CE303 Introduction to Construction Engineering

Cost Estimating
& Bidding

Learning Objectives

- The student should be able to:

- Explain Parametric Estimating.
- Define the elements of Cost, Direct and Indirect, and explain their significance.
- Describe the generalized steps for developing a Detailed Estimate.
- Define "Unbalanced Bidding" and explain how it may help, and hurt.
- Define "Owning & Operating Costs".
- Explain "Bid Ethics" and "Bid Rigging"

Estimating Construction Cost

- Construction Estimation
  - Compilation and analysis of items that contribute to the cost of the project
  - Requires detailed study of bidding documents
- Construction estimating is a crude process
  - Lots of variables
  - Personal factors

Pre-Design or Conceptual Estimate

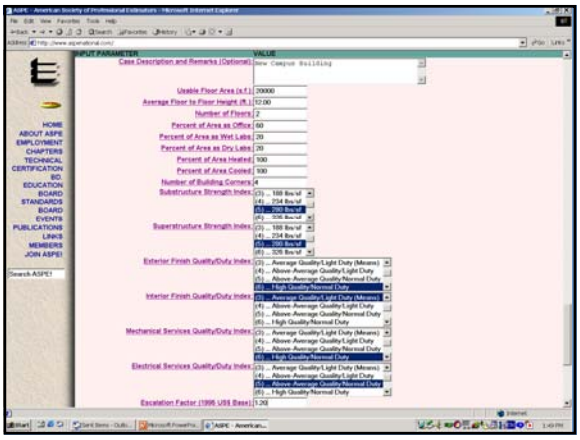
- Estimated cost is used to:
  - Decide whether or not to proceed with design
  - Set a target cost (an estimate) for the project
- Approximate estimates are frequently used to verify
  - Subcontractor's bid prices
  - Detailed estimates

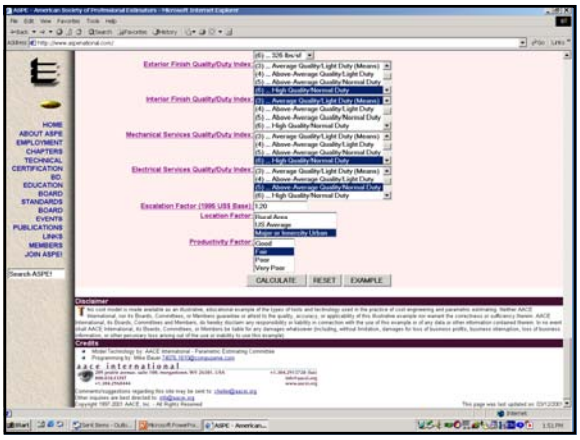
Pre-Design or Conceptual Estimate

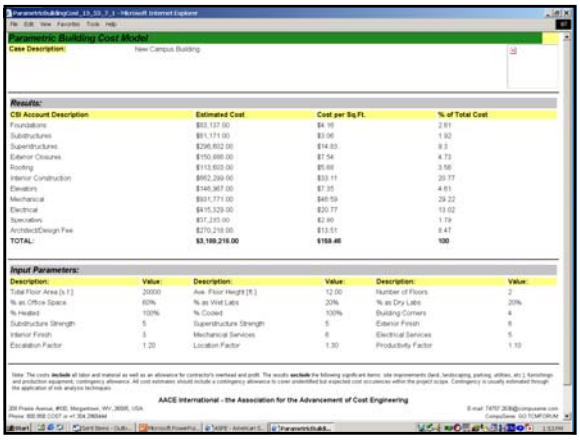
- Can be Based Upon:
  - SF of Building
  - CF of Building or Facility
  - Number of Units
  - Desks, beds, rooms, work-stations, production units, seats, Number of Widgets, etc.
- carries ±20% margin of error with regard to the actual project cost

Pre-Design or Conceptual Estimate

- Parameter or Parametric estimating – an estimate involving unit costs, called parameter costs, for each of several different building components or systems.
- Take into account
  - Type of construction
  - Type of materials to be used
  - Quality of construction desired
  - Project location, etc.
- Must be realistic
  - Must always have a reality check!







Other Types of Conceptual Estimates

- Time Referenced Cost Estimates:

$$C_2 = \left(\frac{\text{Index}_2}{\text{Index}_1}\right) \times C_1$$

- Cost-Capacity Factors:

$$C_2 = \left(\frac{Q_2}{Q_1}\right) \times C_1$$

- Component Ratios:

Total Facility Cost = Equipment Cost x Factor

Construction Cost Indices

- Trend of price changes associated with construction costs
- ENR Building Cost Index (BCI)
  - "66.38 hours of skilled labor at the 20-city average of bricklayers, carpenters and structural ironworkers rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of portland cement at the 20-city price, plus 1,088 board-ft of 2 x 4 lumber at the 20-city price. "

Construction Cost Indices

- ENR Construction Cost Index (CCI)
  - "200 hours of common labor at the 20-city average of common labor rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of portland cement at the 20-city price, plus 1,088 board-ft of 2 x 4 lumber at the 20-city price. "

Construction Cost Index History

HOW ENR BUILDS THE INDEX: 200 hours of common labor at the 20-city average of common labor rates, plus 25 cwt of standard structural steel shapes at the mill price prior to 1996 and the fabricated 20-city price from 1996, plus 1.128 tons of portland cement at the 20-city price, plus 1,088 board ft of 2 x 4 lumber at the 20-city price.

ENR's Construction Cost Index History (1908-2009)

1913=100 * Revised	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVERAGE
1990	4680	4685	4691	4693	4707	4732	4734	4752	4774	4771	4787	4777	4732
1991	4777	4773	4772	4766	4801	4818	4854	4892	4891	4892	4896	4889	4835
1992	4888	4884	4927	4946	4965	4973	4992	5032	5042	5052	5058	5059	4985
1993	5071	5070	5106	5167	5262	5260	5252	5230	5255	5264	5278	5310	5210
1994	5336	5371	5381	5405	5405	5408	5409	5424	5437	5437	5439	5439	5408
1995	5443	5444	5435	5432	5433	5432	5484	5506	5491	5511	5519	5524	5471
1996	5523	5532	5537	5550	5572	5597	5617	5652	5683	5719	5740	5744	5620
1997	5765	5769	5759	5799	5837	5860	5863	5854	5851	5848	5838	5858	5826
1998	5852	5874	5875	5883	5881	5895	5921	5929	5963	5986	5995	5991	5920
1999	6000	5992	5986	6008	6006	6039	6076	6091	6128	6134	6127	6127	6059
1913=100	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANNUAL AVERAGE**
2000	6130	6160	6202	6201	6233	6238	6225	6233	6224	6259	6266	6283	6221
2001	6281	6272	6279	6286	6288	6318	6404	6389	6391	6397	6410	6390	6343
2002	6462	6462	6502	6480	6512	6532	6605	6592	6589	6579	6578	6563	6538
2003	6581	6640	6627	6635	6642	6694	6695	6733	6741	6771	6794	6782	6694
2004	6825	6862	6957	7017	7065	7109	7126	7188	7298	7314	7312	7308	7115
2005	7297	7298	7309	7355	7398	7415	7422	7479	7540r	7563	7630	7647	7446
2006	7660	7689	7692	7695	7691	7700	7721	7722	7763	7883	7911	7888	7751
2007	7880	7880	7856	7865	7942	7939	7959	8007	8050	8045	8092	8089	7966
2008	8090	8094	8109	8112*	8141	8185	8293	8362	8557	8623	8602	8551	8310
2009	8549	8533	8534	8528	8574	8578	8566	8564	8586				

Labor Estimating Relationships

- Labor Productivity Rate = Work per Unit Time or per other Unit or X workhours/unit
- Quantity Takeoff ⇒ Req'd Number of Units (incl. wastage)
- Work Hours Req'd = Productivity Rate (workhours/unit) x Takeoff Quantity
- Duration = Work Hours Req'd / Crew Size
- Activity Labor Cost = Duration x Hourly Crew Labor Cost

Steps for Preparing a Detailed Estimate

1. Review the Scope of the Work of the Project
2. Determine the Quantities of each type of Work by doing a Material Quantity Takeoff
3. Obtain price quotation from suppliers
4. Determine your cost for Materials from your Vendors, extend to find Material Cost
5. Determine your cost for Labor from your Direct Labor Rates, extend to find Labor Cost

Steps for Preparing a Detailed Estimate

6. Determine your cost for your Construction Equipment ~ Owned & Rented Equipment
7. Get your cost of specialty work by bids from Specialty Contractors
8. Determine the Taxes, Bonds, Insurance, and G&A Overhead to be experienced.
9. Determine the Project Contingency (amount set aside for unforeseen negative events)
10. Determine the Profit for your effort.

Get Organized

- Detailed study of bid documents.
- List all of the Items to be considered .
- Any questions and their resolution.
- List of any Missing Prices that need to be included.

Detailed Estimate for an Activity – Jobsite Visit

- Information needed on:
  - Project location
  - Probable weather conditions
  - Availability of electricity, water, telephone, and other services
  - Access to site
  - Local ordinances and regulations
  - Conditions pertaining to the protection or underpinning of adjacent property
  - Storage and construction operation facilities
  - Surface topography and drainage

Detailed Estimate for an Activity – Jobsite Visit

- Information needed on:
  - Subsurface soil, rock, and water conditions
  - Underground obstructions and services
  - Transportation and freight facilities
  - Conditions affecting the hiring, housing, and feeding of workers
  - Material prices and delivery information from local material dealers
  - Rental of construction equipment
  - Local subcontractors
  - Wrecking and site clearing
  - Environmental concerns

Endangered Plant and Animal Species in Kentucky

Gray bat, Indiana bat, Virgina big-eared bat, Catspaw, Clubshell, Combshell, Blackside dace, Relict darter, Bald Eagle, Cumberland elktoe, Fanshell, Winged mapleleaf (mussel) Pink mucket (pearlymussel, Rough pigtoe, Orangefoot pimpleback (pearlymussel), Piping plover, Puma, Northern riffleshell, Kentucky cave shrimp, Pallid sturgeon, White wartyback, Red-cockaded woodpecker, Price's Potatoe-bean, Braun's Rock-cress, Cumberland sandwort, Cumberland rosemary, Eggert's sunflower, White-haired goldenrod, Virginia spiraea, Running buffalo clover….

Detailed Estimate for an Activity

1. Material Quantity Takeoff
   - Calculation of exact quantities of the components by each activity.
   - From plans and specifications, e.g., 1500 CY
   - Take into account waste.
   - Check all estimates of subcontractors or vendors (rebar, structural steel, etc.)
2. Select Method of Construction
   - Based on experience –
   - e.g., "Place Materials from stockpile using 5T hydraulic crane and (3) laborers"

Detailed Estimate for an Activity

3. Estimate Labor & Equipment (Crew) Production Rates
   - Crew Hours/Unit required to install each component.
   - e.g., 0.25 crew hrs/ CY for
     - (3) laborers,
     - (1) operator,
     - (1) crane

Detailed Estimate for an Activity

4. Costing (Pricing)

Cost per unit of material (delivered to site, no taxes)

e.g., $ 32/CY

Cost per unit for labor and equipment

3 laborer @ $15/hr = $45/hr
1 operator @ $18/hr = $18/hr
Labor = $63/crew hr

Crane rental
$200/day (8 hrs/day) = $25/hr
Operating Costs = $ 3/hr
Equipment = $28/crew hr

Detailed Estimate for an Activity

4. Costing (pricing) cont'd.

Extend the units to get unit costs

- Labor: (0.25 hr/cy)($63/hr) = $15.75/cy
- Equipment: (0.25 hr/cy)($28/hr) = $7.00/cy

Detailed Estimate for an Activity

Extensions – to get Total Direct Cost

- Multiply quantities of each of the components by the material, labor and equipment unit costs.

Quantity CY	Material Unit $/CY	Material Total $	Labor Unit $/CY	Labor Total $	Equipment Unit $/CY	Equipment Total $
1,500	32.00	48,000	15.75	23,625	7.00	10,500

Summary Sheets

- List & classify several work items.
- Classification is based on the company's standard cost account number system or CSI Masterformat.
- Summary Sheets are fed into the Recap Sheets

Summary Sheets

- Lump-Sum Bid:
  - Quantity survey totals & their units.
  - Material unit prices & extensions
  - Labor unit prices & extensions
  - For lump-sum bids equipment costs for entire project are computed separately.
- Unit Price Bid:
  - One summary sheet per pay item.
  - Each summary sheet includes several different work categories.
  - Includes columns for material, labor, equipment, and subcontracts.

SUMMARY SHEET

Project Municipal Airport Terminal Building Work Items Concrete and Forms

Cost Account Number	Work Item	Unit	Total Quantity	Material Cost Each	Material Cost Total	Labor Cost Each	Labor Cost Total	Total Cost
240	CONCRETE							
.01	Footings	c.y.	1,040	$39.50	$41,080	$4.50	$4,680	$45,760
.05	Grade beams	c.y.	920	$42.50	$39,100	$6.30	$5,796	$44,896
.07	Slab	c.y.	2,772	$39.50	$109,494	$6.00	$16,632	$126,126
.08	Beams	c.y.	508	$42.50	$21,590	$6.30	$3,200	$24,790
.09	Bond beams	c.y.	62	$42.50	$2,635	$9.00	$558	$3,193
.11	Columns	c.y.	102	$42.50	$4,335	$8.70	$887	$5,222
.12	Walls	c.y.	466	$42.50	$19,805	$6.75	$3,146	$22,951
.16	Stairs	c.y.	317	$42.50	$13,473	$7.80	$2,473	$15,946
.19	Sidewalks	c.y.	320	$39.50	$12,640	$6.00	$1,920	$14,560
.20	Expansion joint	l.f.	41,060	$0.25	$10,265	$0.15	$6,159	$16,424
.40	Screeds	s.f.	148,000	-	-	$0.12	$17,760	$17,760
.50	Float finish	s.f.	22,000	-	-	$0.15	$3,300	$3,300
.51	Trowel finish	s.f.	128,000	-	-	$0.25	$32,000	$32,000
.52	Stair finish	l.f.	2,060	-	-	$1.05	$2,163	$2,163
.60	Rubbing	s.f.	2,530	$0.06	$152	$0.55	$1,392	$1,544
.91	Curing	s.f.	180,000	$0.04	$7,200	$0.03	$5,400	$12,600
					$281,769		$107,466	$389,235
	Indirect Labor Cost					39%	$41,912	$41,912
	Total Concrete				$281,769		$149,378	$431,147
260	FORMS							
.01	Footings	s.f.	1,220	$0.70	$854	$1.00	$1,220	$2,074
.05	Grade beams	s.f.	4,840	$0.80	$3,872	$1.00	$4,840	$8,712
.08	Beams	s.f.	1,965	$0.88	$1,729	$1.08	$2,122	$3,851
.11	Columns	s.f.	1,642	$1.08	$1,786	$1.99	$3,267	$5,053
.12	Walls	s.f.	5,240	$0.88	$2,852	$1.00	$5,240	$8,092
.17	Risers	l.f.	910	$0.68	$619	$1.28	$1,165	$1,784
.45	Chamfer	l.f.	510	$0.08	$41	$0.08	$41	$82
.60	Oil, ties, nails	s.f.	13,443	$0.06	$807	-	-	$807
.65	Anchor slot	l.f.	2,800	$0.30	$840	$0.06	$168	$1,008
					$13,400		$18,063	$29,463
	Indirect Labor Cost					43%	$6,908	$6,908
	Total Forms				$13,400		$22,971	$36,371

Figure 5.3 Summary sheet, lump-sum bid.

Summary Sheets

- Lump-Sum Bid:
  - Quantity survey totals & their units.
  - Material unit prices & extensions
  - Labor unit prices & extensions
  - For lump-sum bids equipment costs for entire project are computed separately.
- Unit Price Bid:
  - One summary sheet per pay item.
  - Each summary sheet includes several different work categories.
  - Includes columns for material, labor, equipment, and subcontracts.

SUMMARY SHEET

Project Holloman Taxiways and Aprons Bid Item No. 5 Concrete Pavement, 9 inch

Cost Account Number	Work Item	Quantity	Unit	Material Unit Cost	Material Total	Labor Unit Cost	Labor Total	Equipment Unit Cost	Equipment Total	Subcontract
250.03	Concrete, production	23,625	c.y.	$20.60	$486,675	$15.27	$360,754	$3.44	$81,270	-
254.01	Concrete, hauling	23,625	c.y.	-	-	$0.30	$7,088	$0.35	$8,269	-
258.02	Concrete, lay-down	90,000	s.y.	-	-	$1.06	$95,400	$0.49	$44,100	-
270.08	Reinforcing	50	ton	$550.00	$27,500	$350.00	$17,500	-	-	-
248.20	Grooves	105,000	l.f.	$0.04	$4,200	$0.03	$3,150	$0.01	$1,050	-
240.95	Curing	90,000	s.y.	$0.10	$9,000	$0.04	$3,600	$0.005	$450	-
			Totals		$527,375		$487,492		$135,139	-
					Labor Indirect Cost, 37%		$180,372			
						Labor Cost	$667,864			

Figure 5.4 Summary sheet, unit-price bid.

Recap Sheets ~ Purpose

- To summarize the entire project on a single sheet.
- To find the total cost by simple addition of component costs.
- To apply project markup:
  - G&A Overhead
  - Bonds, Insurance, & Taxes
  - Contingency & Profit
- To allow for easy adjustments.

Recap Sheets ~ Lump Sum

Example of Bidding Construction Project Bid Summary using the CSI Organization of Work

Item	Division	Material	Labor	Subcontract	Total
1	General Requirements	$ 16,435.00	$ 36,355.00	$ 4,882.00	$ 57,672.00
2	Sitework	15,070.00	20,123.00	146,186.00	181,379.00
3	Concrete	97,176.00	51,524.00	0.00	148,700.00
4	Masonry	0.00	0.00	212,724.00	212,724.00
5	Metals	212,724.00	59,321.00	0.00	272,045.00
6	Woods & Plastics	38,753.00	10,496.00	4,908.00	54,157.00
7	Thermal & Moisture	0.00	0.00	138,072.00	138,072.00
8	Doors & Windows	36,821.00	32,115.00	0.00	68,936.00
9	Finishes	172,587.00	187,922.00	0.00	360,509.00
10	Specialties	15,748.00	11,104.00	9,525.00	36,377.00
11	Equipment	0.00	0.00	45,729.00	45,729.00
12	Furnishings	0.00	0.00	0.00	0.00
13	Special Construction	0.00	0.00	0.00	0.00
14	Conveying Systems	0.00	0.00	0.00	0.00
15	Mechanical	0.00	0.00	641,673.00	641,673.00
16	Electrical	0.00	0.00	354,661.00	354,661.00
	Total Direct Cost	$ 605,314.00	$ 408,960.00	$ 1,558,360.00	$ 2,572,634.00
	Material Tax (5%)	30,265.70			2,602,899.70
	Labor Tax (18%)		73,612.80		2,676,512.50
	Contingency (2%)			53,530.25	2,730,042.75
	Bonds & Insurance			34,091.00	2,764,133.75
	Profit (10%)			276,413.38	3,040,547.13
					$ 3,040,550.00

Recap Sheet ~ Unit Price

- Purpose and general layout are similar to Lump-Sum Recap Sheet – eg. Fig. 5.9, p. 114
- Differences:
  - List only the pay-items (bid items)
  - Quantities listed are Engineer's estimates
    - Not actually used by the contractor (Unbalanced Bidding)

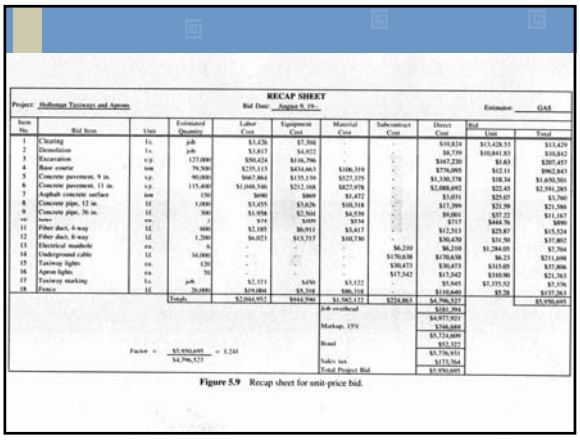

RECAP SHEET

Figure 5.9 Recap sheet for unit-price bid.

Recap Sheet ~ Unit Price

- Contains two additional columns, Bid Unit Price & Bid Total Price.
- Factors are used to increase the "Total Direct Costs" to include O/H & MarkUp to give the "Bid Total Price" for each pay item.
- Unit Price(Bid) = Total Price(Bid)/Quantity
- O/H & MarkUp are not separate items but are included in the Total Bid Cost of the pay items.

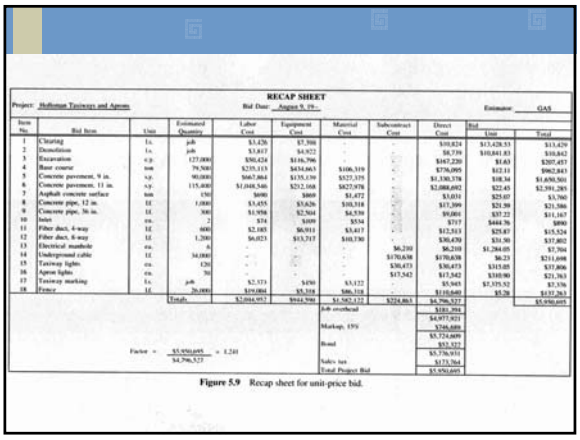

RECAP SHEET

Figure 5.9 Recap sheet for unit-price bid.

Unbalanced Bidding

- Unbalanced Bidding applies to unit bidding.
- Front-End Loading:
  - Raises prices for pay items which occur early on in the project, and reduces prices for pay items that occur later on in the project
  - Owner may accept front-End loading, if he/she fells it covers interest on money and legitimately includes the setup costs.
- Unbalanced Bidding can take advantage of expected mistakes in A/E's estimate.

Unbalanced Unit Price Bidding

Front End Loading

	Engineer's Estimate	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	150,000	1.00	150,000	1.50	225,000
Selected Excavation	100,000	3.10	310,000	2.35	235,000
Total			460,000	=	460,000

Favorable Unbalanced Bid

	Actual Quantities	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	200,000	1.00	200,000	1.50	300,000
Selected Excavation	100,000	3.10	310,000	2.35	235,000
Total			510,000	<	535,000

	Actual Quantities	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	100,000	1.00	100,000	1.50	150,000
Selected Excavation	120,000	3.10	372,000	2.35	282,000
Total			472,000	>	432,000

Disadvantages of Unbalanced Bidding

- If changes are made, they can have quite an unrealistic impact on the pricing situation – the contractor can gain or lose at lot.
- Unrealistic Unit Prices can adversely affect the owner's or A/E's decisions.
  - Quantities at higher price may be drastically reduced and those at lower price may be conversely increased.
- A bid may even be rejected if thought to be unfair or irresponsible.

Unbalanced Unit Price Bidding

	Engineer's Estimate	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	150,000	1.00	150,000	1.50	225,000
Selected Excavation	100,000	3.10	310,000	2.35	235,000
Total			460,000	=	460,000

	Actual Quantities	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	200,000	1.00	200,000	1.50	300,000
Selected Excavation	100,000	3.10	310,000	2.35	235,000
Total			510,000	<	535,000

Unfavorable Bid

	Actual Quantities	Straight Bid		Unbalanced Bid	
		Unit	Total	Unit	Total
Bid Item	CY	$/CY	$	$/CY	$
Ordinary Excavation	100,000	1.00	100,000	1.50	150,000
Selected Excavation	120,000	3.10	372,000	2.35	282,000
Total			472,000	>	432,000

Direct/Indirect Costs

- Direct Costs
  - Costs that can be assigned directly to the work items.
  - Cause (work item) and Effect (direct cost) relationship.
  - If the work item is deleted then its direct cost will disappears.
  - The work item is incorporated into the finished product
- Indirect Costs
  - Costs that can be assigned indirectly to the work items
  - If the work item is deleted, indirect cost remains (still have to pay insurance, taxes, etc)

Examples of Direct Costs

- Direct cost of the contractor's own forces
  - Cost of labor placing reinforcing steel
  - Cost of placing concrete for slabs
  - Cost of installing doors, etc.
- Subcontract costs
  - Tile Installation Subcontract
  - Painting Subcontract
  - Elevators Installation Subcontract
  - Etc.

Examples of Indirect Costs

- Project Overhead (O/H)
  - Costs directly assignable to project but indirectly assignable to individual work items,
    - field supervision,
    - services,
    - office trailers,
    - field fabrication shops,
    - job site elevators,
    - job site crane,
    - etc.

Material Costs

- Material unit prices are needed for the estimate.
- Costs used in estimates include delivery to site, but they do not usually include taxes .
- This allows for comparison of prices from different locations or times.
- Contractor may:
  - Produce his own materials. e.g., aggregate for highway project, concrete for building, etc.
  - Use his own estimate for the cost of material.
  - Purchase material from the manufacturer, a representative, a vendor, a supplier, etc.

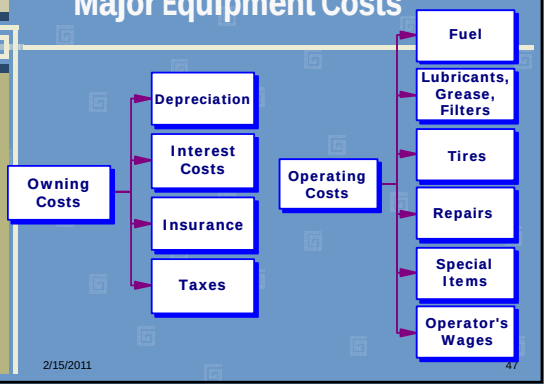
Labor Costs Divided Into Direct and Indirect Costs

- Direct Costs - Basic wages
- Indirect Costs
  - Payroll Taxes and Insurance (Required)
    - Social Security, Unemployment Insurance & Workman's Compensation Insurance
  - Fringes (Voluntary)
    - Health and Welfare Funds
    - Employee Insurance
    - Paid Vacations
    - Pension Plans
    - Apprenticeship Programs

Equipment Cost Estimating

- Equipment used for construction vs. the Permanent Equipment incorporated into the Construction.
- Accuracy of cost estimates depend on importance of equipment
  - Major equipment - Detailed cost analysis
    - concrete plant, draglines, earthmoving machines
  - Minor equipment
    - pumps, concrete vibrators, power buggies
  - Very minor equipment
    - hand tools, power tools, wheel barrows, water hose, & extension cords

Major Equipment Costs



Equipment Production Rates

- Very uncertain (traditionally),
- Depends on
  - weather, ground conditions, haul distances, slopes, rolling resistance, etc.
- Consult records, operators, handbooks, time & motion studies.
- Use average values, not spot values.

Equipment Expense

- Need Hourly Equipment Costs and Production Rates
- Different cost rates used for different purposes
  - Hourly Costs = Ownership, or rental/lease costs, + Operating Costs
  - Cost/Unit of product produced
    - concrete or asphalt mixing plants, aggregate plants, etc.
- Equipment without production rates
  - prefab forms, air compressors, welding machines, cranes, scaffolds, etc.
  - Cost/Week or Cost/Month
- Mobilization and Demobilization Costs
  - Included in project overhead

Allowances

- A/E or owner designates a fixed amount to be included in contractor's bid to cover the cost of certain materials that has yet to be specified.
- Actual selection will occur as needed during the construction.
- Typical uses:
  - hardware, carpet, landscaping, cabinets, light fixtures, appliances, bathroom fixtures, tile, etc.

Allowances

- Allowances cover materials only if allocated for materials
- Payments for Allowances is based on actual moneys spent supported by receipts or Subcontract invoices,

i. e., landscaping

- Allowances normally do not cover Contractor labor, equipment, overhead, & profit.
  - The Contractor should have included this in another part of his bid.
- Allowances are not the same as "Owner Supplied Materials".

Alternatives

- The Owner or A/E may designate a number of alternatives to the base bid.
- Normally, lump sum bids are solicited for alternate ways of achieving same or different project goals.
- The alternate is to be priced as lump sum addition or subtraction to the base bid.

Alternatives

- Lump Sum Prices submitted for alternates should be able to stand alone, including O/H & Profit.
- The selected contractor with the low bid may be determined by the alternative selected by the A/E, or the owner.
- Owner's objective is to stay within project budget, or to make best selection of materials or process.

Bidding Procedures

- Advertisement for bids
  - Public vs private
  - Controlled by law
  - Advertisements in newspapers, magazines, trade publications, and other media
  - Plan service centers
  - Describes the nature, extent, and location of the project

Contractor Qualification

- Qualification is the process whereby only contractors is deemed capable (qualified) and thus are allowed to obtain:
  - bidding documents, submit proposals, or enter into contract for a project.
- Pre-Qualification:
  - the evaluation process that must be completed for the Contractor to receive the bidding documents and submit his bid.
- Post-Qualification:
  - the evaluation process that happens after the contractor's bid is submitted (along with bid price, qualification of materials, etc.)

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Qualification requirements

- Contractor must be licensed.
- Contractor submits detailed info about
  - Contractor owned equipment,
  - Construction experience,
  - finances,
  - jobs in progress,
  - personnel and staff, and
  - references.

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Qualification Process

- Public Highway Construction
  - Pre-Qualification is required for all jobs.
  - Highway contractors submit
    - a detailed questionnaire, and
    - are rated as to max contract capacity and
    - type of work
      - grading, paving, bridges, etc.
- Private Construction - Similar to public process.
  - In closed bidding the contractor may volunteer his company's "advertising" type information along with bid to get job based on quality rather than price.

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Bid Closing

- Bid closing should be selected carefully – to be in owner's best interests.
- Afternoon, middle of week, with no conflicts with other bid closings.

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Bid Closing

- When, where & how to submit a bid is submitted is specified in the instruction to bidders.
- The bid/proposal, with bid security and any other required bidding documents are to be placed in sealed envelope and delivered in person, by Mail - Fed Ex, Express Mail, Fax, etc.
- A late bid is usually disqualified.

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Bid Opening

- For a public opening (public projects) is widely attended,
  - all prices are announced,
  - low bid is not determined until the A/E & owner study and evaluate bids.
- The contractor should communicate the bid opening results to his surety.
- For a closed bidding (private projects), the results are not made public.

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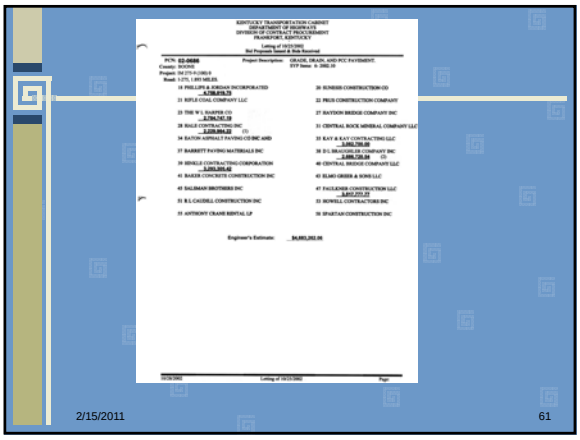

Bid Security – Bid Bond

- Almost all public and many private projects require a guarantee
- that, if selected, a contractor will enter into contract for specified bid price and the contractor usually will be required furnish a bid bonds.
- This bid bond is later returned to the contractor, after contract execution, or other contractor selection.

Bid Bond

- Can also be a designated lump sum.
- Type of "bid bonds":
  - "Liquidated Damages":
    - Owner receives face amount of bid bond.
  - "Difference-in-Price":
    - Owner receives difference between low and next highest up to the face value of the bond.

Bid Bond from a Surety

- In the case of default, the surety does not really pay
- The contractor is liable and indemnifies the surety for any such claims by the owner.
- GC's may require subcontractors to also submit a bid bond.
- The ability to get bid bond serves as a check of contractor's financial stability.

Bid Bond Alternatives

- Certified Check.
  - e.g., a $100,000 check for 2 weeks @ 6% interest costs $240
- Cashier's Check.
- Negotiable Security.
- These alternatives all tie up the contractor's money.

Responsive Bidding – Acceptance Period – Rejection of Proposal

- To be acceptable a bid must be responsive (in form and substance) to the invitation to bid and the instructions to bidders,
- i.e., to do the work exactly as specified in the bidding documents.
- Any deviations in qualification or conditions, or variations in performance may render the bid non-responsive.

Responsive Bidding – Acceptance Period – Rejection of Proposal

- Acceptance period is stated in the invitation to bidders (30-60 days) during which the contractor cannot withdraw bid without losing his/her bid bond.
- Be careful of owners asking for extension.
  - Subcontractors and suppliers may not stand by their prices; escalation; schedule repercussions.

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Responsive Bidding – Acceptance Period – Rejection of Proposal

- The contract documents typically specifies that the owner has the right to reject any or all bids.
- The contractor will be rejected if he/she does not meet qualification requirements or if the bid is not responsive,
- i.e., if all bids are > 10% above the engineer's estimate then all bids are typically rejected.

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Complimentary Bids

- The contractor gives a high bid, intentionally high enough to ensure that the bid will not be accepted.
- The contractor does not want to get the contract and is wanting to compete in the bid process, although appearing to be responsive to the request for bids.
- On the edge of collusion.

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Bid Rigging

- Contractor A giving high bid price to contractor B so that B bids the project.
- B is safe but A may be prosecuted for bid-fixing, collusion, etc.
- Contractors meet and divide available projects among themselves by determining the low bidder and price for each.
- Contractor persuades others to bid who have no intention of winning the bid.
- Unlawful.

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Mistakes in Bids

- Common Law "doctrine of revocability of offer to its acceptance" does not hold true after the deadline for receipt of proposals and during the acceptance period in construction.
- Withdrawal can mean loss of bid bond.

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Mistakes in Bids

- According to the "doctrine of unilateral mistake" a contractor may withdraw his bid legally if the mistake is:
  - So major that enforcing the contract would be "unconscionable", (unscrupulous, outrageous, not controlled by conscience).
  - The mistake relates to material feature of the contract (having real importance or great consequences).
  - Mistake not from violation of a positive legal duty or from culpable negligence, (culpable is defined as blameworthy; meriting condemnation, blame).
  - The owner is put in a status quo position to the extent that it suffers no serious prejudice

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Mistakes in Bids

- If this holds, and the mistake is excusable and one of fact if the error is of mechanical or clerical nature, and Contractor notifies the owner **promptly**
- "Excusable" clerical mistakes:
  - Arithmetic error (faulty addition, missing decimal, typos, transpositions), Transaction error, Leaving something out

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Mistakes in Bids

- Examples of "inexcusable" mistakes:
  - Errors in judgement, Not visiting the site, Incorrect rough estimate
- If the contractor verifies his bid, and the contractor starts work, there is no required relief for a contractor mistake.

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Promissory Estoppel

- When the low-bidding prime contractor bases his bid on a subcontract bid, which is considerably lower than other bids, the subcontractor is prevented from withdrawing his bid by the **doctrine of Promissory Estoppel.**

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Promissory Estoppel

- Promissory Estoppel can bind a sub to its bid price if prime can prove:
  - That it received a clear and definite offer from sub
  - That the sub could expect that the prime would rely on the offer
  - That the prime actually did rely on the offer and such reliance was reasonable
  - That the reliance worked to the prime's detriment

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Subcontractor bids

- Contractor selects sub-bids – He uses letters, cards, phone calls.
- Contractor receives bids – the deadline set is usually 2-3 hours before bid opening.
- Frantic phone calls to the Contractor: gives section of specifications, price, qualification on bid, sub's name and person calling.
- The Contractor gets bids from subs and incorporates these into his bid.
- The GC must know the subs conditions of bid and the assumptions made: availability of crane, supply of water, heat, electricity, material storage area, ...

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Subcontractor Relationships – Bid Shopping

- The GC uses the bid of one sub to drive down a bid of another sub
  - If before the bid opening it may be called down bid of another
  - If after it's called "shopping"

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Subcontractor Relationships – Bid Peddling

- Subs sometimes take advantage of a known price to be submitted then give a reduced price.
- Hard to detect – "all's fair in love and war" concept.
- Subs know which GC is the lowest bidder and his price.
- They may also find out the low sub-bid price
- They then call the GC to get him to use them instead.
- Thus supplanting the other subs.
- GC should not do this: "It takes two to tango."

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Subcontractor Relationships – The Relationship

- General Contractor Needs:
  - Several subbids on each item to be competitive
  - To establish good working relationships with several subs associated with each work specialty .
- Contractor should use lowest responsive bid
- If sub's bid is defective or incomplete, the GC is not bound to use it.
  - Concept of interdependence.
  - Prime/subs depend on each other.

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Cost Estimating & Bidding

End of Lecture