



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

097, 19 DPWH  
12-01-2005

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DEPARTMENT ORDER )

NO. 94 )  
Series of 2005 12-01-05 )

SUBJECT: DPWH Standard Specification for  
Waterstops

For the guidance and compliance of all concerned, the new standard specification for Waterstops is hereby prescribed, which shall form part of the DPWH Standard Specifications, Volume II-Highways, Bridges and Airports.

This supersedes all existing specifications and related issuances issued contrary hereto.

This order takes effect immediately.

HERMOGENES E. EBDANE, JR.  
Acting Secretary



WIN5U00044

**ITEM 614 - SPECIFICATION FOR WATERSTOPS****614.1 Description**

This Item shall consist of furnishing and installing waterstops to prevent water seepage at the expansion and construction joints of concrete structures, in conformity to the details shown on the Plans and in accordance with this Specification.

Waterstops are precision engineered concrete devices for vertical and horizontal expansion joints between cast-in-place concrete units where conditions may subject the concrete to hydro-static pressure or moisture seepage.

**614.2 Material Requirements**

**614.2.1** Waterstops shall be in conformity to the type, shape and dimension and other details as shown on the approved Plans and in accordance with this Specification. They shall be dense, homogeneous and without holes or other defects.

**614.2.1.1 Copper Waterstops**

Sheet copper shall conform to AASHTO M 138M. The resistivity test shall not be required.

**614.2.1.2 Rubber Waterstops**

Rubber waterstops shall be furnished molded or extruded rubber with a uniform cross-section that is free from porosity or other defects. If approved, an equivalent standard shape shall be furnished.

It shall be fabricated from a compound of natural rubber, synthetic rubber, or a blend of the two, together with other compatible materials. Reclaimed material shall not be used. A certification from the manufacturer showing the composition of the material shall be furnished.

Samples taken from the finished rubber waterstops when tested shall conform to the following requirements:

Property	Method of Test	Requirement
Hardness (shore durometer)	ASTM D 2240	60 - 70
Tensile Strength	ASTM D 412	17Mpa, min.
Elongation at breaking	ASTM D 412	450%, min.
Water Absorption by (% by weight)	ASTM D 570	5%, max.
Tensile Strength after accelerated aging, oxygen-pressure method	ASTM D 572	80% of original, min.

**614.2.1.3 Plastic Waterstops**

Plastic waterstop shall be fabricated from a homogeneous, elastomeric plastic compound of basic polyvinyl chloride (PVC). The compound shall contain any additional resins, plasticizers, stabilizers, or other materials needed to ensure that when the material is compounded it will meet the performance requirements of this Specification. Reclaimed polyvinyl chloride shall not be used. It shall be formed to a uniform cross-section that is free from porosity or other defects. If approved, an equivalent standard shape shall be furnished.

Samples taken from the finished plastic waterstops when tested shall conform to the following requirements:

PROPERTY	METHOD OF TEST	REQUIREMENT
Tensile strength	ASTM D 638M	9.6 MPa, min.
Elongation at breaking	ASTM D 638M	250%, min.
Hardness (shore durometer)	ASTM D 2240	60 to 75
Specific gravity	ASTM D 792	Note <sup>(1)</sup>
Resistance to alkali <sup>(2)</sup> Mass change Hardness change (shore durometer) Tensile strength change	ASTM D 543	-0.10 to +0.25% ±5, max. 15%, max.
Water absorption (48 hours)	ASTM D 570	0.50%, max.
Volatile loss	ASTM D1203	Note <sup>(3)</sup>
Low temperature brittleness	ASTM D746	Passed at -35°F

**Notes:**

- (1) Manufacturer's value  $\pm 0.02$ .
- (2) Use a 10% solution of NaOH for a 7-day test period.
- (3) Not more than manufacturer's value.

Furnish the manufacturer's test results for the above properties with the certification. If directed, furnish samples in lengths adequate for performing the specified tests.

**614.2.2 Delivery and Storage**

Waterstops delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants.

### **614.2.3 Acceptance of Material**

Material for waterstops shall be evaluated by visual inspection for compliance to the approved contract. Material or packaging shall be clearly marked with unique product identification or specification standard to which it is produced. Material accepted by certification may be sampled and tested at any time and if found not in conformance to the requirement of the contract, the material shall be rejected even if they are already installed in placed.

### **614.3 Construction Requirements**

#### **614.3.1 General**

Waterstops shall be installed at the locations as shown on the approved Plans, where movement at the joint is provided for. The waterstops shall be of a type permitting such movement without injury. They shall be spliced, welded, or soldered to form continuous watertight joints.

Waterstops shall be furnished in full length for each straight portion of the joint, without field splices. Splices shall be installed at changes in direction, as may be necessary to avoid buckling or distortion of the web or flange. Field splices for the waterstop shall be performed so as to provide watertight connection by such means as specified by the manufacturer.

Carefully place and support waterstops. Waterstops shall be securely held in position by the use of spacers, supporting wires or other approved devices that will not injure or puncture the waterstops. It shall be positioned allowing clearance between waterstops and reinforcing steel at minimum of two times the largest size to prevent rock pockets and air voids. Waterstops shall be centered on joint, with approximately one-half of waterstop width to be embedded in concrete on each side of the joint. During pouring, concrete shall be thoroughly and systematically vibrated in the vicinity of the joint to maximize intimate contact between concrete and waterstop. Prevent waterstops from being displaced or damaged by construction operations or other activities. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued for the first pour. Keep all surfaces of waterstops free from oil, grease, dried mortar, laitance, or any other deleterious material until embedded in concrete. Special care shall be taken in concreting operations around waterstops to preserve their shape and position in the joint. Ensure that embedded portions of the waterstops are completely enclosed in dense concrete. If, after placing concrete, waterstops show indication of having been substantially out of position or shape, the surrounding concrete shall be removed, the waterstop shall be reset or replaced if damaged, and the concrete replaced at the Contractor's expense.

#### **614.3.1.1 Copper Waterstops**

Copper sheet of the required thickness, mass, width, and shape shall be used. Joints shall be soldered for a continuous watertight unit.

#### **614.3.1.2 Rubber Waterstops**

Before installation, the following shall be submitted for approval:

- a. Performance test data
- b. One-meter sample of each type of waterstop required
- c. At least one preliminary field splice if splices are used

Waterstops shall have a cross-section that is uniform in width and web thickness. Straight strips shall not be spliced.

Full-mold all junctions in the special connection pieces. Provide well-cured, dense, homogeneous special connection pieces that are nonporous and are free from other defects.

Fabricate splices that are dense and homogeneous throughout the cross-section. Fabricate splices watertight by vulcanizing or by mechanical means. Fabricate splices so that they have a tensile strength of at least 50% of the reported tensile strength of the unspliced rubber water stop.

#### **614.3.1.3 Plastic Waterstops**

Before installation, submit for approval at least one preliminary field splice sample. Heated splices shall be in conformance to the manufacturer's instructions to make them watertight. A thermostatically controlled electric source of heat shall be used to make all splices. The heat shall be sufficient to melt but not to char the plastic. Fabricate splices so they have a tensile strength of at least 80% of the reported tensile strength of the unspliced plastic waterstop.

#### **614.3.2 Visual Inspection**

Installed waterstops shall be evaluated by visual inspection of completed works for compliance with the details shown on the approved Plans or as directed by the Engineer.

**614.4 Method of Measurement**

Waterstops shall be measured by the length in linear meter or by the lump sum furnished and installed as shown on the Plans or as directed by the Engineer.

**614.5 Basis of Payment**

The accepted quantities, measured as provided above, shall be paid at the contract price per unit of measurement for the pay items listed below that are shown in the bid schedule. Payment shall be full compensation for the work prescribed in this item.

Payment will be made under:

Pay Item	Pay Unit
1 _____ waterstop, _____ mm. width	Meter
2 _____ waterstop	Lump sum

**References:**

1. American Standards for Testing Materials (ASTM)
2. American Association of State Highways and Transportation Officials (AASHTO)
3. Approved Specification of Banza Pedestrian Bridge and Banza River Dredging Works, DPWH
4. Standard Specifications For Construction of Roads and Bridges on Federal Highway Projects, U.S. Department of Transportation Federal Highway Administration
5. Standard Specifications for Road and Bridge Construction, Colorado Department of Transportation, U.S.A
6. Construction Standard Specifications for the City of Chattanooga, Tennessee, U.S.A
7. Design and Construction Standards for the City of Round Rock, Texas, U.S.A
8. Louisville / Jefferson County Metropolitan Sewer District (MSD), , Kentucky, U.S.A
9. Copper Waterstops Product Brochure, Corkjoint (Australia) Pty Ltd
10. Waterstops Product Brochure, Greenstreak, Inc.
11. Rubber and PVC Waterstops Product Brochure, B.B.Rubbers Pvt. Ltd.
12. Waterstops Brochure, Southern Metal and Plastic Products
13. PVC Waterstops Product Brochure, W.R. Meadows, Inc.