Statewide Preliminary Engineering (PE) Cost Estimates by Unified Transportation Program (UTP) Funding Categories

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Unified Transportation Program (UTP) serves as TxDOT's 10-year plan authorizing the distribution of construction funds for transportation projects over the next 10 years. This study developed a model to help estimate and plan preliminary engineering (PE) costs of the UTP by using its funding categories and their associated construction funding amount. The study analyzed the PE cost ratios to the UTP construction funding amount (%PE) of over 4500 construction projects. The obtained average %PE of each UTP funding category was applied to the 2022 UTP construction funding amount to estimate the PE cost for 2022 UTP. For easier implementation for TxDOT, an Excel-based tool was developed which calculates PE cost estimates given construction funding amount by the 12 UTP funding categories.

BACKGROUND

$1.2 Trillion Infrastructure Investment and Jobs Act

Surface Transportation: $284 Billions of New Spending for Next 5 Years

$110B $66B $25B $11B $39B $17B $16B

TXDOT'S UNIFIED TRANSPORTATION PROGRAM (UTP)

- 10-year funding plan updated annually.
- Organized by 12 funding categories.

FUNDING CATEGORY	2022 UTP FUNDING DISTRIBUTION
1. Preventive Maintenance and Rehabilitation	$ 13,926,300,000
2. Metro and Urban Area Corridor Projects	$ 10,012,237,582
3. Non-Traditionally Funded Transportation Projects	$ 5,772,892,508
4. Statewide Connectivity Corridor Projects	$ 10,012,237,583
5. Congestion Mitigation and Air Quality Improvement	$ 2,322,790,000
6. Structures Replacement and Rehabilitation (Bridge)	$ 3,586,560,000
7. Metropolitan Mobility and Rehabilitation	$ 5,038,158,388
8. Safety Projects	$ 3,431,750,000
9. Transportation Alternatives	$ 910,500,000
10. Supplemental Transportation Projects	$ 624,036,355
11. District Discretionary	$ 3,233,380,000
12. Strategic Priority	$ 15,556,223,482
Total UTP Funding: Categories 1–12	$ 74,427,065,898

STUDY NEEDS

- Understand the trend of PE cost expenditures across UTP funding categories.
- Provide a high-level estimation method to help plan engineering needs for various UTP funding scenarios.

METHODOLOGY

PE cost calculation for each UTP funding category at control-section-job (CSJ) Level → Roll up CSJ level data to UTP funding category level for the entire data set → Calculate %PE (PE cost ÷ UTP construction funding amount) for each UTP funding category

CSJ Level: UTP Funding Category | UTP Construction Funding Amount | PE Cost

UTP Funding Category Level: UTP Construction Funding Amount | PE Cost | %PE

Roll-up   Roll-up

ANALAYSIS

DATA DESCRIPTION

- Low-bid design-bid-build projects let FY 2015 – FY 2021 (Sep. 2015 – Aug. 2021).
- More than 4700 projects (CCSJs) consisting of over 16000 control-section-jobs (CSJs).
- Total UTP funding amount for construction: approx. $33 billion.
- %PE: PE cost ratio to construction cost (original contract cost).

ANALYSIS ASSUMPTIONS

Item	Assumptions
DONATED PS&E	♦ Local engineering participation projects with less PE costs not excluded. ♦ Assume the level of locally donated engineering remains the same in the future.
PROJECT TYPE	♦ State-owned rail projects were excluded. ♦ Joint-bid utility projects (ROW) were included when applicable.
PROJECT SIZE	♦ Includes small projects & small PE cost projects.
CHANGE ORDERS	♦ Not considered.

PE COST ESTIMATE BY UTP FUNDING CATEGORY FOR 2022 UTP

	UTP Funding Category	Analysis (FY16-FY21)				PE Cost Forecast (2022 UTP)			
		UTP CST AMT		PE Cost ($)	%PE	UTP CST AMT		PE Cost ($)	% PE
		($)	(%)			($)	(%)		
1	PREVENTIVE MAINTENANCE AND REHABILITATION	$9.2B	27.8%	$373M	4.1%	$13.9B	18.7%	$564M	4.1%
2	METRO AND URBAN AREA CORRIDORS	$5.5B	16.6%	$449M	8.2%	$10.0B	13.5%	$820M	8.2%
3	NON-TRADITIONALLY FUNDED PROJECTS	$1.0B	3.1%	$80M	7.8%	$5.8B	7.8%	$450M	7.8%
4	STATEWIDE CONNECTIVITY CORRIDORS	$4.6B	14.0%	$304M	6.5%	$10.0B	13.5%	$655M	6.5%
5	CONGESTION MITIGATION AND AIR QUALITY	$0.4B	1.1%	$36M	9.9%	$2.3B	3.1%	$231M	9.9%
6	STRUCTURES REPLACEMENT AND REHABILITATION (BRIDGES)	$1.6B	4.8%	$185M	11.8%	$3.6B	4.8%	$423M	11.8%
7	METROPOLITAN MOBILITY AND REHABILITATION	$1.1B	3.3%	$107M	9.8%	$5.0B	6.8%	$493M	9.8%
8	SAFETY PROJECTS	$2.2B	6.7%	$154M	7.0%	$3.4B	4.6%	$240M	7.0%
9	TRANSPORTATION ALTERNATIVES	$0.2B	0.6%	$12M	5.9%	$0.9B	1.2%	$54M	5.9%
10	SUPPLEMENTAL TRANSPORTATION PROJECTS	$0.6B	1.9%	$60M	9.8%	$0.6B	0.8%	$61M	9.8%
11	DISTRICT DISCRETIONARY	$3.2B	9.7%	$164M	5.1%	$3.2B	4.3%	$165M	5.1%
12	STRATEGIC PRIORITY	$3.2B	9.6%	$219M	6.9%	$15.6B	20.9%	$1.1B	6.9%
	Total	$33B	100.0%	$2.1B	6.5%	$74.4B	100.0%	$5.2B	7.0%

* UTP CST AMT: UTP construction funding amount
* B: billions; M: millions

TREND ANALYSIS

PE COST TRENDS

- Total UTP funding amount for construction remain around $6 billion since FY 2018.
- %PE has increased last three years.
- Category 6 (bridge replacement and rehabilitation) has the highest %PE.
- Category 1 (preventive maintenance and rehabilitation) has the lowest %PE.

Total UTP Construction Amount and PE Cost by Project Let Year

Total UTP Construction Amount and PE Cost by UTP Funding Category (FY16-21)

CONCLUSIONS

The study provides
- A high-level PE cost estimation method by UTP funding category.
- An Excel-based tool for TxDOT's use.
- A trend analysis of the past PE costs.

The analysis can be updated regularly incorporating the most current PE cost and UTP data.

LIMITATIONS

- Different data timespan: Analyzed 5-year data to forecast the 10-year plan.
- Let-year-based approach: May not be aligned with the actual timing of PE cost expenditures.

ACKNOWLEDGEMENT

collaborate. innovate. educate.