

AACE
INTERNATIONAL
RECOMMENDED
PRACTICE

19R-97

**ESTIMATE PREPARATION COSTS -
AS APPLIED FOR THE PROCESS
INDUSTRIES**

SAMPLE

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AAACE® International Recommended Practice No. 19R-97

ESTIMATE PREPARATION COSTS – AS APPLIED FOR THE PROCESS
INDUSTRIES

TCM Framework: 7.3 – Cost Estimation and Budgeting

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Disclaimer: The opinions expressed by the authors and contributors to this recommended practice are their own and do not necessarily reflect those of their employers, unless otherwise stated.

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ESTIMATE PREPARATION COSTS – AS APPLIED FOR THE PROCESS INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting



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PURPOSE

This Recommended Practice presents benchmark information on the costs to prepare project cost estimates (for engineering, procurement, and construction) in the process industries. It includes qualitative and quantitative lessons that cost engineers and estimators can use to benchmark their cost estimating experiences against. The data on preparation costs was used to develop a parametric cost model that can be used to estimate the cost of preparing estimates.

This information supports AACE International's Recommended Practice 18R-97 entitled *Cost Estimate Classification System – as Applied in Engineering, Procurement, and Construction for the Process Industries*. The effort or cost to prepare a cost estimate is a secondary characteristic of a cost estimate classification.

A primary value of this Recommended Practice is improved understanding of the variables and trends concerning estimate preparation costs. The amount and quality of published reference data is limited, therefore, the value of the quantitative cost model presented here as a benchmark for measuring estimating performance is limited. The cost model is a good starting point for further development.

INTRODUCTION

This Recommended Practice was researched and developed by a sub-team of the AACE International Cost Estimating and Parametric Estimating technical committees. It presents the cost to prepare project cost estimates for the process industries (including chemical, pulp and paper, hydrocarbon processing, utilities, etc.).

Included in this Recommended Practice is an overview of the scope of work included in the estimate preparation process, a summary of literature and data on the subject, an analysis of the variables affecting estimate preparation costs, and finally a presentation of a parametric estimating cost model for estimating the cost of preparing a cost estimate.

BASIS OF THE DATA

The Scope of Cost Estimate Preparation

As with any estimate, it is necessary to establish the scope of work that is covered. Cost estimate preparation includes estimating functions only (e.g., take-off, costing, risk analysis, benchmarking, etc.) and excludes engineering and design, project cost control, and other functions. Figure 1 illustrates a typical process diagram of the cost estimating process.

The estimating process for a complete project as covered by this study includes the following direct efforts.

- **Establishing estimate requirements** — interface with the project team and client to establish their needs with regard to the estimate.
- **Planning and structuring the estimate** — interface with the project team to establish the work breakdown structure and cost reporting structure and to develop a cost estimating plan (cost, schedule, and resources to prepare the estimate).

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- **Develop the estimate** — quantification and costing of the project scope based on input deliverables provided by the project team. Obtain supporting cost information from internal or external reference or vendor sources. Benchmark with other projects and historical information.
- **Risk analysis and contingency** — estimate contingency costs through risk assessment and analysis, range estimating, or similar practices.
- **Document the project basis and prepare reports** — prepare estimate deliverables to the project team in accordance with the established estimate requirements.
- **Estimate review and benchmarking** — review the estimate with the project team, peers, and management, including analysis of costs against relevant benchmarks. Make any changes that result from review comments.
- **Issue the cost estimate** — issue the estimate to the project team for use in establishing budgets and project controls basis. For contractor bids, there is another step of pricing, including determination of profit and other mark-ups and allocations appropriate to the contract situation.

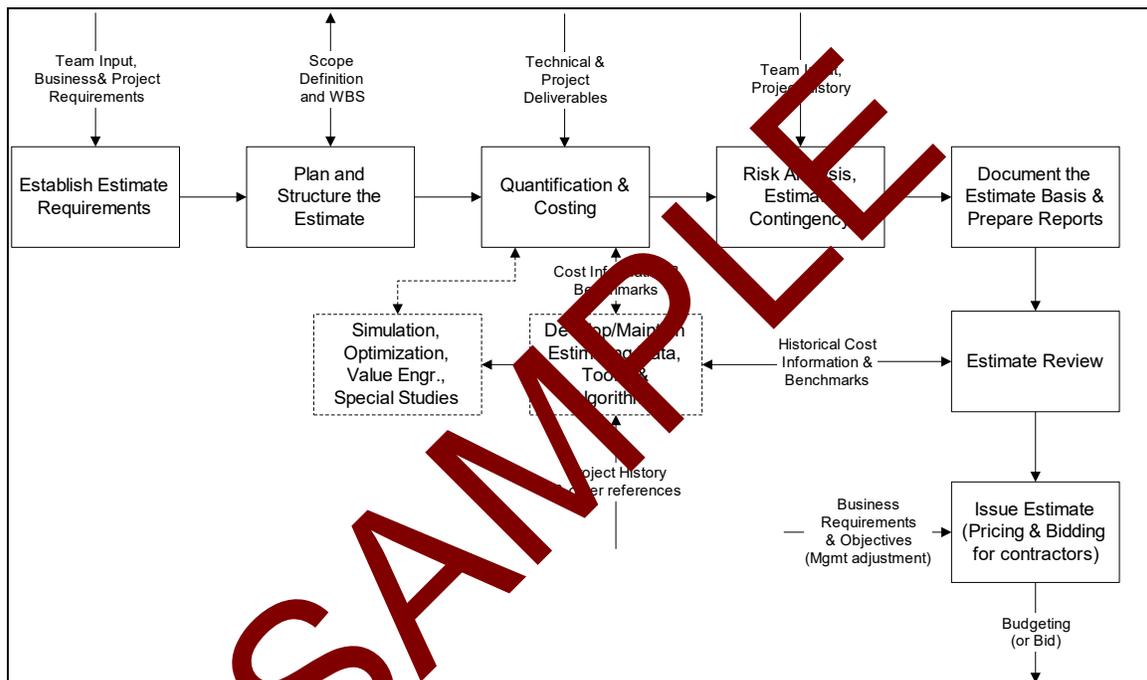


Figure 1 — Typical Process Diagram of the Cost Estimating Process

In support of these efforts, there are overhead or indirect research functions that are normally included as overhead in the estimating billing or charge rate. As such, they are assumed to be included in the cost of preparing an estimate (note: it is often difficult to be sure of the extent of the costs included in charge rates). These include but are not limited to:

- **researching, developing, and maintaining cost estimating and benchmark databases;**
- **creating and maintaining cost estimating procedures, tools, and algorithms;**
- **training of estimators;**
- **marketing of estimating services;**
- **coordination and meetings with the project team and vendors; and**
- **office overhead and expenses (rent, utilities, copying, office supplies, etc.).**

Common estimating functions excluded from the estimate preparation costs covered by this study are the following:

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- **Extensive cost data or tools development needed for unique or special situations.**
- **Formal value engineering** — while estimators strive to improve project value in the course of developing an estimate, formal value engineering studies are not included.
- **Simulation, optimization, life-cycle costing or other extensive, unique, or special cost analysis techniques and studies** — as with value engineering, while estimators will normally examine some alternate approaches for various items, extensive special evaluation techniques are not included.
- **Preparation of estimate input deliverables** — estimating excludes engineering, design, project management, and other project functional work to develop estimate input deliverables. This causes some uncertainty as it is common for various team members, vendors, or subcontractors to provide the estimators with various pieces of cost information, but it is assumed here that their effort is charged to engineering or other accounts and is not included here.
- **Ongoing support of project cost control and scheduling.**

Assumed Estimating Skills and Knowledge

The activities in the estimating process are assumed to be performed by professional cost engineers/estimators with clerical and administrative overhead support. Small project or conceptual estimates may be performed by a single individual who must have excellent skills and knowledge of the estimating process and of the process technology being estimated. On large detailed estimates, the estimating team may include a hierarchy of skill and knowledge levels from the overall team leader to the trade specialist technicians doing take-offs from drawings, to clerical support personnel. For some projects, engineers with estimating skills will prepare the estimate. For many small contractors, the estimator is quite often the owner, with profit/loss responsibility.

Literature Reviewed

For this Recommended Practice, the AACE International library was searched for relevant articles, papers, and texts. While not exhaustive, the search covered the major sources that are current and readily available. Some of the sources are secondary references. Some previously unpublished data from private company sources was also obtained.

ANALYSIS OF SOURCES

Summary of Information

In summary, the literature on the topic is not extensive, and the data included is neither current nor consistent. For a given project size and class of estimate, the costs found varied by as much as a factor of 3:1, with a significant standard deviation in all cases. However, a 3:1 accuracy range is not unusual for class 5 estimates in the process industries. While any one data point is suspect, the data is suitable for further analysis as a group.

Table 1 illustrates the range of data included in the references studied (the “shaded” sources included all engineering and design costs that support the estimate — they are not included in later evaluations, but are shown for the benefit of those who may be interested in that kind of data). Because each reference uses a different method to display estimating costs or effort (by equation, table, or graph, and in hours, %, or absolute dollars), the table converts all source data to one display format. The table displays estimate preparation costs as a percentage of total project costs for various project sizes and estimate type classifications. Where applicable, the assumptions used to convert the original source to this table format are shown.

For illustration, figure 2 graphically displays selected data from the table (for class 3 estimates). It is clear that while there is some variation in the cost data, there are some obvious trends as well, which are discussed in the following section.