Use of Performance Requirements in Design and Construction for Public Private Partnerships

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Presentation Overview

- Why use performance requirements?
- Overview of performance requirements
- Writing performance requirements
- Role of Alternative Technical Concepts (ATC)
- Implementation Considerations
Why Performance Requirements?
P3 Service Delivery

- Integrated delivery of assets and services
  - Design, construction, finance, operations, maintenance

- P3 partner is singly responsible
  - Both Design-Build (DB) and O&M contractors work for P3 Partner

- Better value for money
  - Cost certainty
  - Potential cost minimization
  - Potential for optimizing investment intervals
Realizing P3 Opportunities

- Effective transfer of risks
  - Majority of DB and O&M risks transferred to P3 Partner
    - Asset and operational risks
    - Design-build risks
  - Risk retention with prescriptive requirements

- Potential for efficiency gains
  - Level of integration - More than sum of its parts
    - Larger contract size & increased coordination
    - Design-build efficiencies
  - Flexibility in making decisions
    - Innovations to maximize asset lifecycle and operational performance (e.g. safety, mobility, community impacts)
Concerns with Prescriptive Design Requirements in P3s

- Lost opportunities for efficiency gains
  - Fewer opportunities are available when design decisions are already made
  - Limited potential for innovation and optimization due to over-specificity of design details
- Risks are shifted back to the owner
An Example with Pavement Design

The P3 Developer shall use one of the following pavement types: hot mix asphalt (HMA) or Portland cement concrete (PCC) pavement. The P3 developer shall use pavement designs that meet the following requirements.

<table>
<thead>
<tr>
<th>HMA Pavement</th>
<th>PCC Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum HMA Thickness = 10 inches. Use stone mastic asphalt with PG 76-22 on the top two layers. Minimum Thickness for Granular Base = 12 inches The acceptance of HMA shall be in accordance with XYDOT Standards &amp; Specifications</td>
<td>Minimum PCC Thickness = 12 inches Transverse Joints = 15 feet The acceptance of PCC shall be in accordance with XYDOT Standards &amp; Specifications</td>
</tr>
</tbody>
</table>

Any proposed changes to the above specified pavement sections requires approval by the Department.
Where is scope for innovation and risk transfer?

Project Influence Curve

Adopted from D.D. Gransberg, 2006
Business Case for Performance Requirements

- To ensure effective transfer of risks to P3 partner
- To maximize realization of efficiency gains
  - Remove constraints to innovate
  - Encourage lifecycle perspectives
  - Provide continuity across phases
Questions?

Submit a question using the chat box
Overview of Performance Requirements
What are Performance Requirements?

Stakeholder Expectations → Essential Functions → Performance Requirements → Performance Criteria

**Performance requirements** define what is needed to be done to accomplish the objectives of the project.

**Essential Functions** define how well the highway facility needs to perform as well as the objectives for a successful delivery of the facility.

**Performance criteria** are measures that demonstrate a specific owner requirement has been met.

What are the expectations on how the facility should perform?

Performance requirements define what is needed to be done to accomplish the objectives of the project.
### Hierarchy of Performance Elements

<table>
<thead>
<tr>
<th>Hierarchy of Performance Elements</th>
<th>Example</th>
<th>Contract Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Function</td>
<td>Surface for vehicular traffic</td>
<td>Project Scope</td>
</tr>
<tr>
<td>Performance Requirement</td>
<td>Safe, smooth, durable &amp; cost-effective pavement</td>
<td>P3 Agreement Technical Provisions</td>
</tr>
<tr>
<td>Performance Criteria</td>
<td>Maintain an IRI of less than 160 inches/mile</td>
<td>P3 Agreement Evaluation Plan</td>
</tr>
<tr>
<td>Performance Specification</td>
<td>Construct with an IRI less than 65 inches/mile with 0.1-mile base length</td>
<td>P3 Partner’s Plans &amp; Specifications</td>
</tr>
<tr>
<td>Prescriptive Specification</td>
<td>Use 10 in. of PCC with 550 psi flex. strength</td>
<td>P3 Contractor’s Shop Drawings</td>
</tr>
</tbody>
</table>

*Adopted from D.D. Gransberg, 2006*
Current Practice: Use of Performance Requirements in Various Technical Areas

Technical areas where an agency is more likely to be **flexible** in design requirements:

- Geometric design
- Work zone management
- Ancillary assets
- Drainage/storm water management
- Landscaping and aesthetics

Technical areas where an agency is more likely to be **prescriptive** in design details:

- Pavements
- Bridges – types, structural elements & materials
Questions?

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Writing Performance Requirements
Writing Performance Requirements

▪ Beginning with project scoping, identify the needs:
  • User and stakeholder needs
  • P3 goals: Project delivery, operational and performance management

▪ Prepare a list of functional requirements
  • Must-haves, needs and project constraints

▪ Focus on project delivery as well as service delivery
  • Project delivery: Target cost, quality and schedule outcomes
  • Service delivery: Post-construction asset lifecycle and operational performance needs (life-cycle costs and levels of service targets)
Identifying Performance Requirements/Criteria

What is needed to meet the essential functions of a P3 project?
- User and other stakeholder needs
- Operational goals
- Performance management goals
- Project delivery goals

How to achieve to ensure essential functions are met?
- Lifecycle perspective
- End-of-Term conditions
- Who bears the risk?
- Consequences of cost, schedule, performance
- Enforcement vs Link to payments
Identifying Performance Requirements/Criteria: “Improve Mobility” Example

User Requirement ➔ Essential Functions ➔ Performance Requirements ➔ Performance Criteria ➔ Design Decisions

Ask “what is needed?”

User Requirement

Essential Function

Performance Requirement

Performance Criteria

Design Decisions

Function Analysis System Technique is suggested

Improve Mobility ➔ Reduce Travel Time ➔ Adequate Capacity ➔ Level of Service C or better ➔ Number of Lanes

Free Turning Movements ➔ Eliminate Left Turns ➔ Design speed > 60 mph ➔ Hor. Curves with x Radius

Reduce Deceleration ➔ Interchanges and Ramps ➔ Right Only Lanes
Identifying Performance Requirements/Criteria: “Reduce Cost” Example

User Requirement: Reduce Whole Life Cost

Essential Functions:
- Functionally and Structurally Adequate Pavement
- Adequate Pavement Structure
- Smooth and Safe Riding Surface

Performance Requirements:
- Fatigue Cracking less than 10 percent
- Total Rutting less than 0.5 inches
- IRI less than 120 inches/mile
- HMA Rutting less than 0.25 inches

Performance Criteria:
- Pavement Thickness
- HMA Compaction
- HMA Composition
- Quality of HMA Mix
- Asphalt Binder Grade
- Base Thickness
- Quality of Base Materials
- Subgrade Strength
- Workmanship

Design Decisions: Program Delivery
Writing Performance Requirements: Some Considerations

- Optimal risk allocation between contracting parties
- Whole life perspective
  - Use of performance analysis
- Need for re-evaluating environmental commitments
- Enforcement through non-compliance points and disincentives
- Use of performance specifications to relate construction quality with performance
Performance specifications provide the vital link between construction quality characteristics and performance.

Source: SHRP2 R07, Scott et al, 2014
Linking Construction Quality to Performance: An Example

**Essential Function**
- Pavement Surface for Vehicular Traffic

**Performance Requirement for Pavement Surface**
- Safe, Smooth and Durable Rider Surface

**Performance Criterion for Pavement Rutting**
- Maintain rutting to less than 0.40 inch

**Design Decisions**
- Select a bitumen grade of PG 70-22
- Limit air voids to 7 percent and bitumen content to 5 %

**Criteria for Construction Acceptance**
- Bitumen grade PG 70-22 or better
- Air voids within 7 ± 0.50 %
- Bitumen content within 5 ± 0.25 %
Implementing Performance Specifications

- Degree of readiness depends on technical areas:
  - Pavements & work zone management – more mature
  - Bridges & geotechnical – yet to mature

- Known challenges with performance specifications
  - Understanding factors influencing performance
  - Robustness of performance predictions - Need long-term data
  - Standardization – repeatability and reproducibility
  - Availability of technology and skills
Questions?

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Alternative Technical Concepts
Alternative Technical Concepts

**ATCs** are suggested changes submitted by proposing teams to the contracting agency’s supplied basic configurations, project scope, design or construction criteria.

An ATC is a request by a proposer to *modify a contract requirement*, specifically for that proposer’s use in gaining *competitive benefit* during the bidding or proposal process. An ATC *must provide a solution that is equal to or better than* the requirements in the Invitation for Bid (IFB)/RFP document.
ATCs to Foster Innovation

- Contract tool to attract innovative and alternative ideas from bidders
  - Proven & time-tested process
  - Risk transfer to P3 partner
- Rare need for ATCs when using performance requirements
- For P3s, ATCs contribute:
  - To evaluate bidders’ ideas on case-by-case basis (both control and opportunity)
  - Re-evaluate agency’s mandatory requirements and constraints
What qualifies as an ATC?

- Value: Must generate a cost, schedule or life cycle benefit

- Deviations with RFP requirements and agency standards (design criteria, specifications, etc.)
  - Design Exceptions vs Design Variances Approval

- “Cardinal Change” doctrine – Are the changes within the contract scope?
  - Handling permitting and NEPA commitments

Source: NCHRP 44-09
Interpreting “equal or better than” criteria

- Compare against the baseline concept (3-step process)
- Similar methodologies
  - Caltrans value analysis methodology
  - Performance-based practical design
- Other considerations
  - Unintentional NEPA/Permitting commitments
  - Divesting ownership rights
Questions?

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Implementation Considerations
Drafting Performance Requirements

- Involve interdisciplinary teams in drafting requirements
  - e.g., environmental, maintenance, operations team
- Link performance standards to proposal evaluation criteria
- Determine the methodology and frequency of monitoring
- Consider future changes to service requirements and end-of-term conditions
- Allow sufficient time for drafting
- Consider involving independent advisors
Organizational Cultural Change

- New demands, new skills and new perspectives
  - Understanding performance consequences of design decisions
  - Training needs, particularly on legal issues, dispute resolution, and risk management
  - Audit approach to oversight and quality acceptance

- Potential role of an independent engineer
  - Sharing the benefits of “duty of care”
Performance-Based Decision Making

- Need for performance-based decision making
- Long-term performance data is foundational
  - Performance prediction models
  - Performance specifications
- Parallel FHWA study to capture performance metrics of P3 and non-P3 cohorts
- Need for more robust and integrated asset management systems
Best Practices

▪ Capacity building and knowledge management
▪ Involving multi-disciplinary teams in drafting performance requirements
▪ Robust contract administration and support process
  • Re-engaging advisors who drafted performance requirements
  • Reducing propensity to micromanage
  • Hiring third-party consultants/specialists to support the delivery
▪ Enforcement mechanisms
  • Detection of early deficiencies
  • Linking performance to payments
▪ Robust asset and operational management process
  • Need for performance data
  • Continual update to performance models
Legal Perspectives

▪ Spearin Doctrine: Who is responsible for defects in the plan, design, or specifications provided to the contractor?
  • Developed for D-B-B
  • Less certain on contractor-provided designs
  • Basic principles apply – prescriptive requirement, differing site conditions, inaccurate information

▪ Prescriptive vs Performance Requirements
  • Focus NOT on words “design” and “performance”
  • Evaluates whether “instructive” or “outcome” based
Legal Perspectives

▪ Differing site conditions
  • Provide an opportunity to P3 proposers to conduct their own investigations
  • Shared risks – use risk “allowance”

▪ Order of precedence
  • Likelihood of disputes when technical proposal is directly incorporated into P3 agreement

▪ “Brand name or equal” clause
  • Will be treated as a performance requirement
  • Should be a reasonable number of vendors
Questions?

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Upcoming P3 Webinar

- February 16  P3 Projects in the U.S.

To register for the webinar, please visit:
**FACT SHEETS**
- Ten concise single-sheet discussions of key P3 concepts for a non-technical audience

**PRIMERS**
- P3 Concessions for Highway Projects
  - Risk Assessment
  - Value for Money
- Financial Structuring and Assessment
- Establishing a P3 Program

**GUIDES**
- How FHWA Reviews P3s
- Model Toll Concession Contracts
- Model Availability Payment Contracts
- P3 Project Financing
- Risk Assessment
- Value for Money
- Benefit–Cost Analysis

**DISCUSSION PAPERS**
- Revenue Risk Sharing
- Performance Requirements for Design and Construction in P3s

**ANALYTICAL TOOLS**
- P3-SCREEN
- P3-VALUE

**INFORMATIONAL REPORTS**
- Successful Practices for P3s
- Highway P3 Projects in the U.S
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