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Standard Specification for  
Corrosion-Resistant  
Coated Dowel Bars

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**AASHTO Designation: M 254-06 (2010)**



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

## Standard Specification for

# Corrosion-Resistant Coated Dowel Bars



## AASHTO Designation: M 254-06 (2010)

### 1. SCOPE

1.1. This specification covers the materials, manufacture, and installation of coated dowel bars to be used where corrosion-resistant performance is essential and may be used in lieu of stainless or other approved noncorrosive metals. The dowel shall consist of a steel core covered by an organic coating.

1.2. The coated dowels shall be one of the ~~two~~ **three** following types:

*Type A*—The coating material develops sufficiently low-bond strength with concrete that a bond breaker is not required.

*Type B*—The coating material develops bond strength with concrete such that a bond breaker is required. The type of bond breaker used shall be as recommended by the coating manufacturer.

*Type C*—The coating material meets higher performance criteria for longer life pavements such as Abrasion Resistant overcoat (ARO) and develops bond strength with concrete such that a bond breaker is required. The type of bond breaker used shall be as recommended by the coating manufacturer.

1.3. The values stated in SI units are to be regarded as the standard.

### 2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards:*

- ~~■ M 255/M 255, Steel Bars, Carbon, Hot Wrought, Special Quality, Mechanical Properties~~
- T 253, Coated Dowel Bars

2.2. *ASTM Standard:*

~~■ G 12, Standard Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel~~

■ A 615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

■ A 775 Standard Specification for Epoxy-Coated Steel Reinforcing Bars

■ A 934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars

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2.3. *Other References:*

■ FHWA-RD-74-18, "Nonmetallic Coating for Concrete Reinforcing Bars," 1974

■ Society for Protective Coatings Specifications: SSPC-PA2 Measurement of Dry Coating Thickness with Magnetic Gauges

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### 3. GENERAL REQUIREMENTS

- 3.1. The coated dowels shall resist corrosion and degradation caused by roadway deicing materials and normal highway debris.
- 3.2. The coating shall develop low-bond strengths with portland cement concrete without a bond breaker, if Type A, or with the proper bond breaker, if Type B or Type C.
- 3.3. The coating shall resist wear due to abrasion resulting from pavement expansion and contraction.
- 3.4. The coating used over the steel core shall be continuous on the lateral surface of the dowel.
- 3.5. Test procedures as stated herein and in T 253 shall apply to both Type A and Type B dowels.
- 3.6. In the event there is any change in material composition or geometrics of the joint support system, any or all parts of the dowels and assembly are subject to retesting. The frequency of qualification testing will be determined by the purchasing agency.
- 3.7. The processing facilities of the manufacturer and the fabricator shall be open to inspection by the agent of the purchaser at all times during the manufacturing and fabricating of the material.
- 3.8. A minimum of 24 14 dowel bars shall be made available for testing. Of these, a maximum of six -bars may be in a basket assembly.

### 4. MATERIALS

- 4.1. The core material shall be made of steel meeting the requirements of ~~M 255M/M 255~~ ASTM A 615. The grade shall be as specified by the purchasing agency.
- 4.2. The coating material shall be of organic composition with the exception of the pigment, which may or may not be present, and which may have an inorganic composition.  
**Note 1**—The Type B coating material may be one of the types recommended in Report No. FHWA-RD-74-18 or other types approved by the purchasing agency.  
Note 2 – Powder for epoxy-coated bars for Type B and Type C coatings shall meet as a minimum the requirements set forth in ASTM A 775 Annex A1

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### 5. DIMENSIONS

- 5.1. The core metal shall be ~~21.8 mm~~ (1<sup>1</sup>/<sub>4</sub>-in.) diameter and 18" long or as specified by the purchasing agency.
- 5.2. The nonabraded thickness of the Type A coating shall be 0.64 ± 0.13 mm (25 ± 5 mils). The nonabraded thickness of the Type B coating shall be a minimum 10 mils, ~~0.18 ± 0.05 mm (7 ± 2 mils)~~. The nonabraded thickness of the Type C coating shall be a minimum of 10 mils.
- 5.3. Coating thickness shall be determined according to ~~ASTM G 12~~ SSPC-PA2 or by stripping the coating from the bar.
- 5.4. The dowels shall be supplied to lengths and in support assemblies or baskets or loose as specified by the purchasing agency.
- 5.4. The thickness of the patched ends for Type C coating shall be a minimum of 8 mils.

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## 6. PHYSICAL REQUIREMENTS

- 6.1. The free ends of the dowels shall be saw cut and free of burrs and projections.
- 6.2. Dowel coatings shall be free from contamination, perforations, cracks, and holidays (pinholes not visually discernible). Checking for holidays shall be performed by the electric-resistance process. A 67.5-volt holiday detector shall be used, as recommended by the manufacturer of the test equipment, for the determination of holidays. Type B and C fusion bonded epoxy coating shall be applied per the requirements in ASTM A 775 or as specified by the purchasing agency.
- 6.3. Any damage that results from welding or mechanical fixation to achieve a fixed-end condition shall not extend more than 25.4 mm (1 in.) in from the weld or point of fixation.
- 6.4. Welding to achieve a fixed-end condition shall be sufficiently strong to maintain dowel alignment under the forces imposed by concrete placement and construction practices.
- 6.5. When tested in accordance with T 253, the dowel bars shall have the following properties:
- 6.5.1. ~~Load Deflection—The relative deflection shall not exceed 0.25 mm (0.10 in.) at the 1815 kg (4000 lb) load for any of the three specimens tested.~~
- 6.5.2. ~~Pullout—The maximum pullout load shall not exceed 1360 kg (3000 lb) for any specimens, and no specimen shall show any corrosion, tears, or perforation due to the pullout and subsequent freeze-thaw testing.~~
- 6.5.3. ~~Abrasion—The coating shall not have been worn away, perforated, or wrinkled, and none of the three specimens shall show depth or wear exceeding 70 percent of the original coating thickness. Thickness shall be determined according to Section 5.3 of this specification.~~
- 6.5.4. *Corrosion*—No corrosion shall be apparent on any of the specimens when viewed under five-power magnification.
- 6.5.5. *Chemical Resistance*—The coating shall not blister, soften, disbond, develop holidays, nor exhibit any undercutting at the drilled holes.
- 6.5.6. *Cathodic Disbonding*—No film failure shall take place during the first 1 hour of testing. Such film failure would be evidenced by the evolution of hydrogen gas at the cathode or appearance of corrosion products of steel at the anodes except that such hydrogen evolution or corrosion products at the intentionally cut ~~6.4 mm (<sup>1</sup>/<sub>4</sub> in.)~~ 3 mm (0.12 in) holes will not be considered as basis for rejection. ~~However, no undercutting shall be permitted during the remainder of the test period at the intentionally cut 6.4 mm (<sup>1</sup>/<sub>4</sub> in.) holes in either the anode or cathode.~~
- 6.5.7. ~~Coating Hardness—The hardness of the coating shall exceed the Knoop Hardness Number of 16.~~
- 6.5.8. ~~Coating Impact Resistance—No shattering or disbonding of the coating shall occur except at the impact area (area permanently deformed by the tup).~~

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## 7. SAMPLING

- 7.1. A minimum of ~~24~~ 14 dowel bars, of which up to six may be in a basket assembly, shall be furnished by the manufacturer for testing and verification of the materials and process. The specimens shall be made available to the testing laboratory ~~±20~~ 60 days prior to their first intended use. When fixed mechanical assembly is being used, a complete assembly with dowels shall be made available upon request by the purchasing agency.

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## 8. DOCUMENTATION

- 8.1. Tests performed according to this specification shall be the responsibility of the manufacturers and/or coating applicator and may be performed at his laboratory or an independent laboratory approved by the purchasing agency. ~~Upon completion of the tests, all tested specimens shall be properly labeled as to test procedure, and be made available upon request to the purchasing agency.~~
- 8.2. The laboratory facilities and procedure must be open to observation by the purchaser while tests are underway. The purchasing agency reserves the right to check any or all parts of the required tests in the agency laboratory or a laboratory of his choice.
- 8.3. The coated dowel manufacturer and/or coating applicator shall provide certified copies of test reports to the purchasing agency showing all test data.
- 8.4. For the purpose of identification, the manufacturer or applicator shall provide certification showing the generic type of coating material along with the type and percentages of pigments, diluents, fillers, flexibilizers, and other additives used.
- 8.5. The coated dowel manufacturer is defined as a company that produces a complete product consisting of dowel bar and coating.
- 8.6. The coating applicator is defined as a company that applies coatings to dowel bars.
- 8.7. Rechecks of the coated dowels may be made at the discretion of the purchasing agency. The purchasing agency may delete any of the above specified test procedures during rechecks of any previously approved product.

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## 9. STORAGE

- 9.1 ~~Epoxy coated dowels stored outdoors for more than 3 months shall be covered with opaque polyethylene sheeting or other suitable opaque protective material.~~
- 9.2 ~~Dowels coated with Tectyl or similar material can remain uncovered for a period of one year without detriment to the epoxy coating. Tectyl coated dowels fabricated more than a year in advance of installation shall be stored inside or covered with opaque polyethylene sheeting or other suitable protective material.~~

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