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Estimating Cost Contingency Guidelines

V1.0

Version Control

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Subject: Estimating Cost Contingency Guidelines

1.0 Purpose:

- The purpose of this document is to provide a standardized approach to estimating cost contingency.

2.0 Introduction:

- When estimating the cost for a project, program, product or other item or investment, there is always uncertainty as to the precise content of all items in the estimate. These uncertainties are risks to the project, commonly referred to as "known-unknowns" -- known but not quantified cost. The estimated costs of the known-unknowns are referred to by cost estimators as **cost contingency**.
- It is project management best practice to always factor cost contingency into an estimate to help mitigate the risks related to the "known-unknowns" in a project/program.
- These contingency guidelines provide a standard approach to determine, track and update project/program contingency, and improve the understanding of contingency in the project and cost management process.
- The approach outlined here can be applied to the various types of cost estimates that cover the entire life cycle of a project/program, from feasibility study through execution to closeout.
- It is important to note that contingency should be estimated with diligence, and requires input and cost awareness among the project team.

3.0 Terms and Definitions:

3.1 Contingency:

- The Association for the Advancement of Cost Engineering (AACE) has defined contingency as *"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 aggregate, in additional costs."*
- Contingency cost items cover, but are not limited to:
 - o Minor planning/schedule and estimating errors and omissions.
 - o Minor price fluctuations (other than general escalation).
 - o Design developments and changes that may result from incomplete design within the project scope and variations in market and environmental conditions.

3.2 Contingency Exclusions & Misuses:

- **Exclusion** - Contingency usually does not include:
 - o Major changes in scope.
 - o Major changes in schedule.

- Unforeseeable major events, such as strikes, riot, crime or natural disasters Acts-of-God such as flooding, hurricane, earthquakes, etc.
- **Misuses** to avoid:
 - Contingency is not to be used to avoid making an accurate assessment of the expected cost.
 - Contingency is not to be considered a pool of money available for distribution with little accountability required, because the issues causing project overruns become hidden, and therefore cannot be readily dealt with. This also removes the ability to see opportunities.
 - Never build in hidden contingency in the base estimate, commonly referred to as a “Fat” base estimate. This may result in an excessive application of contingency.

4.0 Key Principles of the Cost Contingency Estimating Approach

- The cost contingency estimating approach outlined in this document is based on the following key principles:
 - Two characteristics drive uncertainty/risk when estimating the Contingency allowance:
 - Clarity of Scope - Maturity level of project definition. (Also referred to as “Scope”)
 - Confidence of Cost - Quality of the base cost estimate without contingency (Also referred to as “Cost”)
 - As the confidence level of the project definition and cost quality is increased through the project lifecycle, the Contingency is decreased as risk/uncertainty is reduced
- These principles are described in more detail below.

4.1 Maturity Level of Project Definition (“Scope”):

- This primary characteristic is based upon percent complete of the project definition.
- The level of project definition defines maturity or the extent and types of input information and deliverables available to the estimating process. Such inputs include: project scope definition, requirements documents, specifications, project plans, drawings, calculations, lessons learned from past projects, reconnaissance data, and other information that must be developed to define the project.

4.2 Quality of the Base Cost Estimate Without Contingency (“Cost”):

- The cost is dependent on the quality of the reference cost data and history, and other key items as follow:
 - The Complexity of the project; is the project low risk- repetitive past practice scope or high risk “first of a kind”, new non-familiar technology, retro-fit work.
 - Reference cost estimating data; is the data low risk current pricing i.e. quotes, past bid prices and the price range of bidders, actual past expenditures, representative samples, verified empirical (actual observed) field data such as man-hours and schedule or high risk with little cost history data available, no independent take-off, use of 2nd or 3rd party information without verification.
 - Is constructability, schedule and site/location restrictions, environmental and safety addressed?

- Quality of assumptions used in preparing the estimate based on the level of detail. Was the assumption the low risk- worst case scenario used or higher risk- best case scenario.
- Experience and skill level of the estimator and Estimating techniques employed.
- Time and level of effort budgeted to prepare the estimate.

4.3 Maturity Level of Project Definition by Estimate Class

- The AACE has established five cost estimate classes, which describe the level of project definition.
- The class designations are labeled: Class 1, 2, 3, 4 and 5.
 - Class 5 is based upon the lowest level of project definition.
 - Class 1 is closest to full definition maturity.
- Refer to Estimate Classes and Characteristics **Table 1** below.
 - *Note: To identify the percent % maturity of a project, see “Reference 1” at the end of this guideline, which shows a typical Matrix of Maturity Level of Project Definition Deliverables*

Table 1		Estimate Classes and Characteristics		
		<i>Primary Characteristic</i>	<i>Secondary Characteristic</i>	<i>Secondary Characteristic</i>
Life Cycle	Estimate Class	Maturity Level of Project Definition Deliverables Expressed as % complete definition	End usage Typical purpose of estimate	Methodology Typical Estimating Method
Exploration Conception	Class 5	0% to 2%	Concept Screening	Square Foot cost factoring, Cost relationships, Judgment
Evaluation Concept Definition to Basic Engineering	Class 4	1% to 15%	Study or Feasibility	Statistical Analysis of other projects, Assembly driven models
	Class 3	10% to 40%	Budget, Authorization or Cost Control	Semi-detailed unit costs with assembly level detail on line items
Execution Detail Engineering to Procurement & Construction	Class 2	30% to 75%	Appropriation of funds and control cost limits	Detailed unit cost with areas still undefined using assumed level of detail takeoff (forced detail)
	Class 1	65% to 100%	Check Estimate or Bid	Detailed unit cost with detailed take-off

5.0 Approach to Estimating Contingency:

- **Step 1→** For Each estimate or line item evaluate the quality and maturity of the **“SCOPE”** and select a **“Confidence Grade”** that is the best fit from **Table 2** below.
 - The Confidence Grade is a basic letter grade A, B, C, D & X with + & -.
 - The Confidence Grade is linked to a Contingency Percentage % on **Table 2**.
- **Step 2→** For Each estimate or line item evaluate the quality of the **“COST”** and select a **“Confidence Grade”** from **Table 3** below.
- **Step 3→** For Each estimate or line item; calculate the **Average** of the **“SCOPE”** and **“COST”** Contingency%.
 - This will be your Contingency Allowance to be added the Estimate.
 - See **Sample 1 - Basic Contingency Application** below and note the Allowance for Contingency is **13%**
- For large multi-discipline projects with various levels of project definition and cost data, apply the same Steps 1, 2 & 3. Then multiply the Average from Step 3 x the estimate line item % portion or (% Cost Distribution) of the total estimate cost to calculate a Weighted (WTD) Average Contingency % Allowance.
 - See **Sample 2- multi-discipline project Weighted Contingency %**. and note the Allowance for Contingency is **18%**
- **Note:** ZERO “0” Contingency should only be used when no uncertainty or risk of added cost exist, such as actuals, delivery completed with no re-work possible.

6.0 Updating and Tracking the Base Estimate and Contingency:

6.1 Update Base Estimate / Cost Contingency

- As the projects/programs advance in the maturity level of definition (**SCOPE**) and the quality of the base cost estimate (**COST**), the confidence level increases as uncertainties/risks are mitigated. Therefore, the base estimate and the associated contingency should be updated to reflect these advancements.
- As a guide, a recommended practice for re-evaluating and updating the estimate and the associated contingency is every 3 months (i.e., quarterly). This can vary dependent on the advancement of the project/program, and the governance processes in place.
 - For example, the Common projects, which are governed by the Strategic Alignment Committee, follow a quarterly cost projection revision process. Other portfolios are updated on a more frequent basis.
- As a result of these updates, contingency that can be confidently categorized as “unused” or “no longer needed” should be released over time, as more information is known and risk level decreases.
- The updates provide data for better informed business decisions for budgets, funding and overall cost management.

6.2 Track Cost Contingency

- The tracking of Base Estimate and the associated contingency changes must be documented and maintained through the life cycle of the project/program.
- This tracking provides transparency and lessons learned for future projects/programs.

Table 2		Estimate Classes and Characteristics			CONTINGENCY BASED ON CLARITY OF SCOPE	
		Primary Characteristic	Secondary Characteristic	Secondary Characteristic		
Life Cycle	Estimate Class	Maturity Level of Project Definition Deliverables Expressed as % complete definition	End usage Typical purpose of estimate	Methodology Typical Estimating Method	Confidence Grade	% Contingency
Exploration Conception	Class 5	0% to 2%	Concept Screening	Square Foot cost factoring, Cost relationships, Judgment	X-	40%
					X	35%
Evaluation Concept Definition to Basic Engineering	Class 4	1% to 15%	Study or Feasibility	Statistical Analysis of other projects, Assembly driven models	D	30%
	Class 3	10% to 40%	Budget, Authorization or Cost Control	Semi-detailed unit costs with assembly level detail on line items	C	25%
Execution Detail Engineering to Procurement & Construction	Class 2	30% to 75%	Appropriation of funds and control cost limits	Detailed unit cost with areas still undefined using assumed level of detail takeoff (forced detail)	B-	20%
					B	15%
	Class 1	65% to 100%	Check Estimate or Bid	Detailed unit cost with detailed take-off	A-	10%
					A	5%
					A+	2%

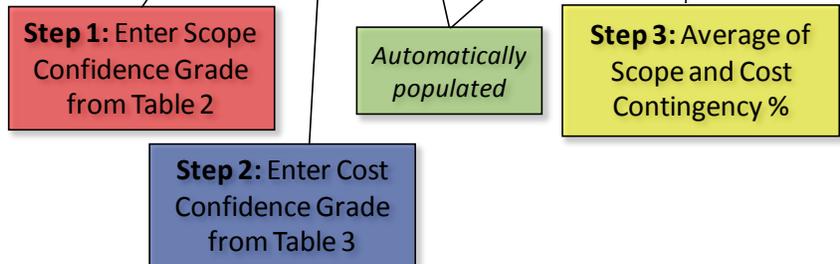
Used in Sample 1 on page 8.

Table 3	Quality of the base cost estimate (without contingency)					CONTINGENCY BASED ON CONFIDENCE OF COST	
	Key Items to consider when evaluating the Quality of the cost estimate						
Risk Level	Complexity of Project/Program	Reference cost estimating data	1- Constructability (access), 2- Schedule, 3- Location restrictions, 4- Environmental & 5-Safety Addressed?	Quality of assumptions	Estimator Experience & Time to develop estimate.	Confidence Grade	% Contingency
Highest	"First of a Kind", new non-familiar technology, Multi-Engineering disciplined, custom development	None or very limited Reference cost data	0 of 5 items addressed	Assumed best case	Very Limited experience, few hours to complete	X-	40%
			1 of 5 items addressed			X	35%
Higher	Multi-Engineering disciplined high level of coordination required, retro-fit work	Some data not exact fit	2 of 5 items addressed	Assumed mostly best case some most likely case	Limited experience, a day to complete	D	30%
High	Retro-fit work, Mod. old existing	Some data not exact fit, but can correlate, not current	3 of 5 items addressed	Assumed even split best case & most likely case	Limited experience, a few days to complete	C	25%
Medium	New Repetitive past practice, some Retro-fit	Various Data, not current	4 of 5 items addressed	Assumed Most likely case	Experienced, a few days to complete	B-	20%
		Various Data some recent		Fewer assumptions more defined	Experienced, a week to complete	B	15%
Low	New Repetitive past practice	Some Quotes 1 yr old	5 of 5 items addressed	Defined few assumptions	Experienced, weeks to complete	A-	10%
Lower		Current Quotes		Defined no assumptions		A	5%
Lowest		Quotes and Actual data		Defined actual no assumptions		A+	2%

Used in Sample 1 on page 8

Sample 1

Sample 1 - Basic Contingency Application	Estimate Total	SCOPE	COST	SCOPE	COST	APPLY
		Confidence Grade	Confidence Grade	Contingency Score %	Contingency Score %	Contingency Average % R/O
Concrete						
Cast-In-Place Concrete - Building Concrete	7,489,071					
Concrete - Encasements	1,059,443					
Plant Precast Structural Concrete (MHS)	116,900					
Total Concrete	\$8,665,414	B	A-	15%	10%	13%



Sample 2

Sample 2- multi-discipline project Weighted Contingency %.

Location: NYC				SCOPE	COST	SCOPE	COST	Final	
Description: New Area Substation				Confidence Grade	Confidence Grade	Contingency Score %	Contingency Score %	Contingency	Contingency
Date:	5/9/2012	Base Estimate		Project Definition	Base Cost Estimate	Project Definition	Base Cost Estimate	Average %	Contingency Weighted (WTD). Average
Section	Title	Total	% Cost Dist	Grade	Estimate	Definition	Estimate	Average %	Note
Div. 1	General & Special Conditions								
	General/Special Conditions/Clas	5,741,181							
	Scaffolding for Concrete Walls	320,356							
	Special Conditions-Removals/P	304,732							
	Total General & Special Con	\$6,366,269	12.7%	B-	B	20%	15%	17.5%	2.2153%
Div. 2	Existing Conditions								
	Civil Demolition	198,505							
	Power Equip Removal & Dispos	163,525							
	Total Existing Conditions	\$362,030	0.7%	B-	B	20%	15%	17.5%	0.1260%
Div. 3	Concrete								
	Cast-In-Place Concrete - Buildi	7,489,071							
	Concrete - Encasements	1,059,443							
	Plant Precast Structural Concre	116,900							
	Total Concrete	\$8,665,414	17.2%	B	A-	15%	10%	12.5%	2.1538%
Div. 4	Masonry								
	Unit Masonry	2,503,188							
	Masonry Repairs	80,488							
	Total Masonry	\$2,583,676	5.1%	C	A-	25%	10%	17.5%	0.8991%
Div. 5	Metals								
	Structural Steel	3,406,933							
	Metal Decking	620,684							
	Light Gauge Framing (Incl w/G								
	Misc Metals	1,030,860							
	Steel Metal Pan Stairs etc..	415,139							
	Total Metals	\$5,473,615	10.9%	C	A-	25%	10%	17.5%	1.9047%
Div. 6	Wood & Plastics								
	Carpentry and Millwork	43,239							
	Fiberglass Grating	4,650							
	Total Wood & Plastics	\$47,889	0.1%	D	B	30%	15%	22.5%	0.0214%
Div. 7	Thermal & Moisture Protection								
	Sheet Membrane Waterproofing	6,893							
	Crystalline Waterproofing	3,862							
	Insulation	428,549							
	Fire Resistive Duct Wrap (Incl								
	Metal Wall Siding	291,674							
	Sprayed-Applied Fireproofing	309,836							
	Fire-stopping	210,728							
	Sealant	77,721							
	Total Thermal & Moisture Pr	\$1,329,262	2.6%	C	B	25%	15%	20.0%	0.5286%
Div. 8	Openings								
	Hollow Metal Doors, Frames &	499,226							
	Roll-Up Doors and Fire Shutters	465,079							
	Aluminum Windows	735,090							
	Aluminum Louvers	860,880							
	Total Openings	\$2,560,275	5.1%	A-	A-	10%	10%	10.0%	0.5091%
Div. 9	Finishes								
	Gypsum Board	23,434							
	Ceramic Tile	51,890							
	Acoustic Ceiling	53,127							
	Resilient Flooring and Base	18,202							
	Resinous Flooring	131,328							
	Resilient Tile Flooring	9,140							
	Access Flooring	108,625							
	Painting	293,813							
	Total Finishes	\$689,559	1.4%	D	A-	30%	10%	20.0%	0.2742%
Div. 10	Specialties								
	Toilet Partitions and Accessorie	22,305							
	Wire Mesh Partitions (NOT US								
	Lockers and Benches	7,186							
	Total Specialties	\$29,491	0.1%	B	B	15%	15%	15.0%	0.0088%
Div. 11	Equipment								
	Control Room Console (NOT U								
	Unit Kitchen (INCL IN PLUMB)								
	Appliances	501							
	Total Equipment	\$501	0.001%	C	B	25%	15%	20.0%	0.0002%

Reference 1: Typical Matrix of Maturity Level of Project Definition Deliverables

- **None (blank):** Development of the deliverable has not begun.
- **Started (S):** Work on the deliverable has begun. Development is typically limited to sketches, rough outlines, markup of existing drawings, assumed engineering/design data, or similar levels of early completion.
- **Preliminary (P):** Work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- **Complete (C):** The deliverable has been reviewed and approved as appropriate.

	ESTIMATE CLASSIFICATION				
	Class 5	Class 4	Class 3	Class 2	Class 1
MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES	0% to 2%	1% to 15%	10% to 40%	30% to 75%	65% to 100%
General Project Data:					
Project General Scope Description	Assumed	Preliminary	Defined	Defined	Defined
Project Location	General	Approximate	Specific	Specific	Specific
Total Building Area - SF or m2	Preliminary	Preliminary	Defined	Specific	Specific
Functional Space Requirements - SF or m2	Started	Preliminary	Defined	Specific	Specific
No. of Building Stories	Preliminary	Preliminary	Defined	Specific	Specific
Exterior Closure Description	Assumed	Preliminary	Defined	Defined	Defined
Finishes Descriptions and Requirements	Assumed	Preliminary	Defined	Defined	Defined
Building Code or Standards Requirement	Assumed	Preliminary	Defined	Defined	Defined
Mechanical Systems and Total Capacity	Preliminary	Defined	Defined	Defined	Defined
Electrical Capacity	Preliminary	Defined	Defined	Defined	Defined
Communication Systems	Preliminary	Defined	Defined	Defined	Defined
Fire Protection and Life Safety Requirements	Assumed	Preliminary	Defined	Defined	Defined
Security System	Assumed	Preliminary	Defined	Defined	Defined
Anti-Terrorism Force Protection Requirements	Preliminary	Defined	Defined	Defined	Defined
LEED Certification Level	Preliminary	Defined	Defined	Defined	Defined
Soils and Hydrology Report	None	Preliminary	Defined	Defined	Defined
Integrated Project Plan	None	Preliminary	Defined	Defined	Defined
Project Master Schedule	Approximate	Defined	Defined	Defined	Defined
Work Breakdown Structure	Preliminary	Defined	Defined	Defined	Defined
Project Code of Accounts	Preliminary	Defined	Defined	Defined	Defined
Contracting Strategy	Assumed	Preliminary	Defined	Defined	Defined
Escalation Strategy and Basis	Assumed	Preliminary	Defined	Defined	Defined
Design Deliverables:					
Building Codes and Standards Drawing	P	P	C	C	C
Fire Protection and Life Safety Requirements	P	P	C	C	C
Site Plan	P	P	C	C	C

Existing Site Plan	P	P	C	C	C
Demolition Plan and/or Drawings	S	P	P	C	C
Utility Plan and/or Drawings	S	P	P	C	C
Site Electrical Plan and/or Drawings	S	P	P	C	C
Site Lighting Plan and/or Drawings	S	S/P	P	C	C
Site Communications Plan and/or Drawings	S	S/P	P	C	C
Erosion Control Plan and/or Drawings	S	S/P	P	C	C
Stormwater Plan and/or Drawings	S	S/P	P	C	C
Landscaping Plan and/or Drawings	S	S/P	P	C	C
Exterior Elevations		P	P	C	C
Interior Elevations			S	P	C
Interior Section Views		P	P	C	C
Partition or Wall Types	S	S/P	S/P	C	C
Finish Schedule	S	S/P	P	C	C
Door Schedules	S	S/P	P	P	C
Window Schedules	S	S/P	P	P	C
Restroom Schedules	S	S/P	P	P	C
Furniture Plans, Schedules or Drawings	S	S/P	P	C	C
Signage Drawings and Schedules	S	S/P	P	P	C
Fire Protection Plan, Drawings and Details	S	S/P	P	C	C
Room Layout Plan or Drawings	S/P	P	C	C	C
Foundation Plan or Drawings	S	S/P	P	C	C
Foundation Sections and Details		S/P	P	C	C
Roof Plan, Drawings and Details		S/P	P	C	C
Material, Equipment and Systems Specifications		S/P	P	C	C
Building envelope/moisture protection/flashing details		S/P	P	C	C
Mechanical Plan or Drawings		P	P	C	C
Mechanical Details		S/P	P	P	C
Mechanical Schedules		S/P	P	P	C
Flow Control Diagrams		S/P	P	P	C
Plumbing Plan or Drawings		P	P	C	C