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START-UP GUIDE:

Performance-Based Practical Design

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The current climate of aging transportation infrastructure, budget challenges, changing technologies, and an increased understanding of performance relationships is allowing engineers to move further away from standards to focus on getting the best return on investment. Many transportation agencies see that meeting standards with today's challenges is unsustainable; thus, they are emphasizing improvement in overall transportation system performance.

There are analytical tools available to help evaluate investment decisions and estimate the safety and operational performance of alternative projects and strategies. These tools can be used to assess and prioritize system-wide investments to improve the performance of the transportation system. Using these analysis tools and engaging stakeholders across the spectrum, from initial planning through design, are key elements of Performance-Based Practical Design (PBPD).

PBPD is a decision making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources.

Many State DOTs routinely practice elements of PBPD (even though they may not call it that) with the goal to deliver maximum value at lower cost by improving the project development decision-making process. Other States have not yet pursued PBPD, but they are interested in learning more about the fundamentals and how to get started.

This Start-up Guide serves as an introductory primer to assist State and local agencies with developing their own PBPD program. An understanding of what PBPD is, what it is not, and how it differs from other initiatives, is the first step in this process.

What is Performance-Based Practical Design?

PBPD is a decision-making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources. Through PBPD, agencies can weigh project-level results and associated trade-offs against system-wide performance needs and goals. By focusing on system-wide performance, agencies can better manage the cumulative effectiveness of individual project investments and build upon the goals of Context Sensitive Solutions, flexibility in design, Practical Design, Asset Management, and Value Engineering.

A PBPD approach relies on quantitative analyses to guide decision-making throughout the project development process, resulting in better system performance. This concept is fundamental to the data-driven National Performance Measures set forth in the Moving Ahead for Progress in the 21st Century (MAP-21) Act and further emphasized in the Fixing America's Surface Transportation (FAST) Act legislation.

PBPD is not a new regulation or policy, rather, the Federal Highway Administration (FHWA) promotes this approach to help States plan and develop projects with a system performance mindset that considers all roadway users, including pedestrians and bicyclists. By embracing PBPD and a system performance mindset, agencies will be better prepared for Transportation Performance Management (TPM) requirements, including meeting TPM targets. Other key points of PBPD to keep in mind:

- PBPD can be implemented within the Federal-aid Highway Program regulatory environment utilizing existing flexibility;

- PBPD does not eliminate, modify, or compromise existing design standards or regulatory requirements; and
- By scrutinizing each element of a project's scope relative to value, need, and urgency, a PBPD approach seeks a greater return on infrastructure investments.

How is Performance-Based Practical Design Different?

FHWA views PBPD as a next step in the evolution of project development and design decision-making. Practical Design, Context Sensitive Solutions, Value Engineering (VE) and other similar initiatives and strategies are considered key components of a successful PBPD program. Practical Design (PD) is a renewed focus on project scoping to strictly address purpose and need and reduce project cost. PBPD helps agencies apply the PD concept in a manner that address objectives including safety and operational performance, context sensitivity, life-cycle costs, long-range corridor goals, livability, and sustainability at the least cost and considers individual project investment decisions within the broader context of overall system-wide performance.

PBPD complements the fundamental concepts of Value Engineering (VE). VE is a systematic process of review and analysis of a project, during the concept and design phases, by a multidisciplinary team of persons not involved in the project. The purpose of the VE effort is to provide recommendations for providing the needed functions safely, reliably, efficiently, and at the lowest overall cost. PBPD also complements Context Sensitive Solutions, which is vital to good project development, by engaging stakeholders to provide a transportation project that fits its surroundings by balancing the project needs and the community values to preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area.

Agencies have become increasingly familiar with these strategies, particularly as they relate to individual projects. As attention turns to performance of the overall transportation system, agencies may find that developing a PBPD program will enable them to realize even greater benefits. This next level can require a cultural change in how an agency conducts business, ranging from changes in policy to program planning and project development to procurement.

Getting Started

Getting started can be the hardest part of developing a new process or implementing change within an organization. Implementing PBPD within an agency requires a change in mindset for everyone and it takes time. Agencies that have successfully implemented PBPD have found that the process to implement PBPD in their project development procedures, from initial studies and assessments to final implementation, can take up to two years.

Initial Steps to Getting Started

Once an agency understands what PBPD is and how it differs from and can enhance their current program, they can get started with implementing a PBPD program that specifically fits their organization. Agencies that have successfully implemented PBPD indicate that there are several elements to initiate a PBPD program, as shown in **Table 1**.

Table 1: Keys to Initiating a Performance-Based Practical Design Program

Step	Key Element	Details
1. LEARN	**Become PBPD Champions**	A PBPD Champion at the State agency is someone who truly believes in the PBPD approach. Champions who vocally support PBPD goals at both leadership and staff levels can affect and accelerate cultural change and can often be the key to a successful PBPD program.
	Learn More about PBPD	Talk to your peers in other states about the successes achieved through the implementation of PBPD. Visit FHWA's website to learn more about PBPD. Review the Brief: Overview of Performance-Based Practical Design (PBPD), Frequently Asked Questions, and Case Studies on the website.
2. MARKET	**Obtain Executive Buy-In**	Educate the leadership of the organization so that they understand and value the importance of PBPD. Support from leadership will facilitate a cultural shift in the entire organization by empowering various departments to work together towards a common goal.
	Gather Stakeholders	Assembling stakeholders from throughout the organization at the outset will foster an atmosphere of partnership. This includes policy, procurement, planning, environmental, design, and construction departments as well as operations and safety groups within the organization. It is also important to form a partnership with the FHWA Division Office and other regulatory agencies, the industry, and consultants.
3. ROLLOUT	**Determine the Baseline**	Identify the existing processes, tools, resources, and business practices that currently guide agency planning and project development activities.
	Set a Goal	Building on the current state of practice, the stakeholders should establish a goal for their PBPD program and identify intermediate milestones. The goal could compare value of projects to funding, progress towards transportation performance measures, or other measures that are key to the organization.
	Establish a Schedule	Work with your team to develop a realistic timeframe. Implementing a new program and shifting an organization's mindset takes time. Expect the process to take 18 to 24 months from scoping and planning through to deploying PBPD.
4. EXECUTE	**Become Familiar with Data and Analytical Tools**	Developing alternatives that meet a project's purpose and need with an understanding of safety and operational implications of each alternative is crucial to PBPD. This requires properly trained staff with knowledge of safety and operational tools, such as Safety Analyst, the Highway Safety Manual, the Highway Capacity Manual, and traffic simulation.
	Provide Technical Support to Staff	Change is hard for all professionals and PBPD is no different. Create opportunities to provide training and support for staff in understanding how to use performance tools and resulting data to make more informed decisions. Help staff understand how to view their role and communicate with others in a performance-value mindset. FHWA provides training to agencies interested in learning about how to apply PBPD.
	Create a Sense of Team	Working together as a team can help any organization achieve its goals. This involves effective communication in setting targets or goals as well as recognition for reaching milestones in achieving progress toward a PBPD implementation.

Organizations may also want to look at other resources. For more information, see the later section entitled Helpful Resources for Implementing Performance-Based Practical Design.

Working Through the Details

After an organization takes the initial steps toward developing a PBPD program, the commitment to working through the details is key. Understanding the current process; identifying, planning, and knowing what changes are possible; and developing ways to facilitate change will all be critical to changing the mindset of the organization.

Changes in the Current Project Development Process

Encourage all staff to take a fresh look at the current process including the tools, processes, objectives, and design guidance that are currently used. By partnering with FHWA, design consultants and other stakeholders, Departments of Transportation will be able to understand and separate those processes and standards that are based on regulation from those that are a result of institutional practices and preferences. Engaging stakeholders and conducting exploratory meetings with staff, consultants, and even other States will provide valuable brainstorming and learning opportunities. Empowering staff creates ownership and responsibility for achieving goals and desired change. For example, project review teams can oversee how projects are scoped and developed and can advise staff on the appropriate use of analytical tools to evaluate operation and safety of various alternatives. This team can help with establishing consistency in the application of design exceptions and resulting documentation while remaining cognizant of design guidance in the AASHTO *Green Book* and applicable state and local policies. This effort can assist in the management of tort liability concerns and serve as the conduit for recommending changes to standards, policy, and/or guidance to implement a successful PBPD program. Finally, applying a team concept can help to work with staff, track, and document key decisions, and maintain focus on solutions that optimize project investments in balance with needs of the system.

Potential Concerns and Overcoming Obstacles

Design exceptions, changing standards, and reducing project cost make some people uncomfortable. Some may view PBPD in a negative light and postulate that maintaining the status quo is appropriate. Agencies have successfully overcome obstacles to PBPD and have empowered staff with additional latitude in exercising professional judgment and design flexibility that benefits not only individual project effectiveness but also overall system performance.

Design Exceptions and Liability

As part of implementing PBPD, an agency may want to develop or revise their design exception methodology and documentation requirements. "Design exceptions are a useful tool that may be employed to achieve a balance of project needs and community values."[1] It is important for staff to understand when design exceptions are required so they are prepared to work through decisions in support of PBPD. Documentation of these decisions is necessary for receiving approval and is vital for establishing the rationale for how and why design decisions are being made. Agencies should consult with their respective attorneys with respect to documentation of design decision making and associated tort liability concern. Agencies may even find it helpful to seek information from other States on how they deal with liability. For

[1] "Guidance on NHS Design Standards and Design Exceptions" can be accessed at the following website: https://www.fhwa.dot.gov/design/standards/qa.cfm#q08

additional guidance from FHWA on design exceptions, visit: http://www.fhwa.dot.gov/design/standards/160505.cfm.

Implications for Other Modes of Transportation

Community members, and even staff members within a public agency, can become concerned when they hear about programs to save costs. Stakeholders may have concern that non-motorized accommodation, travel via transit, or freight movement will be negatively impacted. Establishing effective communication between staff and stakeholders can help educate others on the goals of PBPD and is fundamental to achieving context sensitive solutions. Often, PBPD can help achieve the geometric design flexibility in order to accommodate other modes of transportation in context with the purpose and need of the individual project and the corridor within the overall system.

Lessons from Others

Perhaps one of the best ways to understand how to begin implementing PBPD is to learn from others. In addition to posting several PBPD Case Studies on the PBPD web site, FHWA has hosted several national and regional discussions where States have shared their PBPD implementation related success stories and challenges. **Table 2** below lists some of the highlighted themes shared along with examples.

Table 2: PBPD Implementation Themes and Examples

Lesson	Intent	Example
Set clear targets for measuring success	Make sure all agency staff understand the objectives and targets that will define success.	Set measureable performance targets for the first several years. For instance, *The five-year STIP must have an aggregate saving of 10% without ANY decrease in the commitment to the public.*
Engage stakeholders	While there is no single right way to implement PBPD, encourage stakeholders to participate and give them the opportunity to provide feedback and ask questions during the development of your PBPD program. Strong alignment between a State DOT and the FHWA Division Office is beneficial as well as with your consultant designer community and local agencies.	Meet with: • **Consultants and Contractors** — Apprise them of the new processes and decision-making they can expect. These industries may be hesitant to embrace this sort of change, and it may be necessary to encourage them to do so. • **Public** — PBPD should be implemented in full view of the public, who will likely applaud the responsible stewardship of their taxes. Talk about it at every opportunity such as public hearings, civic group meetings, and conferences. • **Media** — Press releases and interviews are an important way to reach out to the public. • **FHWA** — The agency is an enthusiastic proponent of PBPD. States have found that working with—not in spite of—FHWA can be a critical component of a successful implementation.

Table 2: PBPD Implementation Themes and Examples

Lesson	Intent	Example
Establish a set of simple ground rules to guide the process	Craft simple ground rules from which all else can follow. If the ground rules are met, continue forward. Be prepared to address emergent issues and adjust along the way; if something unforeseen arises, employ a work-around.	Potential ground rules include: • **Safety** — No project designed with practicality in mind should compromise safety. Some projects may have a positive safety benefit, whereas others may have a net zero safety benefit. • **Communication** — There is collaboration in developing every practical solution. Communication among designers, stakeholders, and administration officials is open, tolerant, and frequent. • **Quality** — The practical solution must function properly and cannot leave a legacy of maintenance challenges. With PBPD, quality remains at the forefront.
Dedicate staff resources	In addition to the teams working on the process, there needs to be a champion of the PBPD program. It can be one person or a group of people, but they need to be dedicated to its success. As a grassroots effort, implementing PBPD simply wouldn't survive long enough to thrive. Unless resources are devoted to the effort, the organization's upper management will not be able to invest the time in the details needed to implement the program.	Champion(s) should be appointed to accomplish the day-to-day implementation activities such as: • Rewriting guidance • Communicating with all parts of the organization (districts and divisions) • Speaking with stakeholders • Serving as liaison between upper management and the organization • Serving as liaison between the organization an FHWA • Troubleshooting problems with implementation, especially question from within the organization
Communicate	PBPD must be a consistent topic of conversation, especially coming from leadership. This sort of change can be quickly abandoned if it becomes hidden or forgotten. This also includes coordinating with State and Federal government leaders.	Early in the process, leadership of the organization should promote PBPD any time they address staff. Division meetings, seasonal meetings, and annual conferences are a great opportunity to encourage the PBPD philosophy. Middle management should have mandatory regular (weekly, monthly) project meetings to troubleshoot issues and to hold designers accountable for producing practical designs. Contract personnel should review plans for practicality and discuss non-compliance with designers, being prepared to prohibit projects that are not in line with PBPD from going to bid.
Keep an open mind.	Because this is a change in design philosophy, new ideas and questions will be proposed. Be prepared to create and embrace cultural change and allow technical changes to take place where warranted	The organization should adopt an attitude that says, "yes" until the answer proves to be "no." In other words, every good idea, however unconventional, should be given fair consideration and analysis.

Table 2: PBPD Implementation Themes and Examples

Lesson	Intent	Example
Document everything	Include narratives to explain the process, decisions made, and the justification.	If an agency decides to mow medians and a 30' swath on either side of the road, twice per season, rather than monthly across the entire right-of-way, document the savings in maintenance cost so that people will know the impact and rationale of the change in the future.
Measure and recognize success	Keeping track of the PBPD program by creating a means for measuring impacts will help provide the needed information to evaluate the success of the program. Publicize those successes to promote and gain support for PBPD and demonstrating the effectiveness of delivering your program.	Once the press sees previously unaffordable projects begin to be built, they will pay attention. One state tracked favorable press, and after PBPD the favorability rating soared to as high as 97%. Positive press and results give staff real ownership in the work they do.

Remember, PBPD is about applying the right investment choices in the right place at the right time. Focus on building projects that provide greater return on investment and reducing costs that won't negatively affect performance. The sum of all project savings is used to fund additional projects and priority needs thus increasing the program effectiveness on improving system wide performance.

Helpful Resources for Implementing Performance-Based Practical Design

There are several resources for learning more about PBPD through case study examples of successful implementation of elements of PBPD and resource tools that States and local agencies may find helpful.

Evaluate Your State's Readiness for Performance-Based Practical Design

Agencies may want to gauge their readiness to implement PBPD. By looking at internal processes, coordination with Federal and State agencies, and communication with the industry, an agency can determine how their culture could embrace PBPD. Agencies can use the self-evaluation questions in **Table 3** on the following page to help start the discussion regarding their readiness for implementing PBPD.

Available Resources

There are websites, publications, and personnel within FHWA ready to help. Several states have already participated in FHWA-sponsored workshops and Peer Exchanges related to PBPD and there will be more to come. Visit FHWA's Performance-Based Practical Design for more information related to these resources.

Table 3: Self-Evaluation Considerations to Determine Readiness for Performance-Based Practical Design

Focus Areas	Questions for Consideration
Performance Improvement	How does the agency determine the purpose and need of improvement projects (e.g., based on capacity, based on safety)?
	What measures of effectiveness are used to quantify those performance improvements?
	What are the agency's existing guidelines or policies that describe how to determine these performance measures and define purpose and need?
Evaluation of Projects	What methods, processes, or analyses does the agency use to determine whether the performance measures were met (e.g., whether the project was successful in accomplishing its purpose and meeting its need)?
	What elements within the project are evaluated with respect to value, need, and urgency, and what analysis and performance measures are used in that evaluation?
Consideration of Corridor/System Performance Needs	To what extent does the determination of a project's purpose and need include a consideration of corridor and/or system needs beyond the boundaries of the project? To what extent does the process consider the use of available project budget to make improvements that will benefit the system as a whole?
	At what point in the project process (e.g., planning, scoping, design, construction, etc.) is the adjacent corridor or network considered?
	How are changes made to the project after considering the adjacent network? How are the identified priorities of the corridor integrated into the project?
Implementation of PBPD	Is the leadership of the agency supportive of performance-based practical design? If so, how has this been communicated to employees and consultants?
	Is there a PBPD "champion" or coordinator/promoter within the agency to lead implementation?
	Are agency employees and consultants aware that PBPD can be implemented within the regulations of the Federal-Aid Highway Program using existing flexibility?
	Does the agency's existing guidance and regulatory requirements accommodate PBPD practices? If not, what revisions are necessary to produce a comprehensive and multidisciplinary approach to implementing PBPD projects?

Contact Information

In addition to FHWA's PBPD team, State and local agencies should contact the FHWA Division Office in their State for technical assistance.