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Performance-Based Specifications for Temporary Erosion and Sediment Control During Construction: A Survey of State Practice

The purpose of this TRS is to serve as a synthesis of pertinent completed research to be used for further study and evaluation by MnDOT. This TRS does not represent the conclusions of either CTC & Associates or MnDOT.

Introduction

During construction projects, surrounding soils can be disrupted, causing ecological damage through topsoil erosion and pollution of waterways with sediment. MnDOT currently has requirements and inspection procedures to ensure that contractors take measures, typically referred to as best management practices (BMPs), to control this erosion and sediment. Compliance is financially assured via a lump sum payment: Contractors who follow the requirements get paid upon completion of work according to specifications.

MnDOT is looking into the prospect of applying more innovative modes of contracting to manage this process. Performance-based specifications would provide rewards for outcomes instead of for simply following MnDOT-required procedures. Contractors could apply new techniques and technologies to address this problem at their own initiative, encouraging faster applications of innovation and making management simpler for MnDOT while granting contractors more discretion.

We surveyed other state departments of transportation to assess their experience with performance-based specifications in this area. As part of the survey, we requested guidance for configuring specifications and contract mechanisms, communicating with contractors about erosion and sediment control, and determining whether requirements have been met.

Survey Questions

To gather information about performance-based specifications, we distributed an email survey to members of the AASHTO Standing Committee on the Environment. The survey gathered contact information from agency representatives and asked the following questions:

1. Does your agency currently have specifications requiring contractors to implement temporary measures during construction projects to control erosion and sedimentation and other pollutants?

   (Note: Guidance on these practices is provided in "Erosion and Sedimentation Control," Chapter 4.5 of Environmental Stewardship Practices, Procedures, and Policies for Highway Construction and Maintenance, NCHRP Project 25-25(04), 2008. http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/4_5.aspx)

2. How do you verify compliance with erosion and sediment control specifications?

3. Please provide a reference to your specifications, regardless of methods used.

4. Please describe your communications with contractors about environmental concerns pre-bid, during construction and after delivery. For example, is this addressed at pre-bid meetings, and do you hold a post-construction meeting to gather contractor input?

5. Are your specifications performance-based, that is, based on a measured outcome (for example, maximum turbidity) as opposed to action specifications directing the use of particular methods? (Yes/No/Comments)

6. If you make some use of performance-based specifications, what criteria determine when they are used? (Choose all that apply.)
   - Not applicable (no performance-based specifications used)
   - Project size (based on land disturbance)
   - Project size (based on estimated cost)
   - Project complexity
   - Environmental sensitivity
   - Other (Please specify.)

7. What performance-based contractor compensation procedures do you employ? (Choose all that apply.)
   - Lump sum payment
   - Incentive payments
   - Disincentive payments
   - Other

8. Please describe any experience you may have had with implementing a performance-based approach for temporary erosion and sediment (and other pollutants) control and any plans for future implementation. MnDOT is interested not only in policy or program successes, but also in approaches that your agency tried that didn't work as planned.

Summary of Results

We received responses from 24 agencies representing most U.S. geographic regions. These included:

- Midwest/Northern: Idaho, Illinois, Indiana, Iowa, Montana, Utah, Wisconsin
- East Coast: Connecticut, Delaware, Florida, Maryland, North Carolina, Rhode Island, Virginia
- West Coast: Alaska, Oregon, Washington
- Inland/Southern: Arizona, Arkansas, Kansas, Kentucky, Missouri, Oklahoma, Tennessee

In addition, both Colorado and Ohio responded by emailing some of the information requested, and California communicated directly with MnDOT. These states do not currently employ performance-based specifications, but information from these sources has been provided in this report where relevant.

Only Florida, Montana and Washington reported current use of performance-based specifications. However, nine additional responding agencies reported discussions or plans surrounding this issue.

In the following sections, we provide information from the survey responses about states' experiences using and deliberating the use of these specifications as well as characterizations and quotes regarding how these states communicate with contractors. All respondents said that their agency does have some kind of specifications for temporary erosion and sediment control. Links to these specifications, along with contact information for each respondent, can be found in the **Organizational Contacts and Specifications** section beginning on page 7 of this report. The full text of the survey responses is available in the Appendix (provided separately).

States Using Performance-Based Specifications

- Florida employs performance-based specifications for all of its construction jobs; however, lump sum payment is currently being used as a developmental specification only. According to state water quality standards, "stormwater discharge cannot exceed 29 [nephelometric turbidity units (NTUs)] above background for most water bodies, and discharge to Outstanding Florida Waterbodies cannot exceed the background at all."

  The following specifications are available:

  "Prevention, Control, and Abatement of Erosion and Water Pollution," Section 104, Standard Specifications for Road and Bridge Construction, Florida Department of Transportation, 2010.
  http://www.dot.state.fl.us/specificationsoffice/Implemented/SpecBooks/2013/Files/104-2013.pdf

  "Prevention, Control, and Abatement of Erosion and Water Pollution," Section 104 (revised pages 124-131), Item No. 908-104-1, Standard Specifications for Road and Bridge Construction, Florida Department of Transportation, October 12, 2011.
  http://www.dot.state.fl.us/specificationsoffice/OtherFDOTLinks/Developmental/Files/Dev104.pdf

- In Montana, contractors have operational control over the site and must choose the appropriate BMPs to ensure compliance with applicable laws and permit conditions. Permits vary according to whether or not the project is on Native American land, but in either case, the contractor is responsible for selection, installation, maintenance and inspection of temporary BMP measures.

  The following specifications are available:

  Water Pollution Control and Stream Preservation, Section 208, Detailed Drawings, Montana Department of Transportation, April 2012.
  http://www.mdt.mt.gov/business/contracting/detailed_drawings.shtml

  Erosion and Sediment Control Best Management Practices, Montana Department of Transportation, undated.
  http://www.mdt.mt.gov/research/projects/env/erosion.shtml

  Permanent Erosion and Sediment Control Design Guidelines, Montana Department of Transportation, September 2010.
  http://www.mdt.mt.gov/publications/docs/manuals/pesc_manual.pdf

- Washington currently employs some performance-based and some lump sum specifications, but is trying to transition to all performance-based specifications. According to Elsa Piekarski of Washington State DOT's Erosion Control unit, "The goal is to define the work we need done without arbitrarily limiting the ways and means of the contractors." Washington employs incentive payments and disincentive payments as well as lump sum payments.

  Piekarski adds, "Projects will write General Special Provision contract language as needed for project-specific environmental risks. Our specifications often require the contractor to make plans (usually just a narrative) for certain types of work, especially when the work includes some potential to impact the environment. These different plans are defined throughout our standard specifications. WSDOT reviews and comments on the plans before they are accepted and implemented. In some cases WSDOT makes their own plans; for example, WSDOT prepares the initial Temporary Erosion and Sediment Control (TESC) Plan, which identifies project-specific erosion and water quality risks, and outlines measures and BMPs to minimize those risks. The contractor does have an opportunity to modify the TESC Plan as long as they follow the guidelines in our Highway Runoff Manual, Chapter 6. WSDOT usually accepts the contractor's modified plan after reviewing and commenting."

Environmental specifications:

"General Requirements," Division 1, Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, Washington State Department of Transportation, 2012.
http://www.wsdot.wa.gov/Business/Construction/SpecificationsAmendmentsGSPs.htm

Erosion and sediment control specifications:
"Miscellaneous Construction," Division 8, Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, Washington State Department of Transportation, 2012.
http://www.wsdot.wa.gov/Business/Construction/SpecificationsAmendmentsGSPs.htm

- Delaware doesn't use performance-based specifications, but a specification is required for permanent seeding projects. For a new road project coming up this year, the agency plans to try a performance standard for borrow pits based on turbidity.

Experiences Contemplating/Implementing Performance-Based Specifications

- In Montana, lump sum erosion control payments and the change to the contractor as sole permittee (on non-Native-American lands; on Native-American lands the contractor and Montana DOT are still co-permittees) were introduced in 2008. While the long-term efficacy of this change is unclear, it seems to be working well so far although some contractors are slow to adjust their procedures to meet the changed expectations.

- Piekarski of Washington State DOT warned that performance-based specifications can be very hard to enforce in the field because performance can be subjective. To make it work, the expected performance must be clearly defined in the specification, and the field inspectors must be trained and have the power to enforce the performance-based contract language.

- California used a performance-based specification for this purpose 10 years ago and has abandoned the process as "untenable with unintended consequences." (Note: California's representative communicated in person with MnDOT's Dwayne Stenlund but did not answer this survey.)

- Wisconsin prefers a design-based approach. According to Michelle Reynolds of Wisconsin DOT, "When we thought we needed to measure releases for 280 NTUs, that threw a gigantic wrench into our system as we were trying to figure out who would measure, who would be responsible for reporting, how would it be paid for, etc." The effort conflicted with Wisconsin's existing practices and system. If there are releases or BMPs are not operating satisfactorily, Wisconsin enhances or improves upon the BMPs in place.

- While Oregon does have performance-based specifications, there are intermittent, ongoing discussions about whether to implement performance-based measures. (They have not implemented any at this point.) Oregon uses lump sum payments, paid in four equal payments, for services such as plan updates, inspections, documentation and reporting. For bid items requiring materials installation, payments are made after measures are installed on the project.

- Idaho is interested in moving to performance-based specifications. Currently, maximum turbidity based on state standards is identified.

- Tennessee has not yet implemented performance-based specifications. The state is waiting for the Environmental Protection Agency (EPA) to determine its standards and for the industry to set evaluation criteria to determine whether testing devices meet these standards. Tennessee has conducted research to measure turbidity levels using various test devices and referenced a U.S. Geological Survey study monitoring turbidity during a recently completed Tennessee construction project on State Route 840.

- Arizona has been unsuccessful at implementing incentive-based specifications to enhance compliance.

- Rhode Island's best success to date has been implementing a Storm Water Pollution Prevention Plan template for use on all DOT construction sites. (Details are at http://www.dot.state.ri.us/programs/stormwater/stormwater4.asp.)

  The state suggested that the EPA's National Pollutant Discharge Elimination System Construction General Permit may include performance-based measures. (Details are at http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.)

- North Carolina has deployed water monitoring stations on some projects to verify that installed BMPs are working. But after spending a substantial amount of money on monitoring and calibrating equipment, the results were no different than its traditional use of BMPs.

- Ohio requires the contractor to provide temporary erosion and sediment control, a Stormwater Pollution Prevention Plan and inspections for all construction projects. According to Hans Gucker, Ohio DOT's Storm Water Program manager, the contractor selects and maintains all BMPs according to Supplemental Specification 832: Temporary Sediment and Erosion Control (May 5, 2009): http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/832_05052009_for_2010.PDF.

  This provision is part of the contract, and compensation does not include performance-based incentives or disincentives. The DOT merely confirms that the BMP was installed correctly. Gucker stated that there's some profit for the contractor built into the contract for each BMP purchased, which constitutes an incentive to install them; however, the contract specifies that only "appropriate" BMPs can be installed, so DOT oversight ensures that the contractor does not build more than necessary due to the profit incentive. (Note: Gucker did not respond to the survey but communicated by email.)

Monitoring Compliance with Standards

As exemplified by the comments from Tennessee, Idaho and North Carolina, states are interested in a key piece of performance-based specifications: measuring performance. Nearly all of the responses mentioned inspections as a technique to verify compliance. Some specifics of inspection procedures were provided:

- Delaware conducts weekly erosion and sediment control inspections as well as after every rain event that has at least 0.5 inch of rainfall. Connecticut has a similar requirement, but with inspections after a rainstorm of 0.01 inch.

- Tennessee verifies compliance via on-site stormwater pollution prevention plan (SWPPP) consultants; departments' construction compliance office inspectors; or, when the project is large, by employing a consultant (CEI).

- In Alaska, SWPPP requirements are usually manufacturer's specifications for silt fence and RECPs. Inspectors compare installations to these requirements, using yield method for mulch, seed and fertilizer (count bags). Seed bag tags are inspected before they are opened.

- In Kansas, specifications dictate the activities within weekly inspections by the contractor and also inspections by Kansas DOT field staff.

- In Indiana, the contractor supplies weekly inspection reports that are reviewed by the Indiana DOT project engineer.

- Oklahoma conducts regular field inspections. The Oklahoma DOT Environmental Division and the Oklahoma Department of Environmental Quality also conduct random inspections.

- Iowa requires visual inspection to verify controls are installed per specifications and standard road plans or design details. There is an approved sources list for silt fence fabric, logs, wattles and socks, and labels/tags for seed. Also, depending on the type of mix, mixing may be observed.

- In Arizona, the resident engineer overseeing the project conducts inspections. In addition, headquarters conducts periodic inspections for quality assurance/quality control.

A few respondents indicated the need for expertise on the part of field personnel. Washington, as noted above, indicated the need for training of field personnel to determine whether performance measures have been met. In addition:

- North Carolina has engineers and technicians dedicated to the monitoring and evaluation of erosion and sediment control BMPs. But its negative experience about spending money on monitoring equipment seems to have been a result in part of staff unpreparedness. The monitoring effort proved that staff must be competent in erosion and sediment control anticipating construction and weather conditions, and even then sometimes the best effort results in a failed performance measure.

- In Missouri, design and construction personnel go through in-house land disturbance training every one or two years. This training supports weekly and post-runoff inspections to ensure compliance with specifications, permits and SWPPP.

- In Maryland, the State Highway Administration has a quality assurance program administered by the Office of Environmental Design.

- In Delaware, the Department of Natural Resources and Environmental Control certifies Certified Construction Reviewers.

Communicating with Contractors About Environmental Concerns

All responding states indicated that they communicate expectations to their contractors in this area, but there was some variation about the timing of this communication:

- In only two cases—Idaho and Kentucky—did the respondent indicate that pre-bid communications regularly took place on this issue, though a few other states commented that these were addressed in contract documents. Presumably, since all responding states address environmental requirements through specifications, and all bidders would have access to these specifications (in many cases a rather large booklet) at the time of bidding, this constitutes "communicating" the requirements to all bidders. Rhode Island mentioned that contractors have the opportunity to ask questions regarding environmental concerns at any time during the (online) bidding process; presumably, this is also common to most, if not all, DOT construction projects.

- Nearly all states specifically mentioned addressing this issue during pre-construction meetings, and then as issues arise, such as when an inspection finds something wrong. Delaware and Maryland mentioned having a separate erosion and sediment (E&S) meeting in addition to the regular pre-construction meeting. Connecticut mentioned that contractors must submit an E/S plan before construction. Idaho stated that the contractor is required to have a water pollution control manager, and the EPA requires both the DOT and the contractor to issue a Notice of Intent.

- During the project, some states indicated that these issues were discussed during inspections, but it is unclear from the information gathered whether this entails discussion beyond what is required to address any issues the inspector found. Likewise, most states mentioned that environmental concerns were addressed during regular progress meetings, but it is unclear whether contractors are given specific environmental guidance at this time, if these issues are part of a general checklist, or whether environmental issues are only addressed in general insofar as problems have been detected through an inspection or in some other way.

- Some states indicated particular procedures for ensuring that as a project continues, environmental communications are maintained. In Alaska, a DOT & Public Facilities stormwater compliance specialist will review each project at least once and make recommendations for improved compliance. Inspection reports, grading logs, corrective action logs, SWPPP amendments and other materials are reviewed at the regional and statewide offices, and problems in documentation are communicated back to the contractor. Usually a stormwater specialist is also involved in ensuring adequate stabilization before winter shutdown and before filing Notices of Intent. Some states, such as Missouri and North Carolina, stressed that erosion control is a concern through all stages of the life of a project, but there was no evidence from the responses that any of the states neglect this area of project monitoring.

- For most states, post-construction meetings are rare to nonexistent. If they are held at all, they address any issues that would result in the DOT not signing off on the project. Arizona is supposed to hold a post-construction meeting, but that is not routine. Instead meetings are held following construction of sensitive projects or projects where "something major went wrong." In Montana, environmental concerns are discussed at project closeout meetings. Missouri holds post-construction meetings with the contractor to discuss any remaining items as well as BMP removal, before "buying off" on the project.

Organizational Contacts and Specifications

Below is the contact information for state DOT representatives who responded to the survey as well as any links provided to temporary sediment and erosion control specifications.

Alaska
Kris Benson, Alaska Department of Transportation & Public Facilities, kris.benson@alaska.gov, (907) 465-6326.

http://www.dot.state.ak.us/stwddes/dcsspecs/assets/pdf/hwyspecs/stdmods/stdmods_eng.pdf; see E100 for Section 641 dated January 1, 2012, starting on page 30 of 79.

Arizona
Wendy Terlizzi, Arizona Department of Transportation, wterlizzi@azdot.gov, (602) 712-8353.

http://www.azdot.gov/Highways/CNS/Stored_Specs/Stored_Specs_2008_12-10-12.exe (currently being updated)

Arkansas
Gary L. Williamson, Arkansas State Highway and Transportation Department, gary.williamson@ahtd.ar.gov, (501) 569-2230.

http://www.arkansashighways.com/standard_spec_2003.aspx#

Colorado
Jane Hann, Colorado Department of Transportation, jane.hann@state.co.us, (303) 757-9630.
While Colorado did not answer the survey, Hann sent the 2011 Standard Specifications for Road and Bridge Construction by email (provided separately). The specifications include language (starting on page 125) requiring the contractor to comply with state and federal clean water standards and to install and maintain BMPs as necessary. No performance-based compensation in this area is described.

Connecticut
Paul Corrente, Connecticut Department of Transportation, paul.corrente@ct.gov, (860) 594-2932.

(Specifications not provided.)

Delaware
Vincent W. Davis, Delaware Department of Transportation, vince.davis@state.de.us, (302) 760-2180.

http://www.deldot.gov/information/pubs_forms/manuals/standard_specifications/pdf/2001StdSpecForRoadAndBridgeConstruction.pdf

Florida
Larry Ritchie, Florida Department of Transportation, larry.ritchie@dot.state.fl.us, (850) 414-4168.

http://www.dot.state.fl.us/specificationsoffice/Implemented/SpecBooks/2013/Files/104-2013.pdf,
http://www.dot.state.fl.us/specificationsoffice/OtherFDOTLinks/Developmental/Files/Dev104.pdf

Idaho
Brad Wolfinger, Idaho Transportation Department, brad.wolfinger@itd.idaho.gov, (208) 334-8163.

http://itd.idaho.gov/enviro/Stormwater/default (website being remodeled)

Indiana
Mark Miller, Indiana Department of Transportation, mrmiller@indot.in.gov, (317) 232-5456.
http://www.in.gov/dot/div/contracts/standards/rsp/sep11/200/205-C-230%20120901.pdf

Iowa
Melissa Serio, Iowa Department of Transportation, melissa.serio@dot.iowa.gov, (515) 239-1280.

http://www.iowadot.gov/erl/current/GS/content/2601.pdf,
http://www.iowadot.gov/erl/current/GS/content/2602.pdf

Kansas
Scott Shields, Kansas Department of Transportation, scottsh@ksdot.org, (785) 296-4149.

http://www.ksdot.org/burconsmain/specprov/2007specprov.asp?ID=900

Kentucky
John Drake, Kentucky Transportation Cabinet, john.drake@ky.gov, (502) 564-7250.

(Specifications not provided, but see http://transportation.ky.gov/environmental-analysis/environmental%20resources/ky%20bmp%20manual%20section%201.pdf)

Maryland
Tad C. Daniel, Maryland State Highway Administration, tdaniel@sha.state.md.us, (410) 365-0164.

http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SoilErosionandSedimentControl/Documents/2011%20MD%20Standard%20and%20Specifications%20for%20Soil%20Erosion%20and%20Sediment%20Control.pdf

Missouri
Nate Muenks, Missouri Department of Transportation, nathan.muenks@modot.mo.gov, (573) 751-2790.

http://www.modot.org/business/standards_and_specs/Sec0806.pdf

Montana
Heidy Bruner, Montana Department of Transportation, hbruner@mt.gov, (406) 444-7203.

http://www.mdt.mt.gov/business/contracting/detailed_drawings.shtml (See Section 208.)
http://www.mdt.mt.gov/research/projects/env/erosion.shtml
http://www.mdt.mt.gov/publications/docs/manuals/pesc_manual.pdf

North Carolina
David B Harris, North Carolina Department of Transportation, davidharris@ncdot.gov, (919) 707-2925.

https://connect.ncdot.gov/resources/Specifications/Specification%20Resources/2012%20Standard%20Specifications.pdf, Section 1600

Ohio
Hans Gucker, Ohio Department of Transportation, hans.gucker@dot.state.oh.us, (614) 387-3058.
(Did not respond to the survey, but answered via email)

http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/832_05052009_for_2010.PDF

Oklahoma
Michele Dolan, Oklahoma Department of Transportation, mdolan@odot.org, (405) 521-6771.

http://www.okladot.state.ok.us/cnstrctengr.htm, Section 200

Oregon
Raghu Namburi, Oregon Department of Transportation, raghu.namburi@odot.state.or.us, (503) 986-3551.

http://www.oregon.gov/ODOT/HWY/SPECS/pages/standard_specifications.aspx#2008_Standard_Specifications
http://www.oregon.gov/ODOT/HWY/SPECS/Pages/2008_special_provisions.aspx

Rhode Island
Allison Hamel, Rhode Island Department of Transportation, ahamel@dot.ri.gov, (401) 222-2023 x4097.

http://www.dot.state.ri.us/engineering/standards/bluebook/index.asp

Tennessee
Ali Hangul, Tennessee Department of Transportation, ali.hangul@tn.gov, (615) 741-0840.

Design Division standards and Drainage manual, Chapter 10:
http://www.tdot.state.tn.us/Chief_Engineer/assistant_engineer_design/design/designstandardsmenu.htm

Environmental Division: http://www.tdot.state.tn.us/environment

Utah
Terry Johnson, Utah Department of Transportation, terryjohnson@utah.gov, (801) 633-1327.

http://www.udot.utah.gov/main/uconowner.gf?n=7581211784966422

Virginia
Roy T. Mills, Virginia Department of Transportation, roy.mills@vdot.virginia.gov, (804)786-9013.

http://www.virginiadot.org/business/const/spec-default.asp

Washington
Elsa Piekarski, Washington State Department of Transportation, piekare@wsdot.wa.gov, (360) 570-6654.

Wisconsin
Michelle Reynolds, Wisconsin Department of Transportation, michelle.reynolds@dot.wi.gov, 608-264-8417.

http://roadwaystandards.dot.wi.gov/standards/fdm/16-05-001e001.pdf,
https://docs.legis.wisconsin.gov/code/admin_code/trans/401