

Construction Estimation, Planning and Control

CE4333
Week 1

Introductions

Scope of this class

- Prerequisites: CE3331, CE3332
 - Simple material take-off
 - Estimating cycle times
 - Scheduling
 - Cash flow analysis

... these topic will be repeated!

Scope of this class

- Emphasis on material take-off
 - Specifically divisions 3, 4, 5
- Emphasis on cost control
 - Appropriate material and equipment choice
 - Understanding behavior of money over time
- Emphasis on integrating time + cost
 - Direct and indirect cost analysis
- Emphasis on risk analysis
 - Make contingency plans and formally capture uncertainties
- Emphasis on novel methods
 - Sustainable construction, value engineering, 3D/4D CAD applications

Scope of this class

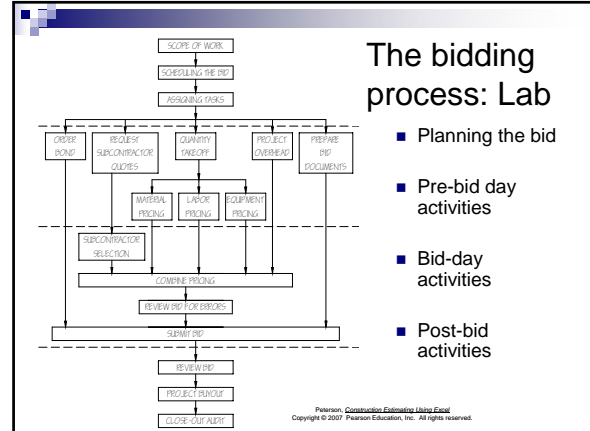
- Emphasis on construction process more than on construction methods
- Emphasis on construction management decision making
- Emphasis on appropriate use of software and modeling methods to understand construction processes

Software

- MS Excel
- RiskAmp Analysis
- Michigan Engineer's Resource Library (MERL) for MDOT bids
- Working knowledge of AutoCAD

The Decision-Maker's Perspective

- Buy, Build or Lease a facility?
- How do you analyze a competitive bid?
- How do you control cash flow?
- What kind of material to use and why?
- How to estimate labor productivity?
- How to estimate equipment productivity?



Syllabus

- [Class Home Page](#)

The Construction Industry

- The Interface between Infrastructure and Design
 - The human element plays a critical role
- Construction Industry: 8.2% of GDP (2000)
- Employs 6 million people
- ~ \$819 Billion in economic activity
- Fragmented
- Very low profit margins (2-3%)

What is estimating?

- The process of determining the anticipated cost of materials, labor, and equipment of a proposed project

Means Illustrated Construction Dictionary, 3rd Edition, RS Means Company, Inc.; Kingston, MA

Questions

- How much material do we need?
 - Basic Quantity take-off + % Waste
 - What is the nature of the work?
 - What is the expected labor productivity?
 - What kind of supervision is expected?
 - What kind of skilled labor is available?
- Judgement!!

What is used?

- Project drawings and specifications
- Nationally published cost manuals
- Time schedule
- Estimator's ability to judge the nature of the job
- Historical information

What does estimating involve?

- Studying scope of work
- Preparing cost estimates
 - Material take-off
 - Equipment requirements
- Estimating time to completion
 - Labor productivity
 - Risk ... what can go wrong?

Estimating costs?

- Determine direct costs
- + Indirect costs (tax, bonds, insurance, field costs, home-office costs)
- + Contingencies (unexpected events)
- + Profit

Estimate of the amount of money the contractor receives

Estimating time?

- Time taken to complete project
- Directly related to direct costs for estimating labor and equipment
- Indirect costs are also dependent
- Very critical in litigation

Time is money

Players

- | | |
|----------------------------|-----------------------------------|
| ■ Contractor | ■ Owner |
| □ To bid a job | □ Buy, build or lease |
| □ To control cash flow | □ Project budgeting and financing |
| □ Level of accuracy +/- 2% | □ Bid negotiation |
| □ Set up payment schedules | □ Set up payment schedules |

Types of Estimates

- Preliminary
 - Conceptual: precedence
 - Low effort
 - Accuracy: +/-20%
 - Do we want to do this job?
- Detailed
 - To the last bolt: Needs plans and specs, CSI MasterFormat
 - Months
 - Accuracy: +/-2-5%
 - Are we being competitive

Detailed Estimates

- Who: Contractor
- For: Owner
- Determine:
 - Costs of MLE
 - Sub-contract
 - Overhead & Profit (O&H)
- Use:
 - Complete set of Bid Documents
- Goal:
 - A bid price

Preparing Detailed Estimates

- Table 1.2
- Table 1.3 (CSI Format)
- Table 1.4
- Table 1.5, 1.6, 1.7 (WBS Format)

Bid analysis

- Payment schedules
- Balanced bids
- Conversion ratios
- Percentage completion
- Cost control