

Certification: Bituminous Street Inspector

Background

The MnDOT Technical Certification Program is mandated by the FWHA Code of Federal Regulations [Code 23 CFR Ch. I (4–1–11 Edition) Title 23. Part 637]. For Minnesota and MnDOT to receive federal funding for highway and bridge projects, we must have a Quality Control, Quality Assurance, and Independent Assurance Program in place that ensures qualified and certified technicians are testing and inspecting materials used on those projects. Minnesota also has chosen to extend this requirement to all state and some local government aid highway projects.

The types of materials that are tested are aggregate (rocks), concrete, bituminous (asphalt), soil, and various other materials used in roadway and bridge construction.

MnDOT has four Specialty Units, each responsible for materials used on the roadways and bridges. MnDOT staff at these Units work collaboratively with each other, the Technical Certification program staff, industry representatives, and people working in the field. These Specialty Units are 1) Concrete, 2) Bituminous (asphalt), and 3) Grading & Base (soil, sand, and rocks) at the Maplewood Office of Materials and Road Research, and 4) the Oakdale Bridge Office.

There are three key levels to the materials Sampling and Testing process, done by people with **Tester** certifications (formerly known as Level 1 certifications).

Quality Control (QC) is done by qualified and certified **Testers** who work for the **contractor** (the company that is building the road or bridge) or a **producer** (the company that supplies the materials). At designated times throughout the project, the Testers sample, test, and record and report on the roadway and bridge materials to make sure they are meeting the specifications described in the contract.

Quality Assurance (QA) is done by qualified and certified **Testers** who work for the **“owner” of the roadway or bridge project** (MnDOT or other designated agencies). QA Testers test the same materials as the QC Testers, using what is known as “companion samples” that are split and shared by QC and QA testers. This QA testing is also done at designated times, but less often than the QC testing. The goal is for the owner to verify that the contractor/producer test results are accurate and confirm that the materials meet the specifications in the contract. These Testers are typically MnDOT staff, consultants hired by MnDOT, or county/city personnel.

The *Independent Assurance Program (IA)* provides a layer of oversight to the testing process on federally funded projects. The **IA staff members** do an independent, unbiased evaluation of all the **sampling procedures, testing procedures, and testing equipment** used to determine the quality of the products specified in every roadway or bridge project contract. Each MnDOT District has at least one IA staff member responsible to review and report on all Federal Aid projects in their district. As part of this work, they check the testing equipment, including the calibrations, and conduct annual reviews of all project Testers, both those doing Quality Control (for contractors and producers) and Quality Assurance (for MnDOT and other agencies).

In the system, there also is another important layer of oversight that is done by **Inspectors**. The Inspector holds an advanced certification (formerly known as Level 2), serves in a decision-making role providing project supervision or oversight (e.g., Chief Inspector, Mix Designer, etc.), and is employed by MnDOT or other designated agencies. The role of the Inspector is to represent the Project Engineer and **oversee, inspect, and evaluate the production and placement** of the roadway and bridge materials, as described in MnDOT plans, specifications, and contracts. It is the Inspector who gives final approval to the placements of materials, when the specifications have been met, and then authorizes payment from the owner to the contractor.

Use of this Certification

The **Bituminous Street Inspector Certification** is required for all personnel (agency/owner and contractors) who obtain and/or split samples, compute yield checks, determine density core locations, and conduct general paving inspections on bituminous projects, and for MnDOT Independent Assurance Inspectors.

For agencies/owners there must be at minimum one certified Inspector per project, preferably one for each major work area (Lead Inspector). For contractors, there is a minimum of one certified individual per paving project and preferably one certified individual for each major work area (Paving Superintendent).

People who have and use this certification typically work at MnDOT and local agencies (counties and cities), consultants, contractors (the private businesses who are contracted to do construction work), and producers (bituminous plants that supply the materials).

Requirements and Relationship to Other Technical Certifications Courses

Prerequisites needed before beginning the course →	Bituminous Street Inspector Certification	→ Is one of the prerequisites for other certification courses
None	<p>Requirements: Attend course (3 day), pass exam (70% or higher)</p> <p>Expiration: after 5 construction seasons (see Certification Card for expiration date)</p> <p>Recertification: yes, if completed before the certification expiration date; attend Recertification course (1 day) and pass exam (70% or higher)</p>	None

Certification Course Description

This 3-day course focuses on fundamental information about bituminous paving, testing, and technology to ensure bituminous paving meets roadway construction quality requirements. Topics include asphalt properties and types, production and testing, plant types and operation, aggregates used in production of hot-mix design concepts, surface preparation, trucking, paving and compaction specifications, inspector and contractor roles, the MnDOT Quality Management Specification, and Certified Plant requirements.

Classroom instruction includes lecture, demonstration, discussion, and practice activities. Quizzes, course resources, and content reviews are included to help participants prepare for the written exam. [Note: Depending on participants' prior knowledge and experience, they may want to do additional practice and review before taking the class and/or the exam.]

Recertification Course Description

This 1-day recertification course reviews core knowledge and skills from the initial certification course and provides information on any recent changes to the relevant specifications and test procedures.

Instruction includes lecture, demonstration, discussion, and practice activities. Participants will also have an opportunity to discuss lessons learned in the field. Quizzes, course resources, and content reviews are included to help participants prepare for the written exam.

[Note: People who have had little or no experience working with their certification since their prior class will want to either 1) review the course content before taking the recertification class or 2) take the initial certification course instead. The recertification course is **not** a complete re-teaching of the content but a review with updates for people who have a solid base of the required knowledge and skills.]

Objectives

A summary of the knowledge, skills, and attitudes students must demonstrate to receive and do the work of this certification:

Materials Testing & Inspecting (Note: #1-6 in all Certifications)

1. Know the basic **history** and **purpose** of roadway and bridge materials testing and inspection
2. Know the Quality Control (QC), Quality Assurance (QA), and Independent Assurance (IA) roles and responsibilities of people at MnDOT, consultants, other government agencies, and private companies (contractors, and producers)
3. Know the role of the **Tester** who samples and tests materials used in the roadway or bridge project to determine if the materials meet the required specifications.
4. Know the proper use of materials **testing for acceptance** (how to document and report when a test procedure shows the material tested does meet the required specifications and to how to communicate that information effectively)
5. Know the documentation and reporting requirements for **materials exception** (what to do when a test procedure shows a material does not meet the required specifications, how problems are resolved, and how to communicate this information effectively)
6. Know the role of the **Inspectors** who oversee, inspect, and evaluate the production and placement of the roadway and bridge materials and how they authorize payment

Key Background, Terms, Tools, and Formulas for the Certification

Safety, Tools, Calculations

7. Know about **safety** hazards related to the specific work and job sites of this certification; know how to follow safe operating procedures and to report unsafe conditions to supervisors.
8. Know and be able to use any special **tools** used for this certification's test procedures
9. Understand and use the **calculations**, formulas, and units of measurement used for this certification, including basic math, use of algebraic formulas, English and metric measures for weight and volume and how to convert from one to another, if needed, particularly for asphalt emulsion (residual asphalt) and hot mix asphalt yield checks

Key Content

10. Know key **background** related to this certification, including various kinds of asphalt binders and the impact of temperature; properties of aggregate sources and their effect on performance; mix design types, principles, characteristics, and relationship to performance; pavement properties such as rut resistance, durability, and workability; additives used to improve the material; and naming conventions and acronyms for materials and tests used in this work
11. Know the reasons for the **test procedures** to assess asphalt content, gradation, Asphalt Film Thicknesses (AFT), and air voids

Inspector Tasks and Responsibilities

Inspection and Documentation

12. Know all steps, terms, and components for the initial **project review**, including the pre-construction meeting, progress schedule, mixture designation codes, and pay items
13. Be familiar with batch and drum Hot Mix Asphalt (HMA) **plant operations**, including the storage and handling of materials, equipment, and processes

14. Know how to review and assess **plant operations** to assure they are working properly, including at different areas of the plant to review, truck loading, and segregation
15. Know and be able to complete inspections of project preparation at the **construction site**, including to ensure traffic control, to review plans and provisions, to attend pre-paving meetings, to use an effective communication system, and adapt to weather limitations
16. Know how to and be able to conduct safe and current behind the paver **sampling** procedures, including the rate of sampling, according to requirements listed in the *MnDOT Schedule of Materials Controls (SMC)*
17. Know how to confirm that all testing, documentation, and materials met the **requirements** as listed in the *MnDOT Schedule of Materials Controls (SMC)*

Communication and Project Supervision

18. Be able to **communicate** effectively, including listening to others, speaking and writing clearly, and taking notes on conversations and observations
19. Be able to **collaborate** with others to solve problems, including the use of conflict resolution techniques
20. Be able to **coordinate** project documents, including standard specifications, supplemental specifications, plans, and special provisions
21. Know how to identify **unqualified workers** and follow proper procedures to have them removed from a project
22. Know when and how to **suspend work** that is unauthorized, unacceptable, or not in compliance
23. Identify common bituminous street problems, know how to address them using clear **problem-solving** strategies, and then document actions as needed.

Bituminous Street

Bituminous Mix

24. Know how to identify the **mix type** used for the project, using the Test Summary Sheet
25. Review **typical mixes** used in **MN**, such as dense graded, SMA, and Ultra-thin bonded wearing course, and be able to explain differences and similarities
26. Know how to identify all the items on the **truck weigh ticket** are properly documented, including through e-Ticketing
27. Know how to identify the proper placement **temperature** of bituminous, and review and assess the accuracy of the information
28. Know how to examine and assess the **quality** of bituminous upon **delivery**, including the appearance, temperature requirements, mat contamination, and truck inspections
29. Know **issues** related to mix **delivery** such as how to place in the paver hopper, overlapping of windrows, maintaining a proper truck queuing, tarping trucks, how to manage a material transfer device, and proper dumping techniques
30. For each of the **preventative maintenance** treatments (surface, chip seal, and micro surfacing), know when and for what conditions it is chosen, the materials and processes used, and seasonal limitations for its use

Mixture Placement

31. Know the rationale for and key components of **surface preparation** including levels (subgrade soil, subbase, and base) and processes to ensure high quality HMA roads
32. Know the proper procedures for **surface milling**, including required tolerances and surface appearance
33. Know when and how to select surface **cleaning** and **patching** methods and how to implement them
34. Know when and how to use an asphalt **emulsion distributor**, including application rates, allowable dilution rates, no field dilution allowed, effect of diesel fuel, full coverage, proper nozzle size, emulsion temperature, and sample method

35. Recognize mixture **placement locations** for the project, including to review surface requirements (edges, slopes, segregation, open/torn sections).
36. Know **weather** conditions that create limitation for placement and understand recommendations for cold weather paving
37. Know and be able to assess all parts of the **construction process**, including the rolldown factor, straight longitudinal lines, echelon paving, truck exchanges, paver operations, the uses of specific parts of the equipment (flow gates, adjustable screw augers, longitudinal cracking, kick back paddles, tow points, extensions), and screed adjustment
38. Know basic information about **grade and slope** and how the pavers' sensors and system work
39. Know how **thermal systems** work and how to quickly act on information provided by them

Compaction

40. Know the purpose of **compaction**, the equipment and settings used, and rolling time needed
41. Know how to and be able to create **sample cores** to be used to assess maximum density, including how to set the core layout, complete the Bituminous Core Stationing Worksheet, label the cores with the Lot ID and core number, patch the core holes, and complete the correct (project specific) Density Incentive/Disincentive worksheet with all needed information
42. Know about the use of a **portable nuclear gauge** to test for ordinary compaction and related safety considerations
43. Know how to construct and assess traverse and longitudinal **joint construction**
44. Know about the use of **Intelligent Compaction** (IC), including the specification requirements of the system
45. Know when and how to assess **ride** and **smoothness** through International Roughness Index (IRI) or ALR Areas of Localized Roughness (ALR) and how to submit the Profile Summary and the Smoothness Assurance Report

Recertification

46. In addition to all the objectives above, the technician will be familiar with all certification area updates from the past 4-5 years, including any changes to specifications and test procedures.