SHRP 2 R-07

Performance Specifications for Rapid Renewal

2010 AASHTO Subcommittee on Bridges & Structures Meeting

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Defining Performance Specs

- TRB E-C074
  - Specifications that describe how the finished product should perform over time.

- Dept of Defense
  - A performance specification states requirements in terms of the required results with criteria for verifying compliance, *but without stating the methods for achieving the required results*.

- FHWA Performance Spec Strategic Roadmap
  - A performance specification defines the performance characteristics of the final product and links them to construction, materials, and other items under the contractor control.
Benefits of Performance Specs

- Innovation
- Greater Contractor Input
- Reduced Completion Time
- Improved Quality
- Improved Service Life
Business Challenges

- Reluctance of DOTs to let go of control
- Industry inexperience
- Difficulty in defining and measuring performance
- Difficulty in translating performance requirements down to second-tier subcontractors and suppliers
- Reduced industry competition
Developing a Performance Spec

Measurable Performance Parameters

1. Identify user needs/project goals
2. Translate user needs into measurable performance parameters
   - Quantitative rather than qualitative
   - Verifiable through analysis, tests, demonstration
   - Attributable to actions within contractor’s control
   - Material & process independent to allow contractor to determine solution
Pyramid of Performance

USER (Tier I)
- Comfort, accessibility, safety, travel time

FUNCTIONAL (Tier II)
- Ride quality, skid resistance, noise, cracking

AS-CONSTRUCTED (Tier III)
- Density, air, thickness, strength, permeability

CONSTRUCTION (Tier IV)
- Transport, placing, curing, sawing

MIXING REQUIREMENTS (Tier V)
- Charging, mixing, handling

COMBINED MATERIALS (Tier VI)
- Mix methods, mix components

BASIC MATERIALS (Tier VII)
- Aggregate, binder
Developing a Performance Spec

Quantitative Measurement Strategy

3. Develop measurement & verification strategy
   - Desired level of performance
     - Project goals
     - Criticality of project/element
     - Reliability of data used to establish limits
     - Sampling interval
     - Flexibility extended to contractor
     - Post-construction warranty/maintenance period?
Developing a Performance Spec

Quantitative Measurement Strategy

3. Develop measurement & verification strategy
   - Measuring & monitoring compliance
     - Test or inspection method
     - Sampling interval/evaluation section length
     - Frequency of measurement
   - Incentive strategies and payment mechanisms
     - Payment over time
     - Incentive/disincentives
     - Penalty point system
Developing a Performance Spec

Quantitative Measurement Strategy

4. Identify potential gaps
   - Lack of understanding of what drives performance
   - Lack of technology to rapidly measure and test for acceptance (NDT)
   - Inability to collect, process, & analyze data in a cost-effective and timely manner
   - Lack of historic data to calibrate models

5. Consider contract delivery approach & risk allocation
Contract Delivery & Risk Allocation

Design-Bid-Build

Design | Const | Maintenance

Contractor Risk Zone

DBB/DB with Warranty

Design | Const | Maintenance

Contractor Risk Zone

Design-Build

Design | Const | Maintenance

Contractor Risk Zone

Design-Build-Maintain

Design | Const | Maintenance

Anticipated Maintenance

Contractor Risk Zone
Contractor Risk vs. Degree of Performance Specifying

Risk-Flexibility Relationship
Method vs. Performance Specs

Selection Criteria

- Initial Screening Considerations
  - Performance parameters are measurable & verifiable
  - Test methods are reliable, practical, & economical
  - Multiple approaches exist to achieve the desired result
  - Incentives may be used to motivate improved contractor performance & innovation
Method vs. Performance Specs

Selection Criteria

- Contracting Considerations
  - Restrictions to use of alternative delivery?
  - Organizational or policy constraints?
  - Advantage to private sector asset management or equity investment?
Method vs. Performance Specs

Selection Criteria

- Project Scope Considerations
  - Where is the project in the development process?
    - Conceptual vs. final design stage
  - Is enhanced performance a project goal?
  - What is the project risk profile?
  - Can the contractor assume greater risk/responsibility for performance?
  - Can flexibility be extended to the contractor?
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STRATEGIC HIGHWAY RESEARCH PROGRAM