



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

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DEPARTMENT ORDER)
No. 149)
Series of 2015)

SUBJECT: **DPWH Standard Specification
for Item 417 - Bearing Devices**

In line with the mandate of the Department in providing effective standard specifications in the implementation of various infrastructure projects and in view of the need of setting a standard specification for Bearing Devices, the attached **DPWH Standard Specification for Item 417 - Bearing Devices** is hereby prescribed, for the guidance and compliance of all concerned.

This specification shall form part of the revised 2012 edition of the DPWH Standard Specifications (Volume II-Highways, Bridges and Airports).

This Order shall take effect immediately.


ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways
Office of the Secretary



WIN5U01155

5.5.2 FET/JFS

DPWH Standard Specification for

ITEM 417 – BEARING DEVICES

417.1 Description

This item shall consist of the requirement for furnishing and installing bearing devices (rocker, roller, and sliding plate) on bridges in accordance with these Specifications and as indicated on the Plans.

417.2 Material Requirements

417.2.1 Bolts and Nuts

Bolts and nuts shall be threaded anchor bolts and shall conform to the requirements of ASTM F1554, Grade 36 (250) or ASTM A307 shown in the approved plans. Nuts conforming to ASTM A563 shall be furnished for appropriate grade and size of anchor bolt. Nuts to be galvanized to Grade DH or Grade DH3 shall be heat-treated. Galvanized nuts shall be lubricated with a lubricant containing a visible dye.

417.2.2 Galvanized Coatings

If galvanized coating is specified in the plans, structural steel shall be galvanized according to AASHTO M 111.

417.2.3 Non-shrink Grout

Non-shrink grout shall conform to the requirements of Item 727, Non-shrink Grout. It shall meet a minimum compressive strength of 35 MPa in 3 days.

417.2.4 Polytetrafluoroethylene (PTFE) Surfaces for Bearings

If PTFE surfaces are specified for bearings, it shall conform to the following:

a. PTFE Resin

It shall be virgin PTFE resin material conforming to ASTM D4894 or ASTM D4895.

b. Filler Material

It shall be milled glass fibers, carbon, or other approved inert material.

c. Adhesive Material

It shall be epoxy resin adhesive conforming to AASHTO M 235.

d. Unfilled PTFE Sheet

Unfilled PTFE sheet shall be made from PTFE resin conforming to Table 417.

e. Filled PTFE Sheet

Filled PTFE sheet shall be made from PTFE resin uniformly blended with filler material. It shall not exceed 15% filler content using glass fiber or 25% filler content using carbon fibers. It shall conform to Table 417.

f. Fabric Containing PTFE Fibers

Fabric shall be made from oriented multifilament PTFE fluorocarbon and other fibers or from a mixture of PTFE fibers made from twisted, slit PTFE tape and other fibers as required by proprietary designs. It shall conform to Table 417.

g. Interlocked Bronze and Filled PTFE Components

Phosphor bronze plate shall conform to ASTM B100. It shall have a 0.25 millimeter thick porous bronze surface layer conforming to ASTM B103 into which is impregnated a lead-PTFE compound. The surface shall be overlaid with compounded PTFE not less than 25 micrometers thick.

h. Lubricants

Lubricants shall consist of a combination of solids that do not react chemically or electrolytically with the PTFE and its mating surface and remain stable in the environmental conditions expected at the bridge site.

i. Surface Treatment

For epoxy bonding, one side of the PTFE sheet shall be factory treated with a sodium naphthalene or sodium ammonia process.

j. Stainless Steel Mating Surface

It shall conform to ASTM A167, Type 304 or ASTM A240, Type 304. It shall have a minimum thickness of 0.91 mm.

Table 417
Polytetrafluoroethylene Sheeting

Property	ASTM Method	Sheet Unfilled	Sheet with 15% Glass Fibers	Sheet with 25% Carbon Fibers	Woven Fabric
Min. tensile strength	D638 or D2256	19 MPa	14 MPa	9 MPa	165 MPa
Min. elongation	D638 or D2256	200%	150%	75%	35%
Min. specific gravity	D792	2.16 \pm 0.03	2.20 \pm 0.03	2.10 \pm 0.03	-
Melting point	D4591	328 \pm 11 °C	327 \pm 10 °C	327 \pm 10 °C	-

417.2.5 Steel Structures (Rocker, Roller, and Sliding Plate Bearings)

Steel structures (rocker, roller, and sliding plate bearings) shall conform to the requirements of Item 403, Metal Structures.

417.3 Construction Requirements

417.3.1 General

417.3.1.1 Drawings

Drawings shall be in accordance to Section 18 of the AASHTO, Load and Resistance Factor Design (LRFD) Bridge Construction Specification. Details of bearings including material proposed for use shall be shown. Fabrication shall not begin until drawings are approved by the Engineer.

417.3.1.2 Fabrication

The surface finish of bearing components in contact with each other or with concrete but not embedded in concrete shall conform to Subsection 403.3.4 of Item 403, Finishing and Shaping.

Bearing assemblies shall be preassembled and shall be checked for proper completeness and geometry. Steel bearing components and anchor bolts shall be galvanized while stainless steel bearing components or anchor bolts shall not be galvanized.

417.3.1.3 Packaging, Handling and Storing Material

Each bearing component shall be clearly identified and shall be marked on its top the location and orientation in the structure before shipping. The bearings must be securely fastened, bolted or strapped to prevent relative movement.

During shipping, handling or storing bearings shall be packaged to prevent damage.

Bearing assemblies shall not be dismantled on-site unless necessary for inspection or installation. Dismantling shall be under the direct supervision or with the approval of the manufacturer.

A listing of all individual bearing numbers shall be furnished.

Bearing devices shall be stored to prevent damage from weather or other hazards.

417.3.2 Construction and Installation

Bearings shall be cleaned of deleterious material. Bearings shall be installed and set to the dimensions shown on the drawings or as prescribed by the manufacturer. Bearings shall be adjusted according to the manufacturer's instructions to compensate for installation temperature and future movements.

Bearings shall be set leveled at the elevation and position shown on the drawings. Full and even bearing shall be provided on all external bearing contact surfaces. The Engineer shall be notified if bearing surfaces are at improper elevations, not level, or if bearings cannot be set properly. A written proposal shall be submitted to the Engineer for approval to modify the installation.

Metallic bearing assemblies shall be bedded on concrete with an approved filler or fabric material when not embedded in concrete.

Machine bearing surfaces shall be seated directly on steel to provide a level and planar bearing surface.

417.3.2.1 Rocker, Roller, and Sliding Plate Bearings

Rocker, roller, and sliding plate bearings shall be fabricated and finished according to Item 403, Metal Structures. Burrs, rough and sharp edges, and other flaws shall be removed. Rocker, roller, and other bearings that are built up by welding sections of plate together shall be stress-relieved before boring, straightening, or final machining.

Contact surfaces shall be thoroughly coated with oil and graphite before placing roller bearings. Rocker, roller, and sliding plate bearings shall be installed vertically at the specified mean temperature after release of falsework and after shortening due to pre-stressing forces. Variations shall be accounted for mean temperature of the supported span at the time of installation and other anticipated changes in length of the supported span.

The superstructure shall be ensured that it has full and free movement at movable bearings. Cylindrical bearings shall be positioned so that their axes of rotation align and coincide with the axis of rotation of the superstructure.

417.3.2.2 Masonry, Sole, and Shim Plates for Bearings

Metal plates shall conform to AASHTO M 270, Grade 36 (250).

Steel shall be fabricated and finished according Item 403, Metal Structures. Holes in bearing plates shall be formed by drilling, punching, or controlled oxygen cutting. Burrs shall be removed by grinding.

Bearing plates shall be set in a level position and provide a uniform bearing over the bearing contact area. When plates are embedded in concrete, provisions shall be made to keep them in correct position as the concrete is placed.

417.3.2.3 Polytetrafluoroethylene (PTFE) Surfaces for Bearings

Furnished PTFE material shall be factory-bonded, mechanically connected, or recessed into the backup material.

The fabric containing PTFE fibers shall be bonded or mechanically attached to a rigid substrate. A fabric capable of carrying unit loads of 70 MPa without cold flow shall be used. A fabric-substrate bond capable of withstanding a shear force equal to 10 percent of the perpendicular or normal application loading plus other bearing shear forces without delamination shall be used.

Approved test methods and procedures according to Section 18 of AASHTO, LRFD Bridge Construction Specification shall be used. At least one material test on the material used in the sliding surface shall be performed for each lot of bearings. If required by the contract, complete bearings shall be tested for complete bearing friction. If the test facility does not permit testing of completed bearings, extra bearings shall be manufactured and prepare samples of at least 450 kN capacity at normal working stresses by sectioning the bearing.

The coefficient of friction between two mating surfaces shall be measured. Test results showing the static and dynamic coefficients of friction meet the requirements for the design coefficient of friction specified in the contract or by the manufacturer for approved material shall be provided.

417.3.2.4 Anchor Bolts

Threaded anchor bolts shall be furnished.

Bolt locations shall be adjusted for superstructure temperature and anticipated lengthening of bottom chord or bottom flange due to dead load after setting as required. Free movement of the superstructure at movable bearings shall not be restricted.

Anchor bolts shall be preset before concrete placement or install anchor bolts in drilled holes after concrete placement. Holes 25 mm in diameter greater than the bolt shall be drilled if non-shrink cement grout is used to secure the bolts. Adhesive manufacturer's recommendations for hole-diameter shall be followed if an approved chemical adhesive is used to secure the bolts.

417.3.2.5 Bedding of Masonry Plates

Contact surfaces of the concrete and steel shall be cleaned before placing the bedding material and installing bearings or masonry plates. If bedding is specified, filler or fabric shall be placed as bedding material under masonry plates and shall be installed to provide full bearing on contact areas. If bedding material is not specified, Subsection 18.10.2 of AASHTO, LRFD Bridge Construction Specifications shall be complied.

417.4 Acceptance

Bearing devices shall be evaluated by visual inspection and certification from a manufacturer with an ISO 9000 certification or an effective testing and inspection system.

Installation of bearing devices shall be evaluated by visual inspection and testing.

417.5 Method of Measurement

The quantity of bearing devices to be paid for shall be the final quantity placed and accepted in the completed structure. The dimensions of bearing devices shall be the quantity placed in accordance with the plans or as otherwise directed by the Engineer.

417.6 Basis of Payment

The accepted quantity, measured as prescribed in Section 417.5, shall be paid for at the contract unit price for Bearing Devices which price and payment shall be full compensation for furnishing and placing all materials, including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this Item.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
417	Bearing Devices	Each

References:

1. *Standard Specifications for Construction of Roads and Bridges on Federal Highways Projects (Federal Project 2014)*, U.S. Department of Transportation, Federal Highway Administration
2. *American Society for Testing and Materials (ASTM)*
3. *American Association of State Highway and Transportation Officials (AASHTO)*
4. *Volume II, DPWH Standard Specifications for Highways, Bridges and Airports, 2012 Edition*
5. *Bridge Design and Assessment Website by David Childs*
6. *AGOM International website*
7. *Section 8-Bearing devices, Design Manual, New York State Thruway*
8. *Delkor Rail Website*