estimates must consider the current and future climate of construction and labor rates in the Minneapolis market. For example, if union trades are at capacity for construction, then workers may need to be imported into the market. The estimate should clearly identify this condition and make appropriate adjustments to account of the market conditions.

3.0 Procedure

3.1 General

The requirements established in this guidance will ensure the consistent development of project cost estimates and periodic updates to the estimates throughout the development process. Reasonable estimate certainty and contingencies will be provided based on the Class of estimate required. This guidance is established to improve understanding among MPS, architects and contractors on the estimates provided and the development of estimates.

This guidance uses requirements established from AACE International recommended practices for application of principles used in estimating capital projects of various complexities. The cost estimate system establishes the stages of cost estimating with the project design maturity and estimating methods to establish an estimate accuracy. Architects are encourage to become familiar with the AACE International estimating protocols to provide uniform and accurate estimates throughout the designs.

AACE International established the following criteria of estimates that MPS will use for capital project estimates.

Table 3.0
MPS Capital Projects Standard Classifications for Estimates

Estimate Class	Project Design Level	Typical End Use	Typical Estimating Methods	Accuracy Range
Class 5	0% - 10%	Concept	Judgement	-50% to +50%
Class 4	10% - 25%	Feasibility	Modeling, prior projects	-30% to +30%
Class 3	10% - 40%	Go/No Go or Budget	CSI major division costing	-20% to +20%
Class 2	30% - 80%	Control	Detailed unit costs	-15% to +15%
Class 1	65% - 100%	Bidding	Take offs with detailed unit costs	-10% to +10%

The contract establishes when specific estimates are required to be submitted and the class of estimate. Further detail is provided on the expectations of the estimates provided MPS throughout the design phase.

3.2 Estimate submittals

Several estimate submittals are required during the design process. Specifically, the B101 contract, Exhibit B, requires an estimate to be submitted at the 15% completion phase that depicts up to three options, (class 4 estimate), 25% completion (Class 3), design development (50%) (Class 3). Construction documents (Class 2) organized by CSI major divisions. Each estimate is expected to be provided to meet the needs of MPS to make decisions at the specific milestone the estimate is provided.

3.3 The 15% estimate

The 15% estimate is the first estimate the Architect is required to deliver to MPS. This estimate is used to determine the scope of the project matches the funding for the project. The estimate at this stage of design needs to be at the feasibility level. A Class 4 estimate is expected with a -30% to +30% accuracy. This estimate should be broken down into the major capital improvement items and the major maintenance items being conducted for a project. Most of MPS projects contain both capital improvement and maintenance items which are required to be in the project. However, it may be difficult for the Architect to determine the line

between capital and maintenance in a particular project. For the Architect, it will be important that the estimate contains costs for all the items in the project charter to confirm the scope of the project and was funded.

The Architect is expected to deliver at this stage three options for MPS to consider for solutions for the project. Not all projects will be able to provide three options due to the scope provided, but the Architect should provide at this point options (more than 1) to consider. Each of the options will also need an estimate of costs. The estimate of costs for the options needs to be comparative so MPS can make decisions at this phase of the project on the scope and ultimate designs. MPS understands that the estimates provided are based on a very broad scope and do not represent the ultimate cost of the project.

The Architect at this stage should use some general guidelines when preparing this estimate. For example, additions should be estimated based on square feet costs for new space, improved mechanical systems should be estimated using generally accepted costs of the improvement (typically in square feet). The Architect may also use previous project costs to provide the estimate. At this stage in design, detailed estimates are not provided except to confirm all items in the project charter are part of the estimate provided. The source of the estimated costs should be provided to assist the Owner in reviewing the estimates.

3.4 The 25% estimate

This estimate is a further refinement of the previous estimate and is expected to be at the Class 3 level with an accuracy of -20% to +20% range. This estimate will be based on the option determined in the 15% review. The estimate should be more refined at this stage since the scope of better defined and the options are reduced from previous designs.

The Architect shall prepare an estimate in a format that will support further refinement of the estimated costs as the project progresses in the design phase. MPS suggests the Architect develop the estimate at this Phase using the major CSI specification categories as line items in the estimate. While this format is not required, the CSI format will be required at later stages and should be developed at this estimate stage.

The estimate should include the known detailed design elements and maintain placeholders for the unknown elements as needed. This estimate should include

some level of contingency as part of the estimate. Contingency shall be no more than 20% of total costs unless significant “unknowns” still exist in the project.

MPS uses this estimate as a check on project scope and costs compared to the budget allocation. At this stage, the scope can be changed to meet the budget allocation or additional funding may be directed to the project to ensure the project can be completed as envisioned. The estimate needs to consider the current climate in the local construction industry given the estimated time for bid letting and general project capacity in the Twin Cities. The Architect needs to examine other school building projects being bid at or near the expected bid for the current project. The Architect should examine adjacent school district construction and any university projects planned. The Architect also needs to consider any specialty requirements for the planned project and potential impacts to the costs.

3.5 Design Development Estimate

The design development estimate is a further refinement of the 25% estimate as more detail is developed in the project. Some of the unknowns in the 25% estimate will be known and should be properly estimated. Additional information about the construction market may also be known at this estimate and should be included to further refine the estimated costs of the project.

The design development estimate is also a Class 3 estimate with an accuracy of -20% to +20%. The Architect shall indicate what further refinements have been made to the estimate and how the estimate differs from the 25% estimate. At this point, the estimate format shall be complete and follow the CSI major sections format. Contingency at this estimate may remain at 20% if there are considerable unknown costs at this stage. However, at design development, the Architect should have an understanding of the major construction items that are influencing the estimate and provide an explanation of the elements and costs.

3.6 Construction Documents

This will be the final estimate before the actual bidding of the project and should be the most accurate estimate for the project. This estimate is expected to be a Class 2 estimate with an accuracy of -15% to +15% or better.

At this stage, there should be very few unknowns in the project that can influence the overall cost of the project. The Architect shall submit a fully detailed estimate with expected costs for major items and components of the project. The estimate shall include both construction and non-construction items

and detail any risk to the estimate. The estimate shall not include costs for items that would not directly be bid by the Contractor. The estimate should also include, as separate line items, any add alternate items and their expected costs. Contingency for this estimate shall not exceed 10% unless authorized by the Owner. If there are significant unknown conditions at the site, the Architect shall prepare a risk register for the estimate that clearly details the unknown condition, the risk the conditions imposes on the project, a mitigation strategy and an estimated range of costs for the risk mitigation.

4.0 Estimate Requirements

Each estimate will indicate the phase of the project and the estimate classification. The estimate will include an assessment of the difficulties inherent in the construction work and will document the determination of productivity, production, and pricing for the estimate. This includes such factors as labor conditions, construction equipment, construction supervision, material costs, and equipment installation costs. All reasonable costs the construction contractor is expected to incur should be included in the cost estimate. This also includes non-construction items such as overhead and profit, bonds, insurance and other costs not attributable to the actual construction.

4.1 A good cost estimate

In general, a cost estimate should answer a series of question. These questions may include:

Scope

- ❖ What is included?
- ❖ What is excluded?
- ❖ Does the scope of the estimate match the design?
- ❖ What variations exist and how where they estimated?
- ❖ What risks are included and defined in the estimate?

Quantities

- ❖ Are the quantities used in the estimate reasonable? Can they be verified?
- ❖ Is the method used clear and easy to follow?
- ❖ Does the math work?
- ❖ Do item totals add up to summary totals?

Pricing

- ❖ Are the unit prices reasonable and justified?
- ❖ Are the explanations and sources reasonable?
- ❖ Does the pricing consider the type and quantity of materials?
- ❖ Are incidental costs addressed such as shipping, shortages and tariffs?

- ❖ Have unusual working conditions or hours been included?

Soft Costs

- ❖ How was work by others addressed?
- ❖ Are there unknowns that will impact soft costs?
- ❖ Is construction management addressed
- ❖ Bond, insurance and overtime included?

Presentation

- ❖ Is the estimate clear and understandable?
- ❖ Is it easy to follow with common terminology used?
- ❖ Is the basis of the estimate and level of accuracy required clearly presented with explanation?

Accuracy

- ❖ Is the estimate the best prediction of expected costs?
- ❖ Is the estimate inflated? Most estimating considers high costs so additional inflation should not be included.
- ❖ Is the accuracy of the estimate at the levels prescribed by the Class of estimate presented.

4.2 Basis of Estimate (BOE) Reports

All estimate documentation will be neatly bound in a report, or compiled in a single electronic file, called the Basis of Estimate (BOE) Report. AACE International Recommended Practice 34R-5 provides general guidance when creating the BOE. The BOE report is required for the Design Development estimate and the Construction Documents estimate. All other estimates for the project can follow the BOE format, but it is not required.

Generally, the well prepared BOE report will include:

- ❖ Documentation of the overall project scope.
- ❖ Effectively communicate the estimator's knowledge of the project by demonstrating an understanding of scope and schedule as it relates to cost.
- ❖ Alert the project team of potential costs risks and opportunities.
- ❖ Provide a record of key communications, assumptions and decisions made during estimate preparation.
- ❖ Provide a record of all documents and sources used to prepare the estimate.
- ❖ Act as a source of support during dispute resolutions.

- ❖ Establish the initial baseline for scope, quantities and cost for use in cost trending throughout the project
- ❖ Provide the historical relationships between estimates throughout the project lifecycle.
- ❖ Facilitate the review and validation of the cost estimate.
- ❖ Document the estimate in a logical, consistent and legible manner.
- ❖ Document what was excluded from the estimate.

The following information is required in each BOE report:

- ❖ Cover Page: A cover page that clearly indicates the project, estimate classification, estimator and the date completed.
- ❖ Purpose Statement: A brief and concise description of the project that is being estimated (i.e. , new facilities, addition/upgrade, rehabilitation etc.), as well as the type and capacity of the process units, the location of the facility, and the overall timing of the project.
- ❖ Project Scope Description: A semi-detailed description of the scope of work for each major segment of the project. Identify any major pieces of mechanical or electrical equipment or components. Indicate primary trades involved in the project.
- ❖ Design Basis: Identify types and status of engineering and design information that was provided. Describe any assumptions that were made with regards to the Design Basis. Provide a checklist of project deliverables as an attachment to the Basis of Estimate. Provide a list of documents and drawings as an attachment to the Basis of Estimate.
- ❖ Planning Basis: Document the execution approaches. Identify contracting and resource strategies. Describe work week and overtime assumptions. Discuss constructability and modularization assumptions. Identify overall schedule and key milestones.
- ❖ Overall Cost: A single line rollup of estimated construction cost including the high and low ranges based on estimate class. Clearly indicate the expected range of accuracy.
- ❖ Estimate History: A short description of the history of the estimate(s) generated to date for the project at a summary level.
- ❖ Estimate Methodology: A description of the primary estimating methodology used to prepare the cost estimate. This should include documentation of the use of cost resources, historical data and project benchmarking.
- ❖ Source Documents: A detailed list/description of the documents used to generate the estimate (e.g., drawings, specifications, etc.) including revision numbers and issue dates.

- ❖ Markups: Identification of markup percentages used (overhead and profit, builder's risk, and bonds) and how they were determined,
- ❖ Escalation Rate: A description of the escalation calculation including the assumed start, end and mid-point dates of construction, the annual escalation rate used and the resulting total escalation.
- ❖ Cost Basis: A description of the methods and resources used for determining all material, labor and subcontract pricing to include pricing sources for equipment, bulk material, labor hours, taxes, influence of local market condition.
- ❖ Assumptions: A detailed list of assumptions used to build the estimate.
- ❖ Excluded Costs: A list of costs not included in the estimate such as hazardous materials remediation, acquisition of land, financing, etc.
- ❖ Allowances: A list of allowances made for known requirements not yet specified in the source documents. Include the basis for calculating the cost (e.g. X percent of net total).
- ❖ Contingency: A detailed explanation of the contingency amount used in the estimate, what it's for and how it was derived.
- ❖ Risks: Identify any areas of the estimate that contain significant threats or opportunities. If a formal risk analysis was performed, identify any items with 'High' or 'Very High' risk.
- ❖ Supplemental Work Authorization: Justification, including calculations, for determining the Supplemental Work Authorization percentage at 100% design.
- ❖ Exceptions: A list of variances to this standard or significant deviations from the project and/or deliverables normally required for the applicable class of estimate.
- ❖ Add Alternates: List of add alternates for the project and estimates for the specific add alternates including a description to support the estimate.
- ❖ Appendices:
 - Total Estimate Summary
 - Estimate Reconciliation
 - Detailed Construction Estimate
 - Reference Documents (e.g., vendor quotes, estimate calculation and takeoffs, assumptions, allowances and
 - any other documentation gathered and/or utilized in the development of the estimate)

4.2.1 Basis of Estimate Appendices

The Total Estimate Summary is a one page summary that shows both direct and indirect project costs on a single page. The Architect will provide the estimator with the indirect costs in order to complete the estimate. Indirect costs generally include surveying, commissioning, and project support that would be part of the Construction phase of the project.

The purpose of the Estimate Reconciliation is to show the evolution of the project estimate over time, identification of significant variances and explanations of the same. The Estimate Reconciliation should summarize the estimate and any escalation that may have occurred between estimates.

The detailed construction estimate contains the quantity, unit and hours information used to develop the total construction cost. The detailed construction estimate should break down detailed asset construction costs depending on the scope of the project.

Each individual row of the detailed cost estimate should contain the following:

- Line #
- WBS
- Item Description
- Quantity
- Units
- Labor Man-Hours
- Labor Rate
- Labor Total Cost
- Material Unit Cost
- Material Total Cost
- Equipment Unit Cost
- Equipment Total Cost
- Unit Cost
- Total Cost

It's understood that consultants may utilize software to perform estimates and that different software packages have differing capabilities. Because of that, the detailed cost estimate data listed above is flexible but should be adhered to as much as possible. The consultant should notify the Owner at the design kick off meeting if they are unable

to provide the information listed above to ensure the detailed estimate meets the requirements.

Any reference documents (excluding drawings) supporting the development of the construction estimate should be included in this section of the BOE report. (Note: to reduce the size of the BOE Report, the consultant may just reference the documents used)

The Work Breakdown Structure (WBS) provides a mechanism to organize the project into a hierarchical framework for the purposes of planning, estimating, and monitoring. The construction scope of the project is to be broken down into unique and manageable parts that correspond to specific units/items in the construction. MPS prefers a breakdown by CSI major sections where possible.

4.3 Contingencies

Contingencies are used to cover unknowns and unanticipated conditions that are not possible to adequately evaluate from the data at the time a cost estimate is prepared, but must be represented by a sufficient cost to cover identified risks. A construction contingency is assigned to cover changing market conditions, design incompleteness, detail changes, alternative design changes, and associated costing inaccuracies during the construction cost estimating portion of the design phase of the project. Contingency specifically excludes major scope changes such as changes in end product specification, capacities, building sizes, and location of the project; extraordinary events such as major strikes and natural disasters. As detailed design progresses and design information becomes known, the construction contingency is reduced.

Contingency ranges for the cost estimates should not exceed 10% for construction documents BOE report and should not exceed 20% for the design basis estimate. The contingency percentage used shall include an explanation of the conditions that generated the contingency and how the percentage was selected by the consultant.

4.4 Add Alternates

Each project will contain add alternates to allow for items that may not be part of the original scope of the project, but could enhance the project outcomes if budget is available for the alternates. MPS strives to include at least three add alternates for each project, as appropriate. When estimating add alternatives, the estimate should provide a lump sum amount for each add alternate in the

design. Add alternates should include market conditions especially around the time to complete the project to ensure there is adequate time for completion of the item without impact to the main project objectives.

4.5 Identification of Project Risk

No two projects are the same and many different variables will determine risk severity and the probability of those risk occurrences. The consultant should identify the project risks that could impact the project, assess the severity and probability and recommend a percentage/allowance to address the risk. This should not be part of contingency, but assigned to specific project line items that may incur risks that need mitigation.

Project risks that could warrant mitigation include:

- Age of facility or infrastructure
- Availability or condition of as-built drawings
- Limited advance surveying or investigation
- Inaccessibility of internal components
- Safety or health
- Lack of access to systems
- Expected conflict structures
- Design inaccuracies

For risks, a risk register should be completed during the estimate process that identifies the risk, assigns a severity (1, low: to 5, high) and probability (1, not probably to 5, likely). Risks that severity times probability is greater than 15 will require a mitigation plan to be developed to minimize project impacts. The Architect should work with the Owner on identified risks that require mitigation development for the project.