

# Cost Estimate Review Simulation

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- **Managing Partner of Conquest Consulting Group**
- **35+ years experience in project estimating, project controls, risk analysis, and project benchmarking primarily for the process industries**
  - **Owner/Contractor/Consulting Experience**
- **AACE International VP-Technical Board**
- **Frequent author, presenter, trainer on cost engineering topics**



- **Manager of Estimating for CH2M Water Business Group**
- **25+ years experience in project estimating and estimating management primarily for the wastewater, civil, and infrastructure industries**
  - **Contractor Experience**
- **Director of Recommended Practices for the AACE Technical Board**
- **Frequent author and presenter on cost engineering topics**



- **Executive Partner of Conquest Consulting Group**
- **40+ years experience in project estimating, project controls, risk analysis, and project benchmarking primarily for the process industries**
  - **Owner/Contractor/Consulting Experience**
- **Frequent author and presenter on cost engineering topics**



- **Executive Partner of Conquest Consulting Group**
- **35+ years experience in project estimating, project controls, risk analysis, and project benchmarking primarily for the process industries**
  - **Owner/Consulting Experience**
- **Chair of the AACE International Technical Board**
- **Frequent author, presenter, trainer on cost engineering topics**

# This Presentation



- **This presentation will involve:**
  - Slides/Discussion
  - Panel Questions/Discussion
  - Simulations of real world review/validation examples
- **We will ask for audience comments or questions during the presentation – we would like some interactive discussion**



- **The Estimate Review and Validation Process**, Larry Dysert and Bruce Elliott, *Cost Engineering*, Vol. 44, No. 1, January 2002
- **Review Checklist of a Third Party Capital Estimate From the Owner's Perspective**, David Roggenkamp and Douglas Leo, *2012 AACE International Transactions*, OWN.921
- **Owner Cost Estimate Reviews**, Allen Hamilton, *2014 AACE International Transactions*, OWN.1545
- **Third-Party Cold-Eye Estimate Reviews and Validations**, Douglas Leo and Dr. Stephen Warhoe, *2014 AACE International Transactions*, OWN.1564
- **Estimate Review and Validation Checklist**, Douglas Leo, *2015 AACE International Transactions*, EST.2058



- **RP 31-03: Reviewing, Validating, and Documenting the Estimate, 2009**
- **RP 34-05: Basis of Estimate, 2014**
- **RP 36R-08: Development of Cost Estimate Plans – As Applied in Engineering, Procurement and Construction for the Process Industries, 2015**
- **TBD: Owner’s Estimate Requirements Document, Under Development**



- **Cost estimates are one of the primary elements in the decision making process to sanction projects**
  - Economics drive most project decisions throughout the project process (i.e. during all stages of project development)
  - The cost estimate not only provides the indicated budget for the project, but is also key to identifying the scope and execution strategies for the project
    - If the estimate does not reflect the full scope of the project; including procurement, contracting and execution strategies then project funding (based on the estimate) may not be adequate



- **Cost estimates and their corresponding review and validations occur throughout the project process**
- **The estimates and their comprehensiveness, appropriateness, and reasonableness (confirmed by review and validation) are critical to effective decision-making.**
  - Early estimates (AACE Class 5/4) support decisions about design alternatives and approval to move to the next stage of project development
  - Typically an AACE Class 3 estimate is used to provide final project authorization, full funding to the project, and establish the cost control baseline for the project



- **This presentation will focus on issues involved with review and validation by the asset owner organization for a Class 3 estimate to be used for final project funding for a large process facility project**
  - The scale of these projects are often significant in terms of:
    - Scope
    - Complexity
    - Contracting and execution strategies
    - Unresolved risks
    - Strategic Importance



- **A comprehensive estimate review and validation is a demanding and time-consuming activity**
  - Ironically, they are often constrained by too little time to be as thorough as they should
  - Often involve a *cold-eyes* review using either:
    - Asset owner organization resources not associated with the project
    - External resources – consultants or contractors
  - Involve assessment of enormous volume of information in the limited time available



- **Estimate Review is a qualitative assessment**
  - Addresses comprehensiveness and appropriateness
  - Evaluates whether full scope of the project has been included in (or specifically excluded from) the cost estimate
  - Evaluates the estimating process
    - methods, tools, personnel
  - Evaluates the presentation and format of the estimate
    - Estimate summaries and detail reports
    - Traceability from detail to summaries
  - Evaluates estimate/schedule compatibility
  - Evaluates that the cost estimate reflects the project execution strategies (engineering, procurement, fabrication, construction, start-up, commissioning)



- **Estimate Validation is a quantitative assessment**
  - Addresses reasonableness
  - Validates appropriateness of estimate quantities, allowances, equipment and bulk material pricing, labour hours and productivity adjustments, labour crew build-up, etc.
  - Evaluates risk identification and assessment
    - Indicated estimate accuracy
    - Contingency determination
    - Reserves
  - Provides and/or reviews estimate benchmarking metrics



- **The goal of estimate review and validation should be to:**
  - Provide a complete understanding of the scope and estimated costs by the estimate requestor
  - Identify (and subsequently correct) any potential errors or shortcomings in the estimate
  - Provide complete understanding of the uncertainty associated with the estimate
    - How was contingency determined
    - What is the accuracy level and confidence level associated with the estimate



- **The estimate review and validation should be a fully transparent exercise between the estimate provider and estimate reviewer**
  - The desire is to cooperatively discover potential problems, areas of confusion, and uncertainty in the estimate
  - The estimate provider should not become defensive in answering questions or in supporting assumptions and decisions made in preparing the estimate
  - Both the estimate requestor and estimate provider must work together to support the eventual decision to be made by the estimate requestor (asset owner)



- In your opinion, what is the most common problem that you experience in estimate reviews?

# Establish Estimate Requirements



- The ability to effectively review an estimate begins before estimate preparation even starts!

**Owner Estimate  
Requirements  
Document**



**Approved  
Estimate Plan by  
Estimate Provider**



**Interim Status  
and Reviews  
During Estimate  
Preparation**



**Well-Prepared  
Estimate, with  
comprehensive  
Basis of Estimate  
and available  
estimate backup**

# Develop Estimate Review and Validation Plan



- Determine information, documents and data to be available for review and timing of delivery
- Determine estimating provider personnel to be available for review
- Determine location, schedule and agenda for review meeting(s)
- Determine content and format of estimate review and validation results

# Typical Documents to Support Estimate Review



- **Basis of Estimate**
- **Estimate Summary and Detail Reports (hardcopy and native files)**
- **Estimate Backup Information**
  - Risk Analysis Studies
  - Escalation Studies
  - Estimate Reconciliation (to prior estimates)
  - Other Estimate Studies, Special Calculations, etc.
- **Overall Project Scope Description**
- **Work and Cost Breakdown Structures**
- **Priced Equipment List (with design parameters)**
- **Any Analysis for Quoted Procurement**
- **Facility Plot Plans, Layouts**
- **Process Control Concept Information**
- **Piping and Instrumentation Drawings**

# Estimate Review and Validation



- Estimate reviews should begin with a thorough review and assessment of the Basis of Estimate:
  - Project Scope Description
  - Estimate Methodology
  - Estimate Classification
  - Design Basis
  - Planning Basis
  - Cost Basis
  - Allowances
  - Assumptions
  - Exclusions
  - Risks/Opportunities
    - Contingency
    - Escalation
    - Reserves
  - Benchmarking

# Estimate Review and Validation



- Evaluate comprehensiveness – focus on the design and technical basis supporting the estimate:
  - Project Scope Description
  - Estimate Methodology
  - Estimate Classification
  - Design Basis
  - Planning Basis
  - Cost Basis
  - Allowances
  - Assumptions
  - Exclusions
  - Risks/Opportunities
    - Contingency
    - Escalation
    - Reserves
  - Benchmarking

If the scope is not comprehensive or adequately addressed by the estimate, then the appropriateness of the estimating process and the accuracy of the cost basis is suspect

# Estimate Review and Validation



- Evaluate appropriateness – focus on the estimating process supporting the estimate:
  - Project Scope Description
  - Estimate Methodology
  - Estimate Classification
  - Design Basis
  - Planning Basis
  - Cost Basis
  - Allowances
  - Assumptions
  - Exclusions
  - Risks/Opportunities
    - Contingency
    - Escalation
    - Reserves
  - Benchmarking

If the estimating process is not appropriate, then the accuracy of the cost basis is suspect

# Estimate Review and Validation



- Finally, evaluate reasonableness – the validation step:
  - Project Scope Description
  - Estimate Methodology
  - Estimate Classification
  - Design Basis
  - Planning Basis
  - Cost Basis
  - Allowances
  - Assumptions
  - Exclusions
  - Risks/Opportunities
    - Contingency
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    - Reserves
  - Benchmarking



## Estimate Scenario Simulation #1

### Estimate Quantities



## Estimate Scenario Simulation #2

### Direct Labor Hours



## Estimate Scenario Simulation #3 Construction Indirects



## Estimate Scenario Simulation #4

### Estimate Accuracy

# THANK YOU!

## QUESTIONS/COMMENTS? (PLEASE USE MICROPHONE)



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