

# **VOLTEx<sup>®</sup>**

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**VOLCLAY BENTONITE GEOTEXTILE  
WATERPROOFING**

## **PRODUCT MANUAL FOR CAST-IN-PLACE CONCRETE APPLICATIONS**



**Certified to  
ANSI/NSF 61**



**VOLCLAY WATERPROOFING**

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THIS MANUAL CONTAINS THE INSTALLATION GUIDELINES FOR THE VOLTEX AND VOLTEX DS WATERPROOFING SYSTEM FOR CAST-IN-PLACE CONCRETE APPLICATIONS, INCLUDING UNDERSLAB, PROPERTY LINE WALLS, AND BACKFILLED WALLS. THIS MANUAL DOES NOT COVER SHOTCRETE, MASONRY BLOCK, OR PRECAST CONCRETE APPLICATIONS. FOR APPLICATIONS NOT COVERED IN THIS MANUAL, CONTACT CETCO FOR SPECIFIC INSTALLATION GUIDELINES. BEFORE INSTALLATION, READ THIS MANUAL TO GAIN FAMILIARITY WITH SPECIFIC PROCEDURES AND APPLICATIONS. IN THIS MANUAL THE PRODUCT NAME "VOLTEX" IS USED GENERICALLY FOR ALL VOLTEX PRODUCT TYPES.

## WHAT IS VOLCLAY<sup>®</sup> ?

Volclay sodium bentonite is a non-toxic mineral of volcanic origin found exclusively in the Black Hills region of the United States. Volclay is specially processed by CETCO to achieve the highest possible performance for all of our waterproofing products. CETCO also manufactures Volclay CR, a contaminant resistant bentonite to assure optimum performance in saline or contaminated water.

Volclay prevents water intrusion by forming a dense monolithic membrane upon contact with water. The specially processed Volclay expands under confinement, forming an impervious membrane that will be maintained for the life of the structure.

## PRODUCT DESCRIPTION

Voltex<sup>®</sup> is a highly effective waterproofing composite comprised of two polypropylene geotextiles and a minimum 1.10 pound of Volclay sodium bentonite per square foot. The two geotextiles are interlocked by a patented needlepunching process which encapsulates and confines the bentonite. Voltex DS<sup>®</sup> integrates a polyethylene (PE) liner bonded to the outside surface of the non-woven geotextile. The PE liner provides extremely low permeabilities for water vapor and gas transmission.

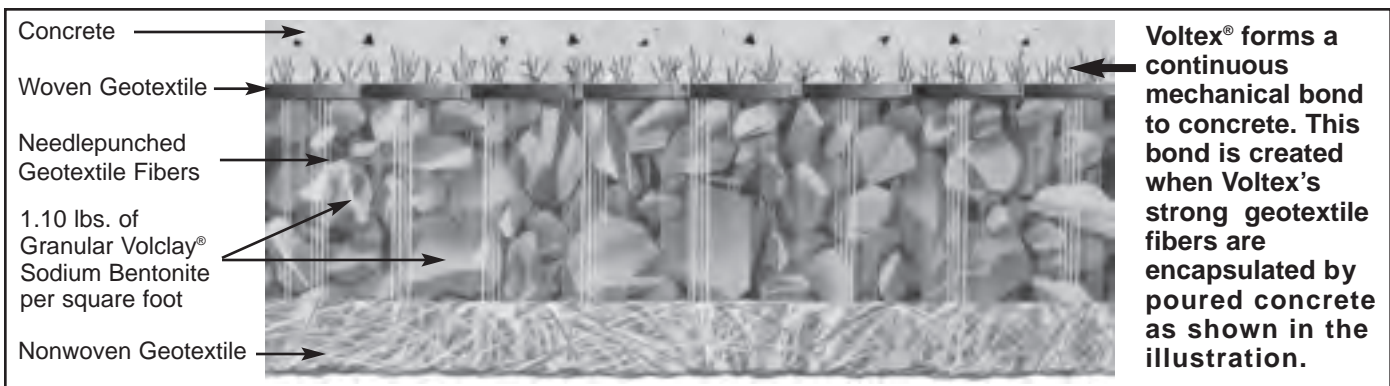


Figure 1 - Cross Section illustration of Voltex waterproofing membrane mechanically bonded to concrete.

# VOLCLAY VOLTEX/VOLTEX DS®

## BENTONITE GEOTEXTILE WATERPROOFING



Installation of Voltex is fast and easy. Simply position the product into place and fasten. Voltex can be installed on green concrete, in virtually any weather, without the need for primers or adhesives. Voltex can be easily cut on site to form around corners and penetrations. The result is always a consistent self-healing membrane.

### DURABILITY

The Volclay® sodium bentonite in Voltex is uniformly encapsulated between two high-strength woven and non-woven geotextiles. CETCO's state-of-the-art needlepunching process interlocks the geotextiles, preventing the displacement of bentonite prior to, during, and after installation. The geotextiles provide superior protection from inclement weather and construction-related damage, without requiring to use a protection course.

### SUPERIOR ADHESION

When concrete is poured against Voltex, a tenacious mechanical bond is created with Voltex's high strength geotextile. Independent laboratory testing conducted in accordance with ASTM D-903 (Peel Adhesion to Concrete), yields an average adhesion value of 15 pounds per linear inch. The mechanical bond will hold Voltex in intimate contact with the concrete should any ground settlement occur, thereby preventing water migration between the waterproofing and the concrete.

### COST EFFECTIVE AND TIME EFFICIENT

Voltex is designed to be installed on a properly prepared subgrade, without the need to pour a working slab. The product's inherent flexibility allows for easy installation on irregular surfaces and rough property line forming. Voltex seams are easily overlapped without the need to roll out every small wrinkle or air pocket. Voltex can be installed as soon as the forms are stripped; there is no waiting for the concrete to cure.

### NSF STANDARD 61 CERTIFIED

Voltex and Voltex DS are certified by NSF International to conform with the requirements of NSF Standard 61 - Drinking Water System Components - Health Effects. Both Voltex and Voltex DS are certified as an external protective barrier material for potable water concrete tanks with a 1,000 gallon (3,785 l) capacity or larger (Voltex CR and DSCR are not part of this certification).

### ASSOCIATED SYSTEM PRODUCTS

**WATERSTOP-RX®** - bentonite-based concrete joint waterstop used around penetrations and applicable concrete joints. Swells upon hydration.

**AQUADRAIN®** - foundation drainage composite consisting of a molded profile core and a filter fabric. Includes sheet drainage and base drain collection.

### ACCESSORIES

**BENTOSEAL®:** trowel grade sodium bentonite compound used to detail around penetrations, corner transitions and terminations.

**HYDROBAR TUBES®:** water soluble film tubing filled with bentonite, used at the footing/wall intersection.

**TB-BOOT®:** - flexible, premolded EPDM boot for detailing small tie-back head rods and plates.

**WATERSTOPPAGE®:** granular Volclay bentonite used at detail areas that require additional Volclay protection.

**AKWASWELL®:** caulk grade hydrophilic waterstop.

**TERMINATION BAR:** Min. 1" (25 mm) wide aluminum or stainless steel bar with pre-punched holes on 12" (300 mm) centering for fastening.

**CEMENTITIOUS BOARD:** ½" (12 mm) thick cementitious wall board for protection of waterproofing during the removal of steel soldier pile cap and top lagging boards.

**SHEET METAL TIE-BACK COVERS:** field fabricated galvanized sheet metal boxes (minimum 26 gauge (ga.).

## LIMITATIONS

Voltex should only be installed after proper substrate preparation has been properly completed and is suitable to receive the waterproofing system. Backfilled wall concrete work should use conventional cast-in-place forms that produce a smooth surface.

Voltex is designed for below-grade waterproofing applications where the product is properly confined. Volclay products should not be installed in standing water or over ice. If ground water contains strong acids, alkalies, or is of a conductivity of 2,500 µmhos/cm or greater, water samples should be submitted to the manufacturer for compatibility testing. Volclay Ultraseal SP may be required if contaminated ground water or saltwater conditions exist.

Voltex is designed for use under reinforced concrete slabs 4" (100 mm) thick or greater on a compacted earth/gravel substrate. Voltex requires a minimum 6" (150 mm) thick reinforced concrete slab if installed over a mud slab. Voltex is not designed for split-slab plaza deck construction.

**Voltex is not designed to waterproof expansion joints. Expansion joints are the responsibility of others. Do not use Voltex on masonry block foundation walls. Consult CETCO for special installation guidelines that apply to shotcrete and precast concrete construction.**

In this manual the product name "Voltex" is used generically in the installation and application guidelines for the applicable products: Voltex, Voltex CR, Voltex DS, and Voltex DSCR. Refer to the table on the back page for product descriptions and roll sizes.

## INSTALLATION GUIDELINES

Before installing Voltex read this installation manual to gain familiarity with specific procedures and applications. For applications not covered in this manual, contact CETCO for specific installation guidelines.

### SECTION 1 UNDERSLAB INSTALLATION

Voltex is engineered for use under reinforced concrete slabs 4" (100 mm) thick or greater on a compacted earth/gravel substrate. Voltex requires a minimum 6" (150 mm) thick reinforced concrete slab if installed over a mud slab. Voltex CR or Voltex DSCR is used in contaminated conditions as determined by a Volclay water sample test.

For hydrostatic conditions, Voltex should be installed under footings and grade beams as shown in Figures 1.6, 1.7 and 1.8. For non-hydrostatic conditions, Voltex should be installed around footings and grade beams as shown in Figures 1.9, 1.10 and 1.11.

Prior to installing Voltex the substrate must be properly prepared. Complete all required elevator pit, sump pit, grade beam and piling work prior to installing Voltex under main slab area. These areas must be correctly tied into the underslab waterproofing to form a monolithic seal.

#### 1.1 Substrate Preparation

Substrate may be concrete, earth, sand, pea gravel or crushed stone. Earth and sand substrates should be compacted to a minimum 85% Modified Proctor density. Crushed stone should be no larger than 3/4" (18 mm) in size. Substrate should be smooth and without sharp deflections or pockets.

#### 1.2 Installation

Install Voltex or Voltex DS over the properly prepared substrate with the **dark gray (woven) geotextile side up**. Overlap all adjoining edges a minimum of 4" (100 mm) and stagger sheet ends a minimum of 12" (300 mm) (Figure 1.1). Nail or staple edges together as required to prevent any displacement before and during concrete placement (Figure 1.2).

When the slab is poured in sections, Voltex should extend a minimum 12" (300 mm) beyond the slab edge (Figure 1.3). This enables Voltex to be properly overlapped for subsequent slab section pours. Volclay Waterstop-RX should be installed in all applicable slab construction joints (Figure 1.3).

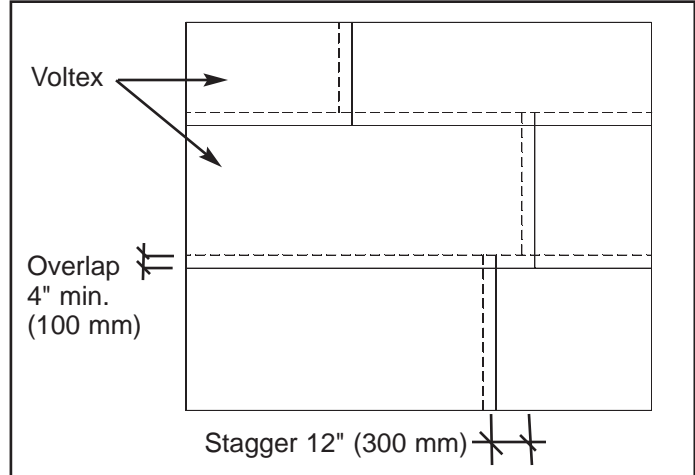


Figure 1.1 - Overlap Voltex 4" with seams staggered 12".

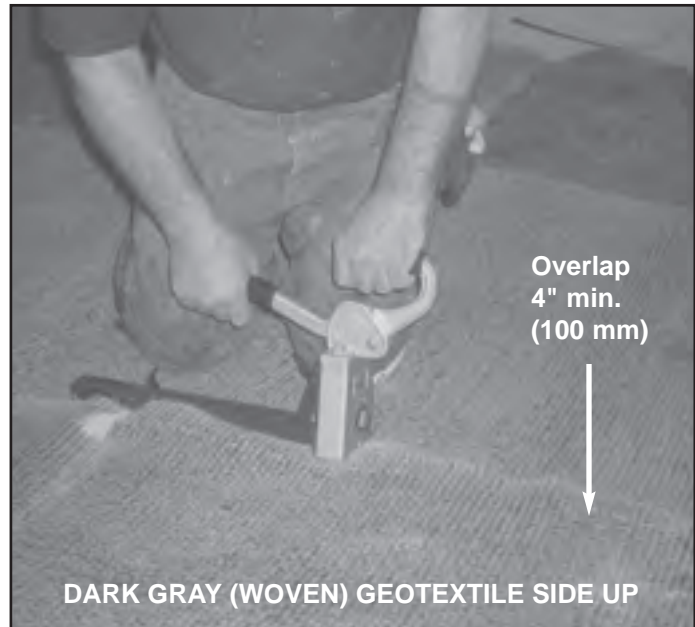


Figure 1.2 - Secure overlaps together with fasteners.

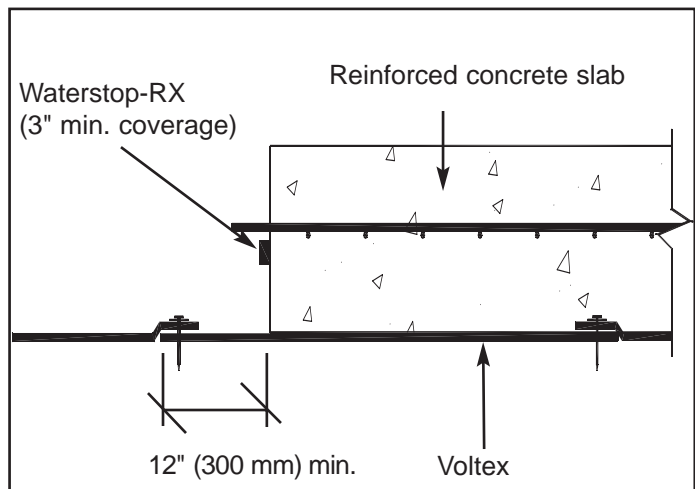


Figure 1.3 - Extend Voltex a minimum 12" beyond slab edge. Install Waterstop-RX in joint.



# VOLCLAY VOLTEX/VOLTEX DS<sup>®</sup> BENTONITE GEOTEXTILE WATERPROOFING

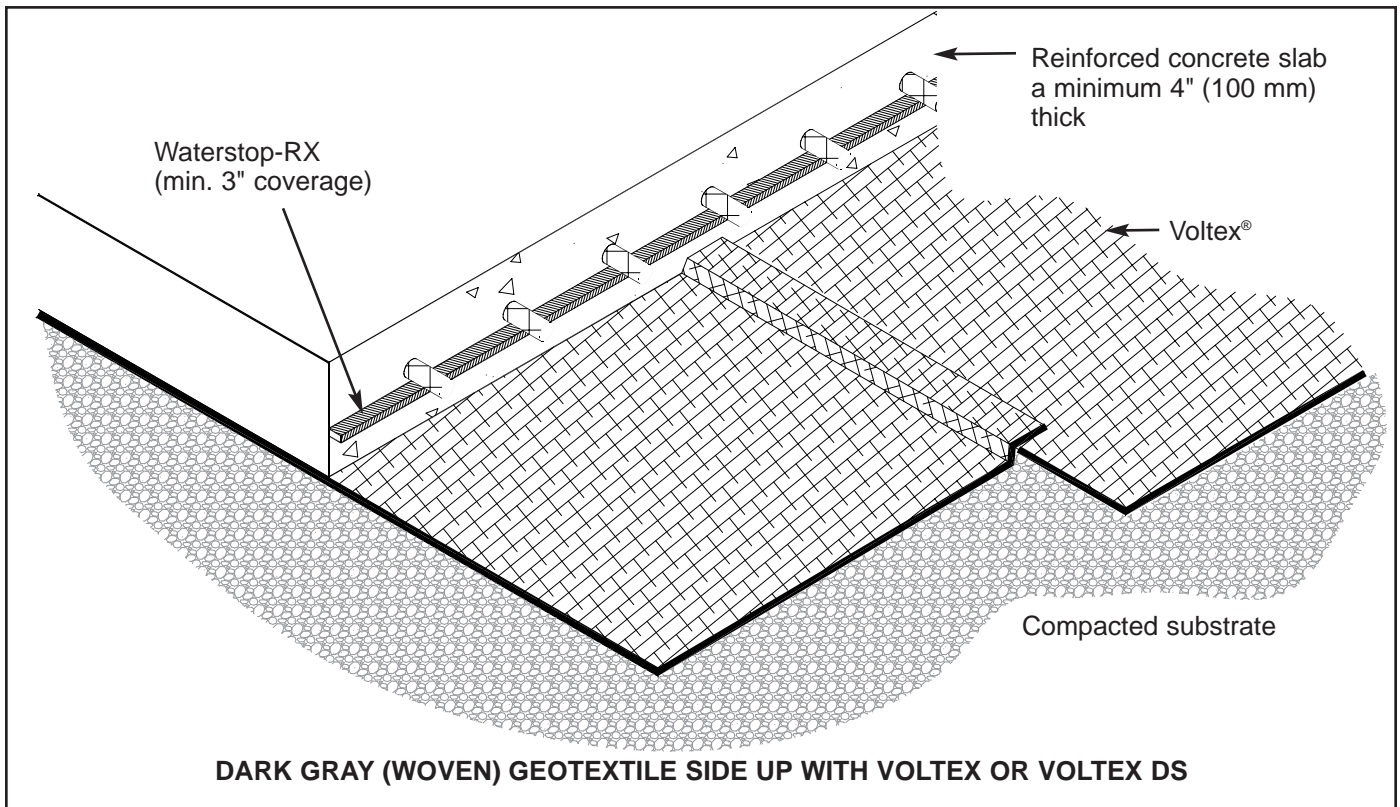


Figure 1.4 - Voltex installed directly over compacted earth/gravel substrate requires a minimum 4" (100 mm) slab.

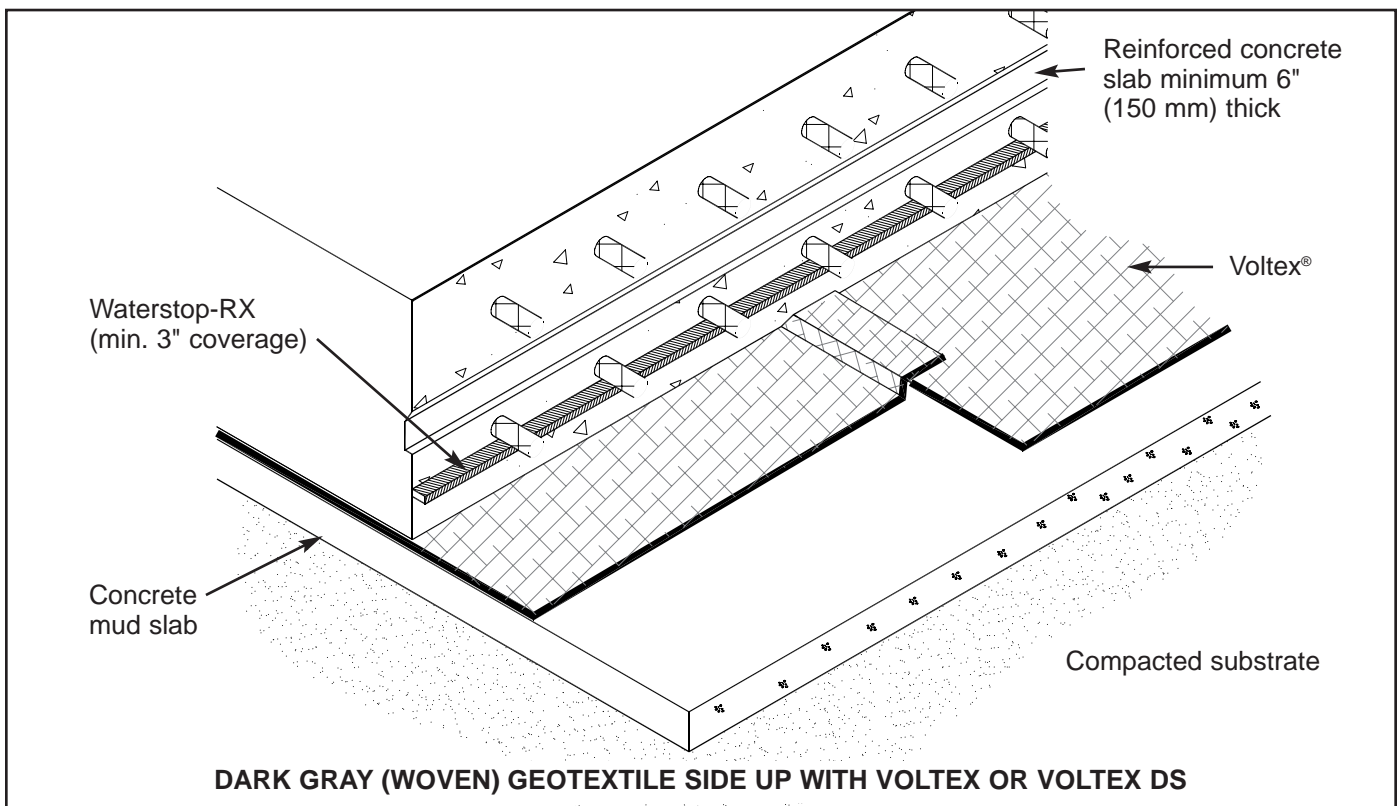


Figure 1.5 - Voltex installed over a mud slab requires a minimum 6" (150 mm) thick reinforced slab.

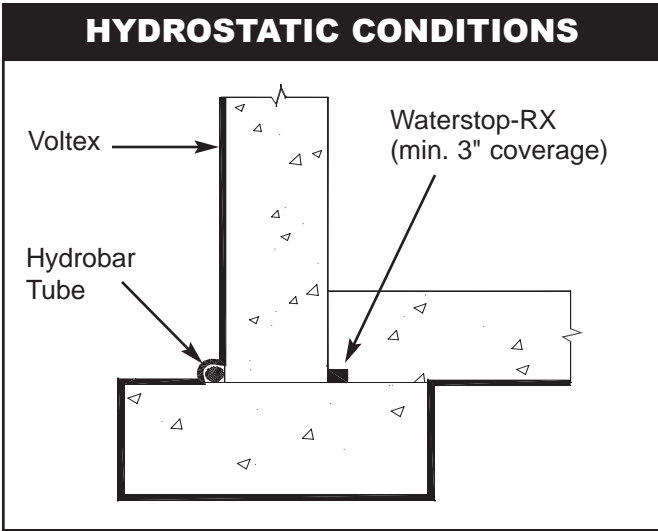


Figure 1.6 - Slab on Footing Detail (Hydrostatic).

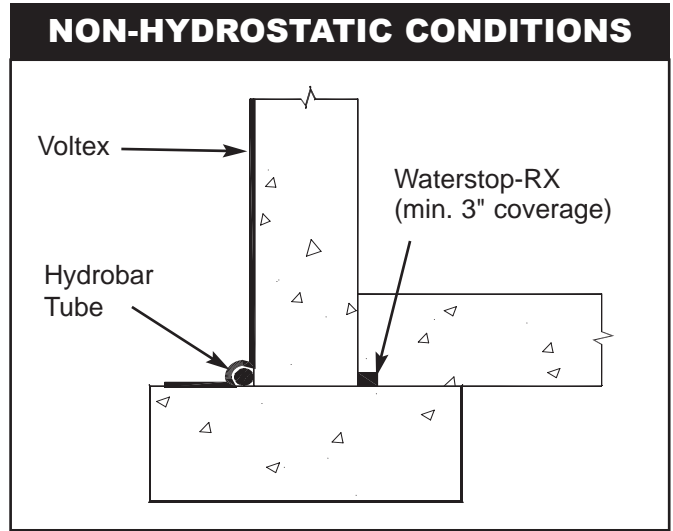


Figure 1.9 - Slab on Footing Detail (Non-hydrostatic).

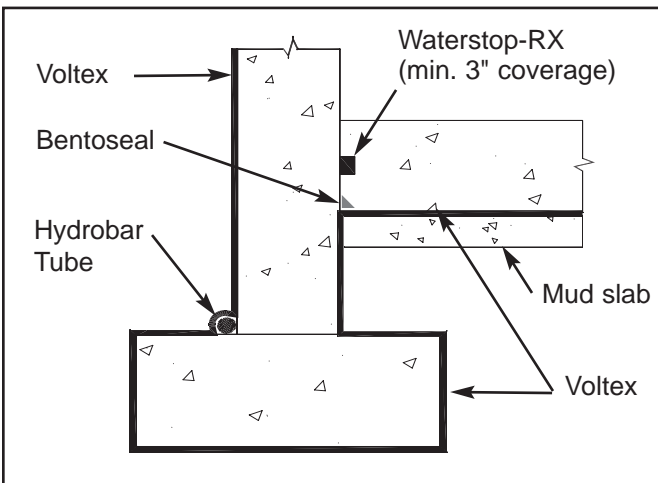


Figure 1.7 - Raised Slab Detail with mud slab (Hydrostatic).

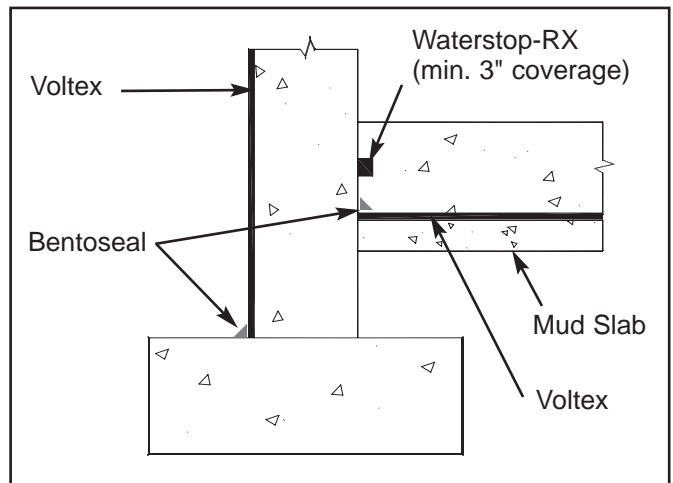


Figure 1.10 - Raised Slab Detail with mud slab (Non-hydrostatic).

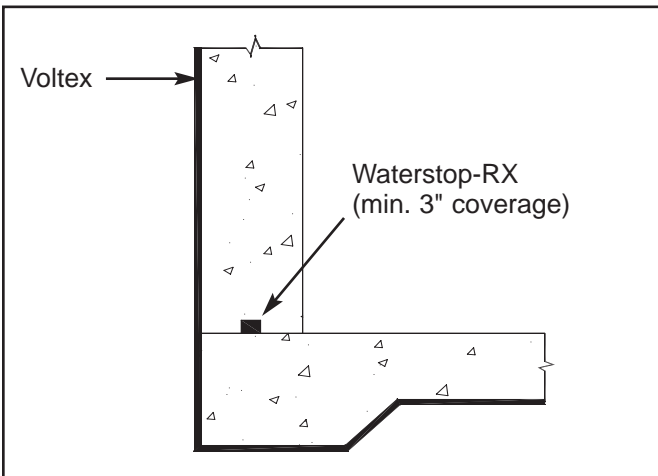


Figure 1.8 - Flush Slab Detail (Hydrostatic).

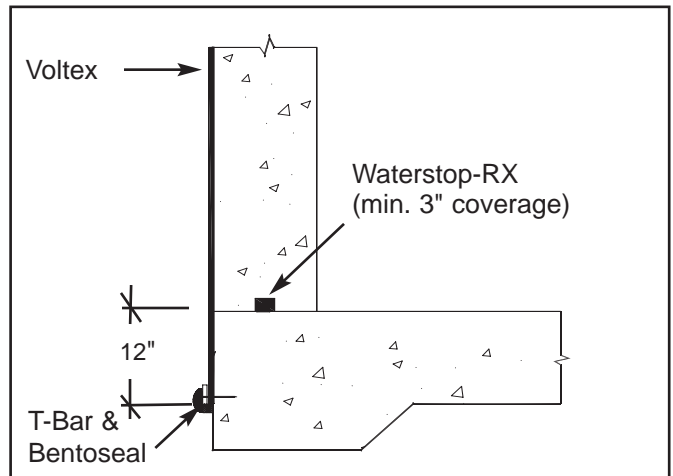


Figure 1.11 - Flush Slab Detail (Non-hydrostatic).

**1.3 Pile Caps and Grade Beams**

Voltex is typically not installed over pile caps but cut to fit tightly around pile caps. Then apply a minimum 3/4" (18 mm) thick fillet of Bentoseal at intersection of Voltex and the piling (Figure 1.12) with Waterstoppage under Voltex at the piling edge. Bentoseal should extend onto Voltex and piling a minimum of 2" (50 mm) at 3/4" (18 mm) thickness. Waterstop-RX should be installed on top surface of pile cap around reinforcing steel (Figure 1.12).

Detail grade beams the same as pile caps (Figure 1.14) with a non-hydrostatic condition. For hydrostatic conditions, Voltex should be installed under the entire grade beam (Figure 1.15). Line the grade beam formwork with Voltex prior to placement of reinforcing steel. Leave a minimum 12" (300 mm) of Voltex at the top of the form to tie into below slab waterproofing.

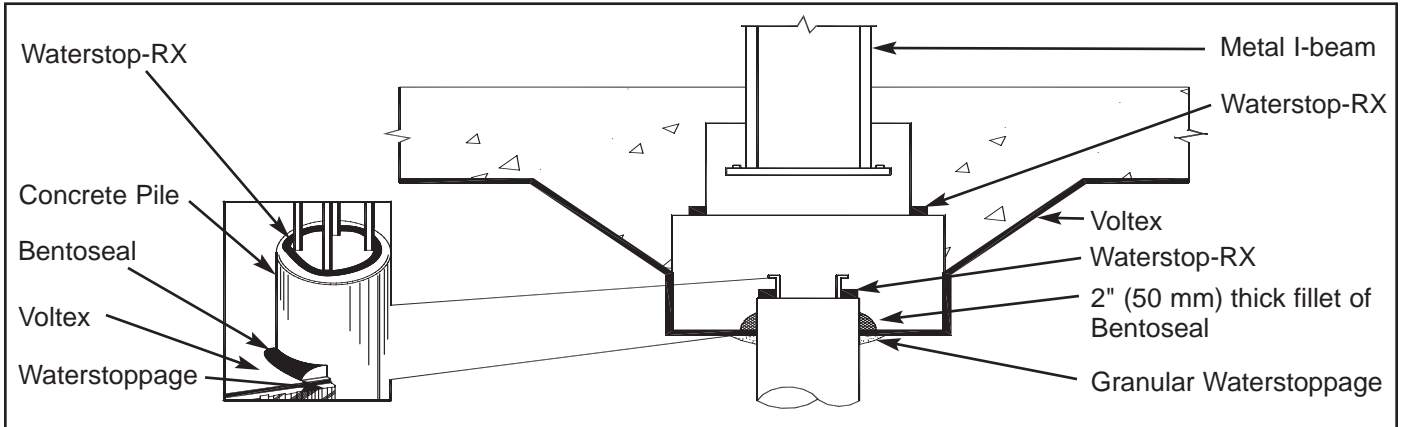


Figure 1.12 - Pile Cap Detail (Hydrostatic condition).

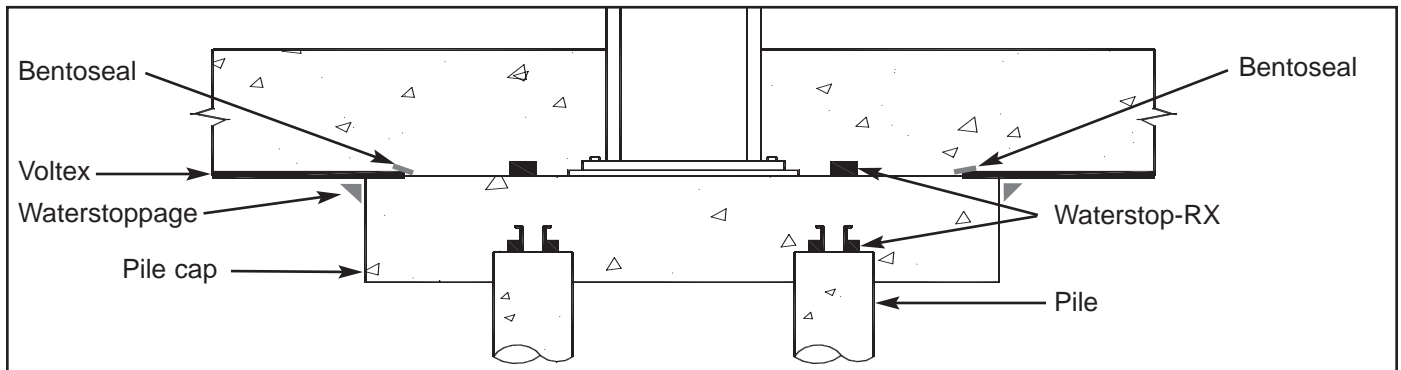


Figure 1.13 - Pile Cap Detail (Non-hydrostatic condition).

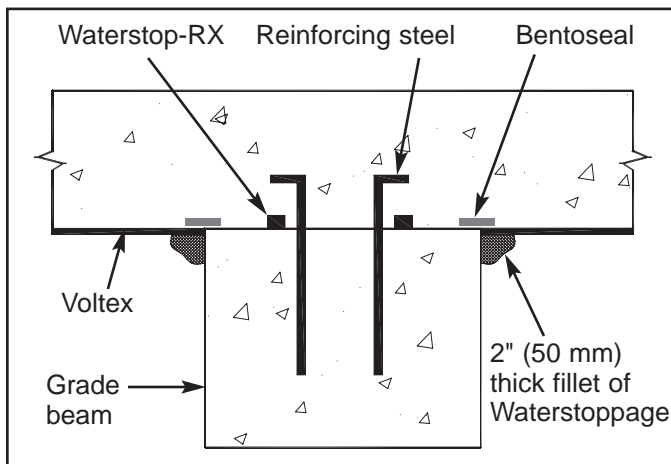


Figure 1.14 - Grade Beam (Non-hydrostatic condition).

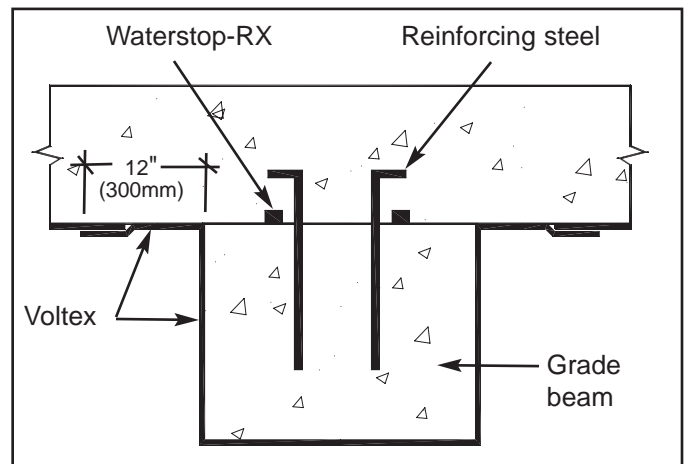


Figure 1.15 - Grade Beam (Hydrostatic condition).

### 1.4 Slab Penetrations

Cut Voltex to closely fit around penetrations (Figure 1.16). Trowel a minimum 3/4" (18 mm) thick fillet of Bentoseal around the penetration to completely fill any void area between Voltex and the penetration (Figure 1.17). The Bentoseal should extend up the penetration about 1-1/2" (38 mm) and extend onto Voltex. In areas where multiple penetrations are close together, it may be impractical to cut Voltex to fit around each penetration. Pour Volclay Waterstoppage, granular bentonite, a minimum 1/4" (6 mm) thick around the penetrations covering the entire substrate area. Then apply a thick layer of Bentoseal around each penetration as detailed (Figure 1.19).



Figure 1.16 - Cut Voltex to closely contour penetrations.

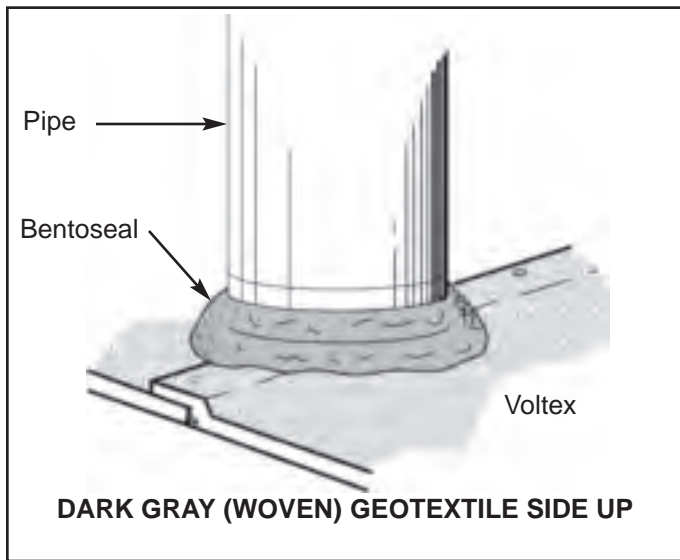


Figure 1.17 - Bentoseal troweled around penetrations.

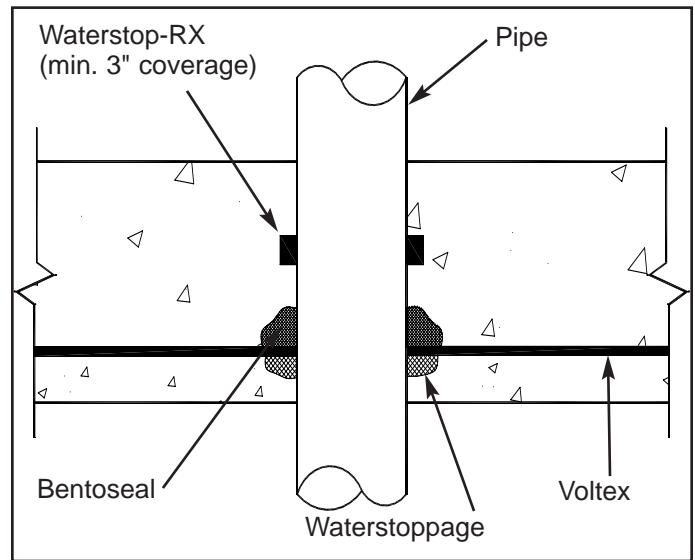


Figure 1.18 - Slab penetration cross section detail.

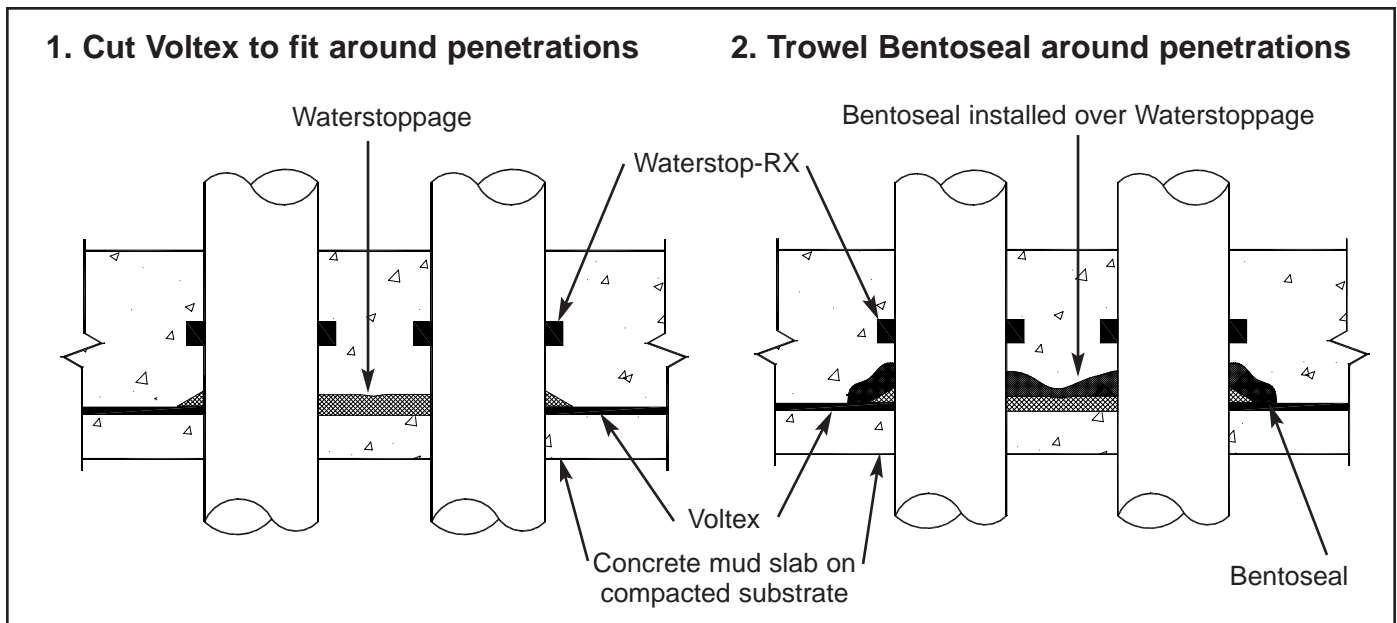


Figure 1.19 - Multiple pipe penetrations. Trowel Bentoseal around pipes and covering area between the pipes.



### 1.5 Elevator Pits

Voltex should be placed on vertical surfaces and on the substrate below the slab to form a continuous envelope around the elevator pit (Figure 1.20). If the vertical soil cut is smooth and stable, Voltex may be installed directly against the soil. Contain unstable soils with a retaining wall. Install Voltex directly against the retaining wall.

Due to various elevator piston plunger designs, consult CETCO for specific installation and detailing recommendations for piston plungers that penetrate the pit slab.

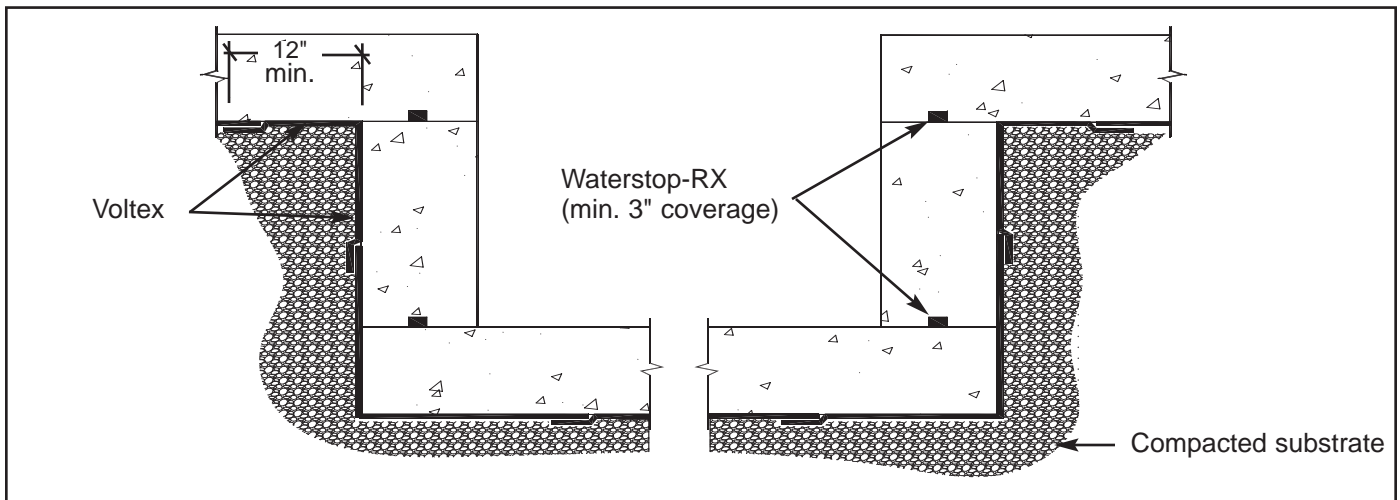


Figure 1.20 - Voltex under elevator pit slab and on vertical surfaces.

### 1.6 Edge of Slab, Backfilled Walls

When the installation reaches the outer edge of the slab, continue Voltex up to the top edge of the forms inside surface (Figure 1.21) or extend the Voltex sheet out the top of the form a minimum of 12" (300 mm) (Figure 1.22). At the slab corner, Voltex should remain in contact with the substrate and the inside surface of the concrete form.

Damaged material outside the form should be cut off and disposed of. Overlap the secured Voltex edge on top of the footing a minimum 6" (150 mm) with the succeeding wall waterproofing. Install Volclay Hydrobar Tubes at wall-to-footing corner prior to installing overlapping wall waterproofing.

When the slab edge form is removed, any undamaged portion of Voltex extended outside the form should be positioned and secured to the top of the concrete footing.

Volclay Waterstop-RX should be installed in the perimeter wall/slab intersection joint as illustrated in Figure 1.23.

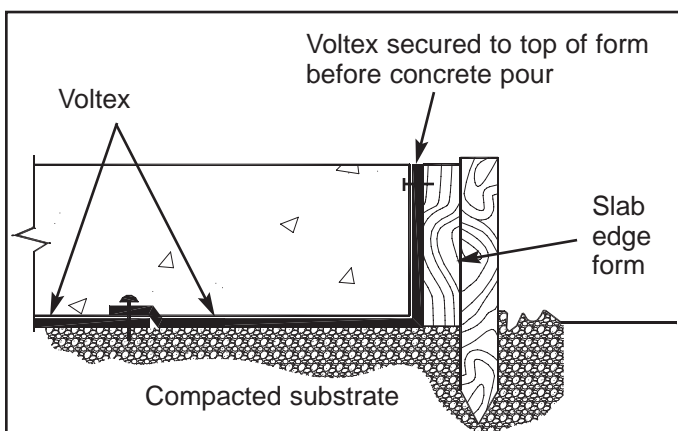


Figure 1.21 - Voltex turned up and secured at top of concrete form.

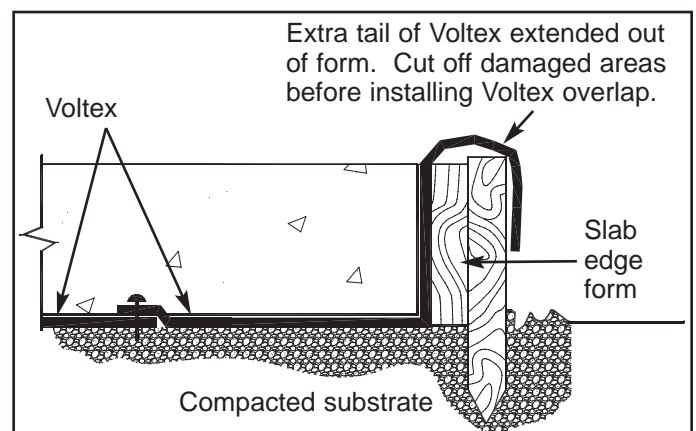


Figure 1.22 - Extra tail of Voltex extended out of form and later cut off after concrete pour.

### 1.7 Edge of Slab, Property Line Construction

Where property line retaining walls, such as soldier pile and lagging, are used as the outside form, continue the underslab Voltex installation up the retaining wall a minimum 12" (300 mm) above the top edge of the slab or footing (Figure 1.23). The extra 12" (300 mm) sheet extension is very important since there is no access to the outer edge of the footing after it is poured.

**Slab to Wall Corner Transition:** Install Voltex or Voltex DS sheet horizontally oriented (dark gray woven geotextile facing installer) with a minimum 12" (300 mm) of the sheet extending out onto the horizontal substrate. The top edge of the sheet must extend a minimum 12" (300 mm) above the finished slab surface. Secure Voltex sheet to lagging wall with washer-head fastener maximum 24" (600 mm) on center. Overlap edges of adjacent Voltex sheets a minimum 4" (100 mm).

If the slab thickness is greater than 24" (600 mm), install a second full sheet or cut strip of Voltex, horizontally oriented, to meet the 12" (300 mm) requirement above the slab. Overlap top edge of previous sheet and edges of adjacent sheets a minimum 4" (100 mm).

**Base Wall Course:** Install first Voltex sheet course on the shoring wall horizontally oriented (dark grey woven geotextile facing installer) over the corner transition sheet, with the bottom edge extending down to the wall/slab transition corner as shown in Figure 1.23. Secure Voltex sheet to lagging wall with washer-head fasteners maximum 24" (600 mm) on center. Overlap edges of adjacent Voltex sheets a minimum 4" (100 mm).

Install underslab Voltex membrane extending to corner transition, overlapping the 12" (300 mm) sheet tail of the corner transition sheet installed at the wall base. Secure corner edge with fasteners 12" (300 mm) on center.

For metal sheet piling shoring walls, cut the underslab Voltex to contour with the property line shoring wall. Then pour a 1-1/2" (38 mm) cant of Waterstoppage on top of the Voltex along the property line wall. Finally install the shoring wall Voltex sheet overlapping the underslab Voltex sheet a minimum of 12" (300 mm) (Figure 1.26). Cut the bottom edge of the shoring wall sheet at piling transition angles to allow the bottom edge strips to lay flat onto the underslab Voltex. Then apply Bentoseal at the cut Voltex edges extending outward from the shoring wall for a minimum of 6" (150 mm).

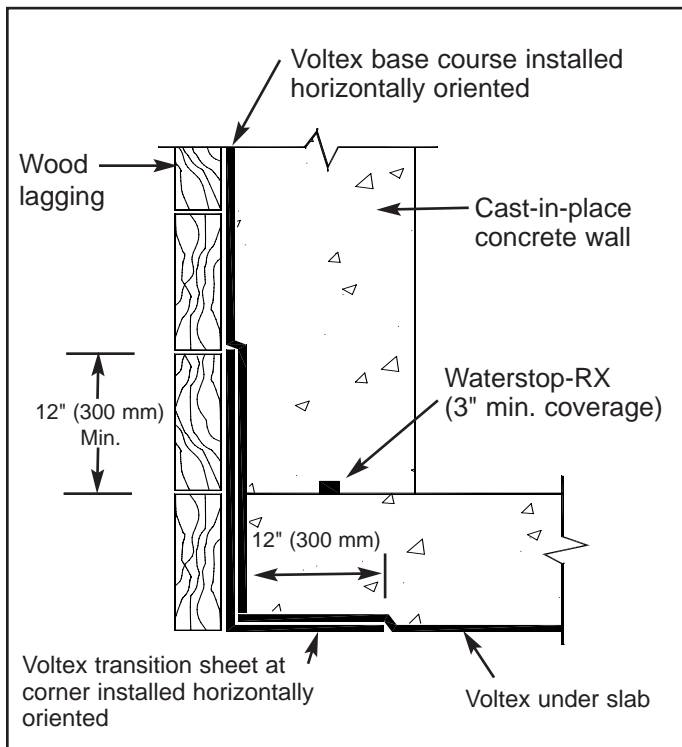


Figure 1.23 - SLAB-TO-WALL TRANSITION  
Voltex corner transition sheet should extend past the height of the top of the finished slab level a minimum 12" (300 mm) and extend under the slab 12" (300 mm).

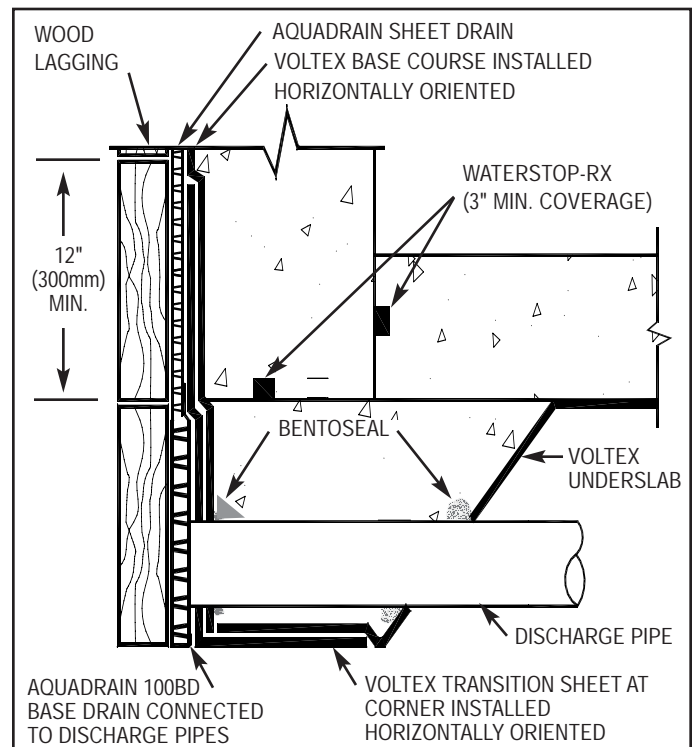


Figure 1.24 - AQUADRAIN 100BD DISCHARGE PIPE  
Connect Aquadrain 100BD to water discharge pipes using 100BD accessory connectors.

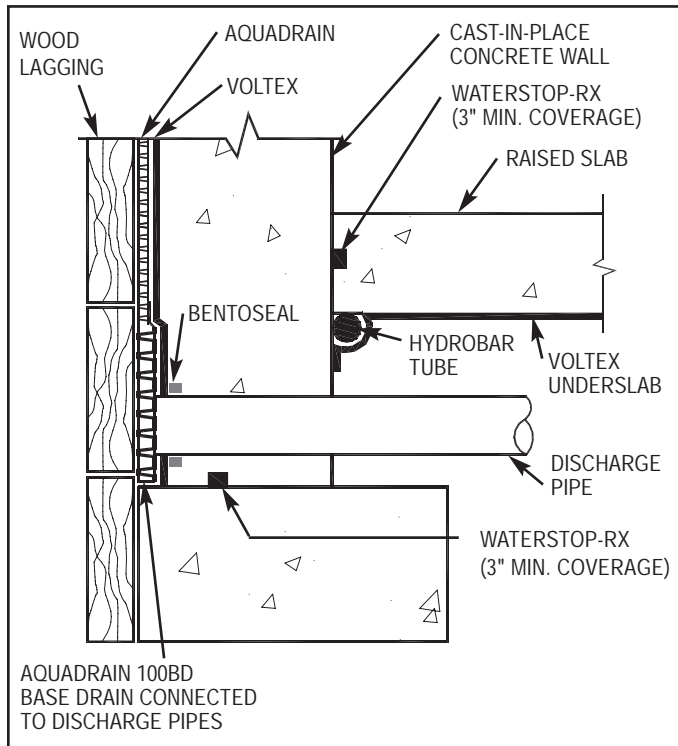


Figure 1.25 - RAISED SLAB CONDITION  
Connect Aquadrain 100BD to water discharge pipes using 100BD accessory connectors.

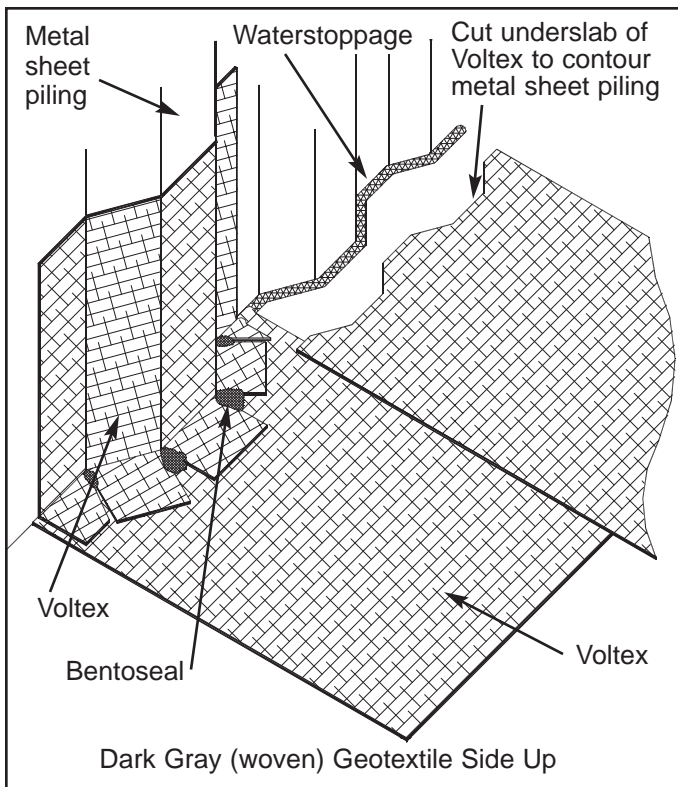


Figure 1.26 - Metal sheet piling to slab transition detail.

## SECTION 2 PROPERTY LINE CONSTRUCTION

The use of construction techniques described in this section allow the exterior building dimensions to coincide with the property line, thereby maximizing use of available land for building. Voltex/Voltex DS has been proven to be one of the most effective and widely used means for waterproofing property line construction. Cast-in-place property line construction methods include soldier pile & lagging, metal sheet piling, earth formed shotcrete retention walls, and auger cast caisson walls.

**For all property line construction methods, Voltex is installed to the shoring wall prior to concrete placement. Install Voltex or Voltex DS with the dark grey (woven) geotextile inward, facing the installer, away from the shoring wall. Refer to each applicable construction method in Section 2 for specific substrate preparation and detailing installation guidelines.**

Aquadrain sheet and 100BD base drain composite system should be connected to an operative water discharge system (sump pump or gravity to daylight discharge).

Protect bentonite waterproofing products from hydrating before material is contained with concrete or backfill. After any precipitation, standing water should be pumped off waterproofing as soon as possible.

**Shoring Wall:** Excavation work should provide shoring wall in good condition to receive waterproofing system. Wood lagging shoring should extend to the lowest level of the waterproofing installation with any voids or cavities exterior of the lagging filled with compacted soil or cementitious grout. Voids or cavities at tie-backs should be filled with grout or compacted soil prior to Voltex installation. Interior surface of lagging timbers should be monolithic and tight together with gaps less than 1" (25 mm). Gaps in excess of 1" (25 mm) should be completely filled with cementitious grout or other solid material.

Cut rock excavations and concrete auger cast caisson retaining walls must be sufficiently planar. Typically a shotcrete or grout layer is required to provide acceptable surface to install Voltex.

Employ construction methods to stop water flowing through shoring wall prior to waterproofing installation. If only water seepage, install 6-mil polyethylene sheeting over the seepage area prior to installing Voltex. Polyethylene sheeting should extend from seepage elevation to base of wall to protect entire waterproofing installation at that area.

### 2.1 Property Line Wall Installation Guidelines

After the slab-to-wall corner transition sheet and bottom wall sheet course have been installed per Section 1.7 Page 10, Voltex sheets can be installed either vertically or horizontally oriented. Fasten the Voltex into position with washer-head fasteners 24" (600 mm) on center around the sheet edge. Install succeeding Voltex sheet overlapping the previous sheet edge 4" (100 mm). (Note: Shingle lap seams so that the bottom edge of the upper sheet is over the lower sheets top edge).

Continue installation up wall until finished grade elevation, or as specified, staggering all sheet ends of adjacent rolls a minimum 12" (300 mm). Do not allow sheet overlap joints to occur at same elevation as concrete cold joints. Plan by chalk lining the location of construction joints.

**Penetrations:** Cut and secure Voltex sheet tightly around pipe penetrations (Figure 2.1). Then cut and secure an extra sheet section around the penetration; extending outward from the penetration a minimum 12" (300 mm) radius. Detail around penetration with  $\frac{3}{4}$ " (18 mm) thick cant of Bentoseal mastic. Extend Bentoseal outward over membrane a minimum 3" (75 mm) radius at minimum  $\frac{1}{4}$ " (6 mm) thickness. For sleeved penetrations, fill the gap between pipe and sleeve with non-shrink cementitious grout and install Waterstop-RX to both sides of sleeve.

**Tie-Back Covers:** Cut and secure Voltex to fit tightly around all tie-back heads. Then install a Volclay TB-Boot preformed EPDM cover over tie-back heads and other applicable retaining wall anchorage (Figure 2.3). TB-Boot will cover tie-back heads up to approximately 6" (150mm) diameter. Prior to installing TB-Boot cover, fill cavity of boot with a 50/50 mix of Bentoseal mastic and Waterstoppage (granular bentonite). Install TB-Boot over tie-back head and secure perimeter flange of TB-Boot with fastener to shoring wall. Cut and secure an extra section of Voltex around the TB-Boot cover; installing the Voltex section over the boot perimeter flange and extending outward from the boot a minimum 12" (300 mm) radius. Finally, install  $\frac{3}{4}$ " (18 mm) cant of Bentoseal around the base of the TB-Boot cover, extending onto surface of Voltex cut section (Figure 2.3).

**Field Fabricated Tie-Back Covers:** Depending on the shoring wall construction and size of tie-back heads, site specific field fabricated sheet metal covers (minimum 26 gauge) (Figure 2.6) may be required in lieu of Volclay TB-Boots for tie-back head covers. Field fabricated covers will need to be used over large tie-back heads and where irregular (non-planer) shoring wall conditions exist. Figure 2.6 illustrates typical sheet metal cover construction. Follow TB-Boot installation instructions above using 50/50 mix in cavity of the metal sheet cover and 12" (300 mm) Voltex section around the radius of the tie-back head cover.

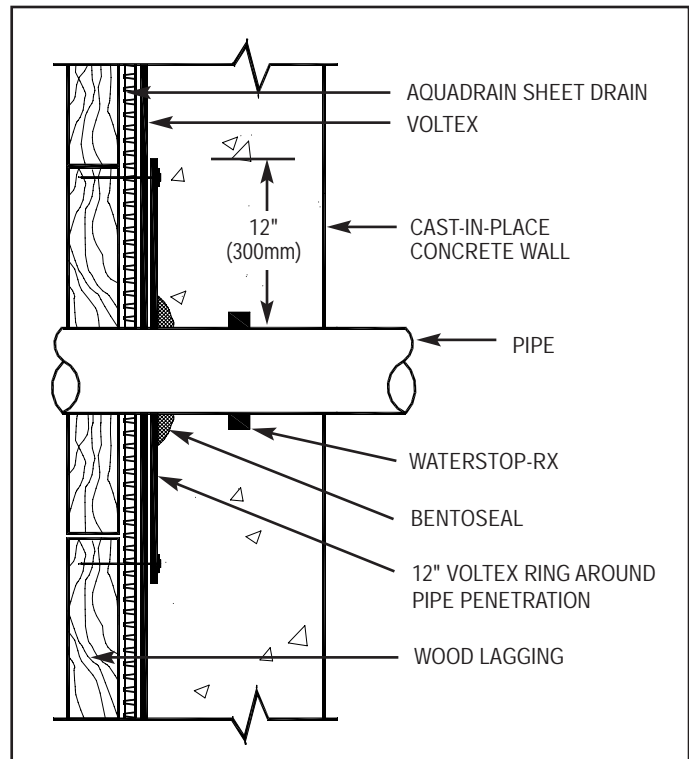


Figure 2.1 - WALL PENETRATION

Cut and secure Voltex tightly around penetrations and then apply Bentoseal  $\frac{3}{4}$ " (18 mm) ring around penetration and extend over membrane a minimum 3" (75 mm) radius at minimum  $\frac{1}{4}$ " (6 mm) thickness.

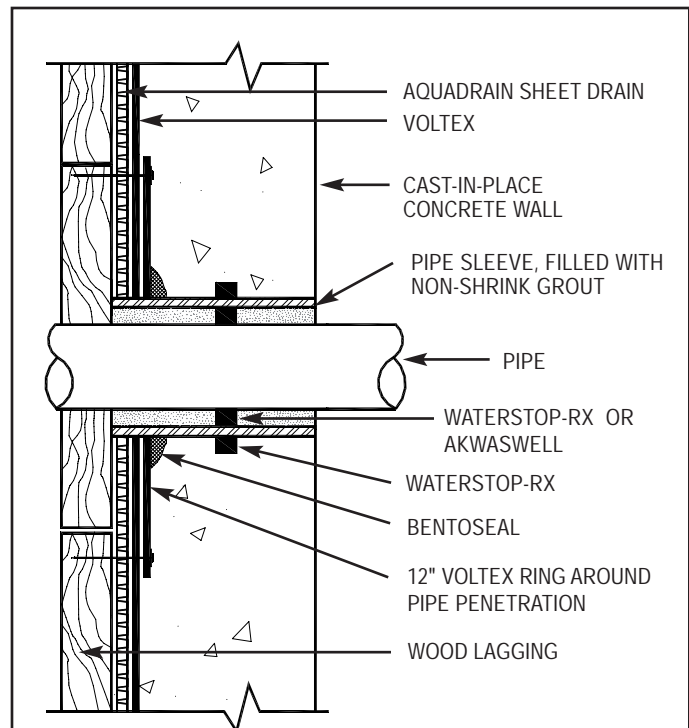


Figure 2.2 - SLEEVED WALL PENETRATION

Cut and secure Voltex tightly around penetrations and then apply Bentoseal  $\frac{3}{4}$ " (18 mm) ring around penetration and extend over membrane a minimum 3" (75 mm).



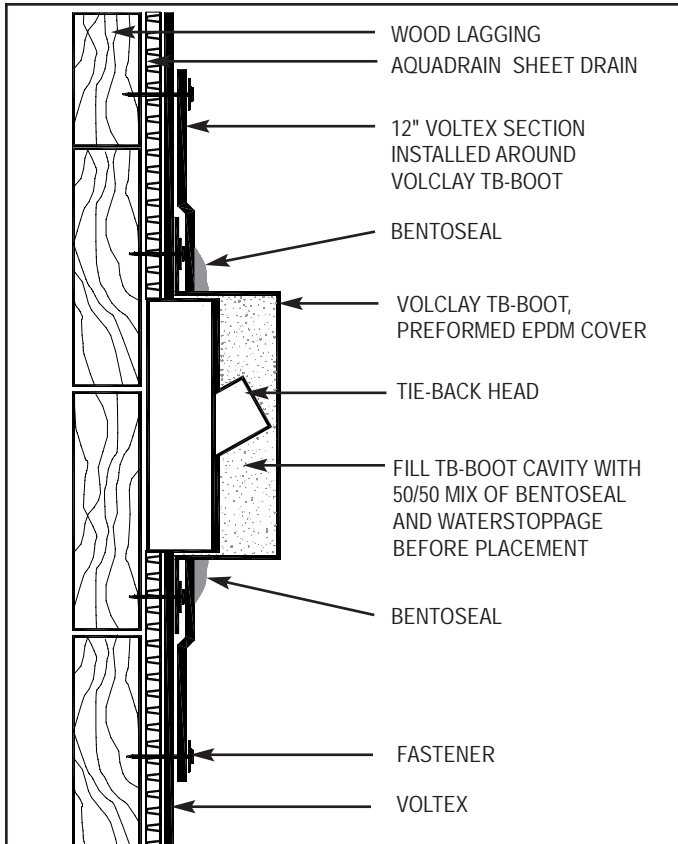


Figure 2.3 - PREFORMED TB-BOOT COVERS  
Install a Volclay TB-Boot preformed EPDM cover over tie-back heads and other applicable retaining wall anchorage. Prior to installing, fill cavity of TB-Boot with a 50/50 mix of Bentoseal and Waterstoppage (granular bentonite).

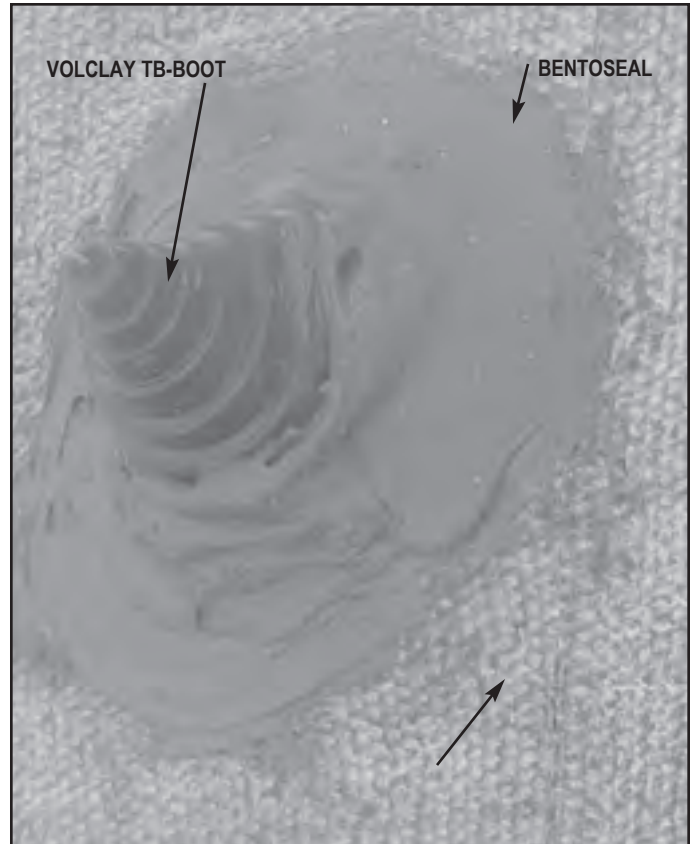


Figure 2.4 - VOLCLAY TB-BOOT TIE-BACK COVER  
TB-Boot installed over soldier pile tie-back head with Bentoseal applied around the perimeter extending onto the 12" Voltex ring section around the tie-back plate.

**Soldier Pile Stripping:** Install a strip of Voltex over all soldier piles with raised lagging hanger bolts, form tie rods, or other irregular surface. Voltex strip should extend a minimum 6" (150 mm) to both sides of the piling. Apply Bentoseal 1/4" x 2" (6mm x 50 mm) to Voltex strip surface along both edges of each soldier pile (Figure 2.9).

**Cementitious Board:** Prior to installing Voltex/Voltex DS to finished grade, install 1/2" (12 mm) thick cementitious wall board centered over steel soldier pile from finished grade elevation to specified depth that the top of steel soldier pile and wood lagging will be removed (Figure 2.13).

**Grade Termination:** Terminate Voltex at grade with a rigid termination bar fastened 12" (300 mm) on center. A 12" (300 mm) wide strip of UV resistant flashing is recommended to be installed with the termination bar. Embed the top edge of Voltex and termination bar in a 2" (50 mm) wide by 1/2" (12 mm) thick bead of Bentoseal. Note that it may be necessary to dig and remove several pieces of lagging to facilitate the termination. See termination details, Figure 3.11 and 3.12, Page 23.

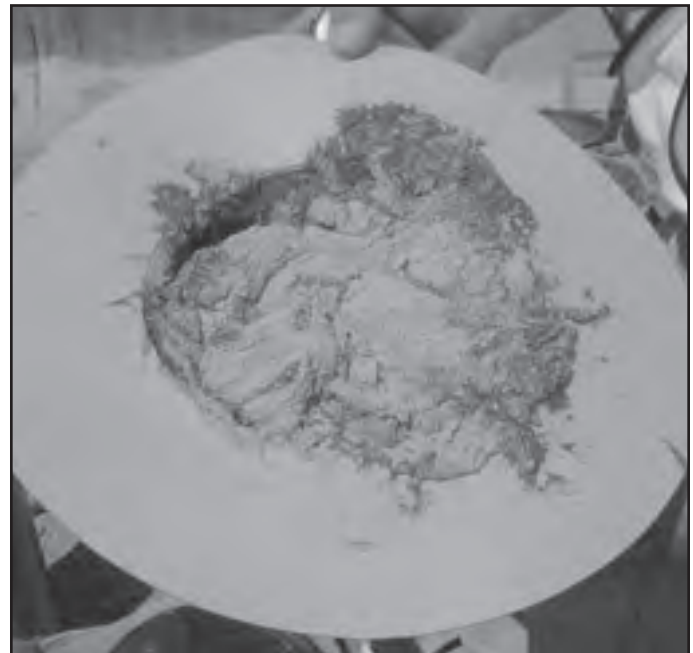


Figure 2.5 - TB-BOOT CAVITY MIX  
Fill TB-Boot cavity with 50/50 mix of Bentoseal and Waterstoppage prior to being installed.



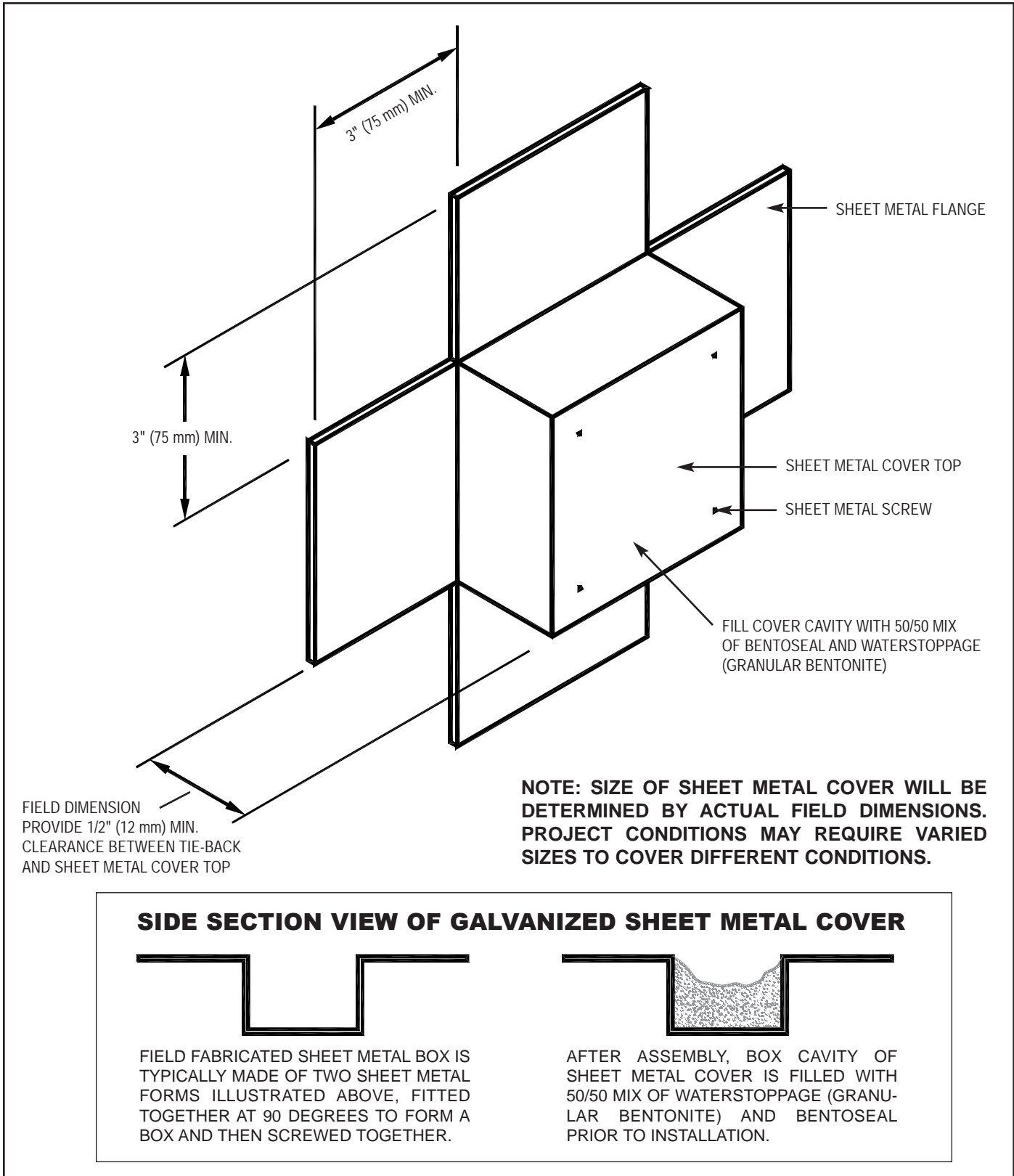


Figure 2.6 - FIELD FABRICATED SHEET METAL TIE-BACK HEAD COVERS.

Field fabricated galvanized sheet metal covers (26 gauge. min.) will need to be used over large tie-back heads and where irregular (non-planer) shoring wall conditions exist. Prior to installation, fill sheet metal cover cavity with 50/50 mix of Bentoseal and Waterstoppage (granular bentonite).

### 2.2 Soldier Pile & Lagging Retaining Wall

Verify the following substrate preparation work has been completed. Then install Voltex following the property line installation guidelines in Section 2.1 on page 12 and 13.

**Preparation:** Gaps between the wood lagging must be no wider than 1" (25 mm). If the gaps between lagging are in excess of 1" (25 mm), the gaps should be completely filled with cementitious grout, wood, extruded polystyrene (40 psi min.) or compacted soil (Figure 2.7). If water is flowing through the lagging, a 6-mil (0.15 mm) polyethylene sheeting can be installed over the area before Voltex is installed.

In areas with large gaps (up to 2-1/2" (63mm)) between lagging, Aquadrain sheet drainage composite can be installed over the lagging to provide a uniform surface to mount Voltex (Figure 2.8). Securely fasten Aquadrain to the lagging surface with washerhead nails before installing Voltex. Gaps larger than 2-1/2" (63 mm) between lagging should be completely filled with grout, wood, extruded polystyrene (40 psi min.) or compacted soil even if Aquadrain is installed prior to Voltex. Do not use plywood or other surface treatment over large lagging gaps that leaves the cavity void. Details 2.10 through 2.12 on page 16 illustrate the installation of Voltex over the different wood lagging positions relative to the soldier piling.

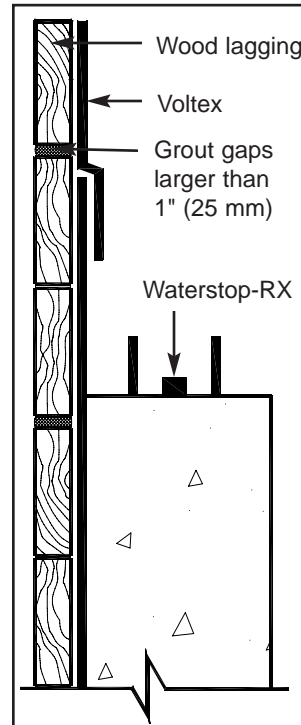


Figure 2.7 Voltex installed directly to wood lagging with gaps filled. (Cast-in-place concrete wall)

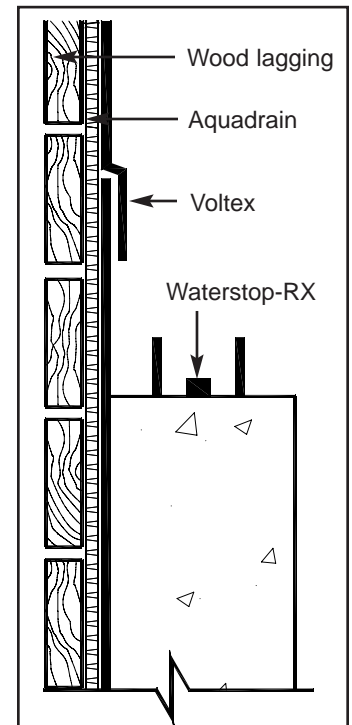


Figure 2.8 Aquadrain used to cover gaps in lagging less than 2.5" (63 mm). (Cast-in-place concrete wall)

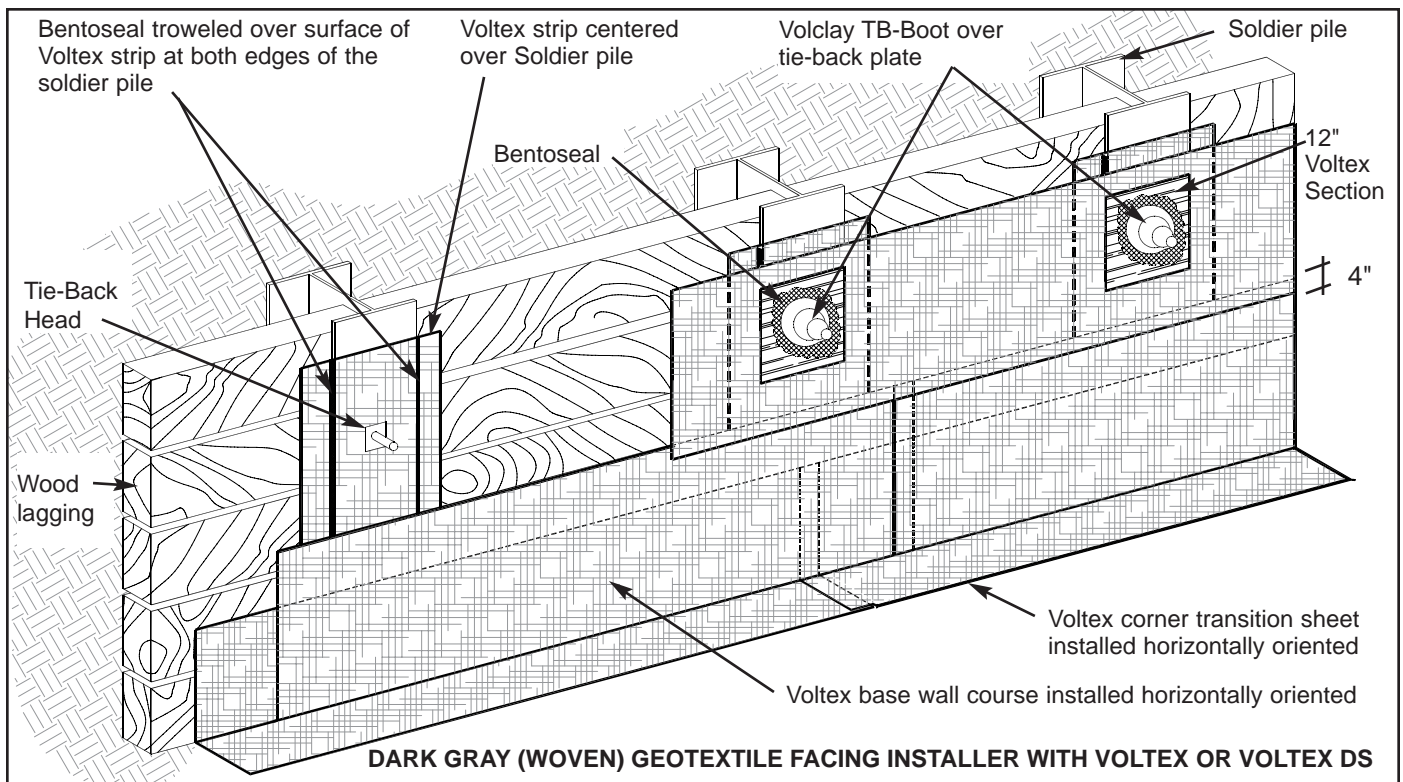


Figure 2.9 - Voltex installation over soldier pile and wood lagging retaining wall prior to cast-in-place concrete wall.

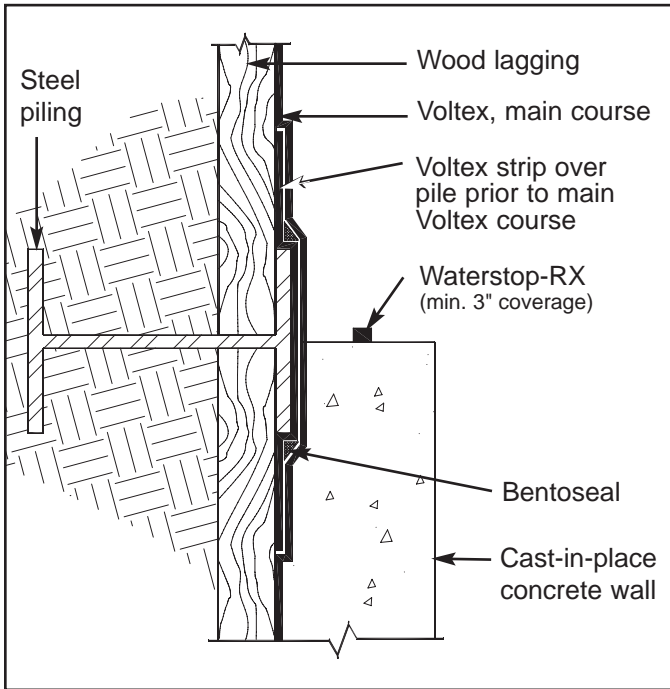


Figure 2.10 - Lagging secured to outside surface of front pile flange providing smooth surface (Plan View).

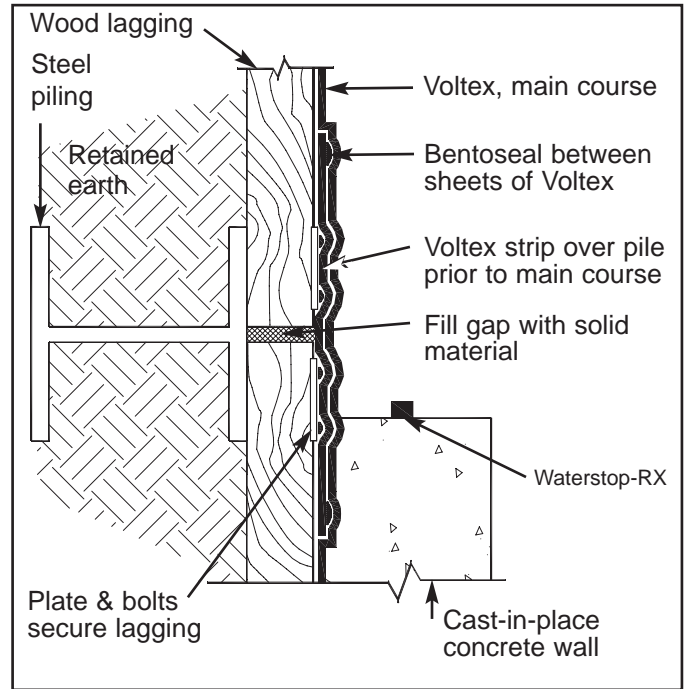


Figure 2.11 - Lagging secured to inside surface of front pile flange. Install Voltex strip to cover mounting plates and bolts prior to main Voltex course (Plan View).

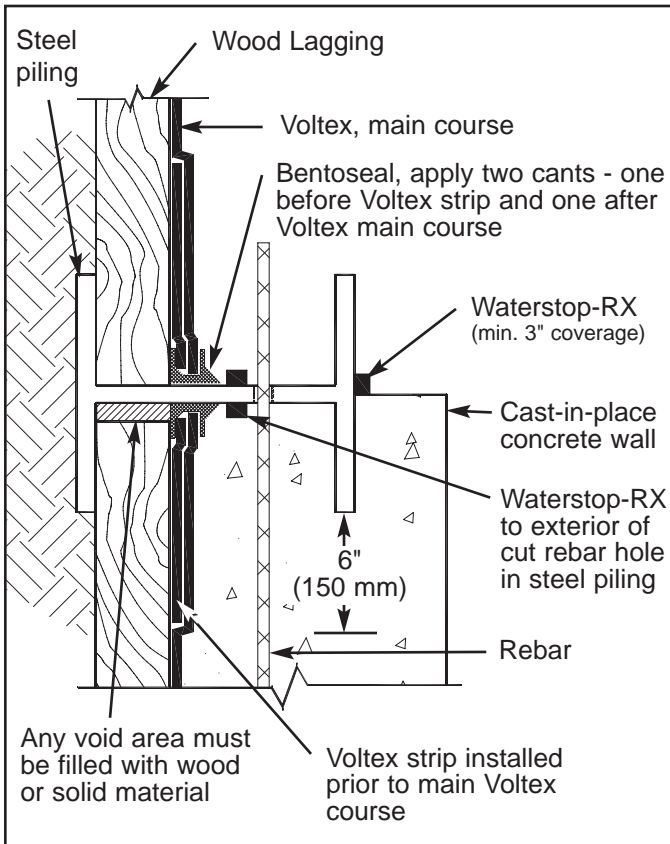


Figure 2.12 - Lagging secured to inside surface of back pile flange. Install Bentoseal and Voltex strip prior to main Voltex course and inward Bentoseal cant (Plan View).

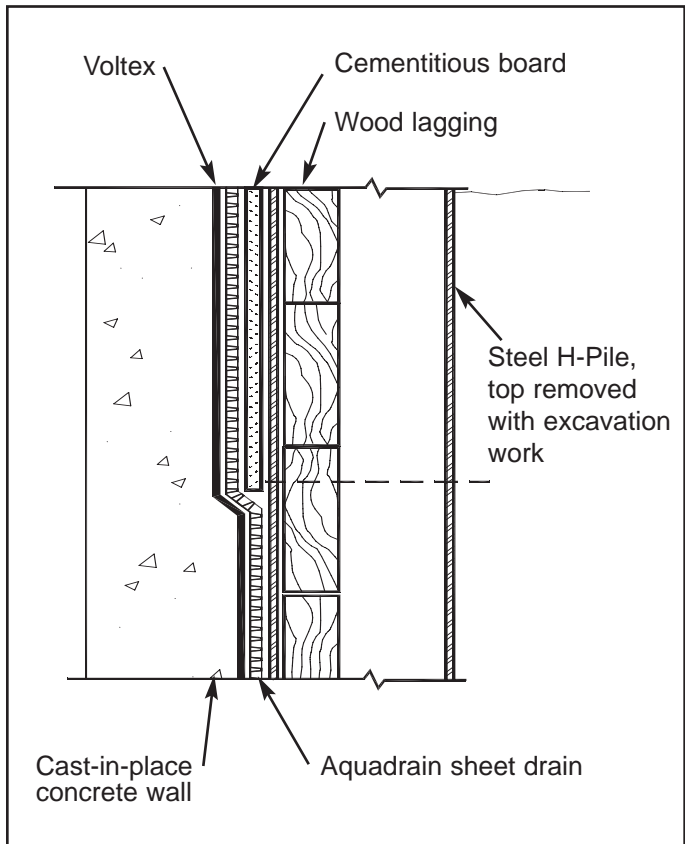


Figure 2.13 - WALL EXCAVATION AT GRADE  
Cementitious board protects waterproofing during excavation and removal of steel pile top and wood lagging.

### 2.3 Metal Sheet Piling Retaining Wall

Verify the following substrate preparation work has been completed. Then install Voltex following the property line installation guidelines in Section 2.1 on page 12 and 13. Special knurled powder-actuated fasteners (Hilti type) are recommended to secure Voltex to the metal sheet piling.

**Preparation:** Trowel a 1/2" (12 mm) thick layer of Bentoseal along all sheet piling knuckles. Fill voids or cavities at tie-back plates with cementitious grout or compacted soils. If excessive water is penetrating the sheet piling knuckles, Volclay BentogROUT can be injected to the outside of the knuckle to stop water flow (Figure 2.14). Consult CETCO for BentogROUT applications and installation guidelines.

#### Alternate Plywood Method

Alternatively, 1/2" (12 mm) plywood may be fastened to the sheet piling to create a flat surface upon which Voltex is fastened. All void spaces between the plywood and sheet piling must be filled with compacted earth or concrete. Apply Voltex to plywood following "Backfilled Wall" Guidelines in Section 3, Page 20.

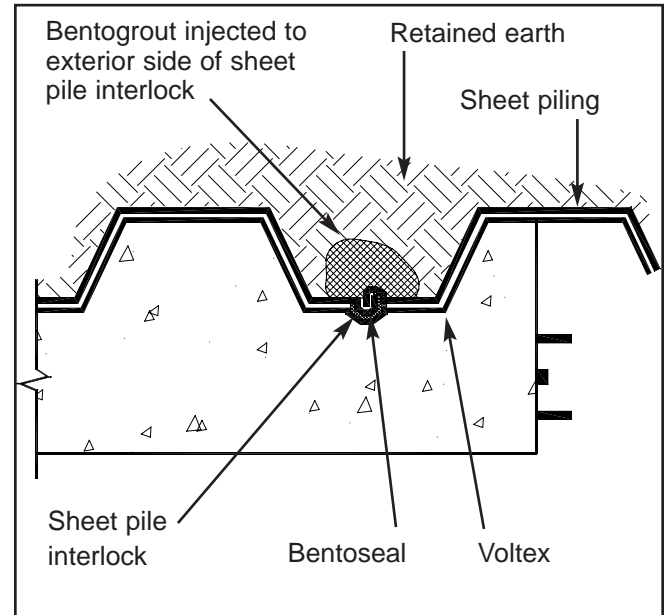


Figure 2.14 - Sheet pile interlock detail.

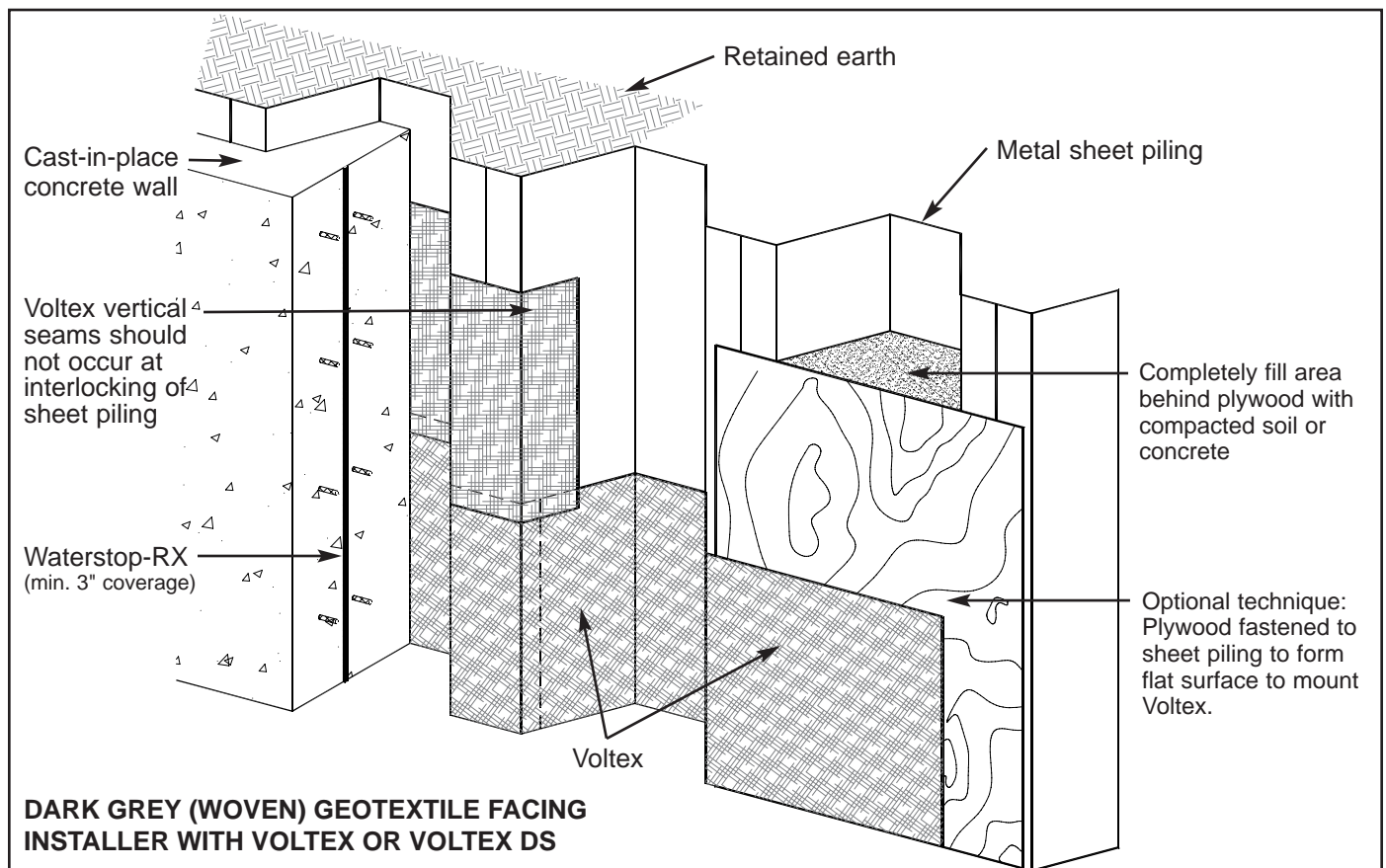


Figure 2.15 - Voltex installation onto metal sheet piling retaining wall with powder-actuated fasteners.



## 2.4 Earth Formed Shotcrete Retaining Wall

Verify the following substrate preparation work has been completed. Then install Voltex following the property line installation guidelines in Section 2.1 on page 12 and 13.

**Preparation:** The surface of the earth formed diaphragm wall must be sufficiently planar to provide an adequately smooth surface to apply Voltex. Voltex can be applied over large, relatively shallow indentations. The surface should not contain voids or sharp protrusions in excess of 1" (25 mm). Fill all voids with cementitious grout and remove protrusions prior to mounting Voltex (Figure 2.18).

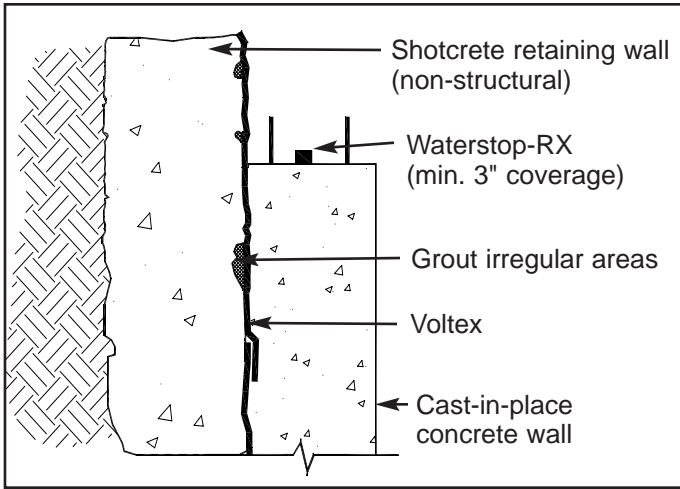


Figure 2.16 - Grout void area and remove protrusions to provide smooth surface for Voltex.

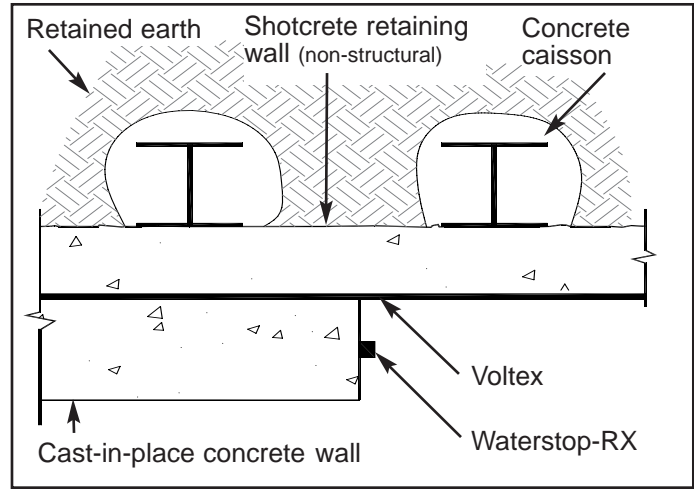


Figure 2.17 - Earth formed concrete retention wall with concrete caisson supports. (Plan View)

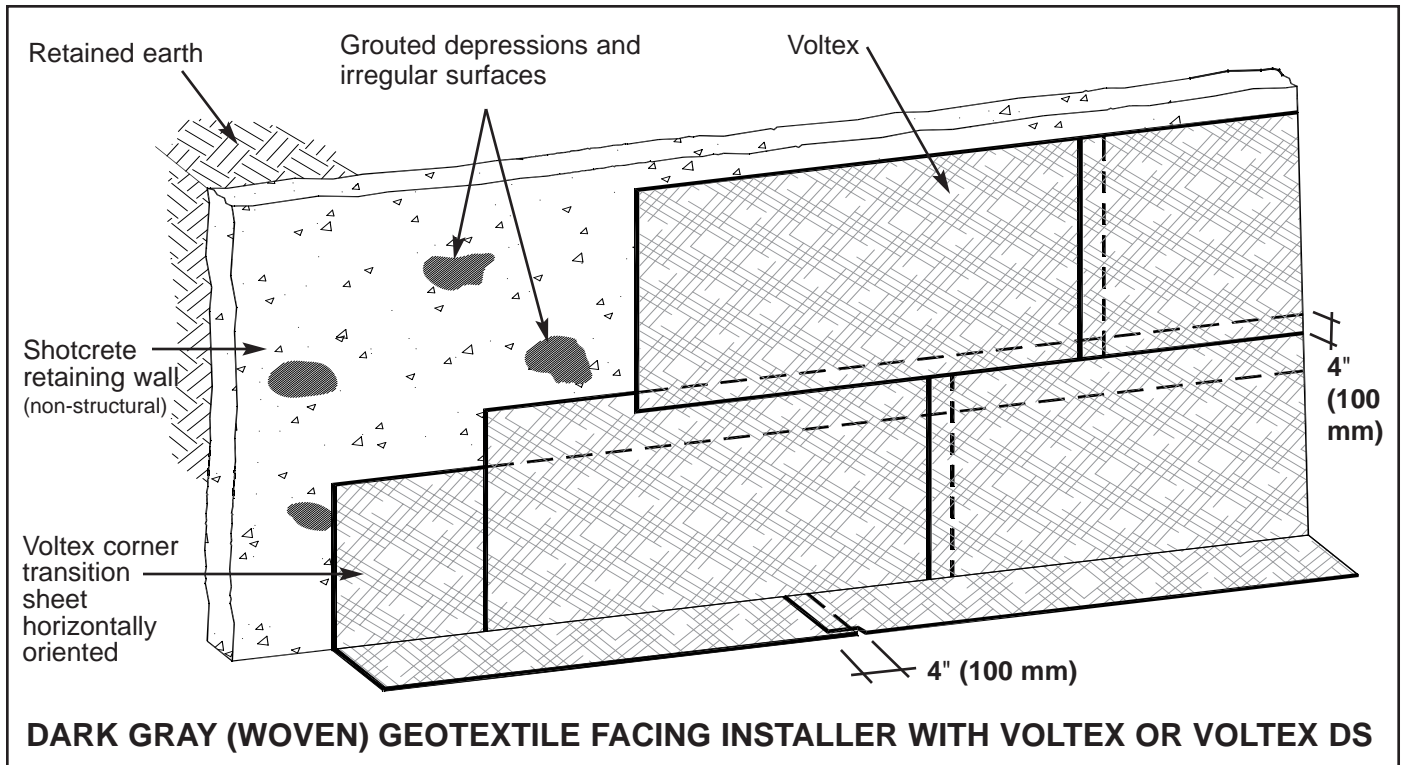


Figure 2.18 - Voltex installation over an earth formed shotcrete retention wall prior to cast-in-place concrete wall.



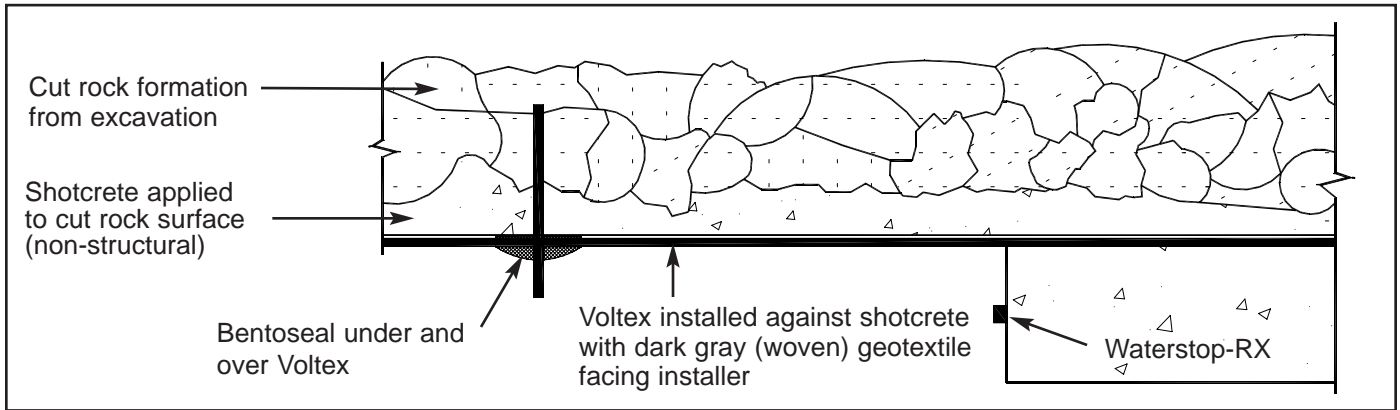


Figure 2.19 - Cut Rock excavation with shotcrete applied to provide a smooth surface for waterproofing installation.

### 2.5 Auger Cast Caisson Walls

Verify the following substrate preparation work has been completed. Then install Voltex following the property line installation guidelines in Section 2.1 on page 12 and 13.

**Preparation:** The surface of auger cast caisson and cut rock excavation walls must be sufficiently planar to provide an adequately smooth surface to apply Voltex. Voltex can be applied over large, relatively shallow indentations where Voltex can conform tight against the surface. The surface should not contain voids or sharp protrusions in excess of 1" (25 mm). Fill all large recesses between caissons with cementitious grout prior to installing Voltex (Figure 2.20). Cut rock excavations typically require shotcrete or grout work to provide acceptable surface to install Voltex (Figure 2.19).

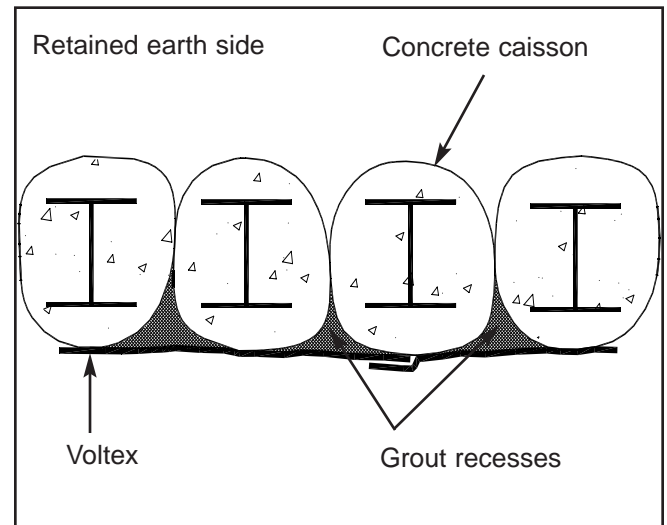
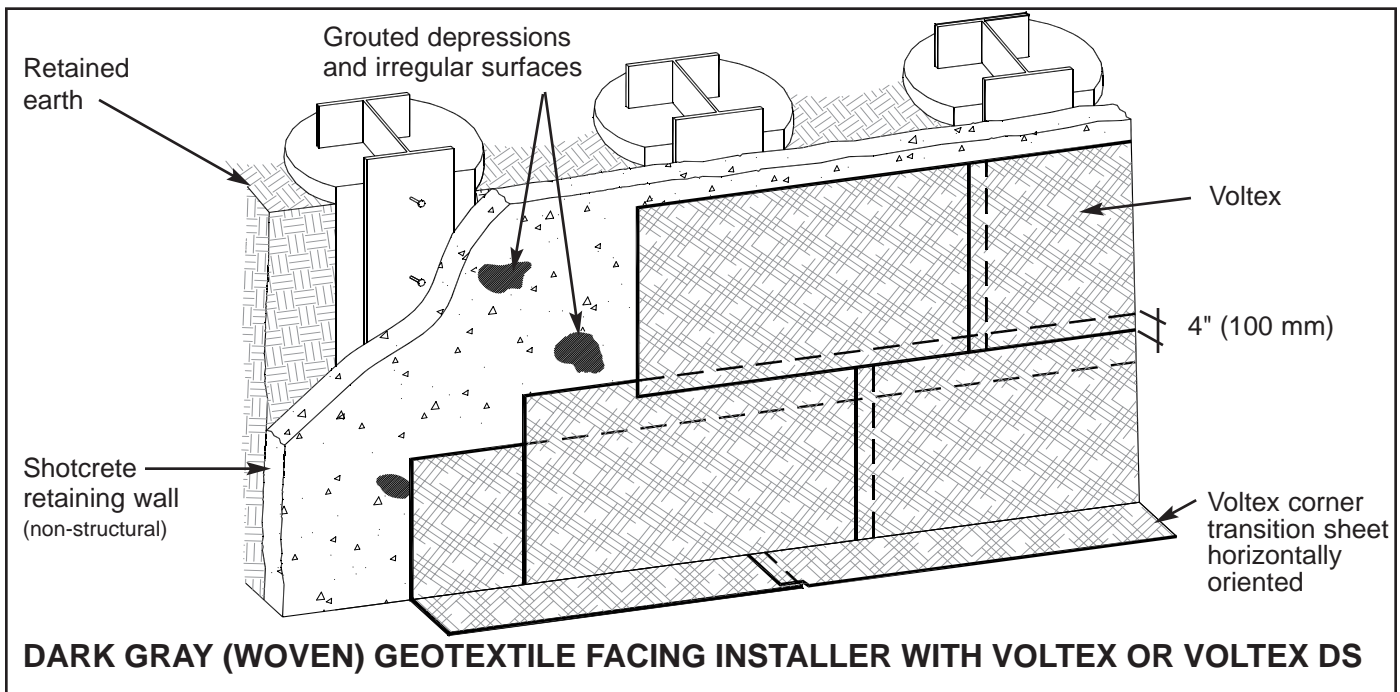


Figure 2.20 - Fill in recesses between cast caissons with grout to provide smooth surface (Plan View).



### DARK GRAY (WOVEN) GEOTEXTILE FACING INSTALLER WITH VOLTEX OR VOLTEX DS

Figure 2.21 - Voltex installation over an auger cast concrete retention wall prior to cast-in-place concrete wall.

## SECTION 3 BACKFILLED WALLS

Install Voltex or Voltex DS with the **dark gray (woven) geotextile side against the concrete wall** on cast-in-place concrete foundation walls prior to backfilling. Voltex may be applied as soon as the forms are removed. It is not necessary to wait for the concrete to completely cure. Use Voltex with concrete cast with conventional forms that produce smooth surface.

### 3.1 Surface Preparation

Footings should be swept clean of silt, rocks and debris to provide Voltex with direct contact to the concrete in the application area. The wall surface must be properly prepared before Voltex is installed. Areas of surface honey-combing or voids should be filled with cementitious grout or Bentoseal. Protrusions of over 1/4" (6 mm) should be knocked off smooth with the concrete surface. Concrete work should include completely filling taper-tie holes with non-shrink cementitious grout and a piece of Waterstop-RX centered in the wall (Figure 3.1). Apply Bentoseal over exterior grouted surface of all form tie holes (Figure 3.1).

### 3.2 Installation

Before installing the first course of Voltex, place Hydrobar Tubes at the wall/footing inside corner (Figure 3.2). "Butt" the ends of Hydrobar Tubes together to form a continuous line.

Beginning at the bottom corner of the wall, install Voltex horizontally oriented with 5' (1.5 m) on one wall and the remainder around the corner on the other wall surface (Figure 3.2). Cut the bottom edge of Voltex at the corner a minimum of 6" (150 mm) so that Voltex can be extended onto the footing. Fasten Voltex into position with washer head fasteners. Then cut and install a Voltex section over the uncovered footing corner area. Apply Bentoseal at the Voltex section to Voltex overlaps. (Figure 3.2).

Install adjacent Voltex rolls of the bottom course horizontally oriented. Each roll should overlap the preceding roll a minimum 4" (100 mm) and should extend onto the footing a minimum 6" (150 mm). At vertical inside corners apply a continuous 3/4" (18 mm) fillet of Bentoseal directly in the corner prior to installing Voltex (Figure 3.3). Stagger all vertical overlap joints a minimum of 12" (300 mm) (Figure 3.4). When hydrostatic conditions exist, the vertical wall Voltex should cover the entire footing and overlap the underslab waterproofing a minimum 6" (150 mm) (Figure 3.6).

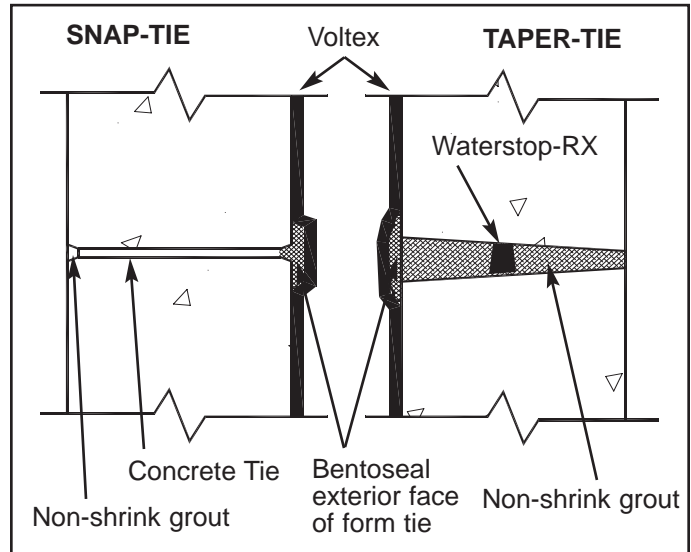


Figure 3.1 - Concrete form tie details.

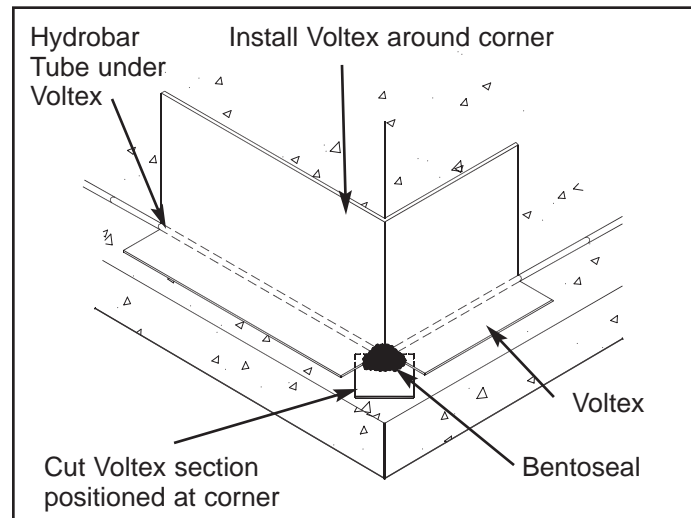


Figure 3.2 - Start Voltex at the corner horizontally. Place cut Voltex section at corner and apply Bentoseal.

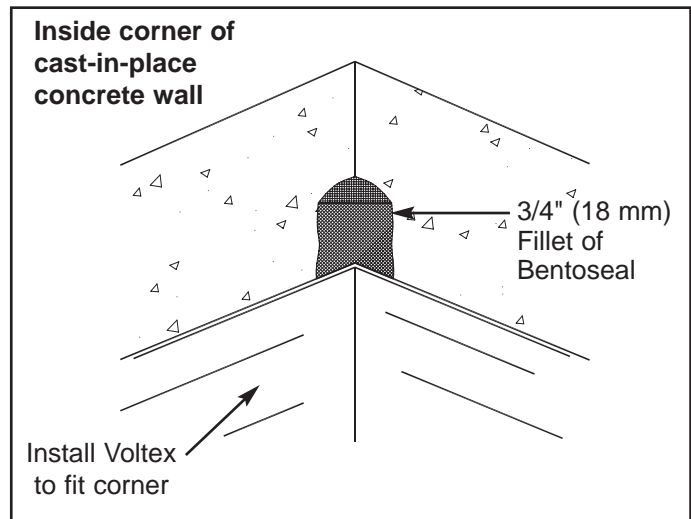


Figure 3.3 - Apply fillet of Bentoseal to inside corner.

# VOLCLAY VOLTEX/VOLTEX DS<sup>®</sup>

## BENTONITE GEOTEXTILE WATERPROOFING

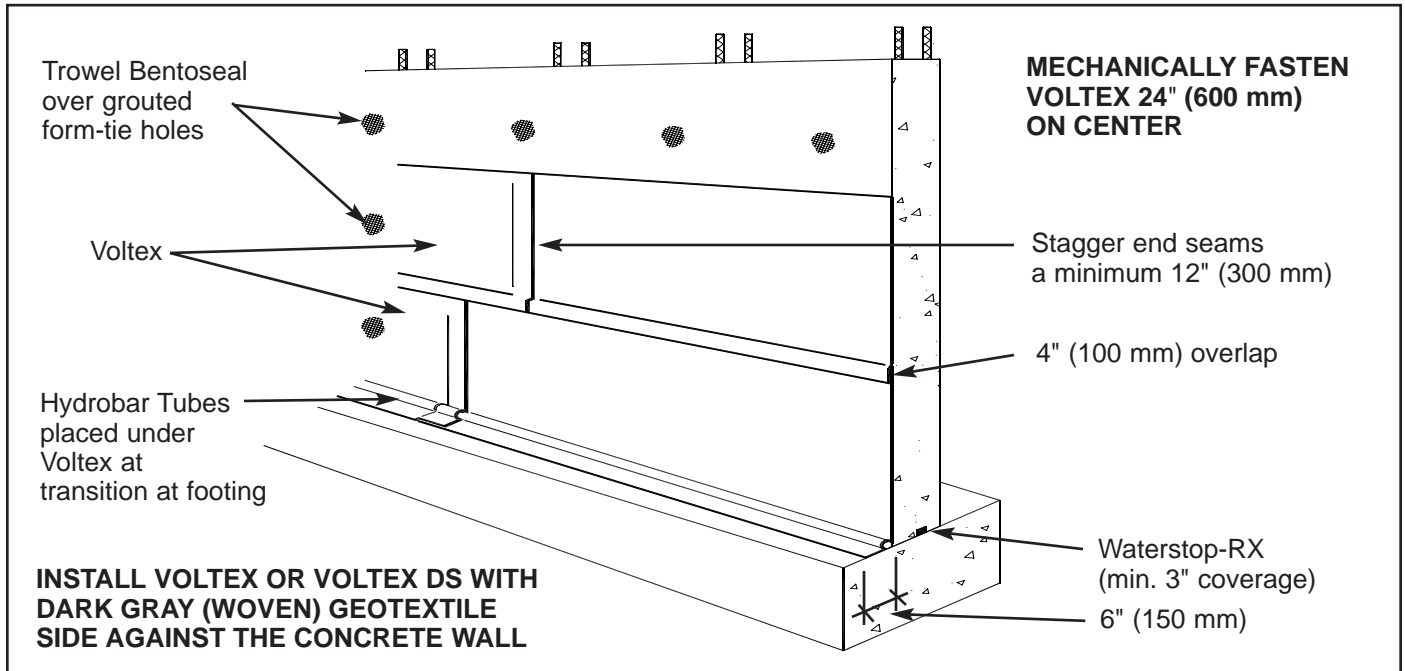


Figure 3.4 - Voltex installed on cast-in-place backfilled wall, overlap edges 4" (100 mm) and stagger vertical end laps.

**Backfill:** The excavated area should be backfilled and compacted immediately after Voltex is installed. Use placed backfill as a platform in applying succeeding Voltex courses. The backfill must be compacted to a minimum 85% Modified Proctor density. Backfill should consist of compactible soils, pea gravel, or crushed stone (3/4" or less). Avoid backfill with aggregate larger than 3/4" (18 mm).

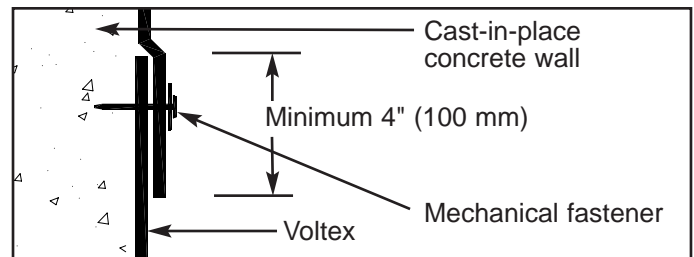


Figure 3.5 - Minimum Voltex overlap detail.

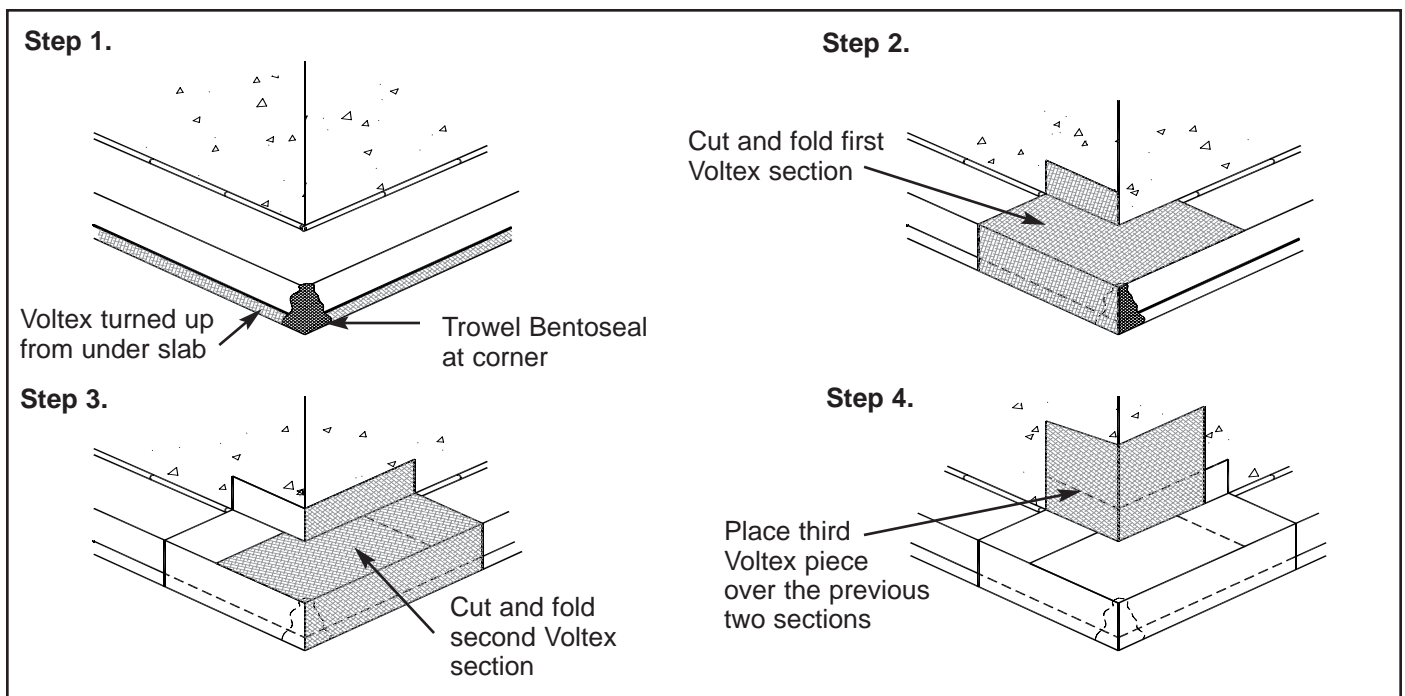


Figure 3.6 - Step by step detail of outside wall base corner installation (hydrostatic condition).

### 3.3 Backfilled Wall Penetrations

Cut Voltex to closely fit around penetrations. After installing Voltex, trowel a minimum 3/4" (18 mm) thick fillet of Bentoseal around the penetration to completely fill any space between the penetration and the Voltex edge. The Bentoseal should extend onto the penetration 1-1/2" (38 mm) and cover Voltex's edge (Figure 3.7). In areas where multiple penetrations are close together, it may be impractical to cut Voltex to fit around base of each penetration. Therefore, apply a 3/4" (18 mm) thick fillet of Bentoseal around each penetration and cover the entire surface between the penetrations (Figure 3.8). Extend Bentoseal 1-1/2" (38 mm) onto the penetrations.

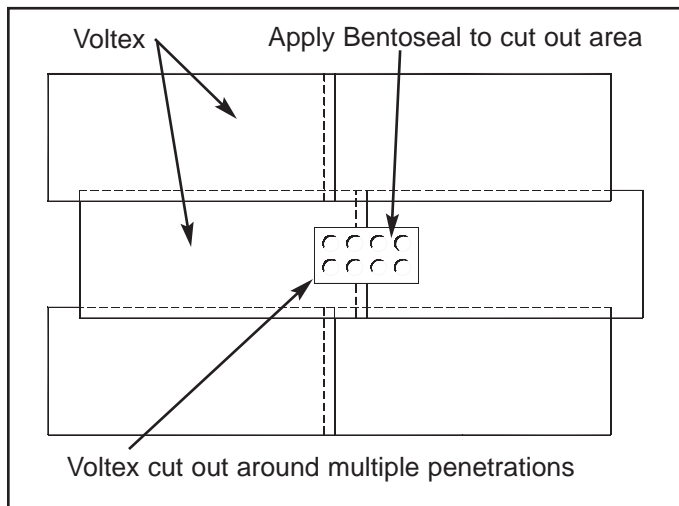


Figure 3.8 - Cut Voltex to fit around multiple penetrations.

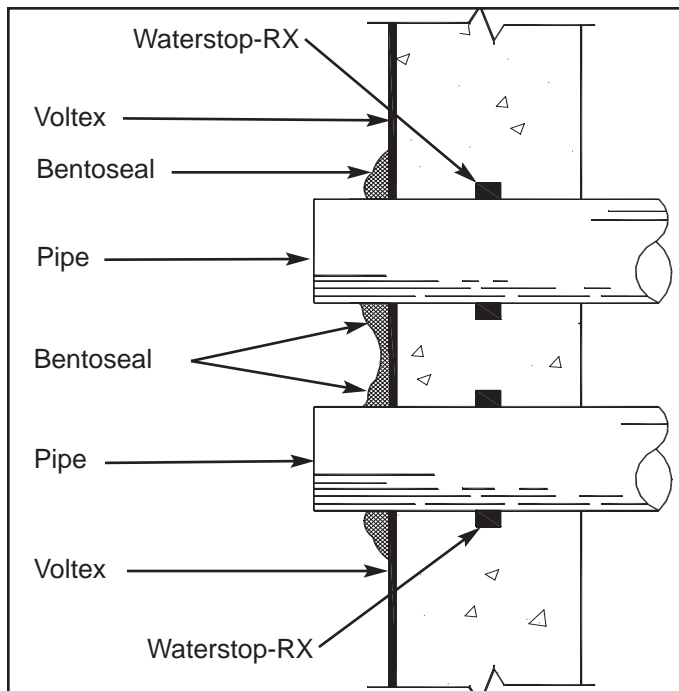


Figure 3.9 - Close multiple penetrations. Trowel Bentoseal around and between penetrations.

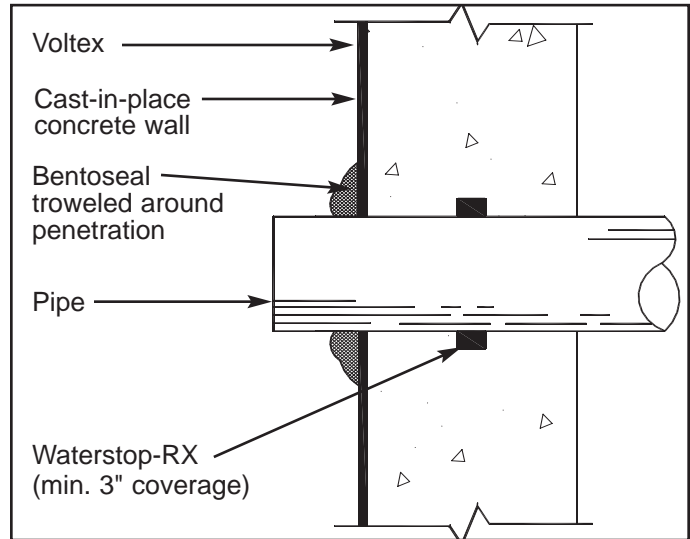


Figure 3.7 - Single penetration cast-in-place wall detail.

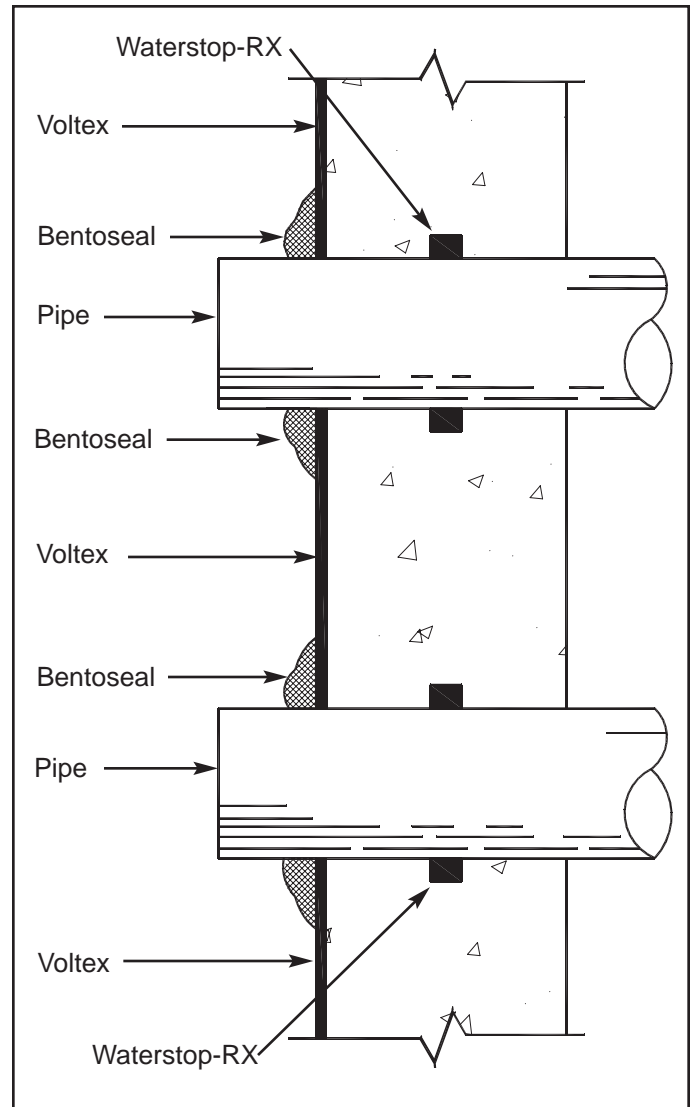


Figure 3.10 - Install Voltex between multiple penetrations with accessibility. Trowel Bentoseal around penetrations.

### 3.4 Grade Terminations

Voltex should be brought up to the grade line on back-filled wall installations. Terminate Voltex at grade with a rigid metal termination bar fastened 12" (300 mm) on center. A 12" (300 mm) wide strip of UV resistant flashing is recommended to be installed with the termination bar at grade level (Figure 3.11). Embed the top edge of the Voltex and termination bar in 2" (50 mm) wide, 1/2" (12 mm) thick bead of Bentoseal. Grade terminations are illustrated in Figures 3.11 and 3.12.

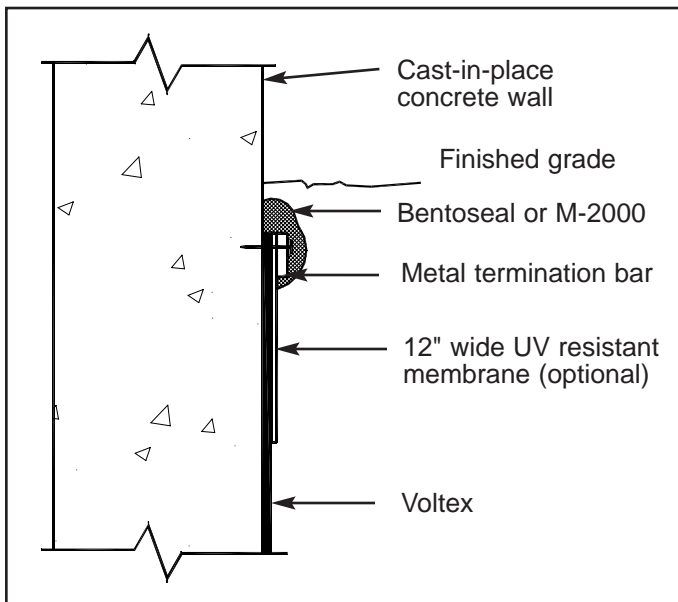


Figure 3.11 - Termination at finished grade.

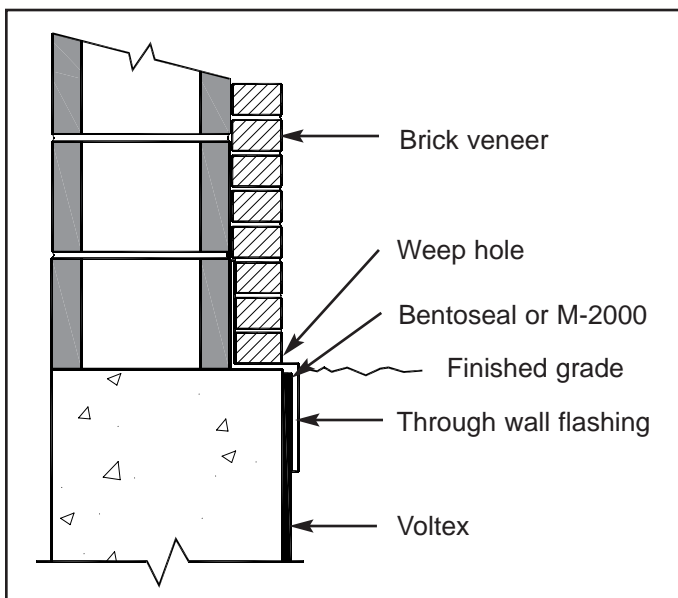


Figure 3.12 - Termination at grade using through wall metal flashing with brick veneer.

### 3.5 Masonry Block Walls

Voltex is not recommended for waterproofing masonry block walls. Consult with CETCO regarding recommended products and installation guidelines for masonry block walls.

## SECTION 5 SPECIAL CONDITIONS

#### 5.1 Precast Concrete Construction

Consult CETCO regarding recommended products and special installation guidelines for precast concrete plank decks, precast earth covered roofs, and precast wall construction.

#### 5.2 Contaminated Conditions

Use Voltex CR (Contaminant Resistant) in conditions where the groundwater contains high concentrations of chemicals or saline. These conditions are typically encountered at industrial sites and coastal regions. If groundwater contains strong acids, alkalis, or has a conductivity of 2,500  $\mu\text{mhos/cm}$  or greater (high salt concentration), water samples should be submitted to CETCO for compatibility testing.

For compatibility testing, provide one quart (one liter) of site groundwater in a clean, unbreakable container. Ship water sample to: CETCO Technical Center, 1500 West Shure Drive, Arlington Heights, IL 60004 - Attn: Building Materials Group. Upon analysis, CETCO will provide a written report evaluating the water's compatibility with Voltex and recommend any special product and/or installation requirements.

#### 5.3 High Hydrostatic Pressure Conditions

If hydrostatic head pressure exceeds 33 feet (10 m) consult CETCO for installation recommendations and guidelines that may apply.

## IMPORTANT NOTICE

**FOR SHOTCRETE, PRECAST CONCRETE, AND OTHER APPLICATIONS NOT COVERED IN THIS MANUAL, CONTACT CETCO FOR TECHNICAL ASSISTANCE AND INSTALLATION GUIDELINES.**



# PRODUCT TABLE

PRODUCT	DESCRIPTION	ROLL SIZE
<b>VOLTEX</b>	Bentonite Geotextile Waterproofing Membrane with standard Volclay sodium bentonite	4-FT x 15-FT (1.2 m x 4.5 m)
<b>VOLTEX CR</b>	Bentonite Geotextile Waterproofing Membrane with contaminant resistant sodium bentonite	4-FT x 15-FT (1.2 m x 4.5 m)
<b>VOLTEX DS</b>	Bentonite Geotextile Waterproofing Membrane with standard Volclay sodium bentonite and a polyethylene liner component	4-FT x 14.5-FT (1.2 m x 4.4 m)
<b>VOLTEX DSCR</b>	Bentonite Geotextile Waterproofing Membrane with contaminant resistant sodium bentonite and a polyethylene liner component	4-FT x 14.5-FT (1.2 m x 4.4 m)

## IMPORTANT NOTICE

**CONTACT CETCO FOR VERIFICATION OF SPECIFICATION AND INSTALLATION REQUIREMENTS TO COMPLY WITH ISSUANCE OF VOLCLAY WATERPROOFING WARRANTY.**



1500 West Shure Drive  
Arlington Heights, IL 60004 USA  
(800)527-9948 Fax:(847)506-6195

[www.cetco.com](http://www.cetco.com)

## LIMITED WARRANTY

The information and data contained herein is believed to be accurate and reliable. Specifications and other information contained herein supersede all previously printed material and are subject to change without notice.

Manufacturer's warranty of installed system is available. Contact seller for terms and sample documents including all limitations.

All goods sold by seller are warranted to be free from defects in material and workmanship.

The foregoing warranty is in lieu of and excludes all other warranties not expressly set forth herein, whether expressed or implied by operation of law or otherwise including but not limited to any implied warranties of merchantability or fitness.

Seller shall not be liable for incidental or consequential losses, damages or expenses, directly or indirectly arising from the sale, handling or use of the goods, or from any other cause relating thereto, and seller's liability hereunder in any case

is expressly limited to the replacement (in the form originally shipped) of goods not complying with this agreement or at seller's election, to the repayment of, or crediting buyer with, an amount equal to the purchase price of such goods, whether such claims are for breach of warranty or negligence.

Any claim by buyer with reference to the goods sold hereunder for any cause shall be deemed waived by buyer unless submitted to seller in writing within thirty (30) days from the date buyer discovered or should of discovered, any claimed breach.

Materials should be inspected and tested by purchaser prior to their use if product quality is subject to verification after shipment. Performance guarantees are normally supplied by the applicator.

Note: Volclay Voltex/Voltex DS waterproofing system is not an expansion joint material. Expansion joints shall be the responsibility of Others.

**JANUARY 2008**

(SUPERSEDES ALL PREVIOUS VERSIONS)