

Meeting the Challenges of Rapid Renewal Projects

MARCH 2013

Rapid renewal techniques help transportation agencies speed delivery of highway renewal projects, but they also present a unique set of challenges. In an accelerated construction environment, workers and managers are more prone to fatigue. The short timeframes for these projects often require creative performance specifications to meet project objectives. And while risks are associated with all construction projects, they may be magnified under rapid renewal conditions. These projects are typically more complex than traditional construction projects, so they need different management strategies. Establishing an optimum sequence of projects along a corridor is also challenging, as infrastructure renewal projects need to maximize available resources, minimize disruptions to the traveling public and to adjacent land uses, and recognize political priorities.

When transportation agencies successfully navigate the challenges to project delivery, they can save time and money. This document describes tools agencies can use to mitigate worker and manager fatigue, develop and apply performance specifications, manage risk and complex projects, and sequence related projects.

Fatigue

Worker and manager fatigue can be a problem on highway construction sites, and it is only exacerbated by rapid renewal and accelerated construction practices, which may require longer shifts, night work, and weekend closures. This problem is widely acknowledged by both management and labor. Methods for dealing with fatigue tend to be informal, and there is wide variability in beliefs and attitudes about fatigue. Relevant fatigue countermeasures have been studied extensively and are already practiced in other industries. Countermeasures include strategic management interventions (such as fatigue training, work scheduling aids, and incident reporting), as well as individual interventions (such as sleep hygiene, napping, appropriate use of caffeine, and self- and peer-monitoring).

This project developed work scheduling and work practice guidance, organizational practice guidance, fatigue management reference material, training material for managers and workers, and outreach materials for raising awareness. This suite of products can help transportation agencies better integrate fatigue countermeasures into existing safety management systems for highway construction environments to reduce fatigue risk and increase safety.

Status: SHRP 2 Project R03: Identifying and Reducing Worker, Inspector, and Manager Fatigue in Rapid Renewal Environments is active. The final report and guide will be available in 2014.

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Performance Specifications

Performance specifications can motivate and empower the contracting industry to create solutions that save time, minimize disruption, and enhance durability. By emphasizing desired outcomes and results, performance specifications challenge owners to think in terms of user needs and to recognize that more than one solution may achieve a project's objectives. Incorporating such concepts into a specification represents a distinct departure from build-to-print culture and requires a new approach to specification writing and contract administration.

This project developed model performance specifications that can be modified and applied to various topic areas (including pavements, geotechnology, work zones, and bridges) and project delivery methods (including design-bid-build, design-build, design-build-warranty, and design-build-operate-maintain). Implementation guidelines for the specifications were also developed to address issues related to project selection, specification development, procurement, and various other cultural and organizational changes.

Performance specifications have the potential to achieve the following objectives:

1. Reduce the completion time of renewal projects while maintaining or improving quality,
2. Encourage innovation by reducing mandatory means and method requirements and defining end product performance,
3. Address strategies to equitably manage and minimize risk to all parties.

Status: SHRP 2 Project R07: Performance Specifications for Rapid Renewal is active. The final report and guidelines will be available in 2014.

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Risk Management

Risks associated with traditional transportation projects can be magnified in rapid renewal situations, in which accelerated environmental and permitting processes, design, and construction methods often are used in conjunction



with innovative contracting methods. The consequences of unforeseen and unknown circumstances include project delays and budget over-runs, as well as disruption during construction and adverse effects on long-term performance. Although few state

departments of transportation (DOTs) use formalized risk assessment and management programs on a routine basis, those that have adopted formal risk-based programs have realized substantial benefits.

This project developed guidance for managing risk during the development process for rapid renewal projects and for optimizing project performance with respect to cost, schedule, disruption, and longevity. The objectives were to (1) advance understanding of risk and risk management associated with the unique aspects of rapid renewal projects; and (2) develop practical guidance and materials so that state DOTs and others can apply risk management methods in ways that are consistent with their business practices.

To accomplish these objectives, the project developed a comprehensive guide (including checklists and an example project application) and implementation materials for conducting risk management on rapid renewal projects (including training materials, presentations, and forms for documenting the process). The guide presents a formal risk management process, which can result in an improved understanding of risks and optimized project performance by anticipating and planning for potential problems (risks) and potential improvements (opportunities). This process consists of a series of steps, including possible variations to prioritize and mitigate risks based on project specifics. Guidance is also provided for integrating a quality control component into the process to ensure compatibility and consistency among the steps, and to ultimately ensure adequate accuracy and defensibility of results. Use of these products can help DOTs, consultants, and contractors develop a culture of risk management and more successfully complete rapid renewal projects, as well as traditional renewal projects.

Status: SHRP 2 Project R09 is complete. The final report, Guide for the Process of Managing Risk on Rapid Renewal Contracts, guidelines, and training materials will be available in 2013.

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Managing Complex Projects

Rapid renewal projects cover a wide spectrum of project types, varying in engineering complexity, size, modality, jurisdictional control, financing approach, contract type, and delivery method. Each project calls for a distinct project management style and for teams with different skill sets. Traditional project management has focused on cost, schedule, and quality, but now it is clear that complex projects incorporate the need to manage contextual factors and innovative financing techniques. Since the project management issues in these cases are markedly different from the issues with traditional projects, project management approaches also need to evolve.

To address this need, SHRP 2 developed a guide for applying a five-dimensional project management (5DPM) approach in Project Management Strategies for Complex Projects. The goal of 5DPM is to identify issues that should be planned for and managed proactively. The products of this research include a guidebook and a training program. The guidebook focuses on practical tools and techniques that were designed to be immediately beneficial to transportation professionals and should, when routinely applied, improve the state of practice in managing complex projects. The five dimensions of the new project management approach are outlined in Table 1, and an overview of the model can be seen in Figure 1.

Status: Research in SHRP 2 Project R10 is complete; pilot tests are ongoing through 2013. The final report is available at <http://www.trb.org/Main/Blurbs/167481.aspx>, and the guidebook is available at <http://www.trb.org/Main/Blurbs/167482.aspx>. The training materials will be available in spring 2013.

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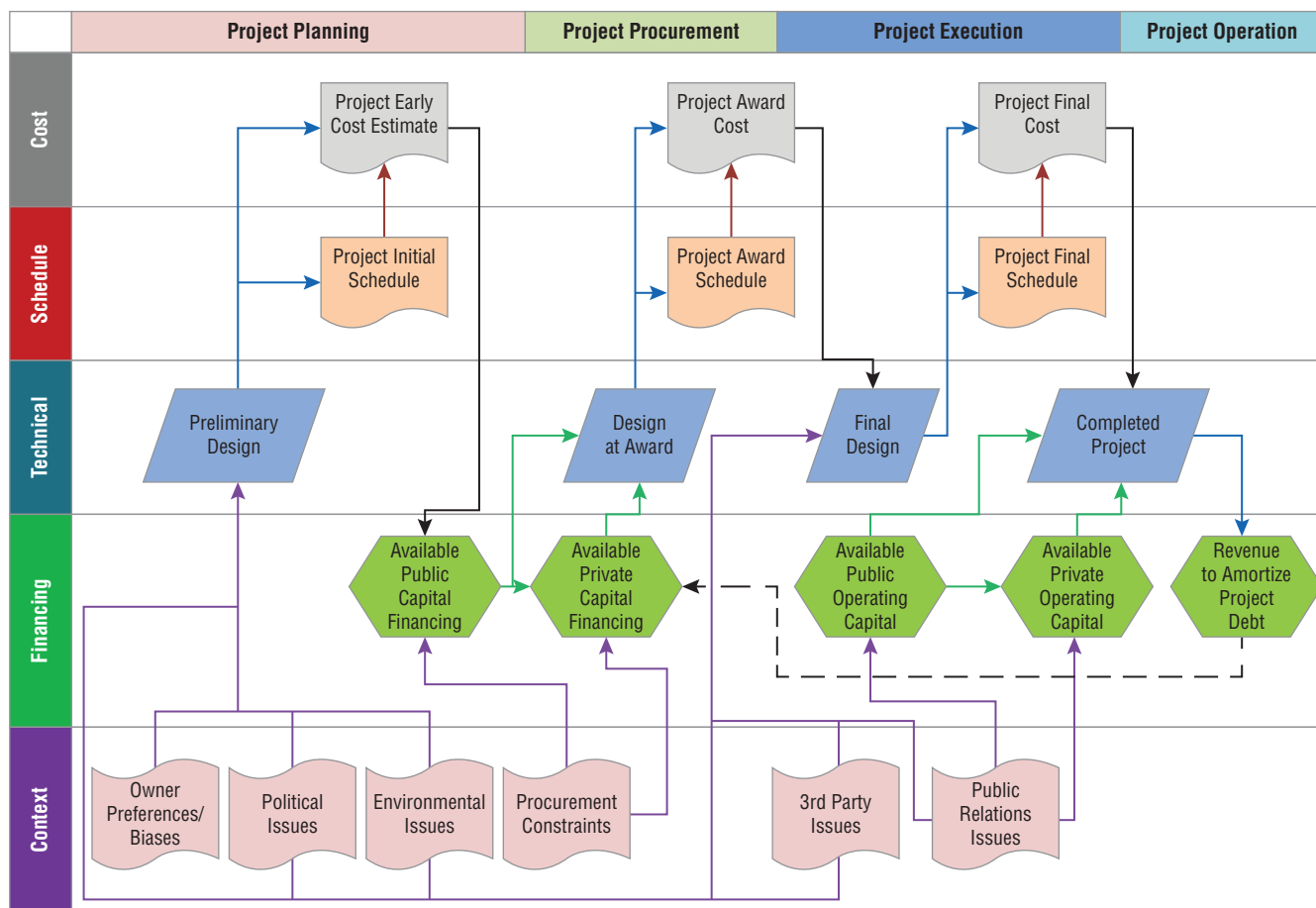
Table 1. The Five Dimensions of Complex Projects

DIMENSION	DESCRIPTION
Cost	Scope of work in dollar terms
Schedule	Calendar-driven aspects of the project
Technical	All typical engineering requirements
Context	External influences that have an impact on project development and progress
Financing	The need to understand how project funding impacts the final scope of work

Sequencing Programs of Renewal Projects

Program managers within DOTs and metropolitan planning organizations (MPOs) are charged with distilling a chaotic universe of identified infrastructure renewal needs into a logically sequenced program of manageable projects over a period of years. In addition, program managers must sequence programs of projects in ways that maximize available resources, minimize disruptions to the traveling public

Figure 1. 5-Dimensional Project Management Model



and to adjacent land uses, and recognize political priorities. Over the past several years, substantial progress has been made in the areas of performance measurement, maintenance of traffic, mitigation of congestion in work zones, and alternative contracting and construction techniques. This work was designed to minimize, manage, and mitigate disruption to traffic and commerce arising from infrastructure renewal programs. In application, however, performance measures are applied largely at the project level and impacts are not analyzed at the program level.

To assist program managers at DOTs and MPOs in sequencing programs of projects, this research developed a software tool known as WISE, which stands for Work Zone Impact and Strategy Estimator, and accompanying training materials. Using WISE, a program manager can assess the impacts of a renewal program and compare different sequencing scenarios of projects, in light of desired performance objectives. This tool is intended to create a more fully informed decision-making process regarding program sequencing and allocation of limited resources.

WISE can evaluate the regional impact of various infrastructure renewal strategies, such as day/night operations, innovative contracting, rapid construction tech-

niques, advanced maintenance of traffic plans, and public information programs. Evaluations can be conducted at both the planning and the operational level. When used as a planning tool, WISE develops an optimized renewal programming schedule that minimizes delays to the public and agency cost. When used at the operational level, it evaluates the impact of individual strategies at the project level; the results can then be used as part of an iterative procedure with the planning analysis. WISE does not require the use of proprietary software; it builds on existing travel demand software used by DOTs and MPOs.



Status: SHRP 2 Project R11: Strategic Approaches at the Corridor and Network Level to Minimize Disruption from the Renewal Process is active. The final report is available at <http://www.trb.org/Main/Blurbs/168143.aspx>; WISE and the accompanying user guide are available at <http://www.trb.org/Main/Blurbs/168144.aspx>.

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