

UTC Project Information	
Project Title	MPC-493 – Incorporating Maintenance Costs and Considerations into Highway Design Decisions
University	University of Utah
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Funding Agencies	USDOT, Research and Innovation Technology Administration
Agency ID or Contract Number	DTRT13-G-UTC38
Project Cost	\$100,000
Start and End Dates	September 30, 2013 to December 31, 2018
Project Duration	September 30, 2013 to December 31, 2018
Brief Description of Research Project	<p>The strategic plan of the American Association of State Highway and Transportation Officials (AASHTO) Subcommittee on Design includes goals related to incorporating costs and impacts associated with maintenance activities into design decisions. These goals include: 1) develop cost-effective solutions for delivering projects that minimize the operational and maintenance resources needed to sustain system effectiveness and functionality; and 2) support efforts to enhance the involvement of construction, maintenance, and operations personnel in the design phase of project delivery. Maintenance costs, while significant throughout the life-cycle of a project, may sometimes be underrepresented as inputs to design decisions. Important considerations may include the frequency and intensity of routine maintenance activities associated with highway and street features and materials, as well as the selection of physical highway and street dimensions to support all types of future maintenance activities and associated temporary traffic control. Maintenance activities for bridges, pavement, and drainage infrastructure are very significant budget items influenced by initial design decisions. In terms of roadway geometric features, maintenance costs and considerations may be particularly relevant to decisions related to cross section allocation, roundabouts, intersection channelization, curb returns, raised medians, indirect left-turn and U-turn treatments, vertical clearance, and pedestrian/bicyclist accommodation. Roadside features such as barriers, sidewalks, signal supports, lighting, and signs (and any related ADA characteristics associated with these features) also have significant maintenance needs. This research project will examine possible policies, procedures, and practices for including life-cycle</p>

	<p>maintenance costs and other maintenance considerations into highway design decisions.</p> <p>An initial exploration of roadway and roadside items will be prioritized in coordination with the DOT and will serve as a basis to select a limited number of items for more in-depth analysis including life-cycle costs and recommended practices. To date, after an initial pre-selection of 4 items, the in-depth analyses are focused on long-term maintenance costs of 1) barrier systems and 2) drainage elements. The two remaining high-priority elements include 1) cross-section elements and temporary traffic control, and 2) intersection and interchange form and design. Supplemental data will be collected for the cross-section element as time permits before the end of the project, whereas data from local crews and other states on effective snow removal and routine cleaning practices at innovative interchange/intersection designs will be also documented as part of the final report.</p>
<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>This study identified and highlighted research needs related to asset maintenance costs, which enables UDOT to prioritize future opportunities to investigate each of such areas. A case study using barrier data, identified specific limitations in the ability of the agency to track costs to establish efficiencies and identify future improvements. Upgraded cost-tracking systems can also now be compared to the previous system to further the optimization of asset-related expenses.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>This research compiled relevant research and practitioners' opinions on issues related to asset maintenance costs, and identified corresponding areas for future analysis, including maintenance and long-term costs for barriers, drainage, cross section elements and temporary control, and intersections/interchange form and design. A case study using barrier systems further explored extensive financial records from Utah DOT to identify issues and potential difficulties to track asset costs over time and conduct life cycle costs analysis.</p>
<p>Web Links</p> <ul style="list-style-type: none"> • Reports • Project Website 	<ul style="list-style-type: none"> • MPC Final Report – Incorporating Maintenance Costs and Considerations into Highway Design Decisions