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Construction Project Cost Life Cycle

Speed Drill through the Construction Project Cost Life Cycle

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Construction Project Cost Life Cycle

Speed Drill through the Construction Project Cost Life Cycle

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Project Charter			
t Name			
escription			
Manager		Date Approved	
Sponsor		Signature	
Business Case		Expected Goals/Deliverable	
Team Members			
ame	Role		
Risks and Constraints		Milestones	

Planning: Charter

- The **Project Charter** formally authorizes the project and provides authority to apply company resources to project activities.
  - Describes Authority, Participants, Stakeholders, Objective, Scope, Budget and Time (A summary of What the project is and what it isn't)
  - Central to forming the project cost (budget) is work scope and time (schedule)

Planning: Needs

- Work Scope - Need a clear description of the Work:
  - Develop a written narrative for the project and describe its components:
    - Equipment List
    - Electrical
    - Mechanical
    - Automation / Controls

Planning: Needs

- Include a schematic general arrangement drawing to communicate location, size, etc.
- Are the needs of the project expressed and identified? (Project Success Criteria)
- Are company design standards included (SOVs, standards of construction)
- Are lessons learned applied from previous projects?

Planning: Conceptual Budget

- Use Benchmark / Historical cost data to help develop/validate the cost estimate - Based on internal data and input from others (A/E, Contractors, Vendors, Cost Estimators)
- Soft Costs
  - Engineering Fees
  - Owner's Equipment
- Hard Costs – Construction Costs
- Contingencies
- Reserve Funds

Planning: Conceptual Budget

- Cost Breakdown Structures (CBS) & Work Breakdown Structures (WBS)
- Process maps for cost accounting
- Accounting Classification methods
- Factor estimates for project location (local labor cost / availability & time (escalation).

Planning: Conceptual Budget

Class 4 or 5 estimate to help establish the budget

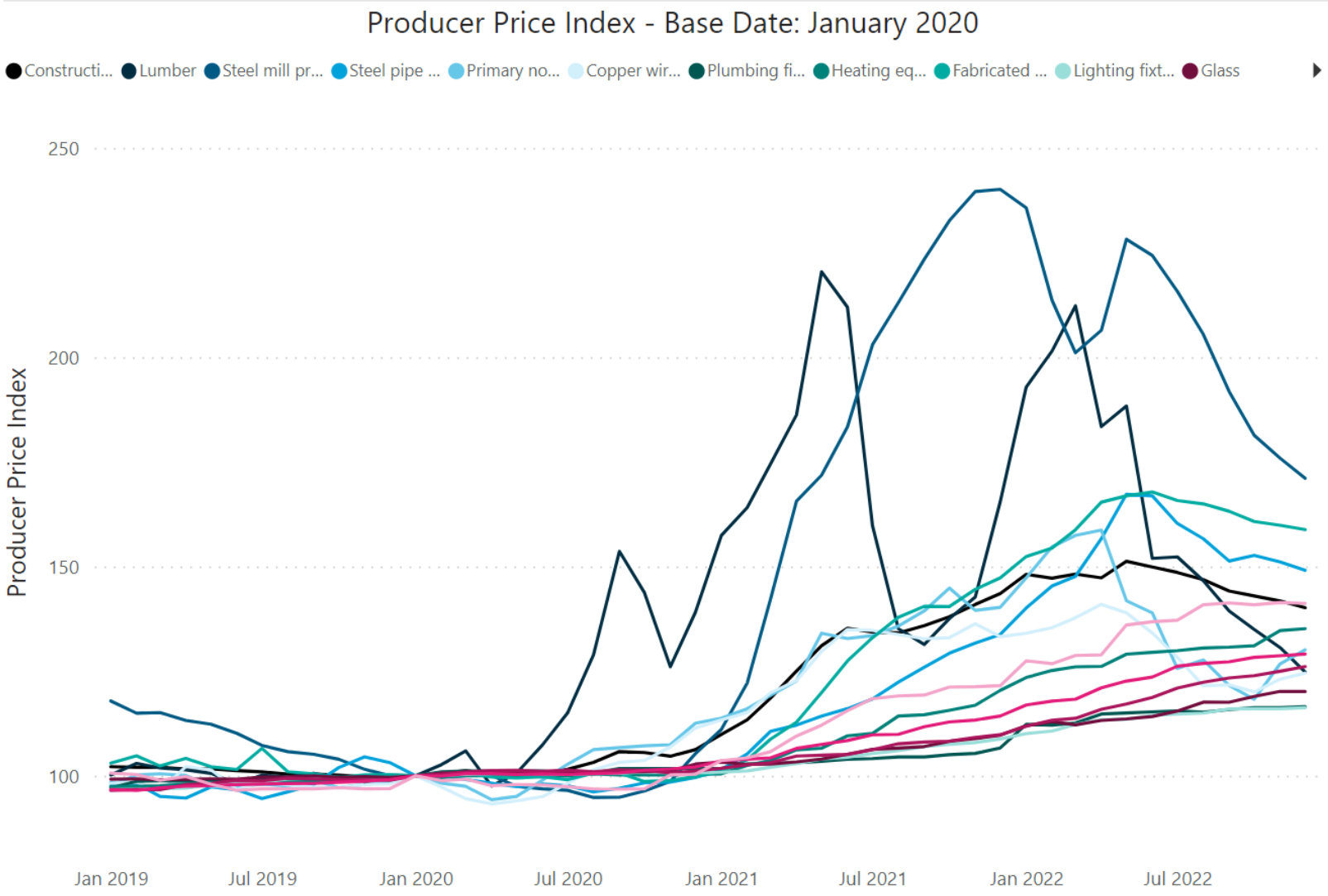
AACE Cost Estimating Classification System

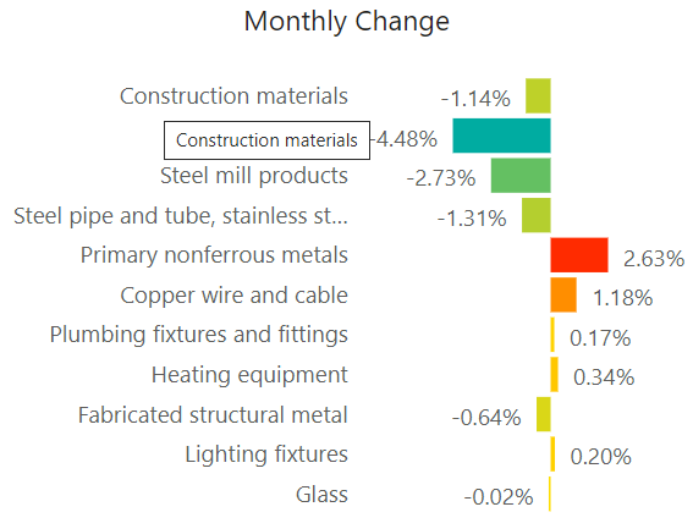
Estimate Class	MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES	END USAGE	METHODOLOGY	DESIGN DEVELOPMENT / ESTIMATING CONTINGENCY		EXPECTED ACCURACY RANGE
	(Expressed as % of complete definition)	(Typical purpose of estimate)	(Typical purpose of estimate)	(Typical estimating method)	(Typical allowance)	(Typical variation in low and high ranges)
Class 5	0% to 2%	Functional area, or concept screening	Program or Rough order of Magnitude (RoM)	SF or m2 factoring, parametric models, judgment, or analogy	20% +	L: -20% to -30% H: +30% to +50%
Class 4	1% to 15%	Schematic design or concept study	Concept or Feasibility	Parametric models, assembly driven models	15% to 20%	L: -10% to -20% H: +20% to +30%
Class 3	10% to 40%	Design development, budget authorization, feasibility	Schematic Design	Semi-detailed unit costs with assemblylevel line items	10% to 15%	L: -5% to -15% H: +10% to +20%
Class 2	30% to 75%	Control or bid/tender, semi-detailed	Design Development	Detailed unit cost with forced detailed take-off	5% to 10%	L: -5% to -10% H: +5% to +15%
Class 1	65% to 100%	Check estimate or pre bid/tender, change order	Construction Documents	Detailed unit cost with detailed take-off	0% to 5%	L: -3% to -5% H: +3% to +10%

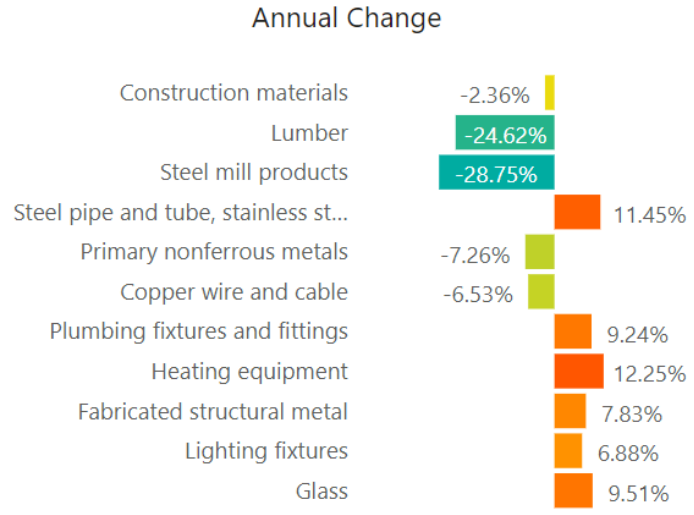
Planning: Further Development of the Scope

- **The Budget & Cost Estimate should be revised as the design is developed:**
  - 30% design, 60% Design, 90% Design / Bidding
    - Benchmark cost at each stage of design 30/60/90
    - Provide variances to plan (costs/scope) at each stage
    - Allows owner to control budget and identify cost drivers
- **Contractor Pricing becomes available:**
  - As packages are awarded, update the budget with contractor pricing
  - Identify any variances to plan (cost/scope)

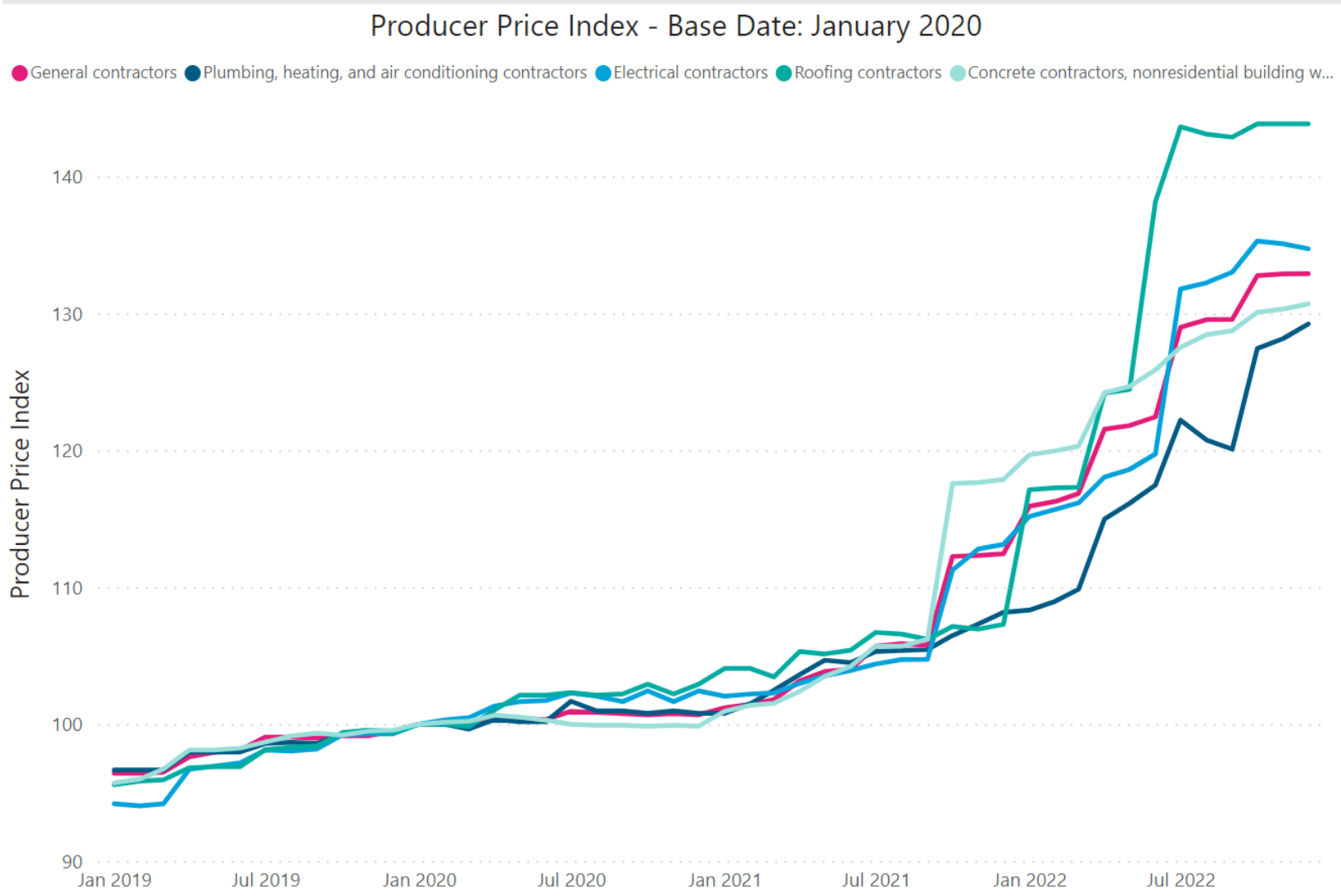
Producer Price Index - Materials

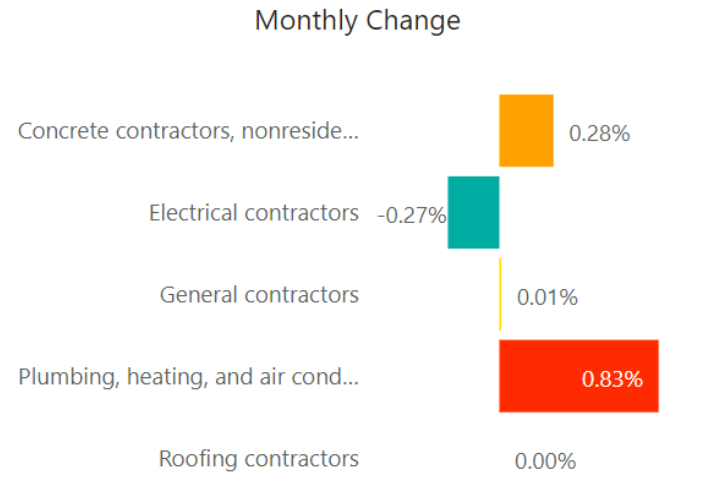


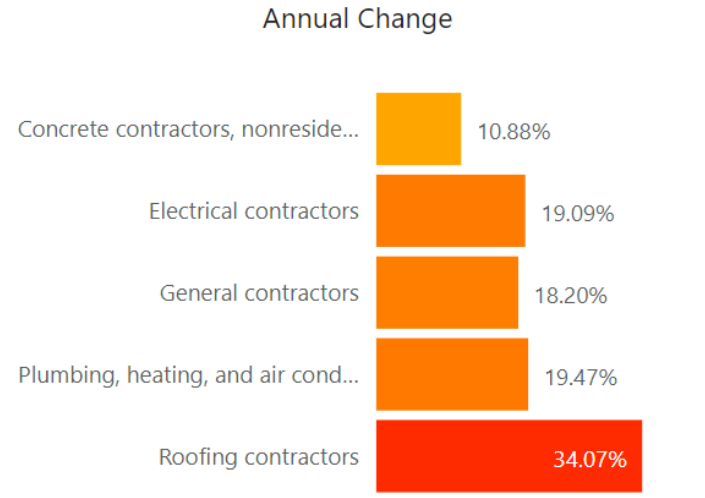




Producer Price Index - Services







Planning: Reporting Requirements

- Understand and Communicate project cost and schedule reporting requirements
  - Schedule of Values
    - Lists a detail breakdown of all construction activities
    - Enable the contractor to invoiced based on physical construction progress
    - Enables the owner to track and measure progress against invoice.

Planning: Monthly Cost Reports

A. Monthly Cost Reports are required from Contractor. Cost Reports shall be based on Commitments and shall also include Expenditures.

   1. Cost Reports shall include the following minimum information for each cost element reported *(additional information may be included at Contractor's option).*

Planning: Monthly Cost Reports

A. Data Cut-Off Date for the Report
B. Original Budget
C. Approved Changes
D. Current Approved Budget
E. Expenditure for the reporting period
F. Total Expenditure to date
G. Total Commitments to date
H. Amount Uncommitted
I. Forecast at Completion (sum of (f), (g) and (h))
J. Variance between Current Approved Budget and Forecast at completion
K. Variance between previous Forecast and current Forecast

Planning: Reporting Requirements

- Reporting Requirements from Contractors need to be included in the contract documents:
  - Monthly cost & schedule reports
  - Cashflow update
  - Payment application & Schedule of Values

Planning: Risks

Risk vs. Contingency

??? Risk = Contingency???

Planning: Risks

Defining Risk

1. An ambiguous term that can mean any of the following:
    - All uncertainty
    - Undesirable outcomes
    - The net impact or effect of uncertainty
2. Probability of an undesirable outcome
3. An uncertain event or condition

Planning: Risks

Defining Contingency

An amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result in, in aggregate, in additional costs.

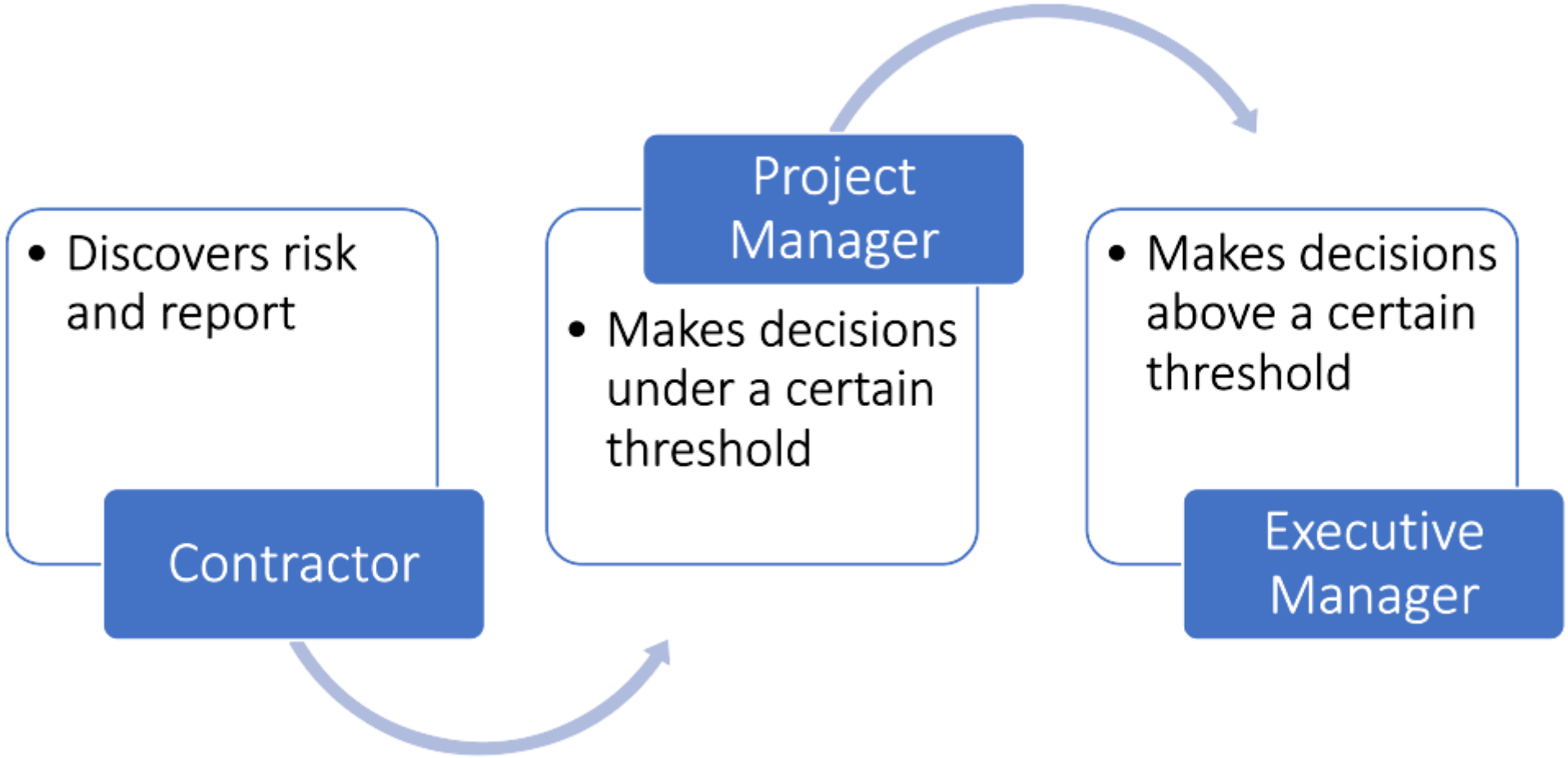
Typically, the amount is estimated using statistical analysis or judgement based on past asset or project experience.

Planning: Risks

Contingency Is Not:

1. Major scope changes
2. Extraordinary events
3. Management reserves
4. Escalation
5. Planning / estimating errors and omissions
6. Minor price fluctuations
7. Variations in environmental conditions

Planning: Risks



Planning: Risks

1. Identifying risk drivers with input from all parties, what are risks?
    - Insufficient Time
    - Incomplete Work Scope
    - Inexperienced Team Members

Planning: Risks

ID	Cause 'As a result of...'	Description 'There is a risk that...'	Total Risk Cost	Type of Occurrenc	Probability of Occurrence	Factor
10	equipment failures		$25,000	Possibility	Possible	3
11	PSSR	additional costs from prestartup safety reivew, need guards, shields, etc..	$0	Chance	Almost certain, will probably arise	
12	additional work to correct deficiencies identified from FSQR reviews		$75,000	Possibility	Unlikely but not impossible	2
13	cost managmeent data discrepencies in financial accounting	costs are not aligned	$75,000	Possibility	Moderately Likely	4

Planning: Constructability

The optimum use
of construction knowledge and
experience in planning, design
/ engineering, procurement, and
field operations to achieve
overall project objectives.

Planning: Constructability

Vague Contract Language:

- "Develop the project budget and schedule with progressive detail."
- "Ensure Engineering Design Service hours/costs definition can be tracked."
- "Review the contractor's schedule for accuracy"

Planning: Constructability

Planning: Construction Delivery Method

- **Design, Bid, Build**
  - More cost certainty (Design / Scope is at / near 100%)
- **Design, negotiated GC w/GMP (CM-at Risk)**
  - Involves the constructor during the design / scope phase
- **Design Build**
  - Single contract for engineering and construction contract
- **CM as Agent**
  - Multiple prime contractors directly with the owner. Owner team or Owner's CM manages the project as a general contractor would

Planning: Procurement - Bidding

- Develop bid form aligned with the cost estimate structure (CBS/WBS)
  - Pre bid meetings – review bid information with contractors to ensure alignment on scope and schedule
- Procurement (compare bids to estimate and understand gaps)
  - Post bid meetings – review bids to close gaps on assumptions and provide additional clarification where needed
- Negotiate/Award bid(s) & understand:
  - Unit rates
  - Labor rates
  - Allowances
  - Contingencies
  - Escalation factors

Construction → Initiation of Changes

- Owner changes
- Contractor changes
- A/E changes
- AHJ changes

Construction → Change

- Communicate Change Management Process
  - Meet regularly with the engineer and contractor(s) & work together
- Understand the Cause of the Change:
  - Design modifications
  - Errors and omissions
  - Changes to means and methods
  - Changed conditions
  - Additional / reduced work scope
  - Work sequencing
  - Weather

Construction → Changes

- Work the change management process
  - Changes are time sensitive and need prompt rejection/approval
- Meet regularly with project stakeholders to determine:
  - Contract review for Entitlement, pricing, quantities, etc.
  - Mitigation (impacts to both the budget and schedule)
  - Review and understand
    - Process flows (AACE RP 100R-19 has a great process example)

Planning → Tools & Systems

There is no out of the box solution that meets all project and internal stakeholder requirements.

Cost Management Tools:

- Excel (most common)
- Multiple different tools and systems
  - Ecosys, etc.…

Construction: Cost Management

Cost Breakdown Structure	CBS Name	Budget
C-011512.2.01.01	Pumps	$$$$
C-011512.2.01.02.01	Filters	$$$$
C-011512.2.01.04.01	Misc Agitators & Mixers	$$$$
C-011512.2.01.07.01	Conveyors	$$$$
C-011512.2.01.07.02	Rotary Valves/ Feeders	$$$$
C-011512.2.01.09	Slide Gates	$$$$
C-011512.2.01.10.01	Plate Heat Exchanger	$$$$

Planning: Tools & Systems

Estimate at Completion (EAC) = MAX (Purchase Orders, Invoices, Budgets)

Project Closeout: Claims

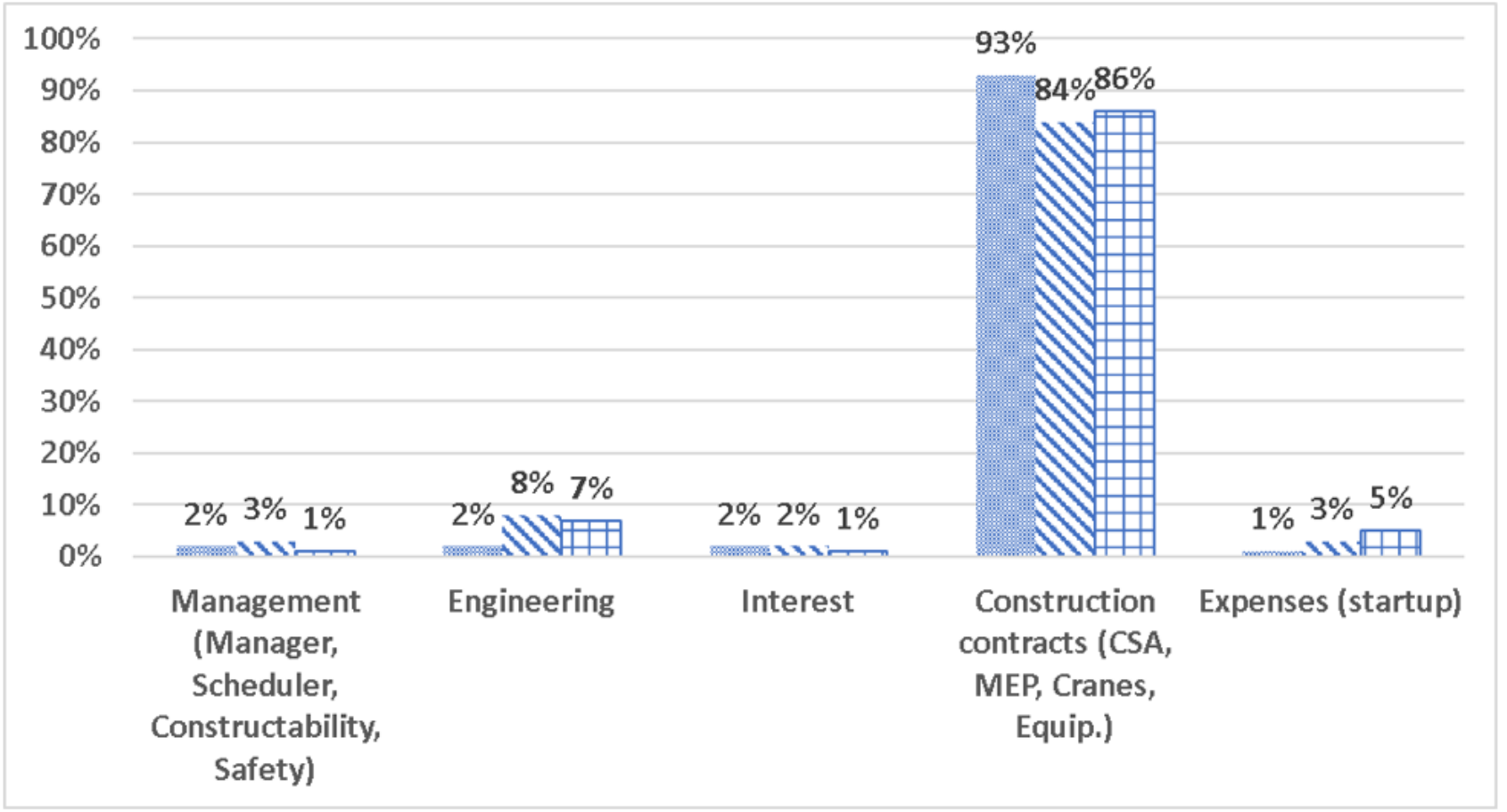
- Claims settlement
- Schedule forensics / delay analysis
- Contract Liquidated indirect costs (LIC) and Liquidated Damages (LD's) resolution

Project Closeout: Remaining Funds

- Project Closeout → Remaining Funds

Project Closeout: Capital Interest

Project Closeout: Overview



Summary: Project Cost Lifecycle

- Plan Ahead
- Understand the Project Scope
- Define and Communicate Requirements
- Understand and Manage Risk
- Actively Manage Changes

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Speed Drill Through the Construction Project Cost Lifecycle Post Survey

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