

CRD-C 572-74

**CORPS OF ENGINEERS SPECIFICATIONS FOR  
POLYVINYLCHLORIDE WATERSTOP**

1. Scope

1.1 These specifications cover polyvinylchloride waterstop.

2. General Requirements

2.1 Waterstop.- The waterstop shall be of the shape and dimensions shown on the drawings accompanying the project specifications. It shall be produced by an extrusion process such that, as supplied for use, it will be dense, homogeneous, and free from holes and other imperfections. The cross section of the waterstop shall be uniform along its length and shall by symmetrical transversely so that the thickness at any given distance from either edge of the water stop will be uniform.

2.2 Material.- The waterstop shall be extruded from an elastomeric plastic compound, the basic resin of which shall be polyvinylchloride (PVC). The compound shall contain any additional resins, plasticizers, stabilizers, or other materials needed to insure that, when the material is compounded, it will meet the performance requirements given in this specification.

3. Inspection and Testing

3.1 All material and all waterstop will be subject to rigid inspection and testing in order to insure that the supplied waterstop meets the requirements of these specifications. Every facility shall be provided for representatives of the Government to perform careful sampling and inspection of the finished waterstop. The sampling of finished waterstop and all testing of finished waterstop, and job-made splices will be done by the Government.

4. Samples

4.1 A sample not less than 12 in. long (30.48 cm) will be cut from each 200 ft (61 m) of finished waterstop. The sample or samples representing a lot of waterstop will include not less than 4 lineal ft (1.2 m) of finished water stop. The sample or samples will be cut into pieces of convenient size and reduced in thickness to between 1/16 and 1/8 in. (1.6 and 3.2 mm), according to the method specified in CRD-C 515. A total of not less than five dumbbell-shaped specimens will be cut from each sample using die C of CRD-C 573, with the long axis of the dumbbell parallel with the direction of extrusion. Additional specimens will be prepared for the other tests in accordance with the provisions of the applicable test methods. When more than 200 ft (61 m) of waterstop is represented, the tests for tensile strength and elongation will be made on samples representing each 200 ft (61 m), other tests will be made on specimens taken at random from all the samples representing the lot of waterstop.

5. Test Conditions

5.1 Tests will be conducted in a standard laboratory atmosphere of  $23 \pm 1.6$  C ( $73.4 \pm 3$  F) and a relative humidity preferably not less than 50 percent, unless otherwise specified in the testing methods.

6. Detailed Requirements

6.1 Finished Waterstop.- Samples taken from the finished waterstop shall meet the requirements listed below when tested by the test method and in the number of specimens shown.

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Method of Test	Number of specimens Tested	Requirement <sup>1</sup>
CRD-C 573	5 per 200 ft (61 m)	Tensile strength, using die C, not less than: 1750 psi (12.17 MPa)
CRD-C 573	5 per 200 ft (61 m)	Ultimate elongation, using die C, not less than: 300%
CRD-C 570	3 per lot	Low temperature brittleness, no sign of failure, such as cracking or chipping at -35 F (-37.2 C)
CRD-C 571	3 per lot	Stiffness in flexure, not less than: 600 psi (4.13 MPa)
		<u>Accelerated Extraction</u>
Par. 7.1 below	5 per lot	Ultimate elongation, using die C, not less than: 280% Tensile strength, using die C, not less than: 1500 psi (10.3 MPa)
		<u>Effect of Alkalies</u>
Par. 7.2 below	3 per lot	Change in weight after 7 days, between: -0.10 and +0.25% Change in Shore durometer readings after 7 days, not more than: $\pm 5$

<sup>1</sup>The average or the median of the results of tests of the group of 3 or 5 specimens tested will be used to determine compliance with the stated requirements, depending on which value is called for by the method of test referenced.

6.2 Job-Made and Factory-Made Splices in Waterstop.- Samples taken across splices should meet the following requirements when tested by the test method shown.

Method of Test	Number of Specimens Tested	Requirement
CRD-C 573	As directed	Tensile strength, using die C, not less than: 1000 psi (6.89 MPa)

## 7. Methods of Testing

7.1 Accelerated Extraction Test.- The five tensile test specimens cut to the shape and dimensions given in CRD-C 573, using die C, will each be weighed to the nearest 0.001 g. The specimens will be placed in a one liter tall-form beaker with spout. The beaker will be filled within 2 in. (5 cm) of the top with a solution made by dissolving 5.0 g of chemically pure sodium hydroxide and 5.0 g of chemically pure potassium hydroxide in one liter of distilled water. The specimens will be completely immersed

and the top of the beaker covered with a watch glass. The beaker will then be placed in a constant temperature bath and the temperature of the solution maintained between 60-65.5 C (140-150 F). A 1/4-in. (6.35 mm) diameter glass tube will be inserted into the spout of the beaker to within 1/2 in. (12.7 mm) of the bottom of the beaker. Air will then be gently bubbled through the solution at the rate of about one bubble per second. The solution will be changed every 24 hr, the new solution being warmed to 65.5 C (150 F) before replacing the old. Once daily, each of the five specimens will be removed from the beaker (preferably at the time of renewing the solution) and rinsed lightly with distilled water. Each specimen will then be superficially dried with a clean cloth. Ten min after the specimens have been thus dried the group of five specimens will be weighed and the weight recorded. The sequence of testing will be carried out continuously for a period of not less than 14 days; after which period, provided the specimens have reached constant weight (Note), they will be tested for tensile strength and elongation. Tensile strength will be calculated from the total load at failure, the nominal width, and the thickness as determined prior to exposure to the extraction test. If the tests for tensile strength and elongation cannot be made within 1 hr after completion of the weighings that demonstrated that constant weight has been achieved, the specimens will be stored immersed in fresh alkali solution at room temperature. Prior to being tested for tensile strength and elongation, the specimens will be removed, rinsed, dried, stored for 10 min, and weighed. The tensile strength and elongation will be determined not more than 72 hr after the weighings which demonstrated that constant weight had been achieved.

Note.- Constant weight is assumed to have been achieved when the weights of the group of specimens on three successive weighings do not differ from each other by more than 0.05 percent of the original weight. If constant weight has not been achieved after 90 days, the exposure will be terminated, the specimen tested for tensile strength and elongation, and a note added to the report indicating the weight losses between the last three successive weighings and the fact that constant weight, as here defined, was not achieved.

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7.2 Effect-of-Alkalies Test.- Three specimens, each weighing about 75 g, will be pressed in accordance with CRD-C 515. The specimens will be washed in tap water, rinsed with distilled water, wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hr. The weight of each specimen, to the nearest 0.001 g, will be recorded. Ten durometer readings, using the Shore durometer (type A), will be taken on each specimen in accordance with CRD-C 569. The specimens will be completely immersed in a freshly made solution containing 5.0 g of chemically pure sodium hydroxide and 5.0 g of chemically pure potassium hydroxide in one liter of distilled water, kept at 21-24 C (70-75 F). At the end of 7 days,

the specimens will be removed, rinsed with distilled water, the surfaces wiped with a clean cloth, and allowed to dry in laboratory air for approximately 1 hr. The weight and durometer hardness will be measured and recorded. Changes in weight and durometer readings will be recorded as a percentage of the weight and durometer readings of the original samples; the averages of these changes for the three specimens tested shall be reported to determine compliance with applicable requirements in Par. 6.2.

**8. Rejection**

8.1 The waterstop may be rejected if it fails to meet any of the requirements of these specifications.