



STATE HIGHWAY
ADMINISTRATION



MDOT SHA
STANDARD SPECIFICATIONS FOR
CONSTRUCTION AND MATERIALS
502

CEMENT TREATED BASE COURSE
&
CEMENT MODIFIED SUBGRADE

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DIVISION CHIEF, SATD, OMT

DATE: 03-22-2022

WHY UPDATE WAS NEEDED

- Addressing only **In Place Treatment**, Not Plant Mix
- Addition of **Cement Modified Subgrade**
- **Full Reclamation** Projects (**MD 980B-Wrighton Rd to Talbot Rd Crossover**)
- **Design-Build** Projects (**MD 404, US 113 Phase III and MD 32**)
- **QA/QC Acceptance Criteria** (**Cylinders for CS vs FWD**)
- Meeting Industry **Standards/Challenges**

MAJOR CHANGES

- **Title and Description**
- **502.02 Materials**
- **502.03 Construction**
 - **Replaced Sections:**
 - 502.03.01 Equipment
 - 502.03.04 Design Mix
 - 502.03.07 Mixed In Place Construction replaced with 502.03.06 Pulverization, Shaping, Stabilization,
 - 502.03.10 Compaction replaced with 502.03.08 Compaction,
 - 502.03.11 Construction Joints replaced with 502.03.09 Construction Joints
 - **Deleted Sections :**
 - 502.03.05 Transportation,
 - 502.03.06 Spreading of Plant Mix Material
 - **Added Sections:**
 - 502.03.05 Control Strip
 - 502.03.13 Subsequent Pavement Layers
 - 502.03.14 Quality Control Plan (QCP)
 - 502.03.15 Quality Assurance (QA) and Final Acceptance
- **502.04 Measurement and Payment**

TITLE AND DESCRIPTION

OLD SPECIFICATION

- **Title**
 - SOIL-CEMENT BASE COURSE
- **Description**
 - Construct soil-cement base course using a combination of soil and Portland cement, uniformly mixed, moistened, compacted, shaped, and sealed. Unless otherwise specified, the soil, cement, and water may be either plant mixed or mixed in place

NEW SPECIFICATION

- **Title**
 - CEMENT TREATED BASE COURSE AND CEMENT MODIFIED SUBGRADE
- **Description**
 - Construct **Cement Treated Base (CTB)** course or **Soil-Cement Modified Subgrade (CMS)** using a combination of soil or **graded aggregate base** and Portland cement, uniformly mixed, moistened, compacted, shaped and sealed to the required depth and widths specified. **Mix the CTB or CMS in place.**

502.02 MATERIALS

OLD SPECIFICATION

- Portland Cement 902.03
- Emulsified Asphalts 904.03
- Production Plant 915
- Soil 916.01.01&02
- Water 921.01

NEW SPECIFICATION

- Graded Aggregate Base 901.01
- Portland Cement 902.03
- Emulsified Asphalts 904.03
- Select or Capping Borrow for CTB 916.01
- Soil for CMS 916.01
- Water 921.01

502.03 CONSTRUCTION (EQUIPMENT)

OLD SPECIFICATION

- **502.03.01 Equipment**

All equipment, including the production plant and on-site equipment, is subject to approval. Have the production plant ready for inspection at least 48 hours before the start of construction operations.

NEW SPECIFICATION

- **502.03.01 Equipment**

- Reclaimer
- Grading Equipment
- Compaction Equipment
- Spreader or Distributor
- Water Trucks

502.03 CONSTRUCTION (DESIGN MIX)

OLD SPECIFICATION

502.03.04 Design Mix

- At least 45 days prior to the start of constructing the base course, submit samples of the soil and Portland cement from the proposed material sources. Sample the materials as specified in the Materials Manual. **The Engineer will determine** the exact proportions of soil and Portland cement, and the optimum moisture content based on these samples. Proportions may be revised during construction to provide for changing conditions as directed.
- **Plant mixed material** shall be sampled at the plant. Mixed in place material shall be sampled from a **100 ft long control strip** constructed on the site.

NEW SPECIFICATION

502.03.04 Design Mix

- **Mix Design** – Developed by AASHTO Accredited Lab
- **Verification** - OMT (New Mix Design/Revised Mix Design)
- **Sampling** - 500 ft of the proposed CTB or CMS placement
- **Required Testing** – AASHTO Standards (T27, T88, T89, T90, T134, T265, M145) and ASTM Standard – D1633
- **Compressive Strength Requirement:** 450-700 psi for CTB and 100-300 psi for CMS

502.03 CONSTRUCTION (CONTROL STRIP)

OLD SPECIFICATION

- **No Separate Section** Addressing QC/QC of Control Strip.

The only statement was

Mixed in place material shall be sampled from a **100 ft long control strip** constructed on the site.

NEW SPECIFICATION

502.03.05 Control Strip

- **Length** – 500 ft
- **Acceptance Criteria** – FWD Testing
 - For CTB - Minimum of **610 000 psi**
 - For CMS – Min:**4500psi** & Max:**10500 psi**

502.03 CONSTRUCTION (PULVERIZATION, SHAPING, STABILIZATION)

OLD SPECIFICATION

- No Separate Section Addressing
[Pulverization, Shaping and Stabilization](#) of
In Place Materials

NEW SPECIFICATION

- **502.03.06 Pulverization, Shaping, Stabilization**
- **Pulverization**
 - Gradation Requirement:
 - 1 inch sieve = [100%](#) Passing
 - #4 Sieve = [Minimum 80%](#) passing
 - For CTB – 901.01
- **Shaping/Stabilization**
 - Cement Rate Measurement – [MSMT 254](#)
 - Moisture Content – [Limit of +2 of OMC](#)

502.03 CONSTRUCTION (COMPACTION)

OLD SPECIFICATION

- **502.03.10** Compaction
- **Requirement:**
 - Density - 100% of MDD
 - Moisture Limit-- +/- 2% of OMC
- No other criteria/clarification was provided in the old spec

NEW SPECIFICATION

502.03.08 Compaction

- **Requirement:**
 - Density – 97% of MDD
 - Moisture Limit -- + 2% of OMC
- **Lift Thickness:**
 - For CTB – 8 inch
 - For CMS – 12 inch
- **New Control Strip:**
 - When target density is not met
- **New Target Density:**
 - Avg of 5 locations on new control strip

502.03 CONSTRUCTION (NEW SECTIONS)

OLD SPECIFICATION

- No Section was related to QCP and QA/Acceptance Criteria

NEW SPECIFICATION

- **502.03.13 Subsequent Pavement Layers**
- **502.03.14 Quality Control Plan**
 - Approval by OMT (30 days)
 - Certified Technician
 - Checks: 1)Cement, 2)Density, 3)MC, 4) Depth
- **502.03.15 Quality Assurance (QA) and Final Acceptance**
 - Mix Design, Control Strip, Field Compaction, Depth Check , QCP, Application rate of Cement

502.04 MEASUREMENT AND PAYMENT

OLD SPECIFICATION

- **502.04.01** Soil-Cement per square yard.
- **502.04.02** Portland Cement for Soil-Cement per ton.

NEW SPECIFICATION

- **502.04.01** Cement Treated Base per square yard.
 - **502.04.02** Portland Cement for Cement Treated Base Course per ton.
 - **502.04.03** Graded Aggregate Base for Cement Treated Base Course per square yard.
 - **502.04.04** Select Borrow for Cement Treated Base Course square yard.
 - **502.04.05** Capping Borrow for Cement Treated Base Course square yard.
 - **502.04.06** Cement Modified Subgrade per square yard.
 - **502.04.07** Portland Cement for Cement Modified Subgrade per ton as determined by the approved mix design.
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