



Oversight Procedure 33 – Capital Cost Estimate Review

1.0 PURPOSE

This Oversight Procedure (OP) describes the review, analysis and recommended procedures and reporting requirements that the Federal Transit Administration (FTA) expects from the Project Management Oversight Contractor (PMOC) with regard to the:

- Soundness of the Sponsor’s cost estimating methods and processes compared with proven professional quantity surveying and cost estimating practices;
- Congruence of the project cost estimate with the project scope and schedule, i.e. do these three elements fully reflect each other;
- Reliability of the estimate for procurements, contract bids, and contract closeout, i.e. will the project budget prove to be adequate at these milestone events.

2.0 BACKGROUND

Congress and FTA’s good stewardship require that a Sponsor’s cost estimates be reliable before entry into Engineering and Full Funding Grant Agreement (FFGA) or Small Starts Grant Agreement (SSGA), as well as other points in project development, when requested by FTA, a thorough evaluation of the scope, schedule and cost is performed to confirm the estimate’s reliability.

3.0 OBJECTIVES

FTA’s objective is to assess the consistency of cost estimating information, understand its characteristics, evaluate the methodologies, and confirm that the estimate adequately reflects the overall project scope, the estimated quantities shown on the design documents, the anticipated market conditions, the risk elements associated with the project, and the project schedule. This procedure is applicable to Design-Bid-Build, Design-Build and other delivery methods. A cost or cost range is established as a base from which future estimates are measured. Later, when contract packages are conceived, the PMOC will evaluate the estimates in the packages. This review may be performed prior to FFGA or SSGA and issuance of documents for bid, or during construction. The review results should help the Sponsor with decisions regarding the level of cost control measures, appropriateness and reasonableness of contingency provisions, and mitigations required; in addition, the results will assist FTA with decisions regarding project advancement and funding.

4.0 REFERENCES

The statutes, regulations, policies, guidance documents and circulars in OP 01 apply. The Sponsor’s estimate should conform to industry standards as published by leading project management and control organizations. In addition, the schedule management and project controls will be subject to reviews as described in the following OPs:

- OP32C – Project Scope Review
- OP34 – Project Schedule Review
- OP40a/b/c – Risk and Contingency Review

5.0 SPONSOR SUBMITTALS

The PMOC shall obtain and study the Sponsor’s current cost information:

- Summary of O&M Cost Assumptions/Productivities;
- Capital cost estimate in original and SCC format;
- Capital cost estimate backup data (take-offs, cut sheets, work breakdown structure, calculations, and recapitulation) for the purpose of traceability or mapping.
- Capital cost estimating methodology memo (refer to Appendix B);
- Assumptions used for all escalation and contingency (allocated, unallocated, and hidden or latent) provisions.
- Before and After Study Documentation.

In addition, the PMOC shall obtain and study the project environmental documents, project drawings, specifications, narratives, design criteria reports, project schedule, information on land acquisitions and relocations, and procurement of vehicles, material, and equipment.

6.0 SCOPE OF WORK

This Review may be performed during project planning, design or construction. The work order may specify the extent of the review, add re-assessments or specialized analyses. Under the MAP-21 process, PMOC cost reviews will occur as directed by the FTA work order manager but, most likely at the following stages:

Review during Project Development (PD)

Preparation of a comprehensive capital cost estimate in native and SCC format should occur during PD. The PMOC should review the cost estimate and also review the Sponsor’s cost estimate staffing, capabilities and processes. OP51, Appendix B, Section 6 provides criteria for evaluating the completeness, level of detail and reasonableness of the project cost estimate at Entry into Engineering.

Entry into Engineering: Preparation of an appropriate cost estimate developed using acceptable methodology, with all elements identified in SCC second level format, including costs for third party, utility and critical ROW agreements. Depending on the initial risk level of the project and/or Sponsor, the PMOC would conduct either a review workshop or a more intensive full cost estimate review (in conjunction with full scope and schedule reviews). The FTA reserves the discretion to conduct risk assessments prior to Entry into Engineering. As a result, additional cost estimating analysis may need to be performed to support processes required under OP40a/b/c.

Reviews during Engineering: Upon Entry into Engineering, the PMOC updates the cost estimate review and conducts a risk assessment which could range from a Sponsor-led expedited review, FTA-led expedited review or FTA-led full review. This review could be used to award Letter of No Prejudice (LONP), Letter of Intent (LOI) or Early Systems Work Agreement (ESWA) or commitment of Federal share.

Review for FFGA/SSGA

: Prior to the final request for FFGA/SSGA, the FTA will perform a readiness review, potentially request the PMOC to refresh its Cost review (along with schedule and risk). FFGA/SSGA, required for construction, can occur at any time after the Project Engineering phase. As such, the PMOC review for FFGA/SSGA will need to be commensurate with the Sponsor's documents available at the time and require the PMOC team performing the update to evaluate the suitability of the project documents to the Sponsor's project execution and contracting strategy, whether design-bid-build, design-build or other FTA acceptable process.

Reviews during Construction: During construction, the FTA may require the PMOC to monitor the Sponsor's compliance with the cost and estimating elements of the PMP and its subplans, monitor for risks to budget, including contingency levels, and monitor the appropriate cost and estimating capacity and capability of the Sponsor's organization.

The PMOC shall assess and evaluate the Sponsor's estimate and its plan for cost control. Consider the adequacy of the Sponsor's project control staff, systems and software for the size and complexity of the project. Validate the usefulness of the estimate as a project management tool, consider the level of definition of the estimate and elements within the schedule for appropriateness to the project phase; identify cost uncertainties, and issues with the project estimate mechanical soundness, and fundamental and reasonable soundness.

The PMOC shall review the Sponsor's cost control including internal procedures and estimate reviews. Consider the timing and adequacy of such reviews to determine if the schedule is sufficiently developed, properly maintained, and consistent with the progress of the project. Review the Sponsor's processes and procedures for developing, monitoring and changing the estimate, including approvals if a significant change in the Revenue Service Date is required. The PMOC should additionally determine if the Sponsor has a formalized Configuration Management process that controls baseline budget and any re-baselining controls for cost revisions.

The PMOC shall provide recommendations to improve the development and implementation of cost management and proactively help the Sponsor solve cost problems. In a report, the PMOC shall document its findings, professional opinions and recommendations.

The PMOC shall:

1. Evaluate the Sponsor's development and implementation of the following cost management components:
 - a. Project Control Organizational Structure – Includes the Sponsor's staff combined with the potential blending of other consultant project controls staff for all project phases
 - b. Project control systems, tools and software used
 - c. Review of project control plans, procedures, and cost management contractual requirements
2. Conduct a Technical Estimate Review
 - a. Mechanical Soundness check
 - b. Fundamental and Reasonable Soundness check
3. Readiness to conduct OP 40 Schedule Risk Analysis check – (If applicable)

The PMOC shall provide a written comparison of the proposed estimate with similar project(s) and analyze the differences. To the extent possible, early in the project early stages, the PMOC shall use the cost data base for comparisons purposes. The PMOC should then draw conclusions and provide recommendations based on this comparison, if applicable.

6.1 Review of Sponsor's Estimate Review Process

The Sponsor should have a review process for its own cost estimate and be continually monitoring and updating its estimate using said process. The PMOC should review the Sponsor's approach to this task for adequacy and timing. Checks may be in the form of peer reviews and/or independent cost estimates or internal reviews that ensure the estimate provided to the PMOC for FTA's review is, at a minimum, internally consistent, coordinated, and reflects current assumptions and project status.

6.2 Review of Sponsor's Cost Estimate

The PMOC should perform any or all of the following after discussing the selection with FTA staff:

- A full project level cost characterization;
- A limited cost element review;
- Development of a cost estimate baseline;
- Specialized quantitative cost modeling or assessments, surveillance reporting or trends analysis;
- Reevaluation of project cost information on a periodic or event driven basis;
- Coordination of the cost estimate with the project scope and schedule;
- Coordination of the cost estimate with any known risk elements worthy of forecast adjustments;
- Presentation to the Sponsor of findings, analysis, recommendations, and opinions;
- Participation in a workshop with the Sponsor to discuss the project.

6.2.1 Proposed Approach to Reviewing the Estimate – A Sampling Plan

After briefly evaluating the Sponsor's submittals associated with their current Cost Estimate (and discussing with them), the PMOC shall propose to FTA an approach to reviewing the Sponsor's cost estimate that, regardless of the level of development of the estimate, will provide FTA will reliable findings and recommendations. The PMOC's proposed approach should be commensurate with the level of development of the Sponsor's Cost Estimate, which typically becomes more detailed as design progresses. In addition, depending on the Sponsor's chosen Project Delivery method(s), the PMOC may need to structure the proposed approach for the reviewing the Sponsor's Cost Estimate to be appropriate for the planned Delivery method(s) (i.e. Design-Build, Construction Manager-General Contractor (GM-GC), or other hybrid approaches might necessitate different and refined techniques for evaluating the Sponsor's Cost Estimate). Further, the Sponsor's cost estimating techniques and methodologies are often different based on the size of the project (from an overall projected cost standpoint), complexities, number of anticipated contract packages, and other factors. As such, in proposing an appropriate and reasonable approach to reviewing the Sponsor's Cost Estimate, the PMOC should consciously consider the stage of project development, the methodology and degree of development of the Sponsor's Cost Estimate, and the size, complexities, and circumstances surrounding the project being evaluated. The proposal should include a description of the level of sampling of the estimate line items, and, if possible, examples of a sampling approach taken from a

previous project(s). The plan shall also identify the sources of comparable data to be reviewed including third parties, market indices, other projects or databases, schedule options, etc.

6.2.2 Review of Sponsor's Cost Estimating Capabilities

When applicable, as part of Checklist, Section 3, Project Sponsor Organization, found in OP-51, the PMOC should request from the Sponsor the names, resumes, and job descriptions of its Cost Estimating representatives, along with any organizational or project-specific policies or procedures that the Cost Estimating representatives are tasked with following. Although this test is also covered in the OP-21, Sponsor Project Management Capacity and Capability Review, the importance of having a sufficient number of qualified Cost Estimators in support of a major capital project cannot be emphasized enough. As such, the PMOC should review the Sponsor's capabilities in this regard as part of its overall evaluation of the Sponsor's Cost Estimate.

In addition, when applicable, the PMOC shall reference the Checklist Section 2.0 Project Management Plan, found in OP-51 to confirm that the Sponsor's Project Management Plan incorporates the practices and procedures needed to manage the cost estimates and cost control processes.

6.3 Basic Review

6.3.1 Review for Traceability, Integration, Coordination, Consistency

The PMOC should check that the Cost Estimate is:

- Mechanically correct and complete; free of any material inaccuracies or incomplete data
- Consistent with relevant, identifiable industry or engineering practices
- Consistent and reasonable approach taken and format used by the Sponsor's cost estimators
- Consistent and reasonable methods of calculation/application of multipliers for escalation, inflation, general conditions, contingencies, cost of money, and taxes.
- Consistent with the project scope described in NEPA document, Record of Decision, and design documents
- Organized into SCC cost accounts categories
- Consistent with the current project schedule

6.3.2 Characterize the Level of Estimating

The PMOC should:

- Characterize the estimating methodologies used:
 - Parametric (Statistical) -- A cost estimating methodology using statistical relationships (see Appendix C). Commonly referred to as "Top Down" estimating.
 - Analogous (Comparison) -- An estimate of costs based on historical data of a similar (analog) item.
 - Bottom-Up (Detailed Engineering) -- This involves using a detailed Work Breakdown Structure (WBS) and pricing out each work package making up the project.
 - Extrapolation (Earned Value) -- Estimates which are based on actual project costs
- For the estimated elements, characterize the nature of the support for the costs estimated, i.e. how these were derived so that the basis of estimate is documented in terms how the scope was captured, how it was priced and what assumptions were considered in the cost
 - Level 1: Characterize the line quantities and nature of the estimate as being:

- the product of unit cost and quantity (Unit costs are defined when the estimate separately identifies direct and indirect cost components)
- a cost estimating relationship (CER); (Unit pricing is classified as CER)
- a lump sum (sometimes referred to as an “allowance” or “plug number”)
- Level 2: Subdivide Level 1 as follows:
 - quantities indicated in both the design documents and the cost estimate
 - quantities indicated only in the cost estimate
 - quantities indicated only in the design documents
- Level 3: Subdivide Level 2 into the following subcategories:
 - Cost to Cost CERs
 - Non-Cost to Cost CERs
 - Cost or Non-Cost to Non-CERs
- Level 4: Subdivide Level 3 as follows:
 - Project direct costs
 - Escalation of materials and labor
 - Total project allowances
 - Project indirect costs
 - Construction contractor profit
 - Total inflation costs (nationwide/regional change in costs over time)
 - Total project contingency (allocated, unallocated, hidden or latent) (coordinate work under this section with work performed separately under OP-40 for risk and contingency)

The PMOC shall provide its professional opinion regarding the over/understatement in the Sponsor’s cost estimate and shall support its opinion with its own spreadsheets and calculations. The PMOC shall assess the integration and traceability of the estimate with the defined scope and schedule of the project for purposes of identifying a “baseline” or initial project estimate. The PMOC shall assess the escalation factors used for material, labor and other costs, as well as the inflation of costs from the Base Year to the Year of Expenditure (YOE) cost, the soundness of the economic forecasts and factors used, and the appropriateness and reasonableness of contingency levels, noting the use of inconsistent and questionable rates or costing techniques within the estimate.

6.4 Specific Reviews

6.4.1 Review of Parametric Project Cost Estimate (Refer to Appendix C for Description)

The PMOC shall characterize the Sponsor’s parametric estimate of project cost to determine that it:

- Identifies the key input drivers (i.e. independent variables) and explains their relative impact on the estimate;
- Adequately provides and supports the data and inputs used in calibration;
- Demonstrates that the model utilizes historical costs that are calibrated to current conditions within a reasonable degree of accuracy;
- Explains any adjustments to the model or to the key inputs, and provides adequate rationale for such adjustments;

- Demonstrates that the calibrated model produces reliable estimates in comparison to some other benchmark (e.g., actuals, comparative estimates).

6.4.2 Review of Definitive Project Cost Estimate (Refer to Appendix D for Checklist)

Review and characterize the Sponsor’s cost estimate using the checklist from Appendix D. Determine that the estimate reflects a thorough and reasonable incorporation of all cost elements consistent with the project scope, schedule, known and unknown risk elements, and correlates with current construction contractor pricing and work quantities. Assess and evaluate construction contract package elements and the impact of the terms in the General and Supplementary Conditions of the Contract, and Division 1 provisions, on the anticipated bid price. Describe and characterize the Sponsor’s construction contract package information as follows:

- Identification of restrictive schedule or mobilization requirements that would materially affect bid prices;
- Identification of construction contract elements or contract language that would reasonably serve as a basis for reduced competition, increased pricing (due to passed-on risks), and ambiguous or incomplete terms leading to additional compensation, which is not part of a scheduled payment item;
- Geotechnical data;
- Provision for third party, real estate, utility relocations and support issues.
- Evaluative and pricing approach to changed conditions;
- Unit pricing and allowed variability in unit pricing (including maximum limits of variance);
- Provision for an adequate amount for the construction contractor’s general conditions;
- Requirements for specific services such as QA/QC or scheduling, appropriately allocated to each contract and evident in bidding documents.

The PMOC shall develop an independent detailed cost estimate of the construction contractor’s general conditions for the systems work and for the three largest construction contracts, and shall compare and contrast and make recommendations of change to the Sponsor’s estimate.

6.4.3 Comparison between Sponsor’s Project Cost Estimate and FTA Database

The FTA maintains a Capital Cost Database on the FTA’s website that can be found at the following link: http://www.fta.dot.gov/12305_11951.html.

The Database presents a summary of “as-built” costs for federally-funded, Light and Heavy Rail projects. The projects’ costs are tracked in FTA’s Standard Cost Categories, (SCCs) which have been validated by the project sponsors. While the Database should not be used exclusively or predominantly as the PMOC’s Cost Estimating review tool, it should be consulted with as it allows for a comparison to historical projects, having generally similar characteristics. It provides a tool for assessing and evaluating the Sponsor’s project estimate, specifically identifying variances in unit costs and quantities from database averages, while promoting analysis of variances. The PMOC should continually consult the Database with each Cost Estimate review as the Database will be further

developed, with new projects being added periodically, along with an annual update of the inflationary factors.

6.4.4 During Engineering, Pre-Bid, Post-Bid: Market Conditions Review

During project implementation, the Sponsor will receive bids or offers that may have a significant impact on the project budget. The PMOC shall analyze project information Pre-Bid:

- Identify, organize, characterize, and analyze substantial construction contracts, signaling, and equipment procurements;
- Describe and evaluate the Sponsor's contract packaging strategy, its relationship to the project cost estimate, and the rationale (political, economic, engineering, etc.) for the contract packaging strategy;
- Characterize and evaluate the Sponsor's proposed plan and processes for solicitations;
- Characterize and evaluate the material elements of the project risk assessments as available, emphasizing scope, cost and schedule reviews as highlighted in internal risk registers, and the Sponsor's Risk and Contingency Management Plan (RCMP). Correlate these elements with the contract packaging strategy analysis, bid/bidder information, market conditions information, specialty equipment requirements, etc.

Address the following Post-Bid:

- Correlate and analyze bids or proposal amounts against the estimated values for each bid or proposal by element. Assess the impact of each deviation on the overall estimate, risk assessments, cost risk-cost ranges and risk mitigations;
- Characterize and evaluate the Sponsor's bid process (plan sets distributed, pre-bid conference attendance, bid question activity, exit conferences, telephone interviews, analytical products, bid tabulations);
- Characterize estimate reconciliation exercises performed between the Sponsor and the contractor (i.e. post bid negotiations, inclusions and exclusions);
- Where significant variances between bid received and estimates are discovered:
 - Trace variances on bid tabulation elements back to the cost estimate and risk register;
 - Sample unit cost and quantity information to evaluate the reliability of estimate compared with bid pricing; obtain independent market data and adjust as necessary to compare to pricing and estimate. Sample scope elements from the contract documents to support conclusions;
 - Survey the market to ascertain reasons for no bids, price drivers, retained risks, etc.;
 - Develop an estimated allocation between unit cost and quantity variance;
 - Organize causal factors into groups such as market factors, general conditions, risk transfers, etc.;
 - Evaluate contract award against design scope to assess whether the contract includes all of the planned scope as originally estimated (sometimes designs are adjusted after the

estimate is prepared and large portions of work are not included in the solicitation package leading up to contract award).

- That the Sponsor has established a plan to utilize bid results to adjust future packages for similar unsolicited work (if necessary).

6.4.5 During Construction -- Assessment of Sponsor's Cost Estimate

Characterize the Sponsor's estimate of the project cost-to-complete the project. Describe the level to which it:

- Is integrated with and makes adequate use of the Sponsor's previously developed supporting documentation for the estimate;
- Reflects current project schedule, including the Contractor's Critical Path (CPM) scheduling plan;
- Reflects the Sponsor's change order experience on the project;
- Evaluates and incorporates project progress and trends to date; and
- Reflects reasonable provisions for testing, commissioning, start-up, and revenue service.

6.4.6 During Construction -- Assessment of Sponsor's Cost Estimate – Contingency and Risk

1. Cost Contingency

Per the requirements of the *Project Cost Contingency* section of OP40b, perform a review of the project cost contingency to ensure that appropriate amounts are included commensurate with the stage of project development. Prepare a cost draw-down curve per the *Cost Contingency Draw-Down Curve* section of OP 40b including both forward pass and backward analysis analyses. Also, refer to the requirements of OP40b, Appendix G Risk and Contingency Management Plan Structure, Cost Contingency Management Plan to ensure that the estimate itself is fully coordinated with the Sponsor's plan.

2. Readiness to perform OP 40 a, b or c Risk Analysis

During the project the FTA may direct the PMOC to conduct/refresh an OP 40 Risk Assessment. The risk assessment includes a cost and schedule risk analysis as described in OP40a, OP40b and OP40c. In order to perform a cost risk analysis the project estimate must first be reviewed or characterized (OP 33) and adjustments must be made if so determined by the PMOC. Most importantly, similar to the project schedule, the project estimate must be completely stripped of all contingencies (patent and latent).

1. Once all contingencies have been identified and documented during the Technical Review, all contingencies must be removed from the project estimate.
2. Once all constraints are identified and documented during the Technical Review, all constraint must be removed from the project estimate.

7.0 REPORT, PRESENTATION, RECONCILIATION

Refer to Appendices E and F below for information on the Body of the Report.

The PMOC shall provide FTA with a written report of its findings, analysis, recommendations, professional opinions, and a description of the review activities undertaken. After FTA review and approval, the PMOC should share the report with the Sponsor. In the event that differences of opinion exist between the PMOC and the Sponsor regarding the PMOC's findings, the FTA may direct the PMOC to reconcile with the Sponsor and provide FTA with a report addendum covering the agreed modifications by the Sponsor and PMOC.

The report formatting requirements of OP 01 apply. When necessary, the PMOC shall perform data analysis and develop data models that meet FTA requirements using Microsoft Office products such as Excel and Word and use FTA-templates when provided. The PMOC may add other software as necessary, but all supporting documentation and report data must be made available to FTA.