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ESTIMATE REQUIREMENTS DOCUMENT – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

AACE INTERNATIONAL

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TCM Framework: 7.3 – Cost Estimating and Budgeting

Rev. October 11, 2019

Note: As AACE International Recommended Practices evolve over time, please refer to web.aacei.org for the latest revisions.

Any terms found in AACE Recommended Practice 10S-90, *Cost Engineering Terminology*, supersede terms defined in other AACE work products, including but not limited to, other recommended practices, the *Total Cost Management Framework*, and *Skills & Knowledge of Cost Engineering*.

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INTRODUCTION

Scope

This recommended practice (RP) is a guideline for the development of an estimate requirements document defining the estimate requestor, typically the owner, estimate requirements to a third party estimate provider of an engineering, procurement, and construction (EPC) cost estimate for the process industries. For the purposes of this document, the term *process industries* (as defined in RP 18R-97 [1]) is assumed to include firms involved with the manufacturing and production of chemicals, petrochemicals, hydrocarbon, and wastewater processing. The common thread among these industries (for the purpose of estimate classification) is their reliance on process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs) as primary scope defining documents. This estimating methodology is also suitable for other equipment-centric industries such as mining process plants, power generation, pumping stations etc.

The main body of this document refers to deterministic (Class 3, 2, and 1) estimates. Conceptual (Class 5 and 4) estimates require a very different approach and are defined in Appendix I and J. These sections provide basic guidelines for the development of a basis of estimate for some of the most common methodologies used in the development of these classes of estimate.

Purpose

The *Total Cost Management (TCM) Framework* [2] section 7.3.2.1, *Plan for Cost Estimating and Budgeting* highlights the need to develop estimate plans. This document addresses the need for the requestor of the estimate to define to the estimate provider many of the elements that will eventually comprise the estimate plan. This RP could also be considered an estimate requirements specification. This RP focuses on the relationship between an estimate requestor, typically the owner, and a separate estimate provider; however, the principles may apply to other estimate requestor to estimate provider relationships such as contractor to subcontractor, or within an individual organization. The key principle is that the estimate requestor identifies the various requirements that the estimate should meet when prepared by the estimate provider.

This recommended practice (RP) is intended to provide a guideline (i.e. not a standard) for establishing and communicating how to prepare, review and approve an estimate requirements document, to be issued from the estimate requestor to the estimate provider. The estimate provider should prepare an estimate plan in alignment with the requirements document. The estimate plan should be approved by the estimate requestor. After estimate preparation, the estimate provider prepares the basis of estimate to provide final documentation of the cost estimate. The final estimate plan shall be the result of collaboration between the estimate requestor and estimate provider.

Background

The estimate requirements document (herein referred to as *requirements document*) is a planning document that should be developed by the owner to clarify goals, objectives, expectations, and responsibilities to third party providers (e.g., engineering contractors, or estimating estimate providers) preparing capital project estimates. The estimate requirements document is necessary for quality and will help to facilitate successful estimate completion in a cost effective and timely manner. Note that the term *owner* refers to the estimate owner and may be an owner company, or a party within the providers organization. It simply refers to the party soliciting the estimate.

RP 10S-90 [3] defines *quality* as “conformance to established requirements”, hence a quality estimate cannot be achieved without well-established requirements. Quality is assured through estimate review and validation as

addressed in RP 31R-03 [4]. As such the requirements are integral to and drive the review process. Note that the quality of the estimate is the responsibility of the owner and assured through the owner's review and validation process. As such, the owner must establish requirements for its own contributions to the overall project estimate (e.g., roll-up, conditioning, owner's cost, risks, etc.). This may include owner's *soft costs* such as preliminary engineering, final design services, project management, construction administration, insurances, legal, permit or review fees by other agencies, commissioning and startup. This RP is focused on the requirements for third parties, but these must be aligned and consistent with those of the owner's as appropriate.

The requirements document is a part of the overall estimate planning process (in turn part of project control planning) undertaken by the owner which must be consistent with the overall project implementation basis described by TCM 4.2.1.8 as "the scope, objectives, targets, criteria, and assumptions" documented by the project leadership team. This basis will be unique to each project, technology, scope development phase, and so on. As such, each requirement document, while having certain standard features, will be unique. Also, requirements should be fit-for-use as described in TCM 4.1.2.5.

The owner should prepare a draft requirements document that is reviewed with their 3rd party estimate provider(s). Any clarifications or changes are documented, and a final requirements document is approved and signed by owner and estimate provider representatives. Upon approval of the requirements document, estimate kickoff sessions are held to communicate the approved requirements in order to proceed with estimate development. Any subsequent changes required should be approved and documented through a formal change management process. The requirements document may become a contractual document.

The requirements document may be used as the starting point for the estimate plan, which is prepared by the 3rd party estimate provider. The plan will be developed following the guidelines of AACE International Recommended Practice No. 36R-08, *Development of Cost Estimate Plans – as Applied in Engineering, Procurement, and Construction for the Process Industries*. [4] The estimate plan should identify the specific activities, methodologies, schedule, etc. that will be undertaken to prepare the estimate on behalf of the owner. The estimate plan should be aligned with the Basis of Estimate Document (BOE) which is subsequently prepared by the estimate provider to accompany the estimate when submitted to the owner; and documents all aspects of the development and preparation of the estimate. The BOE will be developed following the guidelines of AACE International Recommended Practice No. 96R-19, *Development of Cost Estimate Basis – As Applied in Engineering, Procurement, and Construction for the Process Industries*. [6]

The main body of this document is focused on deterministic (Class 1, 2, and 3) estimates where the primary method of cost development is through the use of semi-detailed or detailed unit hours and costs. Class 3 estimates are often developed by a basic engineering or front-end engineering and design (FEED) contractor working closely with the owner in an *open book* (transparent) manner to support a funding decision. Scope is still evolving during Class 3 and the contractor is generally not at risk for the resultant cost. Class 2 estimates are often developed as tender estimates based on well advanced design. The tender may be for a reimbursable contract where the estimate is open book similar to Class 3.

Where, due to contracting strategy, the owner is requesting a lump-sum bid estimate then the level of detail available in the estimate may be less (and correspondingly result in less detail in the estimate requirements). Such an estimate will result in less insight to the owner; and therefore a common approach is for the owner to request a transparent detailed estimate and then convert to a lump-sum contracting strategy based on evaluation of that more detailed estimate.

Conceptual (Class 4 and 5) estimates are primarily developed through the use of more stochastic and varied cost estimating relationships (CER's; e.g. parametric, factoring, etc.) and are often prepared in-house by the owner estimating organization with input from others as needed. Also, multiple scope and value improvement options are usually still being dynamically assessed during these phases, so estimating tends to be iterative and interactive

between owner and contractor. As such the estimate plan will be significantly different than for a deterministic estimate. A guideline for some common methods for both Class 4 and 5 can be found in Appendices A and B. These appendices are intended to replace the sections from "Cost Basis" through "Engineering and Home Office" of this document. Note that the conceptual estimating process is a highly creative one, and these appendices give only an overview of suggested formatting of the document, based on some of the more common methodologies. Regardless of the manner in which the estimate is approached the owner needs to ensure that the estimate provider creates a document that clearly defines the basis of the estimate and leaves the reader with a clear understanding of the strength of the estimate.

The extent to which the following sections of the requirements document are completed will be dependent on the type of project, the class of estimate, and other variables. It is recommended to include as much of the following information as possible.

RECOMMENDED PRACTICE

The primary intent of this RP is to provide a guideline for the topics and contents to be included in a typical requirements document. However, before describing the template contents there are a few significant points worth noting. Some key principles are:

- The estimate requirements document should be a formalized process within an organization.
- The requirements must clarify processes and responsibilities, not just technical specifications.
- Be functionally complete, concise, and tailored for a specific project.

This recommended practice is divided into three main sections:

1. The *Requirements Document Development Process* defines the main steps and discusses issues to be considered in preparing an estimate plan.
2. The *Requirements Document Format and Content* provides a suggested format for a Class 1-3 estimate requirement document along with annotations. It is designed to allow practitioners to use and modify it as needed for their specific situation.
3. Further guidance for owner direction to the estimate provider for Class 5 and 4 estimates may be found in Appendix A and B of this document.

REQUIREMENTS DOCUMENT DEVELOPMENT PROCESS

This section defines the main steps and discusses issues to be considered in preparing a requirements document.

Figure 1 highlights the requirements of the document development process.

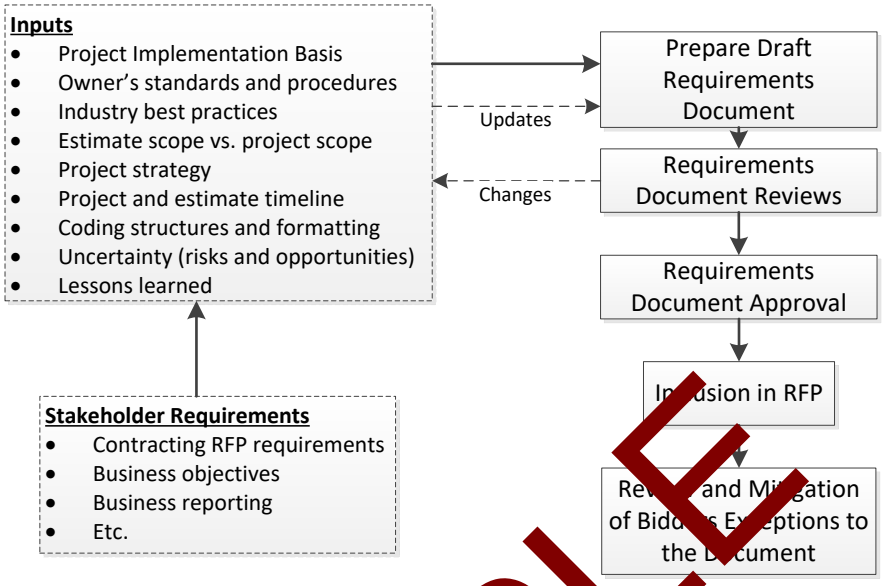

Figure 1. – Requirements Document Development Process

Inputs to the Requirements Document

The requirements document should leave the provider with a clear understanding of the expectations of the estimator requestor, typically the owner. It should clearly define inputs from the following:

Owner's Project Implementation Basis

The requirements of the overall project (e.g., the objectives, targets, criteria, and assumptions) are initial inputs to estimate requirements development. Identify and include a cost strategy to translate the basis (e.g., targets) to estimate criteria (e.g., stated target require "aggressive but reasonably achievable unit hour" basis).

Owner's Standards and Procedures

The owner should reference and provide (as necessary) all owner's documents required to clarify the estimate objectives and requirement contents not detailed directly in the body of the requirements.

Industry Best Practices

In the absence of owner's standards (or in addition to), industry best practices (e.g., AACE recommended practices) may provide valuable input to this document. Leveraging best practices helps ensure a quality, cost effective and optimum outcome.