

**GREENSTREAK GROUP, INC** 

# WATERSTOPS for concrete



For 60 years, Greenstreak has been the leading source for joint sealing technologies and innovative products for concrete. Offering a variety of solutions across all categories of waterstops, Greenstreak has the knowledge and time tested products to meet the most demanding applications.

- Water/Waste Water Treatment Plants
- Lock and Dam Systems
- Reservoirs and Aqueducts
- Flood Walls
- Retaining Walls
- Foundations
- Tunnels and Culverts
- Bridge Abutments
- Containment Structures and Tanks
- Slabs-on-Ground

When you specify Greenstreak, you are specifying the first name in waterstops and the trusted source for superior technical and customer service.

#### 800-325-9504

# **Choose The Right Waterstop**

### Waterstop Basic Use

Embedded in concrete, across and/or along the joint, waterstops form a watertight diaphragm that prevents the passage of liquid through the joint.

### **Suggested Waterstop Design Checklist**

- Verify chemical containment requirements, if any
- Verify hydrostatic head pressure requirements
- Oetermine joint type and joint movement requirements
- Specify material type for best water sealing performance
- Specify profile and size (by product number, if possible)
- Verify joinery details of dissimilar or asymmetric waterstop profiles, if any (consider using one profile throughout to simplify intersections)
- Specify factory fabrications and fittings for transitions and intersections
- Specify appropriate method for securing waterstop in position (see Greenstreak CSI-formatted product specifications for additional guidance)

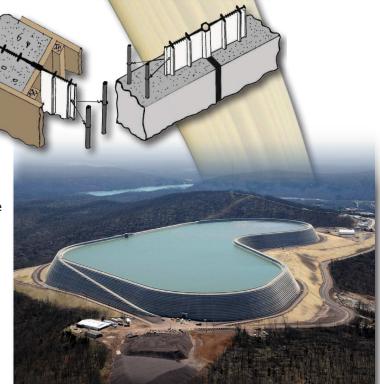


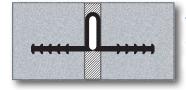
Photo courtesy of Paul C. Rizzo Associates, Inc.

### Selecting A Waterstop Shape

MOVEMENT JOINTS are typically designed to accommodate significant movement due to drying shrinkage, temperature changes, settlement, creep, or live load deflections. The waterstop profile selected must have the ability to accommodate expected joint movement, typically achieved through the use of a centerbulb, tear web, or other suitable waterstop geometry designed to accommodate joint movement. Movement joints typically include contraction joints, expansion joints, and isolation joints. The following profiles are suitable for Movement joints:



#### Ribbed with Centerbulb shapes are the most versatile type of waterstops available. The centerbulb accommodates lateral, transverse, and shear movement. Larger centerbulbs will accommodate greater movement.



**Tear Web** shapes accommodate large movements. When joint movement occurs, the tear web ruptures and allows the U-bulb to deform without putting the material in tension.



Dumbbell with Centerbulb shapes accommodate lateral, transverse, and shear movement. Larger centerbulbs will accommodate greater movement. Consider using Ribbed with Centerbulb for better sealing characteristics.



**Base Seal with Tear Web** shapes accommodate lateral, transverse, and shear movement. Larger centerbulbs will accommodate greater movement. **Base Seal waterstops have some limitations with transitions and intersections.** 

# **Specify Greenstreak**

NONMOVING JOINTS typically have 100% of the bonded steel reinforcement continuous through the joint, and expose the waterstop to negligible or no movement. Flat waterstop profiles without a centerbulb or tear web are suitable for nonmoving joints. Other waterstop materials may be considered for nonmoving joints as well, such as strip-applied or injectable hose waterstops. Examples of waterstop profiles suitable for nonmoving joints are as follows:



Flat Ribbed shapes are preferred for nonmoving joints and provide the best sealing characteristics.



**Dumbbell** shapes are an alternate profile for nonmoving joints. **Consider ribbed shapes for better sealing characteristics.** 

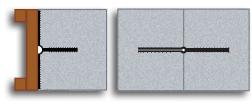




Base Seal is ideal for slab-on-grade joints or backfilled walls and are easy to form. Base Seal waterstops have some limitations with transitions and intersections.



Labyrinth is primarily used in vertical joints. Labyrinth shapes create a keyed joint and do not require split bulkheads. Labyrinth can be difficult to use in horizontal joints and there are some limitations with transitions and intersections.



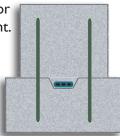
Split Flange shapes can simplify forming. The split flange is opened and attached to the bulkhead for placement of the first concrete element. After stripping the bulkhead, the flange is closed and anchored for placement of the adjoining element. Split waterstops are suitable for straight runs only. Transitions and intersections are not practical with these profiles.



Waterstops for Retrofit Applications seal joints where new construction meets an existing structure and can be suitable for moving joints. Systems include stainless steel batten bars and fasteners for anchoring to the existing structure with the aid of an epoxy gel.

Strip Applied Waterstops are adhered along concrete joints or penetrations and encapsulated by a subsequent concrete placement.

**Hydrotite** is the state of the art for hydrophilic waterstop and is a high-performance, chloroprene rubber material that expands when exposed to moisture to create a compression seal within and along the joint. For less critical applications, Greenstreak also offers **SikaSwell A** and **Swellstop** expanding waterstops.





### **Product and Material Options**

Greenstreak has the industry's most comprehensive collection of waterstop products and solutions to meet the most demanding applications. This catalog is primarily dedicated to PVC (polyvinyl chloride) waterstops, but general information is included for chemical resistant waterstops (TPER, PE, Stainless Steel), strip applied waterstops (Hydrotite, SikaSwell A, Swellstop, Lockstop) and for Fuko Injection Hose Systems. Complete catalogs and technical data for each of these products are available in print or online.

# Greenstreak PVC Waterstop

Greenstreak, one of the first manufacturers of polyvinyl chloride (PVC) waterstop, has formulated, compounded and manufactured PVC waterstop for years. Greenstreak has the knowledge, experience and desire to provide the highest quality joint sealing solutions and services available.

PVC is the industry standard for flexible waterstops, which are typically embedded across and along the joint. PVC is the most versatile waterstop material, offering the broadest design selection and is accepted under the **ACI 350 "Code Requirements for Environmental Engineering Concrete Structures"**. It has great inherent elasticity and is resistant to many waterborne chemicals. It will not discolor concrete or produce electrolytic action.

### **Physical Properties**

All Greenstreak PVC waterstops are specially formulated and manufactured to meet or exceed industry standard product specifications.

Greenstreak PVC Waterstop Physical Properties		
Property	Test	Value
Water absorption	ASTM D570	0.15% max.
Tear resistance	ASTM D624	300 lb./in. min.
Ultimate elongation	ASTM D638	350% min.
Tensile strength	ASTM D638	2000 psi min.
Low temperature brittleness	ASTM D746	Passes @ -35°F / -37°C
Stiffness in flexure	ASTM D747	700 psi min.
Specific gravity	ASTM D792	1.38 max.
Hardness Shore A15	ASTM D2240	79±3
Accelerated extraction -Tensile strength -Elongation Effect of Alkali -Weight change -Hardness change	on Corps of Engineers CRD-C 572	1600 psi min. 300% min. +0.25% -0.10% +/-5 points

Greenstreak conducts regular testing of materials. Call Greenstreak for the latest test values.

Independent laboratory tests are available for the following applicable standards:

- Corps of Engineers CRD-C 572-74
- Bureau of Reclamation
- CH2M HILL
- MWH
- Various State Highway and/or Public Works Department Standards

Test results conducted using British Standards are also available. Consult a Greenstreak engineer for more information.

### **Installation Aids and Fabrications**

PVC waterstops must be securely positioned in the forms to prevent deflection or misalignment during concrete placement. This is achieved by tying off the outer edge of the waterstop to adjacent reinforcing steel. Greenstreak offers options to properly anchor PVC waterstop, including:

- Punched Flanges most ribbed shapes can be provide with punched flanges
- Grommets select shapes can be provided with brass grommets
- Hog Rings and Pliers available for field application and suitable for most shapes

#### **Hog Rings and Pliers**

Virtually every concrete structure requiring a PVC waterstop is going to encounter a joint that will change direction or intersect with another joint. One of the benefits PVC offers is the ability to heat weld the material to create a continuous sealing diaphragm within the joints of a concrete structure.

### Waterstop failures are often the result of field fabricated transitions and intersections.

To avoid potential problems, Greenstreak strongly **recommends factory fabrications** and maintains an inventory of the most common fabrications to meet the demands of a construction schedule.

Splicing irons are available in a variety of sizes for field welding lengths of PVC waterstop. More information can be found on page 11.

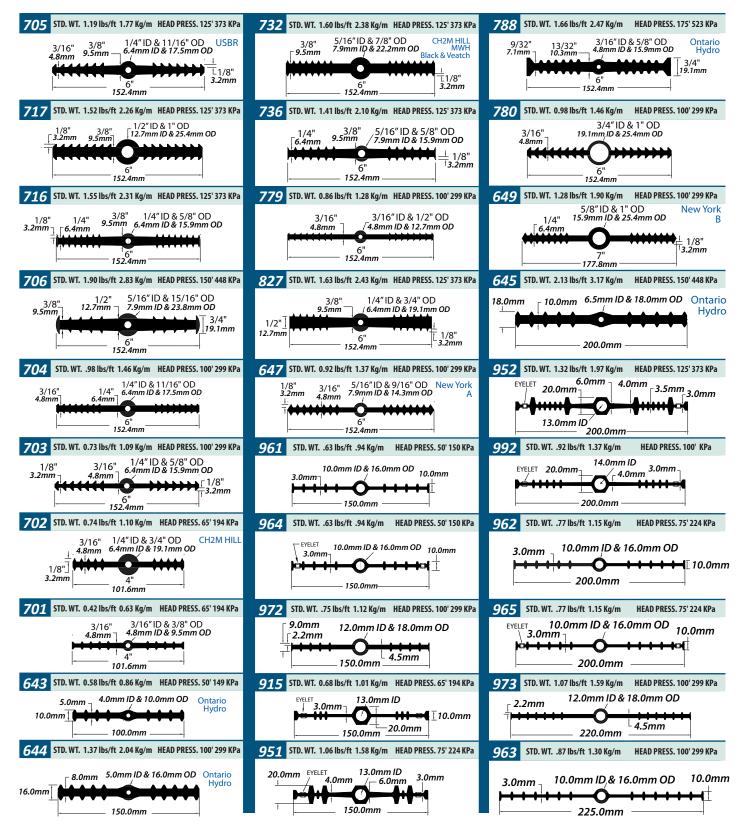




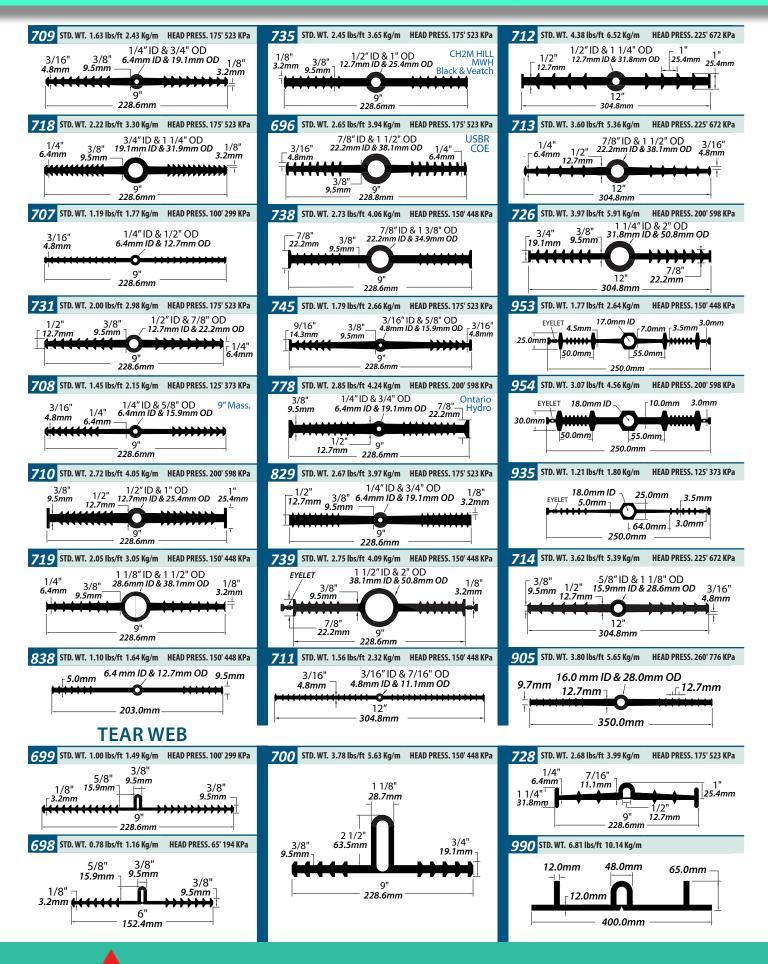
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# **Ribbed with Centerbulb**

Greenstreak offers the industry's widest array of PVC waterstop designs, typically ranging in widths from 4" to 12" and thicknesses from 1/8" to 1/2". Depending on size, most waterstop shapes are provided in 50 or 100 ft. coils. Following is a comprehensive list of available shapes grouped by profile type. Please contact Greenstreak for further information or if you need assistance in selecting a waterstop.



# **Ribbed with Centerbulb / Tear Web**



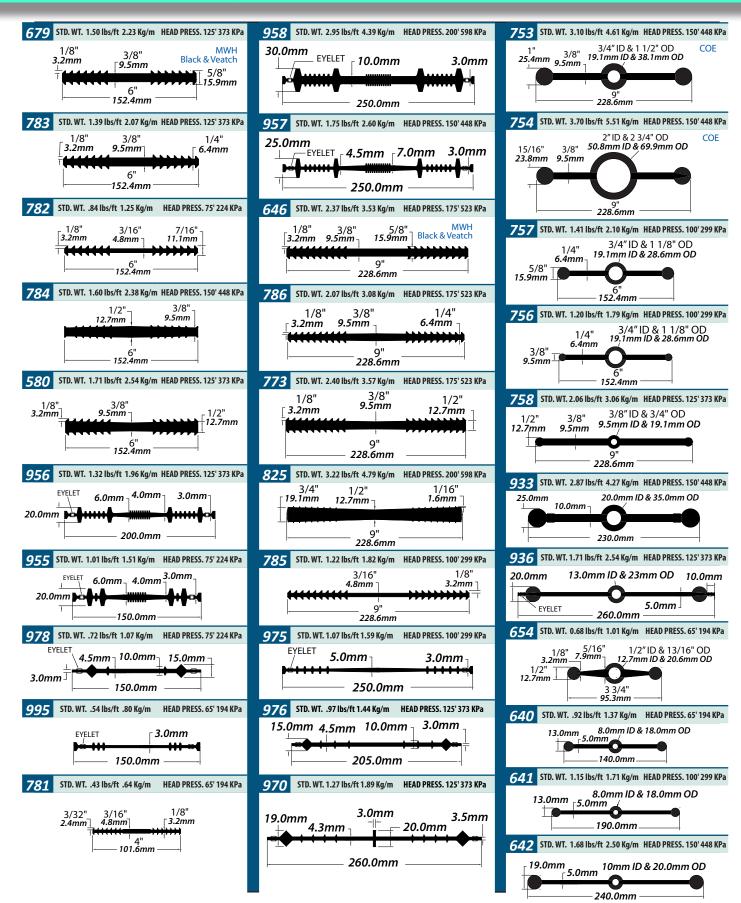
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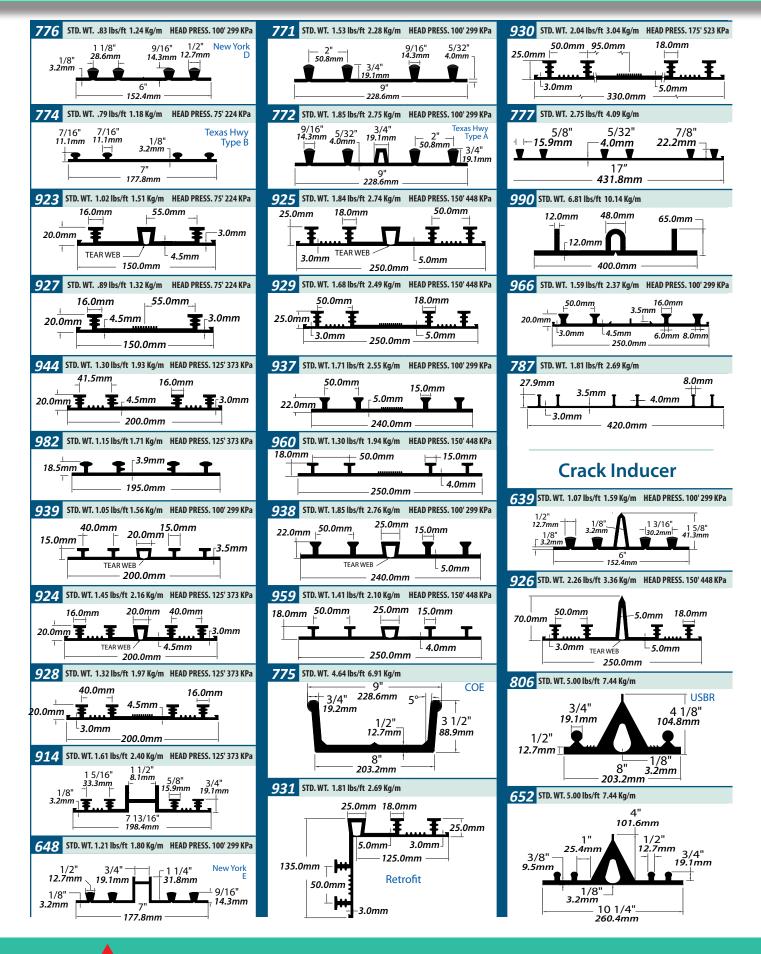
### Flat Ribbed / Dumbbell with Centerbulb



Ribbed waterstops provide the best sealing characteristics

Shapes are drawn to varying scales

# **Base Seal / Crack Inducer**

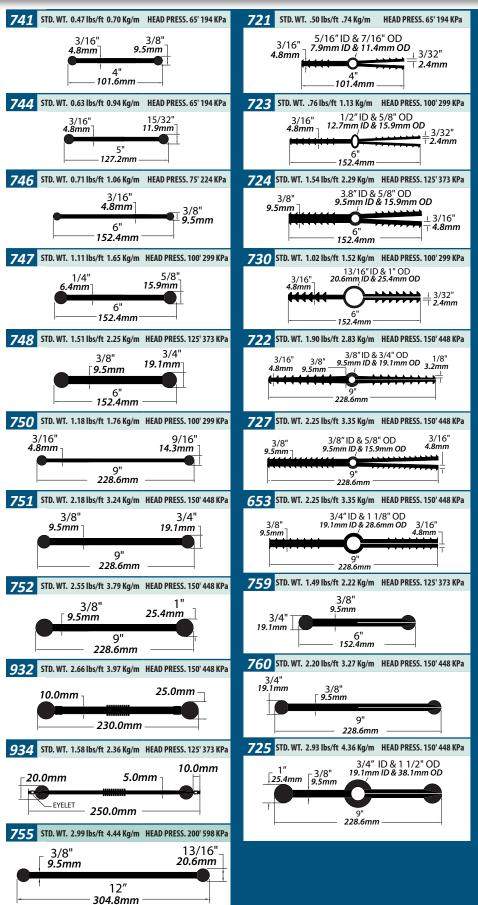


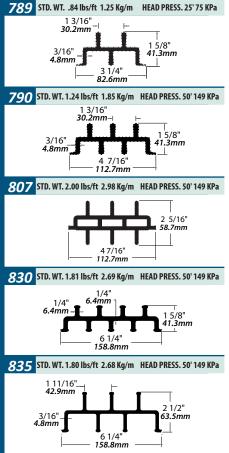
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# **Dumbbell Split Flange Labyrinth**





#### A Note About Head Pressure Ratings:

Head Pressure Ratings are based on parameters published in the Corps of Engineers document, Waterstops and Other Preformed Joint Materials for Civil Works Structures EM 1110-2-2101, dated 30 September 1995. Sample testing conducted by Greenstreak on select profiles has indicated a conservative tendency in these ratings. That said, the published Head Pressure Ratings should be considered to be ultimate values. An appropriate safety factor should be applied to these values.

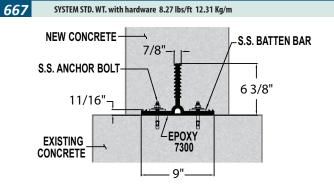
Contact a Greenstreak engineer for more information.

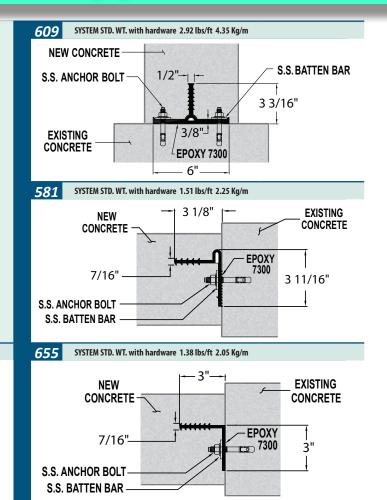
# **Retrofit/Special Applications**



#### **Retrofit Waterstop Systems**

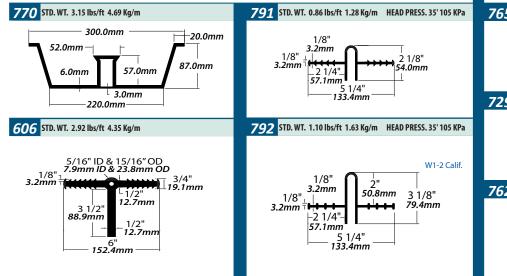
Retrofit waterstops seal joints where new construction meets an existing structure and can be suitable for working joints. Systems include waterstop profile, stainless steel batten bars and anchor bolts. Epoxy 7300 is sold separately.

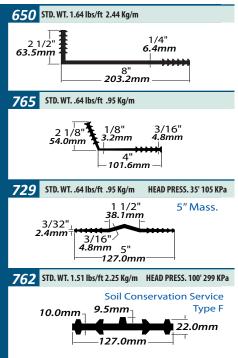




#### **Specialty Shapes**

These shapes have been developed to meet unique requirements of clients or other specifying groups. Consult a Greenstreak engineer for more information or for special applications.







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#### Shapes are drawn to varying scales

# Fabrications/Splicing Irons

### **Typical PVC Fabrications**

Greenstreak strongly recommends factory fabricated transitions and intersections. Typical fabrications for many of the most common shapes are inventoried by Greenstreak and available to meet construction schedules. Greenstreak can provide customized fabrications to suit unusual configurations or a convergence of differing profiles.



Flat Ell, Tee and Cross Fabrications



Vertical Ell, Tee and Cross Fabrications



#### **Splicing Irons For Field Welding**

As noted, a quality waterstop installation requires quality welds. Greenstreak Splicing Irons are specifically designed for welding thermoplastic waterstop and are constructed of the highest quality components for superior and long lasting performance. No other means or methods can be used.

Temperature controls are adjustable for various conditions and products. Irons are typically I 20V operation, but 240V is available for the 213 and 214 irons.

The 213 and 215 irons have an integral thermometer to display the iron temperature for accurate welding. The splicing iron should be large enough to melt the enire cross-section of the waterstop profile. All irons are supplied with a teflon coated cover necessary for welding. Replacement covers are available for purchase.

### **Chemical Resistant Waterstop**

Greenstreak's companion brand, Westec,<sup>®</sup> offers waterstop solutions for secondary containment in petrochemical and industrial applications. Westec's Envirostop<sup>®</sup> TPER (Thermoplastic Elastomeric Rubber) Waterstops resist a wide range of oils, solvents and aggressive chemicals. Alcohols, ketones, glycols, esters and aqueous solutions of acids, bases and salts have little effect on Westec TPER Waterstop.

TPER has excellent ozone resistance, low temperature flexibility, excellent high temperature (up to 250° F) performance and is heat weldable. Westec TPER Waterstop can also be defined as a Thermoplastic Valcanizate, TPV.



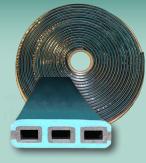


Westec's TPER Waterstop is Certified to NSF/ANSI Standard 61 for Drinking Water System Components

Contact a Greenstreak engineer or visit www.Chemstop.com for more information.

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# **Strip Applied Waterstops And Injection Hose Systems**



SikaSwell A

**HYDROTITE** is a world renowned hydrophilic waterstop. Composed of modified chloroprene rubber protected with a special delay coating, Hydrotite expands when exposed to water, creating an effective compression seal within joints where limited movement will occur.

Hydrotite is used extensively in sealing concrete construction joints, pipe penetrations, precast concrete segments, tunnel lining segments and for repair of existing joints or retrofit applications. Several shapes and sizes are available.

**SikaSwell A** (formerly Duroseal Gasket) and **SWELLSTOP** expand upon contact with water to form a compression seal in nonmoving concrete joints. SikaSwell A is a water-swelling acrylate-ester and Swellstop is a flexible butyl rubber and swellable clay waterproofing compound. As with all hydrophilic waterstops, these products are suggested for applications where exposure to moisture is constant.

**LOCKSTOP** is a single component and self-sealing mastic waterstop which bonds to concrete to prevent moisture from penetrating nonmoving joints.

#### SikaSwell A, Swellstop, Lockstop and some Hydrotite profiles are suitable for nonworking joints only.

Greenstreak offers FUKO VT INJECTION HOSE, the world's number one injection hose system. FUKO VT Systems are available in two sizes and can deliver Portland Cement, Microfine Cement, or a variety of resins to seal cracks or voids in the joint area. FUKO VT has a unique "re-injectable" design, which allows the hose to be cleaned. This key feature allows for a complete maintenance program if leaks appear and future re-injections are required.

**FUKO Eco 1** (formerly Duroject) is an injection hose for delivering cements or resins for planned sealing of construction joints. It is for single injection applications. Greenstreak offers a variety of injection materials for FUKO Injection Hose Systems.

LIMITED WARRANTY: GREENSTREAK warrants to the Buyer that this product will be free of defects and will perform as represented in writing subject to the (2) following conditions: First, the application of the product and the concrete construction practices used in the application are in accordance with GREENSTREAK'S Recommendations. Second, the Buyer has selected the proper product for the specific application required. GREENSTREAK disclaims any responsibility for the selection of a particular waterstop product. Product selection is the sole responsibility and decision of the buyer. The suitability of any material for a specific application requiring fluid resistance is best determined by specific testing for the application. GREENSTREAK urges the Buyer to conduct its own testing.

Any information supplied by GREENSTREAK with respect to its products is believed to be correct. GREENSTREAK makes no representations or warranties, express or implied, as to the accuracy or completeness of such information or the use of such information for a particular purpose. GREENSTREAK has not performed any tests. Any test data has been prepared by independent commercial laboratories.

Because GREENSTREAK has no control over either the application or the selection of its products, GREENSTREAK's Limited Warranty is as follows: The exclusive remedies of the Buyer and the limit of the liability of GREENSTREAK from any and all losses or damages resulting from the use of this product (including claims based on contract, negligence, strict liability, or otherwise) shall be either the full refund of the purchase price to Buyer of this product or the replacement of the quantity of product purchased by the Buyer - at the election of GREENSTREAK. In no event shall GREENSTREAK be liable for any incidental or consequential damages. The Buyer and all users of this product are deemed to have accepted the terms of this Limited Warranty which may not be varied in any way by any verbal or written agreement.

USA



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Apr. 2011

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