

Estimating & Cost Control

- **Design Estimates**

- performed parallel with the feasibility and planning/design phases
- *screening* or *schematic* estimates for determining order of magnitude
- *preliminary* or *conceptual* estimates
- *detailed* or *definitive* estimates
- *Engineer's* estimate

Estimating & Cost Control

- **Design Estimates**

- approximate cost methods
 - square-foot cost estimate
 - cubic-foot cost estimate
 - panel unit cost estimate
 - modular takeoff estimate
 - parameter cost estimate

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- **Design Estimates**

- approximate cost methods
 - cost-per-function estimate
 - time-referenced cost indices
 - cost-capacity factor
 - component ratios

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- **Bid Estimates**

-prepared by contractor or CM for submission to owner for competitive bidding or negotiation
- quantity takeoffs
- subcontractor quotes
- includes indirect costs and markup

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- **Control Estimates**

-for monitoring the project during construction
- budget estimates for *financing*
- budget estimates for *cost control*
- = prepared immediately prior to *or* during construction

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- **Sources of cost data**

-generally based on historical information
- in-house records
- industry publications such as:
 - R.S. Means
 - Engineering News-Record (ENR)
 - many others

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• **Quantity Takeoffs**

-a detailed compilation of the quantity of each elementary work item called for on the project
- also referred to as quantity surveys
- procedure for compiling a detailed estimate
- basic, organized, and systematic process
- manual and/or computerized

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• **Quantity Takeoffs**

-provides valuable information used during the job planning and construction periods including:
- purchasing
- planning and scheduling
- cost control
- resource allocation

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• **Quantity Takeoffs**

-details addressed in the takeoff
- include allowances for waste and anticipated yield factors
- units, number of units, and dimensions

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• **Quantity Takeoffs**

-prime contractors usually perform takeoffs of work to be performed by their own forces (direct work)
- specialty subcontractors will perform their own takeoff (subcontract work)
- vendors will often perform their own takeoff

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• **Quantity Takeoffs**

-must be organized, consistent, and concise
- clarity and legibility are critical...neatness counts!
- organized according to CSI or other format
- set up estimate sheets so that descriptions and dimensions are left-justified, right side is set up in columns

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• **Quantity Takeoffs**

-when performing takeoffs, specifically measurements from scaled drawings....
- be consistent, form good habits
- first measure horizontally then vertically
- consistently go clockwise (or counterclockwise)
- always start on the same place on the drawing

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• **Quantity Takeoffs**

-when performing a building takeoff
- begin by taking off the gross area.....this will be useful as check
- takeoff perimeters, partitions, then floor to floor heights which will give “skin” area
- use a highlighter for marking areas taken off.....using certain colors to represent specific items

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• **Quantity Takeoffs**

-mentally build the project from the ground up
- group by assembly
- “\$” should appear at the extension on the first line and total line only
- use commas for clarity and to avoid possible errors

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• **Quantity Takeoffs**

-work sheets should be organized so that...
- all items can be tabulated for both material and labor
- all similar material items can be subtabulated, then tabulated on one sheet
- work performed by the same trade for the tabulation of total man-hours

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• **Pricing**

-subcontracted work...
- use quotations from reliable or reputable subs
- be familiar with the scope and magnitude of the work
- include any prime contractor cost associated with the item

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• **Summary Sheet**

-should be organized to...
- summarize all direct cost resulting from both direct and subcontract work
- summarize all indirect costs, bonding, taxes, and contingency
- profit
- = total estimated cost or bid price

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• Materials

- everything that becomes a permanent part of the constructed facility

• Labor

- direct = basic wages for the various crafts determined by...
 - applicable union contracts
 - prescribed prevailing wage rates
 - established or current area practice

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- Labor
 - indirect = expenses added to the basic hourly rates that are paid by the employer including:
 - payroll taxes
 - insurance
 - fringe benefits
 - = indirect labor costs can add 30 to 50 percent to the direct payroll costs

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- Equipment
 - owned or leased machinery used to accomplish the work
 - contractor-owned equipment incurs ownership and operating costs
 - ownership costs includes depreciation, interest, taxes, insurance, and storage
 - operating costs includes fuel, oil, lubricants, repairs (parts and labor), tire repair and replacement

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- Project Overhead
 - also referred to as *job* overhead
 - on-site expenses that do not pertain directly to any specific work item, but are necessary for ultimate job completion
 - generally contributes 5 to 15 % of total project cost
 - computed by listing and pricing each item of overhead rather than arbitrary percentage of project cost

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- General Overhead
 - also referred to as *office* overhead
 - includes general business expenses such as office rent and utilities, office supplies, furniture, association dues, advertising, salaries of executives and office staff
 - generally contributes 3 to 10 % of total project cost
 - included in the estimate as a percentage of the total estimated job cost

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- Markup
 - margin added at the end of the estimating process
 - allows for profit, contingency, and general overhead
 - comprises 5 to 20 % (or more) of the bid price
 - affected by many factors, especially risk and bidding environment

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- Bonding
 - cost of contract bond(s)
 - contract may require performance bond only or performance and payment bonds
 - premium depends on project completion time, class of construction, total contract amount, and applicable bond rates
 - accounts for 0.5 to 1.0 % of the contract cost

Lump-sum Bid Price Development

	Total Direct Cost
+	Job Overhead
	<hr/> Job Cost
+	Markup
	<hr/> Subtotal
+	Bond
	<hr/> Subtotal
+	Tax
	<hr/> Bid Price

Estimating & Cost Control

• **Cost Control**

.....the application of procedures to track and minimize the cost in relation to the budget estimate prepared for a specific project

- structured approach to recording and evaluating project costs
- reporting and analyzing project costs to management/project team

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• *Cost Control*....function

- maintain orderly system of records and reports
- measure progress or work accomplished
- forecasting periodic and total cost
- cost engineers are the interface between management, line supervisors, schedulers, estimators, procurement, and accounting

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Cost Control....principles

.....cost control or cost engineering should not be confused with financial accounting

- cost engineers....
 - Must have solid technical understanding
 - emphasis on forecasting and trending

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Cost Control....principles

- accounts deal mainly with historical, documented facts to pay bills, generate invoices, complete tax returns, payroll...all down to the penny
- cost engineers must....
 - deal with and interpret tenuous information
 - use judgement in interpreting and forecasting

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Cost Control....tools

- WBS (work breakdown structure)
 - integrated control system interrelating costs, schedules, and other parameters
- standard cost code (such as *Masterformat*)
- project cost code

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Project Control Codes

- Apply project cost code to reference and document....
 - expenditures and commitments for labor, material, equipment, subs, and indirect costs
 - procurement documents such as....
 - requisitions
 - purchase orders
 - receiving slips
 - invoices

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Project Control Code....components

- Project number
- Area-facility code
- Work-type code (use standard code)
 - account hierarchy
 - » prime account
 - » subaccount
- Distribution code

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Sample Project Code

Project	Area-Facility	Work-Type	Distribution Code
98NB04	11	3320	2

98 = Job start 1998
N = Negotiated Contract
B = Building
04 = 4th Building that year

11th Floor
Concrete,
(Lightweight Aggregate)
Material

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Project Control Code....practical considerations

- tracking
- control cost where they occur
- code for cost impact, not design function
- coding labor and equipment
- be precise, avoid ambiguity

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Control Budgets

.....basic reference standard for monitoring and controlling cost

- derived from cost estimate
- employs project code structure
- used for recording and reporting....
 - actual performance, to-date and this period
 - projection or forecasts
 - variance and explanation of variance

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Sources of data for cost control

- Time sheets
 - labor: name, ID No., craft, hours, and code
 - equipment: description, number, hours, code
 - material received: code and intended location
 - work completed for payment: description, location, code, and quantity
 - weather conditions
 - special notes or comments

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Application of Engineering Economy

- time value of money
- comparative economic studies
- objectively and rationally evaluate scenarios
- assist financial managers in forecasting cash flow or borrowing needs

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Engineering Economic Analysis Techniques

- present-worth analysis
- equivalent annualized costs
- benefit/cost analysis
- break-even or payout time
- rate of return on investment
- cash-flow analysis