Construction Project Management: A Complete Introduction

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Slides are available for instructors who assign this book. They were developed using PowerPoint to assist instructors and are linked to a specific chapter or chapters in the book. Each slideshow represents a class of approximately 40-60 minutes and covers 1-2 chapters in the book. This PDF is representative of the slides that are included with the Teachers Resource Package and which you will be able to freely edit to suit your needs.

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Estimating

The following slides are linked to Chapters 10 and 11: The Fundamentals of Estimating and Creating Estimates.

The assumption is that instructor explanations, examples, and/or expanded discussion will accompany each slide.

Estimating: when and why?

- During feasibility
  - By owner or his agent
  - To determine project goals and budget
- During design
  - By architect or his agent
  - To make decisions about and adjustments to scope of work

- During bidding
  - By owner or her agents to provide a check on bid prices
  - By bidding contractors to provide detailed pricing for bidding
- After award of contract
  - By contractor to double check figures and use for hiring subs

The estimator's considerations

- Size and complexity of the project
- Quality of the materials
- Location of the project
  - Variations based on proximity to home office
  - Cost variations based on location

- Schedule
  - Reasonableness of owner's timeframe
  - Potential bad weather
  - Price increases
- Market conditions
  - Links between local/national/global economy and costs
  - Level of competition
  - Availability of labor, materials, equipment
- Management
  - Who are the team members?

Costs

In order to understand estimating it is helpful to understand that costs are categorized in two broad ways:

- Direct costs
- Indirect costs (of which there are 2 types)
  1. Indirect Project Costs (also called *General Conditions, General Requirements costs*)
  2. Indirect Business Costs (*Overhead*)

Direct costs

- Direct costs include the material, labor & equipment costs that can be billed to a specific task.

  Examples of direct costs include: Windows and doors, foundation concrete, structural steel, the light fixtures, subcontractors and other workers, scaffolding for the masons.

Pricing direct costs - materials

- Steps in pricing materials
  - Complete quantity take-offs (from the plans)
  - Determine the quality and other characteristics of the items from specifications
  - Identify unit costs for each product or material
  - Multiply total quantity of each material or product by its unit cost

Pricing direct costs - labor

- Labor is tied to quantities so take-off must be complete before labor costs can be calculated

- Wage rates per worker are determined
  - Union rate
  - prevailing wage
  - open shop

- Productivity is estimated for each worker (a measurement of how much a worker can produce - typically identified in hours)
- Productivity is a reflection of the following:
  - Quantity of the work
  - Complexity
  - Special conditions such as supervision, work conditions, overtime, weather

- Estimator multiplies the estimate of productivity for each task (number of hours/ days to complete a task) × labor rate/hour

EXAMPLE: Given 3840 SF of drywall (total units)

A crew of 2 can install 2000 SF/day (productivity rate)

Therefore a crew can install 3840 SF in 1.92 days (2)

Assume a labor rate of $40/hr/worker

Therefore: The cost to install 3840 SF of drywall is:

$640/day × 2 (days) = $1280

Pricing direct costs - equipment

- Equipment includes those things that are mobile (such as a bulldozer)
- Equipment is either owned or rented by the contractor and the direct cost should be the same (realistic rental rates + operating costs)
- Equipment costs are added to the estimate

Indirect project costs

Indirect project costs are labor, materials, equipment and administrative costs that are required to complete the work but have the following characteristics:

- They are billable to a specific task
- They are directly linked to project schedule and their costs end when the project ends
- They typically occur at the jobsite and not at the contractor's home office

- Indirect project costs are also referred to as general conditions costs, general requirements costs, division 1 costs, or jobsite administrative costs.

  EXAMPLES: The GC's superintendent, temporary power to the jobsite, jobsite trailer, chemical toilets, reports and schedules, clean-up, close-out

Indirect business costs (overhead)

- Indirect business costs are the costs of running a business and are not directly billable to a specific project but they must be paid for through the contractor's work
- Overhead is variable from contractor to contractor and their quantity of work but are typically accounted for as a fixed percentage markup.

Profit

The estimator will not want to forget to add profit

- Profit = money earned after expenses
- Highly variable; very market-driven. In a "down" economy sometimes contractors will bid on jobs and assume no profit just to keep crews busy. In better times profit will be whatever the market will bear.

Goal of an estimate

The goal of an estimate is to be:

- Complete and accurate so that it is as close as possible to the actual cost
  - Has everything been included?
  - All take-offs accurate?
  - Prices current?
  - Productivity accurately estimated?
  - Discounts for prompt payment?
  - Contract terms understood and accounted for?
  - Understanding of risks?
- Competitive enough to win the job

Class exercise

1. What sort of estimate is done before design decisions have been made? What is it's purpose?
2. Which type of estimate is the most accurate and who prepares it?
3. Describe how the concept of a learning curve relates to an estimate. What else will the estimator consider when putting an estimate together?
4. How are the costs of labor estimated?

5. There is very little construction work happening in town. How will this reality impact a contractor's bid estimate?
6. You are bidding a job and understand that the owner and the architect are both disorganized. How might this impact your estimate?
7. How do indirect project costs differ from overhead?

Types of estimates

- Conceptual estimates
  - Rough order of magnitude estimates
  - By owners early in the process
- Preliminary estimates
  - Square foot estimates (and other types)
  - By architects during design
- Bid estimates
  - Costs broken down by material, labor, equipment costs. By contractors: very detailed.

Rough order of magnitude estimates

- Use very preliminary design information
- Costs are based on a unit basis such as pupils per school, number of rooms per hotel, number of beds per prison

EXAMPLE:

Cost to build a 50 room hotel =

50 rooms X rough $/room

This number can be modified depending on how much information is known

Square foot estimates

- Some design information is known
- Costs broken down by area (square footage) as opposed to units (e.g.rooms)
- More accurate than ROM estimates

EXAMPLE:

Cost to build 50 room hotel:

Total square footage x $/SF

Square foot estimates

EXAMPLE

Costs to build a 1400 SF stucco over wood frame house in Tampa, Florida with average characteristics plus 1 ½ baths, detached garage, textured ceilings

How to do this when the estimator has no historical data and relies on published data such as RSMeans?

How to do square foot estimating when the estimator relies on published data?

Refer to RSMeans SQ. Ft. cost data for residential projects:

1. Identify the building type, class, configuration, garage type
2. Find the appropriate cost data sheet
3. Calculate base cost
4. Add modifications, alternatives, upgrades for base cost
5. Adjust for location

Bid estimates

- Putting a bid estimate together
  1. Complete the take-off
  2. Price
     - Labor, materials, equipment, subcontractors
     - Adjust for location, time frame (historical costs)
     - Develop estimate summary of all costs
     - Add taxes, labor burden
     - Add overhead and profit figures

What knowledge is required to do estimating at entry level?

Entry level estimators generally do take-offs:

- Be able to read and understand plans and technical specifications
- Be familiar with basic construction processes and sequences (If you can't visualize it you can't estimate it)
- Perform basic mathematical procedures
- Document all calculations
- Work under pressure

What knowledge is required to do estimating beyond entry level?

- Access to current price data
- Access to data regarding firm's resources - labor and equipment.
- Access to cost analysis and efficiency data from past jobs including labor, equipment, time performance, administrative costs
- Understanding of profit desired