

# The Path Towards Performance Specifications

**National Concrete Consortium**

**Columbus, Ohio**

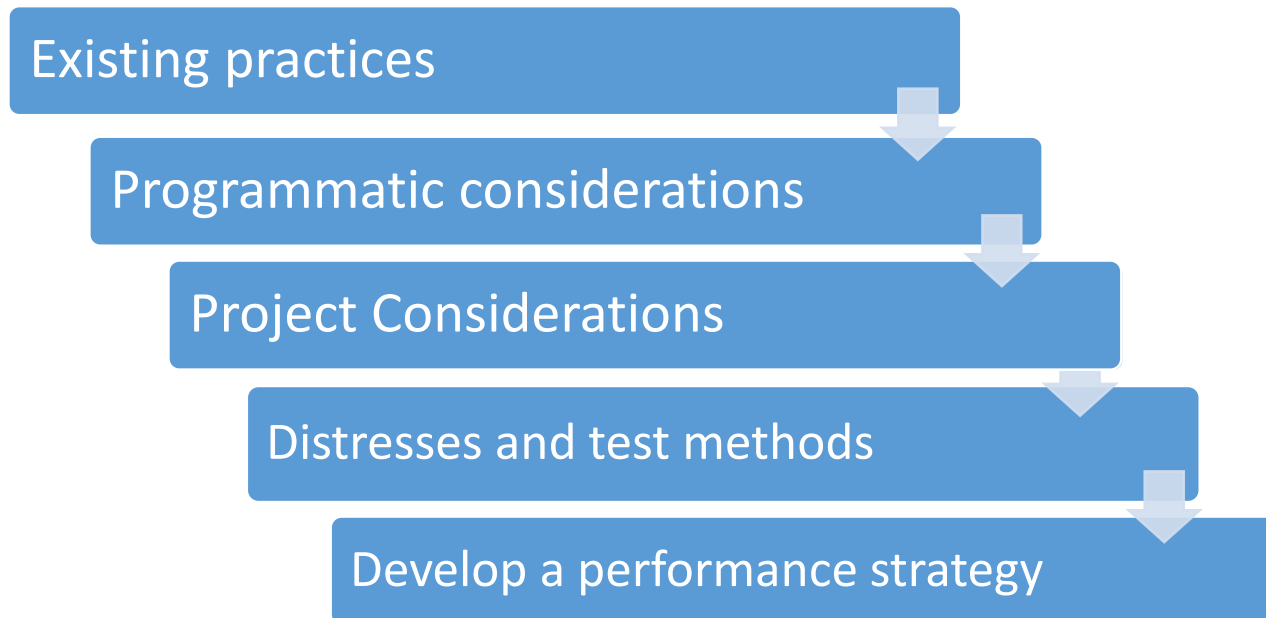
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# Concept

- Develop a continuum, or sliding scale of the range of possibilities
- Develop a series of steps to assist agencies consider



# What is included?

- A series of questions to guide users through a decision making process
- Tables of possible approaches and test methods tied to performance
- Worksheets to guide users through the process
- Detailed examples of the worksheets to aid in clarity of process

# Range of Specifications Options

## Prescriptive Specifications

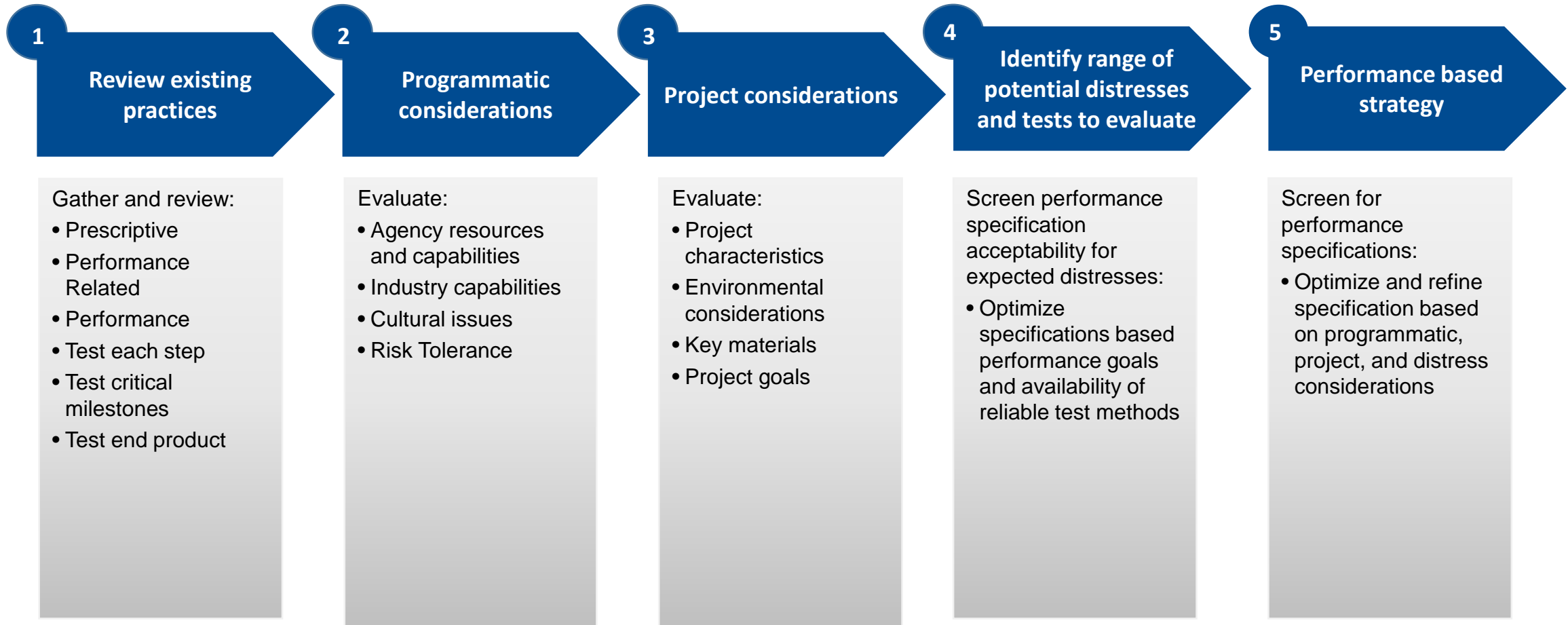
## Performance Specifications

### Concrete Specifications

- ✓ Agency specifies means and methods
- ✓ Performance risk mostly retained by agency
- ✓ Agency tests component materials as well as fresh and hardened concrete

- ✓ Agency tests component materials for performance qualities
- ✓ Industry assumes responsibility for designing concrete mixture to address specific distresses
- ✓ Industry assumes responsibility for designing concrete mixture to address specific environmental conditions

- ✓ Industry has primary responsibility for performance
- ✓ Performance risk mostly transferred to industry
- ✓ Statistically-based sampling and testing for selected materials properties to balance risk
- ✓ Agency in an audit oversight or stewardship role
- ✓ Performance based testing for durability and service life



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## Optimization Strategies

Identify Potential Optimization Strategies in Use:

- Component Materials Requirements
- Mixture Design
- Fresh Concrete Testing
- Acceptance Tests

After identifying existing practices, consider willingness to:

- Eliminate or reduce component materials requirements
- Eliminate or reduce limits for amount of individual components
- Reward Industry innovation focused on performance
- Eliminate or reduce testing not related to performance
- Include acceptance tests related to performance

Strategies  
not used?

YES

Consider additional optimization strategies not currently in use

NO

No need to further optimize existing practices

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## Programmatic considerations

Evaluate:

- Agency resources and capabilities
- Industry capabilities
- Cultural issues

- Agency staffing constraints limits ability to review, test & inspect all facets of work
- Agency faces constraints related to experienced staff
- Industry has capability of assuming more responsibility for quality
- Agency maintains quality/performance data of suppliers
- Agency supports modifying traditional practices
- Agency willing to relinquish some control
- Industry willing to accept more risk

General Agreement?

YES

- ✓ Agency has resource and experience constraints
- ✓ Industry capable of using innovative practices to enhance performance
- ✓ Agency support allowing non traditional materials and processes to meet performance requirements

NO

Use conventional agency specifications

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### Project considerations

Evaluate:

- Project characteristics
- Key materials & environmental considerations
- Project Goals

- Minimal risk to Agency if material not in specification limit
- Materials under control with minimal variability
- Agency staffing limitations to oversee all facets of construction
- Specific materials or environmental conditions critical for performance
- End result specifications exist to evaluate performance

General Agreement?

YES

- ✓ A performance related specification aligns with project characteristics
- ✓ Key materials & environmental considerations relate to performance testing results
- ✓ Project goals fit with performance related measures

NO

Use conventional agency materials acceptance practices



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## Project considerations

Evaluate:

- Potential distresses
- Availability of performance tests

- Need to protect against specific distresses
- Need to protect against specific environmental conditions
- Availability of standards to evaluate performance
- Open to use of innovative methods to address distresses
- Industry willing to accept

General Agreement?

YES

- ✓ Open to innovation to address potential distresses
- ✓ Performance specs with a focus on innovation and longevity would require more advanced testing and enhanced materials quality management by industry
- ✓ Standards exist to evaluate performance characteristics

NO

Use conventional agency materials acceptance practices

**Concern:**

**Aggregate Durability**

**Workability**

**Strength**

**Transport  
(Permeability)**

**Freeze Thaw  
Durability**

List of approaches and/or test methods

List of approaches and/or test methods

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**Performance Strategy**

# Test Methods

- Include brief description of available methods
  - Describe performance characteristic measured (if applicable)
  - Describe what environmental condition or distress does it address
  - Established method (Standard Number)
  - Current status if under development
  - Brief discussion of advantages and challenges of method
- Develop a series of steps to assist agencies to consider appropriate methods to meet performance goals

Property	Prescriptive approach	Performance approach
<b>Adequate Strength</b>	Cementitious type and content, <i>w/cm</i>	Flexural and compressive strength
<b>Cracking Risk</b>	Paste content, SRA	Unrestrained shrinkage Restrained shrinkage
<b>F-T Durability</b>	Total air, air-void system, <i>w/cm</i> , SAM	F-T testing (ASTM C666 and C672)
<b>Resistance to Chemical Deicers</b>	SCM type and content, <i>w/cm</i>	Low temperature differential scanning calorimetry (LT-DSC)
<b>Durable Aggregate</b>	Pre-qualify source (PP65, IA Pore index, ASTM C666)	Job mixture (PP65, IA Pore index, ASTM C666)
<b>Impermeable</b>	SCM type and content, <i>w/cm</i>	Resistivity testing Formation factor
<b>Workable</b>	Box test, <i>V<sub>kelly</sub></i> – applied during mixture design and during construction	

# Two Deliverables

- Guidance document
  - Detailed discussion of performance measures
  - Detailed discussion of how measures could be evaluated
  - Framework to facilitate decision making
  - Worksheets to guide through the process
  - Appendix of existing standards and work underway
- Proposed AASHTO Standard Practice
  - Details of process in AASHTO Format
  - Includes framework from Guide and worksheets

# Timeline

April, 2016 – Rough draft to NCC



July, 2016 – Final draft completed



August, 2016 – Present to SOM



September, 2016 – Final draft to NCC



November, 2016 – SOM Ballot