

CHAPTER 13

CHECK ESTIMATES AND INDEPENDENT COST ESTIMATES

1. INTRODUCTION

Check estimates and independent cost estimates (ICEs) are tools that can be used to validate a cost estimate. Estimate validation entails an objective review of the estimate to ensure that estimate criteria and requirements have been met and a well documented, defensible estimate has been developed. The validation procedure occurs late winter to early spring in the pre-budgetary cycle. Validation is not a direct estimating function; however, estimators need to be aware of the validation cycle to ensure that those projects that require validation are ready for the validation process. This chapter describes check estimates and their procedures and various types of ICEs. DOE Order 5700.2, Cost Estimating, Analysis, and Standardization, also discusses these estimates and can be used as a reference.

2. CHECK ESTIMATES

A. General Definitions

Check estimates are one way that a field office can infuse quality assurance/quality control practices into a cost estimate. These estimates should be developed and performed by a third party who did not participate in the original cost estimate. An “outsider” provides the opportunity for the estimate to be reviewed by a fresh observer. Check estimators should be able to identify any weaknesses in estimate documentation or methodology before these weaknesses have a negative effect on the estimate. For example, if personnel performing the check estimate cannot follow the existing documentation, chances are that the documentation is not sufficient to support the estimate in the approval process.

B. Check Estimate Procedures

General procedures for performing a check estimate are outlined in the following sections. A sample estimate review checklist is provided at the end of this chapter.

1. Review Background Data and Conditions

Before the estimate can be checked, the estimate parameters and requirements must be understood by all personnel performing the check estimate. These conditions provide the framework for the estimate and are what the estimate is compared against. At this time, the check estimator may also want to modify the estimate review checklist based on the estimate criteria.

2. Review Check Estimate Coverage and Scope

During this phase of the check estimate, the original estimate is reviewed and compared against the information gathered in Part A. Check estimators must assess if the estimate satisfies the criteria and conditions.

3. Evaluate the Estimate Methodology

Personnel performing the check estimate must be able to follow and check the estimate methodology. Steps include verifying estimating techniques and sources of estimate data. Check estimators should be able to clearly understand the origin of all numerical data in the estimate.

4. Identify Uncertainties

During this phase of the check estimate, the check estimator should confirm all uncertainties documented in the estimate. Check estimating personnel may also identify other uncertainties in the estimate that were missed or glossed over. It is better to note these uncertainties at this time so that a true, accurate estimate is developed and used.

5. Complete Estimate Review Checklist

Once the estimate has been checked, the results of the check estimate must be documented. Personnel may use an estimate review checklist or prepare a concise written report that documents any findings in the check estimate. A sample estimate review checklist has been included at the end of this chapter.

3. INDEPENDENT COST ESTIMATES

A. General Definition

ICEs are defined as estimates developed by FM-50 for the express purpose of serving as an analytical tool to validate, cross-check, or analyze estimates developed in the proponent channels. ICEs follow a specific procedure and may involve site visits. ICEs are usually performed by a group of cost engineers, the estimator, schedulers, and experts in other disciplines, as required, hereinafter referred to as the ICE team. Estimates not performed by FM-50, but performed for the purpose of validating the

official project estimate, are referred to as check estimates or review estimates, not ICEs.

B. Independent Cost Estimate Types

The following techniques will be utilized by the ICE team depending on the stage of the project, the level of documentation available, and the time available.

1. Documentation Review (Type I)

This type of review is not normally accomplished as an ICE, nor does it fulfill the requirements necessary to support an Energy System Acquisition Advisory Board (ESAAB) decision, since it only consists of an assessment of the documentation available to support the estimate. It is merely an inventory of existing documents, not a review, and determines that the required support documentation exists and identifies missing data.

2. Reasonableness Review (Type II)

For this review, the ICE team reviews all available project documentation, receives briefings from the project team, holds discussions with the project team, completes sufficient analysis to assess the reasonableness of the project assumptions supporting the cost and schedule estimates, ascertains the validity of those assumptions, assesses the rationale for the methodology used, and checks the completeness of the estimate. The result is a report that details findings and recommendations.

3. Parametric Estimating Technique (Type III)

This technique, in addition to incorporating all the activities needed for a reasonableness review, uses parametric techniques, factors, etc., to analyze project costs and schedules and is usually accomplished at a summary (WBS) level.

The parametric techniques (including CERs and factors) should be based on accepted historical cost/schedule analyses. At a minimum, these tools should be based on historical estimates from which models have been derived, and, where possible, from actual completed projects. An estimate with a minimum of 75 percent of the total project cost (TPC) based on parametric techniques is classified as a parametric estimate.

4. Sampling Technique (Type IV)

This review also begins with the activities needed for a reasonableness review, but in addition, it requires the ICE team to identify the key cost drivers. A “cost driver” is a major estimate element whose sensitivity significantly impacts the TPC. Detailed independent estimates must be developed, which should include vendor quotes for major equipment and detailed estimates of other materials, labor, and subcontracts. For the balance of the project costs, the project estimate may be used (if deemed to be reasonable through the reasonableness review), or, if appropriate, parametric techniques may be used for certain portions of the project costs. An estimate that provides a detailed cost for all cost drivers is classified as a sampling estimate.

5. Bottoms-up Estimating Technique (Type V)

This is the most detailed and extensive ICE effort, and begins with the activities needed for a reasonableness review. In addition, it requires a detailed bottoms-up independent estimate for both cost and schedule. This involves quantity take-offs, vendor quotations, productivity analysis, use of historical information, and any other means available to do a thorough and complete estimate of at least 75 percent of the project’s cost. It may not be possible to do a completely independent estimate on some portions of the PSO estimate, and for those portions—which should not exceed 25 percent of the total estimate—the project estimate may be used if it has passed the test of reasonableness. In all cases, a total cost (both total estimated cost (TEC) and TPC should be developed.

It must be recognized that all estimates will involve a combination of the techniques described in this section, because varying levels of information will be available. The accuracy of the estimate will be subjectively determined based on the weighted totality of the information available.

6. Independent Cost Estimate Content

The ICE is a term that includes all those elements that impact a project’s TPC. Therefore, depending on the specific project involved, the ICE will address the reasonableness of the project scope and such activities as:

- direct project costs (equipment, material, labor subcontract),
- indirect costs (overhead),
- NEPA,
- design/site,
- project/construction management (manpower),
- program management,
- research and development,
- startup,

- offsite costs,
- transportation,
- operations,
- remedial investigation/feasibility studies,
- decommissioning and demolition,
- contingency,
- escalation,
- interagency agreements,
- schedule,
- funding profile (including procurement plan),
- progress to date (including estimate to complete), and
- other costs outside DOE.

4. DOUBLE CHECKING THE ESTIMATE

After the estimate has been prepared, a check for completeness and correctness should be made. This check includes but is not limited to the following.

- Check mathematical extensions and additions for correctness;
- Check takeoff for omissions or oversights. For example, a project that is primarily mechanical in nature may have some electrical, structural, civil work, or demolition required with it.
- Compare the construction or cleanup labor hours with the schedule to determine a labor force density. Evaluate whether the labor force density can adequately function on the construction or cleanup site, whether shift work might be required, or whether the total labor hours are adequate to complete the required work. These are judgment considerations, but they are very helpful in finding inadequacies in the estimate.
- Check the calculations of the indirect costs. Verify that the vendor quotations used as direct costs do not include indirect costs.
- Compare the construction or cleanup cost with any similar project for an order of magnitude check.
- Compare the current estimate with the previous estimate and explain any discrepancies.

ESTIMATE REVIEW CHECKLIST

WBS Number:	Review Date:	Review Location:
Program Name:		
Reviewers' Names and Organizations:		
Program Location:	Program Manager:	

	Yes	No	NA	Comments
A. Background Data and Conditions				
<ul style="list-style-type: none"> Has a complete technical scope documentation, including the following elements, been prepared for the estimate. <ul style="list-style-type: none"> ___ Description of the work to be performed; ___ End condition or end product of work; ___ Performance criteria and requirements; ___ Discrete tasks and deliverables; ___ Resource requirements; ___ Sequence of events and discrete milestones; ___ Performance methodology and task plans; and ___ Work not included in the scope. 				
<ul style="list-style-type: none"> Are the major assumptions used in developing the technical scope for the program clearly identified and justified in the technical scope documentation? 				
<ul style="list-style-type: none"> Are technical logic diagrams and/or process flow diagrams, where appropriate, included in the technical scope documentation? 				
<ul style="list-style-type: none"> Have milestone log and milestone description sheets been developed that contain descriptions of each milestone associated with the program? 				
<ul style="list-style-type: none"> Is the rationale used to develop task descriptions and logic diagrams, milestones, and resource requirements explained in the technical scope documentation? 				

	Yes	No	NA	Comments
<ul style="list-style-type: none"> Does the technical scope documentation for the estimate include specific activities associated with the work to be performed and activity-based resource descriptions? 				
A. Background Data and Conditions (continued)				
<ul style="list-style-type: none"> Has an activity dictionary been developed for the program, including detailed descriptions of activities associated with the work to be performed? 				
<ul style="list-style-type: none"> Does the technical scope documentation for the estimate include descriptions of support activities (e.g., occupational health and safety, quality assurance, security, etc.) associated with the work to be performed? 				
<ul style="list-style-type: none"> Is back-up documentation (such as production or waste management plans, process technical and engineering data, process output or throughput projections, and historical operating data) available for review, used in scope development, and referenced in the technical scope documentation? 				
<ul style="list-style-type: none"> Is the technical scope for the estimate consistent with the site mission, regulatory drivers and constraints, and internal and external drivers and constraints (e.g., consent orders, permit conditions, regulations, orders, etc.) identified during the planning process? 				
B. Cost Estimate				
<ul style="list-style-type: none"> Are historical cost data included in the cost estimate for the activities for which costs have been estimated? 				
<ul style="list-style-type: none"> Do the historical data used to prepare the cost estimate show each activity costed and show the cost of conducting that activity, broken down into the quantity associated with each activity and the labor cost, material cost, and other costs incurred per unit quantity? 				
<ul style="list-style-type: none"> Are indirect, overhead, or other costs that are distributed among activities included in the cost estimate clearly and individually identified? 				
<ul style="list-style-type: none"> Are direct costs that are associated with individual activities included in the cost estimate clearly and individually identified? 				
<ul style="list-style-type: none"> Are the indirect labor costs used throughout the cost estimate approved and audited, and appropriately and correctly identified? 				
<ul style="list-style-type: none"> Are unit labor costs broken down into direct costs and indirect costs? 				

	Yes	No	NA	Comments
B. Cost Estimate (continued)				
<ul style="list-style-type: none"> Has the cost estimate been updated in a timely manner in response to relevant changes in its basis, background data, or assumptions? 				
<ul style="list-style-type: none"> Are an appropriate change control document and an estimate development history attached to the cost estimate? 				
<ul style="list-style-type: none"> Does the estimate development history include an itemized and chronological list of the changes made to the cost estimate since initiation of its preparation, and the rationale for each change? 				
<ul style="list-style-type: none"> Is an estimate purpose statement included in the cost estimate? Does the estimate purpose statement clearly describe the purpose of the estimate? 				
<ul style="list-style-type: none"> Is the scope of work for the program for which the cost estimate was prepared adequately described and consistent with the planning and technical scope documentation developed through the planning and scoping process? 				
<ul style="list-style-type: none"> Has an estimate-specific work breakdown structure been developed for the program? 				
<ul style="list-style-type: none"> Does the estimate-specific WBS organize the work to be performed in a logical and consistent manner? 				
<ul style="list-style-type: none"> Is the cost estimate activity-based? 				
<ul style="list-style-type: none"> Are activities, quantities, and unit costs associated with the work to be performed clearly identified and defined in the cost estimate? 				
<ul style="list-style-type: none"> Has an estimate-specific activity dictionary been developed for the program? 				
<ul style="list-style-type: none"> Does the estimate-specific activity dictionary describe all activities associated with the work to be performed in a logical and consistent manner? 				
<ul style="list-style-type: none"> Does the estimate-specific activity dictionary describe all activities associated with the work to be performed in a logical and consistent manner? 				
<ul style="list-style-type: none"> Are the assumptions and exclusions upon which the cost estimate is based clearly identified and defined in the cost estimate? 				

	Yes	No	NA	Comments
B. Cost Estimate (continued)				
<ul style="list-style-type: none"> • Are time and cost assumptions and cost elements associated with each activity clearly identified, defined, and documented in the cost estimate? Cost elements for program activities include: <ul style="list-style-type: none"> - quantity; - unit of measure; - labor hours per unit; - total labor hours; - material usage rate per unit; - total material cost; - equipment usage rate per unit; - total equipment cost; - overhead rate; and - total overhead allocated cost. 				
<ul style="list-style-type: none"> • Are significant findings of the cost estimate preparer identified during preparation of the cost estimate included in the cost estimate? 				
<ul style="list-style-type: none"> • Have estimate factors been used to adjust the cost estimate? If so, have they been adequately documented and appropriately applied? 				
<ul style="list-style-type: none"> • Have escalation factors been used to escalate the cost estimate? 				
<ul style="list-style-type: none"> • If escalation factors provided by DOE Headquarters have been used, have they been adequately documented and appropriately applied? 				
<ul style="list-style-type: none"> • If escalation rates other than the provided by DOE Headquarters have been used, have they been audited and approved by DOE Headquarters? 				
<ul style="list-style-type: none"> • Are indirect rates used in the cost estimate adequately documented and appropriately applied? 				
<ul style="list-style-type: none"> • Are estimate summary and detailed reports included in the cost estimate? 				
<ul style="list-style-type: none"> • Do the estimate summary and detailed reports provide cost totals for each activity in the activity dictionary and for each cost element in the cost estimate? 				
<ul style="list-style-type: none"> • Is a schedule included with the cost estimate? 				
<ul style="list-style-type: none"> • Are activities included in the schedule consistent with those included in the technical scope documentation, activity dictionary, and cost estimate? 				

	Yes	No	NA	Comments
B. Cost Estimate (continued)				
<ul style="list-style-type: none"> Are milestones and deliverables included in the schedule consistent with those included in the technical scope documentation and cost estimate? 				
<ul style="list-style-type: none"> Is an estimate criteria document included in the cost estimate? 				
<ul style="list-style-type: none"> Does the estimate criteria document clearly describe the methodology by which the cost estimate was developed? 				
<ul style="list-style-type: none"> Does the estimate criteria document clearly describe the basis for the cost estimate and the assumptions made in developing the cost estimate? 				
<ul style="list-style-type: none"> Has the entire cost estimate package (including technical scope and schedule) for the program been subject to peer review by individuals who were <u>not</u> involved in preparation of the cost estimate, but who are qualified to have prepared the cost estimate themselves? 				
<ul style="list-style-type: none"> Has the peer review considered the elements listed below? <ul style="list-style-type: none"> - the basis for the assumptions made in developing the cost estimate; - consistency of assumptions made in the cost estimate, technical scope, and schedule; - consistency of definitions of activities in the cost estimate, technical scope, and schedule; - consistency of durations of activities in the cost estimate, technical scope, and schedule; - documentation of productivity and unit cost data for program activities; and - appropriate use of indirect rates, escalation factors, and other factors used by the cost estimate preparer? 				
<ul style="list-style-type: none"> Have the findings and recommendations of the peer review been documented in a peer review document? 				
<ul style="list-style-type: none"> Is the peer review document included with the cost estimate documentation? 				

	Yes	No	NA	Comments
B. Cost Estimate (continued)				
<ul style="list-style-type: none">• Have the findings and recommendations of the peer review been addressed in revisions to the cost estimate?				
<ul style="list-style-type: none">• Are activities included in the schedule consistent with those included in the technical scope documentation, activity dictionary, and cost estimate?				