Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
DPWH Central Office, Bonifacio Drive, Port Area, Manila

BAGONG PILIPINAS

097.13 DPWH
06.25.2026

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DEPARTMENT ORDER)
)
NO. 81)
Series of 2026 dt 6/25/2026)

SUBJECT: DPWH Standard Specification for Item 425 – Bridge Repair and Retrofitting Works

To support the Department's commitment in updating the standard specifications and adopting effective/appropriate solutions for specific project needs, the attached **DPWH Standard Specification for Item 425 – Bridge Repair and Retrofitting Works** is hereby prescribed for adoption in DPWH infrastructure projects.

This Standard Specification shall form part of the on-going revision, modification, and updating of DPWH Standard Specifications for Highways, Bridges and Airports, Volume II. Likewise, the new pay item subscript is now included in the Standard Pay Item List and Project and Contract Management Application (PCMA).

This Order supersedes Department Order No. 98, Series of 2024 and shall take effect immediately.

VIVENCIO B. DIZON
Secretary

Department of Public Works and Highways
Office of the Secretary
SVBD-2026-03717

Encl.: DPWH Standard Specification for Item 425 – Bridge Repair and Retrofitting Works

14.1 JDV/LMIE

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DPWH Standard Specification for
ITEM 425 – BRIDGE REPAIR AND RETROFITTING WORKS

425.1 Description

This Item shall consist of repair and retrofitting works of permanent bridges at locations shown on the Plans and in accordance with this Specification.

425.2 Material Requirements

425.2.1 Waterproofing on Deck Slab

425.2.1.1 Rubberized Membrane

Rubberized membrane shall conform to the requirements of Table 425.1.

Table 425.1 Requirements of Rubberized Membrane

Property	Requirement	Test Method
Elongation, Min.	450 %	ASTM D638
Tensile Strength, Min.	15 Kgf/cm^2	ASTM D638
Concrete Bond Strength, Min.	7 Kgf/cm^2	ASTM D882

Notes: ASTM D638 – Standard Test Method for Tensile Properties of Plastics
ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting

425.2.1.2 Asphalt Compound Membrane

Asphalt compound membrane shall conform to the requirements of Table 425.2.

Table 425.2 Requirements of Asphalt Compound Membrane

Property	Requirement	Test Method
Penetration with Conic Needle	2 – 5 mm	ASTM D217
Melting Temperature, Min.	80 °C	ASTM D3461
Elongation, Min.	3.5 %	ASTM D638
Tensile Strength, Min.	300 Kgf/cm^2	ASTM D638

Notes: ASTM D217 – Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D3461 – Standard Test Method for Softening Point of Asphalt and Pitch (Mettler Cup-and-Ball Method)

Silica sand used as protection for the waterproofing layer shall conform to the manufacturer's recommendations and shall be subject to approval by the Engineer.

425.2.1.3 Epoxy-Type

Epoxy-type shall conform to the requirements of Table 425.3.

Table 425.3 Epoxy Resin for Waterproof to Deck Slab

Property		Requirement	Test Method
Viscosity	Main Resin	1000-5000 mPa-sec	ASTM D2196
	Hardener	500-1100 mPa-sec	
Flash Point	Main Resin	≥130 °C	ASTM D92
	Hardener	≥145 °C	
Density	Main Resin	1.1-1.3	ASTM D1475
	Hardener	0.8-1.0	
Properties of Cured Product	Tensile Strength (23°C)	≥2.0 MPa	ASTM D638
	Elongation at Break	≥100 %	

Notes: ASTM D2196 – Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer
ASTM D92 – Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D1475 – Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D638 – Standard Test Method for Tensile Properties of Plastics

425.2.2 Epoxy Coating on Cracks

425.2.2.1 Epoxy Sealant

The epoxy sealant for coating on cracks shall conform to the requirements of Table 425.4.

Table 425.4 Requirements of Epoxy Sealant for Coating on Cracks

Property	Requirement	Test Method
Viscosity, Max.	500 mPa-sec	ASTM D445
Bond Strength to Concrete Dry / Wet, Min.	1.5 MPa	ASTM D7234
Slant Shear Bond Strength, Min.	15 MPa	ASTM C882

Notes: ASTM D445 – Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
ASTM C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear

425.2.3 Epoxy Injection on Cracks (Deck Slab and Bridge Superstructure)

425.2.3.1 Epoxy Resin

Epoxy injection materials shall be compatible with the concrete substrate and shall conform to the requirements of Table 425.4.

Table 425.5 Requirements of Epoxy Resin for Epoxy Injection on Cracks

Property	Requirement	Test Method
Viscosity, Max.	1000 mPa-sec	ASTM D445
Specific Gravity	1.15 ± 0.1	ASTM D792
Compressive Strength, Min.	50 MPa	ASTM D695
Flexural Strength, Min.	40 MPa	ASTM D790
Tensile Shear Bond Strength, Min.	10 MPa	ASTM D1002
Slant Shear Bond Strength to Concrete, Min. [A]	15 MPa	ASTM C882
Bond Strength to Concrete (Dry / Wet), Min.	1.5 CF[B] MPa	ASTM D7234

Notes: [A] Requirement shall only apply to Bridge Superstructure
[B] Concrete Failure
All other requirements shall apply to Deck Slab and Bridge Superstructure
ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics And Electrical Insulating Materials
ASTM D792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D1002 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)

425.2.3.2 Sealant

Sealant materials used in conjunction with epoxy injection shall be compatible with the injection material and shall conform to the requirements of Table 425.6.

Table 425.6 Requirements of Sealant for Epoxy Injection on Cracks

Property	Requirement	Test Method
Specific Gravity	1.50 ± 0.30	ASTM D792
Compressive Strength, Min.	50 MPa	ASTM D695
Flexural Strength, Min.	15 MPa	ASTM D790
Tensile Shear Bond Strength, Min.	10 MPa	ASTM D1002
Bond Strength to Concrete (Dry / Wet), Min.	1.5 CF MPa	ASTM D7234

Note: All requirements shall apply to Deck Slab and Bridge Superstructure

425.2.4 Replacement of Expansion Joints

425.2.4.1 New Expansion Joint

The expansion joint to be installed shall conform to the requirements of Item 413, Expansion Joint Systems.

425.2.4.2 Expansion Joint Rubber Seal

Rubber seals shall conform to the requirements of Table 425.7.

Table 425.7 Requirements of Expansion Joint Rubber Seal

Property	Requirement	Test Method
Tensile Strength, Min.	0.98 MPa	ASTM D412
Elongation at break, Min.	100 %	ASTM D412

Note: ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

425.2.5 Caulking

425.2.5.1 Epoxy Grout

The epoxy grout for caulking shall be compatible with the concrete and shall conform to the requirements of Tables 425.8 and 425.9.

Table 425.8 Requirements of Epoxy-Based Injection Material for Caulking of Deck Slab and Girder

Property	Requirement	Test Method
Viscosity, Max.	1000 mPa-sec	ASTM D2196
Specific Gravity	1.15±0.10	ASTM D792
Compressive Strength, Min.	50 MPa	ASTM D695
Modulus of Elasticity, Min.	1000 MPa	ASTM D695
Flexural Strength, Min.	40 MPa	ASTM D790
Tensile Shear Bond Strength, Min.	10 MPa	ASTM D1002
Bond Strength to Concrete (Dry/Wet), Min.	1.5 CF MPa	ASTM D7234

Table 425.9 Requirements of Epoxy-Based Injection Material for Caulking of Substructure

Property	Requirement	Test Method
Specific Gravity	1.1±0.1	ASTM D792
Viscosity, Max.	2000 MPa-sec	ASTM D445
Consistency	Liquid	ASTM C881
Elongation, Min.	50%	ASTM D638
Bond Strength to Concrete (Dry/Wet), Min.	3.0 MPa	ASTM C882

Note: ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

425.2.5.2 Sealant

The epoxy-based sealant shall be compatible with the injection material and shall conform to the requirements of Tables 425.10 and 425.11.

Table 425.10 Requirements of Epoxy-Based Sealant for Caulking of Deck Slab and Girder

Property	Requirement	Test Method
Specific Gravity	1.50 ± 0.30	ASTM D792
Compressive Strength, Min.	50 MPa	ASTM D695
Flexural Strength, Min.	15 MPa	ASTM D790
Tensile Shear Bond Strength, Min.	10 MPa	ASTM D1002
Bond Strength to Concrete (Dry/Wet), Min.	1.5 CF MPa	ASTM D7234

Table 425.11 Requirements of Epoxy-Based Sealant for Caulking of Substructure

Property	Requirement	Test Method
Specific Gravity	1.50 ± 0.30	ASTM D792
Consistency	Paste-like	ASTM C881
Elongation, Min.	50%	ASTM D638
Bond Strength to Concrete, Min.	3.0 MPa	ASTM C882

425.2.6 Patching

425.2.6.1 Portland Cement Mortar

Portland Cement Mortar shall conform to the requirements of Item 405, Structural Concrete. Strength test for Portland cement mortar shall conform to ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

425.2.6.2 Polymer Cement Mortar

Polymer Cement Mortar (PCM) shall conform to the requirements of Table 425.12.

Table 425.12 Requirements for Polymer Cement Mortar

Property	Requirement	Test Method
Compressive Strength at 28 days, Min.	25 MPa	ASTM C39
Bonding Strength to Concrete, Min.	1.5 MPa	ASTM D7234
Bleeding Rate	0%	ASTM C39

Notes: All requirements shall apply to routine maintenance, repair of deck slab, superstructure, and substructure.
ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

425.2.6.3 Protective Coating for Rebar

Protective coating for rebar shall conform to the requirements of Table 425.13.

Table 425.13 Requirements for Protective Coating for Rebar

Property	Requirement	Test Method
Compressive Strength, Min.	75 MPa	ASTM D695
Flexural Strength, Min.	40 MPa	ASTM D790
Tensile Strength, Min.	30 MPa	ASTM D638
Tensile Shear Bond to Steel, Min.	10 MPa	ASTM D1002
Slant Shear Bond to Mortar, Min.	15 MPa	ASTM C882

Note: All requirements shall only apply to repair of deck slab.

425.2.6.4 Epoxy Bonding Agent

Epoxy Bonding Agent shall conform to the requirements of Tables 425.14 and 425.15.

Table 425.14 Requirements for Epoxy Bonding Agent for Routine Maintenance Repair

Property	Requirement	Test Method
Compressive Strength, Min.	70 MPa	ASTM D695
Flexural Strength, Min.	40 MPa	ASTM D790
Tensile Strength, Min.	30 MPa	ASTM D638
Tensile Shear Bond to Steel, Min.	15 MPa	ASTM D1002
Slant Shear Bond to Mortar, Min.	15 MPa	ASTM C882
Bond Strength of Cured Concrete to Fresh Concrete, Min.	15 MPa	ASTM D7234

Table 425.15 Requirements for Epoxy Bonding Agent for Major Maintenance Repair

Property	Requirement	Test Method
Compressive Strength, Min.	75 MPa	ASTM D695
Flexural Strength, Min.	40 MPa	ASTM D790
Tensile Strength, Min.	30 MPa	ASTM D638
Tensile Shear Bond to Steel, Min.	10 MPa	ASTM D1002
Slant Shear Bond to Mortar, Min.	15 MPa	ASTM C882

Note: All requirements shall only apply to repair of superstructure and substructure.

425.2.6.5 Zinc-Rich Primer for Rebar

Zinc-Rich Primer shall conform to the requirements of Table 425.16.

Table 425.16 Requirements for Zinc-Rich Primer for Rebar

Property	Requirement	Test Method
Gloss at 60° Angle	Flat	ASTM D523
Adhesion, Min.	3A	ASTM D3359
Salt Spray Resistance	Excellent	ASTM B117
% Zinc (By weight in Dried Film Test)	87.5 ± 2%	ASTM D6580

Notes: All requirements shall only apply to repair of deck slab, superstructure, and substructure
ASTM D523 – Standard Test Method for Specular Gloss
ASTM D3359 – Standard Test Methods for Rating Adhesion by Tape Test
ASTM D117 – Standard Guide for Sampling, Test Methods, and Specifications for Electrical Insulating Liquids

425.2.7 Partial Deck Slab Replacement

425.2.7.1 Portland Cement

This material shall conform to the applicable requirements of Item 405, Structural Concrete.

425.2.7.2 Reinforcing Steel

This material shall conform to the applicable requirements of Item 404, Reinforcing Steel.

425.2.7.3 Epoxy Resin

This material shall conform to the requirements of Subsection 425.2.6.4, Epoxy Bonding Agent.

425.2.7.4 Zinc-Rich Primer

This material shall conform to the requirements of Subsection 425.2.6.5, Zinc-Rich Primer for Rebar.

425.2.8 Special Anti-Corrosion Paint

Special anti-corrosion paint shall conform to the following requirements:

Table 425.17 Requirements for Special Anti-Corrosion Paint

Property	Requirement	Test Method
Adhesive Test, Min.	1.0 MPa at 7days 1.5 MPa at 28 days	ASTM D7234
Elongation, Min.	0.40% at 7 days 0.40% at 28 days	ASTM C190
Saltwater Test	Not detected	ASTM D6943

Notes: ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers
ASTM C190 – Standard Test Method for Tensile Strength of Hydraulic Cement Mortars
ASTM D6943 – Standard Practice for Immersion Testing of Industrial Protective Coatings and Linings

425.2.9 Dismantling and Reinstallation of Existing Signs

The dismantling and reinstallation of existing signs shall conform to the applicable material requirements of Item 602, Monuments, Markers, and Guide Posts and Item 605, Road Signs.

All damaged components shall be replaced with new materials.

425.2.10 Protective Coating for Concrete Structures

Acryl urethane protective coatings shall conform to the requirements of Table 425.18.

Table 425.18 Requirements for Protective Coating

Property	Requirement	Test Method
Bond Strength, Min.	1.5 MPa	ASTM D3359/ ASTM D7234
Tap Water Resistance	No Change	ASTM D6943
Acid Resistance (5%H_2SO_4)	No Change	ASTM D6943
Alkali Resistance (5%NaOH)	No Change	ASTM D6943

Notes: All requirements shall apply to repair of deck slab, superstructure, and substructure.
ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test
ASTM D6943 - Standard Practice for Immersion Testing of Industrial Protective Coatings

425.2.11 Bridge Seat Extension

425.2.11.1 Concrete

Concrete shall conform to the requirements as shown in Table 425.12.

The actual mix portion shall be determined during a field mixture test and shall be approved by the Engineer.

425.2.11.2 Anchor Bar

Anchor bar shall conform to the applicable requirements of Item 710, Reinforcing Steel and Wire Rope.

425.2.11.3 Epoxy Bonding Primer

The epoxy bonding primer to concrete shall conform to the requirements as shown in Table 425.15.

425.2.11.4 Zinc-Rich Primer

The zinc-rich primer to rebar shall conform to the requirements as shown in Table 425.16.

425.3 Construction Requirements

The application criteria and work sequence for waterproofing on deck slab, epoxy coating and epoxy injection on crack, replacement of expansion joint, caulking, patching, partial deck

replacement, bridge seat extension, application of special anti-corrosion paint and protective coating for concrete structures shall conform to the DPWH Bridge Repair Manual and its Addendum or its latest equivalent.

425.3.1 Dismantling and Reinstallation of Existing Signs

Dismantling of existing signs and support shall be handled with care to avoid unnecessary damage. Concrete foundations of disassembled signs shall be removed 610 mm below finish grade. Backfilling of holes and removal of all salvable materials shall conform to the applicable requirements of Item 101, Removal of Structures and Obstructions.

Damaged surfaces shall be restored to good as new condition.

Signs to be reinstalled or relocated shall include new foundations and shall conform to the applicable requirements of Item 605, Road Signs. Supports shall be reused and adjusted to the required length as approved by the Engineer.

Upon reinstallation of signs, dirt, grease, oil smears, and other foreign materials shall be removed by any cleaning methods approved by the Engineer.

425.3.2 Acceptance Requirements

Acceptance shall conform to the requirements for each repair works of the DPWH Bridge Repair Manual and its Addendum.

425.4 Method of Measurement

425.4.1 Waterproofing on Deck Slab

The quantities to be paid for waterproofing on deck slab shall be measured based on the actual area in square meters (m^2) of bridge deck material applied and accepted by the Engineer. Application on curb faces and overlaps shall not be included.

425.4.2 Epoxy Coating and Epoxy Injection on Cracks

The quantities to be paid for epoxy coating and injection on cracks shall be based on the total length of cracks in linear meters as identified by the Engineer.

425.4.3 Replacement on Expansion Joint

The quantities to be paid for shall be measured by the actual length of joint defined by the Engineer in linear meters.

425.4.4 Caulking

The quantities to be paid for shall be measured based on the total length of the cracks in linear meters, as identified by the Engineer.

425.4.5 Patching

The quantities to be paid for shall be measured by the actual area in square meters (m^2) of unsound or delaminated concrete marked and verified by the Engineer. Measurement shall be made after the removal of identified area.

425.4.6 Partial Deck Slab Replacement

The quantities to be paid for shall be measured by the actual volume of the replaced concrete in cubic meters (m^3) accepted by the Engineer.

425.4.7 Special Anti-corrosion Paint

The quantities to be paid for shall be measured by square meters (m^2) of steel surfaces cleaned, painted, and accepted by the Engineer.

425.4.8 Dismantling and Reinstallation of Existing Signs

The quantities to be paid for shall be measured for each sign dismantled, reinstalled and accepted.

425.4.9 Protective Coating for Concrete Structures

The quantities to be paid for shall be measured by the total area of applied protective coating in square meters (m^2).

425.4.10 Bridge Seat Extension

The quantities to be paid for shall be measured in cubic meters (m^3) as verified with the Engineer.

425.5 Basis of Payment

The accepted quantities, measured as prescribed in Section 425.4 Method of Measurement, shall be paid for at the Contract Unit Price for the respective Pay Item listed below which price and payment shall be full compensation for furnishing and placing all materials, including labor, equipment, tools and incidentals necessary to complete the work prescribed in the Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
425 (1)a	Waterproofing on Deck Slab, Rubberized Membrane	Square Meter
425 (1)b	Waterproofing on Deck Slab, Asphalt Compound	Square Meter
425 (1)c	Waterproofing on Deck Slab, Epoxy Type	Square Meter
425 (2)	Epoxy Coating on Cracks	Linear Meter
425 (3)	Epoxy Injection on Cracks	Linear Meter

Pay Item Number	Description	Unit of Measurement
425 (4)	Replacement of Expansion Joints	Linear Meter
425 (5)	Caulking	Linear Meter
425 (6)	Patching	Square Meter
425 (7)	Partial Deck Slab Replacement	Cubic Meter
425 (8)	Special Anti-Corrosion Paint	Square Meter
425 (9)	Dismantling and Reinstallation of Existing Signs	Each
425 (10)	Protective Coating for Concrete Structures	Square Meter
425 (11)	Bridge Seat Extension	Cubic Meter