CCP Certification Study Guide

Second Edition

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A continuing project of the AACE International Education Board

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# Table of Contents

## PREFACE

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 – Cost Elements</td>
<td>8</td>
</tr>
<tr>
<td>Chapter 2 – Pricing and Costing</td>
<td>9</td>
</tr>
<tr>
<td>Chapter 3 – Materials</td>
<td>15</td>
</tr>
<tr>
<td>Chapter 4 – Labor</td>
<td>20</td>
</tr>
<tr>
<td>Chapter 5 – Engineering Role and Project Success</td>
<td>26</td>
</tr>
<tr>
<td>Chapter 6 – Machinery, Equipment, and Tools</td>
<td>33</td>
</tr>
<tr>
<td>Chapter 7 – Economic Cost</td>
<td>38</td>
</tr>
<tr>
<td>Chapter 8 – Activity-Based Cost Management</td>
<td>44</td>
</tr>
</tbody>
</table>

## SECTION 1 – COST

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 9 – Cost Estimating</td>
<td>56</td>
</tr>
<tr>
<td>Chapter 10 – Process Product Manufacturing</td>
<td>57</td>
</tr>
<tr>
<td>Chapter 11 – Discrete Part Manufacturing</td>
<td>64</td>
</tr>
</tbody>
</table>

## SECTION 2 – COST

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 12 – Project Planning</td>
<td>73</td>
</tr>
<tr>
<td>Chapter 13 – Scheduling</td>
<td>82</td>
</tr>
</tbody>
</table>

## SECTION 3 – PLANNING AND SCHEDULING

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 14 – Earned Value Overview</td>
<td>98</td>
</tr>
<tr>
<td>Chapter 15 – Performance and Productivity Management</td>
<td>99</td>
</tr>
</tbody>
</table>

## SECTION 4 – PROJECT AND COST CONTROL

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 16 – Project Management Fundamentals</td>
<td>104</td>
</tr>
<tr>
<td>Chapter 17 – Project Organization Structure</td>
<td>109</td>
</tr>
<tr>
<td>Chapter 18 – Project Communications</td>
<td>110</td>
</tr>
<tr>
<td>Chapter 19 – Project Labor Cost Control</td>
<td>115</td>
</tr>
<tr>
<td>Chapter 20 – Leadership and Management of Project People</td>
<td>120</td>
</tr>
<tr>
<td>Chapter 21 – Quality Management</td>
<td>127</td>
</tr>
<tr>
<td>Chapter 22 – Value Engineering</td>
<td>137</td>
</tr>
<tr>
<td>Chapter 23 – Contracting For Capital Projects</td>
<td>143</td>
</tr>
<tr>
<td>Chapter 24 – Strategic Asset Management</td>
<td>148</td>
</tr>
<tr>
<td>Chapter 25 – Change Management Practical Guide</td>
<td>153</td>
</tr>
<tr>
<td>Chapter 26 – Overview of Construction Claims and Disputes</td>
<td>160</td>
</tr>
</tbody>
</table>

## SECTION 5 – PROJECT MANAGEMENT

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 27 – Financial and Cash Flow Analysis</td>
<td>167</td>
</tr>
<tr>
<td>Chapter 28 – Practical Corporate Investment Decision-Making Guide</td>
<td>172</td>
</tr>
<tr>
<td>Chapter 29 – Statistics &amp; Probability</td>
<td>179</td>
</tr>
<tr>
<td>Chapter 30 – Optimization</td>
<td>180</td>
</tr>
<tr>
<td>Chapter 31 – Risk Management Fundamentals</td>
<td>190</td>
</tr>
<tr>
<td>Chapter 32 – Risk Management Practical Guide</td>
<td>199</td>
</tr>
<tr>
<td>Chapter 33 – Total Cost Management Overview</td>
<td>205</td>
</tr>
<tr>
<td>Chapter 34 – The International System of Units (SI)</td>
<td>211</td>
</tr>
</tbody>
</table>

## SECTION 6 – ECONOMIC ANALYSIS, STATISTICS, PROBABILITY AND RISK

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 35 – Sample Exam Questions</td>
<td>217</td>
</tr>
<tr>
<td>Chapter 36 – Values of the Standard Normal Distribution Function</td>
<td>222</td>
</tr>
<tr>
<td>Chapter 37 – Discrete Compound Interest Tables</td>
<td>228</td>
</tr>
</tbody>
</table>

## APPENDICES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPENDIX A – Sample Exam Questions</td>
<td>233</td>
</tr>
<tr>
<td>APPENDIX B – Values of the Standard Normal Distribution Function</td>
<td>253</td>
</tr>
<tr>
<td>APPENDIX C – Discrete Compound Interest Tables</td>
<td>255</td>
</tr>
</tbody>
</table>
PREFACE

The *Certified Cost Professional (CCP) Certification Study Guide*, 2nd Edition (CSG-2) is a companion workbook to the *Skills and Knowledge of Cost Engineering*, 6th Edition (S&K-6). The design and layout of this study guide is intended to assist readers in testing their knowledge of cost engineering by offering practice problems and questions related to the subject matter addressed in S&K-6. First published in 1996 as the *CCC/CCE Certification Study Guide*, the *CCP Certification Study Guide* has gone through several revisions and changes. In 2013 the name of the study guide was changed to the *CCP Certification Study Guide* to reflect the consolidation of CCC/CCE credentials by AACE International. For the latest information on all of the AACE certifications, visit the AACE International website at: www.aacei.org

**How to Use this Book**

The chapters and topics presented in this publication correspond to specific chapters in the *Skills and Knowledge of Cost Engineering* (S&K-6). The reader should use this publication in conjunction with S&K-6. Together, these publications provide readers with the knowledge base expected of a cost-engineering professional as outlined in Recommended Practice 11R-88, *Required Skills and Knowledge of Cost Engineering* and the *TCM Framework*, 2nd Edition. This publication has two specific objectives:

1. To provide a summary of specific knowledge areas and the associated key terms that a cost engineering professional should comprehend, at a minimum, when preparing for the Certified Cost Professional (CCP) certification exam.
2. To provide sample problems and questions for each topic area, as well as the associated answers, to exercise the reader’s understanding of the concepts and skills presented in S&K-6.

The S&K-6 and CCP CSG-2 are companion publications which serve as reference texts for individuals preparing for the Certified Cost Professional (CCP) and other AACE International certification examinations. To further assist in preparation, the reader should visit the AACE International website at www.aacei.org for updates to the CCP certification as well as Recommended Practice 10S-90, *Cost Engineering Terminology*.

Readers should begin their examination preparation by first studying the material presented in S&K-6 and then working out the sample problems and questions in the CCP CSG-2. The summary and key terms found in each chapter offer a checklist of the comprehensive knowledge needed to fully prepare for the examination. Readers may have to go back and forth between the two publications to gain a full understanding of the subject matter as they attempt the exercise problems and questions. Please note that the actual certification examination questions are likely to address skills and knowledge from multiple chapters; therefore, a thorough understanding of the material is vitally important. In addition, the CCP CSG-2 includes several key appendices such as: (1) sample exam questions, (2) values of the standard normal distribution, and (3) the discrete compound interest tables.

**Acknowledgements**

This work is an undertaking of the AACE Education Board. A work of this magnitude and quality cannot be completed without dedicated contributions from (i) the Education Board champions/associate editors who identified subject matter experts and diligently followed up with them to write and/or revise the chapter summaries and the related questions, (ii) all the authors for their contribution to this publication, (iii) the reviewers who methodically evaluated each chapter for accuracy and depth of questions covered, as well as, (iv) my graduate students - Sayanti
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We hope you find this publication to be of value. The Education Board welcomes any comments and suggestions you might have in improving the Certification Study Guide (CSG-2) as well as the Skills and Knowledge of Cost Engineering (S&K-6).

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October 2015
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SECTION 1 – COST
Chapter 1: Cost Elements
Chapter 2: Pricing and Costing
Chapter 3: Materials
Chapter 4: Labor
Chapter 5: Engineering Role and Project Success
Chapter 6: Machinery, Equipment, and Tools
Chapter 7: Economic Cost
Chapter 8: Activity-Based Cost Management
Chapter 1 – Cost Elements

Frank D. Postula, PE CCP FAACE AACE Hon. Life

Introduction/Learning Objectives

Cost is one of the three fundamental attributes associated with performing an activity or the acquisition of an asset. These are: price (cost), features (performance), and availability (schedule). The key learning objectives are:

- Understand what makes up cost – i.e., the basic resources (material, labor, etc.) that are needed to perform an activity or create an asset.
- Understand the distinction between cost elements that are directly applied to an asset and those that are indirectly applied.
- Relate the cost elements to the life cycle of the asset: acquisition, use and disposal.
- Use the understanding of cost elements to further understand how cost is measured, applied, and recorded to arrive at the total activity and/or asset cost.
- Apply the knowledge gained to solve problems related to cost element source and definition.

Terms to Know

- Activity
- Asset
- Cost
- Cost categories
- Cost elements
- Cost objectives
- Direct costs
- Fixed costs
- Indirect costs
- Project
- Resources
- Variable costs
- Work breakdown structure (WBS)

Key Points for Review

- Concepts
  - Cost engineering is the application of scientific principles and techniques.
  - What are the key activities that generate cost when they are performed or that define plans and processes that cause (or influence) cost to be generated in other activities and/or assets?
  - What are the elements that make up cost?
  - How are these cost elements categorized and how do they relate to one another?
  - Why is it important to collect and account for costs as they relate to specific activities and assets?
How to apply these cost elements and categories to the insight for managing activities and assets?

**Cost Definition**
- Cost is the value of an activity or asset.
- Resources used are categorized as material, labor, and “other.”
- The value of the asset may also include the cost elements of scrap material or manufacturing spares, construction form-work and expendable safety items, as well as the cost of transporting the material to the work site.

**Material**
- Material is the physical composition of the asset. However, the value of the asset may also include the cost elements of scrap material or manufacturing spares, construction form work and expendable safety items, and the cost of transporting the material to the work site.

**Labor**
- Labor as the value of the work needed to complete the activity or asset.

**Other**
- The “other” cost category is resources that are needed to support the activity and/or asset.

**Cost Category and Value of Asset**
- Another important aspect of cost relates to whether one is the producer or consumer of an activity or asset.
- The value of an asset or activity may also be related to intangible costs.

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost Element Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Pen, desk, lumber, etc.</td>
</tr>
<tr>
<td>Labor</td>
<td>Draw plans, order materials, receive materials, installation, etc.</td>
</tr>
<tr>
<td>Other</td>
<td>Permit fees, gas, truck, etc.</td>
</tr>
</tbody>
</table>

**Cost Structure**
- It is important to further structure the cost elements within the material, labor, and other resource categories in order to understand how they influence the total cost of the activity or asset and to get a better understanding of how they can be controlled.

**Grouping**
The cost elements can be grouped into direct costs, indirect costs, fixed costs, and variable costs.

- **Direct costs** are those resources that are expended solely to complete the activity or an asset. In other words, any cost that is specifically identified with a particular final cost objective, but not necessarily limited to items that are incorporated in the end product as material or labor is considered direct cost.
- **Indirect costs** are those resources that need to be expended to support the activity or asset, but are also associated with other activities and assets. In other words, any cost not directly
identified with a single final cost objective, but identified with two or more final cost objectives. Indirect costs may also be referred to as “overhead costs” or “burden costs.” Indirect costs are general administrative activities associated with operating the business, costs for providing and maintaining field equipment or a manufacturing facility, and expenses for utilities, taxes, legal services, etc.

- **Fixed costs** are those cost elements that must be provided independent of the volume of work activity or asset production that they support. These can be either direct or indirect costs.
- **Variable costs** are those cost elements that must be provided and are dependent on the volume of work activity or asset production that they support. Again, these can be either direct or indirect costs.
- Grouping examples can be found in Chapter 1, *Skills and Knowledge of Cost Engineering, 6th Edition*, Tables 1.2 and 1.4.

**Cost Accounting Definition:**
- Cost accounting is defined as the historical reporting of disbursements, costs and expenditures on a project.
- Recording of cost information is nothing more than the mechanical gathering of data in a routine manner.
- Become familiar with the code of accounts structure.
- Activity based costing assigns resources to activities.
- Work breakdown structure (WBS) can be used with code of accounts. Be familiar with the structure.

**Cost Management**
The four common methods for providing cost information as they apply to cost management are as follows:

- **Cost Estimating**: This is the prediction of the quantity and cost of resources needed to accomplish an activity or create an asset.
- **Cost Trending**: Cost trends are established from historical cost accounting information. Cost management questions may focus on how expenditures are trending relative to physical accomplishments.
- **Cost Forecasting**: Forecasts are much like estimates. Whereas an estimate is always for future activities and assets, forecasts are prediction of the cost at completion for cost elements that are in progress.
- **Life-Cycle Costing**: Life-cycle costs (LCC) are associated with an asset and extend the cost management information beyond the acquisition (creation) of the asset to the use and disposal of the asset.
Check on Learning

1. _______________ are those cost elements that must be provided and dependent on the volume of work activity or asset production that they support.
   
   A. Direct Costs  
   B. Indirect Costs  
   C. Fixed Costs  
   D. Variable Costs

2. _______________ is a method of cost element classification where resources are assigned to activities that are required to accomplish a cost objective.
   
   A. Code of Accounts  
   B. Summary Level Accounts  
   C. Activity Based Costing  
   D. Work Breakdown Structure

3. _______________ are those cost elements that must be provided independent of the volume of work activity or asset production that they support.
   
   A. Direct Costs  
   B. Indirect Costs  
   C. Fixed Costs  
   D. Variable Costs

4. _______________ are those resources that are expended solely to complete the activity or asset.
   
   A. Direct Costs  
   B. Indirect Costs  
   C. Fixed Costs  
   D. Variable Costs

5. _______________ are associated with an asset and extend the cost management information beyond the acquisition (creation) of the asset to the use and disposal of the asset.
   
   A. Life-Cycle Costs (LCC)  
   B. Indirect Costs  
   C. Fixed Costs  
   D. Variable Costs
6. _______________ are those cost elements that must be provided and difficult to appropriate as a direct cost on specific assets that they support.
   
   A. Direct Costs  
   B. Indirect Costs  
   C. Fixed Costs  
   D. Variable Costs

7. The work breakdown structure (WBS) can be an effective aid for which type of communications?
   
   A. Team  
   B. Company  
   C. Customer  
   D. All of the above

8. Which of the following is a key reason to use a work breakdown structure (WBS)?
   
   A. Organize the work  
   B. Prevent work from slipping through the cracks  
   C. Provide a basis for estimating the project  
   D. All of the above

9. Which of the following is not an example of a variable?
   
   A. Size  
   B. Shape  
   C. Stamping tool  
   D. Weight

10. Procurement planning involves:
    
    A. A make or buy decision  
    B. Answering supplier’s questions  
    C. Creating the contract  
    D. Creating the RFP
Solutions

1. D  Variable Costs  
   Refer to Chapter 1, “Cost Structuring” topic

2. C  Activity Based Costing  
   Refer to Chapter 1, “Cost Structuring” topic

3. C  Fixed Cost  
   Refer to Chapter 1, “Cost Structuring” topic

4. A  Direct Cost  
   Refer to Chapter 1, “Cost Structuring” topic

5. A  Life-Cycle Costs (LCC)  
   Refer to Chapter 1, “Cost Management” topic

6. B  Indirect Cost  
   Refer to Chapter 1, “Cost Structuring” topic

7. D  All of the above  
   Refer to Chapter 1, “Cost Structuring” topic

8. D  All the above  
   Refer to Chapter 1, “Cost Structuring” topic

9. C  Stamping tool  
   Refer to Chapter 1, “Cost Structuring” topic

10. A  A make or buy decision  
    Refer to Chapter 1, “Cost Management” topic
Chapter 2 – Pricing and Costing

Rohit (Roy) Singh, P.Eng. M.Ed., CCP

Introduction/Learning Objectives

This chapter highlights the difference between pricing and costing. It is very important to distinguish between the terms “price” and “cost.” There is a very fine difference between them, which is why people often tend to use them interchangeably. This chapter discusses the concepts of pricing and costing of a project, illustrates the differences and helps the reader to identify the inputs, transforming mechanisms and outputs related to the costing and pricing process. The key learning objectives are:

- Differentiate between costing and pricing.
- Identify the inputs, transforming mechanisms and outputs related to the cost and pricing process.
- Understand the budgeting process.
- Calculate financial ratios related to the costing and pricing of projects.
- Understand the reasoning behind the costing and pricing process outputs.

Terms to Know

- Cash flow
- Competitive advantage
- Cost
- Financial management
- Inputs
- Opportunity cost
- Outputs
- Price
- Profit
- Return on assets (ROA)
- Return on investment (ROI)
- Transforming mechanism

Key Points for Review

- **Costing and Pricing**
  - Costing follows scope determination and quantification and precedes pricing and budgeting.
  - Cost can be categorized into direct or indirect cost.
  - Direct costs are those that are specific and tangible to the project, and include the costs of materials, labor, equipment, etc.
  - Indirect costs are those costs not directly accountable or tangible to the project, such as business taxes, home office overhead, or transportation fleet distributed cost.
  - Pricing can be defined as the determination of the amount to be charged to the client including:
    - Direct cost
✓ Indirect cost
✓ Contingency
✓ Profit
  o Seller vs buyer perspective determines price vs cost – e.g. $100,000 transaction
  ✓ $100,000 is the price including profit from seller’s perspective
  ✓ $100,000 is the cost from the buyer’s perspective
  o Cost-Pricing Process Inputs
    ✓ WBS/Scope
    ✓ Historical records
    ✓ Vendor quotations
  o Transforming mechanism (Tools and techniques)
    ✓ Cost and pricing strategies
    ✓ Financial management
  o Outputs
    ✓ Project estimate
    ✓ Project acquisition
    ✓ Business decision

❖ Budgeting process
  o Activity cost estimates
  o Scope baseline
  o Project schedule
  o Contracts

❖ Forecasting
  o Applying earned value method
  o Using Cost Performance Index (CPI) to calculate Estimate at Complete (EAC)
  o Early prediction of overrun when EAC is higher than Budget at Completion (BAC)

❖ Financial management
  o Return on investment (ROI)
  o Return on assets (ROA)
  o Net profit margin

❖ Project Acquisition and Business Decision
  o Review financial ratios (e.g. ROI, ROA, net profit margin) to determine the validity of acquisitions and support business decisions.
Check on Learning

1. Which of the following is not a major step in the Cost-Pricing process?
   A. Inputs
   B. Transforming mechanisms (Tools & Techniques)
   C. Outputs
   D. Bid award

2. Which item is not a major output to the Cost-Pricing process?
   A. Project Estimate
   B. Project acquisition
   C. Business decision
   D. Resource loaded CPM schedule

3. Which item is not considered a direct cost?
   A. Labor
   B. Material
   C. Site overhead
   D. Equipment

4. Historical records for costing and pricing a project does not include:
   A. Quantity take-offs
   B. Cost reports
   C. Competitor pricing
   D. Bid breakdowns

5. Inputs to the costing-pricing process do not include:
   A. Scope of work
   B. Historical records
   C. Vendor quotations
   D. Sales forecasts

6. Inputs to the budget development process include:
   A. Activity cost estimates
   B. Scope baseline
   C. Project schedule
   D. All of the above
7. Which financial management tool is best for comparing projects in the same industry?

   A. Net profit margin  
   B. Return on assets  
   C. Gross profit margin  
   D. Break-even analysis

8. In regards to the difference between price and cost, which statement is incorrect?

   A. The vendor’s price is the cost to the contractor  
   B. The vendor’s price plus the contractor’s markup is the cost to the client  
   C. The bid price to the owner is the contractor’s cost  
   D. The subcontractor quote is the contractor’s cost
Solutions

1. D Bid Award
   Refer to Chapter 2, “Cost-Pricing Process” topic & Figure 2.2

2. D Resource Loaded Schedule
   Refer to Chapter 2, “Cost-Pricing Process” topic & Figure 2.2

3. C Site Overhead is not considered a direct cost
   Refer to Chapter 2, Figure 2.1

4. C Competitor pricing
   Refer to Chapter 2, “Historical Records” topic

5. D Sales Forecasts
   Refer to Chapter 2, “Inputs” topic & Figure 2.2

6. D All of the above
   Refer to Chapter 2, “Budgeting” topic

7. B Return on Assets
   Refer to Chapter 2, “Financial Management” topic

8. C The bid price to the owner is the contractor’s cost
   Refer to Chapter 2, “Conclusion” topic