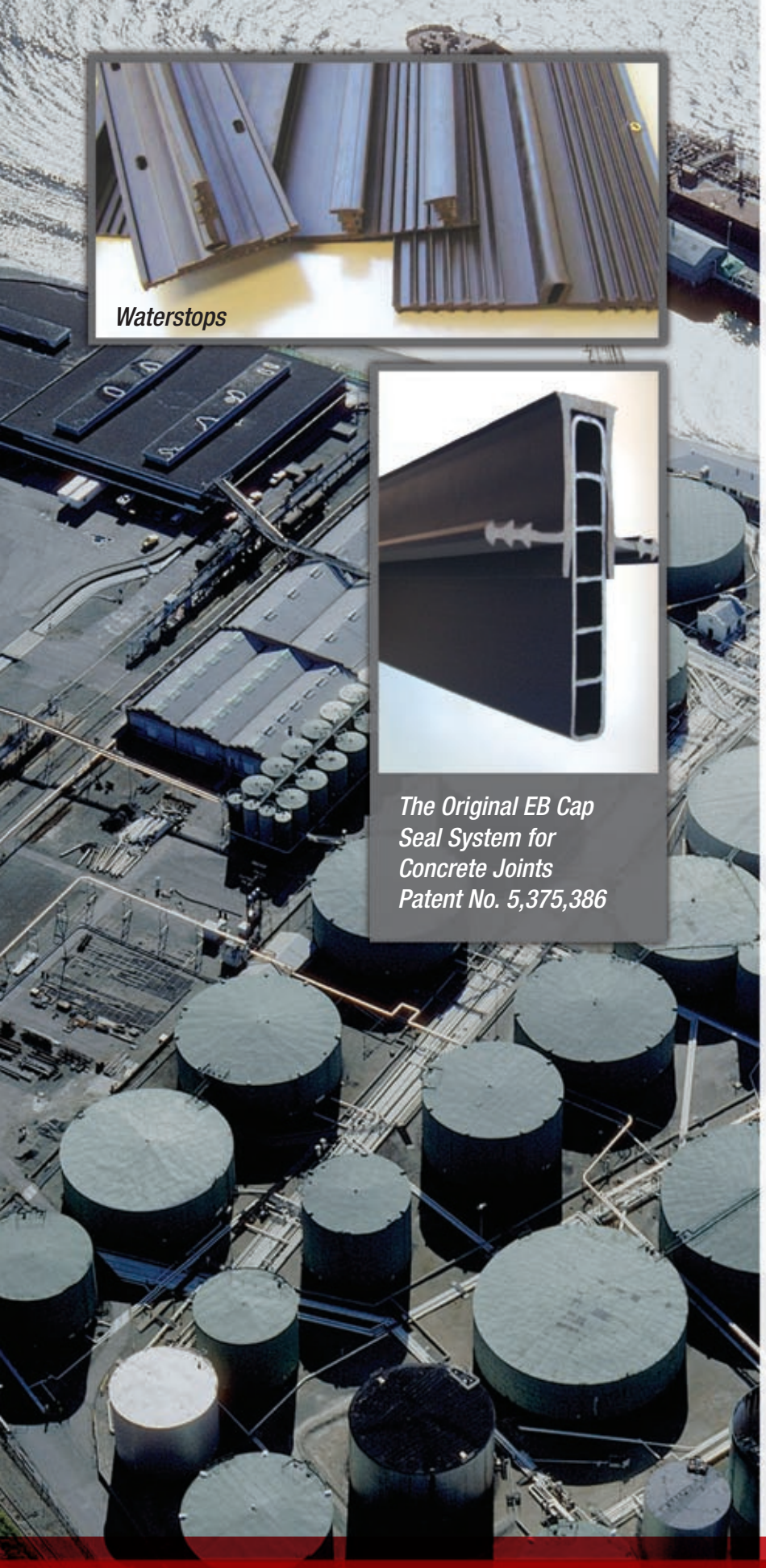


Waterstops

The Original EB Cap Seal System for Concrete Joints Patent No. 5,375,386

WESTEC®

Barrier Technologies

Quality Products for Secondary Containment

Industrial applications mean special requirements for containment structure design and construction. The standard flexible PVC waterstop material may not be suitable for the harsh chemical environments. Westec Barrier Technologies and Greenstreak Group Inc., specialize in waterstop applications for these unique industrial environments. In addition to the traditional waterstop profiles, Westec offers several profiles specifically designed for industrial applications, particularly retrofit profiles for expanding and updating existing facilities.

Application Areas:

- Ethanol/Biodiesel
- Petrochemical Manufacturing
- Refineries
- Pulp and Paper Mills
- Land, Air and Seaports
- Fuel Storage / Tank Farm
- Pipeline
- Pharmaceutical Plants

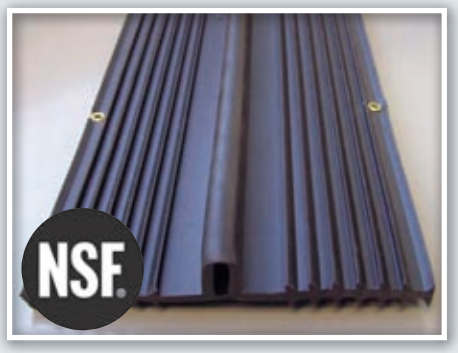
Superior Service

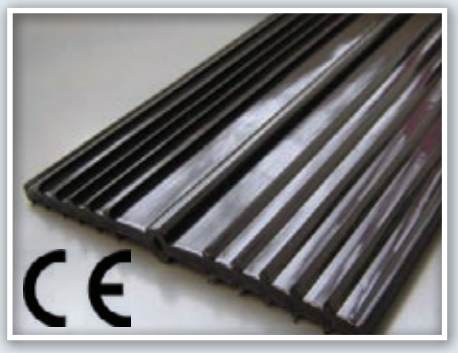
Greenstreak engineers are available for design review, chemical test data, material take-off and shop drawing assistance.

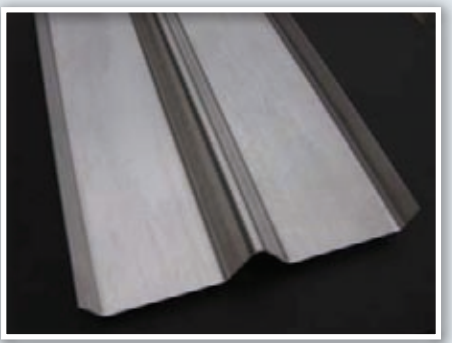
GREENSTREAK GROUP, INC.

Learn more at Chemstop.com • GreenstreakGroup.com • email: info@chemstop.com
Phone (800) 7-westec (793-7832) or (636) 225-9400

Material Choices for Optimum Performance







Envirostop® TPER

Thermoplastic Elastomeric Rubber is a fully vulcanized blend of EPDM and Polypropylene, also called a Thermo-plastic Vulcanizate or TPV. This gives the waterstop the flexibility and sealing properties of a rubber seal, but allows for heat welding and processing like a plastic. In addition to the favorable physical properties, TPER also has excellent chemical resistance to a wide range of chemicals. ASTM tests (D-471) show good resistance to oils, fuels, acids, bases and numerous solvents.

Envirostop® TPER

Westec Envirostop® TPER waterstop is certified to NSF/ANSI Standard 61 for drinking water applications. The standard establishes minimum health effects requirements for the chemical contaminants and impurities that may be indirectly imparted to drinking water. Although more commonly known for its use in chemical containment applications, TPER waterstop is now widely used for ozone contact structures in the water treatment industry. Envirostop® TPER waterstop can be specified for any drinking water containment structure where this certification is required for joint sealing materials.

PE Polyethylene

Polyethylene (VLDPE) is more plastic-like, having increased elastic modulus and hardness than TPER. PE also has greater resistance in some applications, and is particularly effective for hydrocarbons such as Benzene, Toluene and Xylene. After exposure (1-4 weeks) to such and subsequent drying, PE waterstop was found to return nearly to its original physical properties.

Westec PE 050 and 631 waterstop profiles are the first to receive the European Technical Approval for watersealing bands and have been approved for CE marking in the European Union, ETA-04/0044.

Grommets

TPER and PE, 6" and 9" waterstops are pre-punched in the outermost rib with brass grommets providing convenient points on 12" centers to wire the water stop to reinforcement. Properly securing the waterstop is critical to ensure good consolidation around the ribs and a liquid tight seal.

SS Stainless Steel

Stainless Steel is for high temperature environments that exceed 250ºF or the most severe chemical applications. Westec offers 316 Low Carbon Stainless Steel waterstops. However many applications that have traditionally used SS waterstop can be served with TPER, including ozone contact structures.

Splicing and Fabrications

Greenstreak PVC welding equipment and techniques can be used for Westec TPER and PE waterstops, requiring only a higher temperature set at 410°F. Westec recommends factory-fabricated joints at all intersections and direction changes.

Factory fabrications offer a quick and economical alternative to cutting and splicing these critical junctions in the field. Contact a Greenstreak engineer to arrange for a material take-off and custom shop drawings. Fabrications are available for TPER, PE and Stainless Steel.

Physical Properties of Finished Waterstop

Property	Test Method	TPE-R	PE	*Stainless Steel
Tensile Strength	ASTM D 638	2000psi	2000psi	75000psi
Elongation	ASTM D 638	450%	800%	40%
100% Modulus	ASTM D 638	1000psi	4200psi	
Brittle Temperature	ASTM D 746	-70F		
Hardness	ASTM D 2240	85 Shore A	40 Shore D	95 max Rockwell B
Yield Strength				25000psi

*SS Properties taken from ASTM A240, Table 2

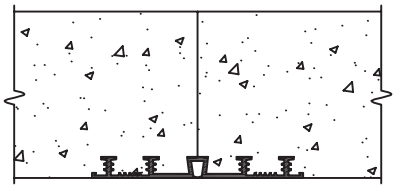
Chemical Resistance General Guidelines

Chemical Resistance recommendations are based on short term, secondary containment applications. Typical testing is performed according to ASTM D-471 "Standard Test Method for Rubber Property-Effect of Liquids" with 166 hour (7day) immersion. Performance data has been collected from a variety of sources including industry reference data, 3rd party and in house testing. Consult a Greenstreak Engineer for application specific chemical data or further testing.

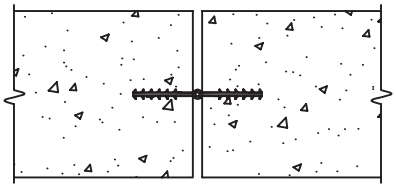
Chemical Exposure	Temp. (C/F)	TPER	PE	Stainless Steel 316	PVC
Rating Key: A = Excellent B = Good C = Conditional X = Do not use					
Ammonia, Anhydrous	23 C/73.4 F	A	B	A	A
Antifreeze	100 C/212 F	A	B	A	A
(50% Ethylene Glycol/50% Water)	125 C/257 F	B		A	
ASTM Oil #2	100 C/212 F	B		A	X
Benzene	23 C/73.4 F	B	B	A	X
Carbontetrachloride	23 C/73.4 F	X	X	B	X
Chlorine (Wet/Dry)	23 C/73.4 F	A/A	C/C	A/X	X/X
Creosote	23 C/73.4 F	A		A	X
Cyclohexane	23 C/73.4 F	X	X	A	X
Diesel Fuel	23 C/73.4 F	B	B	A	X
Ethanol	23 C/73.4 F	A	A	A	C
Hydraulic Fluid	23 C/73.4 F	A	B	A	X
Hydrogen Peroxide	23 C/73.4 F	A	B	B	A
Isopropyl Alcohols	23 C/73.4 F	A	A	A	A
Jet Fuel - JP8	23 C/73.4 F	B	B	A	C
Kerosene	23 C/73.4 F	B	C	A	C
Methyl Ethyl Ketone	23 C/73.4 F	B	B	A	X
Nitric Acid- 70%	23 C/73.4 F	B	X	A	X
Oil, Mineral	23 C/73.4 F	A	B	A	B/C
Sodium Hydroxide 80% Solution	23 C/73.4 F	A	C	X	A
Sodium Hypochlorite	23 C/73.4 F	A	B	A	A
Styrene	23 C/73.4 F	B	B	A	X
Sulfuric Acid 98%	23 C/73.4 F	B	C	X	X
Tetrahydrofuran	23 C/73.4 F	B	X	A	X
Toluene	23 C/73.4 F	B	B	A	X
Trichloroethylene	23 C/73.4 F	X	X	A	X
DI Water pH 11	23 C/73.4 F	A	B	A	A
Xylene	23 C/73.4 F	B	B	A	X

Selecting The Right Profile

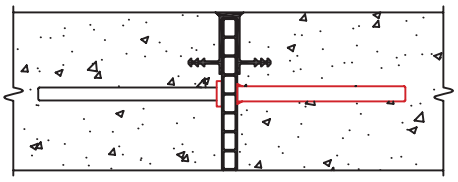
Envirostop® TPER and PE waterstops are available in a variety of sizes and profiles to meet the needs of various structures and applications.



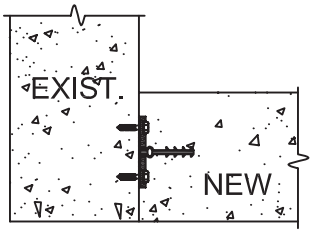
Base Seal is designed for slab on grade joints or backfilled walls and eliminates difficult split forming details. This profile is difficult to join to other waterstops so may not be suitable for containment areas with standard waterstop in other joints. This profile is available only as TPER.



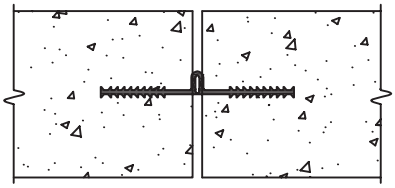
Ribbed with Centerbulb is a very versatile waterstop and a standard for the concrete industry. The centerbulb of the waterstop accommodates vertical and horizontal movement equal to the inside diameter of the centerbulb. This waterstop can be used in control joints and expansion joints, vertical and horizontal applications. TPER and PE profiles are available.



EB Cap - The patented Expansion Board Cap Seal system was design to serve as both a waterstop and joint sealant. This unique design allows for one step placement of your joint sealant and waterstop. No stripping, sawcutting or sealing is required. The result is an easy to install, maintenance free joint. TPER and PE profiles are available.



Retrofit - Modern chemical plants and manufacturing facilities are constantly expanding, modifying existing areas for new technologies and products. Structural changes to the concrete areas create the potential for leaks between the new and existing concrete. Westec offers multiple profiles for a variety of situations and applications. TPER, PE and Stainless Steel retrofit profiles are available.



Ribbed with Tear Web is designed for larger joint movements. The thin web in the U shaped centerbulb will tear during joint movement and allow for additional expansion or differential settlement. Some fabrication types are limited. TPER and PE profiles are available.

What about Split Waterstops?

Split waterstops have a split flange that opens and is attached to one side of the bulkhead. Following the first pour, the bulkhead is removed and the flange is closed and secured to adjacent reinforcing steel prior to the succeeding pour. These waterstops typically cannot be joined to other waterstops and cannot accommodate directional changes or intersections. The applications for split waterstops are limited and not suitable for chemical containment. Westec Retrofit and EB Cap systems address many of the forming issues served by split waterstop.

What about Dumbbell Waterstops?

Generally any situation suited for dumbbell waterstops can be better served with a ribbed profile. The multi-rib configuration disperses stress to the waterstop more effectively than a single dumbbell and creates a more circuitous path for liquid migration.

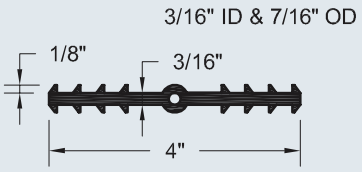
What about Hydrophilic (swelling) Waterstops?

Hydrophilic strip applied waterstops are easy to install and effective in a variety of applications. However they have some limitations and should be used with caution in secondary chemical containment installations. Designers should consider not only the chemical resistance of hydrophilic materials, but the degree and rate of swell of the waterstops during exposure to a media other than water. Embedded waterstops generally provide a more reliable seal against infrequent but sudden exposure to aggressive liquids.

Envirostop® TPER Profiles: Standard, Retrofit and EB Cap

Ribbed Centerbulb

618



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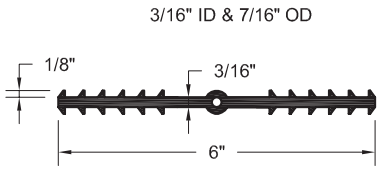

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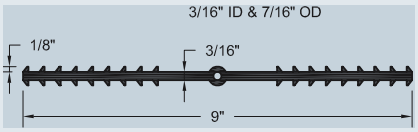

Ribbed Tear Web

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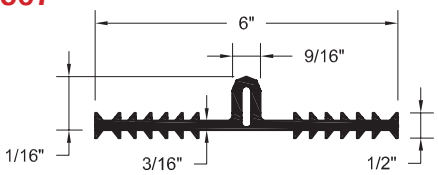

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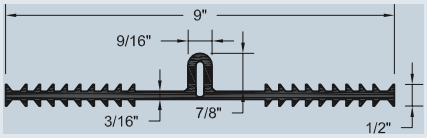

Base Seal

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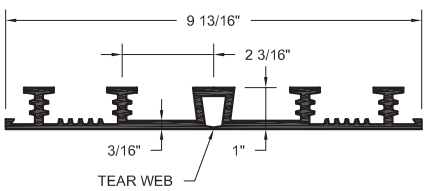

Retrofit

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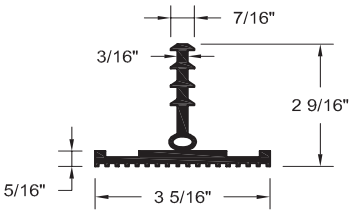

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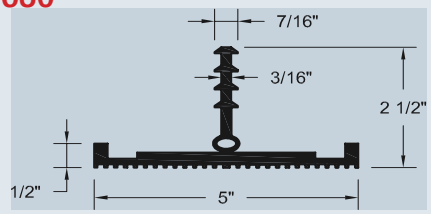

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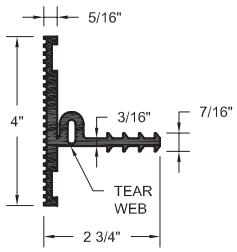

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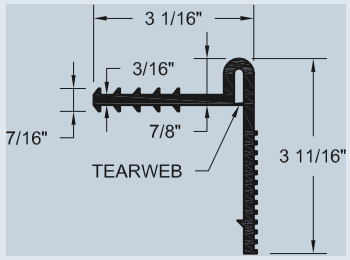

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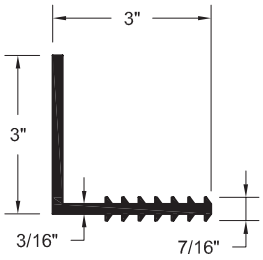

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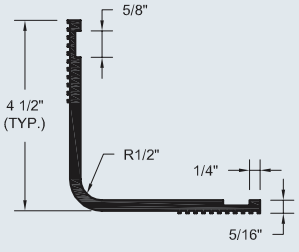

EB Cap

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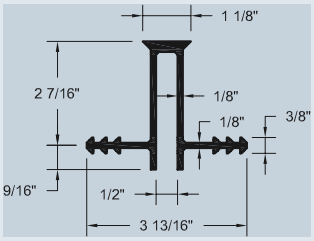

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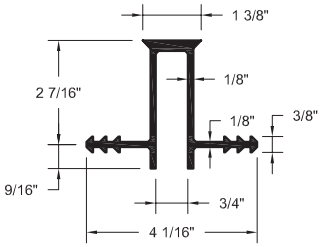

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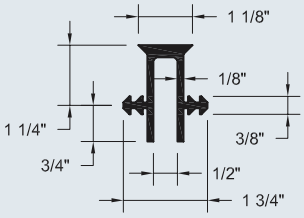

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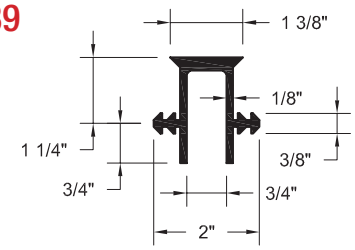

EB Cap Retrofit

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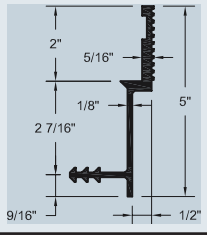

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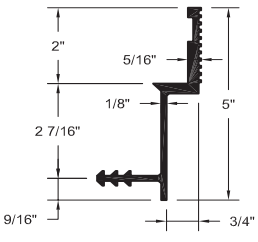

NSF Envirostop® TPER Products are certified by NSF to NSF/ANSI Standard 61

PE Profiles: Standard, Retrofit and EB Cap

EB Cap Retrofit

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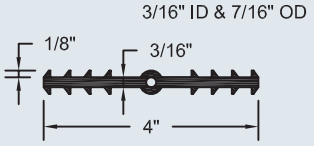

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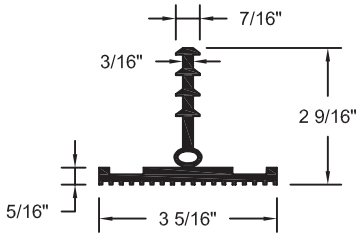

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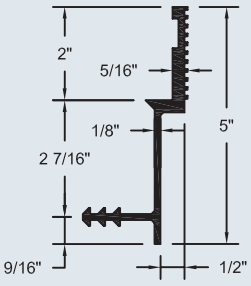

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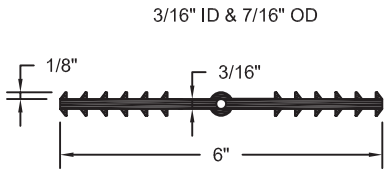

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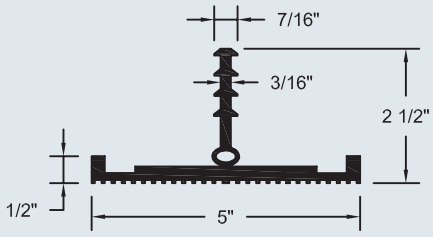

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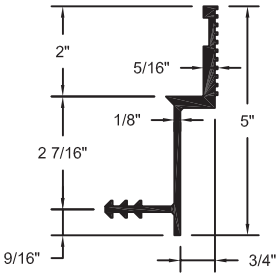

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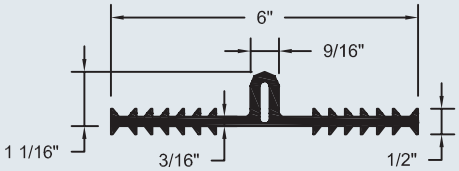

EB Cap

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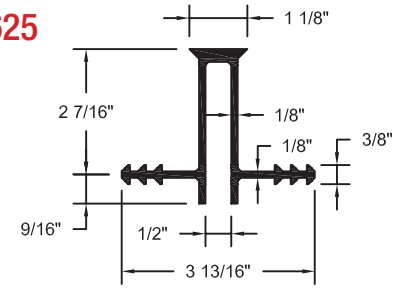

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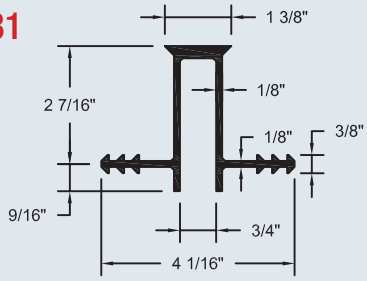

Stainless Steel Profiles: Standard and Retrofit

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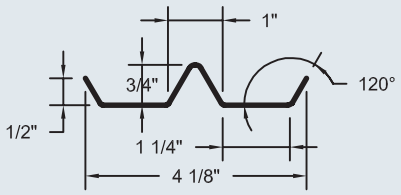

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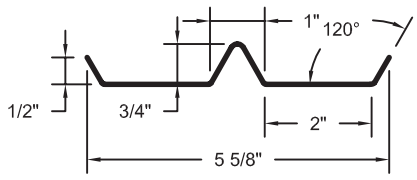

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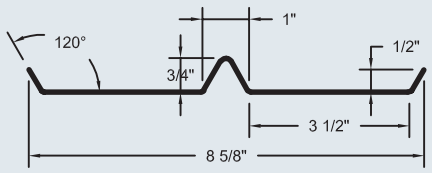

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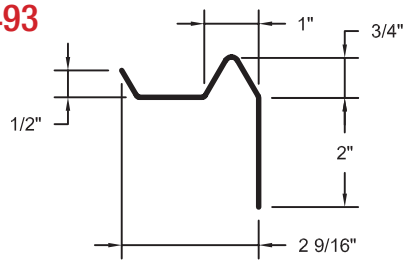

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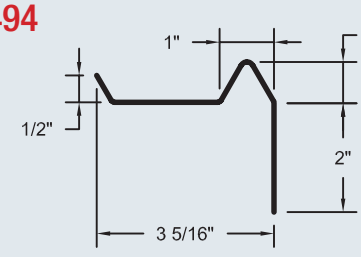

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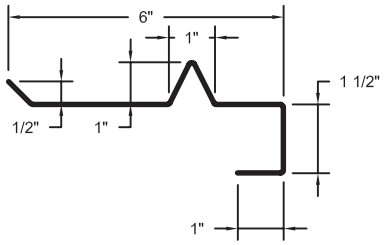


Retrofit Waterstop

Installing Retrofit

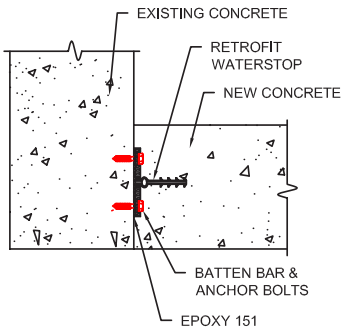
Westec has a variety of retrofit profiles for varying applications. The general principle is to secure a waterstop profile to existing concrete by mechanically fastening a profile into a bed of epoxy. This eliminates any requirement for saw cutting into the existing concrete. Stainless Steel batten bars, concrete fasteners and Novolac Gel Epoxy are supplied with each profile.

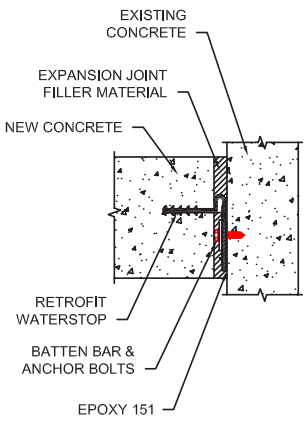
This 4-part system eliminates the saw cut requirement and creates a fluid-tight joint at the new to existing concrete junction.

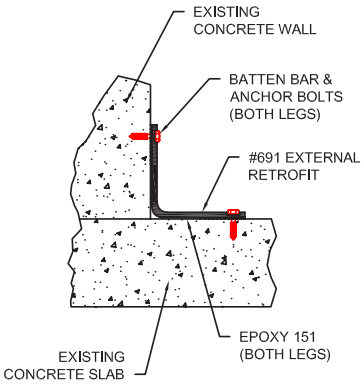
Novolac Gel Epoxy

1. **Epoxy Bed:** A bed of epoxy (about 1/8”) is applied to the existing concrete. The gel epoxy serves as a gasket, ensuring a liquid tight seal between the profile and existing concrete. Concrete should be clean, dry and free of loose material.
2. **Waterstop Profile:** Next the waterstop profile is pressed into the uncured bed of epoxy. Westec has numerous configurations of waterstop for a variety of applications (large movements, expansion joints, external joints, etc.) but all have the same basic components; waterstop profile, batten bars, anchor bolts and epoxy. TPER and PE profiles feature a series of small ridges for the epoxy bed and a larger web for embedment into the new concrete, similar to a standard ribbed waterstop.
3. **Batten Bar:** A stainless steel batten bar (sometimes two) runs the length of the waterstop to maintain even pressure on the waterstop and distribute shear forces due to differential slab settlements. Batten Bars come in multiple sizes, depending on the profile, but all are predrilled for concrete fasteners every 6”.
4. **Concrete Fasteners:** Retrofit systems are supplied with stainless steel concrete anchors/screws. These bolt through the batten bar, profile and epoxy and secure everything to the existing concrete. While the epoxy does have some adhesive properties, batten bars and fasteners are required to maintain a fluid tight seal and support any concrete movement. Using the batten bar as a guide, drill anchor bolt holes through the concrete and waterstop in one pass before the epoxy cures.

Construction Details for Special Retrofit Designs







WESTEC®
Barrier Technologies

Patented Expansion Board Cap Seal System

The Patented Expansion Board Cap Seal System, designed by Westec is a complete concrete joint system with a simple installation. The EB Cap integrates the waterstop, forming system, expansion board, joint seal and load transfer units into a single structure. Just stake down the board, set your screed elevation and that's it. No stripping forms, no messy sealants, no problems.

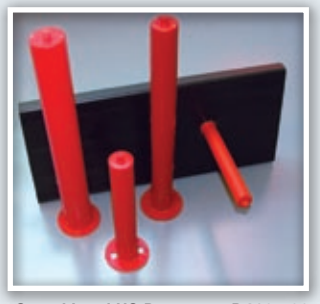
EB Cap US Patent no. 5,375,386

Installation Benefits:

- No split formwork
- No poured-in-place sealant required
- No remobilization for saw cutting or sealant
- "Checkerboard" concrete placement potentially avoided
- Convenient strip pouring possible with Speed Loads
- Lower labor and installation costs
- No joint finishing required

Polyboard

Westec HDPE Polyboard is designed to work with the EB Cap Seal and EB Cap Retrofit profiles and serves as both expansion material and a stay-in-place forming system. Polyboard is available in 3/4" widths for 6" and 8" paving applications or 4' x 8' sheets for thicker slabs. A 1/2" width Polyboard is available in 4' x 8' sheets.

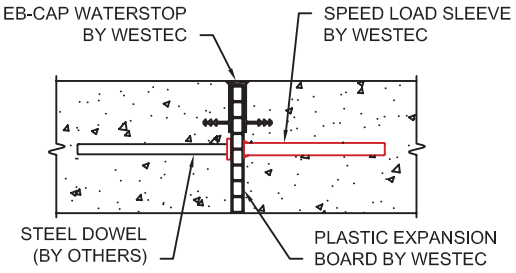


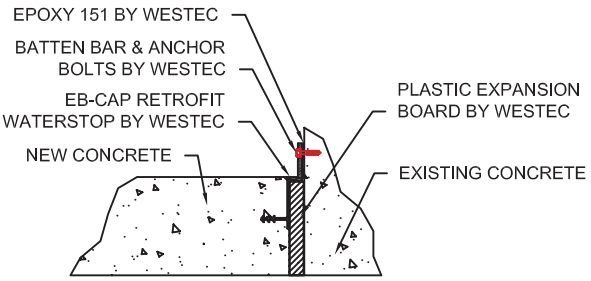
Speed Load US Patent no. D419,700

Speed Load

Speed Loads are an excellent addition to the EB Cap Seal and Polyboard. The Speed Loads align the steel load transfer dowels and are designed specifically for stay-in-place forming systems like the EB Cap System.

Construction Details for Special EB Cap Designs





Call a Greenstreak Group Engineering representative today to discuss your application.

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