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Standard Guide for the Selection and Use of Waterstops¹

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1. Scope

1.1 This guide covers the use of waterstops within cast-in-place concrete construction. Waterstops are generally placed within static, non-moving construction joints in concrete to close off the joint to water, which may be under significant hydrostatic pressure. They are used as part of the overall waterproofing strategy for a building or other structure. Expansion and other types of moving joints may require the use of waterstops, which can accommodate the anticipated movement of the structure and are beyond the scope of this guide.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1079 Terminology Relating to Roofing and Waterproofing

¹ This guide is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.22 on Waterproofing and Dampproofing Systems.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 *Federal Specification:*³

SS-S-210A Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology **D1079**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *chemical grout*—injection repair media other than particulate or cementitious grout that may be multi-component, with or without additives, and based on either polyurethane resin or acrylic resin.

3.2.2 *sodium bentonite*—a natural clay mineral consisting mostly of montmorillonite (aluminum silicate) that is processed and typically treated with polymer additives. Sodium bentonite is a highly expansive mineral having characteristics of cohesion, binding, sealing, and upon hydration forms a very low permeable water barrier.

4. Significance and Use

4.1 This guide is intended to be used in the selection and installation of waterstops in cast-in-place concrete construction. This guide is intended to assist the building owner, owner's representative, architect, engineer, contractor, and/or authorized inspector during the specification and installation of waterstops.

4.2 This guide is applicable to cast-in-place concrete construction. The use of this guide may not be appropriate for installation of waterstops in other types of concrete construction, including but not limited to, pneumatically applied (that is, shotcrete) and precast concrete construction.

5. Materials

5.1 *General*—The intent of this section is to define the available materials and properties that a waterstop should have to perform effectively to create a water barrier in properly

³ Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.



prepared concrete construction joints in the intended application and under expected field conditions.

5.1.1 Waterstops and waterproofing may be installed by different contractors. Close coordination is required during design and construction.

5.2 *Materials:*

5.2.1 *Bentonite Swelling Strip Waterstop*—A bentonite composite material, adhered and/or mechanically fastened to a properly prepared substrate, which swells in the presence of water.

5.2.2 *Rubber Swelling Strip Waterstop*—A hydrophilic rubber compound material, adhered and/or mechanically fastened to a properly prepared substrate, which swells in the presence of water.

5.2.3 *Swelling Gun Grade Waterstop*—Single or multi-component sealants, applied to a properly prepared substrate that swell in the presence of water.

5.2.4 *Grout Injection Waterstop*—Prefabricated porous tubes or strips, installed prior to concrete placement with ports for future use. Tube is then injected with chemical grout, usually polyurethane foam after the concrete has sufficiently hydrated.

5.2.5 *Crystalline Waterstop*—Cementitious slurry that includes admixtures that react with water to form crystals to fill small cracks and voids in the concrete.

5.2.6 *Mastic Waterstop*—Butyl or asphalt strips.

5.2.7 *Extruded Rigid Waterstop*—Typically PVC (thermoplastic) or rubber but can sometimes be coated metal or other materials. Interlocks with concrete at construction joints to block water passage.

5.2.8 *Metal Waterstop*—Typically steel, used to form a rigid physical barrier at concrete construction joints. Similar in functionality to extruded rigid waterstops.

5.3 *Site Conditions:*

5.3.1 Perform an analysis of the existing ground water and soil to determine if there are hydrostatic conditions and/or if there are any contaminants, which may negatively impact the performance of the selected waterstop.

5.3.2 Verify the composition of any fluids that may contact with the concrete such as in tanks or other types of vessels that

may negatively impact the performance of the selected waterstop. Determine chemical components, concentrations, and temperatures.

5.3.3 See [Appendix X1](#) for additional information pertaining to the selection of waterstops.

6. **Procedure**

6.1 Install waterstop in accordance with the manufacturer's instructions. Before concrete is placed, the waterstop installer coordinates and completes any required inspections.

6.2 Take care with installation of waterstop as it pertains to the installation of reinforcing steel and the placement of concrete and other associated work. Inspect and repair waterstops as necessary immediately prior to casting concrete.

6.3 Waterstops shall be continuous and sections shall be properly joined, lapped, or welded (per the type of waterstop) to prevent water ingress through the construction joint.

6.4 Provide proper concrete coverage and consolidation in accordance with manufacturer's guidelines.

6.5 Place waterstop within vertical and horizontal joints within reinforcing bars where multiple rows exist unless otherwise specified.

6.6 Mechanically attach and/or adhere waterstop in accordance with manufacturer's guidelines to prevent movement within the joint during casting of concrete.

6.7 Verify proper substrate conditions.

6.8 Prevent concrete from splattering onto the previously installed waterstop. Place concrete in a manner to secure proper position of waterstop. Consolidate concrete to prevent voids, honeycombing and/or shadowing.

6.9 Protect installed waterstop to prevent damage and/or prehydration.

7. **Keywords**

7.1 bentonite swelling strip waterstop; chemical grout; crystalline waterstop; grout injection waterstop; mastic waterstop; metal waterstop; plastic waterstop; rubber swelling strip waterstop; sodium bentonite; swelling gun grade and pourable waterstop



APPENDIX

(Nonmandatory Information)

X1. WATERSTOP COMPARISON TABLE

TABLE X1.1 Waterstop Comparison

Waterstop Type	Description	Advantages	Limitations
Swelling/ Hydrophilic	Bentonite Swelling Strip Consist of bentonite composite material. Swells in the presence of water in concrete construction joints.	<ul style="list-style-type: none"> •Accessory product for many below-grade waterproofing assemblies; may be part of below-grade watertight warranty •Easy to apply •Pliable and molds to uneven substrates 	<ul style="list-style-type: none"> •Can swell prior to concrete placement if exposed to water for an extended period of time •Requires sufficient concrete clear cover (i.e. thickness) to avoid spalling concrete •Must be thoroughly adhered to the substrate •The effect of saltwater and contaminated soils must be taken into consideration. Check with the waterstop manufacturer
	Rubber Swelling Strip Rubber strip adhered and/or mechanically fastened to properly prepared concrete.	<ul style="list-style-type: none"> •Contractor familiarity, widely available •Easy to apply •Inexpensive 	<ul style="list-style-type: none"> •Can swell prior to concrete placement if exposed to water for an extended period •Requires sufficient concrete clear cover (i.e. thickness) to avoid spalling concrete •Does not conform to irregular substrates •Usually used with sealant/adhesive •Must be thoroughly adhered to the substrate •The effect of saltwater and contaminated soils must be taken into consideration. Check with the waterstop manufacturer
	Swelling Gun Grade Single or multi-component, sealants that swell in the presence of water. Can be used as standalone waterstop or in combination with hydrophilic blocks or hydrophobic strips.	<ul style="list-style-type: none"> •Conforms to irregular substrates •Does not require fastening or supplemental attachment •Can be installed over rough substrates, tight corners, and other unique substrate conditions not easily accommodated by other waterstops 	<ul style="list-style-type: none"> •Can swell prior to concrete placement if exposed to water •Requires sufficient concrete clear cover to avoid spalling concrete •Easily displaced during concrete placement and other construction work if not properly installed •Size and configuration of waterstop subject to installation variations •Typically used as an adhesive and detailing accessory •Must be adhered to the substrate •The effect of saltwater and contaminated soils must be taken into consideration. Check with the waterstop manufacturer
	Grout Injection Consists of prefabricated porous tubes or strips installed prior to concrete placement. Tube is then injected with chemical grout, usually polyurethane foam after the concrete has sufficiently hydrated.	<ul style="list-style-type: none"> •Allows treatment to leaking joints after concrete has been placed. Not affected by water exposure prior to concrete placement •If properly placed can be effective with filling voids within and around the joint •Has ability to fill cracks and joints around the waterstop 	<ul style="list-style-type: none"> •Requires care after concrete placement to protect waterstop and injection ports •Requires sufficient concrete clear cover to avoid spalling concrete during grout installation •Most expensive waterstop option in most cases •Multi-tube injection system can plug adjacent "open" tubes not yet injected. Also challenging at T and X intersections •The lighter than concrete tubes can float when concrete is vibrated lifting the tubes into the concrete and out of the joint
	Crystalline Cementitious slurry that includes admixtures that react with water to form crystals to fill small cracks and voids in the concrete.	<ul style="list-style-type: none"> •Resistant to construction traffic and trade damage once cured •Typically requires little or no concrete clear cover •Can be troweled or brushed directly into the joint •Can be applied across the entire joint 	<ul style="list-style-type: none"> •Slurry is mixed and installed in field, making it more sensitive to workmanship issues. The crystalline mixture has no flexibility. If the joint moves after the crystals are done forming. Cracks/joints may therefore not be protected.
Passive	Mastics Butyl or asphalt strip	<ul style="list-style-type: none"> •Easy to apply •Can be applied to irregular substrates •Less affected by exposure prior to concrete placement 	<ul style="list-style-type: none"> •Does not expand •Sensitive to cold application temperatures •Limited lengths create more joints than other waterstop types

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