

Project Cost Management

PMG 213

Lecture 4

**Prepared by
Dr. Rasha B. AL Jerd**



Project Cost Management

PMG 213

Lecture 4

Project Cost Management

PMG 213

Prepared by
Dr. Rasha B. AL Jerd

Cost Estimating





Cost Estimating Outlines:

3.1 CAPITAL COST ESTIMATION:

- 3.1.1 Purpose of Estimates
- 3.1.2 Fixed Capital and Working Capital
- 3.1.3 Current Trends in Capital-Cost Estimating
- 3.1.4 Types of Estimates
- 3.1.5 Functions of Capital-Cost estimates
- 3.1.6 Cost of Making Estimates
- 3.1.7 Representation of Cost Data
- 3.1.8 Factored Estimating:
 - Lang Factors
 - Hand Factors
 - Plant Cost Estimating by Analytical Procedures
 - Plant Component Ratios
 - Cost Indexes
 - Equipment Installation Cost Ratios
- 3.1.9 Codes of Account
- 3.1.10 Startup Costs
- 3.1.11 Evaluation of the Estimate

Plant Cost Estimating by Analytical Procedures: Analytical methods, instead of tables and charts, are particularly useful when using a **computer for making cost estimates**.

Three methods suitable for computer calculation are:

(1) ratio factor method, (2) Hirsch-Glazier method, and (3) Rudd-Watson method.

❑ **The ratio factor method uses a number of factors added together which are multiplied by the total major equipment cost. Thus:**

$$\text{Capital investment for plant} = (f_1 + f_2 + \dots) \Sigma E \quad (3.1)$$

Where ΣE is the major process equipment cost, and $f_1, f_2, \dots$, are cost factors for installation, piping, instrumentation, and so on.

The difference between the Hand method and the ratio factor method is in the detail of the factors.

- A plant automation script is processing an order-of-magnitude capital estimate. The baseline cost code is processing three core data streams:

Total F.O.B. Purchased Equipment Price (ΣE): \$3,200,000,

Calculated Material Cost Factor fm 1.45 (represents piping, electrical, structures relative to equipment)

Calculated Field Labor Cost Factor fl 0.85 (represents workforce payroll relative to equipment)

Calculated Freight & Shipping Factor fs: 0.10 (represents logistical delivery to the site). Your

Task: Calculate the Total Capital Plant Asset Valuation based on this analytical configuration.

Answer: The rule governing analytical ratio models states that individual installation component ratios must be aggregated (summed together) plus the base unit factor of 1.0 (which represents the baseline equipment value itself).

Total Combined Factor = $1.0 + fm + fl + fs = 1.0 + 1.45 + 0.85 + 0.10 = 3.40$

Total Capital Plant Asset Valuation: Multiply the aggregated analytical ratio factor directly by the raw total purchased equipment pool cost: Total Equipment Price ΣE * Total Combined Factor

Total Plant Valuation = $\$3,200,000 * 3.40 = \$10,880,000$

3.1.8 Factored Estimating

If you don't use the 1.0, you have to calculate every installation expense individually and then manually add them back to the original equipment cost:

Base Equipment Cost: \$3,200,000

Material Cost: $\$3,200,000 \times 1.45 = \$4,640,000$

• **Labor Cost:** $\$3,200,000 \times 0.85 = \$2,720,000$ **Freight Cost:** $\$3,200,000 \times 0.10 = \$320,000$

Now, you add all four numbers together to get the total plant cost:

Total Cost = $\$3,200,000 + \$4,640,000 + \$2,720,000 + \$320,000 = \$10,880,000$

3.1.8 Factored Estimating

The *Hirsch-Glazier* method takes the form

$$I = EA(1 + F_L + F_P + F_M) + B + C \quad (3.2)$$

where

- I = total battery-limit investment
- E = indirect cost factor representing contractors' overhead and profit, engineering, supervision, and contingencies; E is normally 1.4
- A = total purchased cost f.o.b. less incremental cost for corrosion-resistant alloys
- B = installed equipment cost
- C = incremental cost of alloys used for corrosion resistance

- F_L = cost factor for field labor
- F_M = cost factor for miscellaneous items
- F_P = cost factor for piping materials

The factors F_L , F_M , and F_P are not simple ratios but are defined by logarithmic relationships.*

3.1.8 Factored Estimating

➤ An estimator is running a Hirsch-Glazier programmatic budget evaluation for a high-pressure petrochemical distillation train. The engineering database provides the following discrete cost components:

-Total purchased equipment cost (inclusive of all metallurgy options): \$2,300,000

-Isolated titanium-alloy corrosion premium cost: \$300,000

-Direct field labor factor FL: 0.45

-Direct piping installation factor FP: 0.35

-Miscellaneous material installation factor FM: 0.20

-Contractor engineering, indirect fees, and overhead factor (E): 1.40

-Localized structural building / heavy civil foundation allowance (C): \$150,000

Your Task: Calculate the Total Capital Investment (I) for this distillation train using the Hirsch-Glazier method. Answer:

Step 1: Calculate the Alloy-Free Equipment Base Value (A) The formula explicitly requires pulling out the alloy premium from the core equipment loop so installation multipliers do not get over-inflated by material premiums.

3.1.8 Factored Estimating

A= Total Equipment Cost - Alloy Premium (B)

$$A = \$2,300,000 - \$300,000 = \$2,000,000$$

Step 2: Aggregate the Installation Ratios Sum up the installation moving pieces. Do not forget to include the base 1.0 to keep the core equipment value preserved inside the brackets!

$$\text{Installation Subtotal} = 1 + FL + FP + FM$$

$$\text{Installation Subtotal} = 1 + 0.45 + 0.35 + 0.20 = 2.00$$

Step 3: Solve the Main Factored Module: Multiply the indirect contractor factor (E = 1.40) by the equipment base (A = \$2,000,000) and the aggregated installation multiplier (2.00).

$$\text{Factored Core} = 1.40 * \$2,000,000 * 2.00$$

$$\text{Factored Core} = \$2,800,000 * 2.00 = \$5,600,000$$

Step 4: Add the External Increments (B and C) to find (I) Add the alloy premium (B = \$300,000) and the civil site construction costs (C = \$150,000) back onto your factored core module.

$$(I) = \$5,600,000 + \$300,000 + \$150,000$$

$$(I) = \$6,050,000$$

Final Answer: The total capital investment required for this asset train is \$6,050,000.

3.1.8 Factored Estimating

The *Rudd-Watson* method takes the form

$$C_{FC} = \phi_1 \phi_2 \phi_3 SC_{EQ} \quad (3.3)$$

where

C_{FC} = fixed capital investment

ϕ = components for installation, etc.

C_{EQ} = purchased equipment cost

Note that in the Rudd-Watson method, the factors are multiplied together, whereas in the ratio factor method they are added together.

- A project engineer is using the Rudd-Watson analytical model to estimate the cost of a new distillation module. The model uses three consecutive multiplier factors based on historical plant setups:

Material installation factor (ϕ_1): 1.35

Labor adjustment factor (ϕ_2): 1.20

Contractor indirect/engineering fee factor (ϕ_3): 1.25

Regional location index multiplier (S): 1.10

Total uninstalled equipment purchase cost (C_{EQ}): \$800,000 Your Task:

Calculate the Total Fixed Capital Cost (C_{FC}) using the Rudd-Watson method. Answer: Because this method is strictly multiplicative, you chain the factors together:

1. Multiply the factors consecutively: Combined Multiplier = $1.35 * 1.20 * 1.25 * 1.10 =$

2. Multiply by the baseline equipment cost (C_{EQ}): (C_{FC}) = $2.2275 * \$800,000 = \$1,782,000$

Final Answer: The total fixed capital cost is \$1,782,000.

Notice how the total combined multiplier becomes 2.2275, This means the total plant cost is roughly 223% of the bare equipment cost due to compounding inflation and regional factors.

3.1.8 Factored Estimating

Plant Component Ratios:

Plant cost estimates can be made using factors for separate components. However, this method is generally no more accurate than is using an overall factor unless a great deal of information is available. Table 3.4 gives a range of plant direct investment cost for individual components in a typical battery limit process plant.

Indirects should be added for total capital investment. The figures shown in Table 3.5 also provide some ratios according to major cost categories for a typical chemical plant. Cost-capacity factors are used to estimate a cost for a new size or capacity from the known cost for a different size or capacity. The relationship has a simple exponential form:

$$C_2 = C_1 \left(\frac{Q_2}{Q_1} \right)^x \quad (3.4)$$

where

C_2 =desired cost of capacity Q_2

C_1 =known cost of capacity Q_1

x =cost-capacity factor

3.1.8 Factored Estimating

Your company purchased a water purification unit with a capacity of 20,000 gallons per day for \$150,000 three years ago. You are designing a new facility that requires an identical type of unit, but with an increased capacity of 50,000 gallons per day.

Your Task: Using the standard rule ($x = 0.6$), estimate the purchase cost of the new, larger unit.

Answer:

1. Identify your variables : $C_1 = \$150,000$ $Q_1 = 20,000$ $Q_2 = 50,000$ $x = 0.6$

2. Set up the capacity ratio: $\text{Ratio} = 50,000 / 20,000 = 2.50$

3. Apply the scaling exponent (0.6): $(2.50)^{0.6} = \text{approximately } 1.73286$

4. Calculate the new cost (C_2): $\$150,000 * 1.73286 = \$259,929$

Final Answer: The estimated cost of the larger 50,000-gallon unit is \$259,929.

3.1.8 Factored Estimating

This equation is often referred to as the *6/10ths Rule* or the *7/10ths Rule* because the average value of the exponent is about 0.6 for equipment and 0.7 for complete plants. However to blindly assume either of these value is

Table 3.4 Cost of Components of Typical Chemical Plants

	Percent of direct total	Range, %
Foundations	4	1–8
Equipment	39	26–46
Insulation	4	1–5
Site work	4	1–9
Buildings	10	6–20
Duct work	1	0–3
PWR wiring	8	7–12
Instruments	8	5–10
Piping	22	12–29

3.1.8 Factored Estimating

dangerous because the factors can, and do, vary within a range of 0.3 to 1.0 and, in some cases over an even wider range. Rather than assuming a value for the exponent, it is far better to calculate the value if data for various equipment sizes or plant capacities is available or to use published sources of cost capacity factors. Only if nothing is known should the 0.6 value for equipment or the 0.7 value for complete plants be applied, and then only with caution. Further, the use of the equation should be limited to scaleups of no more than 2 to 1 because of structural effects when equipment gets larger or taller. Often discontinuities in the factor occur over a wide range of capacities. As an example of the use of the equation, assume that the cost for equipment making 100,000 tons/year is \$8 million. If 0.6 is a usable value for the exponent, the cost for equipment making 200,000 tons per year would be \$12,100,000:

$$C_2 = 8,000,000 \left(\frac{200,000}{100,000} \right)^{0.6} = \$12,100,000$$

3.1.8 Factored Estimating

Table 3.5 Major Cost Categories in a Typical Chemical Plant

Category	Percent of project range
Engineering design	10–15
Engineering control ^a	2–5
Indirect field costs	15–25
Field labor	30–40
Field material	15–25
Fabricated equipment	25–35

^aEngineering control includes (1) construction home office expense and drawing reproduction, (2) quality assurance engineering and vendor inspection, and (3) cost control and estimating.

**3.1.8
Factored
Estimating**

The same procedure can be used for order-of-magnitude estimates for entire plants. Lacking other information, use 0.7 as the cost-capacity factor for entire plants only with extreme caution. Table 3.6 gives some cost-capacity factors for battery-limit plants. Humphreys (1996) has provided an extensive tabulation of cost-capacity factors for both individual equipment items and complete plants.

3.1.8 Factored Estimating

Table 3.6 Cost Capacity Factors for Process Plants

Product or process	Units of production	Typical plant size	Cost capacity factor
Chemical plants	1000 ton/yr		
Acetic acid		10	0.68
Acetone		100	0.45
Ammonia		100	0.53
Ammonium nitrate		100	0.65
Butanol		50	0.40
Chlorine		50	0.45
Ethylene		50	0.83
Ethylene oxide		50	0.78
Formaldehyde (37%)		10	0.55
Glycol		5	0.75
Methanol		60	0.60
Nitric acid		100	0.60

3.1.8 Factored Estimating

Polyethylene (high density)		5	0.65
Propylene		10	0.70
Sulfuric acid		100	0.65
Urea		60	0.70
Refinery units	1000 bbl/day		
Alkylation		10	0.60
Coking (delayed)		10	0.38
Coking (fluid)		10	0.42
Cracking		10	0.70
Distillation (atm.)		100	0.90
Distillation (vac.)		100	0.70
Hydrotreating		10	0.65
Reforming		10	0.60
Polymerization		10	0.58

3.1.8 Factored Estimating

The following techniques are used for both budget and definitive estimates. Building costs can be estimated from: Unit costs (e.g., dollars per square foot) Component costs (e.g., floor, wall, roof), or Knox volumetric ratio concept that process equipment occupies 3.75% of building volume.

The R.S. Means Company publishes many cost data books and a CD-ROM database on building costs that are quite useful for estimating the cost of buildings, building components, and building systems.

3.1.8 Factored Estimating

Costs change continuously because of three factors:

- (1) changing technology,
- (2) changing availability of materials and labor, and
- (3) changing value of the monetary unit—that is, inflation.

Various cost indexes have been devised to keep up with changing costs. **Some frequently used indexes are:**

- Engineering News-Record Indexes: two indexes—construction and building
- Marshall and Swift Equipment Cost Indexes: 47 individual industry indexes plus a composite index representing the installed equipment cost average for these industries
- Nelson-Farrar Refinery Construction Index: based on 40% material and 60% labor costs
- Chemical Engineering Plant Cost Index: based on four major components
- Bureau of Labor Statistics indexes: various indexes compiled from national statistics.

Cost indexes

Use and Limitations of Cost Indexes:

Cost indexes can be used to upgrade a cost for passage of time by a simple proportional relationship. Thus, if a cost was \$50,000 when an index was 229, the cost after the index has risen to 245 would be about \$53,500:

that is

$$C_1 \left(\frac{I_2}{I_1} \right) = C_2 \quad (3.5)$$

where

C_1 =earlier cost

C_2 =new estimate

I_1 =index at earlier cost

I_2 =index at new estimate

- A piece of equipment cost \$120,000 when the Chemical Engineering Plant Cost Index was 400.

Calculate its updated cost if the index has risen to 550. Answer:

Using formula:

$$C_1 \left(\frac{I_2}{I_1} \right) = C_2$$

$$C_2 = C_1 * (I_2/I_1)$$

$$=\$120,000*(550/400)=\$120,000*1.375=\$165,000$$

Lecture 3**Some limitations of cost indexes are:**

- They represent composite data, not complete projects.
- They average data.
- They use various base periods for different indexes.
- Their accuracy for periods greater than 5 years is very limited, at best $\pm 10\%$.
- They are highly inaccurate for periods greater than 10 years and, in such cases, should be used for order-of-magnitude estimates only.
- For imported items, indexes do not reflect currency exchange fluctuations and currency reevaluations. These must be considered separately.

For maximum accuracy, index labor and material costs separately if this breakdown is known. This eliminates possible weighting differences between a composite index and a specific project.

Lecture 4

Equipment Installation Cost Ratios

A ratio cost factor is merely a factor used to multiply one cost factor by another to get another cost. The principle can be used to obtain installed costs from purchased costs. Thus, if F denotes an equipment installation cost ratio, then

$$\text{Installed cost} = (\text{purchase cost})(F)$$

Some equipment installation factors are given in Table 3.7. Note that these factors assume that the foundation, hooks-up, etc. for the equipment are in place, and all that is required is to anchor the equipment in position and connect the required, wiring, piping, controls, etc. AACE (1990) and Humphreys (1996) have provided factors for determining the cost of foundations, structures, buildings, insulation, instruments, electrical requirements, piping, painting, and miscellaneous costs associated with equipment installation. These factors reflect the type of material to be processed (solids, gases, or liquids), the process temperature, and process pressure and are applied to the equipment purchase costs.

Lecture 4

Table 3.7 Distributive Labor Factors for Setting Equipment

Equipment type	Factor ^a	Equipment type	Factor ^a
Absorber	20	Hammermill	25
Ammonia still	20	Heater	20
Ball mill	30	Heat exchanger	20
Blower	35	Knockout drum	15
Briquetting machine (with mixers)	25	Lime leg	15
Centrifuge	20	Methanator (catalytic)	30
Clarifier	15	Mixer	20
Coke cutter	15	Precipitator	25
Coke drum	15	Regenerator (packed)	20
Condenser	20	Retort	30
Conditioner	20	Rotoclone	25
Cooler	20	Screen	20
Crusher	30	Scrubber (water)	15
Cyclone	20	Settler	15

Lecture 4

Decanter	15	Shift Converter	25
Distillation column	30	Splitter	15
Evaporator	20	Storage tank	20
Filter	15	Stripper	20
Fractionator	25	Tank	20
Furnace	30	Vaporizer	20
Gasifier	30	Water scrubber	20

*% of bare equipment purchase cost.

Factors to determine the labor cost to set equipment onto prepared foundations/supports includes costs for rigging, alignment, grouting, making equipment ready for operation, etc. The money allowed is to a great extent a matter of judgement. The following general rules are offered as an aid:

1. Equipment such as hoppers, chutes, etc. (no moving parts) require a setting cost of about 10% of the bare equipment purchased cost.
2. Rotary equipment such as compressors, pumps, fans, etc. require a setting cost of about 25% of the bare equipment purchased cost.
3. Machinery such as conveyors, feeders, etc. require a setting cost about 15% of bare equipment purchased cost.

Lecture 4

Find the recommended distributive labor setting factor for a generic Blender machine using Table 3.7 guidelines.

Answer: Rotary machinery typically defaults to roughly 25% of bare equipment cost

Lecture 4

Historical workhour requirements are more desirable than these factors, if available. The factors do not work well for very large equipment. For example, a \$750,000 compressor does not require 25% of the bare equipment cost to set same on the foundation and to "run-it-in." The listing above provides approximate factors for specific other types of equipment.

Piping costs vary from 1 to 25% of project cost in a process industry facility. Installation costs are three to four times purchase costs for common materials. Order-of-magnitude estimates can be made by use of factors or ratios. Detailed estimates involve quantity take-offs, labor units, and costing.

Lecture 4

Intermediate estimates utilize tables and charts for average piping components. The diameter-inch method is based on:

$$(\text{Number of connections}) \times (\text{pipe diameter}) \times (\text{labor factor})$$

An average is 1.5 workhours per diameter-inch. Ratios are also available for materials other than carbon steel.

Several manuals and references are available for estimating piping costs. Table 3.8 presents estimating data from five different sources for installation of 3/4-inch carbon steel piping. It can be readily seen that not all sources cover all situations; indeed, none of these five give values for all of the situations listed. Even more importantly, the spread of values for the same situation in different sources is extensive.

Lecture 4

Estimating field pipe welds across a new tank farm footprint.

•Practice Problem:

12 pipe connections .

Diameter: 4 inches.

Labor baseline: 1.5 workhours per diameter-inch.

Calculate total labor workhours.

Mathematical Solution:

$$\text{Workhours} = 12 * 4 * 1.5 = 72 * \text{hours}$$

Lecture 4

Table 3.8 Example of Tabular Estimating Data Workhours for Fabrication and Erection of 3/4 inch Carbon Steel Piping

Operation	Source				
	A	B	C	D	E
Butt weld, std wt	1.1	0.8	0.4	—	0.5
Butt weld, X.H.	1.3	0.9	1.2	0.7	0.6
Lin. ft. std. pipe	0.13	0.07	0.2	—	0.19
Lin. ft. X.H. pipe	0.15	0.08	0.25	0.16	0.20
Std. weld ells	2.2	1.6	0.9	2.1	1.3
Std. weld tees	3.3	2.4	1.2	3.0	1.8
X.H. weld ells	2.6	2.7	1.0	2.1	1.5
X.H. weld tees	3.9	2.7	1.5	3.0	2.1
Std. weld reducer	2.0	1.4	0.5	2.1	1.3
X.H. weld reducer	2.2	1.5	0.9	2.1	1.5
150# slip-on flange	1.1	—	0.9	—	0.80
300# slip-on flange	1.2	—	1.0	—	0.90
600# slip-on flange	1.3	—	1.1	—	—
150# weld neck flange	1.1	1.1	0.4	—	0.80
300# weld neck flange	1.2	1.1	1.3	—	0.95
600# weld neck flange	1.3	1.1	1.4	—	—
150# flange bolt-up	—	0.6	1.5	—	—
300# flange bolt-up	—	0.7	1.6	—	—
600# flange bolt-up	—	0.7	—	—	—
Handle 150# valve	—	0.31	1.5	0.8	—
Handle 300# valve	—	—	1.6	—	—
Handle 600# valve	—	—	—	1.1	—

Lecture 4

3.1.9 Codes of Account

The capital-cost estimate should be prepared according to an accounting code system. When the estimate is made in such a format, analysis of the project is simplified, and the estimate then becomes the basis of cost reporting and cost control. Table 3.9 gives an example of various types of work categorized by accounting codes that can be used as an estimating tool.

Lecture 4

Table 3.9 Typical Cost Estimate Codes of Account

Ac No.	Item and description	Estimated cost				
		Workhours	Labor	Subcontracts	Materials	Total
00.00	Excavation					
10.00	Concrete					
20.00	Structural Steel					
30.00	Buildings					
40.00	Machinery and Equipment					
50.00	Piping					
60.00	Electrical					
70.00	Instruments					
80.00	Painting and Scaffolding					
85.00	Insulation					
	DIRECT FIELD COSTS					
90.00	International Expense					
91.00	Temporary Construction Facilities					

Lecture 4

92.00	Constr. Services, Supplies and Expense					
93.00	Field Staff, Subsistence and Expense					
94.00	Craft Benefits, Payroll Burdens and Insur.					
95.10	Equipment Rental					
95.50	Small Tools					
99.40	Field Staff Overhead Costs					
	INDIRECT FIELD COSTS					
	TOTAL FIELD COSTS					
96.00	Home Office Construction					
	Project Engineering					
	Process Engineering					
	Design					
	Purchasing					
	Business Services					
97.00	Office Expense					
98.00	Office Payroll Burdens					
99.50	Office Overhead Costs					
	TOTAL OFFICE COSTS					
	TOTAL FIELD AND OFFICE COSTS					
99.60	Fee					
99.30	Sales Tax					
99.10	Escalation					
99.20	Contingency					
	TOTAL					

Lecture 4

Codes of Account

Example: Tagging a concrete invoice to Code 10.00 to track foundation overruns .

Practice Problem: Identify which standard account code receives an invoice for "Pressure Transmitters"

Answer: Code 70.00 (Instruments)

Lecture 4

3.1.10 Startup Costs

Startup costs are a capital cost item and are the costs of making the transition from construction to operation. They include costs to make changes so the plant can operate at or near design capacity. Startup costs are generally about 10% of the project cost.

3.1.11 Evaluation of the Estimate

After material take-offs and the various estimating techniques previously described have been applied, several other factors must be considered in order to complete the total capital investment estimate. Contingencies should be applied as required to cover undeveloped design, technological unknowns, and estimate omissions. It is very important to understand that contingency is not a “slush fund” to cover scope changes. It is an allowance to cover costs that are known from experience to occur but which can not be determined at the time the estimate is prepared.

Lecture 4

AACE International defines contingency as: An amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, and/or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. Typically estimated using statistical analysis or judgment based on past asset or project experience. Contingency usually excludes: (1) major scope changes such as changes in end product specification, capacities, building sizes, and location of the asset or project (see management reserve), (2) extraordinary events such as major strikes and natural disasters, (3) management reserves, and (4) escalation and currency effects. Some of the items, conditions, or events for which the state, occurrence, and/or effect is uncertain include, but are not limited to, planning and estimating errors and omissions, minor price fluctuations (other than general escalation), design developments and changes within the scope, and variations in market and environmental conditions. Contingency is generally included in most estimates, and is expected to be expended to some extent.

A more succinct definition of contingency is that of the Association of Cost Engineers (UK): Budgetary provision for unforeseen occurrences within a defined project scope

A risk analysis should be prepared to determine what level of contingency is required based on the owner's expectations and requirements.

A properly done risk analysis will identify the amount of contingency required to be added to the estimate to reduce the probability of a cost overrun to whatever level is deemed appropriate by the owner. Finally, escalation rates should be calculated and applied according to labor and material categories for the projected expenditures that will occur in each year of the project schedule. When the estimate has been completed, the estimate accuracy should be verified by an independent check. Validation should be made for major parts of the project and for the overall project. The validation begins by comparing major items (such as design cost, construction management, labor, and material estimated project level percentages) to normal ranges for the company or industry

Contingency

Lecture 4

-A project manager uses contingency funds to pay for a new warehouse building extension.

Explain why this violates AACE rules.

Answer: Contingency excludes major project scope or size changes.

-A water treatment module estimate yields a baseline project cost of \$4,200,000. Following the guidelines in your lecture notes, allocate a standard 10% for startup expenses. Additionally, the client requires a 12% contingency fund for unforeseen occurrences within the project scope .

Your Task: Calculate the dollar amount for the startup cost, the contingency fund, and the total required budget.

Solution:

Startup Cost = \$4,200,000 * 0.10 = \$420,000

Contingency = \$4,200,000 * 0.12 = \$504,000

Total Budget = \$4,200,000 + \$420,000 + \$504,000 = \$5,124,000

Next, major project components such as buildings and piping should be compared to similar projects and processes to ensure that the estimate is in line with actual costs. The final validation step should be to use a similar completed project as a basis, and after accounting for quantitative differences between the project and estimate, determine if this new number is close to the estimated number. These validations help explain how the proposed project is different from or similar to other projects and indicate where a closer evaluation should be made. After these validations are successfully made, the estimate may be judged to be reasonable.



Thank You