Standard Operating Procedure for Reviewing and Documenting Construction Cost Estimates

San Antonio District, May 2025

Contents

Introduction

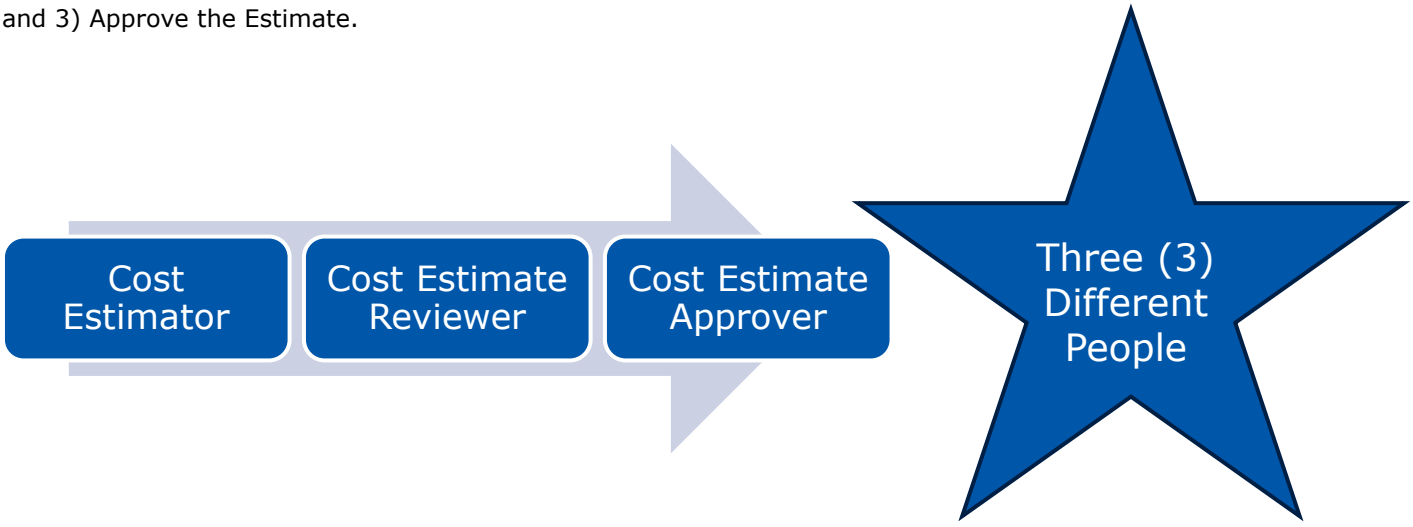
The intent of this Standard Operating Procedure (SOP) is to define and document procedures for the review of construction estimates, how they will be documented and where they will be stored for the San Antonio District (SAT). The following topics are included, but not limited, in this document:

- Typical Estimate Documentation
  - Cost Estimate Development
  - Cost Estimate Assumptions
  - Cost Estimate Review
- Maintenance and Retention of Estimate Documentation
  - Cost Estimate Maintenance
  - Cost Estimate Retention
  - Cost Estimate Document Storage

Construction Cost Estimates

Developing and maintaining construction cost estimates are critical to the overall success of a project. This guidance document does not go in depth into the formal process of developing construction cost estimates. The TPD – Project & Portfolio Management Construction Cost Estimating Guide should be utilized to develop the construction cost estimate. This document provides guidance to ensure the appropriate steps are taken to ensure the cost estimates are appropriately developed, documented, retained and maintained consistently for SAT.

There are multiple individuals who are involved in the development, review and maintenance of cost estimates. For each construction cost estimate developed in the San Antonio District, **it is required to have a minimum of three different people** to 1) Develop the Estimate, 2) Review the Estimate and 3) Approve the Estimate.



Cost Estimate Development and Documentation

Responsible Person: Cost Estimator

1. **Develops Cost Estimate.** The estimate must be developed with the TxDOT Design Division (DES) Estimate Quantity Summary tool. https://www.txdot.gov/business/resources/design-tools-training/estimate-quantity-summary.html
    - For all Milestones
    - Must print a .pdf of the estimate at each milestone to preserve the estimate
2. **Uses Standardized File naming convention**
    - CCCSSSJJJ_XX%_CostEstimate.xlsm
    - CCCSSSJJJ_XX%_CostEstimate.pdf
    - "XX%" designates the milestone submittal (ex: 30%, 60%, 90%, 95%, 100%)
3. **Stores/Retains the file in ProjectWise**
    - CCCCSSJJJ → 4 – Design → Estimates
4. **For each bid item:**
    - Provides and documents quantity calculations
        - Design Files, Calculation Worksheets, and/or design file screenshots justifying quantities
    - Provides and documents unit price determination, including assumptions
        - DES Estimate Quantity Summary Tool
    - Provides justification for prices not within average low bid prices
        - DES Estimate Quantity Summary Tool
    - Notes any unique items or decisions made for selected unit prices
        - DES Estimate Quantity Summary Tool

Responsible Person: Cost Estimate Reviewer

1. **Reviews the Cost Estimate & Completes the SAT District Estimate Review Checklist**
    - For all Milestones
    - Reference Appendix A and/or https://www.txdot.gov/about/districts/san-antonio-district/standards-forms.html for the checklist
    - Names the form: CCCSSSJJJ_XX%_Cost Estimate Review Checklist.pdf
        - "XX%" designates the milestone submittal (ex: 30%, 60%, 90%, 95%, 100%)
    - Proof of Review (redlines) must be provided and stored in the same location
        - File Name: CCCCSSJJJ_XX%_CostEstimate_REVIEW.pdf
            - XX%" designates the milestone submittal (ex: 30%, 60%, 90%, 95%, 100%)
2. **Submits the Cost Estimate and completed SAT District Estimate Review Checklist to Cost Estimate Approver**
    - Retains all original file naming conventions

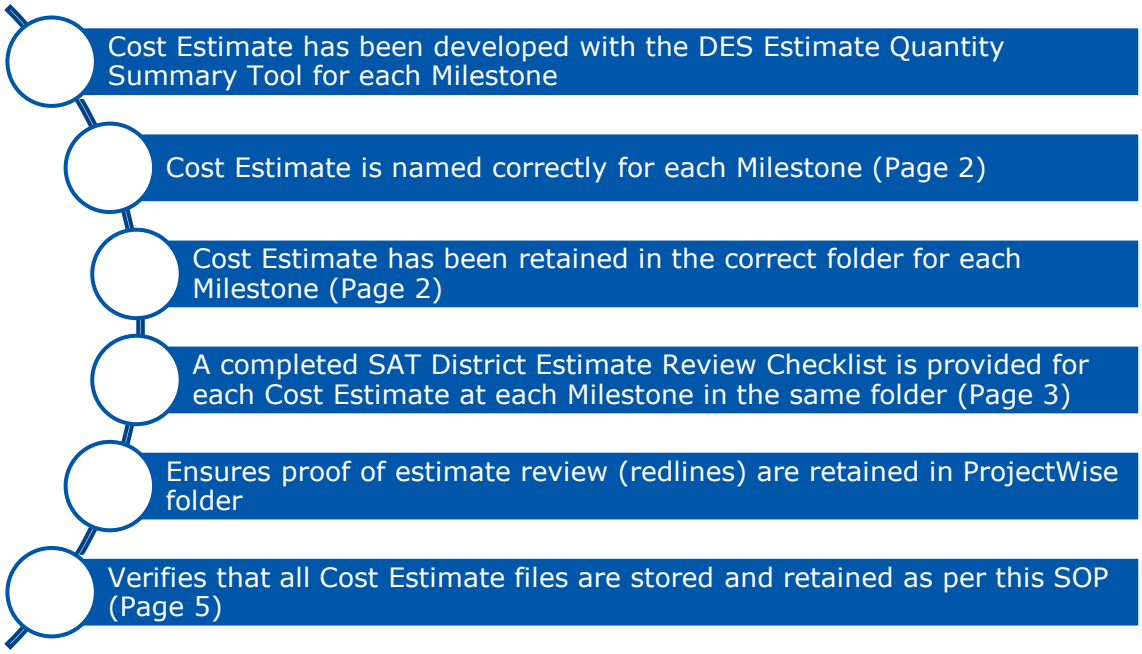
Responsible Person: Cost Estimate Approver

1. **Receives and reviews the Cost Estimate and SAT Estimate Review Checklist from the Estimate Reviewer**
    - Ensures both the Cost Estimate and Estimate Review Checklist are accurate and complete
    - Ensures both the Cost Estimate and Estimate Review Checklists are documented and stored per the process
    - Ensures Proof of Review is available
2. **Communicates the approval with the Cost Estimator and Cost Estimate Reviewer.**

Cost Estimate Maintenance, Retention/Storage Documentation

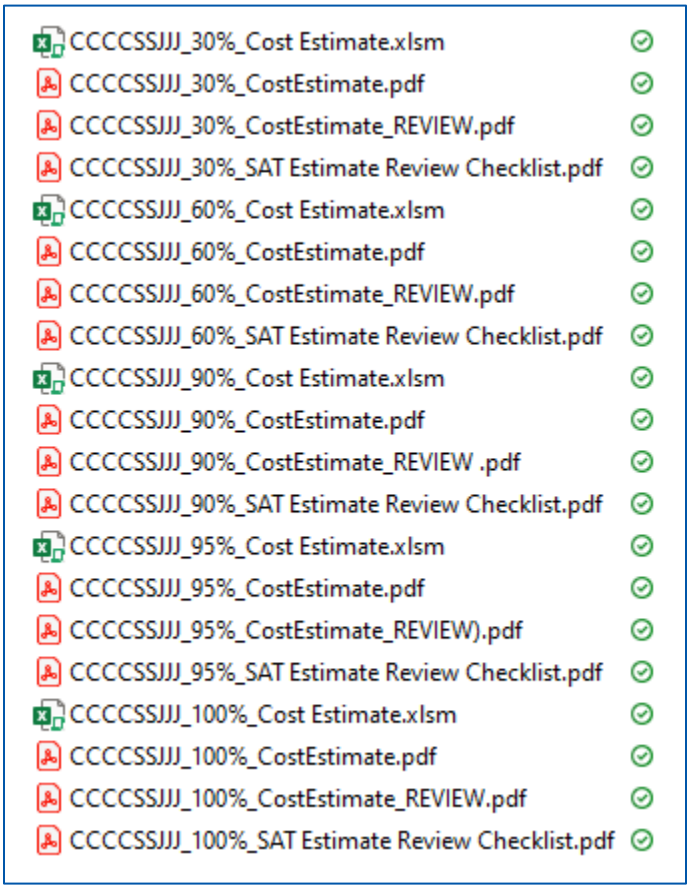
Responsible Person: TxDOT Project Manager

The **TxDOT Project Manager is responsible** for ensuring all steps provided in this document and shown below is adhered to in order to appropriately document and retain construction cost estimates for the San Antonio District.



Final Folder Documentation Example

All files shown below are **required** to be in the appropriate ProjectWise folder. In the San Antonio District, not all projects will have a 90% milestone.



APPENDICES

Appendix A: SAT Estimate Review Checklist

Appendix B: TPD – Project & Portfolio Management Construction Cost Estimating Guide with DES Appendices A, B, & C

(Rev. 04/25)

SAT DISTRICT ESTIMATE REVIEW CHECKLIST

Name of Estimator	
Date of Estimate	
Date Tableau Data Downloaded	
Project Milestone	
Name of reviewer	
Date of Review	
Name of Approver	
Date of Approval	

1. Is the DES Estimate Quantity Summary tool being used?

☐ Yes ☐ No ☐ N/A Comments

2. Is the estimate named per the S.O.P.?

☐ Yes ☐ No ☐ N/A Comments

3. Is the estimate stored in the correct Projectwise folder per the S.O.P.?

☐ Yes ☐ No ☐ N/A Comments

4. Is proper documentation of quantity calculations available? List where in comments.

☐ Yes ☐ No ☐ N/A Comments

5. Is proper documentation of unit price determination available? List where in comments.

☐ Yes ☐ No ☐ N/A Comments

6. Are the reviewer's comments documented by redlines attached to this document?

☐ Yes ☐ No ☐ N/A Comments

7. Is all proposed work in plans accounted for in the estimate?

a. Earthwork	☐ Yes	☐ No	☐ N/A	j. Pavement marking	☐ Yes	☐ No	☐ N/A
b. Pavement structure	☐ Yes	☐ No	☐ N/A	k. Bike/ped improvements	☐ Yes	☐ No	☐ N/A
c. Removals	☐ Yes	☐ No	☐ N/A	l. Erosion control	☐ Yes	☐ No	☐ N/A
d. Retaining walls	☐ Yes	☐ No	☐ N/A	m. Landscaping	☐ Yes	☐ No	☐ N/A
e. Drainage structures	☐ Yes	☐ No	☐ N/A	n. Joint bid utility work	☐ Yes	☐ No	☐ N/A
f. Bridge structures	☐ Yes	☐ No	☐ N/A	o. Mobilization	☐ Yes	☐ No	☐ N/A
g. Signals	☐ Yes	☐ No	☐ N/A	p. Barricades/traffic control	☐ Yes	☐ No	☐ N/A
h. Illumination	☐ Yes	☐ No	☐ N/A	q. Contingency %			
i. Signing	☐ Yes	☐ No	☐ N/A	r. Other	☐ Yes	☐ No	☐ N/A

8. Do the unit prices properly incorporate the following?

				Comments
a. Geographic considerations	☐ Yes	☐ No	☐ N/A	
b. Quantity considerations	☐ Yes	☐ No	☐ N/A	
c. Material availability	☐ Yes	☐ No	☐ N/A	
d. Expedited work schedule	☐ Yes	☐ No	☐ N/A	
e. Site specific constraints	☐ Yes	☐ No	☐ N/A	
f. Lumpsum/subsidiary items	☐ Yes	☐ No	☐ N/A	

Assumptions

Introduction

This Reference Guide provides instruction for the creation and management of construction cost estimates for roadway and bridge projects. This guide provides a framework of recognized and accepted processes and tools that each TxDOT district can adapt and use as appropriate for their situation.

The Reference Guide was developed to:

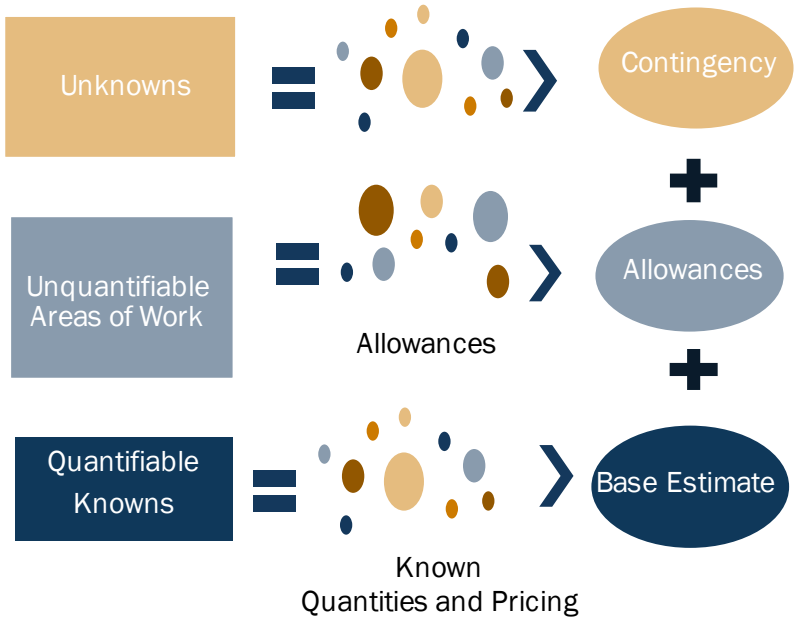
- *Achieve accuracy, accountability, and consistency in cost estimation, and cost management efforts during the Planning and Programming, Preliminary Design, and Design phases of project development as well as in consrtuction*
- *Acknowledge that uncertainty exists in all projects and how to account for and present the impact of those uncertainties within a cost estimate*
- *Define a process framework relating to cost estimating, and cost estimate management that can be consistently applied to ensure that TxDOT is thorough and transparent in the development of roadway and bridge projects*
- *Follow a framework based on national research and recommended best practices from other state departments of transportation and federal guidelines*
- *Include discussions and tools to address projects of different complexity/rigor levels*

Components of a Cost Estimate:

Base Estimate: Will be developed and documented by the districts, engineering judgement will be applied. They will be developed and based on the best information known at the time and the phase of the project.

Allowances: Items known to be required on the project but at a particular project development stage are not yet known or quantifiable.

Contingencies: Costs for unknowns and uncertainties should be documented and included in the engineer's estimate.



Risk and Contingency:

Cost estimation considers uncertainties and related risks early and often in the project development process. Management uses identified risks and uncertainties to structure procedures that mitigate, eliminate, or account for the possible variation in the outcomes.

- *Contingency is needed in an estimate to account for the second type of known unknowns.*
- *Risk management practices and tools can assist in the calculation of appropriate contingencies to account for these costs.*

By their very nature, risks have a probability of occurring and if they do occur, will impact the project in a positive or negative way. A Project Contingency is used to capture the cost impacts associated with risks.

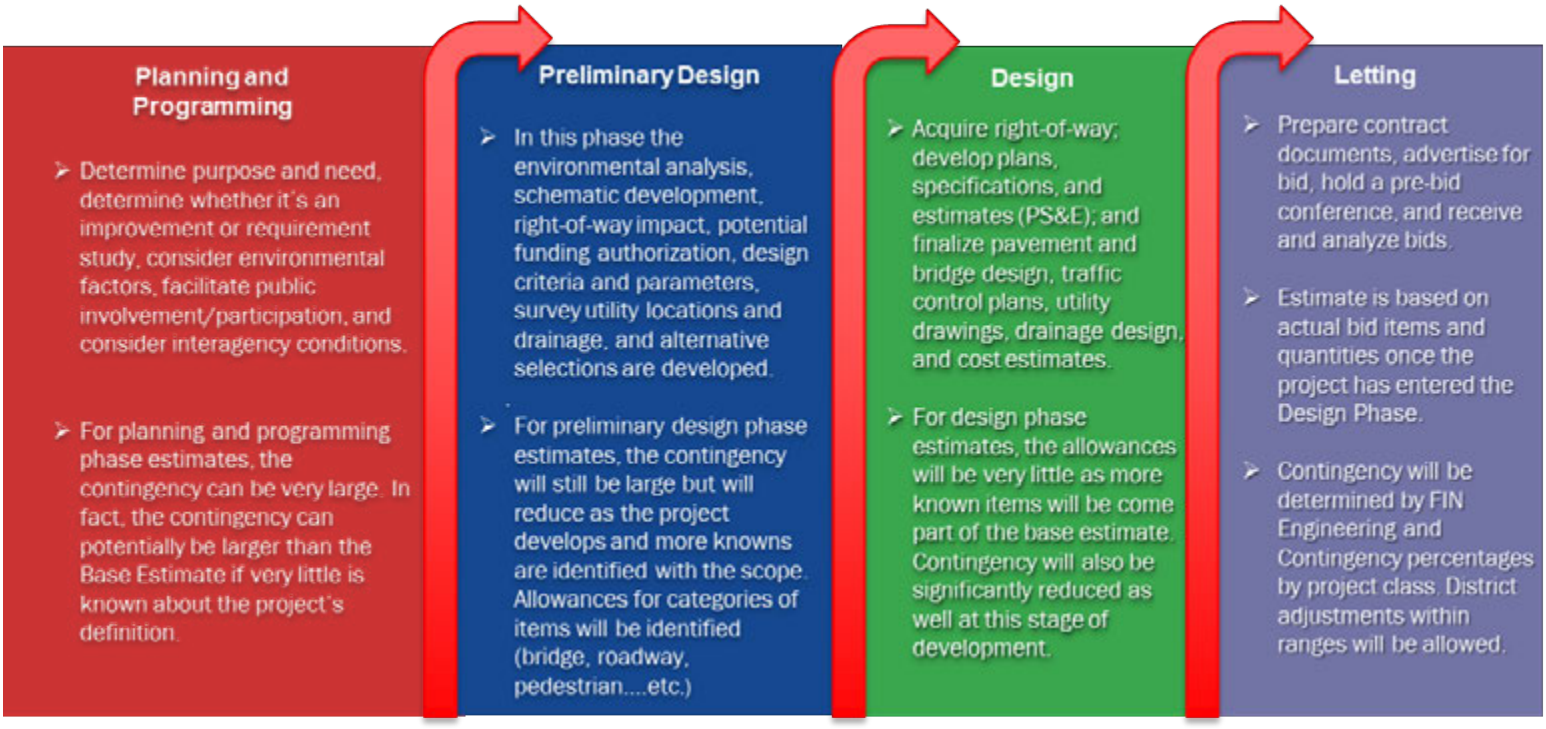
Contingency funds are incorporated into a cost estimate to account for the risks associated with the project.

Contingency is meant to protect the project against cost increases that may arise when risks become reality, not to cover overruns, inflation, or allow for scope creep.

Project Development Phases:

Project Phase: *The current project phase is used to identify necessary steps in developing the cost estimate. As shown in Figure 1: Project Development Process Phases, each phase builds on the previous phase's information. Items listed for the Planning and Programming Phase are also used in the Preliminary Design and Design Phases.*

Figure 1: Project Development Process Phases



Construction Cost Estimate Development and Project Phase:

Project Cost Maturity is how the project cost develops over time with the project, the more developed a project is, the cost estimate becomes more defined. Until the final engineer's estimate just prior to letting, an estimate is compiled with various levels of known and unknown information. *Figure 2: Project Cost Maturity, combines the concept of accounting for the Base Estimate and Contingencies separately throughout project development as well as the idea that an estimate can fluctuate due to unknowns, risks, and variability. Notice how contingency reduces as the design matures because assumptions are resolved, risks are managed, and fewer unknowns remain in the estimate. As a project moves through the development process, the proportion of "knowns" to "unknowns" change so that, ideally, the project goes to letting with little contingency.*

- *An estimate at any given point is made up of a base estimate, allowances, and contingency component. As the project progresses in development, the contingency and allowance amounts are expected to decrease because the project information is refined. The base estimate increases as some of the project contingency and allowances are realized and included as part of the base estimate.*

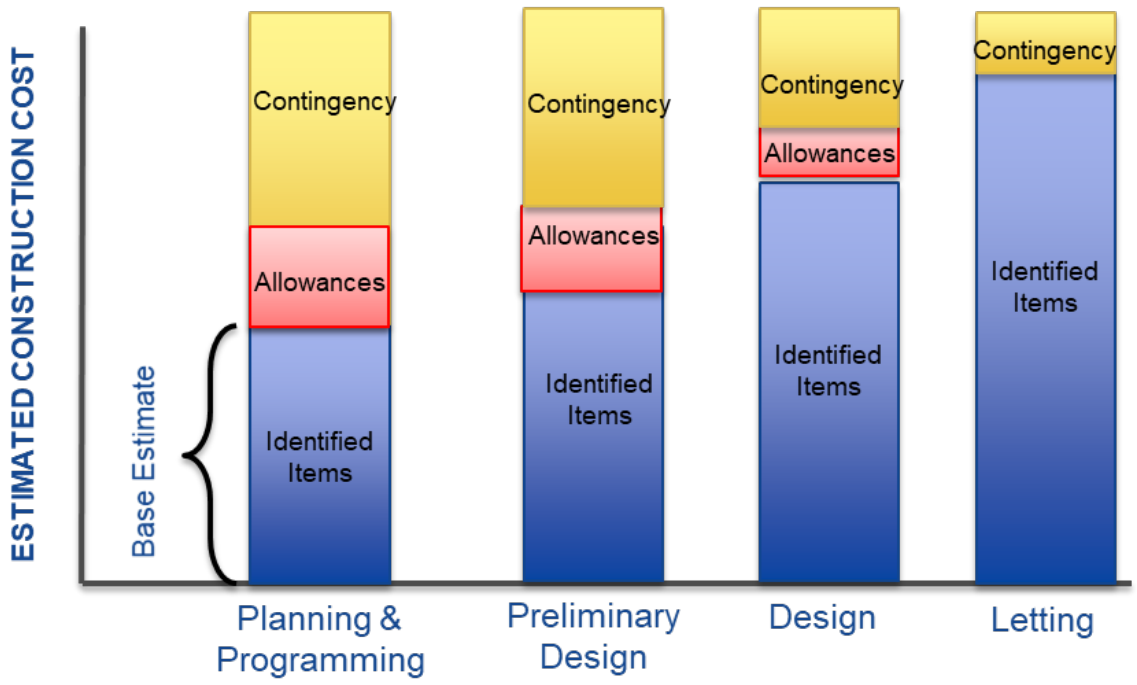


Figure 2 : Project Cost Maturity

Cost Estimating Framework

The framework for the cost estimating process presented provides a systematic approach for determining anticipated project costs, as shown in Figure 3: Cost Estimating Framework. The description of the steps are generic and applicable to the cost estimating process across each development phase. These steps convey the idea of a structured approach to cost estimation. The operational manner in which the steps are performed will vary depending on project development phase. (The level of completeness in the project scope and refinement of project design will drive these variations.)

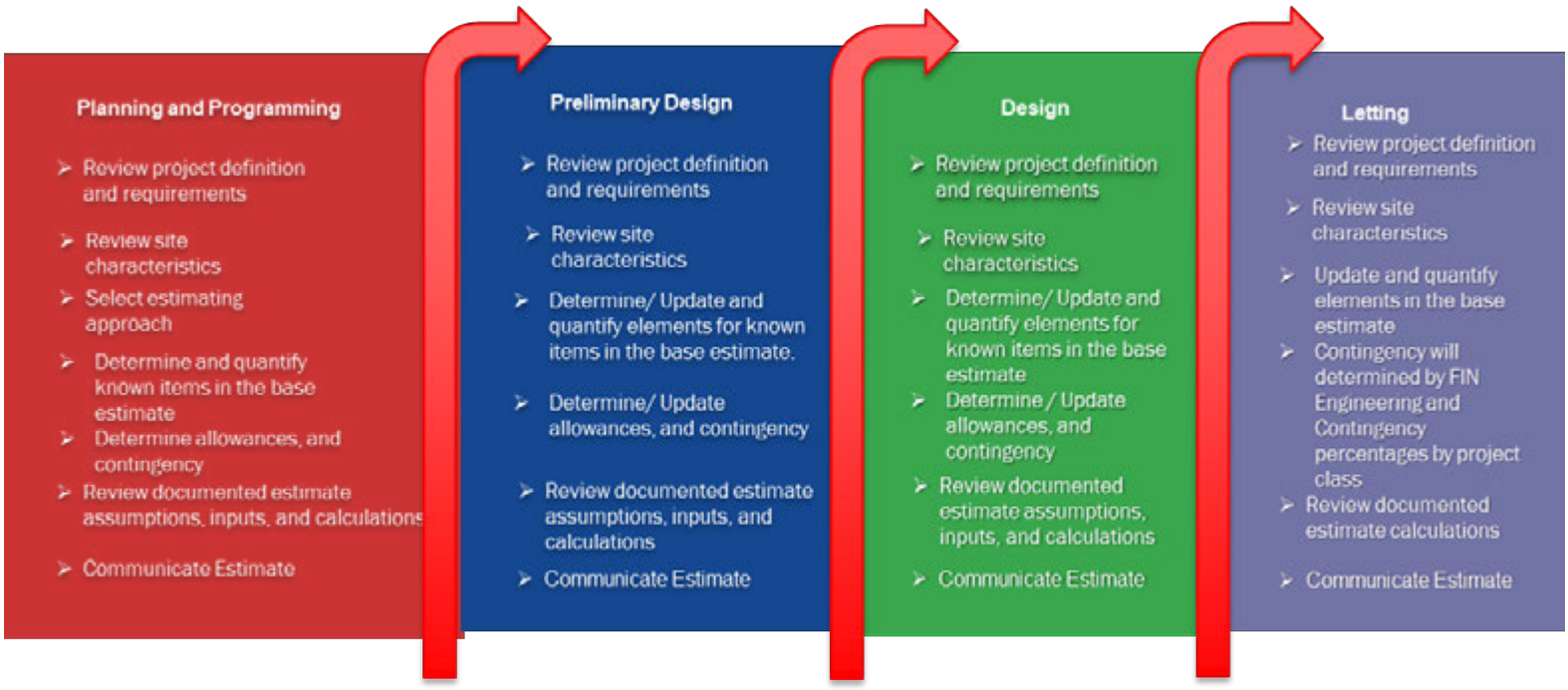


Figure 3: Cost Estimating Framework

Developing a Cost Estimate:

Key Activities	PURPOSE
A. Review project definition and requirements.	Collect and review relevant project information to gain knowledge of the project in order to identify the proper items and inputs that will serve as an accurate basis of the estimate and its updates.
B. Review site characteristics.	Helps the Estimator gain knowledge get a holistic perspective as well as, insight, and a better understanding of the project site characteristics and their impact on cost. **Examples of cost increase** –work adjacent to historic structures, environmentally sensitive or hazardous sites, and limited work space. Site Constraints that require a large amount of equipment or if the contractor will need to mobilize several times. **Example of cost decrease**- green field consruction, limited traffic control devices.
C. Determine and quantify estimate elements for known items for the base estimate.	Determine the categories and quantities for the known items in the base estimate at the time. Be certain to state and document any assumptions in determing pricing and quantities at the time. • Three point estimating will be done for determing the base estimate. Three point estimating is the utilization of three estimates (current or historical). This method will assist to improve the accuracy of a single-point estimate by considering price variability and takes into account uncertainty and risk, by evaluating the optimistic, most lilkely, and pessimistic cost outcomes. This provides an estimator to tailor the estimate costs to their location and have a more holistic approach to the pricing. Three point estimating defines a cost range for an activity's durations as well as item's quantities. • Appendix A details how to conduct a three point estimate.
D. Determine areas of known work but are not yet quantifiable for the allowances.	Develop/update allowances for each category of work. Document any assumptions that are made for the project in determing the cost of the allowancs at that time. Allowances can be determined for category of items for the project such as: roadway, pedestrian, safety items….etc. based on the appropriate price unit. Appendix B will go into detail on determining allowances. For example: If a bridge is part of the project requirements, all bridge elements will not be individually detailed. The bridge cost can be estimated based on square foot of bridge deck area or based on historical bids from similar types of bridges.

Every project, regardless of size or complexity, needs an up-to-date Project Estimate File. Based on the maturing of project design and/or the amount of time that has passed since the previous estimate, a completely new estimate may be warranted.

Document all assumptions and changes. Documentation of assumptions and methods for identifying and accounting for allowances and contingency within an estimate is critical so contingency is not double-counted.

Getting input from others avoids unnecessary or inaccurate assumptions.

Design alternatives need a documented base estimate, list of assumptions, and a list of considered risks for which the contingency is derived. This information should be consistent with the level of information available at the time of each estimate.

E. Determine contingency based on the project's stage of development.	Develop/update contingency based on the project phase of development. Document any assumptions that are made for the project in determing the contingency at that time and project phase. Contingency funds are incorporated into a cost estimate to account for the risks associated with the project. Contingency is meant to protect the project against cost increases that may arise when risks become reality. Contingency is not for overruns, inflation, or allow for scope creep. There are different methods in determinging the contingency for a project. 1. **Letting Contingency** – A set percentage applied to the overall project cost to determine the Total Construction Cost Estimate. Contingency will default to Financial Management Division Engineering and Contingency data sheet (examples include safety contingency, change orders, etc.) based on project class. 2. **Risk Based Contingency**- An element of uncertainty is inherent in any cost estimate. In order to account for as much of the uncertainty associated with a project cost estimate as is practical, project teams will use a risk analysis to estimate the contingency amount to be included in the Total Construction Cost Estimate. Appendix C will go into detail in determing a Risk Based Contingency.
F Review documented estimate assumptions, inputs, and calculations.	State the decisions and assumptions used in the estimate for communication to management in a structured format. Accumulate and organize all details, summaries, and assumptions made in completing the estimate.
G. Communicate Estimate	Estimates can be communicated and shared with confidence to internal and external stakeholders. This will reduce perception of cost increase as a project develops. Discussion of project cost and needs can be communicated in a confident and transparent manner with the public and our planning partners.

When assessing a risk and determining a contingency amount to carry in the estimate, base the analysis and calculations on the information you know at the time. You can revise and update as the project design matures.

For risks that are frequently identified for similar projects, it may be more efficient to develop some standard documentation to explain and support the risk analysis and determined contingency value. Additionally, districts and divisions may determine ways to programmatically respond to common, recurring risks.

Appendix A : Three Point Estimating

Utilization of three estimates is to define an approximate range for an activity's durations, quantities, and costs to improve upon the accuracy of a single-point estimate by considering uncertainty and risk. Concept originated from the Program Evaluation and Review Technique (PERT).

- PERT Beta Distribution Estimation Equation:

$$E = \frac{(O + 4M + P)}{6}$$

- Most Likely (M): Most realistic expectations of activity durations/quantities/costs
- Optimistic (O): Best-case scenario of activity durations/quantities/costs
- Pessimistic (P): Worst-case scenario of activity durations/quantities/costs

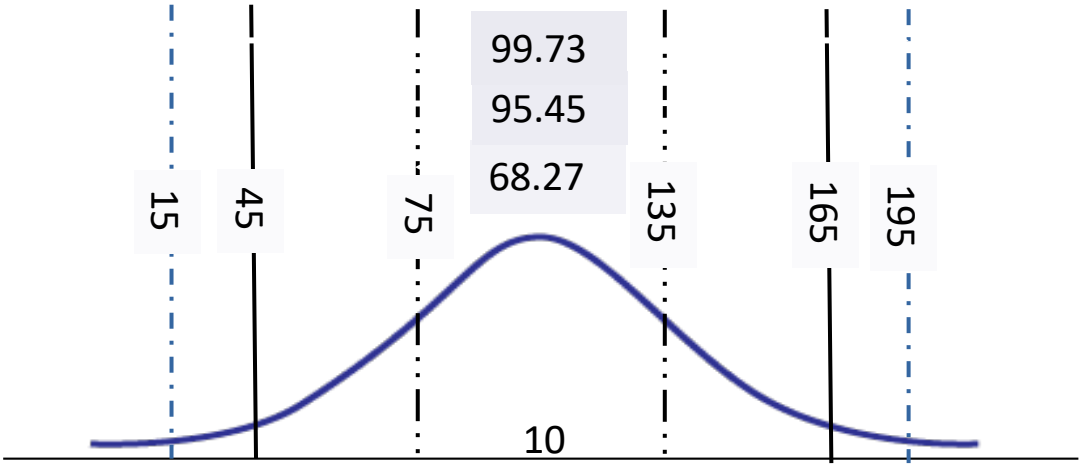
Standard Deviation σ: A quantity calculated to indicate the extent of deviation from the mean.

$$\sigma = \frac{(P - O)}{6}$$

- Optimistic (O): Best-case scenario of activity durations/quantities/costs
- Pessimistic (P): Worst-case scenario of activity durations/quantities/costs

Confidence Level: The probability that the value for the activity falls within a specified range of values.

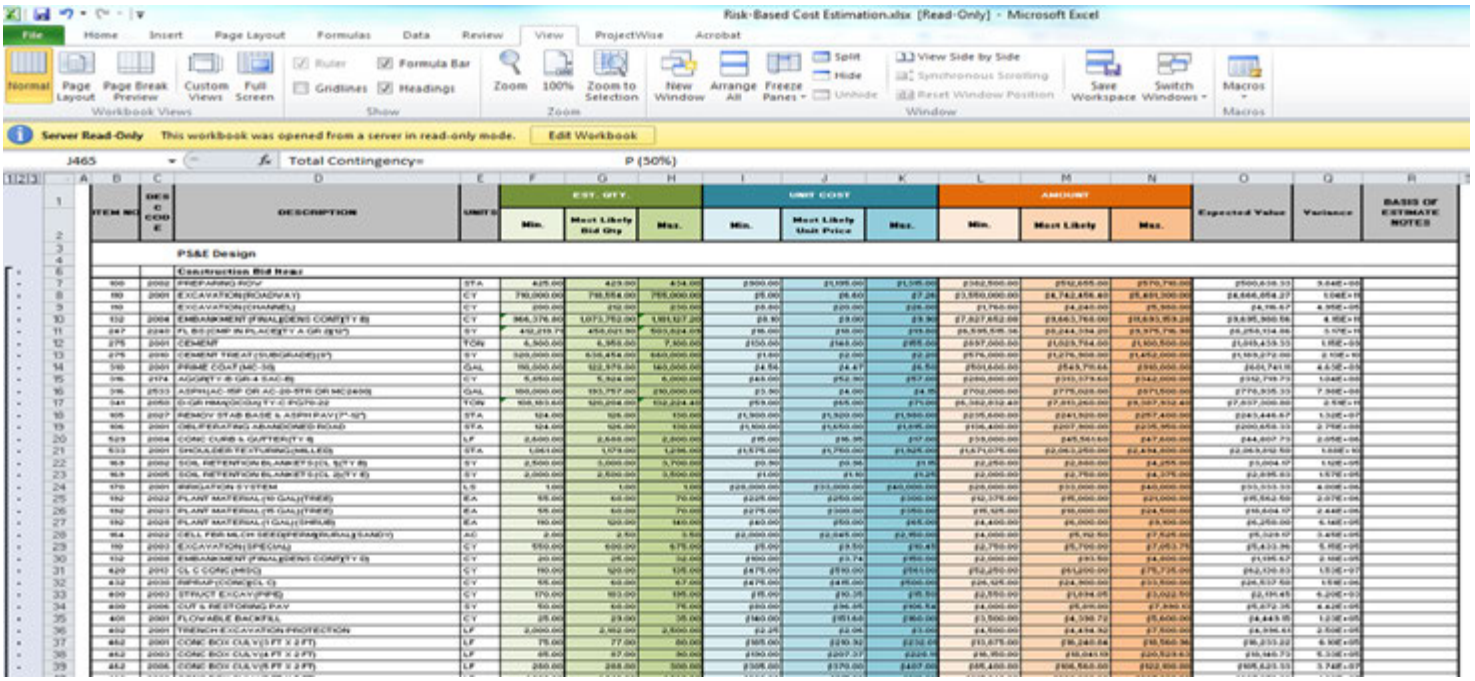
- 68% confidence level = +/- 1 σ
- 90% confidence level = +/- 1.645 σ
- 95% confidence level = +/- 2 σ
- 99.7% confidence level = +/- 3



A tool to assist with the calulations and determination of the estimate confidence level is available at the following link:
https://txdot.sharepoint.com/:x:/r/sites/office-epmo/intranet/_layouts/15/Doc.aspx?sourcedoc=%7B802E7503-E4A7-4E44-9D37-D940CD7DEC5B%7D&file=Risk-Based%20Cost%20Estimation.xlsx&action=default&mobileredirect=true

The following image is a snap shot of the tool that will assit with the three point estimating and determining the base estimate. In this tool the known and identified items will be be entered at each phase of the project's development. There are tabs for the each stage to document the estimate.

Note: Considerations in determining the bid prices : geographic location, quantity of item, item availability, type of qty pricing such as lump sum.



Appendix B : Determining Allowances:

Allowances are for the known items that you have that are not yet quantifiable. For example, it is known that a project will need some traffic items (pavement markers, signs, lighting); however those items are not just yet quantified. We will apply the same concept of the most likely, optimistic outcome, and pessimistic outcome as we did in the Three Point for the Base Estimate.

The same tool that is used to determine the Base Estimate also has a section for determining the allowances as well. Below is a snap shot of the tool being utlilzed to determine the allowancs for a project.

Tool to determine allowances: https://txdot.sharepoint.com/:x:/r/sites/office-epmo/intranet/_layouts/15/Doc.aspx?sourcedoc=%7B802E7503-E4A7-4E44-9D37-D940CD7DEC5B%7D&file=Risk-Based%20Cost%20Estimation.xlsx&action=default&mobileredirect=true

ITEM	DESCRIPTION	UNITS	EST. QTY.			UNIT COST			AMOUNT			Expected Value
			Min.	Most Likely	Max.	Min.	Most Likely	Max.	Min.	Most Likely	Max.	
	Additional Items (Allowances)											
	TRAFFIC ITEMS (PAV MRKS, SIGNS, LIGHTING)	LS	0.035	0.05	0.065	$29,537,209.98	$42,196,014.25	$54,854,818.53	$1,033,802.35	$2,109,800.71	$3,565,563.20	$2,173,094.73
	TEMPORARY EROSION CONTROL	LS	0.035	0.05	0.065	$29,537,209.98	$42,196,014.25	$54,854,818.53	$1,033,802.35	$2,109,800.71	$3,565,563.20	$2,173,094.73
	TCP (BARRICADES, SIGNS, AND TRAFFIC HANDLING)	LS	0.070	0.10	0.130	$29,537,209.98	$42,196,014.25	$54,854,818.53	$2,067,604.70	$4,219,601.43	$7,131,126.41	$4,346,189.47
	DRAINAGE MISCELLANEOUS	LS	0.035	0.05	0.065	$29,537,209.98	$42,196,014.25	$54,854,818.53	$1,033,802.35	$2,109,800.71	$3,565,563.20	$2,173,094.73
	MOBILIZATION	LS	0.100	0.10	0.100	$29,537,209.98	$42,196,014.25	$54,854,818.53	$2,953,721.00	$4,219,601.43	$5,485,481.85	$4,219,601.43
	ADDITIONAL WIDENING SCOPE NOT INCLIDED YET - US 54 COLLECTOR LANES AND IH-10 EB RAMP	LS	0.700	1.00	1.300	$1,400,000.00	$2,000,000.00	$2,600,000.00	$980,000.00	$2,000,000.00	$3,380,000.00	$2,060,000.00
	ROW ACQUISITION - PARCELS	EA	3.000	4.00	6.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	UTILITIES - NUMBER OF RELOCATIONS	EA	5.000	5.00	10.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
											Sub-Total (Allowances)	$17,145,075.09
											SUB-TOTAL	$59,341,089.35

Figure 1 : Determining Allowances

Appendix C : Risk Based Contingency

Evaluating the risk and applying the contingency formally and consistently will create a cost estimate that builds in all costs to match what you end up paying, not what you end up bidding.

Risk and Impact to Construction Cost:

Key Activities	PURPOSE
Determine Level of Risk Management Needed	Understanding the level of risk analysis needed for this project will help identify who needs to be involved in risk management and the level of effort anticipated. Tailor as needed and determine which elements will be used and not used within the Risk Register
Identify Any Known Risks	All projects—regardless of size and complexity—contain elements of uncertainty. These uncertainties can pose risks to meeting the project's objectives including being delivered on budget. Identifying risk throughout project development helps TxDOT to eventually monitor and control those risks.
Determine Cost of Risks	The key purpose of this activity is to figure out the costs of your Event driven risks in order to determine the amount of contingency that should be carried in the estimate to cover these potential risks.
Determine Probility of Each Risks	Confidence level probability to associate the cost to the risk that is associated with the risk tolerance of your district administration.
Calculate Estimate	Total Estimate = Base + Allowances+ Risk Based Contingency

Tools:

- Project Estimate File
- Design Summary Report
- Annual Scope and Estimate Documntation Form
- Typical Sections on a per Mile Basis
- Similar Projects.
- Historical Bids.
- Parametric Estimating.
- Cost Estimate Spreadsheet Template.

Determing Cost Associated with Event Driven Risk:

Event Driven Risks *are identified risks that, when triggered, result in the predicted impacted event. To figure out the contingency needed for these unknown costs, you will figure out the* ***probability*** *and* ***impact*** *of these risks* ***(P x I)****. Figure 1, has the the Probability Rating to determine the risk based contingency.*

Event Driven Risk Example:

- *Problems with utility relocations*
- *If problems with negotiating with utility companies occurs, then there will be delay to the project schedule and change orders.*
- *You will figure out the P x I for this as well as the contingency plan and cost.*

	Probability Rating				
	1	2	3	4	5
Probability of Occurrence	Low	Medium-Low	Medium	Medium-High	High
	10%	30%	50%	70%	90%

Figure 2, Risk Based Contigency Register, identifies the risk associated with the project that will have an impact to the construction cost. Determine the probability of each Event Driven risk in the risk register. This accounts for the probability and impact of that risk. The cost associated with the risk is then used to determine the contingency on a project. Like the Three Point Estimating, we will look at the :

- Most Likely (M) Outcome
- Optimistic (O): Best Outcome
- Pessimistic (P): Worst Outcome

The following spreadsheet tool can be used to determine the expected value of the risk. This tool is deivided out to assist with developing the Risk Based Contingency for the different stages of project development.

The Link to Risked Based Contigency Tool: https://txdot.sharepoint.com/:x:/r/sites/office-epmo/intranet/_layouts/15/Doc.aspx?sourcedoc=%7B802E7503-E4A7-4E44-9D37-D940CD7DEC5B%7D&file=Risk-Based%20Cost%20Estimation.xlsx&action=default&mobileredirect=true

Figure 2 : Risk Based Contingency Register

		PROBABILITY	COST IMPACT			AMOUNT			Expected Value
			Min.	Most Likely	Max.	Min.	Most Likely	Max.	
1	Due to the variable and uncertain nature of subsurface utilities, major changes in foundation design during construction may occur resulting in construction delays and a frustrated public	100.00%	$2,800,000.00	$4,000,000.00	$5,200,000.00	$2,800,000.00	$4,000,000.00	$5,200,000.00	$4,000,000.00
4	Need to verify that the condition of existing bridge structure sufficiency rating is above 80 (HL-93), resulting in increased cost and delays due to bridge not being able to be widened.	65.00%	$7,000,000.00	$10,000,000.00	$13,000,000.00	$4,550,000.00	$6,500,000.00	$8,450,000.00	$6,500,000.00
10	Due to lack of funding, project letting date may not be met, resulting in the project falling out of the current UTP/STIP year program.	40.00%	$1,500,000.00	$2,000,000.00	$3,000,000.00	$600,000.00	$800,000.00	$1,200,000.00	$833,333.33
								Sub-Total (Risk Items -- Contingency)	$11,333,333.33

Calculating Total Construction Cost Estimate with Risk Based Contingency:

Now, that the Base Estimate, Allowances, and Risk Based Contingency are determine, the total Total Construction Cost Estimate can be caluculated. Based on the assumptions of the most likely, optimistic outcome, and pessimistic outcome we will determine the probability and confidence level of the entire construction cost estimate with the cost estimating tool.

Below in Figure 3: Probability Density Function, you will see the values of the estimate at the P10, which is a 10% confidence level of the estimate and the P90, which is a 90% confidence level. At the P50, this is the most likey expected outcome of the construction estimate. This will assist with determining the estimate that is used to request funding and entered for the project.

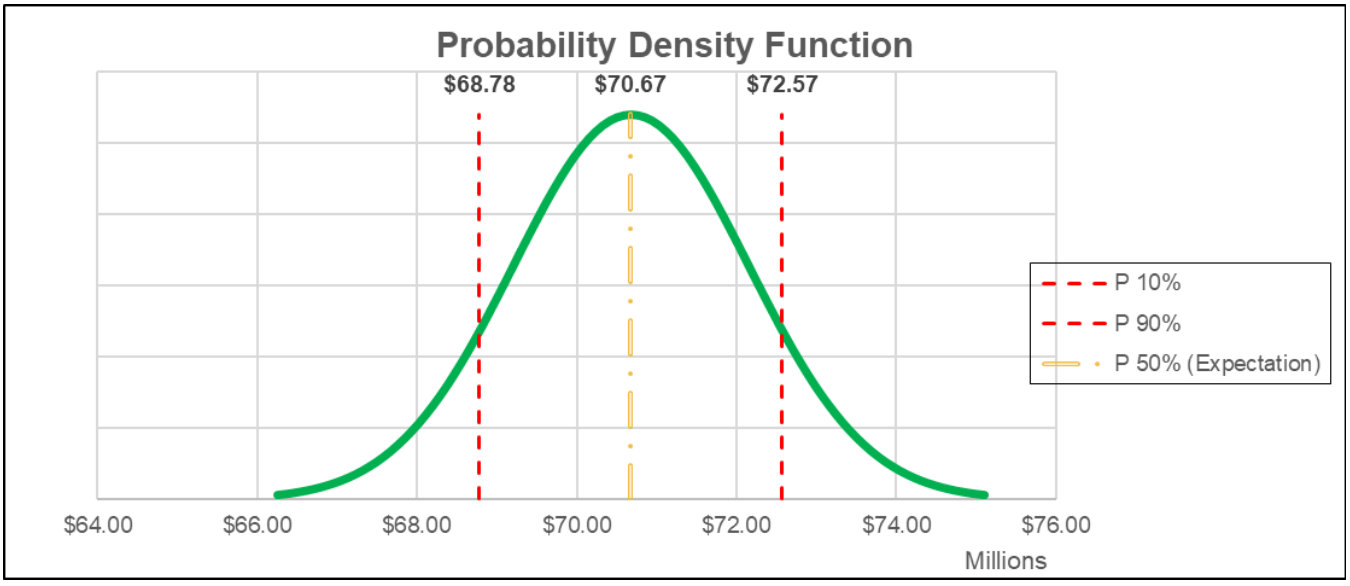


Figure 3: Probability Density Function

Sub-Total (Risk Items -- Contingency)	$11,333,333.33

TOTAL = Base + Allowances+ Contingency	P (50%)	$70,674,422.68

Aggressive (10% chance of NOT exceeding)	$68,783,579.05
Expected (50% chance of NOT exceeding)	$70,674,422.68
Conservative (90% chance of NOT exceeding)	$72,565,266.31

Appendix A: Estimate Guidance and Reference Material

Project Development Process Manual

http://onlinemanuals.txdot.gov/txdotmanuals/pdp/index.htm
This manual is an informational guide for transportation engineers learning the Project Development process which consists of the project concept to the complete PS&E project.

PS&E Preparation Manual

http://onlinemanuals.txdot.gov/txdotmanuals/pse/index.htm
This manual has a detailed description of building a cost estimate including the development of quantities, prices, funding overruns, and an estimate checklist. This manual is focused on the plan preparation through final engineers estimate phase of roadway design project.

Construction Cost Estimating Guide

https://www.txdot.gov/inside-txdot/forms-publications/publications/project-mgmt.html
Framework for the determination and development of a cost estimate including the engineers estimate will be in accordance to the TxDOT's Construction Cost Estimating Guide.

PMD 142 Construction Cost Estimating Class

Construction Cost Estimating – PMD 142 is a TxDOT interactive class that introduces the concepts and best practices of portfolio, program, and project management around cost management, which can help improve performance of current programs and portfolios. Participants will learn and about the construction cost estimating process, the components of a construction cost estimate, examine the application of construction cost estimating throughout a project lifecycle, understand construction cost estimating terms, three point estimating, and the benefits of construction cost estimating at TxDOT. The PMD 142 Construction Cost Estimating Class is in accordance of the TxDOT Construction Cost Estimating Guide.

Practical Guide to Cost Estimating

This is guidance developed by the American Association of State Highway and Transportation Officials (AASHTO) Technical Committee and Cost Estimating (TCCE). It is a guide for state DOT employees in creating a cost estimate and managing the estimate process. The guide in divided up by cost-estimate techniques and cost management activities.

FHWA guidelines on preparing Engineer's estimate bid reviews and evaluation

To ensure that the final Engineer's Estimate supports the financial obligation in the project authorization between FHWA and the state and to improve competitive bidding procedures FHWA has outlined recommended procedures for preparing the engineer's estimate. Those guidelines can be found at FHWA.gov.

Appendix B: Resources for Construction Cost Estimates

Monthly bidding results

http://www.dot.state.tx.us/business/bt.htm
The TxDOT Construction Division posts a spreadsheet with monthly bidding results in the CST crossroads page. This excel sheet shows all the construction and maintenance projects of the state and it includes: Engineer's Estimate, Low Bid Amount, O/U amount, % O/U estimates, and the number of bids.

Monthly bidding results (bid tabs)

https://ftp.txdot.gov/plans/State-Let-Construction/
The TxDOT Design Division posts all project bid tabs on Plans Online (external and internal). The bid tabs show all bid amounts for every item in the construction contract from each contractor that placed a bid.

Highway Cost Index report

https://tntoday.dot.state.tx.us/cst/Pages/letting_info.aspx
The TxDOT Construction Division posts a spreadsheet with monthly bidding results in the CST crossroads page. The report shows the historical data of TxDOT bid items, the report is broken up into groups and data to view trends. The data is divided by base period quantity/price to their current period quantity/price. The groups are split by each year and separated by one, three, and twelve months in category function, control item element, and element category.

CST Letting Dashboard

https://tableau-txdot/#/views/EngineeringOperationsDashboard/CSTLettingdashboard?:iid=1
The TxDOT Construction Division has developed a Tableau dashboard for viewing monthly letting results. This dashboard shows projects by size of the estimate and the percent difference from the engineers estimate to the awarded low bid.

Engineers Estimate Bulk Upload Spreadsheet

https://tntoday.dot.state.tx.us/des/Pages/Plan%20Development%20Main.aspx
The TxDOT Design Division has developed a spreadsheet that can be used to document an estimate throughout the lifecycle of the project and then can be used to develop quantity summary sheets in MicroStation and upload the estimate to TxDOT Connect through the bulk upload function.

Appendix C: Best Practices to Develop Final Construction Cost Estimates

Best management practices (BMPs) were evaluated by a working group comprised of district and division personnel that are involved in multiple aspect of the construction cost estimation process. The selected BMPs have been divided in the three major areas that are key to the selection of bid items and unit prices. The selection of bid items, selection of unit prices, calculation of quantities and their associated BMPs are shown below.

Selection of Bid Items

- Utilize standard bid items rather than Special Spec items when possible.
  Special Specifications are great tools for getting specialized work done on construction projects. Contractors typically only have 3 weeks to review an entire construction proposal and prepare a bid to build the project. Special Specifications can be seen as a risk to the contractor that could result in higher bid prices than a similar standard specification.
- Utilize "regular" standard bid items.
  Consistent use of frequently used bid items will allow the bidding contractors to learn the districts preferences and anticipate the needs of construction projects. This can reduce the contractor's perception of risk and result in more competitive bid prices.
- Utilize bid items with specified dimensions rather than variable dimensions.

Selection of Unit Prices

When selecting the unit price for each bid item the estimator should first select a base unit bid price and then adjust to account for things like geographic location, quantity of item, and item availability.

Historical Bid-Based Prices are the most common source of base unit costs used by estimators for TxDOT projects. They are typically found in two forms, low bid average prices and monthly letting bid tabs. The best estimates are developed using a combination of both sources to select the most appropriate base unit price.

- Low bid average prices are
  - Compiled from monthly letting results by the Construction Division
  - Available as either statewide or districtwide averages
  - Available as 3-month or 12- month average low bid price
  - Can be found here on TxDOT.GOV.

- Adjustment factors
  - Should be applied to the assigned base unit prices to adjust for project specific factors (see table below)
  - Inflation rates should not be used as an escalation factor. Inflation is applied in the TxDOT Connect system
  - Adjust to market conditions and competitive bidding environment

Chapter 3.3.3.2 Bid Price Adjustments

AASHTO *Practical Guide to Cost Estimating*, 1st edition 2013

	Urban Setting	Increase - confined workspace, high traffic, limits on work hours, night workDecrease - local contractors, materials, equipment and personnel
	Rural Setting	Increase - lack of local contractors, materials, equipment and personnel Decrease - open workspace, low traffic, no work hour restrictions
	Distance to Material Sources	Increase - if material sources are far from project location Decrease - if material sources are close to project location
	Terrain	Increase - projects with mountainous terrain or steep slopes Decrease - project on level terrain
	Local Policies, Taxes, Restrictions,Air & Water Quality	Increase - most restrictions increase project cost
	Tribal Lands	Increase - tribal taxes could increase costs
	Large Quantities	Decrease - generally reduced unit cost because of supplier discounts, spread ofmobilization, overhead, profit and waste over a larger quantities and increased production rates
	Small Quantities	Increase - generally increased unit cost because of higher supplier charges, decreasedproduction rates and sub-contracting of small quantity items
	Extremely Large Quantities	Increase - extremely large quantities of can result in shortage or delay in delivery ofsome materials (structural steel, asphalt, concrete, etc.)
	Readily AvailableItems	Decrease - commonly used items are generally less expensive
	Non-StandardItems	Increase - rarely used items are generally more expensive
	Difficult Construction	Increase - examples include underwater activities and working near railroads
	Site Constraints	Increase - examples include work adjacent to historic structure or environmentallysensitive or hazardous sites and limited work space
	Mobilization	Increase - project that include require a large amount of equipment and staff to relocateor if the contractor will need to mobilize several times