

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



JAN 2 4 2025

DEPARTMENT ORDE	R)
NO. 19))
Series of 2025	8/2025

SUBJECT: DPWH Standard Specification for Item 902 - Reinforcing Steel

In order to ensure uniformity in the application/adoption of the Pay Item of Work to be used/adopted by those who are involved in the preparation of the Design Plans and Quantities, Program of Works (POW) and Approved Budget for the Contract (ABC) for infrastructures Project Nationwide, the attached **DPWH Standard Specification for Item 902 -Reinforcing Steel** is hereby prescribed for adoption in Government infrastructure projects that require the utilization of such on the Program of Works.

The Standard Specification shall form part of the DPWH Standard Specifications for Highways, Bridges and Airports, Volume II and is now included in the Project and Contract Management Application (PCMA).

> Department of Public Works and Highways Office of the Secretary

> > WIN5U02093

This Order shall take effect immediately.

MANUEL M. BONOAN Secretary

Encl: DPWH Standard Specification for Item 902 - Reinforcing Steel

14.1.2 JDV/AGC

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DPWH Standard Specification for Item 902 – Reinforcing Steel

902.1 Description

This Item shall consist of furnishing, cutting, bending, fabricating, welding, and placing of steel reinforcement with or without epoxy coating of the type, size, shape and grade required in accordance with this Specification and in conformity with the requirements shown on the Plans.

902.2 Material Requirements

Reinforcing steel shall conform to the requirements of Table 902.1.

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Type of Reinforcing Steel	Specification
Deformed and Plain Bars for Concrete Reinforcement	AASHTO M 31M, Standard Specification for Deformed and Plain Carbon and Low-Alloy Steel Bars for Concrete Reinforcement
	ASTM A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
	PNS 49, Philippine National Standard, Steel Bars for Concrete Reinforcement - Specification
Plain and Deformed Steel	AASHTO M 336M, Standard Specification for Steel Wire and Welded Wire, Plain and Deformed, for Concrete Reinforcement
Wire and Welded Wire for Concrete Reinforcement	ASTM A1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
Fabricated Steel Bar or Rod Mats for Concrete Reinforcement	AASHTO M 54M, Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
	ASTM A184M, Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
Plastic Coated Dowel Bars	AASHTO M 254M, Standard Specification for Corrosion-Resistant Coated Dowel Bars Type A
Low Alloy Steel Deformed Bars for Concrete Reinforcement	ASTM A706M, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
Deformed Rail – Steel and Plain Bars for Concrete Reinforcement	ASTM A996M, Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

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Table 902.1 Reinforcing Steel Bars

Type of Reinforcing Steel	Specification
Epoxy-Coated Steel Reinforcing Bar	ASTM A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars

If reinforcing bars are to be welded, these ASTM specifications shall be supplemented by requirements assuring satisfactory weldability.

Dowel and tie bars shall conform to the requirements of AASHTO M 31/ASTM A615/PNS 49, whichever is applicable, except that rail steel shall not be used for tie bars that are to be bent and restraightened during construction. Tie bars shall be deformed bars. Dowel bars shall be plain round bars. They shall be free from burring or other deformation restricting slippage in the concrete. Before delivery to the site of the work, a minimum of 1/2 the length of each dowel bar shall be painted with one coat of approved tar paint.

The sleeves for dowel bars shall be metal of an approved design to cover 50 mm, plus or minus 6.3 mm of the dowel, with a closed end, and with a suitable stop to hold the end of the sleeve at least 25 mm from the end of the dowel bar. Sleeves shall be of such design that they do not collapse during construction.

902.2.1 Wire Rope or Wire Cable

The wire rope or wire cable shall conform to the requirements of AASHTO M 30, Standard Specification for Zinc-Coated Steel Wire Rope and Fittings for Highway Guardrail for the specified diameter and strength class.

902.2.2 Prestressing Steel

Prestressing steel shall conform to the requirements of the Table 902.2.

Wire/Steel Bar	Specification	
	AASHTO M 204M, Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete	
High-Tensile Wire	ASTM A421M, Standard Specification for Stress-Relieved Steel Wire for Prestressed Concrete	
	ASTM A882M, Standard Specification for Filled Epoxy-Coated Seven-Wire Prestressing Strand	
• High-Tensile Wire Strand or Rope	AASHTO M 203M, Standard Specification for Steel Strand, Low Relaxation Uncoated Seven-Wire for Concrete Reinforcement	
	ASTM A416M, Standard Specification for Low-Relaxation, Seven-Wire Steel Strand for Prestressed Concrete	

Table 902.2 Prestressing Steel

Wire/Steel Bar	Specification
High Strength Steel Bar	AASHTO M 275, Standard Specification for High-Strength Steel Bars for Prestressed Concrete
	ASTM A722M, Standard Specification for High-Strength Steel Bars for Prestressed Concrete

Where strands are to be used for post-tensioning, the same shall be cold-drawn and either stressrelieved in the case of uncoated strands, or hot-dip galvanized in the case of galvanized strands.

902.2.3 Epoxy Coated Reinforcing Steel Bars

Epoxy coated reinforcing steel bars shall be applied with protective epoxy coating by the electrostatic spray method to strengthen the concrete and protect against corrosive conditions that will be exposed to the aggressive elements.

Epoxy coated reinforcing steel bars shall conform to ASTM A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars for steel bars coated in straight condition and then bent, and ASTM A934M, Standard Specification for Epoxy-Coated Prefabricated Steel Bars for steel bars that are bent prior to coating.

The powder coating shall be of organic composition except for the pigment which may be inorganic if used.

The following kinds of reinforcing steel bars are allowed to be applied with epoxy coating.

Table 902.3 Kinds of Reinforcing Steel Bars Allowed to be Applied with Epoxy Coating

Reinforcing Steel	Specification
Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement	ASTM A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
	AASHTO M 31M, Standard Specification for Deformed and Plain Carbon and Alloy Steel Bars for Concrete Reinforcement
Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement	ASTM A706M, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcements	ASTM A996M, Standard Specification for Rail-Steel and Axle- Steel Deformed Bars for Concrete Reinforcement
	AASHTO M 322, Standard Specification for Rail-Steel and Axle- Steel Deformed Bars for Concrete Reinforcement

902.2.4 Mechanical Couplers

All mechanical couplers shall be uniaxial.

The mechanical coupler shall be die-stamped showing bar dimension, model and Manufacturer's identification, and production lot number.

902.2.4.1 Sampling

Prior to sampling, the Contractor shall submit to the Engineer the following:

1. Manufacturer's original mill certificates with attached test results per production batch of each coupler type, model, bar size, and grade in use.

2. The installation manual secured from the manufacturer shall contain procedures for the tests on coupler type, model, bar size, and grade in use.

For threaded, swaged and jaw types, the manufacturer shall provide the name and address of the machine shops that threaded and swaged the reinforcing steel.

For projects with more than one sample lot, specimen must be grouped and marked in order to identify its origin. Each of the sample lot shall represent 1,000 couplers, or a fraction thereof, for each type, model, size, and grade which were delivered at one time and of the same production batch.

Each sample lot of mechanical couplers shall be stocked separately by type, model, size and grade in a suitable manner; not in contact with soil and in a way to facilitate easy identification and sampling.

The Contractor, with the supervision of the Engineer, shall give necessary demonstration of the coupler assembly. Make sure the connecting bars are straight or uniaxial all throughout since reading from bent bars creates erroneous result of slips.

902.2.4.2 Mechanical Testing

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Two (2) samples shall be tested from each lot of mechanical couplers. One (1) sample each shall be tested for slip test and tensile test. For cyclical test and fatigue test, additional one (1) sample for each test per project shall be tested, accordingly.

If quality tests is to be performed in a foreign country, the Engineer shall witness the conduct of tests and monitor if the standard procedure of the test method is being followed. In the absence of a witness, a certified true copy of the said test results with original Authentication Certificate from the state or country of origin or a certification from the Department of Foreign Affairs (DFA) to guarantee the authenticity of the foreign document shall be submitted by the manufacturer/Contractor to the Engineer for approval.

Mechanical Test	Requirements
⁽¹⁾ Slip Test	The total slip must not exceed 0.25 mm for bars with 40 mm dia. and smaller; and 0.75 mm for 50 mm dia. bars.
⁽²⁾ Tensile Test	The coupled connection shall develop a tensile strength of at least 125% of the specified yield strength of the reinforcing bar.
⁽¹⁾ Cyclical Test	The sample shall be cyclically loaded from 5% to 90% of the specified yield strength of the sample for 100 cycles. A haversine waveform shall be used at 0.5 cycles per second (cps) for diameters 32 mm, 36 mm, 40 mm, and 50 mm bars, and a haversine waveform at 0.7 cps for smaller bars.
⁽¹⁾ Fatigue Test	The sample shall be fatigue loaded from +170 MPa (tension) to -170 MPa (compression) for 10,000 cycles. A sine waveform shall be used at 0.083 cps for diameters 32 mm, 36 mm, 40 mm, and 50 mm bars, and a sine waveform at 0.35 cps for smaller bars The sample must not fracture.

Table 902.4 Performance Requirements

(1) Shall be in accordance with California Test 670, Method of Tests for Mechanical and Welded Reinforcing Steel Splices under California Department of Transportation (Caltrans)

⁽²⁾ Shall be in accordance with ASTM A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products

902.3 Construction Requirements

902.3.1 Order Lists

Before materials are ordered, all order lists and bending diagrams shall be furnished by the Contractor, for approval of the Engineer. The approval of order lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams. Any expense incident to the revisions of materials furnished in accordance with such lists and diagrams to make them comply with the Plans shall be borne by the Contractor.

902.3.2 Handling and Storage

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Steel Reinforcement

Steel reinforcement shall be stored above the surface of the ground upon platforms, skids, or other supports and shall be protected as far as practicable from mechanical injury and surface deterioration caused by exposure to conditions producing rust. When placed in the work, reinforcement shall be free from dirt, detrimental rust, loose scale, paint, grease, oil, or other

foreign materials. Reinforcement shall be free from injurious defects such as cracks and laminations. Rust, surface seams, surface irregularities or mill scale will not be cause for rejection, provided the minimum dimensions, cross sectional area and tensile properties of a hand wire brushed specimen meets the physical requirements for the size and grade of steel specified.

Epoxy-Coated Reinforcing Steel Bars

- a. Epoxy coated steel stored at the site shall be placed on timber sills suitably spaced so that no steel shall be laid upon or come in contact with the ground and elevated sufficiently to prevent sags in the bundles and from workers walking on the steel.
- b. If rainy or exceptionally humid weather occurs or is anticipated, bars shall be stored under cover immediately upon delivery to site. Epoxy bars shall be covered with polyethylene or other materials to prevent exposure to direct sunlight.
- c. Reinforcement steel bars shall be handled and stored in manner to prevent damage to bars or the epoxy coating.
- d. Coated reinforcing steel bars, whether individual bars or bundles of bars or both, shall be covered with opaque polyethylene sheeting or other suitable opaque protective material. For stacked bundles, the protective covering shall be draped around the perimeter of the stack. The covering shall be secured adequately, and allow for air circulation around the bars to minimize condensation under the covering.
- e. All systems for handling the epoxy coated bars shall have padded contact areas to eliminate damage.
- f. All bundling bands shall be padded or suitable banding shall be used to prevent damage to the coating. All bundles of coated reinforcing steel bars shall be lifted with a strong back, spreader bar, multiple supports, or a platform bridge to prevent bar to bar abrasion from sags in the bundles of coated reinforcing steel bars.

902.3.3 Bending and Standard Hooks

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It shall be in accordance with the latest edition of the National Structural Code of the Philippines or ACI 318M – Building Code Requirements for Structural Concrete, whichever is applicable.

902.3.4 Placing and Fastening

All steel reinforcement shall be accurately placed in the position shown on the Plans and firmly held there during the placing and setting of the concrete. Bars shall be tied at all intersections except where spacing is less than 300 mm in each direction, in which case, alternate intersections shall be tied. Ties shall be fastened on the inside.

Distance from the forms shall be maintained by means of stays, blocks, ties, hangers, or other approved supports, so that it does not vary from the position indicated on the Plans by more than 6 mm. Blocks for holding reinforcement from contact with the forms shall be precast mortar blocks

of approved shapes and dimensions. Layers of bars shall be separated by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks shall not be permitted. Unless otherwise shown on the Plans or as required by the Engineer, the minimum distance between bars shall be 40 mm. Reinforcement in any member shall be placed and then inspected and approved by the Engineer before the placing of concrete begins. Concrete reinforcement placed in violation of this provision shall be rejected and removal shall be required unless otherwise structural integrity of the structure was proved adequate by the Contractor in writing and approved by the Engineer. If fabric reinforcement is shipped in rolls, it shall be straightened before being placed. Bundled bars shall be tied together at not more than 1.80 m intervals.

902.3.5 Splicing

All reinforcement shall be furnished in the full lengths indicated on the Plans. Splicing of bars, except where shown on the Plans, will not be permitted without the written approval of the Engineer. It shall be in accordance with the latest edition of the National Structural Code of the Philippines or ACI 318M – Building Code Requirements for Structural Concrete, whichever is applicable.

Couplers-shall be installed following the manufacturer's instructions and as approved by the Engineer.

Locations of mechanical couplers shall be as shown on the Plans. Only the specified mechanical coupler type shall be used for application. All procedures and equipment for mechanical connections shall be in accordance to the mechanical connector manufacturer's recommendations. For threaded type coupler, threads cut on the ends of the steel reinforcement shall match the internal threads in the mechanical connector. Stirrups, ties, and other reinforcement shall be adjusted or relocated, if necessary, to provide the required clear concrete cover to the reinforcement. Joints between the coated reinforcing steel bars, coated splice bars and mechanical connectors shall be sealed/coated with epoxy according to the applicable requirements of Subsection 902.2.3

902.3.6 Lapping of Bar Mat

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The overlap shall not be less than one (1) mesh in width.

902.3.7 Bundled Reinforcement

It shall be in accordance with the latest edition of the National Structural Code of the Philippines or ACI 318M – Building Code Requirements for Structural Concrete, whichever is applicable.

902.3.7 Welding

Welding of reinforcing steel bars shall conform to American Welding Society, AWS D1.4M, Structural Welding Code - Reinforcing Steel.

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For steel bars conforming to ASTM A706M, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement the bars can be welded without preheating. Steel bars conforming to ASTM A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement shall be preheated to 260°C.

After completion of welding on epoxy-coated bars, the damaged areas shall be repaired using patch materials conforming to ASTM A47M, Standard Specification for Ferritic Malleable Iron Castings.

902.4 Method of Measurement

The quantity of reinforcing steel to be paid for will be the number in kilograms placed and accepted in the completed structure as shown on the Plans.

902.5 Basis of Payment

The accepted quantity, measured as prescribed in Section 902.4, Method of Measurement shall be paid for at the Contract Unit Price for reinforcing steel 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 this Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
902 (1) a1	Reinforcing Steel, Deformed, Grade 40	Kilogram
902 (1) a2	Reinforcing Steel, Deformed, Grade 60	Kilogram
902 (1) a3	Reinforcing Steel, Deformed, Grade 80	Kilogram
902 (1) b	Reinforcing Steel, Plain/Round	Kilogram
902 (2) a1	Epoxy-Coated Reinforcing Steel, Deformed, Grade 40	Kilogram
902 (2) a2	Epoxy-Coated Reinforcing Steel, Deformed, Grade 60	Kilogram
902 (2) a3	Epoxy-Coated Reinforcing Steel, Deformed, Grade 80	Kilogram
902 (2) b	Epoxy-Coated Reinforcing Steel, Plain/Round	Kilogram