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Guiding Principles for Performance-Based Practical Design

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Introduction & Overview

This document has been prepared to provide guidance on using Performance-Based Practical Design (PBPD) in the development of Arizona Department of Transportation (ADOT) projects. PBPD is not intended to replace existing design standards or project development processes, but provides flexibility and encourages project development professionals to diligently evaluate design decisions and alternatives. Utilizing the PBPD approach will help ensure that designs meet the project's objective and need, resulting in the most optimized performance of the roadway system.

The Federal Highway Administration (FHWA) has defined **PBPD** as a decision–making approach that relies on quantitative analyses to guide decision-making throughout the project development process resulting in a better system performance. The **PBPD** approach combines the Practical Design philosophy of designing roadway facilities that makes the best use of financial resources to optimize performance, with the Performance-Based Design philosophy of evaluating the effects the roadway features have on its actual performance. By focusing on the overall system performance, PBPD helps agencies better manage their transportation investment and serve system-level needs and performance priorities with the limited resources it has.

It is expected that all ADOT project development professionals and consultants will apply the **PBPD** approach on every project by incorporating:

- Clear project objectives and need statements that document the Departments performance objectives for the project.
- Performance-based, data-driven decision making. • Practical Design methodology that results in the most cost effective (efficient) design solution that meets the project objective and optimizes system performance.
- Consideration of design alternatives that address and support the documented project objectives and needs, while maximizing system improvements. Evaluation of more than one design option is inherent in the performance-based approach.

Goal and Approach

ADOT's goal is to deliver projects that:

1. Maintain or improve the operational performance of the roadway system:
   a. Preserve, Improve, Safety & Capacity

2. Are the most cost effective solution to meeting the Project Objective and Need:
   a. Identify and solve problems as quickly and inexpensively as possible.
   b. Don't over design based on standards where the over design does not provide any additional performance benefit to meeting the overall project objective and need.

ADOT is approaching its design efforts by focusing on the performance objectives of the project. **PBPD** removes unnecessary constraints to designers, encouraging them to consider a range of factors when applying design criteria in developing a project that meets the project's specific objectives and needs and meets the unique context and conditions of the project location.

Roles & Responsibilities

All ADOT Divisions and Technical Groups, as well as consultants performing professional services for the Department, must assist each other for **PBPD** to be successful.

State Engineers Office, Infrastructure Delivery and Operations Division & Multimodal Planning Division Senior Leadership Team

- Encourage and support the use of **PBPD** in the development and delivery of projects.
- Clearly articulate the overarching goals of a **PBPD** program and how it will be enacted and administered.

Project Managers

- Will ensure design decisions are in alignment with the project's documented **objective & need statement, scope, schedule and budget.**

Technical Professionals/Engineers/Consultants

- Develop solutions and designs that meet the needs outlined in the Project Objective & Need Statement.
- Exercise professional judgment, weighing several factors when designing the transportation infrastructure.
- Propose, consider, evaluate and recommend alternative concepts and designs.
- Perform project safety reviews utilizing the Highway Safety Manual and the Interactive Highway Safety Design Manual as part of the documentation of design evaluation and decisions.
- Perform Cost Benefit Analysis – Documenting decisions that reflect value, risk, benefits.
- Use design flexibility and the design exception process where appropriate to achieve practical, cost-effective and context sensitive solutions.
- Document all decisions related to the project design and development – Pros vs. Cons, Risks, Value, and how decisions and designs align with the Project Objective and Need Statement.

Operations

- Responsible for the long term operation and maintenance of the system. Provides professional input during the evaluation of design alternatives.

PBPD Process

Although **PBPD** is used in all phases of project development, ADOT's focus is on the design phases of a project.

Project Design

1. A project Objective and Need Statement shall be developed to serve as the foundation for system improvements and project development. It is developed by the project team at the initiation of a project. It clearly describes the goals and expected outcome of the project, not a specific solution. Any items that do not directly support the objective and need statement can be re-evaluated, redesigned or eliminated altogether. Project Objective and Need Statement will document: a. Project Need - primary reason a project has been proposed at a location. b. Project Performance Objectives - Goals/Outcomes to be achieved by the completion of the project.

2. Design projects that meet the project's objective and need, resulting in the most optimized performance of the roadway system.
    a. Design and deliver a project that is consistent with the Project Objective & Need Statement, Scope, Schedule, and Budget.
    b. Document design decisions, alternatives evaluated and approved.
    c. Designs that focus on building up from the existing conditions to eliminate over design costs.
    d. Address the value of every improvement to the corridor and system (how does it maintain or improve the performance of a project, cost and benefits for improvement, etc.).
    e. Utilization of Design Exceptions and Variances to sufficiently meet the Project Objective and Need.
        (1) Document approved design exceptions and variances. Documentation in support of Design Exceptions or Variances shall be in accordance with ADOT and FHWA requirements.

Resources:

Resources for Performance Based Practical Design methodology include:

- Highway Safety Manual – American Association of State Highway and Transportation Officials (AASHTO), 2010
- Interactive Highway Safety Design Model – Federal Highway Administration (FHWA)
- Highway Capacity Manual – Transportation Research Board (TRB), 2016
- NCHRP Report 783 Evaluation of the 13 Controlling Criteria for Geometric Design, 2014
- NCHRP Report 839 A Performance-Based Highway Geometric Design Process, 2017
- Design Exception and Design Variance Process Guide – Arizona Department of Transportation, 2009
- Complete Transportation Guidebook – Arizona Department of Transportation, 2016