

# Dowels

*National Concrete Consortium*

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# Dowel Bar Revisions

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**Standard Specification for  
Corrosion-Resistant  
Dowel Bars**

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AASHTO Designation: M 254-14



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

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**Standard Method of Test for  
Dowel Bars**

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AASHTO Designation: T 253-2014



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# All Dowell Bar Types or Not

- Current AASHTO 254 and 253 only apply to steel with epoxy or plastic coating.
- Should an all inclusive specification be written or just update current specification to address epoxy?
- Should the specification be performance based or method specific?

# Three Dowel Types

- Type A
  - Type B
  - Type C
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- Must meet minimum load transfer efficiency and differential deflection for each type.
  - Must comply with a simple corrosion test.
  - Must comply with a pullout test.

# Type A

The standard dowel develops bond strength with concrete such that a bond breaker may be required. The type of bond breaker used shall be as recommended by the coating manufacturer. Load Transfer Efficiency shall not be less than 70% and differential deflection no more than 15 mils.

- *Epoxy Coated Dowels*
- *Plastic Coated Dowels*

# Type B

The dowel meets a higher performance criteria and develops bond strength with concrete such that a bond breaker may be required. The type of bond breaker used shall be as recommend by the coating manufacturer. Load Transfer Efficiency shall not be less than 80% and differential deflection no more than 10 mils.

- Epoxy Coated Dowels with Coated Ends
- Glass Fiberglass Reinforced Polymer (GFRP) Dowels
- GFRP over Steel
- Zinc Coated Dowels

# Type C

The dowel meets the highest performance criteria and develops bond strength with concrete such that a bond breaker may be required. The type of bond breaker used shall be as recommend by the coating manufacturer. Load Transfer Efficiency shall not be less than 85% and differential deflection no more than 5 mils.

- 316L Stainless Steel Dowels
- 316L Stainless Steel Tubes
- 316L Stainless Steel Pipes
- Two Coat Epoxy Coated Dowels

# Accelerated Testing 10 Million Loads

	Static Load Transfer Efficiency	Static Deflection Difference
All Epoxy Coated Dowel	93	2.3
Stainless Steel Dowel <sup>1</sup>	-	-
Stainless Steel Tube	86	5
Stainless Steel Pipe	91	3.9
Zinc Coated Dowel	86	6
GFRP over Steel <sup>2</sup>	88	6
GFRP <sup>3</sup>	82	4.9
Plastic Coated Dowel <sup>1</sup>	-	-

<sup>1</sup>Assumed to be similar to epoxy coated dowel performance

<sup>2</sup><sub>1</sub> 1/4" steel dowel with 1/8" coating

<sup>3</sup><sub>1</sub> 1/2" dowel and 6.7 million load cycles



# Epoxy Requirements

	Type A <sup>1</sup>	Type B <sup>2</sup>	Type C	
			Base <sup>2</sup>	Top
Thickness	Min 10 mils	Min 10 mils	>7 mils	>7 mils
Cathodic Disbondment	4 mm radius	2 mm radius	2mm radius	1 mm radius
Macrocell Test		Pass	Pass	Pass
Abrasion		<6 mils	<6 mils	<3 mils
Gouge		<8 mils	<8 mils	<6 mils
Impact	>80 inlb	>80 inlb	>80 inlb	>80 inlb
Patched End Thickness		10 mils	10 mils	

<sup>1</sup>ASTM 1078 Type 1 (ASTM 755 epoxy) or ASTM 1078 Type 2 (ASTM 934 epoxy)

<sup>2</sup>ASTM 1078 Type 2 (ASTM 934 epoxy)

**WHEN TESTED IN ACCORDANCE WITH T 253, THE  
DOWEL BARS SHALL HAVE THE FOLLOWING  
PROPERTIES:**

- ***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.
- ***Corrosion***—Corrosion rate limits determined by salt spray test:
  - Type A dowels – 300  $\mu\text{m}/\text{yr}$ .
  - Type B dowels - 150  $\mu\text{m}/\text{yr}$ .
  - Type C dowels – 50  $\mu\text{m}/\text{yr}$ .
- ***Coating Impact Resistance***—No shattering or disbonding of the coating shall occur except at the impact area (area permanently deformed by the tup).