



مدیریت پروژه‌های صنعت ساخت (ساختمانی، زیرساختی و صنعتی)

فصل پنجم: مدیریت مالی و هزینه
ارزیابی اقتصادی
مدیریت هزینه
مدیریت مالی
تامین مالی

ارائه دهنده:

سید محمدرضا علوی پور

(PhD, PMP, CMIT)

دانشگاه Illinois Tech آمریکا

What we will learn?

- ☐ Economic analysis
- ☐ Cost management
 - ❖ Estimating
 - ❖ Control
- ☐ Financial management
- ☐ Project financing
- ☐ Cm roadmap related to this section

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

ECONOMIC ANALYSIS

Introduction

- ❑ **Construction firms** acquire funds, as most individuals do, by **borrowing money** from banks and similar lending sources.
- ❑ It is typical, for instance, to borrow money to **finance operations** in the field pending receipt of progress payments from the client.

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Introduction

- ❑ A **more long-term** variety of borrowing occurs when
 - ❖ Purchasing new equipment
 - ❖ Expanding staff
 - ❖ Move into a new geographical location or industry sector

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Construction managers and economic analysis

- ❑ The **management** of expensive, long-term construction projects definitely requires a **thorough understanding** of the principles and techniques of Economic Analysis and Financial Management.
- ❑ The **mathematical approach** of engineering economy is **increasingly useful** even for small, personal decisions.
- ❑ **Construction managers** need to have a **good working understanding** of the concepts of economic analysis and financial management.

Time value of money

- ☐ **One dollar** available **right now** is more attractive than one dollar offered to be available at a **future time**.
- ☐ A dollar **promised to be given a year from now** is more attractive than a dollar promised to be **given two years from now**.
- ☐ The **value of an amount of money**, therefore, depends on its
 1. Nominal
 2. When it is earned or paid out (effective)

This key concept is known as the **time value of money (TVM)**

Simple interest

Year (n)	Base for Applying i	Interest i for Period	Total Owed (F)
0 (now)			10,000
1	10,000	$10,000 \times 0.10 = 1,000$	11,000
2	10,000	$10,000 \times 0.10 = 1,000$	12,000
3	10,000	$10,000 \times 0.10 = 1,000$	13,000

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Compound interest

Year (n)	Base for Applying (i)	Interest for Period	Total Owed (F)
0 (now)			10,000
1	10,000	$10,000 \times 0.10 = 1,000$	11,000
2	11,000	$11,000 \times 0.10 = 1,100$	12,100
3	12,100	$12,100 \times 0.10 = 1,210$	13,310

Prepared by Dr. ...
DO NOT DISTRIBUTE

Nominal and effective rate

- ❑ Technically, rate can refer to any time unit, from **seconds to decades**.
- ❑ A lender could advertise a loan with a “**1% interest rate**” and then indicate in small print that it refers to **1% per week**.
- ❑ To protect consumers, Congress passed the **Truth in Lending Act in 1968**, which among other issues, requires that lenders clearly indicate interest rates as an **annual percentage** of each received dollar.
 - ❖ This annual percentage rate (APR) also includes upfront commissions and fees converted to **equivalent annual percentages**.

Equivalence and minimum attractive rate of return

- ❑ **Equivalence** is usually considered in terms of interest rates **instead** of total interest.
- ❑ If a person or company considers it **equally attractive** to have \$100 now or to get \$150 a year from now, the interest rate that this person considers **equivalent** would $\frac{\$50}{\$100} = 50\%$.
 - ❖ This particular interest rate is called the minimum attractive rate of return (MARR) for that person or company.
- ❑ In a **business environment**, a company's MARR is **not found** as **arbitrarily** as shown.

Equivalence and minimum attractive rate of return

- ☐ If the **company** works in heavy construction and in its **experience** a reasonable return on equity is 20%,

then it could **not aspire** to a 50% MARR.

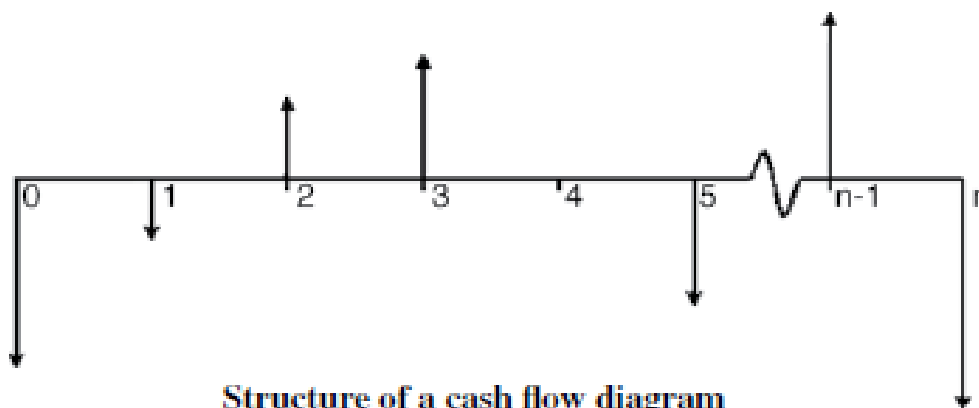
- ☐ Or, if it is **paying** a **10% interest rate** on its borrowed money,
then its MARR cannot be less than 10%.

- ☐ Inflation

- ☐ Risks

- ☐ ?

Cash flow diagrams



Structure of a cash flow diagram

Summary of equivalence formulas

1. Compound amount factor for P to F (F/P)
2. Present worth factor for F to P (P/F)
3. Compound amount factor uniform series for A to F (F/A)
4. Sinking fund factor for F to A (A/F)
5. Present worth factor uniform series for A to P (P/A)
6. Capital recovery factor for P to A (A/P)

Type of Cash Flow Name	Single Payment		Uniform Series (Annuities)			
	Compound Amount Factor	Present Worth Factor	Compound Amount Factor	Sinking Fund Factor	Present Worth Factor	Capital Recovery Factor
Description	Find F given P (F/P)	Find P given F (P/F)	Find F given A (F/A)	Find A given F (A/F)	Find P given A (P/A)	Find A given P (A/P)
Formula	$(1+i)^n$	$\frac{1}{(1+i)^n}$	$\frac{[(1+i)^n - 1]}{i}$	$\frac{i}{[(1+i)^n - 1]}$	$\frac{[(1+i)^n - 1]}{i \times (1+i)^n}$	$\frac{i \times (1+i)^n}{[(1+i)^n - 1]}$



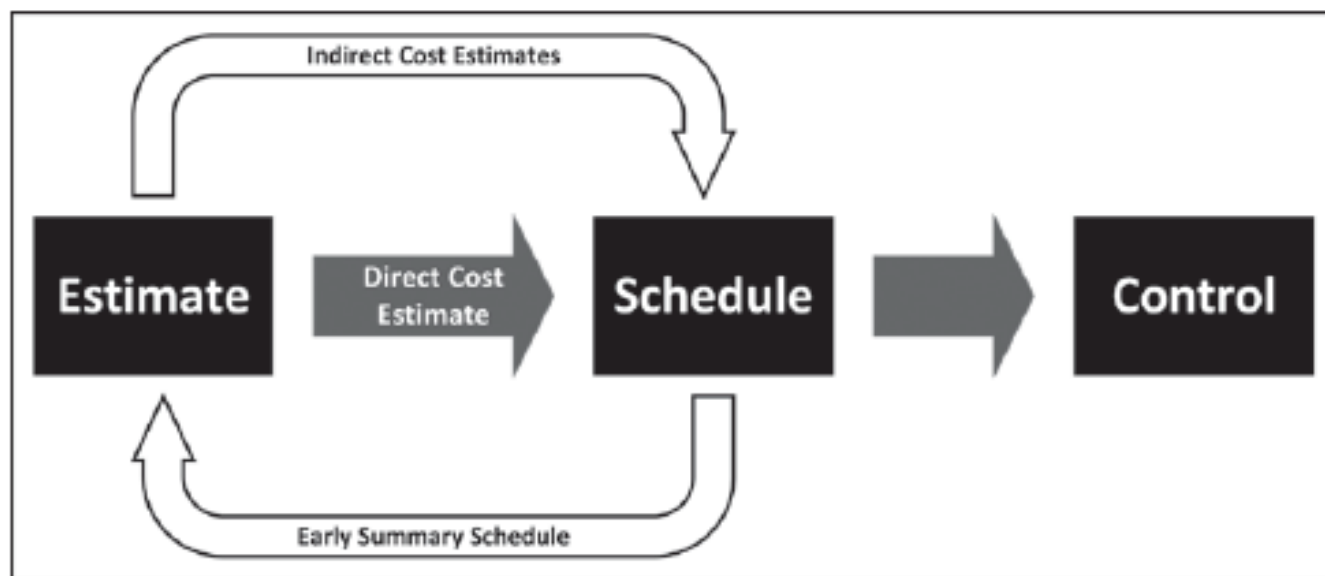
Sensitivity analysis

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

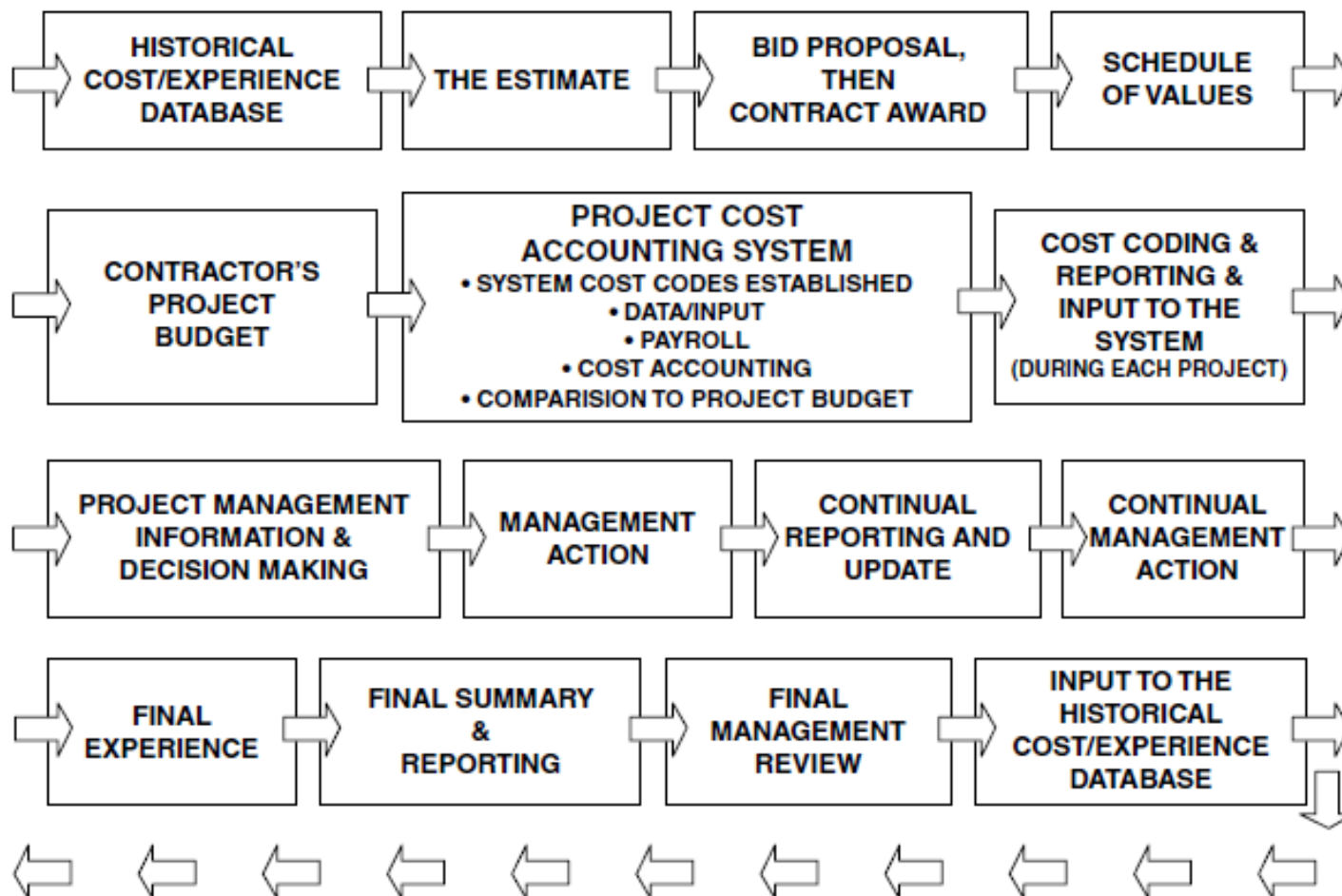
COST MANAGEMENT

(Estimating)

Project controls



Cost management cycle



Estimating project cost

❑ Estimators have an **awesome responsibility**.

1. First, they must come up with an accurate but competitive estimate that will win the job.
2. Second, their planning and calculations set the stage for the **overall management targets** for the entire project.

Once the **estimator turns** the project over to the project manager and the on-site team, the **estimator shifts** to a **support role** and really has **no direct management duties** associated with the day-to-day operations.

Estimating project cost

- ❑ Every person in construction management **must** be **familiar** with the estimating process, but **not everyone** in construction is suited to be an estimator.
- ❑ It takes **special skills** and aptitude to be successful at this **very important role** in construction management.

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

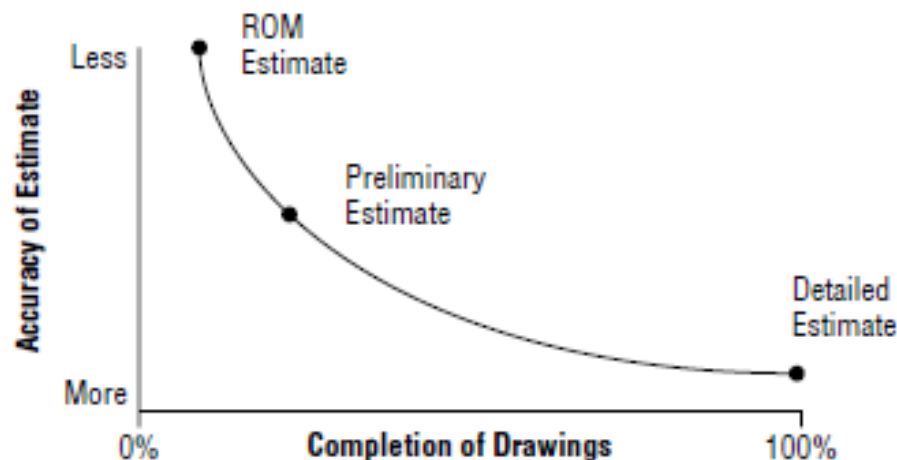
Estimating project cost

NOTE

When a job goes bust for the contractor with significant cost overruns, there is often an internal argument regarding who is to blame. The project manager may point to a bad estimate as the source of the failure. But the estimator may turn around and accuse the on-site team of poor management resulting in the overruns. This finger-pointing is usually a futile effort; the time would be better spent looking at specific areas of overrun and analyzing them, line item by line item, to see what mistakes should be avoided on the next project or estimate.

Types of estimates

- ☐ Conceptual estimates
- ☐ Preliminary estimates
- ☐ Detailed estimates



Estimate accuracies

<i>Type of estimate</i>	<i>Document development</i>	<i>Accuracy</i>
Budget or rough order of magnitude (ROM)	Schematics, design development, 30% construction documents	10–20%
Guaranteed maximum price for cost-plus projects	60%–90% construction documents	5%
Lump sum bid	100% plans and specifications	2%

Factors impacting project cost

- ☐ Project size
- ☐ Complexity
- ☐ Site location
- ☐ Time of construction
- ☐ Quality of work
- ☐ Market conditions management factors

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE



Types of costs – Direct costs

- ☐ Materials
- ☐ Labor
- ☐ Equipment
- ☐ Subcontractors

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

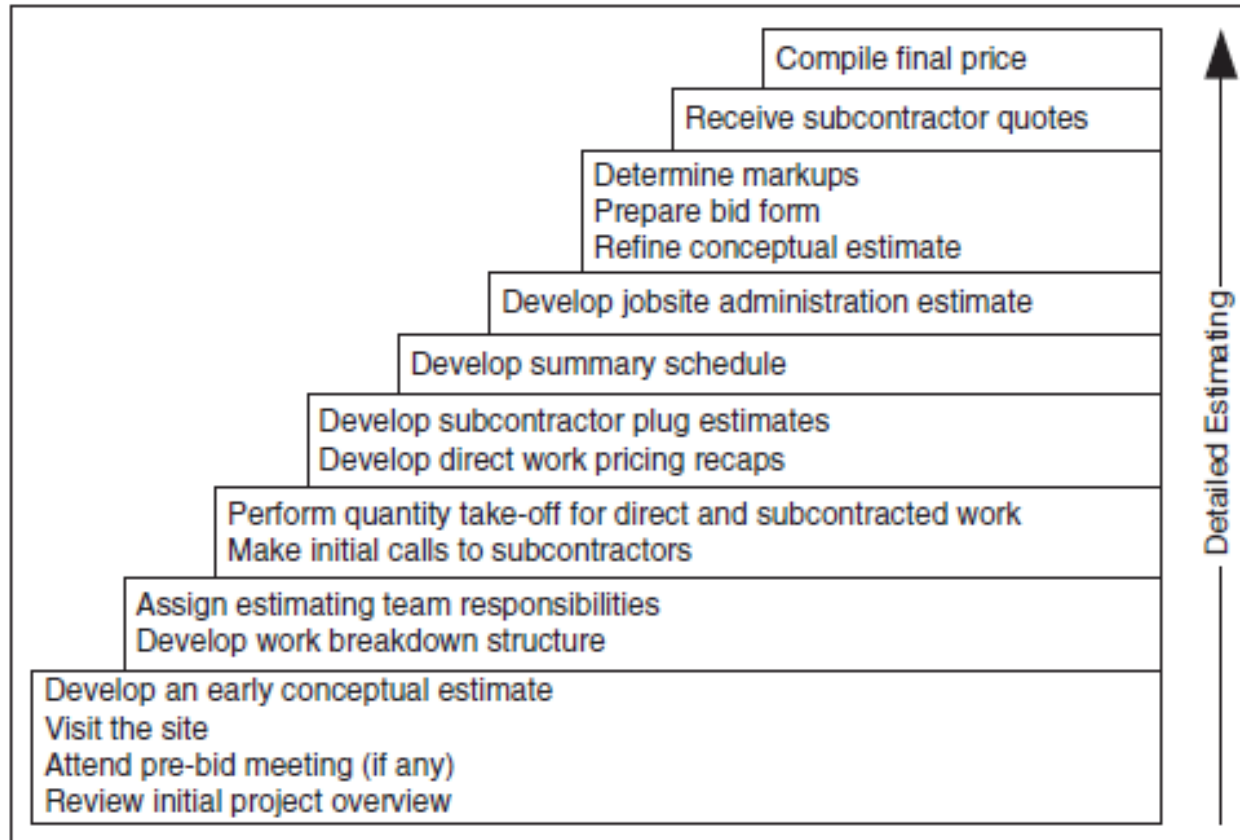


Types of costs – Indirect costs

- ☐ Supervision
- ☐ Job trailer expense
- ☐ Temporary utilities
- ☐ Testing and inspections
- ☐ Job photographs
- ☐ Safety suppliers
- ☐ Cleanup
- ☐ Bonds and insurance

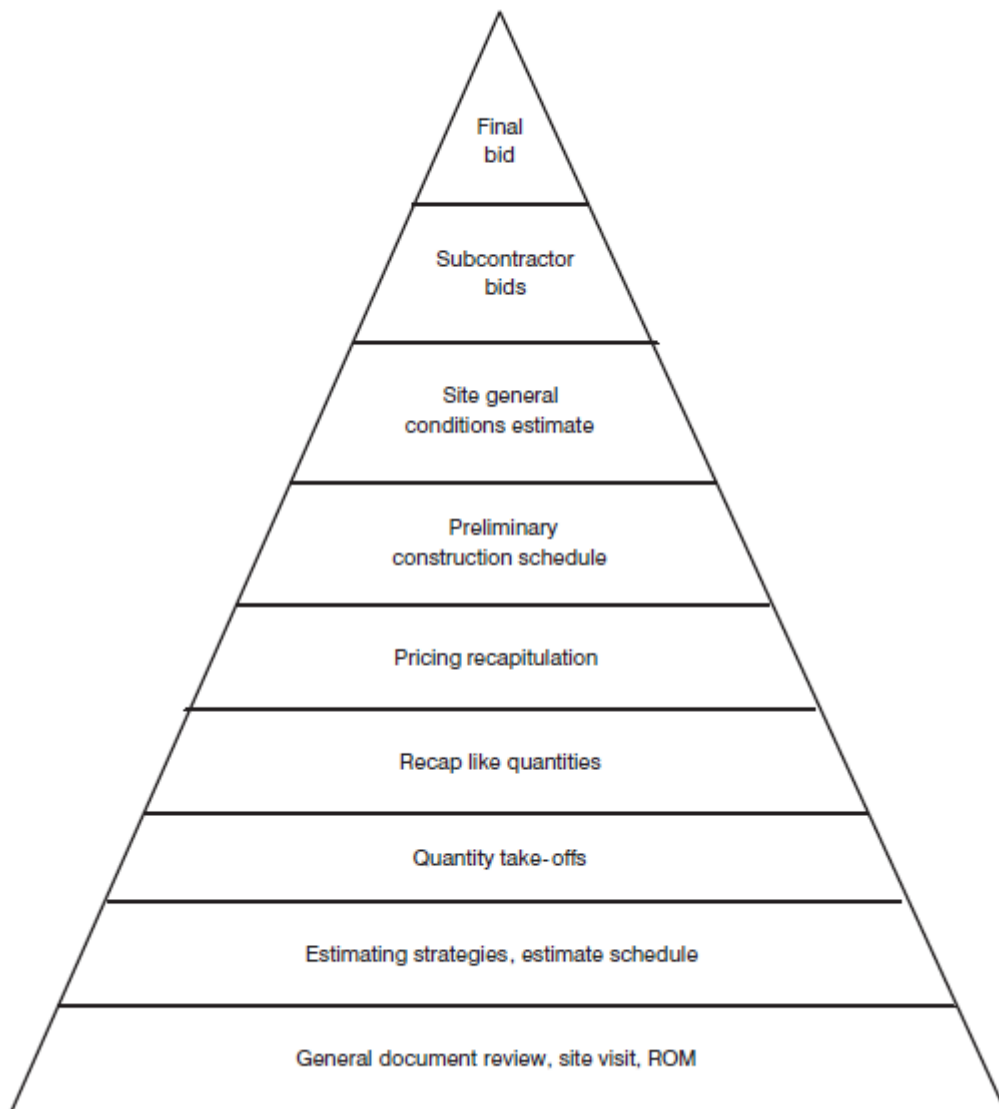
Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Estimating process



our
UTE

Estimating process



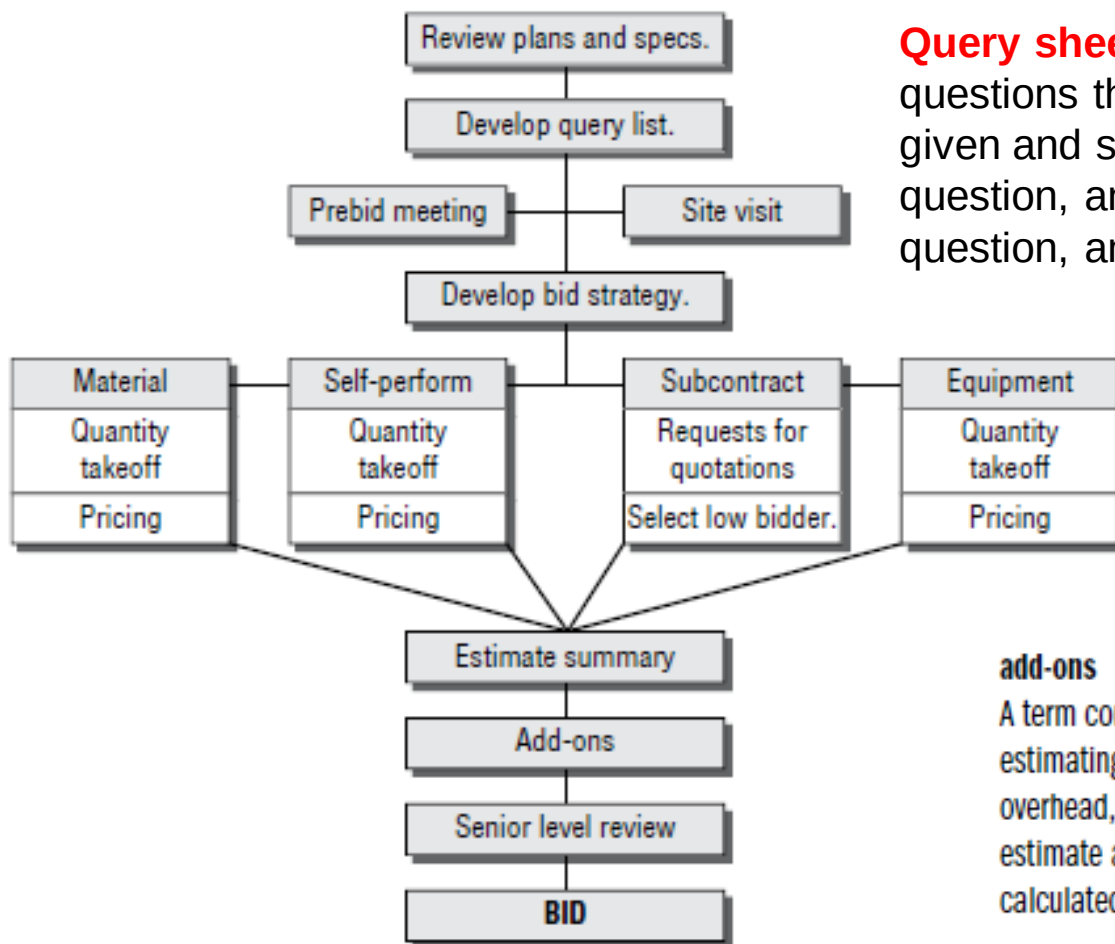
ذکر مطالب فوق تنها در صورت ذکر منبع بلامانع است.

Estimating process

- ☐ How many (quantities)
- ☐ How much (pricing)
- ☐ How long (productivity)

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

General document review, site visit, ROM



Query sheets provide a formal record of questions that have been asked and answers given and should also record who asked each question, and when, and who answered each question, and when.

add-ons

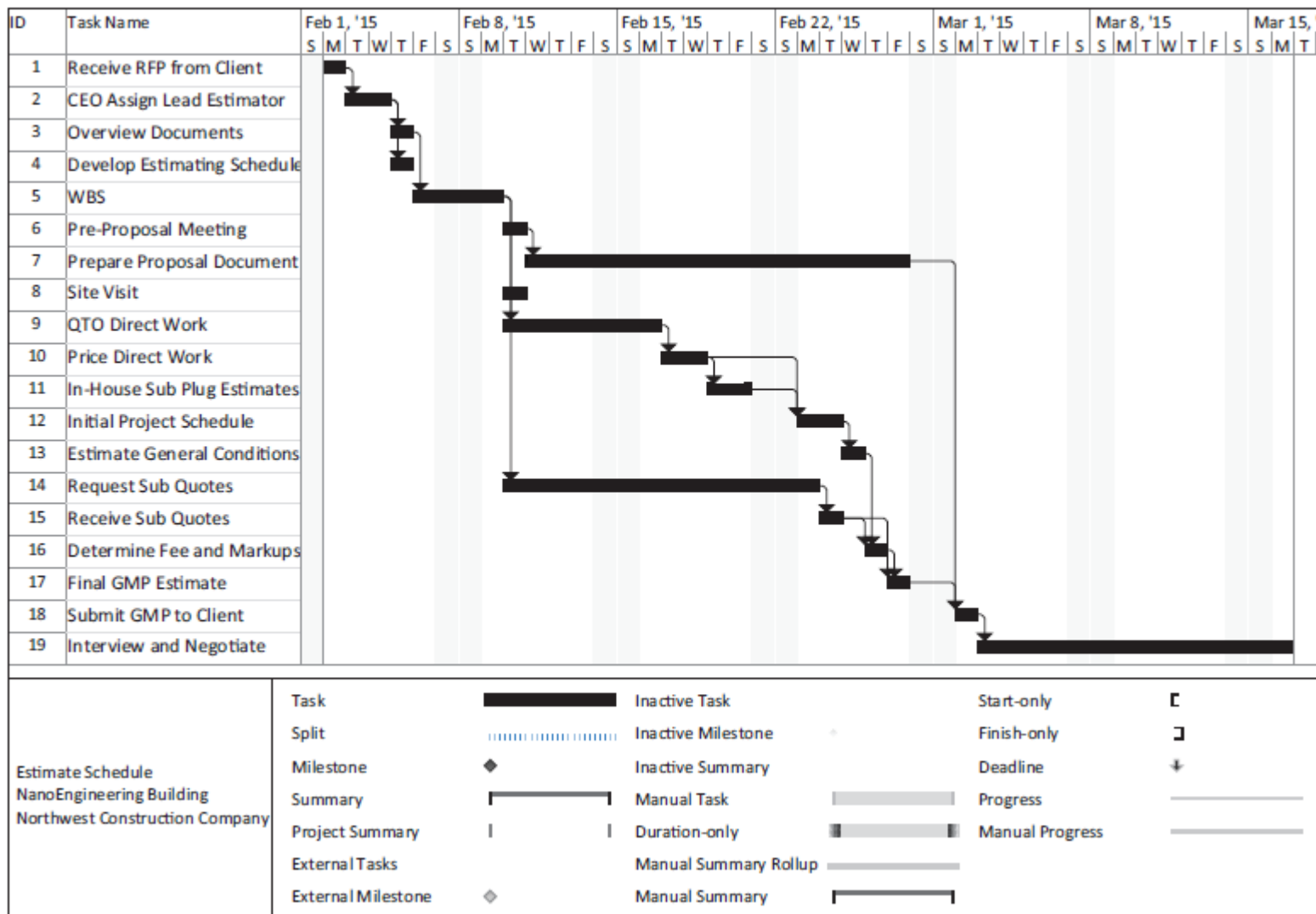
A term commonly used in construction estimating to describe the taxes, overhead, and profit added to the estimate after all other costs have been calculated.

Estimating strategies, estimate schedule: Estimating strategies

<i>Types of cost</i>	<i>Budget estimate</i>	<i>Semi-detailed or GMP estimate</i>	<i>Detailed or lump sum estimate</i>
Direct Work:			
Labor and material:	Assembly pricing	Detailed QTO Competitive UPs	Detailed QTO Competitive UPs
Equipment rental:	with assemblies	with assemblies	Competitive pricing
Subcontractors:	In-house plugs	OM plugs or 1-3 quotes	Competitive sub quotes
General conditions:	Percentage add-on	Detailed estimate	Detailed estimate

Estimating strategies, estimate schedule: Estimate schedule

NanoEngineering Building Estimate Schedule



Estimating strategies, estimate schedule: Work breakdown structure

work breakdown structure (WBS)

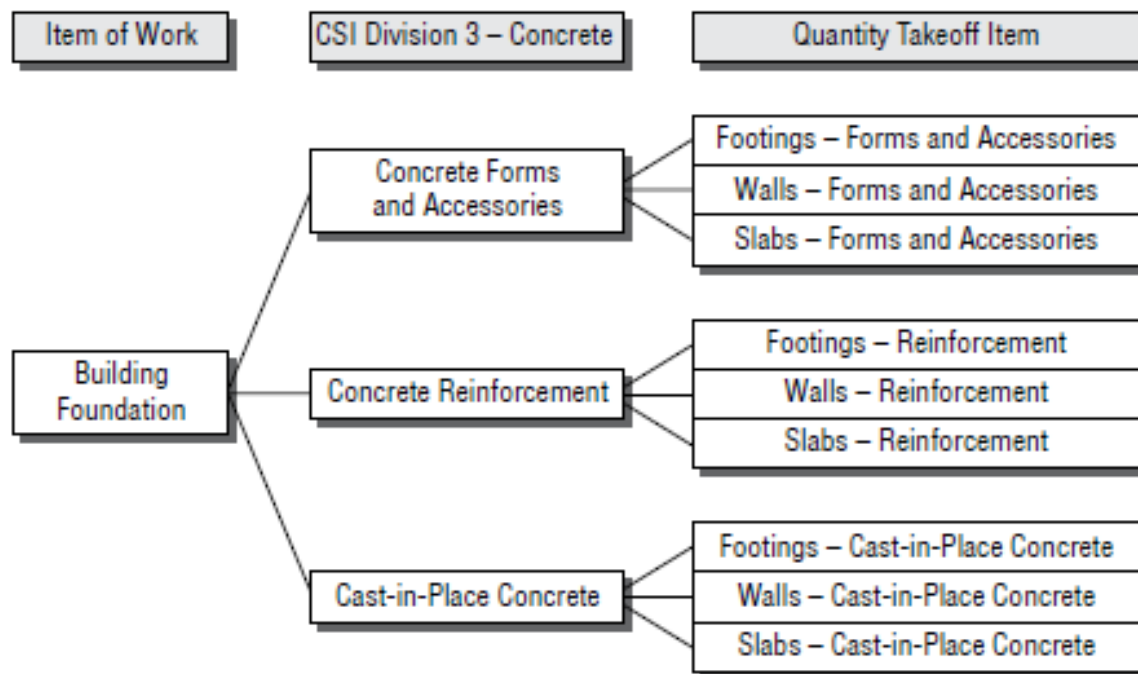
A tool used by estimators to organize the work of a contract in a hierarchical fashion.

work package

Detailed items of work bundled together under a particular trade. This is also called a bid package.

- ❖ The **work breakdown structure (WBS)** for the project is an **early compilation** of the significant work items that will have associated cost or schedule considerations.
- ❖ **Before any detailed estimating** is performed, the estimator should have a **general idea of the work** that will be included on the **WBS**.
- ❖ The first step is to perform a document overview.
- ❖ The goal is to slowly leaf through the drawings and specifications and develop a **good understanding** of the type of project and the systems that are included.
- ❖ The **estimator** should not start quantifying or pricing any work items **until this overview is complete**.

Estimating strategies, estimate schedule: Work breakdown structure



You build an estimate in **very much the same order that you build the actual facility**. Generally, you start from the ground up and work through the 50 divisions of the CSI MasterFormat outline.

Each CSI division is broken down into detailed items of work. This format is one of the most common ways to organize the estimate. However you decide to organize the estimate, it is very important to **stick with a consistent format**, even if some divisions are not applicable to every project. In this way, the estimate outline acts as a **master checklist** that should be consulted for every project to make sure that nothing gets left out of the estimate.



Estimating strategies, estimate schedule: Work breakdown structure

Project: I-90 Overpass, Project #1732 Date: 3/25/2018
Estimator: Jim Bradley

			Provider			
			General Contractor		Subcontractor	
Line #	CSI Div	Cost Item Description	Materials	Labor	Materials	Labor
2	2	Sitework	X	X	X	X
3	3	Concrete:				
3.1	3	CIP Concrete:				
3.1.1	3	Pile Caps:				
3.1.1.1	3	Excavate	X	X	X	X
3.1.1.2	3	Formwork	X	X		
3.1.1.3	3	Rebar	X	X		
3.1.1.4	3	Anchor Bolts	X	X		
3.1.1.5	3	Purchase Concrete	X			
3.1.1.6	3	Pump Concrete			X	X
3.1.1.7	3	Place Concrete		X		
3.1.2	3	SOG	X	X	X	X
3.1.3	3	Columns	X	X		
3.1.4	3	Elevated Decks	X			X
3.1.5	3	Gypcrete			X	X
3.2	3	Pre-cast Concrete		X	X	
4	4	Masonry			X	X
5	5	Structural Steel:				
5.1	5	Rolled Shapes:				
5.1.1	5	Fabricate	X			
5.1.2	5	Install				X
5.2	5	Metal Deck	X			X

Estimating strategies, estimate schedule: Work breakdown structure

WORK BREAKDOWN STRUCTURE

NanoEngineering Building

CSI Division	Description
01	Jobsite General Conditions
02	Demolition
03	Concrete:
	Purchase Reinforcement Steel
	Foundations
	CIP Walls and Slabs
	Post-Tension Elevated Slabs
04	Masonry: CMU and Stone Veneer
05	Structural and Miscellaneous Steel
06	Wood and Plastic:
	Rough Carpentry
	Finish Carpentry
07	Thermal and Moisture Protection:
	Waterproofing
	Insulation
	Roof and Accessories
	Gutters and Downspouts
08	Doors, Windows, and Glass:
	Door Frames and Leafs
	Windows and Storefront
	Door Hardware
09	Finishes:
	Drywall
	Painting
	Acoustical Ceilings
	Floor Covering: Carpet
	Floor Covering: Ceramic, Vinyl, Base
10	Specialties
11, 12, 13	Equipment, Furnishings, Special Conditions
14	Conveying Systems, Elevators
	Mechanical:
21	Fire Protection
22	Plumbing
23	HVAC and Controls
	Electrical Systems:
26	Line Voltage: Power and Lights
27, 28	Low Voltage: Communications, Safety
31	Earthwork: Mass Excavation, Backfill, and Shoring
32	Exterior Improvements:
	Paving
	Walks and Miscellaneous Site work
	Landscaping
33	Utilities: Water, Sanitary Sewer, Storm

Quantity takeoffs



Real World Scenario

A Simple Estimate: How Many Gallons of Paint?

You have decided to repaint your living room. You want to go buy the paint, but you must first figure out how much you need. What types of information will be required to make this determination? Based on that information, how many gallons will you need, and how much will it cost?

Basic Information

A gallon of paint covers 350 square feet. Each gallon of paint costs \$27. The room is 16' × 14' with an 8' ceiling, one door (3' × 7'), and three windows (each 3' × 4').

Specification

Paint all walls and ceiling with two coats of paint, one color only. Do not paint door, windows, or trim.

Process

Ceiling area = $16' \times 14' = 224$ square feet

Wall area = $[16' + 14' + 16' + 14'] \times 8' = 480$ square feet

Deduct openings: Door = $3' \times 7' = 21$ square feet and $[3] \times 3' \times 4' = 36$ square feet

Total square feet: $224 + 480 - [21 + 36] = 647$ square feet

Total gallons of paint:

$647 \text{ square feet} \times 2 \text{ coats of paint} = 1,294 \text{ square feet}$

$1,294 \text{ square feet} \div 350 \text{ square feet per gallon} = 3.70 \text{ gallons}$

You must purchase 4 gallons $\times \$27 = \108 plus tax.

Note: Labor, preparation materials, and equipment are not included (ladders, brushes, rollers, masking tape, drop cloths, cleanup).

Quantity takeoffs

Heavy civil QTO example

You are a project engineer for the Gateway Construction company, which is bidding on the Montana I-90 overpass project in three weeks. You have been assigned the task of estimating the volume of concrete, square feet of formwork, and number of anchor bolts needed for the F10 pile caps. You note from the foundation plan and pile cap schedule that there are 15 F10 pile caps, each of them measuring 10-foot square by 2.5-foot deep with eight embedded 1-inch diameter by 12-inch long anchor bolts (ABs), which will later receive 6-inch square hollow structural section (HSS) columns. You will note all of this on the QTO sheet, similarly to the following list:

- 15 EA @ $10' \times 10' \times 2.5'$ deep = 3750 CF (rounded)
- 3750 CF + 5% waste = 3956 CF, /27 CF/CY = 147 CY of concrete
- 15 EA @ 8 ABs/EA = 120 EA 1" $\times$ 12" ABs
- 15 EA @ 4 sides of 10' long by 2.5' deep = 1,500 SFCA of formwork

After successfully showing this QTO to your project manager, you may be asked to perform the same process for the other types of pile caps and perhaps the concrete grade beams as well. The quantities are extended, totaled, and underlined, ready to be transferred to the pricing recap sheets.

Recap like quantities

Gateway Construction Company Quantity Takeoff Sheet								
Project: I90 Overpass				Date: 3/25/2018				
Owner/Loc: State of Montana, Missoula, MT				Estimator: Jim Bradley				
Div #: 03, Pile Caps, Bid Item 172				Est #: 1				
Ref	Description	Qty (ea)	L (ft)	W (ft)	H (ft)			
15 each: 2.5'd x 10' SQ with #6 @ 6" OC rebar EW T&B and 8 EA 1" round x 12" long ABs/pile cap:								
Structural Excavation: Top of pile cap 2 feet below existing rough grade								
Pile Cap Size:		15	10	10	2.5			
Hole Size:		15	12	12	4.5	9720	CF	
		Plus 40% swell @ 27CF/CY=				504	Say 500 TCY	
						SF	CF	
						Formwork:	Concrete	Finegrade:
Concrete:		15	10	10	2.5	1500	3750	1500 SF
								@ 9SF/SY=
								167 SY
Concrete purchase:		@ 1.055% waste @ 27CF/CY =				147 CY		
Rebar:		4 matts @ 21 bars per matt @ 10' long per bar =				840 LF/PC		
		@ 15 pilecaps =				12600 #		
		#6 @ 1.502#/LF @ 2000 #/T =				9.5 tons		
		Note: no lap or waste figured with spot footings or pile caps						
Anchor Bolts:		8 per PC =		120 EA				

Alavipour
IBUTE

Pricing recapitulation

Labor wage rates

<i>Craft</i>	<i>Union wage rate</i>	<i>Prevailing wage rate*</i>
Carpenter	\$38/hour	\$54/hour
Cement finisher	\$35/hour	\$54/hour
Drywall taper	\$38/hour	\$54/hour
Electrician	\$46/hour	\$65/hour
Floor covering/tile mason	\$28/hour	\$32/hour
Glazier	\$40/hour	\$56/hour
Ironworker	\$40/hour	\$64/hour
Laborer	\$32/hour	\$44/hour
Operating engineer	\$40/hour	\$56/hour
Painter	\$29/hour	\$39/hour
Plumber	\$46/hour	\$46/hour
Sheet metal worker	\$47/hour	\$73/hour
Teamster	\$32/hour	\$51/hour

* Prevailing wage rates include labor taxes as dictated by jurisdiction. Additional labor benefits, such as training and retirement, may also be added depending upon location and union preferences.



Pricing recapitulation

NORTHWEST CONSTRUCTION COMPANY

1242 First Avenue, Cascade, Washington 98202

(206) 239-1422

Middle School Bid
Lump Sum Estimate

Owner: Washington School District
Architect: ABC Partners

Estimator: Ted Jones
Date: 07/15/15

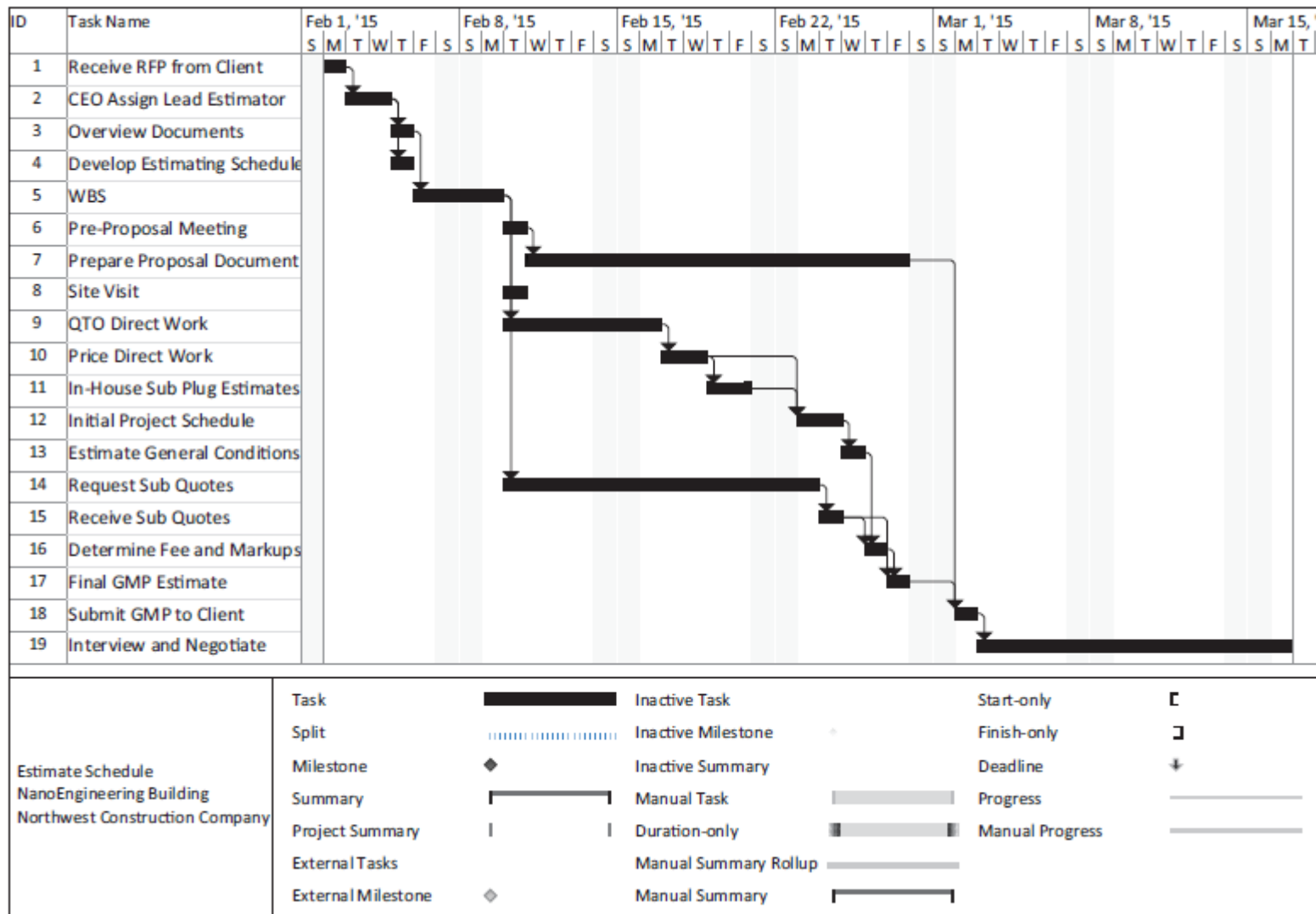
EST #1
SHEET: 1

Description	Quantity	Unit	Labor				Material	
			UMH	MH	Rate	Cost	UP	Cost
SYSTEM: CONCRETE FOUNDATIONS PRICING RECAP								
Layout: 3 man crew	1	DAY	24.00	24	38.00	912	100.00	100
Excavate and export foundations	185	TCY	0.10	19	32.00	592	15.00	2,775
Import and place backfill	96	TCY	0.10	10	32.00	307	22.00	2,112
Perforated drain system: Pipe	250	LF	0.05	13	32.00	400	2.50	625
Gravel	17	TCY	0.10	2	32.00	54	25.00	425
Fabric	700	SF	0.02	14	32.00	448	0.50	350
Fine grade under foundations	985	SF	0.05	49	32.00	1,576	0.25	246
Form continuous footings	772	LF	0.08	62	38.00	2,347	0.80	618
Form spot footings	280	SF	0.10	28	38.00	1,064	1.00	280
Form pilasters	180	SF	0.20	36	38.00	1,368	1.20	216
Form elevator pit	130	SF	0.20	26	38.00	988	1.20	156
Rebar: See separate recap	0		0.00	0	40.00	0	0.00	0
Pour continuous footings	21	CY	0.80	17	32.00	538	10.00	210
Pour spot footings	11	CY	1.00	11	32.00	352	10.00	110
Pour pilasters	6	CY	2.00	12	32.00	384	10.00	60
Pour elevator pit	2	CY	2.00	4	32.00	128	11.00	22
Buy concrete	120	CY	0.00	0	0.00	0	115.00	13,800
Pump concrete	120	CY	0.00	0	0.00	0	15.25	1,830
Concrete equipment	120	CY	0.00	0	0.00	0	50.00	6,000
Concrete accessories	120	CY	0.00	0	0.00	0	15.00	1,800
Tube/steel column embeds	14	EA	1.00	14	38.00	532	25.00	350
SUBTOTAL:				339 Hours		\$11,990		\$32,085
LABOR TAX:		@50% of labor						\$5,995
LABOR:								\$11,990
TOTAL SYSTEM:								\$50,070
SYSTEM COST \$/CY:		\$50,070/120 CY = \$417/CY				Checks		
AVERAGE WAGE RATE:		\$11,990/339 HR = \$35.36 per hour				Checks		
(System cost of \$417/CY is high but many non-foundation items are included here and quantities are small, therefore acceptable)								

ذکر مطالب فوق تنها در صورت ذکر منبع بلامانع است.

Preliminary construction schedule

NanoEngineering Building Estimate Schedule



General conditions estimate

NanoEngineering Building		Owner: UW		Estimator: Ted Jones #1		Estimate	
GMP Estimate		Architect: ZGF		Date: 03/18/15		Sheet: 1 of 1	
			Labor		Material		
Description	Quantity	Unit	Rate	Cost	UP	Cost	
SYSTEM: JOBSITE GENERAL CONDITIONS							
Project Manager	99	wks	2,100	207,900	0		0
Superintendent	95	wks	2,400	228,000	0		0
Assistant Superintendent	31	wks	2,000	62,000	0		0
Project Engineers: 2 @ 99 wks	197	wks	1,300	256,100	0		0
Commissioning	50	wks	1,300	65,000	0		0
Office Administrator	23	mos	5,000	115,000	0		0
Field Survey	16	wks	4,000	64,000	4,000		64,000
QC Inspector	22	mos	8,000	176,000	0		0
Off-Shift Security	10	mos	0	0	7,500		75,000
Police for Traffic Control	15	mos	0	0	15,000		225,000
In-house Flagger	99	wks	1,000	99,000	0		0
Safety Inspector	22	mos	8,000	176,000	2,500		55,000
Forklift Rental & OE	20	mos	12,000	240,000	7,000		140,000
Small Tools	3,023,350	DL\$	0	0	0.04		120,934
Tower Crane: Erect/Dismantle	2	LS	0	0	50,000		100,000
Tower Crane: Rent	13	mos	0	0	20,000		260,000
Tower Crane: Operator	13	mos	1,000	130,000	0		0
Rubbish Removal	22	mos	0	0	5,000		110,000
Periodic Cleanup	22	mos	8,000	176,000	0		0
Final Cleanup	1	quote	0	0	51,684		51,684
Glass Cleaning	1	LS	0	0	35,000		35,000
Preconstruction Services	1	LS	0	0	250,000		250,000
SUBTOTAL LABOR AND MATERIAL:				2,194,081		2,422,168	
LABOR:						2,194,081	
LABOR BURDEN:				38% Average		833,751	
TOTAL SYSTEM:						\$5,450,000	
Cost per month:				22		\$247,727	
Percentage of direct cost:				\$56,761,237		9.6%	
Percentage is high, but due to tower crane, security, traffic, safety, QC, etc. therefore acceptable.							

ذکر مطالب فوق تنها در صورت ذکر منبع بلامانع است



General conditions estimate

Gateway Construction
Jobsite General Conditions Estimate
(Abbreviated)Project: I 90 Overpass, Project #1732Owner: State of MontanaEstimator: Jim BradleyEstimate # 1Date: 25-03-18

Description	QTY	Units	Labor		Material		Total Cost
			Unit Price	Cost	Unit Price	Cost	
From Page 1, Administration Expenses:							
Project Manager	60	wks	2100	126000		0	126000
Project Superintendent	60	wks	2200	132000		0	132000
Project Engineer	60	wks	1250	75000		0	75000
Safety Engineer	12	wks	1200	14400	1400	16800	31200
Field Engineer	See Project Engineer			0		0	0
Form Detailing	1	LS		0	2500	2500	2500
Office Utilities	14	mos		0	500	7000	7000
From Page 2, Equipment:							
Pickup Truck	14	mos			800	11200	11200
Compressor	w/cost of the work					0	0
Welder	w/cost of the work					0	0
Forklift	14	mos	1125	15750	3275	45850	61600
Small Tools	3,301,005	Labor \$			1%	33010	33010
Consumables	14	mo			500	7000	7000
From Page 3, Temporary Construction:							
Job Office	14	un/mo			2000	28000	28000
Dry Shacks	14	un/mo			1800	25200	25200
Temporary Lighting	Separate stand alone bid item on SOV				0	0	0
Radios, 2 ea	28	un/mos			75	2100	2100
75kw Generator for Crew Shack	14	mos			2750	38500	38500
5kw Generator for tools, 5 each	70	un/mos			450	31500	31500
Fences	1950	LF/mo			7	13650	13650
From Page 4, General Operations:							
Street use Permit	14	mos			1225	17150	17150
Flaggers	Separate stand alone bid item on SOV				0	0	0
Periodic Cleanup	14	mos	1000	14000			14000

TOTALS FROM PAGE 1, ADMIN:

347900 41400 389300

TOTALS FROM PAGE 2, EQUIP:

15750 97700 113450

TOTALS FROM PAGE 3, TEMP:

0 142950 142950

TOTALS FROM PAGE 4, OPERNS:

19400 79463 98863

GRAND TOTAL JOBSITE GENERAL CONDITIONS:

\$383,050 \$361,513 \$744,563

LABOR BURDEN ON SALARIED LABOR:

\$75,564 \$75,564

ADDITIONAL BURDEN ON UNION LABOR:

\$91,933 \$91,933

TOTAL JOBSITE GENERAL CONDITIONS:

\$912,060

% OF TOTAL BID @

\$9,510,000

CHECKS? YES

9.6%

ذکر مطالب فوق تنها در صورت ذکر منبع بلامانع است

Pricing subcontracted work

❑ There are **four steps** to **ensure** that the solicitation of the subcontracted work and vendor pricing are complete and thorough:

1. Solicit the bids
2. Receive the bids
3. Analyze the bids
4. Choose the bids

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Pricing subcontracted work – Soliciting the bids

Subcontractor/Vendor List

Div	Item Of Work	Self-Perform	Sub	Vendor
03	Concrete forming	X		
	Concrete reinforcing	X		
	Concrete placing	X	X	
	Concrete finishing	X	X	
04	Masonry—CMU block		X	X
	Masonry—stone work		X	X
05	Metal railings	X		X
06	Rough carpentry	X		X
	Finish carpentry	X	X	X
07	Roofing		X	
	Waterproofing	X		
08	Doors and windows	X		X
	Skylights	X		X
09	Drywall		X	
	Painting		X	
	Tile		X	
	Carpet		X	
10	Specialties		X	
14	Elevator		X	
23	Mechanical		X	
26	Electrical		X	
31	Earthwork		X	

Dr. Alavipour
DISTRIBUTOR

Pricing subcontracted work – Receiving the bids

Telephone Bid

Project: A.J. Coffee House

Date: July 18, 2020

Company: Wayne's House of Tile

Address: 432 Rocky Blvd., Rimrock, AZ 97660

Phone: 734-555-1212

Fax: 734-555-1212

Division of Work: FINISHES

Work Included: TILE

Scope:

Work includes all surface preparation, layout, mastic, tile, grout, and clean-up for kitchen area, storage area, customer area, and restrooms.

Exclusions:

Outside tile work

Quoted per plans and specs: YES

Acknowledged Addendum: No. 1 and No. 2

Includes Sales Tax: YES

Bond: YES

Calculating the Estimate

Description of Work	Quantity	Mat. Unit Price	Total Mat.	Labor Unit Price	Total Labor	Equip. Unit Price	Total Equip.	Total Cost
Form slab	390 LF	\$0.31	\$121	\$1.25	\$488	\$0.05	\$20	\$625
Reinforce slab	9,500 SF	\$0.18	\$1,710	\$0.16	\$1,525	—	—	\$3,235
Place concrete	120 CY	\$63.00	\$7,560	\$11.15	\$1,338	\$5.35	\$642	\$9,540
Finish slab	9,500 SF	—	—	\$0.31	\$2,945	\$0.06	\$570	\$3,515
TOTAL SLAB CONCRETE			\$9,391		\$6,292		\$1,232	\$16,915

Final bid – Putting all together

Estimate Summary for Office Building

	Division of Work	Total Material	Total Labor	Total Equipment	Subcontracts	TOTAL
1	General requirements	\$112,400	\$64,100	\$1,040	0	\$177,540
2	Site conditions	0	0	0	\$7,800	\$7,800
3	Concrete	\$83,900	\$54,340	\$4,110	0	\$142,350
4	Masonry	0	0	0	\$46,300	\$46,300
5	Metals	\$5,100	\$1,800	0	0	\$6,900
6	Wood, plastics, and composites	\$243,500	\$191,250	0	0	\$434,750
7	Thermal and moisture protection	0	0	0	\$86,000	\$86,000
8	Openings	\$43,970	\$15,120	0	\$1,775	\$60,865
9	Finishes	0	0	0	\$102,200	\$102,200
10	Specialties	\$7,950	\$2,790	0	0	\$10,740
11	Equipment	\$5,400	\$1,300	0	\$3,600	\$10,300
12	Furnishings	0	0	0	0	0
13	Special construction	\$1,345	\$890	\$950	0	\$3,185
14	Conveying systems	0	0	0	\$60,000	\$60,000
21	Fire suppression	0	0	0	\$50,000	\$50,000
22	Plumbing	0	0	0	\$114,000	\$114,000
23	HVAC	0	0	0	\$97,600	\$97,600
25	Integrated automation	0	0	0	\$19,400	\$19,400
26	Electrical	0	0	0	\$160,000	\$160,000
27	Communications	\$9,400	\$2,790	\$10,000	\$30,000	\$52,190
28	Electronic safety and security	0	0	0	\$14,900	\$14,900
31	Earthwork	\$4,600	\$3,500	\$2,300	\$116,800	\$127,200
32	Exterior improvements	\$9,780	\$4,900	\$3,500	\$29,400	\$47,580
33	Utilities	0	0	0	\$37,750	\$37,750

continues

Final bid – Putting all together

Estimate Summary for Office Building (continued)

Division of Work	Total Material	Total Labor	Total Equipment	Subcontracts	TOTAL
TOTALS	\$527,345	\$342,780	\$21,900	\$977,525	\$1,869,550
Sales tax (7.5%)	\$39,551	0	0	0	\$39,551
Payroll tax (31%)	0	\$106,262	0	0	\$106,262
SUBTOTAL	\$566,896	\$449,042	\$21,900	\$977,525	\$2,015,363
Overhead (6.5%)	—	—	—	—	\$130,998
SUBTOTAL	—	—	—	—	\$2,146,361
Profit (3.5%)	—	—	—	—	\$75,123
TOTAL ESTIMATE	—	—	—	—	\$2,221,485



Final bid – Estimate summary

SUMMARY ESTIMATE FOR NANOENGINEERING BUILDING

3/25/2015

Line Item	Description	Estimated Cost
1	Jobsite General Conditions	\$5,450,000
2	Demolition	\$850,000
3	Concrete	\$8,055,000
4	Masonry	\$1,525,100
5	Structural & Miscellaneous Metals	\$803,030
6	Wood & Plastic	\$937,500
7	Thermal & Moisture Protection	\$3,080,900
8	Doors, Windows, Glass	\$2,673,000
9	Finishes:	
9.1	Drywall	\$1,778,800
9.2	Painting	\$590,000
9.3	Acoustical Ceilings	\$722,000
9.4	Floor Coverings: Carpet, Ceramic, Vinyl	\$1,604,550
10	Specialties	\$388,290
11-13	Equipment, Furnishings, Special Construction	\$2,740,350
14	Elevator	\$842,000
21-23	Mechanical Systems:	
21	Fire Protection	\$772,000
22	Plumbing	\$2,750,000
23.1	HVAC	\$10,500,923
23.2	Controls	\$1,300,000
26	Line Voltage Electrical	\$5,000,000
27	Low Voltage Electrical	\$1,148,000
31	Earthwork: Excavation, Backfill, Shoring	\$3,139,664
32	Exterior Improvements	
32.1	Paving	\$255,050
32.2	Walks & Miscellaneous Sitework	\$500,000
32.3	Landscaping	\$255,000
33	Site Utilities	\$295,000
	Subtotal Direct and Indirect Costs:	\$57,761,237
	Estimating & Escalation Contingency @ 1%:	\$577,612
	Liability Insurance @ 0.75%:	\$437,541
	State Excise Tax @ 0.8%:	\$470,211
	CM Fee @ 3%:	\$1,777,398
	Total Contract, Excluding State Sales Tax:	\$61,024,000

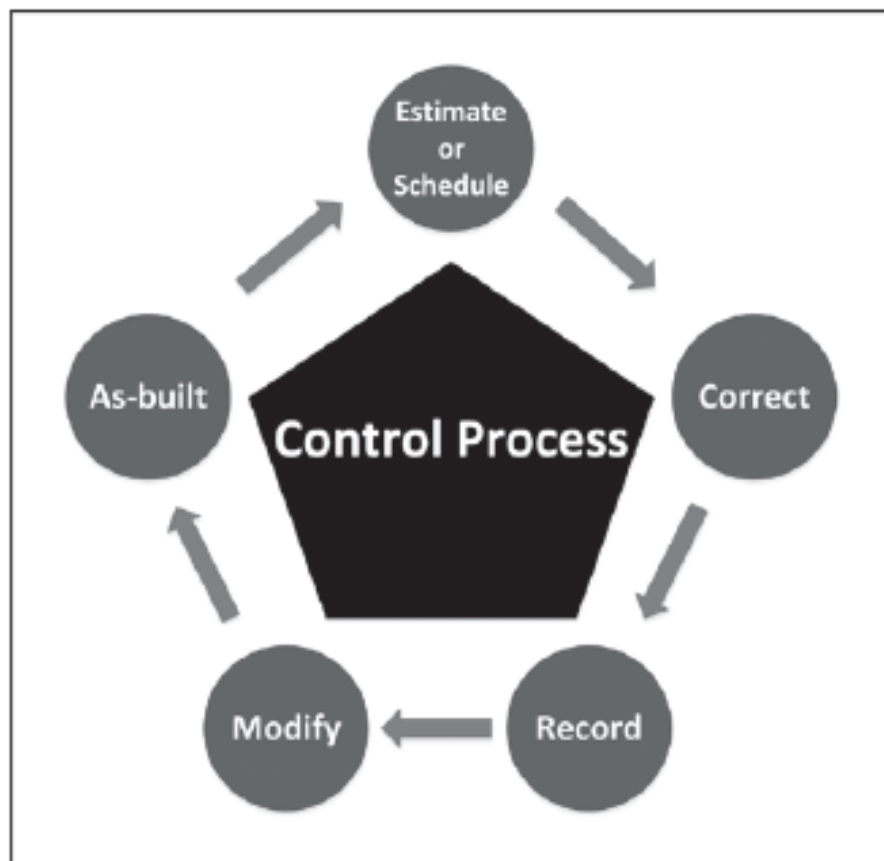
COST MANAGEMENT

(Control)

Cost control as a management tool

- ☐ The **early detection** of actual or potential cost overruns in field construction activities is **vital to management**.
- ☐ It provides the opportunity to **initiate remedial** action and increases the **chance of eliminating** such overruns or minimizing their impact.
- ☐ Because cost overruns increase project costs and diminish profits, it is **easy to see why** both project management and upper-level management **must be sensitive** to the costs of all project activities.

Cost control process



Alavipour
TRIBUTE

Cost control as a management tool

Aggregate cost analysis

	Quantity	Estimated unit price	Estimated cost	Actual unit price	Actual cost	Variance
SOG	4,000 SF	\$4/SF	\$16,000	\$6/SF	\$24,000	+\$8,000

Detailed cost analysis

	Quantity	Estimated unit price	Estimated cost	Actual unit price	Actual cost	Variance
Formwork:	440 LF	\$4.10/LF	\$1,800	\$4.30/LF	\$1,900	+\$100
Reinf. Steel:	2 ton	\$1,500/ton	\$3,000	\$3,000/ton	\$6,000	+\$3,000
Concrete:	50 CY	\$120/CY	\$6,000	\$140/CY	\$7,000	+\$1,000
Placement:	50 CY	\$24/CY	\$1,200	\$22/CY	\$1,100	-\$100
Finish:	4,000 SF	\$1.00/SF	\$4,000	\$2/SF	\$8,000	+\$4,000
Total system:		\$4.00/SF	\$16,000	\$8/SF	\$24,000	+\$8,000



Labor cost data collection

Dewey, Cheatum, and Howe
Company

Report No. 16 Date 12 September XX

Sam Duck Job No. 101
Foreman's signature Location Peachtree Corners Shopping Mall

Employee or badge number	Name	Code	Craft or union	Rate	Description of work performed and cost account number					Total hours		
					80,103	80,104	80,260.01	80,260.02	ST	PT		
65	Adam Apple	ST	15	16.50	4	4					8	0
		PT										
14	Ella Del Fabbro	ST	10	12.50			8				8	0
		PT										
22	Charles Hoarse	ST	10	12.50			6	2			8	0
		PT										
		ST										
		PT										
		ST										
		PT										
		ST										
		PT										
		ST										
		PT										
		ST										
		PT										
Totals					4	4	14	2			24	0

Approved by Ward

Fixed overhead

This procedure is illustrated in the following example (Adrian and Adrian, 2006).

Step 1: Estimate of Annual Overhead (G & A Expense)

Last year's G & A	\$270,000
10% inflation	27,000
Firm growth	23,000
Estimated G & A	<u>\$320,000</u>

Step 2: Estimate of \$ of Cost Basis for Allocation

Estimated volume	\$4,000,000
Gross margin	20% = \$800,000
Labor and material	\$3,200,000

Step 3: Calculate Overhead Percentage

Overhead costs estimated (G & A) / Labor and material estimate
= $320,000 / 3,200,000 = 10\%$

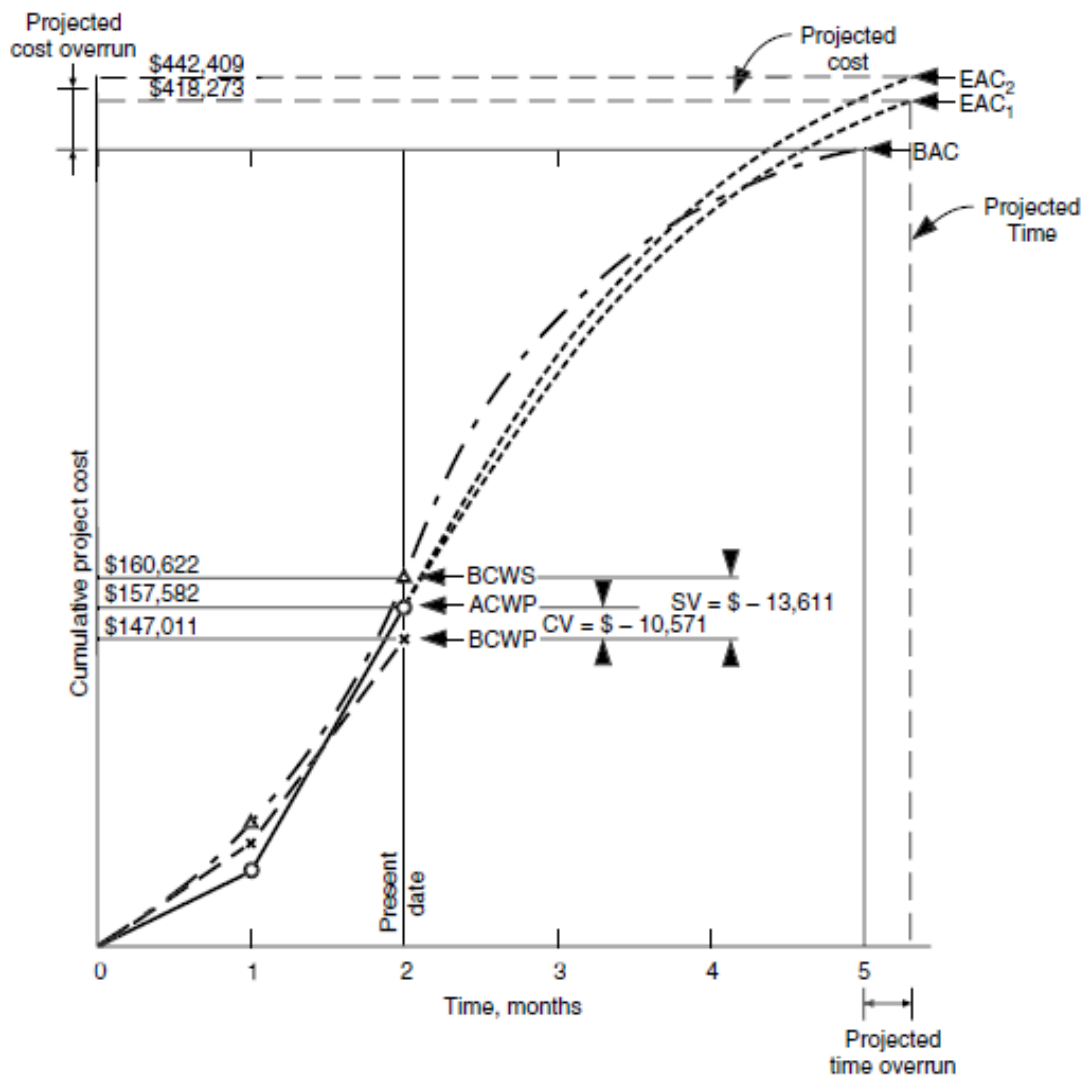
Step 4: Cost to Apply to a Specific Project

Estimated labor and material costs	\$500,000
Overhead to apply (@ 10 percent)	<u>50,000</u>
	\$550,000

Earned value management system (EVMs)

- ❑ The Earned Value Management System (EVMS), sometimes referred to as Cost/Schedule Control Systems Criteria, is an **extension of the time-cost envelope** principle.
- ❑ **Originally** developed by industrial engineers to gauge plant output performance, EVMS compares the physical work accomplished to date with both the actual cost expenditure and the planned work to be accomplished.
- ❑ This **three-dimensional comparison** determines the earned value on a project and forms the basis for a **more accurate projection** of final project cost than can be calculated simply by **contrasting actual costs** with planned funds.

Earned value management system (EVMs)



FINANCIAL MANAGEMENT

Introduction

- ❑ One **additional major feature** of the construction management system remains to be treated: **financial control**.
- ❑ The **construction manager** bears the overall responsibility for **financial management** of the work.
- ❑ This includes carrying out such **fiscal duties** as may be imposed by the construction contract and implementing appropriate monetary procedures according to the dictates of good business practice.

Financial control

❑ **Construction contracts** normally require that contractors perform prescribed duties of a **financial nature**.

❖ For example, they are made responsible for **certain aspects** of the payment process.

✓ This can include

- ✓ project cost breakdowns,
- ✓ forecasted schedule of progress payments,
- ✓ preparation or approval of periodic pay estimates, and
- ✓ documentation required for final payment.

*One of the most important of these is **monitoring project cash requirements** during the **contract period**.*

Financial control

- ☐ **Another aspect** of financial control is that of **maintaining** a complete and detailed daily record of the project.
- ☐ Such a **job log** can be **invaluable** in the settlement of claims and disputes that may arise from the work.
- ☐ This job history includes names, dates, places, and documentation of everything that happens as well as everything that **fails to happen**.



Progress payments

- ❑ **Construction contracts** typically provide that the **owner** shall make **partial payments** of the contract amount to the prime contractor as the work progresses.
- ❑ Depending on the type of work and contract provisions, the **monthly pay requests** may be prepared by the contractor, the architect-engineer, or the owner.
- ❑ Typically, this compilation is done in practice by
 1. Determining the total value of work actually performed to date and
 2. Then subtracting the sum of the previous progress payments made by the owner.

Pay request for unit-price contracts

Payment Request					
Project Highway Bridge					
Periodic Payment No. 2 for Period <u>July 1–July 31</u>					
Item No.	Description	Quantity	Unit	Unit Price	Amount
1	Excavation, unclassified	1,667	cy	\$3.83	\$6,384.61
2	Excavation, structural	120	cy	\$50.72	\$6,086.40
3	Backfill, compacted	0	cy	\$17.77	\$0.00
4	Piling, steel	2,240	lf	\$66.46	\$148,870.40
5	Concrete, footings	120	cy	\$195.62	\$23,474.40
6	Concrete, abutments	140	cy	\$380.87	\$53,321.80
7	Concrete, deck slab, 10 in.	0	sy	\$153.03	\$0.00
8	Steel, reinforcing	57,150	lb	\$1.045	\$59,721.75
9	Steel, structural	0	lb	\$1.725	\$0.00
10	Bearing plates	0	lb	\$2.49	\$0.00
11	Guardrail	0	ft	\$93.59	\$0.00
12	Paint	0	ls	\$12,140.39	\$0.00
Construction performed to date					\$297,859.36
Materials stored onsite (schedule attached)					\$0.00
Total work performed and materials stored					\$297,859.36
Less 10% retention					\$29,785.94
Net work performed and materials stored					\$268,073.42
Less amount of previous payments					\$1,441.00
Balance due this payment					\$266,632.42

Highway bridge, monthly pay request



Pay request for lump-sum contracts

THE BLANK CONSTRUCTION COMPANY, INC. 1938 Cranbrook Lane Portland, Ohio					
Periodic Estimate for Partial Payment					
Project Municipal Airport Terminal Building			Location Portland, Ohio		
Periodic Estimate No. 4		For Period September 1, 20XX to September 30, 20XX			
Item No.	Item Description	Total Cost (1)	Completed to Date (2)	Cost to Complete (3)	Percent Complete (4)
1	Clearing and Grubbing	\$22,508	\$22,508	\$0	100
2	Excavation and Fill	\$67,559	\$57,425	\$10,134	85
3	Concrete and Forms				
	Footings	\$108,572	\$77,086	\$31,486	71
	Grade Beams	\$108,898	\$63,161	\$45,737	58
	Beams	\$65,960	\$6,596	\$59,364	10
	Columns	\$21,306	\$6,392	\$14,914	30
	Slabs	\$383,093	\$45,971	\$337,122	12
	Walls	\$59,566	\$21,444	\$38,122	36
	Stairs	\$43,380	\$0	\$43,380	0
	Sidewalks	\$35,662	\$0	\$35,662	0
4	Masonry	\$734,584	\$22,038	\$712,546	3
5	Carpentry	\$57,025	\$0	\$57,025	0
6	Millwork	\$129,284	\$0	\$129,284	0
7	Steel and Misc. Iron				
	Reinforcing Steel	\$129,218	\$67,193	\$62,025	52
	Mesh	\$28,382	\$4,257	\$24,125	15
	Joist	\$140,334	\$0	\$140,334	0
	Structural	\$269,908	\$45,884	\$224,024	17
8	Insulation	\$38,782	\$0	\$38,782	0
9	Caulk and Weatherstrip	\$8,667	\$0	\$8,667	0
10	Lath, Planter, and Stucco	\$296,270	\$0	\$296,270	0
11	Ceramic Tile	\$33,651	\$0	\$33,651	0
12	Roofing and Sheet Metal	\$312,079	\$12,483	\$299,596	4
13	Resilient Flooring	\$39,381	\$0	\$39,381	0
14	Acoustical Tile	\$48,771	\$0	\$48,771	0
15	Painting	\$145,071	\$0	\$145,071	0
16	Glass and Glazing	\$108,478	\$0	\$108,478	0
17	Terrazzo	\$138,859	\$0	\$138,859	0
18	Miscellaneous Metals	\$120,238	\$0	\$120,238	0
19	Finish Hardware	\$83,304	\$0	\$83,304	0
20	Plumbing, Heating, Air Cond.	\$939,150	\$84,524	\$854,627	9
21	Electrical	\$592,057	\$29,603	\$562,454	5
22	Clean Glass	\$4,873	\$0	\$4,873	0
23	Paving, Curb, and Gutter	\$123,381	\$0	\$123,381	0
		\$5,438,251	\$566,565	\$4,871,686	
24	Change Order No. 1	\$5,240	\$0	\$5,240	0
Total Contract Amount		\$5,443,491	\$566,565	\$4,876,926	10.4%
A	Cost of Work Performed to Date	\$566,565			
B	Materials Stored onsite (Schedule Attached)	\$102,207			
C	Total Work Performed and Materials Stored	\$668,772			
D	Less 10% Retainage	\$66,877			
E	Net Work Performed and Materials Stored	\$601,895			
F	Less Amount of Previous Payments	\$272,309			
G	Balance Due This Payment	\$329,586			

*Adapted from Richard H. Clough, Glenn A. Sears, and S. Keoki Sears, *Construction Contracting*, 7th ed.(Hoboken, NJ: John Wiley & Sons, 2005), p. 264.

*Adapted from Richard H. Clough, Glenn A. Sears, and S. Keoki Sears, *Construction Contracting*, 7th ed. (Hoboken, NJ: John Wiley & Sons, 2005), p. 264.

Schedule of payments by owner – Unit price contract

- ❑ A **common contract provision** requires the contractor to provide the owner, **before the start** of construction, with an **estimated schedule of monthly payments** that will become **due during the construction period**.
- ❑ The **owner needs** this information so that it can have **cash available** to make the necessary **periodic payments** to the contractor.
- ❑ Because the owner sometimes must sell bonds or other forms of securities to **obtain funds** with which to pay the contractor, it is important that the **anticipated payment schedule** be as accurate a forecast as possible.

Schedule of payments by owner – Unit price contract

Item No.	Bid Item	Estimated Quantity	Bid Unit Price	June 30		July 31		August 31		September 30	
				Estimated Quantity Complete	Total Value to Date	Estimated Quantity Complete	Total Value to Date	Estimated Quantity Complete	Total Value to Date	Estimated Quantity Complete	Total Value to Date
1	Excavation, unclassified	1,667	\$3.83	418	\$1,601	1,667	\$6,385	1,667	\$6,385	1,667	\$6,385
2	Excavation, structural	120	\$50.72			120	\$6,086	120	\$6,086	120	\$6,086
3	Backfill, compacted	340	\$17.77					340	\$6,042	340	\$6,042
4	Piling, steel	2,240	\$66.46			2,240	\$148,870	2,240	\$148,870	2,240	\$148,870
5	Concrete, footings	120	\$195.62			120	\$23,474	120	\$23,474	120	\$23,474
6	Concrete, abutments	280	\$380.87			140	\$53,322	280	\$106,644	280	\$106,644
7	Concrete, deck slab, 10 in.	200	\$153.03					200	\$30,606	200	\$30,606
8	Steel, reinforcing	90,000	\$1.045			57,150	\$59,722	90,000	\$94,050	90,000	\$94,050
9	Steel, structural	65,500	\$1.725					65,500	\$112,988	65,500	\$112,988
10	Bearing plates	3,200	\$2.49					3,200	\$7,968	3,200	\$7,968
11	Guardrail	120	\$93.59					40	\$3,744	120	\$11,231
12	Paint	job	\$12,140.39					20%	\$2,428	100%	\$12,140
Totals					\$1,601		\$297,859		\$549,284		\$566,484
						Monthly Progress Payment			Total Payment on Contract		
June 30				1,601 x 90% =		\$1,441			\$1,441		
July 31				\$297,859 x 90% - \$1,441 =		\$266,633			\$268,073		
August 31				\$549,284 x 90% - \$268,073 =		\$226,283			\$494,356		
September 30				\$566,484 x 90% - \$494,356 =		\$15,480			\$509,836		
Final Payment						\$56,648			\$566,484		

Schedule of payments by owner – Lump-sum contract

- ☐ The **payment schedule for a lump-sum** project often is computed using the traditional bar chart—one that is **not network based**.
- ☐ An **approximate cost** is established for **each bar on the chart**, and this cost is **distributed uniformly** over the length of the bar.
- ☐ From this, a **cumulative total project cost curve** is computed for the contract period.
- ☐ The **problem** with this procedure is the **inaccurate way the costs** of the project segments are distributed over the contract period.

Schedule of payments by owner – Lump-sum contract

- ❑ Although the **total cost of each major job** segment can be established with reasonable accuracy,

the **time rates** at which these **expenses are incurred** can involve such variation that the **payment schedule derived** therefrom may be **seriously in error**.

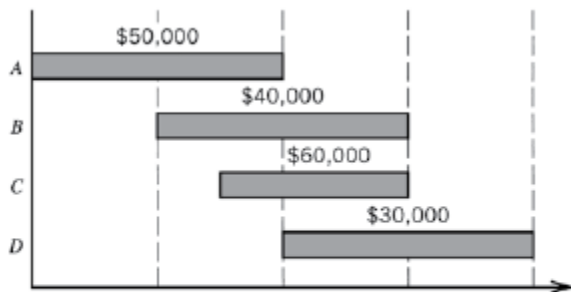
- ❑ The **total value of this work**, which is usually subcontracted, is **distributed uniformly** over its duration.

This is **seldom** a realistic time allocation of expense.

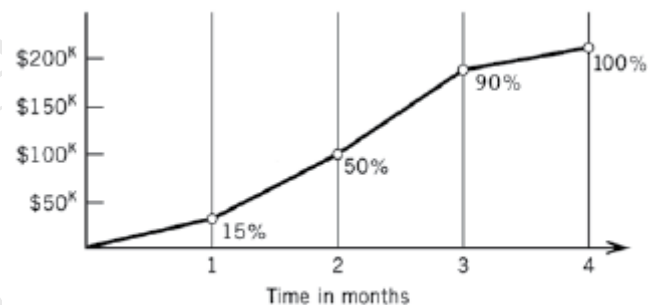
Schedule of payments by owner – Lump-sum contract

COST LOADED SCHEDULE											
8/15/2015											
			\$ X 1,000:								
Item	Description	Cost	2nd Qtr 2015	3rd Qtr 2015	4th Qtr 2015	1st Qtr 2016	2nd Qtr 2016	3rd Qtr 2016	4th Qtr 2016	1st Qtr 2017	Totals
2	Demolition	\$850,000	850								\$850,000
3	Concrete	\$8,055,00			4,200	3,855					\$8,055,00
4.1	CMU	\$450,100					450				\$450,100
4.2	Stone Veneer	\$1,075,000					400	675			\$1,075,000
5	Structural & Misc Metals	\$803,000				600	203				\$803,000
6.1	Rough Carpentry	\$457,500				458					\$457,500
6.2	Finish Carpentry	\$480,000						240	240		\$480,000
7.1	Insulation	\$835,000					170	500	165		\$835,000
7.2	Roof & Accessories	\$1,095,000					1,095				\$1,095,000
7.3	Waterproofing	\$575,000			150	425					\$575,000
7.4	Sheetmetal Siding & Flashing	\$575,980					576				\$575,980
8.1	Doors	\$752,000					127	375	250		\$752,000
8.2	Windows & Storefront	\$1,522,000					800	722			\$1,522,000
8.3	Door Hardware	\$399,000					69	200	130		\$399,000
9.1	Drywall	\$1,778,800					670	670	439		\$1,778,800
9.2	Painting	\$590,000						300	290		\$590,000
9.3	Acoustical Ceilings	\$722,000						250	472		\$722,000
9.4	Floor Covering: Carpet	\$954,000						400	554		\$954,000
9.5	Floor Covering: Ceramic, vinyl	\$750,550						300	451		\$750,550
10	Specialties	\$388,290						200	188		\$388,290
11	Equipment, Furnishings	\$2,740,350						1,500	1,240		\$2,740,350
14	Conveying Systems (Elevator)	\$842,000	200					500	142		\$842,000
21	Fire Protection	\$772,000				100	270	270	132		\$772,000
22	Plumbing	\$2,750,000			500	250	750	750	500		\$2,750,000
23	HVAC & Controls	\$11,800,923		500		1,200	3,500	3,500	3,101		\$11,800,923
26	Electrical Systems	\$5,000,000		500	500	500	1,500	1,300	700		\$5,000,000
27	Low-Voltage Electrical	\$1,148,000						500	648		\$1,148,000
31.1	Excavation & Backfill	\$1,999,000	500	1,400	99						\$1,999,000
31.2	Shoring	\$845,664	100	600	146						\$845,664
32.1	Paving	\$255,050						200	55		\$255,050
32.2	Walks & Misc. Sitework	\$500,000						500			\$500,000
32.3	Landscaping	\$255,000							255		\$255,000
33	Site Utilities	\$295,000	50					200	45		\$295,000
Subtotal Direct Costs:		\$52,311,237	\$1,700	\$3,000	\$5,595	\$7,388	\$10,580	\$14,052	\$9,997	\$0	\$52,311,237
Jobsite General Conditions		\$5,450,000	710	710	710	710	710	710	710	480	\$5,450,000
Fee % Markups		\$3,262,763	136	210	356	458	638	834	605	26	\$3,262,763
Qtr Total, Excluding Tax		\$61,024,000	2,546	3,920	6,661	8,555	11,928	15,596	11,312	506	\$61,024,000
Cumulative Totals:			2,546	6,466	13,127	21,682	33,610	49,206	60,518	61,024	\$61,024,000

Cash flow projection

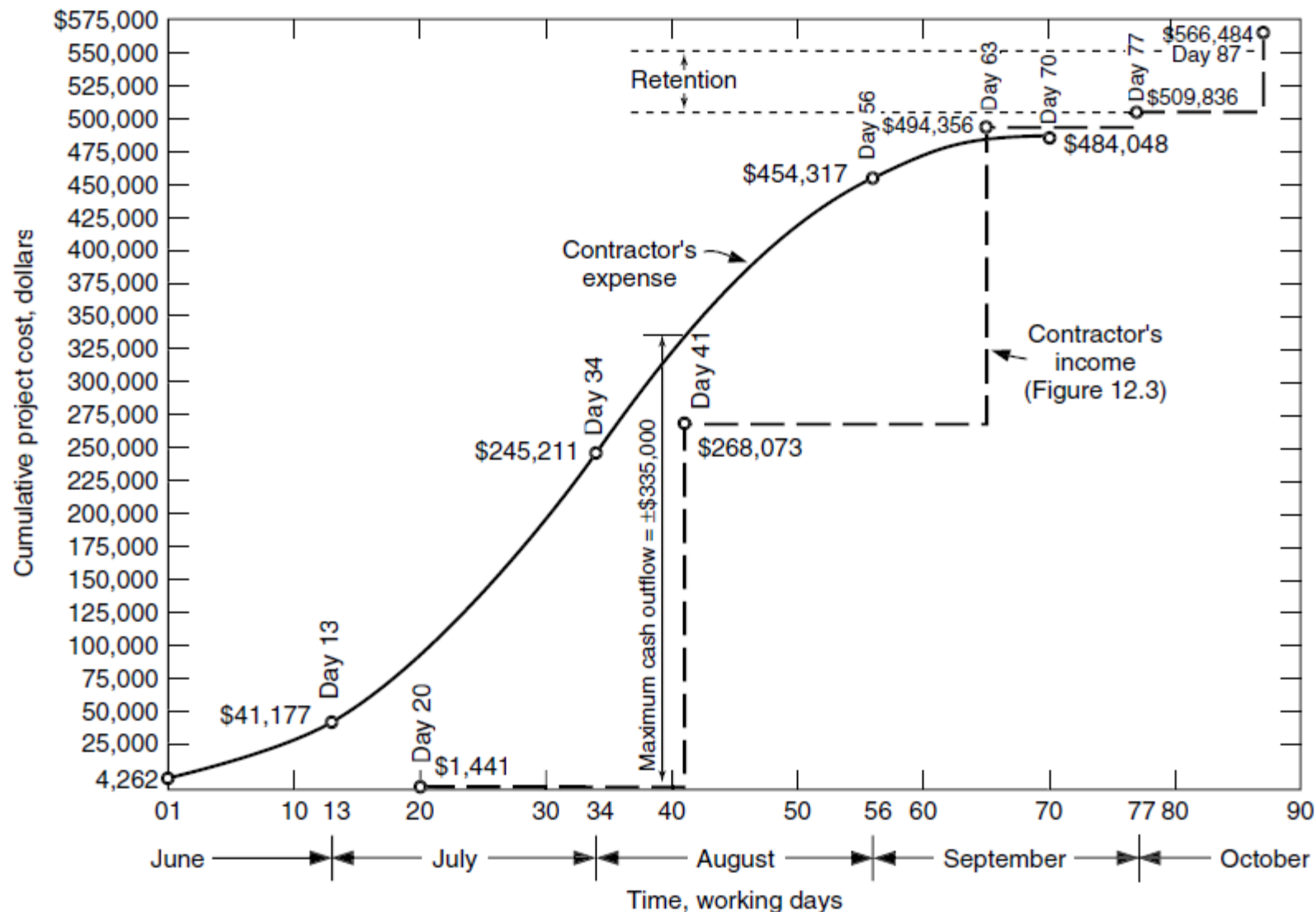


Monthly direct costs	\$25,000	\$ 65,000	\$ 75,000	\$ 15,000
Monthly indirect costs	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000
Total monthly costs	\$30,000	\$ 70,000	\$ 80,000	\$ 20,000
Cumulative monthly costs	\$30,000	\$100,000	\$180,000	\$200,000



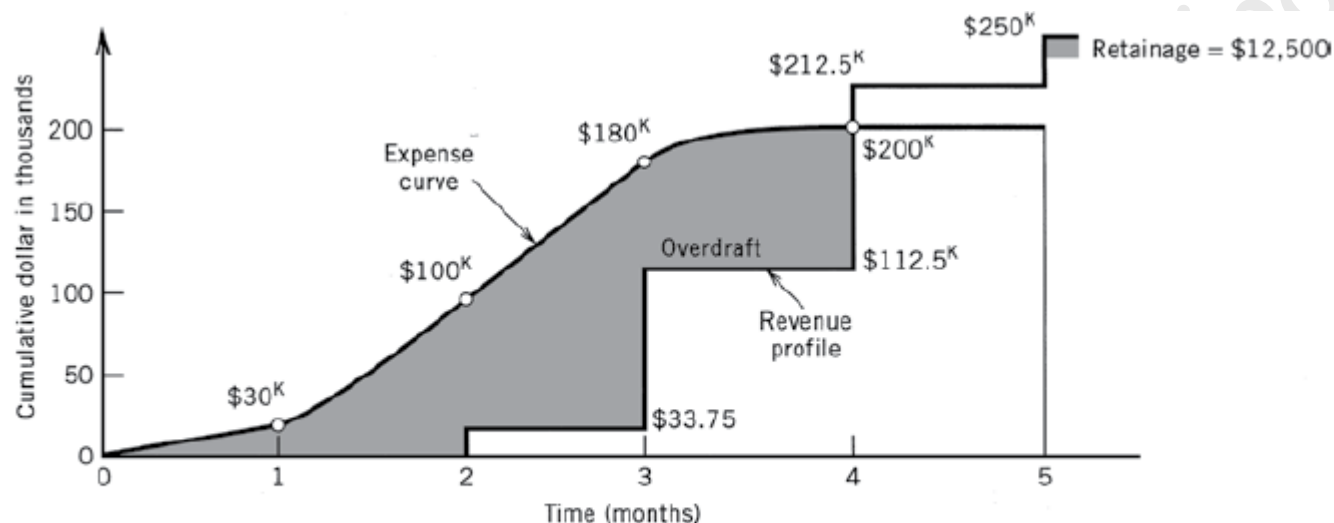
The letter "K" is used to indicate thousands of dollars.

Cash flow projection



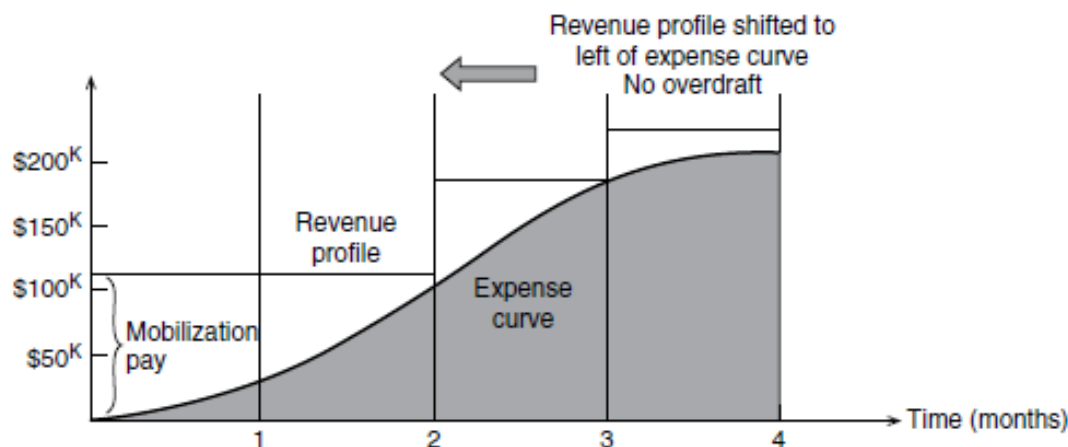
Highway bridge, contractor's expense and income

Cash flow to the contractor



Expenses and payments profiles

Cash flow to the contractor



Influence of front (or mobilization) payment on profiles

Overdraft requirements

- ❑ To know **how much credit** must be made **available at the bank**, the contractor needs to know what the maximum overdraft will be during the life of the project.

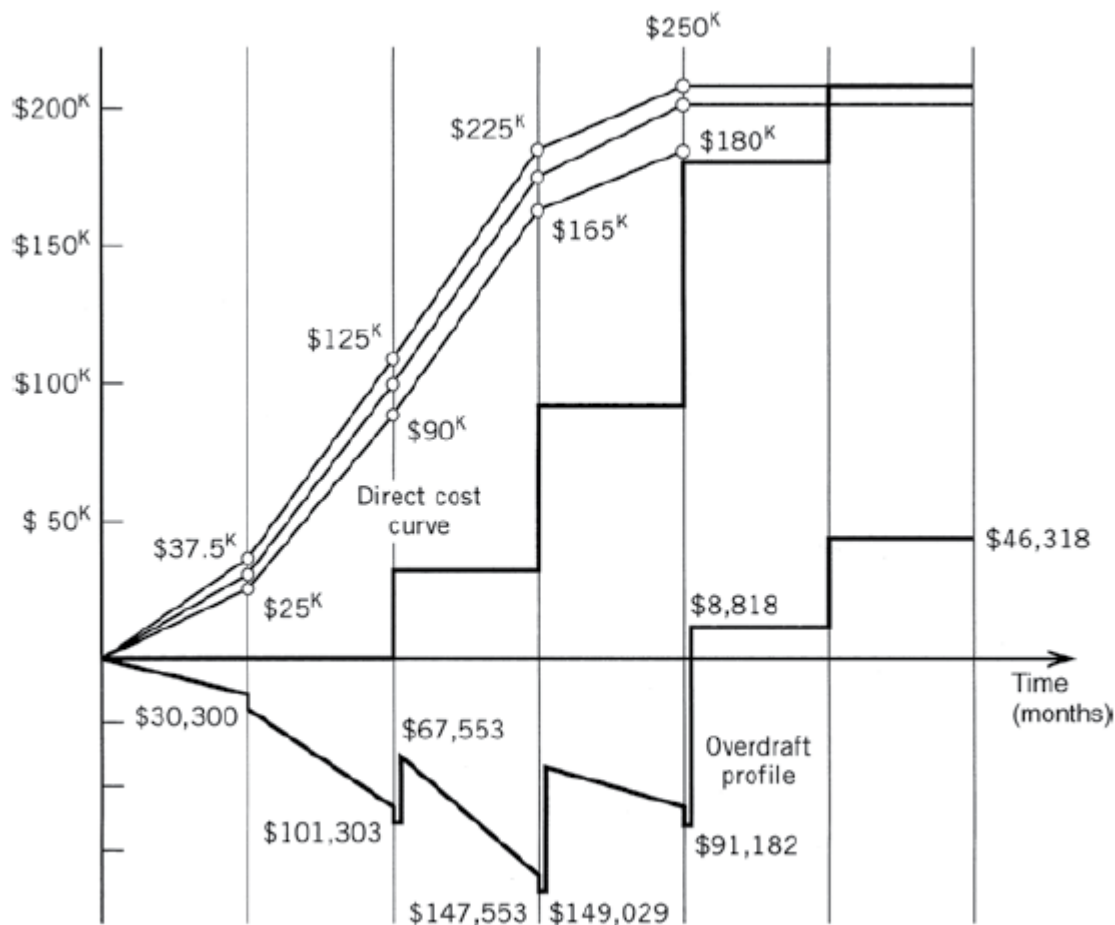
Overdraft Calculations

	Month					
	1	2	3	4	5	6
Direct cost	\$25,000	\$65,000	\$75,000	\$15,000		
Indirect cost	5,000	5,000	5,000	5,000		
<i>Subtotal</i>	30,000	70,000	80,000	20,000		
Markup (25%)	7,500	17,500	20,000	5,000		
<i>Total billed</i>	37,500	87,500	100,000	25,000		
Retainage withheld (10%)	3,750	8,750	0	0		
<i>Payment received</i>			\$33,750	\$78,750	\$100,000	\$37,500
Total cost to date	30,000	100,000	180,000	200,000	200,000	
Total amount billed to date	37,500	125,000	225,000	250,000	250,000	
Total paid to date			\$33,750	112,000	212,500	250,000
Overdraft end of month	30,000	100,300	147,553	90,279	(8,818) ^b	(46,318) ^b
Interest on overdraft balance ^a	300	1,003	1,476	903	0	0
Total amount financed	30,300	101,303	149,029	91,182	(8,818)	

^a A simple illustration only. Most lenders would calculate interest charges more precisely on the amount/time involved employing daily interest factors.

^b Parentheses indicate a positive balance in this case.

Overdraft requirements



Plot of maximum overdraft

PROJECT FINANCING

Money: A basic resource

- ☐ The **essential resource ingredients** that must be considered in the construction of a project are usually referred to as the **four Ms**.
- ☐ These **basic construction resources** are
 - (a) money,
 - (b) machines,
 - (c) manpower, and
 - (d) materials.

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Money: A basic resource



Project money flow

Construction financing process

- ❑ The **owner's financing** of any significant undertaking typically requires **two types** of funding:
 1. Short-term (construction) funding and
 2. Long-term (mortgage) funding.

- ❑ The **short-term funding** is usually in the form of a construction loan,
whereas the **long-term financing** involves a **mortgage loan** over a term ranging from 10 to 30 years.

Construction financing process

- ❑ The **short-term loans** may provide funds for items such as facility construction, land purchases, or land development.
- ❑ Typically, these **short-term loans** extend **over the construction period** of the project.
- ❑ For **large and complex projects**, this can be a period of **six to eight years** as in the case of utility power plants.
- ❑ A short-term loan is provided by a **lending institution**, based on the **assurance** that it will be **repaid with interest**, by some other loan.
- ❑ This subsequent **mortgage loan** constitutes the long-term financing.

Construction financing process

- ❑ **Lending institutions** are cautious; they will undertake a great deal of research and evaluation before providing a commitment for funding.
- ❑ At a **minimum**, an entrepreneur will be expected to provide the following as part of the loan application:
 1. A set of **financial statements** for the firm.
 2. **Personal financial statements** from the principals of the firm.
 3. **Proof of clear title** to the land for the project and documentation that it has an appropriate zoning.
 4. **Preliminary floor plans** and elevations for the project.
 5. **Preliminary cost estimates**.
 6. A **market research study** to verify expected income.
 7. A **detailed pro forma** indicating projected income and expense throughout the life of the mortgage loan.

Long-term pro forma example

Market rent for subject property (unfurnished) 55 two-bedroom A, B, or C units—1167 sq ft @ 41.0 cents/sq ft = \$478.47/mo or \$480 × 55	\$ 26,400.00
20 three-bedroom A, B units—1555 sq ft @ 37.3 cents/sq ft = \$580.00/mo \$580 × 20	11,600.00
Total estimated monthly income	\$ 38,000.00
Other income: Coin laundry, vending machine	150.00
	\$ 38,150.00
× 12 = annual total	457,800.00
Less vacancy factor of 5% (based on historical data)	-22,890.00
Adjusted gross annual income	434,910.00
Less estimated expenses @ 29.45%	-128,080.00
Net income before debt service	\$ 306,830.00
Capitalized value @ 9.5% = \$3,229,789.00 =	$\frac{306,830.00}{(0.095)}$
Requested loan value	= \$2,422,000.00
Loan/value ratio	= 75% (high) governed by law
Long-term debt service @ 9.75% constant	= \$236,145.00
Debt service coverage ratio	= 1.3
Loan per unit	= \$32293.33
Loan per square foot	= \$25.42

Pro forma for 75 apartment units

Long-term pro forma example

Construction Related Costs	1. Excavation and grading	\$ 67,500
	2. Storm sewers	48,000
	3. Sanitary sewers	84,030
	4. Water lines	28,000
	5. Electric lines	14,000
	6. Foundations	31,000
	7. Slabs	96,000
	8. Lumber and sheathing	185,000
	9. Rough carpentry	185,000
	10. Finish carpentry	81,362
	11. Roofing and labor	20,035
	12. Drywall and plaster	70,000
	13. Insulation	28,888
	14. Millwork	140,556
	15. Hardware	8,813
	16. Plumbing	165,000
	17. Heating and air conditioning	95,025
	18. Electrical	90,350
	19. Linoleum and tile	17,752
	20. Carpeting	101,881
	21. Kitchen cabinets	62,075
	22. Painting and decorating	107,000
	23. Masonry, block	20,680
	24. Masonry, brick	100,200
	25. Ranges and hoods	29,638
	26. Disposals	3,139
	27. Exhaust fans	1,022
	28. Refrigerator	35,040
	29. Paving	20,915
	30. Walks and curbs	20,792
	31. Landscaping	30,000
	32. Fence and walls	36,792
	33. Fireplace	51,100
Non- Construction Costs	34. Cleanup	29,200
	35. Lender's fee	32,000
	36. Surveyor's fee	1,000
	37. Architect's fee	12,500
	38. Land cost	80,000
	39. Attorney's fee	7,500
	40. Title insurance premium	5,762
	41. Other closing costs	150
	42. Hazard insurance premium	4,780
	43. Construction loan interest	120,000
	44. Appraisal	750
	45. Building permit	1,500
	46. Tax	50,000
Total		\$2,422,000

Construction loan

- ❑ Once the **long-term financing commitment** has been obtained, the negotiation of a construction loan is possible.
- ❑ **Commercial banks** often make construction loans because they have **some guarantee** that the loan will be repaid from the **long-term financing**.
 - ❖ However, even in these situations, there are **definite risks** involved for the **short-term lender**.
 - ✓ These risks relate to the possibility that the **entrepreneur or contractor** may, during construction, find themselves in **financial difficulties**.

Construction loan

❑ If this occurs, it may not be possible for the **entrepreneur/contractor to complete** the project,

in which case the **construction leader** may have to take over the job and initiate action for its **completion**.

❖ This risk is **offset** by a **discount (1-2%)**, which is **deducted from the loan** before any money is disbursed.

✓ *For example, if the amount of construction money desired is \$1,060,000. The lender will provide \$1,020,000 although the borrower signs a note that he or she will pay back \$1,060,000. The borrower, in effect, pays immediately an interest of \$40,000.*

Construction loan

- ❑ This is referred to as a **discount** and may be viewed as an additional interest rate for the construction loan.
- ❑ One **way to minimize** these risks is to **require** the borrower to designate the intended contractor and design architect.
- ❑ The **lender may also require** that all contractors involved in the construction be **bonded** as well.
- ❑ **Some commercial banks** evaluate and seek to approve the owner's intended contractor, the intended prime subcontractors, and the owner's architect,
as a **prerequisite** to approving the construction loan.
- ❑ This evaluation extends to an **evaluation** of their financial positions, technical capabilities, and current workloads.

Construction loan

❑ Once the construction loan has been approved,
the lender **sets up a draw schedule** for the builder or contractor.

❑ This **draw schedule** allows the release of funds in a defined pattern,
depending on the site and length of the project. <https://dralavipour.com/blog/view/Project-cost-optimization>

Table 7. Model Output of Optimized Financing Outflow Schedule (Repaid Money Including Interest) for Three Cases

Month	Case 1				Case 2				Case 3
	Short-term loan (B12) (\$)	Short-term loan (C9) (\$)	Long-term loan (LP) (\$)	Line of credit (LC) (\$)	Short-term loan (B12) (\$)	Short-term loan (C9) (\$)	Short-term loan (E3) (\$)	Line of credit (LC) (\$)	Line of credit (LC) (\$)
0	0	0	0	0	0	0	0	0	0
1	0	0	96,044	0	7,956	419	2,448	0	69,258
2	0	0	96,044	164,098	7,956	419	2,448	101,171	571,334
3	0	0	96,044	178,164	7,956	419	170,116	0	477,777
4	2,259	0	96,044	0	7,956	419	0	0	303,394
5	2,259	0	96,044	0	7,956	419	0	0	270,759
6	2,259	0	96,044	0	7,956	419	0	0	267,666
7	2,259	1,835	96,044	0	7,956	739	0	85,373	357,384
8	2,259	1,835	96,044	63,734	7,956	739	0	73,577	599,437
9	2,259	1,835	96,044	0	7,956	53,298	0	0	274,566
10	2,259	1,835	96,044	0	7,956	320	0	0	161,667
11	2,259	1,835	96,044	98,974	7,956	320	0	0	368,414
12	2,259	1,835	96,044	277,672	1,244,548	320	0	0	566,498
13	2,259	1,835	96,044	0	0	320	10,781	69,493	313,390
14	2,259	1,835	96,044	63,410	0	320	10,781	101,171	410,728
15	353,385	231,921	96,044	66,979	0	40,479	749,132	0	829,165

Construction loan

- ❑ **Smaller projects**, such as single unit residential housing, will be set up for **partial payments**

based on completion of **various stages of construction** (i.e., foundation, framing, roofing, and interior),

corresponding to the work of the **various subcontractors who must be paid.**

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Construction loan

❑ **Larger projects**, the draw schedule is based on **monthly payments**.

❖ The **contractor** will invoice the owner **each month** for the work put in place that month.

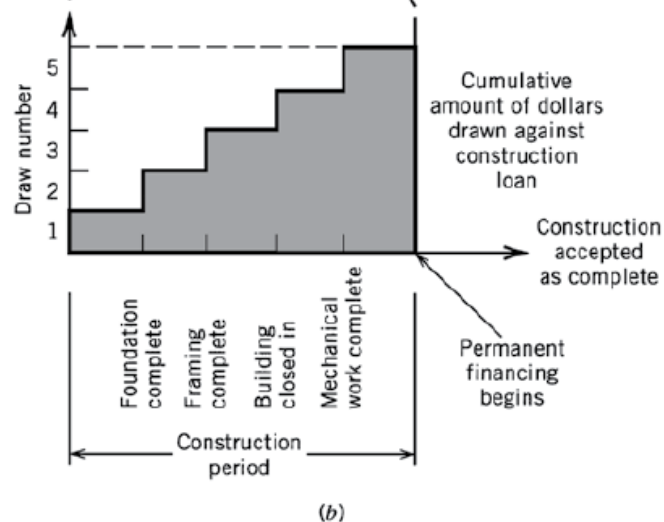
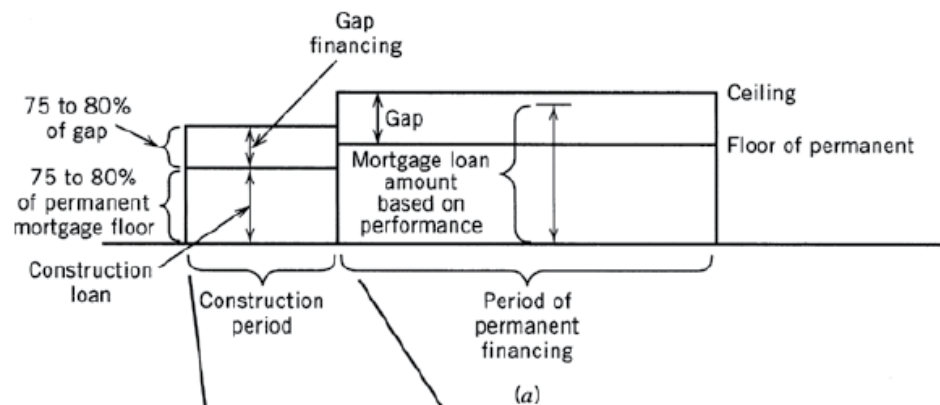
✓ This **request for funds** (i.e., progress payment) is usually sent to the owner's representative or architect

who **certifies the quantities** and value of work in place.

✓ **Once approved** by the architect and representative, the **bank will issue payment for the invoice**,

less an owner's retainage.

Construction loan



(a) Profile of project financing by entrepreneur and (b) draw schedule

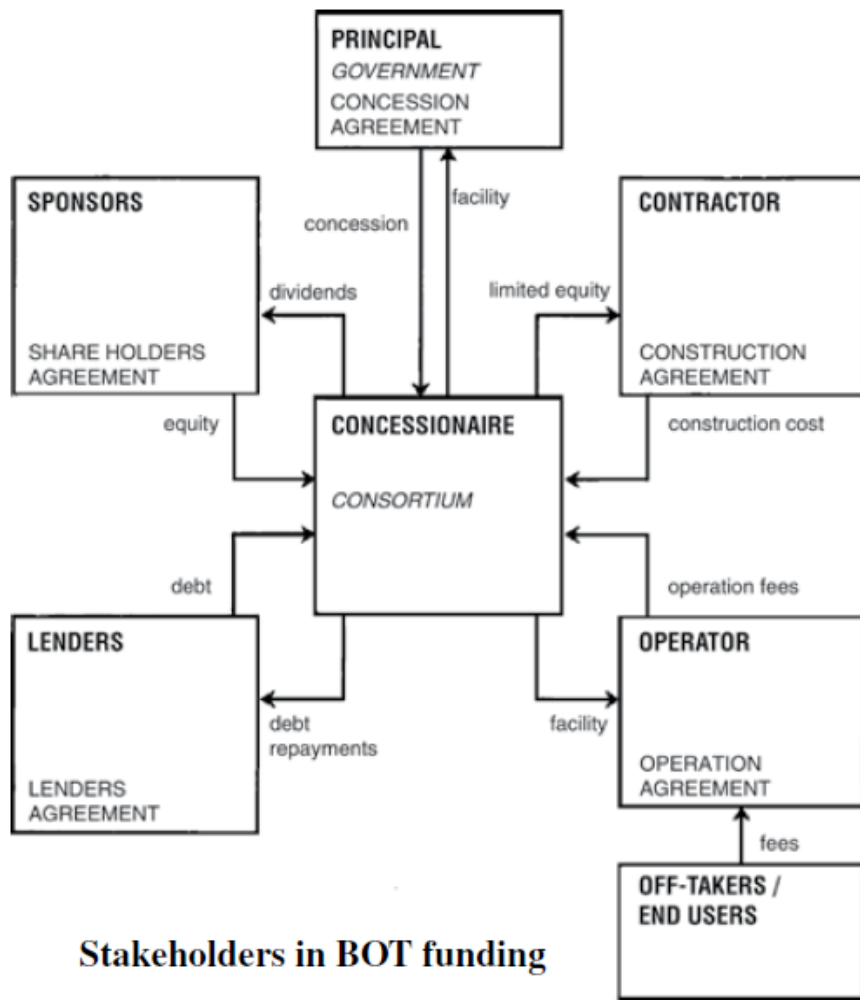
Build, operate, and transfer

- ❑ In the **BOT approach**, a private party or concessionaire retains a concession for a **fixed period** from a **public party**,
called principal (client), for the development and operation of a public facility.
- ❑ The **development** consists of the financing, design, and construction of the facility, managing and maintaining the facility adequately, and making it sufficiently profitable.
- ❑ The **concessionaire** secures **return of investment** by
operating the facility and, during the concession period,
the **concessionaire acts as owner**.
- ❑ At the **end of the concession period**,
the **concessionaire transfers** the ownership of the facility
free of liens to the principals at no cost.

Build, operate, and transfer

- ❑ The **modern implementation of BOT** (also called a public private partnership or PPP) concepts is **generally accredited** to the Turkish government under the leadership of Prime Minister Turgut Ozal (Birgonul and Ozdogan, 1998).
- ❑ This **method of funding and constructing** a large infrastructure program was **initiated in Turkey** starting in 1984.
- ❑ In fact, the **financing and construction** of the Suez Canal by the French in the 19th century was done **using a system** that would be considered BOT or PPP by **today's standards** (Levy, 1996).

Build, operate, and transfer



Stakeholders in BOT funding

**CM ROADMAP
RELATED TO THIS SECTION**

CM Roadmap – Hard skills

مهارت‌های سخت (Hard Skills) - سطح کارشناسی و اجرایی					
سطح ۵	سطح ۴	سطح ۳	سطح ۲	سطح ۱	دپارتمان‌ها
	استاندارد مدیریت ساخت CMAA	متدولوژی Prince2	راهنمای PMBOK	مدیریت پروژه‌های صنعت ساخت	مدیریت پروژه
	تامین مالی پروژه			مدیریت مالی و هزینه پروژه ارزیابی اقتصادی پروژه	مدیریت مالی و هزینه
				برنامه‌ریزی و کنترل پروژه نرم‌افزار MSP نرم‌افزار P6	مدیریت برنامه‌ریزی و زمان‌بندی
		مدیریت کیفیت پروژه			مدیریت کیفیت
اجرای پروژه به روش CM			مدیریت ادعاء و اختلافات	آنالیز تاخیرات پروژه	مدیریت قرارداد
		مدیریت ایمنی پروژه			مدیریت ایمنی
مدیریت طرح		مدیریت چابک Agile	مدیریت پروژه به روش Lean دفتر مدیریت پروژه (PMO)		مدیریت طرح و برنامه
		مدیریت پایداری پروژه			مدیریت پایداری
			مدیریت ریسک پروژه		مدیریت ریسک
			نرم‌افزار Power BI	مدیریت اسناد و مدارک پروژه	مدیریت اطلاعات
	مدیریت BIM در پروژه		نرم‌افزارهای BIM		مدیریت مدل‌سازی اطلاعات ساختمان (BIM)

Relevant comprehensive courses



<https://dralavipour.com/general-course/economic3>



<https://dralavipour.com/general-course/financial3>

Relevant comprehensive courses

**Project financing
Next years...**

**[https://dralavipour.com/gener
al-course/project-financing](https://dralavipour.com/gener-al-course/project-financing)**

CM Roadmap – Hard skills

مهارت‌های سخت (Hard Skills) - سطح ارشد استراتژی					
سطح ۵	سطح ۴	سطح ۳	سطح ۲	سطح ۱	دپارتمان‌ها
		منشور اخلاق در مدیریت پروژه			مدیریت پروژه
			استراتژی مدیریت هزینه و مهندسی ارزش		مدیریت مالی و هزینه
			استراتژی مدیریت برنامه‌ریزی و زمان‌بندی		مدیریت برنامه‌ریزی و زمان‌بندی
	استراتژی مدیریت کیفیت				مدیریت کیفیت
		استراتژی مدیریت قرارداد		اصول مدیریت ساخت	مدیریت قرارداد
	استراتژی مدیریت ایمنی				مدیریت ایمنی
استراتژی مدیریت طرح و برنامه					مدیریت طرح و برنامه
	استراتژی مدیریت پایداری				مدیریت پایداری
		استراتژی مدیریت ریسک			مدیریت ریسک
		استراتژی مدیریت اطلاعات			مدیریت اطلاعات
استراتژی مدیریت BIM					مدیریت مدل‌سازی اطلاعات ساختمان (BIM)

Relevant comprehensive courses



<https://dralavipour.com/video-course/ve>



<https://dralavipour.com/video-course/web12>

Relevant comprehensive courses

The list will go further...

CM Roadmap – Management skills



منتورینگ (Management Skills) - سطح مدیریتی

سطح ۵	سطح ۴	سطح ۳	سطح ۲	سطح ۱
پیش‌نیاز ورود	پیش‌نیاز ورود	پیش‌نیاز ورود	پیش‌نیاز ورود	پیش‌نیاز ورود
داشتن مدرک مدیریتی سطح ۴	داشتن مدرک مدیریتی سطح ۳	داشتن مدرک مدیریتی سطح ۲	داشتن مدرک مدیریتی سطح ۱	دارای مدرک کارشناسی در زمینه مهندسی
تسلط بر مباحث مهارت‌های سخت و نرم سطح ۵	تسلط بر مباحث مهارت‌های سخت و نرم سطح ۴	تسلط بر مباحث مهارت‌های سخت و نرم سطح ۳	تسلط بر مباحث مهارت‌های سخت و نرم سطح ۲	تسلط بر مباحث مهارت‌های سخت و نرم سطح ۱

CM Roadmap – Consulting skills



مشاوران (Consulting Skills) - سطح مشاوره

سطح ۵	سطح ۴	سطح ۳	سطح ۲	سطح ۱
مدیریت درس آموخته‌های پروژه	مدیریت کیفیت پروژه	جلوگیری و حل اختلاف در پروژه	برنامه‌ریزی پروژه	
	مدیریت ایمنی پروژه	آنالیز و مدیریت ریسک پروژه	مدیریت تغییرات پروژه آنالیز و اجرای ساخت‌پذیری پروژه	

Relevant comprehensive courses



<https://dralavipour.com/general-course/consultplan1>



مدیریت پروژه‌های صنعت ساخت (ساختمانی، زیرساختی و صنعتی)

فصل ششم: مدیریت قرارداد
مدیریت اجرای قرارداد
مدیریت اسناد و مدارک
مدیریت ادعاء و اختلافات
مدیریت اختتام پروژه

ارائه دهنده:

سید محمدرضا علوی پور

(PhD, PMP, CMIT)

دانشگاه Illinois Tech آمریکا

What we will learn?

- ☐ Administration
- ☐ Documentation
- ☐ Claims and disputes
- ☐ Close-out
- ☐ CM roadmap related to this section

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

ADMINISTRATION



Contract administration

- ❑ **Contract administration** is all about managing the business details and relationships.
- ❑ When you consider all of the general conditions, supplemental conditions, and specifications associated with the contract,
you can understand **what a challenge this is**.
- ❑ Every statement and every clause in the contract **sets forth rules, regulations, and procedures** for every aspect of the **construction process**.
- ❑ **Nothing goes forward without** some paperwork leading the way:
written requests for information, change orders, submittal logs, shop drawings, pay requests, lien waivers, progress reports, and on and on.

Staying on top of it all is a huge task and a critical one.



Contract administration

- ☐ It is **virtually impossible** for **one person** to **accomplish** the job; support from the main office and the job site is required.
- ☐ Although **one person** may be the contract administrator,
it takes the efforts of the **entire project team** to accomplish the task.
- ☐ **Without proper attention** to the contract details,
the **whole job** could end up in one big lawsuit.
- ☐ **No matter** how **good** your concrete finishers or carpenters might be,
you can't really fulfill the requirements of the project without strong contract administration.

Contract administration

NOTE

Keeping up with all of the paperwork and red tape of the contract is a real challenge, and it cannot be taken lightly. Poor contract administration procedures are one of the main reasons that projects get into trouble. And if the project should go to court, the party with the most organized managerial procedures will win the majority of the time. The contractor must train all of his management personnel in good administrative practices.



Contract administration

One of the things that new field engineers get nervous about when they first go to work on the job site is their inexperience in construction. All of a sudden they go from working summers cleaning up construction debris for their father's home-building business to being smack dab in the middle of a multimillion-dollar high-rise project somewhere. And on top of that, now they are actually accountable for something important. My advice to new recruits is always the same. "No one expects you to know everything there is to know about construction, but they do expect you to know where to go to get the information you need."

NOTE

Contract administration

In situations where an owner lacks the management experience and expertise to handle their own construction process, a professional construction management firm can be hired as an agent of the owner. The agency CM firm works with the general contractor on the owner's behalf. This arrangement mitigates risks for both the owner and the contractor.

NOTE

Pre-Construction

- ❑ On design-bid-build (DBB) projects,

pre-construction activities are **owner-led**, and

contractors have limited to no involvement with the project owner and design team **during design development**.

- ❖ However, the **emergence of novel project delivery methods** is providing the **general contractor (GC) with opportunities** to participate in the pre-construction phase.

- ❑ On construction management at risk (CMR) projects,

owners will engage a **general contractor early** in the design process for a fee to **assist the designer and owner** with the quality of their design.

- ✓ Under CMR, design activities are **still owner-led**.

Pre-Construction

- ❑ On design-build (DB) projects, the **design-builder entity**
 - usually led by a GC— will also be secured **early in the design process**.
 - ❖ However, **different DB models** will result in a different governance model for the design phase.
- 1. Under progressive DB,
 - ✓ the **owner will lead or co-lead** pre-construction activities and
 - ✓ the **GC will provide assistance**, similarly to **CMR**.
- 2. Under bridging DB,
 - ✓ the **owner will lead** pre-construction activities and
 - ✓ the **GCs will review the outcome** while preparing their **proposals and negotiating** the contract.
- 3. Under competitive DB,
the **design-builder** will
 - ✓ **review** what has been **done by the owner up to the request for proposal (RFP)**
 - ✓ lead **pre-construction activities afterward**.

Pre-Construction – Important activities

❑ Some of the activities that will be performed during pre-construction include:

❖ **Constructability review**, including

evaluation of potential changes to the design to make it easier to build (i.e., less cost and time) and with improved quality and safety goals in mind,

❖ Budgeting,

❖ Scheduling,

❖ **Identification of long-lead materials** (possibly bidding and awarding) and ordering long-lead materials and equipment (such as elevators and structural steel), and

❖ Value engineering.

Pre-Construction – Project startup

- ❑ **Project start-up** is a **sub-set of preconstruction planning**.
- ❑ Once the **construction manager** has been notified that the project has been **won**, he or she must **plan project startup activities**.
- ❑ **Start-up activities** involve establishment and organization of the project office and staff, construction site layout, and mobilization of the jobsite.
- ❑ The **construction manager** selects the construction management team and **involves them** in start-up planning.
 - ❖ Contract files,
 - ❖ project office administrative procedures, and
 - ❖ correspondence management systemsare also established.

Pre-Construction – Project startup

- ❖ Award of subcontracts,
- ❖ Procurement of materials, and
- ❖ Actual mobilization

must **wait until** the notice to proceed (NTP) is received,

but the **planning should be completed**

prior to its issuance, so implementation can begin
immediately upon receipt of the notice.

Pre-Construction – Project startup: Notice to proceed

NOTICE TO PROCEED

To: *Northwest Construction Company* Date: *March 25, 2015*
1242 First Avenue
Cascade, Washington 98202

Project Name: *NanoEngineering Building*

You are hereby notified to commence WORK in accordance with subject contract executed *March 24, 2015 on March 25, 2015* and you are to complete the WORK within 690 consecutive calendar days thereafter. The date for substantial completion of all WORK is therefore *January 15, 2017*.

By: *Jeffrey Jackson*
Title: *Director, Capital Projects*
Owner: *University of Washington*

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by *Northwest Construction Company* this the *26th* day of *March, 2015*.

By: *Sam Peters*
[No Title] *Vice President*
Contractor: *Northwest Construction Company*

- ☐ The **NTP** authorizes the contractor to start work on the project and often is issued at the end of the preconstruction conference.

Pre-Construction – Project startup: Notice to proceed

- ❑ Once the **NTP** has been received, the **construction manager** should buy out the project by
 1. Awarding subcontracts and
 2. Ordering needed materials and equipment, especially those long-lead items.
- ❑ The **NTP often is provided** at the **preconstruction conference** along with verification of owner financing and needed permits.
 - ❖ Project-specific quality control and safety plans need to be **finalized** and, if **required by contract**, submitted to the owner or owner's representative.

Pre-Construction – Project startup: Jobsite planning

- ❑ **Efficient jobsite organization** is essential for a **productive construction project**.
- ❑ The **jobsite layout** affects the **cost** of material handling, labor, and the use of major equipment by the general contractor and the subcontractors.

THIS GATE RESERVED EXCLUSIVELY
FOR THE EMPLOYEES, AGENTS,
SUBCONTRACTORS AND SUPPLIERS OF:

Richardson Electric, Inc.

Acme Roofing Company

Smith Fencing Company

Hi Gloss Painting Contractors

All other persons must use the gate located on
15th Avenue on the east side of the project

Pre-Construction – Project startup: Mobilization

- ☐ The actual mobilization and physical move onto the jobsite is the **superintendent's responsibility**.
- ☐ The **project office** is established, and temporary utilities (electricity, water, sewer, and telephone) are **installed**.
- ☐ **Site access** is secured with adequate fencing, and **gates** are installed to provide needed site access for craftsmen and material delivery.
- ☐ A **project sign** is installed at a visible location on the project site.

Mobilization **occurs soon after** receipt of the NTP to demonstrate the contractor's **commitment to starting** the project.

Pre-Construction – Project startup: Start-up checklist

NORTHWEST CONSTRUCTION COMPANY
1242 First Avenue, Cascade, Washington 98202
(206) 239-1422

PROJECT START-UP CHECKLIST

Project: NanoEngineering Building

Project Manager: Ted Jones

	Scheduled Completion	Date Completed
Cost codes set up:	3/26	<u>3/25</u>
Work packages set up:	5/1	_____
Buyout complete:	7/1	_____
Draft contract complete:	2/11	<u>2/11</u>
Certificate of insurance submitted to owner:	3/20	<u>3/22</u>
Subcontracting plan submitted to owner:	4/1	_____
Safety plan submitted to owner:	4/1	<u>3/28</u>
Quality control plan submitted to owner:	4/1	_____
Subcontracts drafted:	7/1	_____
Subcontracts awarded:	8/1	_____
Subcontractor insurance certificates received :	9/1	_____
Subcontractor safety manuals received:	9/1	_____
Subcontractor preconstruction meeting conducted:	8/15	_____
Building permit in hand:	3/2	<u>3/2</u>
Construction schedule submitted to owner:	2/15	<u>2/14</u>
Schedule of values submitted to owner:	3/20	<u>3/22</u>
Telephone list completed:	8/1	_____
Change order proposal log established:	7/1	_____
Purchase order log established:	7/1	_____
RFI log established:	7/1	_____
Expediting log established:	7/1	_____

Pre-Construction – Project startup: Start-up log

PROJECT START-UP LOG

Project Number: 9821

Project Name: NanoEngineering Building

Project Manager: Ted Jones

Sub/PO Code:	00.01.15	31.00.00	32.12.16	03.30.00	03.20.00	22.00.00	26.00.00
Category:	Temp Fence	Mass Ex	Asphalt	Rebar Fab	Redi-Mix	Plumbing	Electrical
Sub/Supplier:	Smith Fence	Earth Ent	ATB Asph	Steel Fab	Westside	Rainy City	Richardson
Letter of Intent:	NA	NA	4/1/15	4/1/15	NA	4/1/15	4/1/15
Rough Sub/PO:	NA	2/15/15	4/15/15	5/15/15	NA	5/1/15	4/15/15
Final Sub/PO:	3/25/15	3/25/15	5/1/15	5/15/15	5/15/15	5/1/15	4/15/15
Sub/PO Returned:	3/26/15	5/1/15	5/5/15		5/30/15		5/1/15
Insurance Rec'd:	3/26/15	5/1/15		NA	NA		5/1/15
Insurance Expires:	12/21/15	10/31/15		NA	NA		1/31/16
Safety Plan Rec'd:	NA	5/1/15		NA	NA		

Pre-Construction – Project startup: Project buyout

- ☐ The process of **project buyout** involves awarding subcontracts and procuring materials being **furnished by the general contractor** and **comparing** the actual costs to the budgeted costs.
- ☐ The purpose is to determine the **status of the project** with respect to the contractor's budget.
- ☐ A **log** can be used to **buy out** the project.
- ☐ The **major unknown**, which is not reflected on the **buyout log**, is the **labor cost** for self-performed work.
- ☐ This must be **monitored weekly** to track actual expenditures versus budgeted costs.
- ☐ Most construction managers will choose to use electronic spread sheet software, such as Microsoft Excel, to **compare** buyout costs with budgeted costs.

Pre-Construction – Project startup: Project buyout

❑ Buyout log

PROJECT BUYOUT LOG							
Project Number: <u>9821</u>		Project Name: <u>NanoEngineering Building</u>			Project Manager: <u>Ted Jones</u>		
Code	Category	Budget	Buyout	Variance	Date	Sub/Supplier	Comments
01.40.00	Temp fence	\$15,000	\$15,000	\$0	3/25	Smith Fence	Rental allowance
31.00.00	Mass ex	\$1,949,000	\$1,999,000	\$50,000	5/1	Earth Enter.	Added spoils
32.12.16	Asphalt	\$26,000	\$25,050	-\$950	5/1	ATB Asphalt	Picked up striping
32.17.23	Pavement stripe	\$5,000	\$0	-\$5,000	5/1		w/ATB
03.30.00	Rebar supply	\$250,000	\$250,000	\$0	5/15	Steel Fab	
03.20.00	Redi-mix supply	\$1,500,000	\$1,650,000	\$150,000	5/30	Westside	Admixtures
09.30.00	Carpet	\$1,800,000	\$954,000	-\$806,000	2/15	Soft Touch	As Bid
09.65.43	Vinyl	w/carpet	\$750,000	\$750,000	2/15	United	As Bid
22.00.00	Plumbing	\$2,750,000				Rainy City	Negotiating
26.00.00	Electrical	\$4,900,000	\$5,000,000	\$100,000	5/1	Richardson	Temp Power
01.50.00	Temp Power	\$150,000	\$0	-\$150,000	5/1	Richardson	was w/GCs

Pre-Construction - Conference

☐ The **agenda** for this meeting **usually covers** all of the items listed in

1. General conditions and
2. Supplemental conditions

of the **contract (think back to “The Construction Contract”)** but in **much greater detail.**

☐ This initial preconstruction meeting is an **opportunity for the parties** to be introduced and primary relationships to be established.

Pre-Construction - Conference

❑ A number of **common discussion items** are listed next:

❖ **Introductions and accountabilities**

❖ **Mobilization and site logistics**

- ✓ Site access
- ✓ Temporary utilities
- ✓ Temporary facilities
- ✓ Site security
- ✓ Traffic and pedestrian issues

Prepared by Dr. Alavipour
DO NOT DISTRIBUTE

Pre-Construction - Conference

❑ A number of **common discussion items** are listed next:

❖ **Construction coordination issues**

- ✓ Subcontracts
- ✓ Submittals
- ✓ Shop drawings
- ✓ Requests for information

❖ **Schedule issues**

- ✓ Notice to proceed
- ✓ Sequence of work
- ✓ Work hours
- ✓ Liquidated damages

Pre-Construction - Conference

❑ A number of **common discussion items** are listed next:

❖ **Payment issues**

- ✓ Schedules of value
- ✓ Applications for payment

❖ **Change orders and extra work**

❖ **Dispute issues**

- ✓ Claims
- ✓ Alternative dispute resolution

❖ **Completion procedures**

- ✓ Substantial completion
- ✓ Final inspection
- ✓ Final payment

Construction

- ❑ A **design package** is **rarely 100% complete** at the time of the contractor's bid or even when construction commences.
 - ❖ Even when construction expertise is available during pre-construction, it is expected that the **design will further develop during construction**, especially early on, but at a slower pace than during pre-construction.
- ❑ Specialty contractors and suppliers submit their **portion of the design** to the GC, the design team, and the project owner for their reviews.
- ❑ **Design submittals** act as the contractual vehicle to receive preliminary acceptance before further financial commitment.
 - ❖ However, **submittals** are not **limited to design deliverables** but are also used to seek **preliminary approval** to purchase materials, fabricate assemblies, or install materials or assemblies.

موسسه مهندسی و مدیریت ساخت علوی پور (ACEMI)

دفتر آموزش



تهران، بلوار فردوس شرق، مجتمع آبگینه، طبقه سوم اداری، واحد C42



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۴۵



+۹۸ ۲۱ ۴۶ ۱۰۰ ۴۵۰



info@dralavipour.com



www.dralavipour.com



@alavipour_pm



@acemi_social



@alavipour_pm



@IRANACEMI

