

## Conceptual Estimates - To bid or not to bid

Lecture 2  
09/11/06

### Reading for next week: The Process (Chapter 3)

- Preliminary workload assessment
- Workload breakdown
- Preliminary work-plan
- Gather expertise around: material suppliers, vendors, contractors etc.
- Laying down expectations
- Establishment of estimate work plan, staffing requirements
- Iterate

### Should we bid?

- Bonding capacity
- Nature of project and available expertise
- Contractual terms
- Contractor responsibilities – relationship to owner/other players
- Conceptual estimate of time and money to be invested

### Bid Documents

- Invitations to bid
- Instructions to bidders
- Bid forms
- Drawings
- Specifications
- Requirements for bonds and insurances
- Appendices

### Contract Documents

- Bid documents *after* contract has been signed
- + Change orders during the construction process
- + Signed agreements, bonds, insurances, plans, specs. (CSI, DOT etc)

### Types of Contracts

- Lump sum
- Unit-price
- Cost + Fee
- Incentive Contracts
- Guaranteed Maximum Price (GMP)

## Bid Forms

- Lump-sum Contracts
  - Base bid prepared for entire project (At-Risk)
  - When quantity of work to be performed is definite and well defined
- Unit-price Contracts
  - Specify unit costs for necessary work
  - Be careful to specify all work units
  - Direct cost +

## Players

- Owner (Provides the money: Project financing!!)
- Architects/Engineers (Provides all plans/specs.: contract documents)
- Contractors (Builds in accordance with the contract)
- Sub-contractors

## What is a Project Delivery System?

- Definition of scope and project requirements
- Procedures, actions, and sequence of events
- Contractual requirements, obligations, responsibilities
- Inter-relationships between “players”
- Mechanisms for managing time
- Forms of agreements and documentation of activity

## Defining characteristics

- Are design and construction under separate contracts?
- What is the final selection criteria for the constructor?

## Project Delivery Systems

- Design Bid Build (*Traditional*)
  - Separate contracts, lowest bid
- Construction Management at-Risk (GMP)
  - Separate contracts, not just lowest cost
- Design Build
  - Combined contracts
- Design Build Operate
  - Combined contracts

## Agency Construction Manager

- Not at-Risk
- Responsible for managing the construction project
- Activities include: Scheduling, estimating, cost control, documenting paper work
- May have an incentive clause

Division	Materials	Labor	Equipment	Total
1. General Requirements	105,217	392,857	0	498,074
2. Site Construction	189,565	480,000	91,384	760,949
3. Concrete	406,957	322,857	26,087	755,901
4. Masonry	695,652	857,143	156,522	1,709,317
5. Metals	730,435	466,429	69,565	1,266,429
6. Wood and Plastics	122,609	52,143	0	174,752
7. Thermal and Moisture	216,522	127,143	0	343,665
8. Doors and Windows	166,957	58,571	0	225,528
9. Finishes	146,087	112,857	0	258,944
10. Specialties	13,043	7,143	0	20,186
11. Equipment	257,391	123,571	0	380,962
12. Furnishings	0	0	0	0
13. Special Construction	36,522	4,286	0	40,808
14. Conveying Systems	92,435	35,714	0	128,149
15. Mechanical	863,478	510,000	17,391	1,390,869
16. Electrical	1,130,435	414,286	17,391	1,562,112
Total Field Costs	5,173,305	3,965,000	378,260	9,516,565
Taxes on Materials (5%)				258,665
Taxes on Labor (25%)				991,250
Insurance and Bonds				265,000
Overhead and Profits (15%)				1,654,722
Total Bid Price				12,686,202

**Figure 2.2:** An Example of a Detailed Estimate at the Division Level  
Source: Construction Cost Estimating for Decision Makers, (Manuscript)  
Eddy M. Rojas, University of Washington

## Bid Analysis

- CSI Format (slide)
- Conversion ratio (CR):
  - Ratio by which raw materials are converted to the finished product

$$CR = [TB - MC]/MC$$

TB: Total Bid Price  
MC: Material Cost including taxes

## Conceptual Estimates

- Based on primary function
  - Hospitals: cost/bed
  - Schools: cost/sq-ft
- Based on area/volume
- Modified for:
  - Time
  - Location
  - Capacity
  - Size

## Broad Scope Estimates

Unit Cost (UC) forecast = (A + 4B + C) / 6

A = Minimum unit cost of previous projects  
B = Average unit cost of previous projects  
C = Maximum unit cost of previous projects

## Cost Index

- Used to update historical cost data
- Take into account inflation (i)
- Base year Jan 1, 1913
- Page 437 of RS Means (See announcements for latest ENR construction cost index)

## Adjustment: Time

- $I(2006 + n) = I(2006)(1+i)^n$
- $I(2006) = 7763.15$   $i = 3.0\%$  (0.03)

$$\text{Cost}(\text{Year B}) = \frac{\text{Cost}(\text{Year A}) \cdot (\text{Index B})}{(\text{Index A})}$$

## Adjustment: Location

- To adjust for local differences
- RS Means page 458
- 49931: 92.2

$$\text{Cost(City B)} = \text{Cost(City A)} \left[ \frac{I(\text{City B})}{I(\text{City A})} \right]$$

<http://www.rsmeans.com/calculator/index.asp>

## Adjustment: Process Unit Capacity

$$\text{Cost(Process Unit B)} = \text{Cost(Process Unit A)}$$

$$\times \left[ \frac{C(\text{Project B})}{C(\text{Project A})} \right]^a$$

C() = Process unit capacity

a = Slope of cost capacity curve

Relationship of plant cost vs unit production assumed linear over narrow capacity ranges

## Adjustment: Unit cost for size

- Unit cost goes down for higher outputs
- Use historical data to build linear relationship
  - $Y = mX + c$
  - Y: Cost per unit X: Number of units
  - For given  $(x_1, y_1)$  and  $(x_2, y_2)$  calculate  $m$  and  $c$

## Payment Schedules

- Working on borrowed money
- Payments made on % completion
- An agreed schedule of payment:
  - Owner's Bid Price (pre O&P)/Division Reqmt. = Cost Allocation per division (CA/div)
  - CA/div x Contractor's estimate = Division payment sched.
- Balanced/Un-balanced bids

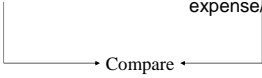
Division	Owner's Estimate	Cost Allocation	Payment Schedule	Contractor's Estimate
1. General Requirements	619,216	5.6	630,444	625,342
2. Site Construction	908,014	8.2	924,478	1,125,342
3. Concrete	874,630	7.9	890,488	965,896
4. Masonry	1,976,052	17.9	2,011,881	2,423,499
5. Metal	1,437,225	13.0	1,463,283	1,632,564
6. Wood and Plastics	211,585	1.9	215,421	216,432
7. Thermal and Moisture	403,944	3.7	411,267	405,643
8. Doors and Windows	266,185	2.4	271,012	175,543
9. Finishes	312,129	2.8	317,798	234,609
10. Specialties	40,291	0.4	41,021	45,321
11. Equipment	442,391	4.0	450,413	450,000
12. Furnishings	0	0	0	0
13. Special Construction	61,372	0.6	62,484	60,654
14. Carving Systems	159,366	1.4	162,256	158,763
15. Mechanical	1,579,219	14.3	1,607,844	1,339,543
16. Electrical	1,739,872	15.8	1,771,418	1,372,445
Bid Price before O&P	11,031,480	100	11,231,499	11,231,499
Overhead and Profits (15%)	1,654,722			
Total Bid Price	12,686,202			

Figure 2.3: An Example of a Payment Schedule Calculation

## Cost Control

- Controlling on-going expense
- Information required:
  - % Completion
  - Estimate of cost of material stored on-site
  - Accrued expense (so far, independent of payment)
  - Estimated cost
- Check Accrued Expenses so far vs. Estimated Expense

## Cost Control

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>■ Accrued expense/div<ul style="list-style-type: none"><li>□ +Cash expenditures</li><li>□ - Inventory valuation</li><li>□ + Accounts payable</li></ul></li></ul> | <ul style="list-style-type: none"><li>■ Estimated expense/<br/>As-planned expense:<ul style="list-style-type: none"><li>□ % completion x<br/>Estimated<br/>expense/div.</li></ul></li></ul> |
|  <p>→ Compare ←</p>   |   |