

Materials Acceptance Plans for Projects using ACMs

NCHRP 20-07 Task 349

AASHTO Subcommittee on Materials

Greenville, South Carolina

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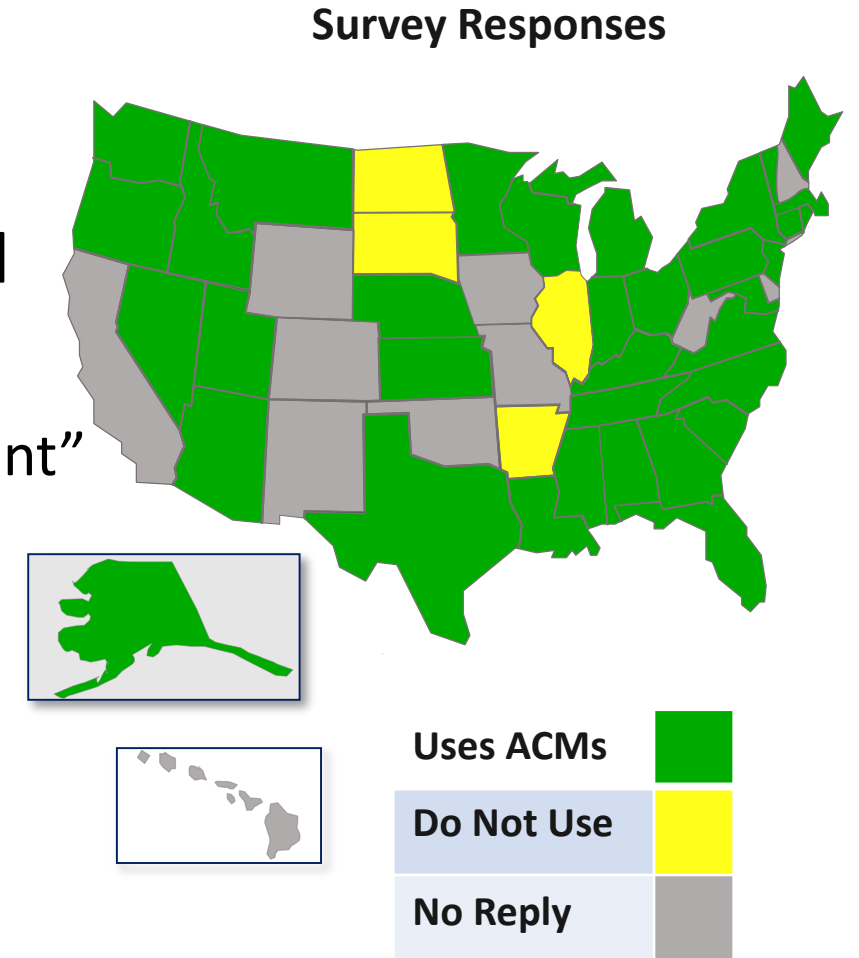
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Project Team

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Background

- More agencies using ACM's
 - Staffing, funding and time of delivery issues
- QA roles and responsibilities not well defined
- QA practices vary widely
 - FHWA "...significant opportunities for improvement"
 - Cited a lack of systems to verify contractor data



Approach

- Literature review and assessment of existing plans
- Survey and analysis
- Interviews with selected agencies
- Develop a framework and details of guidelines
- Provide Guide Document and proposed Standard Practice

Approach

- One size fits all not useful
- Acknowledge and respect variations between agencies
 - Risk tolerance
 - Agency and/or Industry experience and expertise
 - Willingness to allow contractor innovation
 - Use of warranties
- Interviews with selected agencies
- Develop a framework and details of guidelines
- Provide Guide Document and proposed Standard Practice

Conclusion

- Develop a continuum for the range of possibilities
- Develop a series of steps to assist agencies consider best fit
- Develop worksheets to guide decision making

Conventional Acceptance

Alternative Acceptance

Material Acceptance Plans

- ✓ Agency has primary responsibility for quality (certification, inspection, testing)
- ✓ Materials acceptance risk mostly retained by agency
- ✓ Statistically-based sampling and testing for selected materials to balance buyers and sellers risk

- Reduced agency QA effort based on:
 - Material criticality and risk
 - Quantities (large and small)
 - Use of contractor test data with owner verification
 - Reduced agency verification testing for field-produced materials under control
 - System-wide or regional certification of plant-produced materials
 - Umbrella certifications for materials/product assemblies
 - Reduced levels of inspection for low risk or certified materials

- ✓ Industry has primary (whole-life) responsibility for quality (certification, inspection, testing)
- ✓ Materials acceptance risk mostly transferred to industry
- ✓ Statistically-based sampling and testing for selected materials to balance risk
- ✓ Agency in an audit oversight or stewardship role



IDIQ

- Advanced or accelerated testing to meet production schedules
- Performance-based testing for long-life and durability
- Greater reliance on industry self-certification
- Acceptance by certification or inspection of materials traditionally accepted by testing



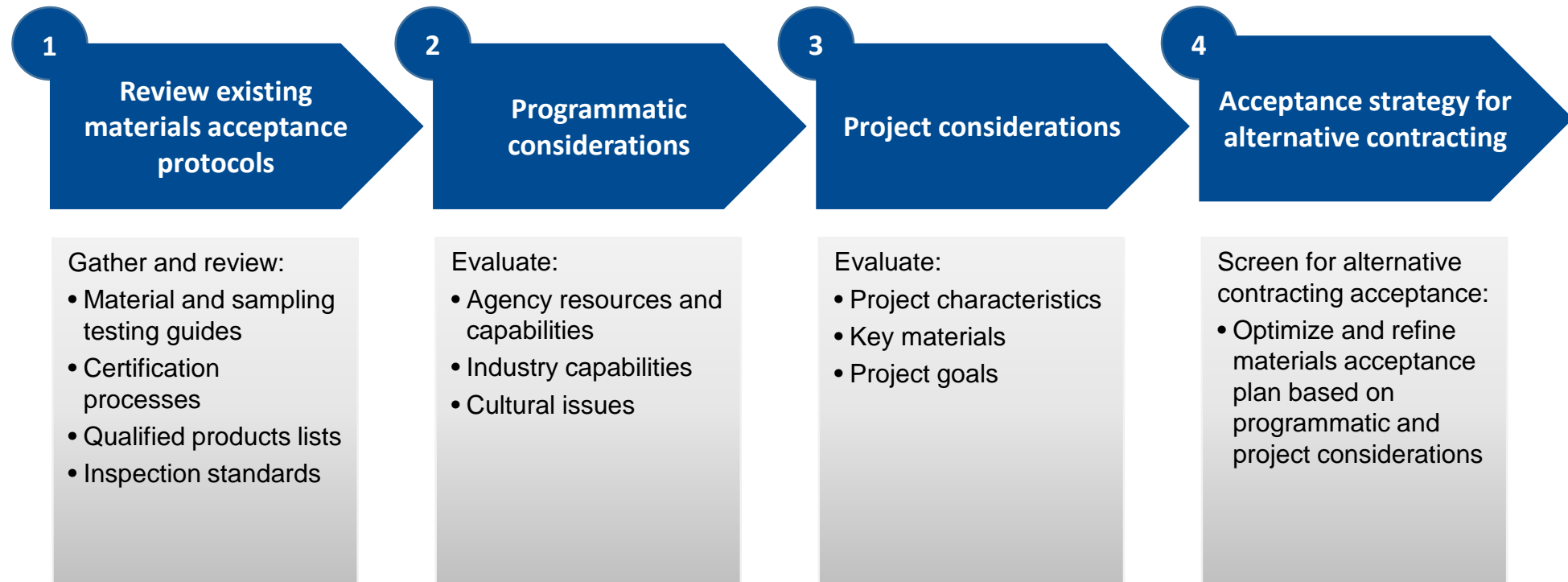
DB

DBOM

What is included?

- Questions to guide decision making
- Tables of possible approaches
- Worksheets to guide the process
- Detailed sample worksheets to aid in clarity

Steps for Determining Materials Acceptance Plans for a Given ACM



Optimization Strategies

1 Optimization Strategies

Identify Potential Optimization Strategies in Use:

- Sampling and Testing
- Certification
- Inspection



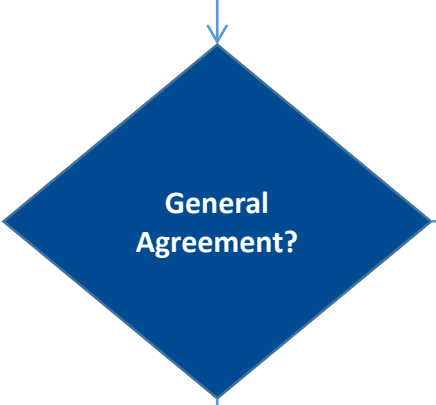
General Area	General Questions	Yes	No
Sampling and Testing	1. Reduced frequencies for small quantities or large quantities of field-produced materials under control.	<input type="checkbox"/>	<input type="checkbox"/>
	2. Statistically-based sampling and testing using contractor QC data and agency verification testing for acceptance.	<input type="checkbox"/>	<input type="checkbox"/>
	3. Adjustment of sampling and testing frequencies based on material criticality or risk.	<input type="checkbox"/>	<input type="checkbox"/>
	4. Use of performance-based material properties and tests for QC and acceptance.	<input type="checkbox"/>	<input type="checkbox"/>
Certification	1. Certification acceptance of constituent mix properties.	<input type="checkbox"/>	<input type="checkbox"/>
	2. Certification acceptance of small quantities or low risk field-produced materials.	<input type="checkbox"/>	<input type="checkbox"/>
	3. Umbrella Certification of product/material assemblies.	<input type="checkbox"/>	<input type="checkbox"/>
	4. Certification acceptance of qualified materials/products based on qualifications, past performance.	<input type="checkbox"/>	<input type="checkbox"/>
	5. Acceptance of nationally certified materials/products.	<input type="checkbox"/>	<input type="checkbox"/>
Inspection	1. Acceptance by visual inspection for non-critical, low risk field-produced materials.	<input type="checkbox"/>	<input type="checkbox"/>
	2. Levels of plant inspection based on plant certification, producer past performance.	<input type="checkbox"/>	<input type="checkbox"/>
	3. System-wide plant inspections (multiple projects).	<input type="checkbox"/>	<input type="checkbox"/>
	4. Regionally-shared plant inspection.	<input type="checkbox"/>	<input type="checkbox"/>

Consider additional optimization strategies not currently in use

No need to further optimize existing materials acceptance practices

2 Programmatic considerations

- Evaluate:
- Agency resources and capabilities
 - Industry capabilities
 - Cultural issues



YES →

- ✓ Agency has resource and experience constraints
- ✓ Industry capable of assuming more responsibility for materials quality assurance activities
- ✓ Agency support for modifying traditional materials acceptance practices

NO →

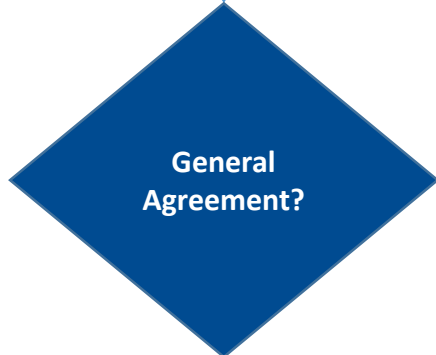
Use conventional agency specified materials acceptance practices

Topic Area	General Considerations
Agency resources	<ol style="list-style-type: none"> 1. The Agency faces constraints related to the number of personnel that can be devoted to materials quality assurance activities. 2. The Agency faces constraints related to the experience levels of personnel that can be devoted to materials quality assurance activities.
Industry capabilities	<ol style="list-style-type: none"> 1. Industry is capable of assuming more responsibility for materials quality. 2. The Agency maintains quality or performance records of suppliers. 3. Accredited commercial labs are located in the State.
Cultural issues	<ol style="list-style-type: none"> 1. Internal Agency support exists for modifying traditional materials acceptance practices. 2. Agency personnel are willing to relinquish some control in exchange for the contractor accepting more performance risk.

3a **Project considerations**

Evaluate:

- Project characteristics
- Key materials



YES

✓ A modified materials acceptance plan aligns with given project characteristics
 ✓ Key materials would lend themselves to modified or reduced agency testing or increased certification by industry

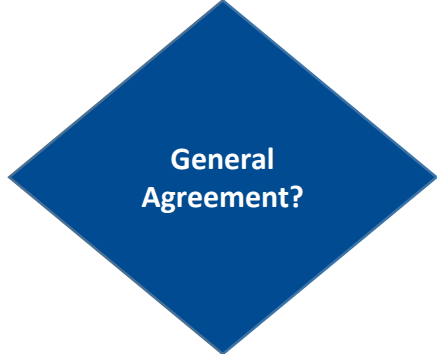
NO

Use conventional agency materials acceptance practices

Topic Area	General Considerations
Project size and complexity	<ol style="list-style-type: none"> 1. Materials quality presents minimal risk to the Agency given the nature of the project (e.g., small size, low AADT, routine materials and construction, State vs. Federal funding, etc.). 2. Agency resources and/or expertise are inadequate to oversee construction given the large size and/or complexity of the project. 3. The work can be specified and accepted using end result or specifications. 4. Third-party issues are not expected to introduce quality-related concerns
Key materials	<ol style="list-style-type: none"> 1. Project materials are relatively low risk or non-critical from the perspective of difficulty to repair or replace, safety, cost of rework, or future maintenance costs. 2. Materials are produced under generally controlled conditions and are expected to have less variability in properties. 3. Several non-local or out-state materials sources will be used. 4. The work can be accepted using end result specifications.

3b Project considerations

Evaluate:
 • Project goals



Goals	General Considerations
<input type="checkbox"/> Schedule compression	1. The fast-paced nature of construction may strain the ability of Agency resources to provide full oversight. 2. Full Agency oversight may disrupt production. 3. Advanced or non-traditional testing methods could help accelerate production. 4. The contractor is <u>not</u> expected to compromise quality as a means to meet schedule objectives.
<input type="checkbox"/> Cost savings	1. The contractor is <u>not</u> expected to compromise quality as a means to meet budget or profit objectives
<input type="checkbox"/> Innovation	1. Specialized expertise (or a non-traditional acceptance protocol) is required to evaluate quality. 2. The Agency cannot predefine materials acceptance parameters as part of the initial scoping and procurement process.
<input type="checkbox"/> Longevity or durability	1. Performance specifications are being used to establish requirements. 2. The project contains a warranty or post-construction maintenance period that will be used to monitor distresses over time. 3. QA data will be used to support PMS?

✓ A modified or accelerated materials acceptance plan most advantageous to support project goals
 ✓ Performance specs with a focus on innovation and longevity would require more advanced testing and enhanced materials quality management by industry

Use conventional agency materials acceptance practices

Detailed Worksheets

➤ Programmatic Criteria

- Agency Resources
- Industry Capabilities
- Cultural Issues

➤ Project-Level Considerations

- Project Characteristics
- Key Materials

➤ Impact of Project Goals

- Schedule compression
- Cost savings

➤ Impact of Project Goals

- Schedule compression
- Cost savings
- Innovation
- Durability/Longevity

➤ Scoring sheet

- Maintain existing protocol
- Shift more QA to industry
- Use non-traditional techniques

Project-Level Criteria	Shift more responsibility to industry	Use non-traditional acceptance techniques
Project Characteristics		
2a) What is the size/complexity of the project?	2a) _____	2a) _____
A. Large, high volume, urban and/or Federally-funded project	A. 0 pts	A. 10 pts
B. Medium size project with some complexity	B. 5 pts	B. 5 pts
C. Small, simple and/or relatively routine project	C. 10 pts	C. 0 pts
2b) Does the Agency have sufficient staff to provide full oversight?	2b) _____	2b) _____
A. Resources are available	A. 0 pts	A. 0 pts
B. Full-time oversight could strain staff resources	B. 5 pts	B. 0 pts
C. Resources are unavailable	C. 10 pts	C. 0 pts
2c) Does the project present third-party issues or constraints that would complicate or increase the risk of materials QA?	2c) _____	2c) _____
A. Third party issues could be best managed by the Agency	A. No-Go	A. 0 pts
B. Some third party issues that could be jointly managed by Agency and industry	B. 0 pts	B. 0 pts
C. Minimal to no third party issues or those that could be managed by industry	C. 0 pts	C. 0 pts

Key Materials		
2d) Does the project include high risk or highly critical materials?	2d) _____	2d) _____
A. Key materials present a high risk of non-conformance and/or will result in a large impact if a nonconformance occurs	A. 0 pts	A. 10 pts
B. Materials present moderate risk	B. 5 pts	B. 5 pts
C. Materials are relatively low risk or non-critical from the perspective of difficulty to repair or replace, safety, cost of rework, or future maintenance costs	C. 10 pts	C. 0 pts
2e) Are key project materials produced under controlled conditions?	2e) _____	2e) _____
A. Key materials are produced directly for a specific project, and require subsequent mixing, compacting, finishing, curing, or other processes for incorporation into the work	A. 0 pts	A. 5 pts
B. Material are produced under generally controlled conditions and, assuming proper transporting, handling, and storage practices, will not be subject to alteration	B. 5 pts	B. 2 pts
C. Materials are produced under highly controlled conditions and have stable properties	C. 10 pts	C. 0 pts
2f) Will non-local or out-of-state materials be used?	2f) _____	2f) _____
A. No more than typical	A. 0 pts	A. 0 pts
B. More than typical	B. 2 pts	B. 0 pts
C. Much more than typical	C. 5 pts	C. 0 pts
Project-Related Criteria Subtotal (Questions 2a – 2f)	Score _____	Score _____

Worksheet

Scoring Summary

	Shift more QA responsibility to industry		Use non-traditional acceptance techniques	
	Scored Points	Maximum Possible Points	Scored Points	Maximum Possible Points
Programmatic Considerations (Worksheet 1)		44		12
Project-Level Considerations (Worksheet 2)		45		25
Project Goals (Worksheet 3)		See note*		See note*
Total Score				
Percentage (Score/Maximum Possible Points)				

* Will vary based on number of applicable project goals

Final Recommendations

Strategy	Comments
<input type="checkbox"/> Maintain Standard Protocol	
<input type="checkbox"/> Shift more QA responsibility to industry	
<input type="checkbox"/> Use non-traditional acceptance techniques	

If Using:

Design-Bid-Build

CM/GC

ID/IQ

Design-Build

Design-Build-Operate-Maintain

Alternative Acceptance Strategies

Agency retains responsibility for testing, certification, & inspection.
Potential optimization of agency QA effort:

Testing:

- Use of contractor QC tests for acceptance
- Reduced agency verification testing for less critical materials
- Reduced testing for small quantities, large quantities under control, or low risk materials

Certification

- Qualified products and sources, small quantities or low risk materials
- Umbrella certification
- System-wide/Regional certification (plant-produced materials)

Inspection

- Acceptance by visual inspection for small quantities or low risk
- Levels of inspection based on material criticality

Use same optimization strategies as for DBB, but due to fast-tracking, consider:

- Using more advanced or non-destructive testing to accommodate accelerated production
- Accepting by certification or visual inspection for lower risk field-produced materials backed by periodic testing

Use same optimization strategies as for DBB, but for very simple or routine projects, consider :

- Pre-qualified sources, standardized materials, and small quantities
- Accepting by certification or visual inspection for standardized items and small quantities backed by periodic sampling and testing

Use same optimization strategies as for DBB, but in the interest of fast-tracking and/or shifting more performance risk to industry, consider:

- Requiring submission of a contractor quality management plan
- Using performance-oriented materials acceptance parameters as a better predictor of performance
- Using advanced non-destructive testing for accelerated production
- Using certification or inspection in lieu of testing for low risk or small quantities

Industry assumes full responsibility for design, construction quality, and long-term performance

- Contractor defines and executes construction quality management and O&M plans
- Performance-oriented materials acceptance parameters for improved long-term performance
- Agency oversight audits during construction
- Agency/Industry joint inspections/monitoring during post-construction period

Proposed Standard Practice for Developing
Materials Acceptance Plans for Alternative
Contracting Methods

AASHTO Designation: R XX-15



American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

GUIDELINES FOR DEVELOPING A MATERIALS ACCEPTANCE PLAN FOR ALTERNATIVE CONTRACTING METHODS

**DELIVERABLE OF
NCHRP PROJECT 20-07 TASK 349**

LIMITED USE DOCUMENT

This Interim Report is furnished only for review by members of the NCHRP project panel and is regarded as fully privileged. Dissemination of information included herein must be approved by the NCHRP.

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Next steps

- Subcommittee on Materials feedback
- Subcommittee on Materials consideration
- Workshops or training sessions?

Thank You!