



# Project Summary

Texas Department of Transportation

## 0-6023: Synthesis on Construction Unit Costs Development

### *Background*

Cost estimating occurs repeatedly throughout all phases of project development. The use of techniques such as historical bid-based or cost-based estimating varies depending on the project development phase and level of project definition and information available. Historical data that support cost estimation also vary based on the specific estimating techniques used. The purpose of this project was to study the use of systematic methodologies to analyze, develop, and apply unit costs for construction and maintenance project cost estimation.

The main objective of this project was to explore current industry practices in determining unit costs based on historical bids and/or historical production rates, crew sizes and wages, material costs, and equipment production costs. Information relevant to the unit cost development processes and procedures from the Texas Department of Transportation (TxDOT) was gathered and compared with similar practices at other state highway agencies (SHAs). This comparison forms the basis of potential recommendations for TxDOT's consideration in modifying its approach to construction unit cost development.

### *What the Researchers Did*

A comprehensive survey identified practices related to the development of unit prices. This survey was web based and covered critical aspects of construction unit cost development such as acquiring, storing, accessing, and applying unit cost information for estimate preparation. A general section of the survey identified the use of historical bid-based and cost-based estimating techniques within SHAs. The survey contained a small set of questions covering maintenance unit costs. The targeted audiences of the survey were the offices of construction and design within SHAs. Of agencies surveyed, 36 responded, including TxDOT.

Researchers analyzed survey results and interviewed personnel in key states to better understand best practices and procedures in the use of unit costs. The research team identified seven SHAs for follow-up and interviewed their office staff. Personnel from three TxDOT districts (Dallas, Fort Worth, and Bryan) were also interviewed to understand how unit costs were used within TxDOT districts, and their approach established a representative method for TxDOT districts.

Compilation and analysis of results from the online survey and the interviews helped researchers understand the practices of SHAs. Comparison of results of the SHA analysis with the TxDOT approach (as followed by the three districts interviewed) revealed similarities and differences that form the basis for recommendations.

### *Research Performed by:*

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## What They Found

Survey results yielded the following observations:

- Most SHAs used historical bid-based estimating.
- Some SHAs utilized the cost-based estimating technique during the plans, specifications, and estimate (PS&E) phase. This estimation approach was often limited to estimating major items of work only.
- No SHA had a *comprehensive* documented process for developing unit costs, including TxDOT.
- SHAs had no formal or documented process in place for adjusting unit costs for project complexity and market conditions, including TxDOT.
- Though some SHAs had guidance on factors that are often considered when adjusting unit costs for project estimation, most adjustments are made based on the individual experience and engineering judgment of the estimator to select and apply unit costs.

Within TxDOT districts, the results were:

- TxDOT developed its in-house database and estimating tools, some of which are based on the Design and Construction Information System (DCIS).
- District personnel used different sources of historical cost data and tools to prepare their estimates.
- There were no documented procedures for developing unit costs and then adjusting them for project conditions when preparing cost estimates within TxDOT districts.

## What This Means

The potential outcomes of this project depended on determining the practices of other SHAs. Since the survey and interviews did not uncover any structured or *comprehensive* processes for development and adjustment of unit costs, only potential recommendations can be provided based on observations related to similarities and differences between TxDOT and other SHAs.

Short-term recommendations include:

- Consider cost-based estimating for items of work related to hot mix asphalt, steel, and concrete. These materials have shown vast cost fluctuations in the recent past.
- Consider Estimator (Trns\*port®) for implementation in district offices for developing construction project estimates in the PS&E phase as well as in the design phase of project development.
- Consider the Site Manager database spreadsheet that is available on Crossroads (TxDOT intranet) for accessing more current unit cost data on various line items in district offices.

Long-term considerations include:

- Review the use of cost-based estimating for project estimation in the design and PS&E phases or a combination of both cost-based estimating and historical bid-based estimating, with cost-based estimating used to estimate major items of work.
- Study the effort required to implement cost-based estimation in the Estimator software.
- Use other information systems to access unit costs more efficiently (e.g., BidTabs Pro).
- Develop an approach similar to the Red Flag analysis used by the Utah Department of Transportation to adjust estimates based on unique project and site characteristics.
- Develop guidelines for adjusting unit prices during different project phases.

For More Information:

0-6023-1 Synthesis on Construction Unit Cost Development: Technical Report

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