Cost Estimating

Construction Project Management

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Construction Cost Estimating

- Project Cost Management (PMI)
  - Resource Planning
  - Cost Estimating
  - Cost Budgeting
  - Cost Control

- Construction cost estimating is the process of figuring out construction cost
- Accurate estimating is crucial to the success of construction projects

Cost Estimating is Subjected to

- Overall economy
- Political stability
- Social culture
- Project size
- Weather
- Transportation
- Soil conditions
- Labor issues
- Material availability
- Subcontractors
- Productivity
- Construction methods

Types of Estimates

- Conceptual estimate
- Preliminary estimate
- Engineer’s estimate (owner’s estimate; fair-cost estimate)
- Bid estimate (contractor’s estimate)
- Progress estimate
- Final estimate

CSI MasterFormat

- Construction Specification Institute (CSI) developed the MasterFormat – a standard for organizing specifications
- MasterFormat: 50 divisions (16 divisions until 2003):

0. Procurement and contracting requirements
1. General requirement
   Project management coordination, etc.
2. Existing Conditions
   Surveys, geotechnical investigations, etc.
3. Concrete
4. Masonry
5. Metals
6. Wood, Plastics & Composites
7. Thermal and Moisture Protection
   - Waterproofing, roofing
8. Openings (Doors & Windows)

http://en.wikipedia.org/wiki/MasterFormat

CSI MasterFormat (Cont'd)

9. Finishes
    - Plaster, flooring, tile, painting
10. Specialties
    - Visual display surfaces, signage.
11. Equipment
    - Bank, library, theater, medical equipment
12. Furnishings
    - Artwork, light control, site seating and tables
13. Special construction
    - Clean rooms, sauna, towers
14. Conveying equipment
    - Elevators, escalators, moving walks
21. Fire suppression
22. Plumbing
23. HVAC
25. Integrated Automation
26. Electrical

http://en.wikipedia.org/wiki/MasterFormat

CSI MasterFormat (Cont'd)

27. Communications
28. Electronic safety and security
31. Earthwork
32. Exterior Improvements (Retaining wall, etc.)
33. Utilities (Ponds and reservoirs, etc.)
34. Transportation (Vehicle barriers)
35. Waterway & marine
40. Process integration
41. Material processing and handling equipment (cranes and hoists)
42. Process heating, cooling, and drying equipment
43. Process gas and liquid handling, purification and storage equipment
44. Pollution and waste control equipment
45. Industry-specific manufacturing equipment
46. Water and wastewater equipment
48. Electrical power generation

http://en.wikipedia.org/wiki/MasterFormat

Detailed Estimate

- Direct costs
- Indirect costs
  - Job overheads
  - General overheads
- Mark-up

Direct Costs

- Construction Resources = 4M
  - Manpower, Machines, Materials, and Money
- Direct costs of all the resources
  - Labor
  - Equipment
  - Material
  - Others (O&P (overhead & profit))

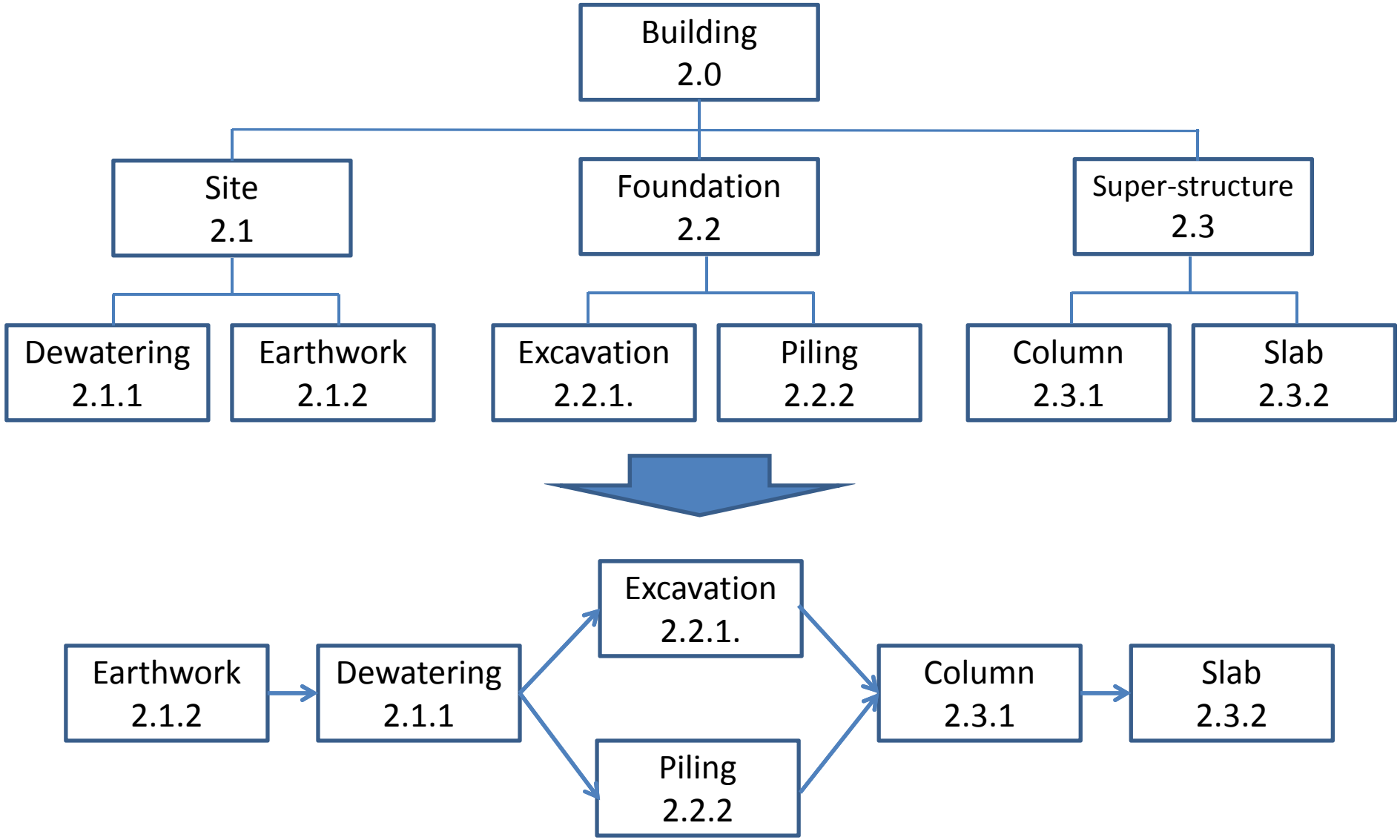
Indirect Costs

- Mobilization cost
- Bond premiums
- Insurance premiums
- Fees for licenses and permits
- Costs for temporary utilities (water, electricity, and telephone)
- Costs for temporary roads
- Home office overheads

Simplified Procedure for Cost Estimating

- Decompose the project into smaller components
  - The smaller components can have names such as cost center, line item, estimating account, and work package
- Quantify the amount of work for each component (quantity takeoff)
- Obtain a unit price for the component
- Multiply the required quantity by the unit price to get the total cost for each component
- Add up the costs for all the components to get the total cost for the project

Work [Project] Breakdown Structure (WBS)



Work Package

- A subset of a project that can be assigned to a specific part for execution
- Work packages are defined by brief statements of
  - Activity Description
  - Activity Resources
  - Activity Estimates of Effort and Duration
  - Activity Schedule
  - Activity Risks
  - Activity Budget
- Work Packages are assigned a control account

http://en.wikipedia.org/wiki/Work_package

Quantity Takeoff

- In a narrow sense, quantity takeoff simply means to measure quantities of work to be placed in appropriate units
- Procedure of quantity takeoff
  - Review drawings and specifications
  - Identify the materials required for each work package
  - Extract relevant dimensions
  - Calculate the required quantity
- In a broad sense, quantity takeoff means not just measurement of quantity but also the whole cost estimating.
- Quantity surveying, a term used in the UK and Commonwealth countries, indicates a big portion of project management, including cost planning, tendering, and contract administration.

Quantity Takeoff Errors May Occur in

- Calculation
- Transposition
- Omission
- Order of magnitude
- Poor reference
- Incorrect units
- Unrealistic loss factors

Pricing (Cost Determination)

- Pricing can be based on historical data, vendor quotations, suppliers catalogs, pricing books, in-house databases, and experiences.
- It is important to have and improve in-house database to have a competitive edge.
  - Think about why some contractors lose big in international construction projects.
- Pricing can be unit price basis or lump sum basis
- For unit price, resource analysis may be required

How to Calculate the Unit Price?

- Assume a crew composition to include number of workers and equipment
- Estimate the hourly production based on the crew composition and the job conditions -> (Quantity / Hour)
- Estimate the hourly cost of the crew composition -> ($ for L&E / Hour)
- Divide the hourly cost by the hourly production to get the unit price for labor and equipment ->

($ for L&E / Hour) / (Quantity / Hour) =

($ for L&E / Quantity)

How to Calculate the Unit Price? (cont'd)

- Obtain the unit cost for material ->

($ for M / Quantity)

- Add the unit cost for labor and equipment to the unit cost for material, in order to get the unit cost for labor, equipment, and material ->

($ for L&E / Quantity) + ($ for M / Quantity) =

($ for L,E,&M / Quantity)

- Since the unit price is the bare cost, consider the profit margin and overhead to get the total unit price with overhead and profit->

($ for L,E,&M / Quantity) + O&P =

($ for L,E,&M with O&P / Quantity)

Estimating References

- R.S. Means Construction Cost Data Books
- F.R. Walker's Building Estimator's Reference Book
- Richardson General Construction Estimating Standards
- Korean Standard Estimating Reference (표준품셈)