SHOTCRETE APPLICATION MANUAL

Voltex

THIS INSTALLATION MANUAL IS SPECIFICALLY FOR SHOTCRETE FOUNDATION WALL APPLICATIONS. THE MANUAL IS DIVIDED INTO TWO SECTIONS: HYDROSTATIC AND NON-HYDROSTATIC CONDITIONS.

CETCO®

THIS MANUAL CONTAINS THE INSTALLATION GUIDELINES FOR THE VOLTEX DS WATERPROOFING SYSTEM ON FOUNDATION SHORING WALLS, WHERE SHOTCRETE WILL BE APPLIED AS THE STRUCTURAL WALL. THIS MANUAL DOES NOT COVER THE INSTALLATION OF VOLTEX DS WITH CAST-IN-PLACE CONCRETE APPLICATIONS. FOR APPLICATIONS NOT COVERED IN THIS MANUAL, CONTACT CETCO FOR SPECIFIC INSTALLATION GUIDELINES. BEFORE INSTALLING VOLTEX DS, READ THIS INSTALLATION MANUAL TO GAIN FAMILIARITY WITH SPECIFIC PROCEDURES AND APPLICATIONS.

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SHOTCRETE SUMMARY

Shotcrete is concrete pneumatically projected onto a surface at high velocity. It is typically blown through a hand-held nozzle, after all the ingredients are mixed to project specification. Using shotcrete for constructing property line below-grade structural walls has become more common over the last ten years.

However, application of shotcrete can create difficult conditions for insuring the performance of below-grade waterproofing systems. Improperly mixed or placed shotcrete can, among other problems, create voids between the shotcrete and the waterproofing membrane. Shadow voids or poor consolidation behind steel reinforcement is another common problem. Shotcrete's high cement to water ratio can promote excessive cracking and increased efflorescence. Improper cleaning of shotcrete during application can produce rebound pockets, unbonded areas, sags and other defects; shotcrete overspray contamination can reduce the excellent mechanical bond that normally occurs between the Voltex DS shotcrete.

Unlike cast-in-place concrete, the success in applying shotcrete is mostly dependent on the skill and experience of the shotcrete installation crew, especially the nozzleman. Although it may be reassuring to have properly qualified nozzlemen on the project, it cannot be assured that the quality of in-place shotcrete will be consistently high unless there is continued attention to, and inspection of, shotcrete placement. The inspection process should include substrate preparation, steel reinforcement (position, size and anchorage), shotcrete material quality, mixing of materials, equipment operation and gunning technique, encapsulation of steel reinforcement and proper curing.

Furthermore, even properly applied shotcrete is more likely to develop shrinkage cracks than cast-in-place concrete during curing; due to shotcrete's lower water to cement ratio, and the lack of actual field practice of moisture curing the shotcrete for several days per American Concrete Institute (ACI) 506.

To address the difficult conditions of waterproofing shotcrete, CETCO has developed special product installation guidelines and drafted specification coordination directives for design professionals to use when specifying the Voltex DS System to waterproof below-grade, shotcrete foundation walls.

The special installation guidelines covered in this manual are further segmented by hydrostatic and non-hydrostatic conditions. Refer to and follow the correct section that meets the conditions on your project.

HYDROSTATIC / NON-HYDROSTATIC CONDITIONS

Hydrostatic conditions exist when elevation of the below-grade foundation is lower than the project site ground water level or historical high water table. Hydrostatic conditions are typically continual but may be intermittent with the fluctuation of the natural ground water table.

Non-hydrostatic conditions exist when site soil testing has determined that no ground water table exists or the elevation of the below-grade foundation is well above the expected historical high water table elevation. Intermediate temporary hydrostatic pressure conditions may exist after precipitation or irrigation but is not a continual or prolonged condition.

PRODUCT DESCRIPTION

Voltex DS is a highly effective waterproofing membrane comprised of 1.10 pounds of sodium bentonite per square foot, two polypropylene geotextiles, and an integral polymeric liner bonded to the outside surface of the non-woven geotextile. The two geotextiles are interlocked by a proprietary needle punching process which encapsulates and confines the sodium bentonite. The polymeric liner provides extremely low permeability for water vapor and gas transmission.

Sodium bentonite is a non-toxic mineral of volcanic origin that expands and seals upon hydration with water. Bentonite stops water by forming a dense monolithic membrane on the exterior of the structure that is impervious to water.

Voltex DS is excellent for waterproofing below-grade horizontal and vertical surfaces. Typical applications are underslab and property line construction, including soldier pile and lagging, metal sheet piling, shotcrete soil retention and concrete caisson retaining walls.

Installation of Voltex DS is fast and easy. Simply position the product into place and fasten. Voltex DS can be installed on green concrete, in virtually any weather, without the need for primers or adhesives. Voltex DS can be easily cut on site to form around corners and penetrations. Voltex DS is installed with an accompaniment of accessory and associated system products to provide a waterproofing system.

VOLTEX DS SPECIFICATIONS	
Roll Length	**14.5 Ft. (4.4 m)**
Roll Width	**4 ft. (1.2 m)**
Bentonite per Sq. Ft.	**1.10 lbs (5.3 kg/m^2)**
Typ. Roll Weight	**68 lbs (30.8 kg)**

ACCESSORIES

BENTOSEAL®: trowel grade 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®: Pre-formed thermoplastic cover installed over both cable and rod type tie-back heads.
WATERSTOPPAGE®: active granular product used at detail areas that require additional waterproofing protection.
TERMINATION BAR: Min. 1” (25 mm) wide aluminum 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.
GF-40SA: 40-MIL thick UV resistant flashing membrane for grade terminations and thru-wall flashing.
CETSEAL: multi-purpose, single component polyether moisture cure sealant/adhesive. CETSEAL is a low VOC, 100% solids, non-shrinking product with excellent UV resistance.

Additional accessory products not listed herein may be required for site specific details.

ASSOCIATED SYSTEM PRODUCTS

CORTEX: 4-ft x 25-ft roll of Active Polymer Core barrier material to provide high performance substrate system.
WATERSTOP-RX®: active, swelling 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.

LIMITATIONS OF VOLTEX DS

Use Voltex DS with reinforced shotcrete walls, conforming to ACI 506 Core Grade 1 or 2; minimum 8” (200 mm) thick, applied from the bottom up to their full design thickness in a single application with lift heights limited to a maximum 4 feet (1.2 m). Do not use stay-in-place concrete forming; use removable forming products only.

Voltex DS is not designed for above grade or unconfined waterproofing applications. Waterproofing 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. Ultraseal or CoreFlex may be required if contaminated ground water or saltwater conditions exist.

Voltex DS is not designed for split-slab deck construction or to waterproof expansion joints. Expansion joints are the responsibility of others. Do not use Voltex DS on masonry block foundation walls. Refer to other product manuals for installation instructions and limitations regarding underslab and cast-in-place concrete applications. Refer to CETCO’s warranty documents for guidelines, eligibility, coverage and protocol. NOTE: Illustrations herein are not to scale.

SECTION - H1
GENERAL GUIDELINES

Install Voltex DS Waterproofing System with the woven geotextile side (dark gray) facing the installer so that the shotcrete will be against the dark gray geotextile side. On shoring walls to receive shotcrete, install Voltex DS with minimum 6" (150 mm) sheet edge overlaps fastened with both washer-head fasteners placed maximum 24" (600 mm) on center and pneumatic staples placed 6" (150 mm) on center. Install pneumatic staples within 1" (25 mm) of sheet edge to tightly secure membrane overlap to the shoring wall. Secure center line of Voltex DS sheets to shoring wall with pneumatic staples or washer-head fasteners as required to hold membrane tight against shoring wall (Figure H2-2).

Prior to installing adjacent Voltex DS sheets, apply continuous ¼" (6 mm) thick by 3" (75 mm) wide trowel of Bentoseal along top and side edges of the installed Voltex DS sheet. Install Bentoseal so it will be confined within the 6" (150 mm) membrane edge overlap (Figure H2-4).

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

Voltex DS waterproofing is not an expansion joint filler or sealant, but may be used as an expansion joint cover over properly installed expansion joint material placed during substrate preparation.

Protect adjacent work areas and finish surfaces from contamination from waterproofing products during installation operations.

Substrate Preparation: Excavation contractor should provide shoring wall in good condition to receive waterproofing system. Shoring should extend to the lowest level of the waterproofing installation with any voids or cavities exterior of the shoring filled with compacted soil or cementitious grout. With lagging, interior surface of boards should be uniform and tight together with gaps less than 1" (25 mm). Gaps in excess of 1" (25 mm) should be filled with cementitious grout or CETCO approved 2-part spray closed cell polyurethane foam, minimum 20 PSI compressive strength. Irregular lagging may require a liner prior to waterproofing installation to smooth out substrate prior to waterproofing installation received. Contact CETCO for recomendations based on the severity of condition.

SECTION - H2
CORTEX BASE

At the underslab-to-wall transition, first install Voltex DS membrane horizontally oriented (dark gray geotextile side facing the installer) with a minimum 12" (300 mm) of the bottom portion extending out onto the substrate (Figure H2-1). Secure Voltex DS membrane edges to shoring wall with washer-head fasteners maximum 24" (600 mm) on center. Apply Bentoseal along membrane sheet edges and then overlap all adjacent sheets edges a minimum 6" (150 mm). The top membrane edge of this Voltex DS transition installation must extend a minimum 30" (750 mm) above the finished slab elevation. Thus, as required, install a second full sheet of Voltex DS to meet the 30" (750 mm) requirement above the slab elevation.

Starting at base corner of the shoring wall, install Cortex membrane horizontally oriented over Voltex DS corner transition and continue up shoring wall to finished grade detail. Overlap Cortex roll edges minimum 4" (100 mm) and secure along each edge with washer-head fasteners maximum 24" (600 mm) on center (Figure H2-1). Stagger overlap joints of succeeding courses and with previously installed Voltex DS.

For HydroShield Warranty eligibility, the slab-to-wall transition requires that a minimum 24" (600 mm) of the shotcrete wall base be applied inside a temporary, removable cast-in-place kicker form and vibrated for proper consolidation (Figure H2-2). The balance of the wall can be constructed with wet method shotcrete spray installation techniques conforming to ACI 506 Core Grade 1 or 2.

The minimum 24" (600 mm) kicker form shotcrete application technique shall be used at the slab-to-wall transition for all below-grade levels of the structure that will be constructed within the historical high ground water elevation as determined by the projects geotechnical report. Additionally, the kicker form technique shall be used one floor level above the ground water elevation when one or more levels of the structure will be constructed above the ground water elevation.

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

Cementitious Board: Prior to installing Cortex to finished grade detail, install ½" (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 H2-3).

SECTION - H3
SLAB TO WALL TRANSITION

At base of shoring wall, install Voltex DS waterproofing sheet over the Cortex previously installed onto the shoring wall following procedure in Section H2, page 4. Install Voltex DS sheet horizontally oriented (dark gray geotextile side facing the installer) with the bottom edge extending down to the wall/slab transition corner as shown in Figure H3-1. Secure Voltex DS to lagging wall with washer-head fasteners maximum 24" (600 mm) on center along edges and down center of sheet to secure firmly. Overlap adjacent Voltex DS sheet edges a minimum 6" (150 mm). Maintain a minimum 2" (50 mm) spacing between Voltex DS and reinforcement steel.

Prior to installing adjacent Voltex DS sheets, apply continuous ¼" (6 mm) thick by 3" (75 mm) wide trowel of Bentoseal along top and side edges of the installed Voltex DS sheet. Install Bentoseal so it will be confined within the 6" (150 mm) membrane edge overlap.
Section continued on page 6.

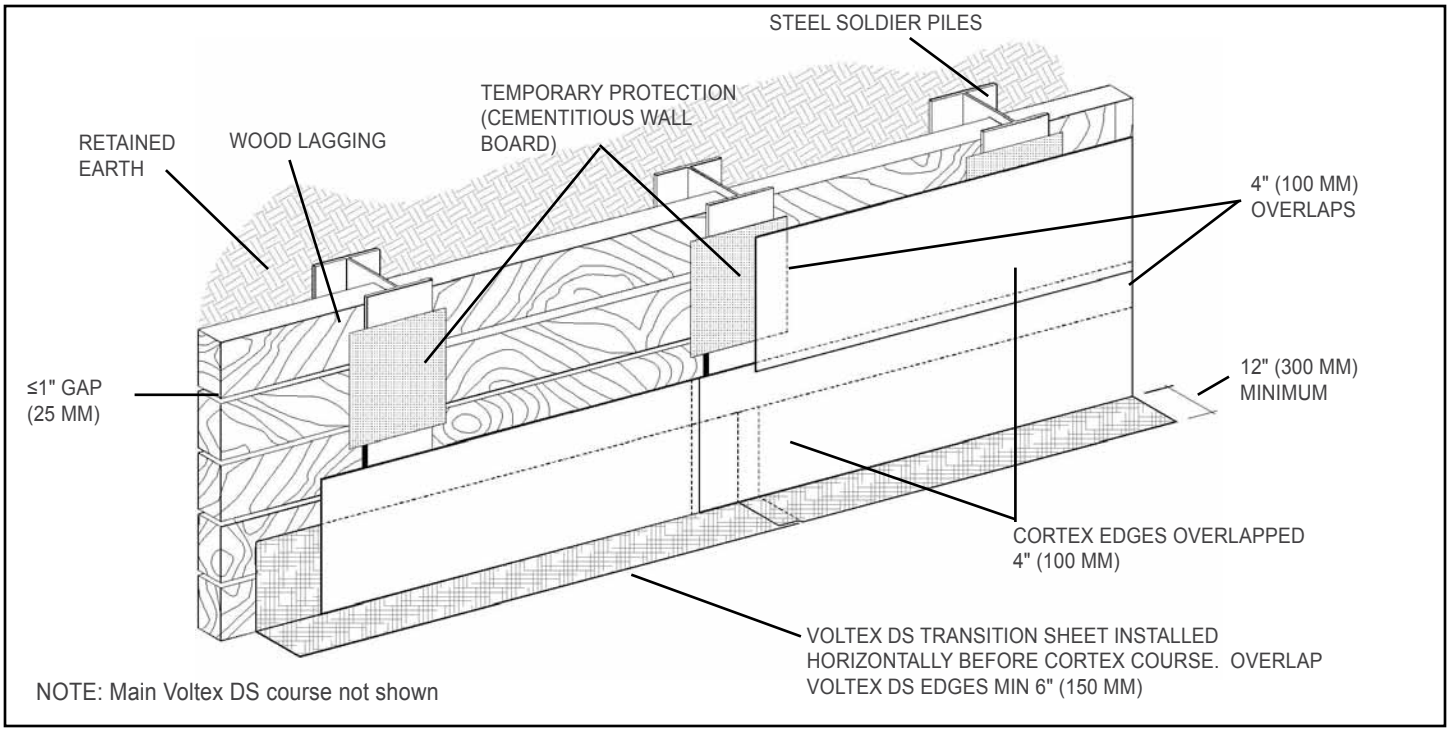

Figure H2-1: CORTEX INSTALLED ONTO SHORING WALL PRIOR TO VOLTEX DS
Install Cortex onto shoring wall prior to installing Voltex DS waterproofing membrane.

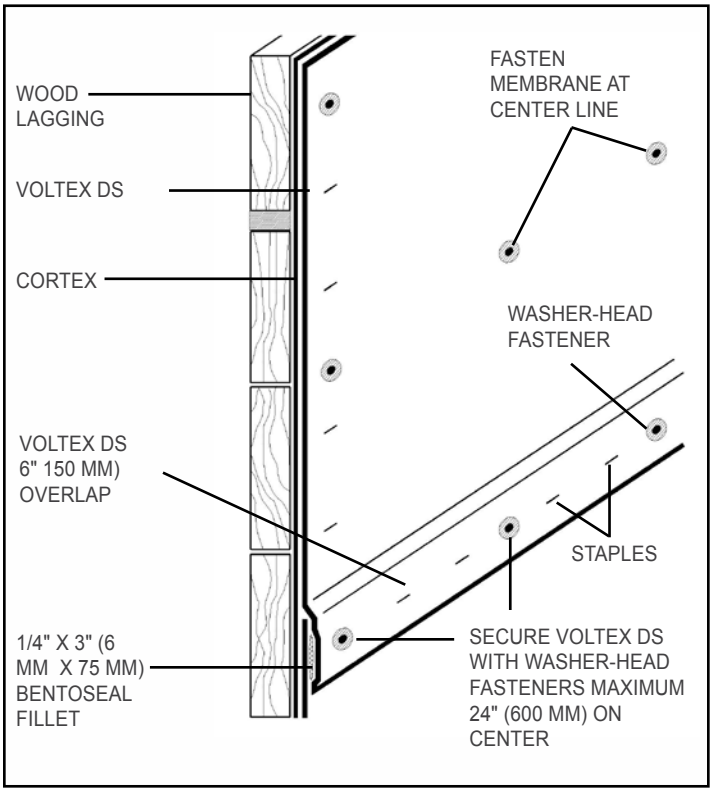

Figure H2-2: GENERAL WALL INSTALLATION
Install Cortex layer onto shoring then install Voltex DS layer directly over Cortex with washer-head fasteners placed maximum 24” (600 cm) on center and staples placed 6” (50 mm) on center.

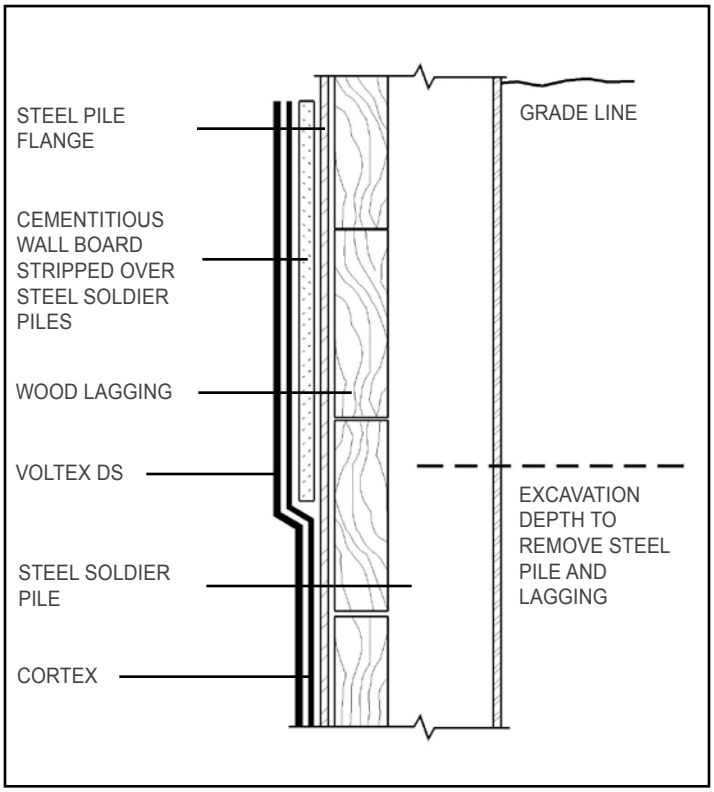

Figure H2-3: CEMENTITIOUS BOARD AT GRADE
Install cementitious board strip over steel piling at grade to protect waterproofing during removal of top lagging timbers and top of steel pile (typically with acetylene torch). Remove cement board before backfilling.

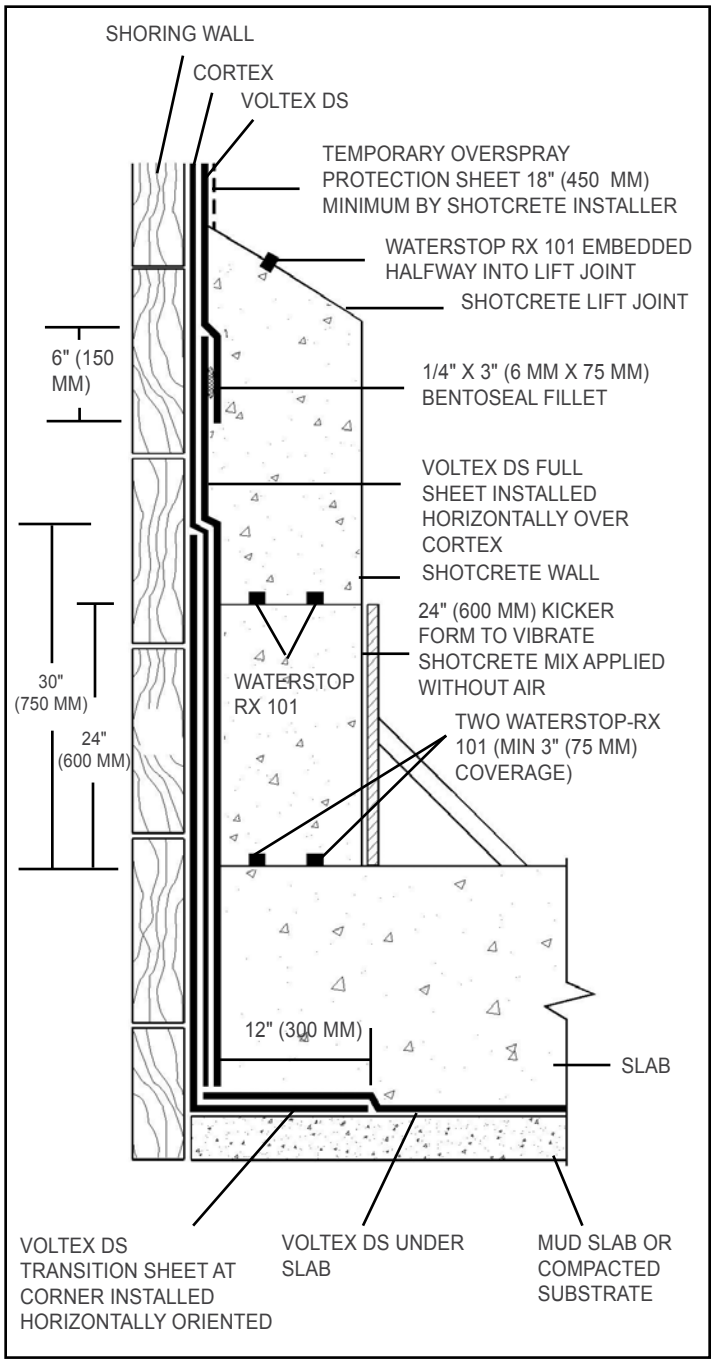

Figure H3-1: SHOTCRETE WALL WITH KICKER FORM
Install base Voltex DS sheet horizontally oriented onto shoring wall over Cortex and extend the underslab Voltex DS sheet to the slab/wall corner overlapping the Voltex DS transition sheet a minimum 12" (300 mm).

Continued from page 4.
Continue Voltex DS installation along base of wall with sheets horizontally oriented. Overlap adjacent Voltex DS sheet edges a minimum 6" (150 mm). Further secure membrane overlap edges with pneumatic staples placed 6" (150 mm) on center within 1" (25 mm) of sheet edge.

Install under slab Voltex DS membrane extending to corner (gray geotextile side up), fully overlapping the 12" (300 mm) horizontal tail of the Voltex DS corner membrane installed at the wall base. Secure corner edge of membrane with washer-head fasteners or pneumatic staples 12" (300 mm) on center.

For HydroShield Warranty eligibility, bottom 24" (600 mm) of wall shall be temporarily formed so that the project's approved shotcrete mix can be installed inside the kicker form without air velocity and consolidated by vibration per ACI industry standards.

If slab is greater than 24" (600 mm) thick, consult CETCO for guidelines.

NOTE: Reinforced shotcrete walls shall conform to ACI 506 Core Grade 1 or 2. Do not use stay-in-place concrete forming; use removable forming products only.

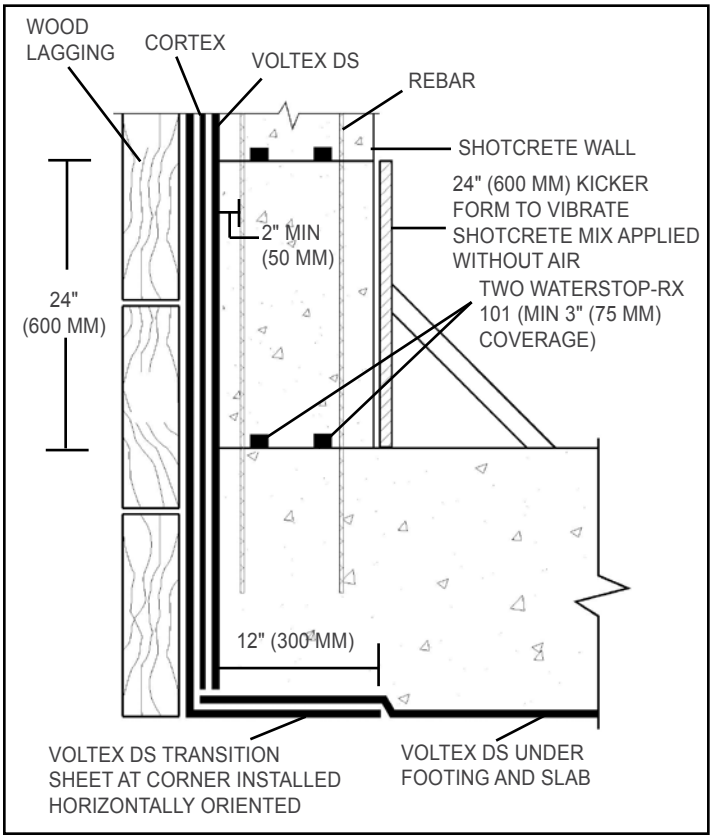

Figure H3-2: SLAB TO WALL TRANSITION
Voltex DS sheet installed at the corner should extend past the height of the top of the finished slab level a minimum 12" (300 mm) and extend under the slab 12" (300 mm).

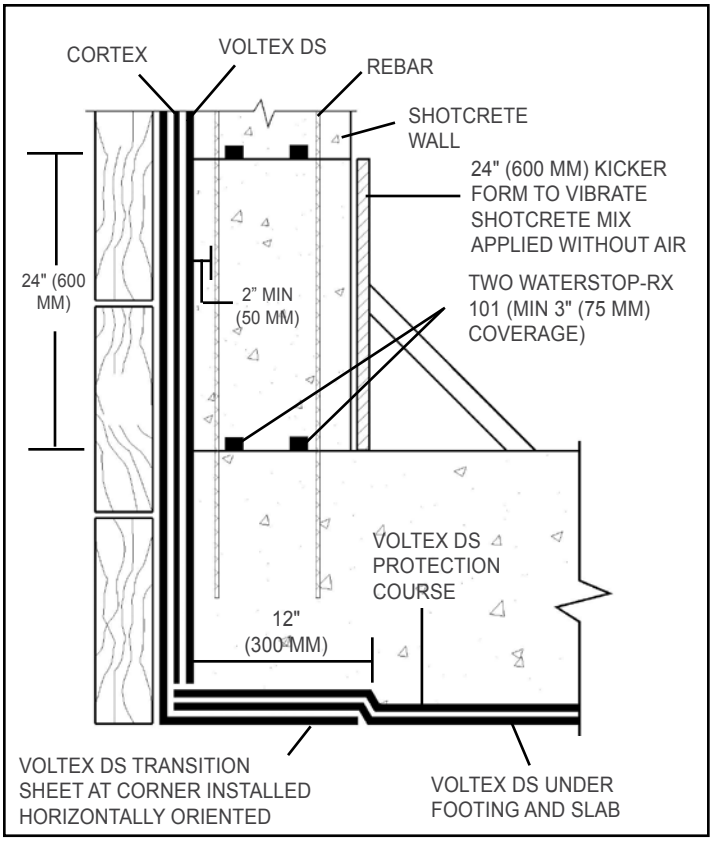

Figure H3-2A: VOLTEX DS PROTECTION COURSE
As specified or to provide additional waterproofing protection, install a second course of Voltex DS over the first course of Voltex DS in lieu of a concrete protection slab.

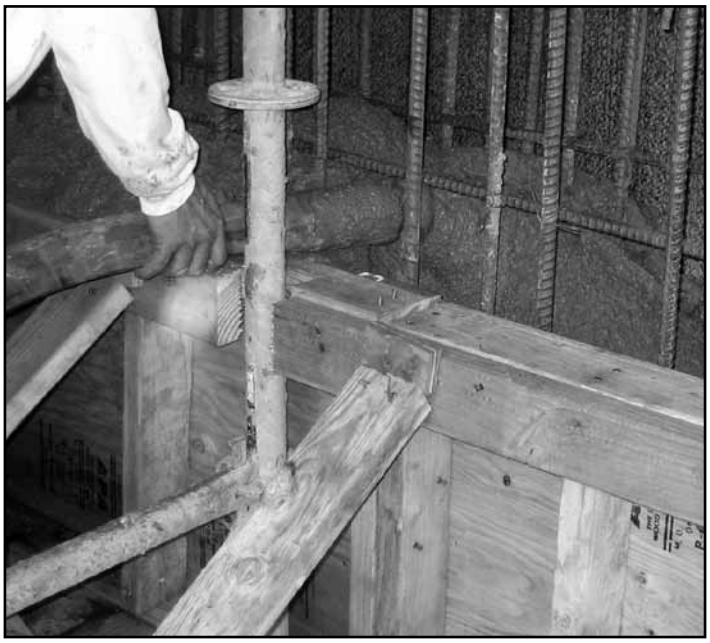

Photo H3-3: SHOTCRETE PLACEMENT IN KICKER FORM
Apply project approved shotcrete mix without air velocity into minimum 24" (600 mm) high kicker form and then consolidate by vibration.

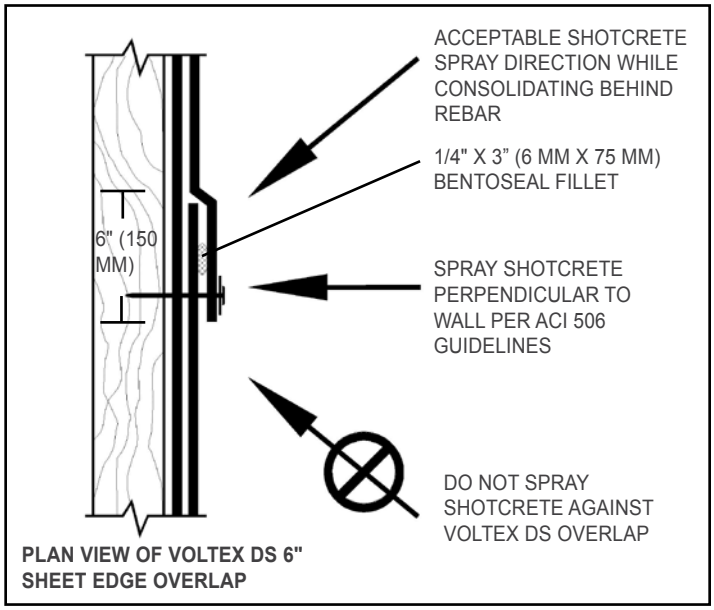

Figure H3-4: SHOTCRETE SPRAY DIRECTION
Shotcrete gunning should be applied straight against the wall per ACI 506. Do not allow shotcrete to be sprayed against Voltex DS overlap as illustrated above.

SECTION - H4
SHORING WALL

Cast-in-Place Columns/Pilasters: As it is extremely difficult to place and consolidate dry-mix shotcrete behind heavy or closely placed steel reinforcement typical within integrated or attached columns and pilasters, CETCO HydroShield eligibility requires that these structural components be cast-in-place (Figure H4-1). Sequence integrated cast columns and pilasters prior to spraying the connecting or adjoining shotcrete walls in order to minimize the impact of overspray and maintain the cleanest surface possible to pour against in these locations. Sequencing in this manner will also create a much more stable/defined surface to spray the shotcrete against when construction adjacent walls. If the shotcrete walls are constructed prior to the cast-in-place columns, use removable forming and not stay-in-place forming. Install Voltex DS sheet to shoring wall (dark gray geotextile side facing installer) with the bottom edge overlapping top edge of the Voltex DS corner transition work a minimum 6" (150 mm). Secure sheet edges to shoring with both washer-head fasteners placed maximum 24" (600 mm) on center and pneumatic staples placed 6" (150 mm) on center within 1" (25 mm) of sheet edge.

Membrane Installation: Prior to installing adjacent Voltex DS sheets, apply continuous ¼" (6 mm) thick by 3" (75 mm) wide trowel of Bentoseal along top and side edges of the installed Voltex DS sheet. Install Bentoseal so it will be confined within the 6" (150 mm) membrane edge overlap.

Secure center line of Voltex DS sheets to shoring wall with pneumatic staples or washer-head fasteners as required to hold membrane tight against shoring wall.

After the bottom horizontal transition sheet course, Voltex DS sheets can be installed either vertically or horizontally oriented. Continue Voltex DS installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 12" (300 mm). Do not allow horizontal Voltex DS overlap joints to run at same elevation as the shotcrete lift joints. Plan by chalk lining the location of shotcrete lift joint lines.

Inspect completed waterproofing installation and repair any damaged material prior to shotcrete placement. Assure Voltex DS overlap is not separated during shotcrete placement.

Tie-Back Covers: Select appropriate size TB-Boot to fit over tie-back plate and allow proper concrete coverage per project requirements. TB-Boot should fit entirely over tie-back head without the tie-back plate or cables in direct contact with the TB-Boot. Prior to TB-Boot installation, fill voids in retention wall substrate and tie-back head assembly with spray foam (min. 20 PSI) or non-shrink grout. Prior to TB-Boot placement, install waterproofing membrane strip over soldier pile.

Fill pre-formed of TB-Boot with 2-part urethane spray foam (min. 20 PSI) and place over tie-back head before foam sets up. Secure TB-Boot to soil retention system with washer-head fasteners along the outside edge of the flat base. Apply ¼" (6mm) thick by 3" (75mm) wide continuous ring of Bentoseal onto the flat base just to the outside of the ½" (12mm) raised collar. Install Cortex and then Voltex DS membrane overlapping the entire flat base to the ½" (12mm) raised collar. Secure both the Cortex and Voltex DS sheet edge with washer-head fasteners just outside the ½" (12mm) raised collar so that the fasteners pass through the Bentoseal ring; typical fastener spacing 6" (150mm) on center. Do not install fasteners or puncture TB-Boot inside of the ½" raised collar. Complete detail by applying continuous counter flashing of Bentoseal along Voltex DS field sheet edge.

For soil nail rod and plate assemblies, install applicable TB-Boot over assembly and fasten to shoring wall. Install Cortex and then Voltex DS with Bentoseal detailing per TB-Boot installation guidelines herein.

Penetrations: Install a cut collar of Cortex tightly around the penetration; extending Cortex around penetration a minimum 12" (300 mm) radius.

Apply Bentoseal over Cortex collar around penetration; extending Bentoseal a minimum 3" (75 mm) radius at minimum ¼" (6 mm) thickness. Then install main course of Voltex DS membrane tightly around the penetration over Cortex. Finally, detail around penetration with ¾" (18 mm) thick cant of Bentoseal mastic. With sleeved penetrations, fill the gap between the pipe and the sleeve with Department of Transportation (DOT) non-shrink grout or 2-part polyurethane spray foam (min. 20 psi) and install mechanical seal (by Others) around the pipe (Figure H4-5A).

Rebar Anchorage: Install Bentoseal ¾" (18 mm) thick around all rebar anchorage penetrating Voltex DS. Then install a length of Waterstop-RX around the shaft of the rebar anchorage (Figure H4-6) securing it with zip tie or rebar wire.

Waterstop: As part of Division 3 Shotcrete Work, the shotcrete contractor should install one strip of Waterstop-RX 101 into each shotcrete lift joint, and two strips of Waterstop-RX 101 at all construction cold joints regardless of whether the joint will encounter hydrostatic or non-hydrostatic conditions. Applicable construction cold joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place columns; and daily shotcrete lift joint stops. Refer to Waterstop-RX product literature for installation guidelines.

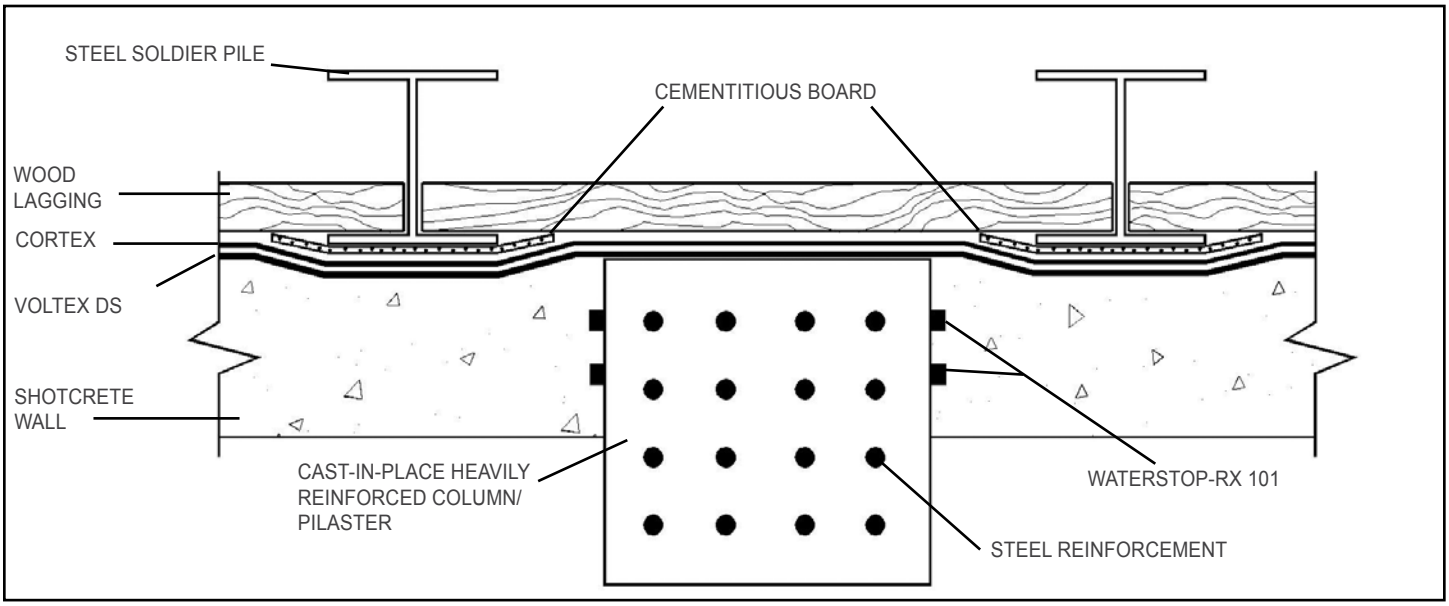

Figure H4-1: CAST-IN-PLACE STRUCTURAL COLUMNS AND PILASTERS
For HydroShield Warranty eligibility, CETCO requires that structural columns and pilasters be constructed with cast-in-place concrete. It is extremely difficult to properly apply and consolidate shotcrete, behind heavy or closely spaced steel reinforcement.

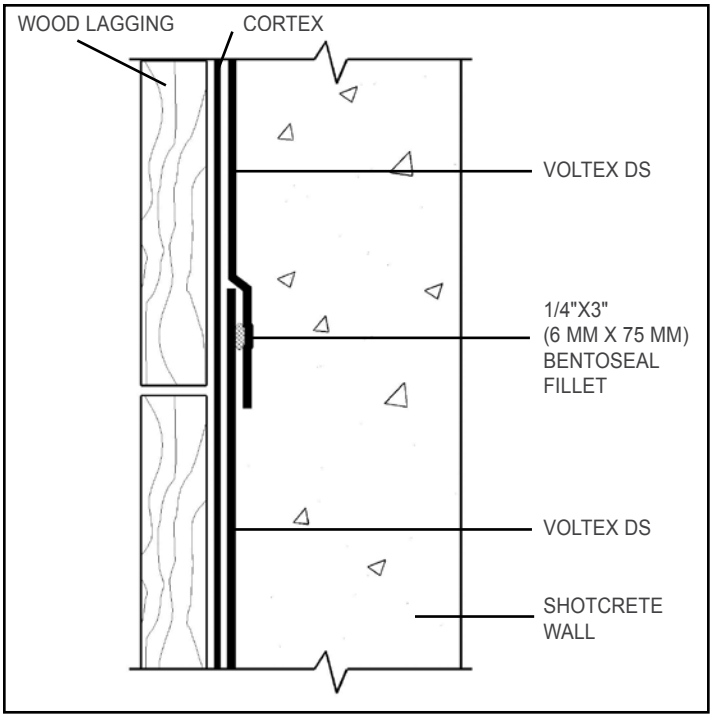

Figure H4-2: APPLY BENTOSEAL IN OVERLAPS
Prior to installing adjacent Voltex DS sheets, apply continuous 1/4" x 3" trowel of Bentoseal along top and side edges of previously installed Voltex DS sheet

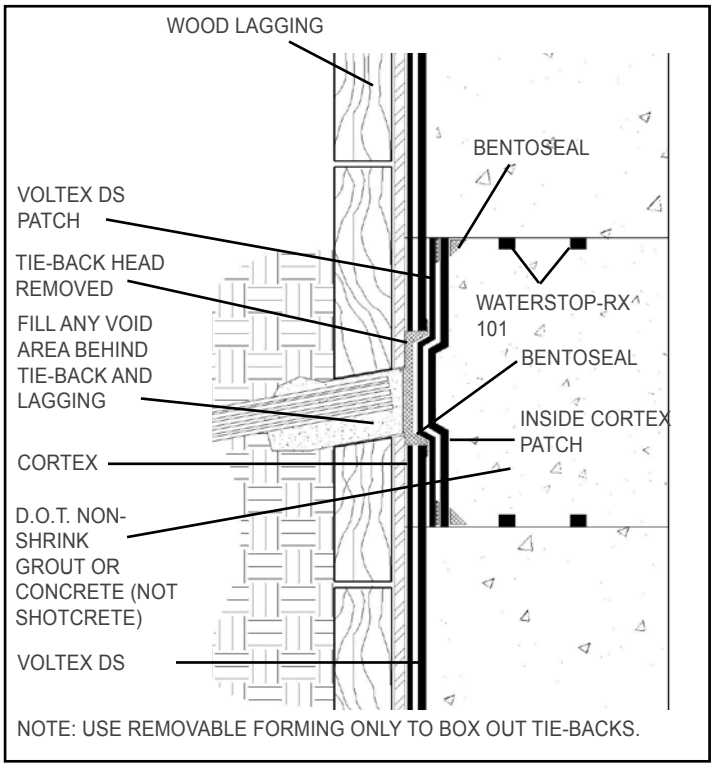

Figure H4-4: TIE-BACK BOX OUT DETAIL
After tie-back head removal, complete detail by installing Voltex DS patch, Bentoseal, inside Cortex patch, and Waterstop-RX. Only use D.O.T. approved non-shrink grout or concrete to fill box out (no shotcrete).

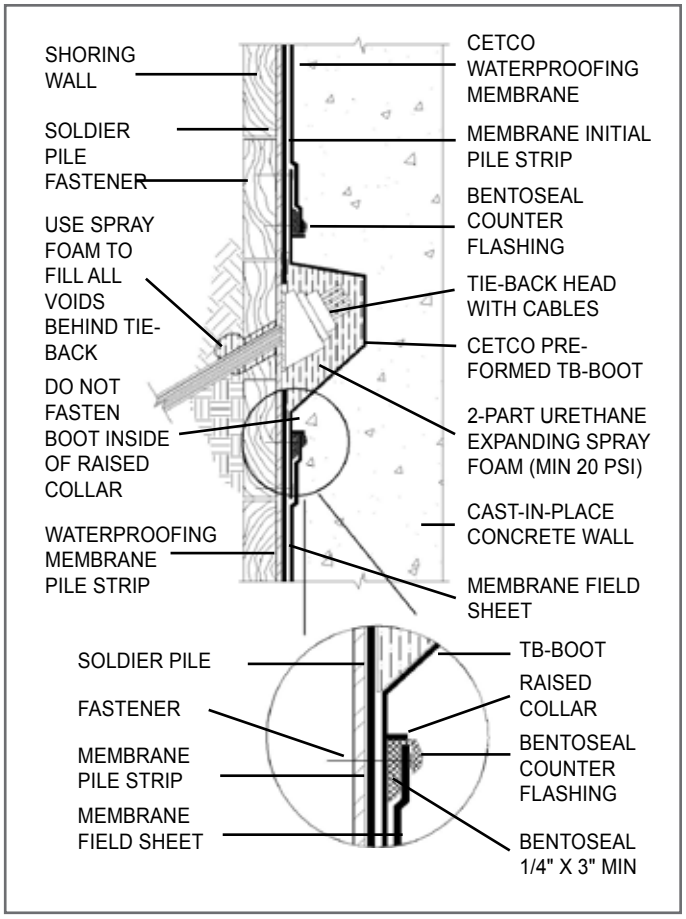

Figure H4-3 TIE-BACK DETAIL
Install TB-Boot centered over tie-back then install Voltex DS with Bentoseal detailing. Do not fasten boot inside of raised collar around center formed area.

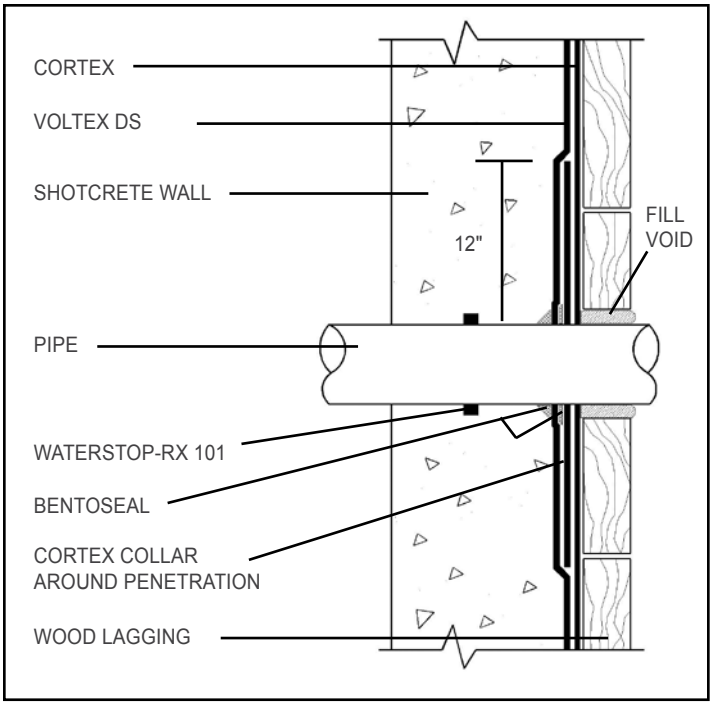

Figure H4-5: WALL PENETRATION
Cut and secure Voltex DS tightly around penetrations and then apply Bentoseal ¾" (18 mm) ring around penetration and extend over membrane a minimum 3" (75 mm) radius at minimum ¼" (6 mm) thickness.

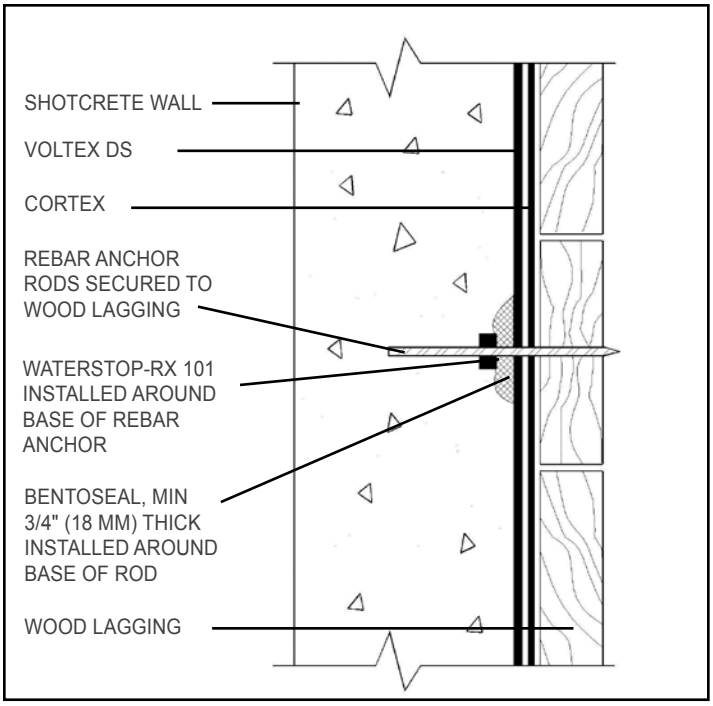

Figure H4-6: REBAR ANCHORAGE
Install Bentoseal ¾" (18 mm) thick around all rebar anchorage penetrating Voltex DS. Then install a length of Waterstop-RX around the shaft of the rebar anchorage secured with plastic zip tie or rebar wire.

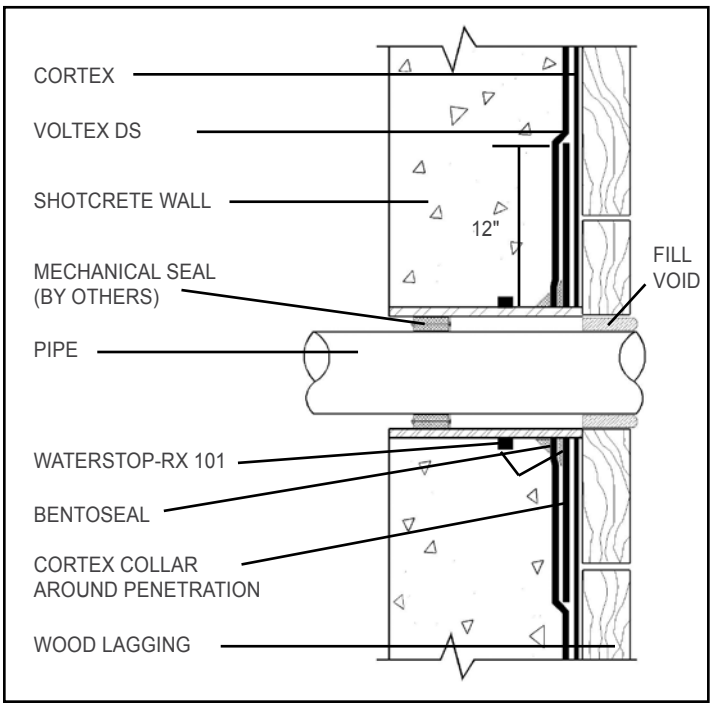

Figure H4-5A: SLEEVED WALL PENETRATION
Cut and secure Voltex DS tightly around penetrations and then apply Bentoseal ¾" (18 mm) thick ring around penetration and extend over membrane a minimum 3" (75 mm).

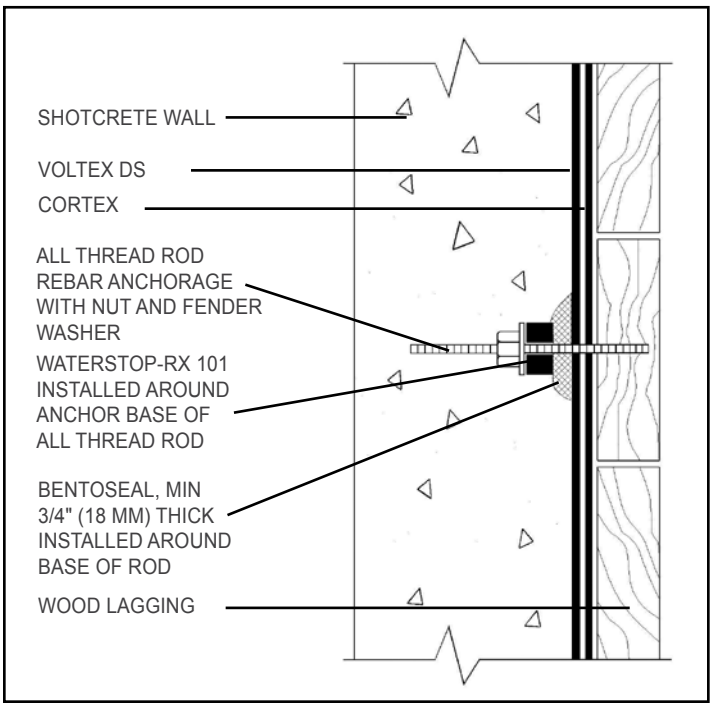

Figure H4-6A: REBAR ANCHORAGE (ALL THREAD)
Install Bentoseal ¾" (18 mm) thick and Waterstop-RX 101 around all rebar anchorage penetrating Voltex DS. Tighten nut and fender washer down all thread rod until compressing RX-101.

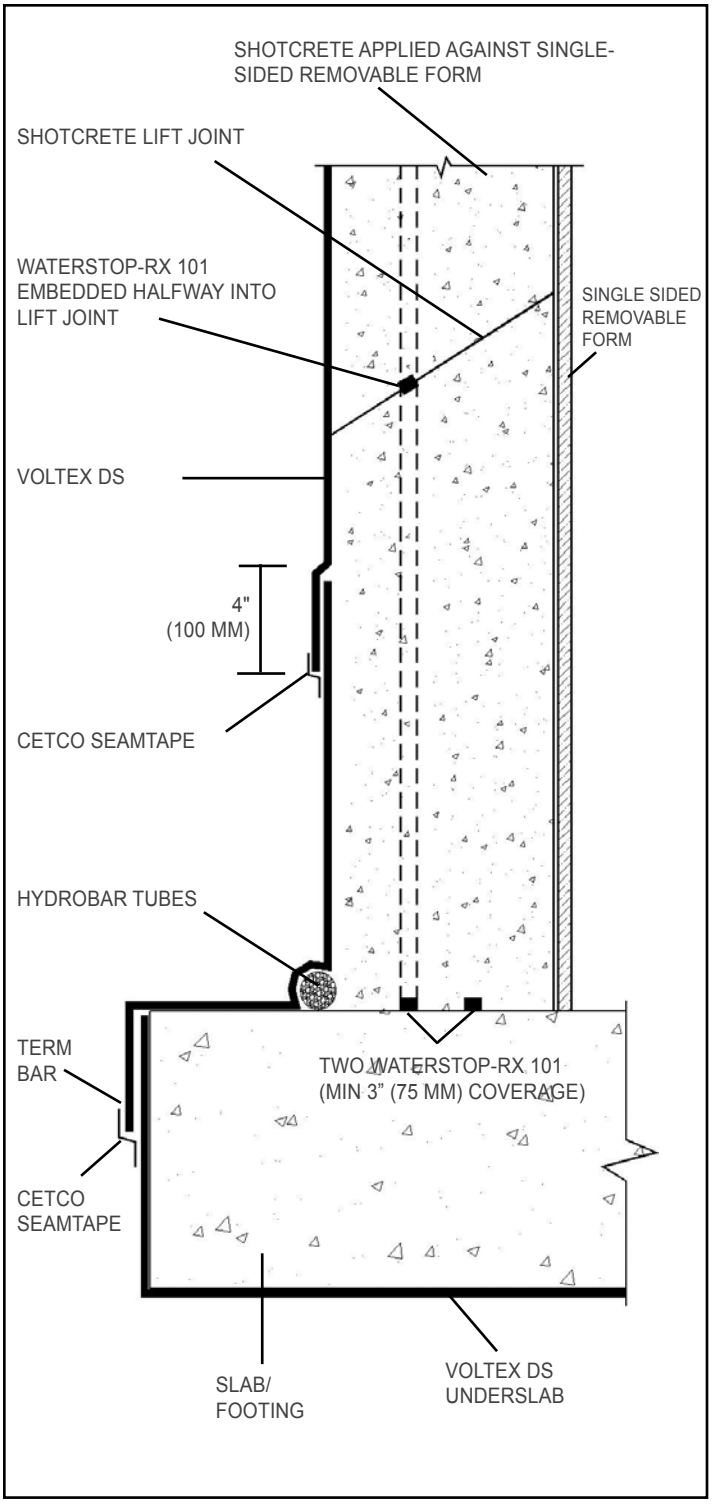

Figure H5-1: HYDROSTATIC BACKFILLED SHOTCRETE WALL

After form removal and surface prep, install Voltex DS to exterior surface of shotcrete wall with all seams overlapped minimum 4" (100 mm). Apply CETCO Seamtape to all Voltex DS overlap seams.

SECTION - H5 BACKFILLED WALLS

For backfilled walls constructed with shotcrete applied against single-sided removable form, install course of Voltex DS (dark gray geotextile side against concrete) to the exterior surface of the shotcrete wall. Install waterproofing only after inspection and repair of shotcrete wall surface. Shotcrete wall should be sound and without any defects including non-consolidated or irregular surface areas.

Prior to waterproofing, install line of Hydrobar Tubes at the wall/footing corner. Install base course of Voltex DS membrane horizontally oriented with the bottom edge extending to overlap underslab waterproofing a minimum of 6" (150 mm). Secure Voltex DS with washer-head fasteners and overlap sheet edges minimum 4" (100 mm) during the installation of both courses. Apply CETCO Seamtape to all Voltex DS overlap seams.

After the bottom horizontal course, Voltex DS sheets can be installed either vertically or horizontally oriented. Continue Voltex DS installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 12” (300 mm). Do not allow horizontal Voltex DS overlap joints to run at same elevation as the shotcrete lift joints. Plan by chalk lining the location of shotcrete lift joint lines.

Refer to Section - H6 for applicable grade termination detailing and backfill operation guidelines.

Inspect completed waterproofing installation and repair any damaged material prior to backfill placement.

NOTE: Reinforced shotcrete walls shall conform to ACI 506 Core Grade 1 or 2. Do not use stay-in-place concrete forming; use removable forming products only.

SECTION - H6 EXCAVATION, BACKFILL & GRADE TERMINATION

Coordinate with excavation and backfill operations conducted under Division 31 Work to remove the top few wood lagging members and top of the steel soldier piles. Identify and repair any waterproofing damaged by excavation and removal of soldier pile heads and lagging.

Terminate Voltex DS and Cortex at grade detail with metal termination bar fastened 12" (300 mm) on center to exterior of shotcrete wall (Figure H5-2). Install 1/2" (12 mm) thick, continuous bead of CETSEAL centered on top edge of Voltex DS/Cortex system. Fully adhere 18" wide GF-40SA grade flashing strip to concrete wall with bottom edge overlapping top of Voltex DS/Cortex termination minimum 4" (100 mm). Complete detail with 3/8" bead of CETSEAL along top edge and overlap seams of GF-40SA flashing strip.

Care should be exercised during backfill operation to avoid damage to the waterproofing system. Division 31 backfill Work should follow generally accepted practices for backfilling and compaction of soil. Backfilled soils should be added in 6” to 12” (150 - 300 mm) lifts and compacted to a minimum 85% Modified Proctor density. Compacted aggregate backfill should be limited to 3/4” (18 mm) or less in size; non-washed gravel with fines included.

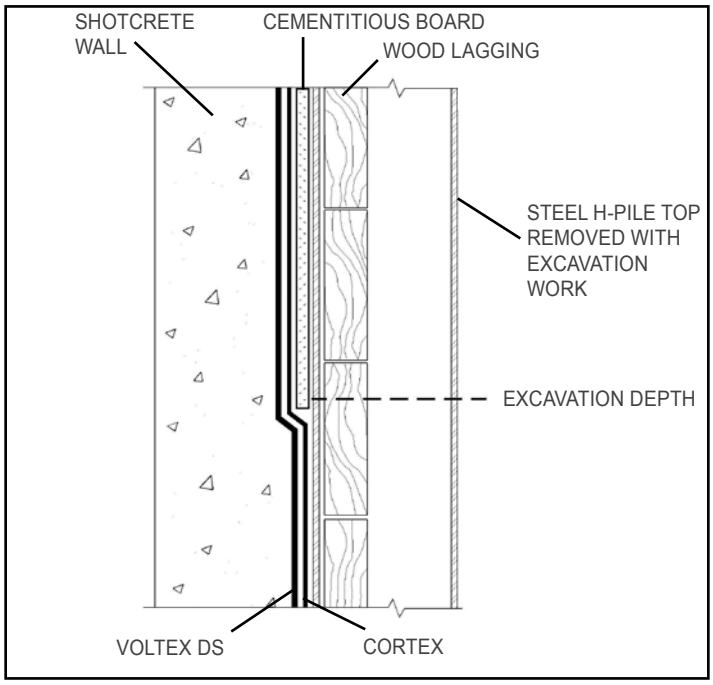

Figure H5-1: WALL EXCAVATION AT GRADE
Cementitious board protects waterproofing during excavation and removal of steel pile top and wood lagging.

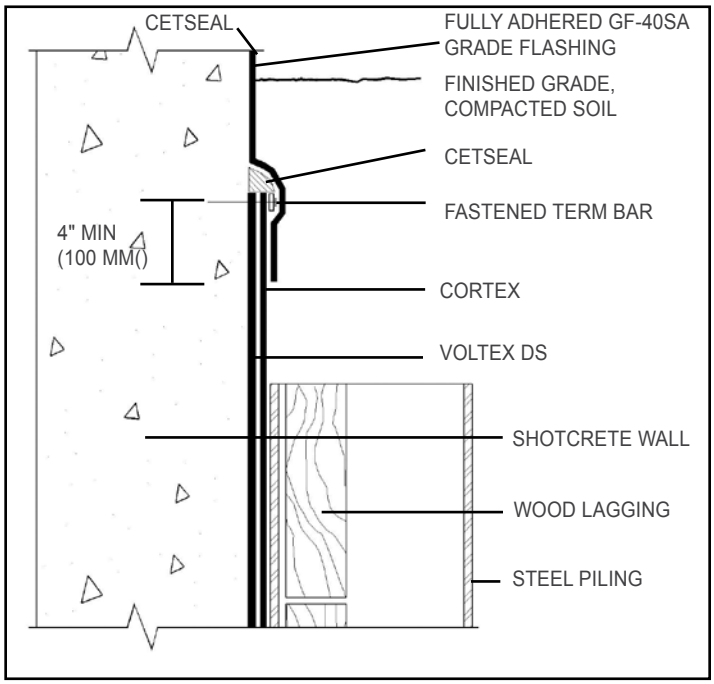

Figure H5-2: FULLY ADHERED GRADE FLASHING
Fully adhere 18" (450 mm) wide GF-40SA flashing strip to concrete wall with bottom 4" (100 mm) overlapping top of Voltex DS/Cortex installation.

INSTALLATION GUIDELINES FOR NON-HYDROSTATIC CONDITIONS

This section of the manual only covers the installation of the Voltex DS waterproofing system on foundation shoring walls where shotcrete will be applied as the structural wall under non-hydrostatic conditions with an operable water collection and discharge system. Non-hydrostatic condition means that the entire structure will be constructed above the historical high ground water elevation as determined by the projects geotechnical report. Before installing Voltex DS, read this installation section to gain familiarity with specific procedures and applications.

SECTION - NH1 GENERAL GUIDELINES

Install Voltex DS Waterproofing System with the dark gray geotextile side facing the installer so that the shotcrete will be shot against the dark gray geotextile side.

On shoring walls to receive shotcrete, install Voltex DS with minimum 6" (150 mm) sheet edge overlaps fastened with both washer-head fasteners placed 24" (600 mm) on center and pneumatic staples placed 6" (150 mm) on center. Install pneumatic staples within 1" (25 mm) of sheet edge to tightly secure entire overlap assembly to the shoring wall.

Secure center line of Voltex DS sheets to shoring wall with pneumatic staples or washer-head fasteners as required to hold membrane tight against shoring wall.

Voltex DS waterproofing system installation on a non-hydrostatic shotcrete foundation wall requires that the Aquadrain sheet and 100BD base drain composite system be connected to an operative water discharge system (sump pump or gravity to daylight). If the drainage system will not be connected to a operable water discharge system, instead of Aquadrain, install a course of Cortex over the shoring wall prior to installation of the Voltex DS waterproofing system.

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

Voltex DS waterproofing is not an expansion joint filler or sealant, but may be used as an expansion joint cover over properly installed expansion joint material placed during substrate preparation.

Protect adjacent work areas and finish surfaces from damage or contamination from waterproofing products during installation operations.

Shoring Wall: Excavation contractor should provide shoring wall in good condition to receive waterproofing system. Shoring should extend to the lowest level of the waterproofing installation with any voids or cavities exterior of the shoring filled with compacted soil or cementitious grout. With lagging, interior surface of lagging boards should be uniform and tight together with gaps less than 1" (25 mm). Gaps in excess of 1" (25 mm) should be filled with cementitious grout or CETCO approved polyurethane foam. Irregular lagging may require liner prior to waterproofing installation.

SECTION - NH2
AQUADRAIN INSTALLATION

At the base of the lagging wall, install Aquadrain 100BD base-drain horizontally oriented with the open core edge up and the 2" (50 mm) fabric flap side away from the lagging wall. Secure the bottom edge of 100BD to the lagging wall with washer-head fasteners every few feet. Use couplers and corner fittings, as required, to form a continuous 100BD installation. Install discharge outlet fittings to connect with operable discharge pipes as required for the project.

Install the bottom course of Aquadrain sheet drainage horizontally oriented (geotextile side against the lagging wall) with the sheet drain bottom edge fabric flap tucked behind the top edge of the 100BD against the lagging to prevent the passage of soil into the core at the connection. Bottom edge of sheet drain core should be in contact with open top core edge of 100BD. Place the 2" (50 mm) fabric flap of the 100BD over the back of the sheet drain core and secure it with CETCO Seamtape. Secure the top edge of 100BD to the shoring wall with washer-head fasteners 24" (600 mm) on center.

Install subsequent rolls of Aquadrain sheet drainage to within 12" (300 mm) of finished grade or as shown on the project drawings. Tightly abut adjoining sheet drain core edges and tuck the extra fabric flaps behind the adjacent roll edge to keep soil from entering the sheet drain. Another installation method is to overlap the drain sheet core edges in a manner that sheds water to the outside. Secure sheet drain to shoring wall with fasteners.

Prior to installing Aquadrain sheet drainage composite near grade detail, install ½" (12 mm) thick cementitious wallboard centered over metal soldier pile from finished grade elevation to specified depth of soldier pile removal (Figure NH2-2). Cementitious wall board (Durock) will protect drainage and waterproofing when top of soldier pile is excavated and removed. Remove cementitious board with removal of soldier pile top and lagging.

Around penetrations and tie-back heads, cut sheet drainage composite to fit and wrap extra filter fabric around open core edge to prevent soil from entering core.

At the top of the sheet drain installation, wrap the filter fabric flap behind the exposed top core edge to prevent intrusion of soil into the core and secure sheet drain to wall with termination bar fastened 12" (300 mm) on center with the fabric wrapped.

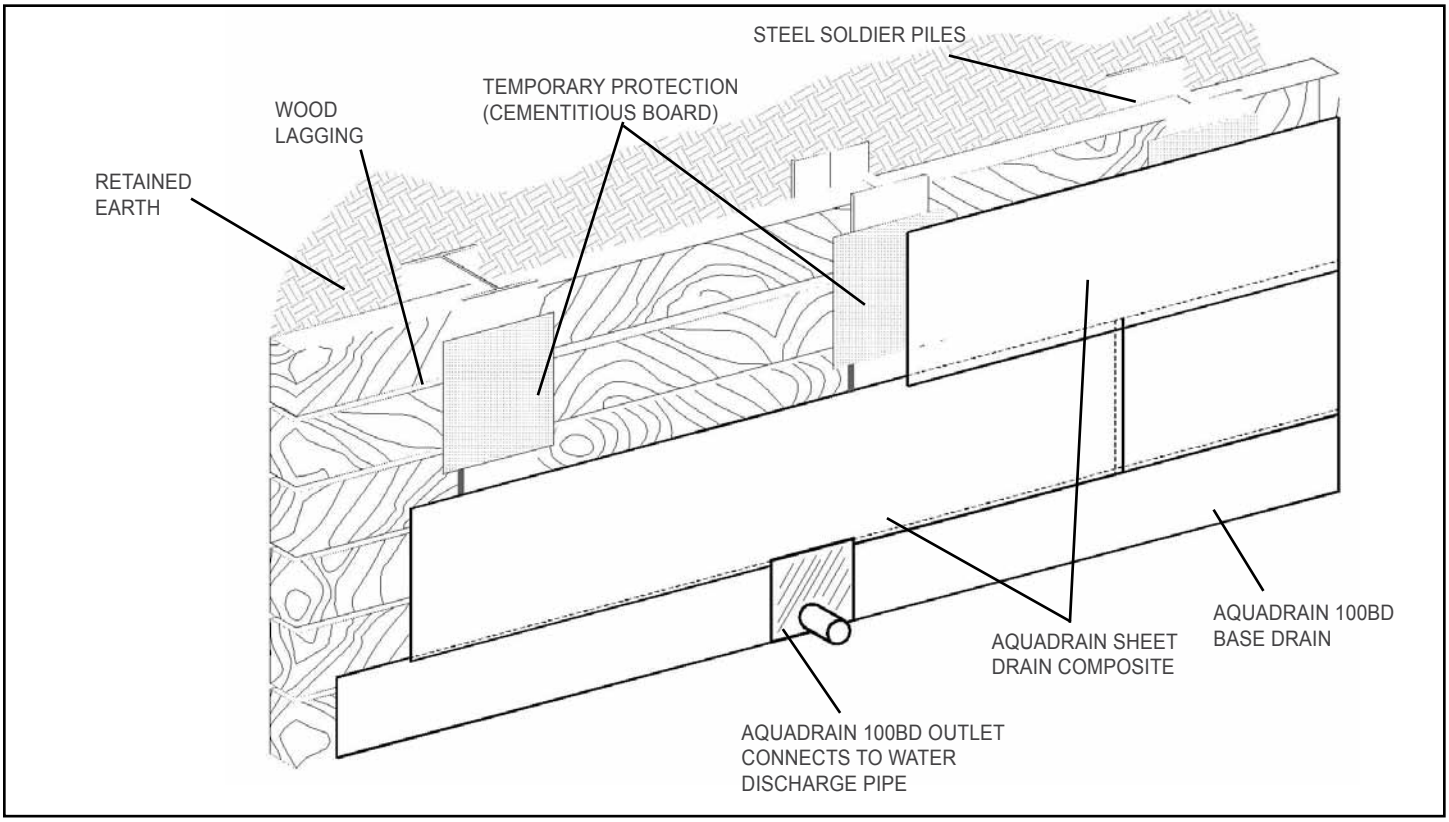

Figure NH2-1: AQUADRAIN SHEET DRAINAGE INSTALLED ONTO SHORING WALL PRIOR TO VOLTEX DS
Install Aquadrain sheet drainage over shoring wall prior to installing Voltex DS waterproofing membrane. Aquadrain should be applied from base of wall to grade level unless otherwise specified per project documents.

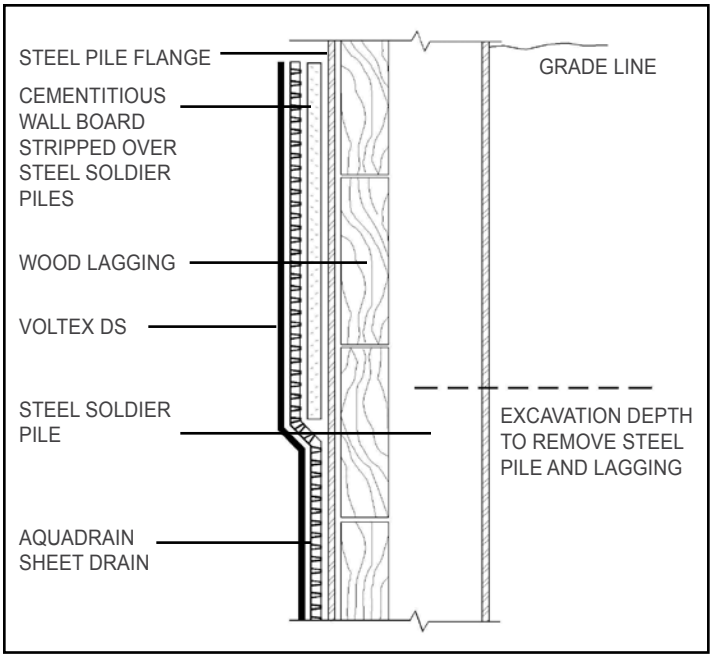

Figure NH2-2: CEMENTITIOUS BOARD AT GRADE
Install cementitious board strip over steel piling at grade to protect waterproofing during removal of top lagging boards and top of steel pile.

SECTION - NH3
SLAB TO WALL TRANSITION

Starting at the base of the shoring wall, install Voltex DS waterproofing over the Aquadrain drainage system previously installed in accordance with Section NH2.

For the slab to wall corner transition, install Voltex DS sheet horizontally oriented (dark gray geotextile side facing installer) with a minimum 12" (300 mm) of the bottom edge 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 DS sheet to lagging wall with washer-head fasteners maximum 24" (600 mm) on center. Overlap edges of adjacent Voltex DS sheets a minimum 6" (150 mm).

Install second Voltex DS sheet course horizontally oriented (dark gray geotextile side facing installer) onto the lagging wall over the corner transition sheet, with the bottom edge extending down to the wall/slab transition corner as shown in Figure NH3-1. Secure Voltex DS to lagging wall with washer-head fasteners maximum 24" (600mm) on center. Overlap edges of adjacent Voltex DS sheets a minimum 6" (150 mm). Further secure membrane overlap edges with pneumatic staples placed 6" (150 mm) on center within 1" (25 mm) of sheet edge.

Install underslab Voltex DS membrane extending to corner transition (dark gray geotextile side up), overlapping the 12" (300 mm) Voltex DS tail extending from Voltex DS corner transition sheet installed at the wall base. Secure corner edge of membrane with washer-head fasteners or pneumatic staples 12" (300 mm) on center.

If slab is greater than 24" (600 mm) thick, consult CETCO for guidelines.

NOTE: Reinforced shotcrete walls shall conform to ACI 506 Core Grade 1 or 2. Do not use stay-in-place concrete forming; use removable forming products only.

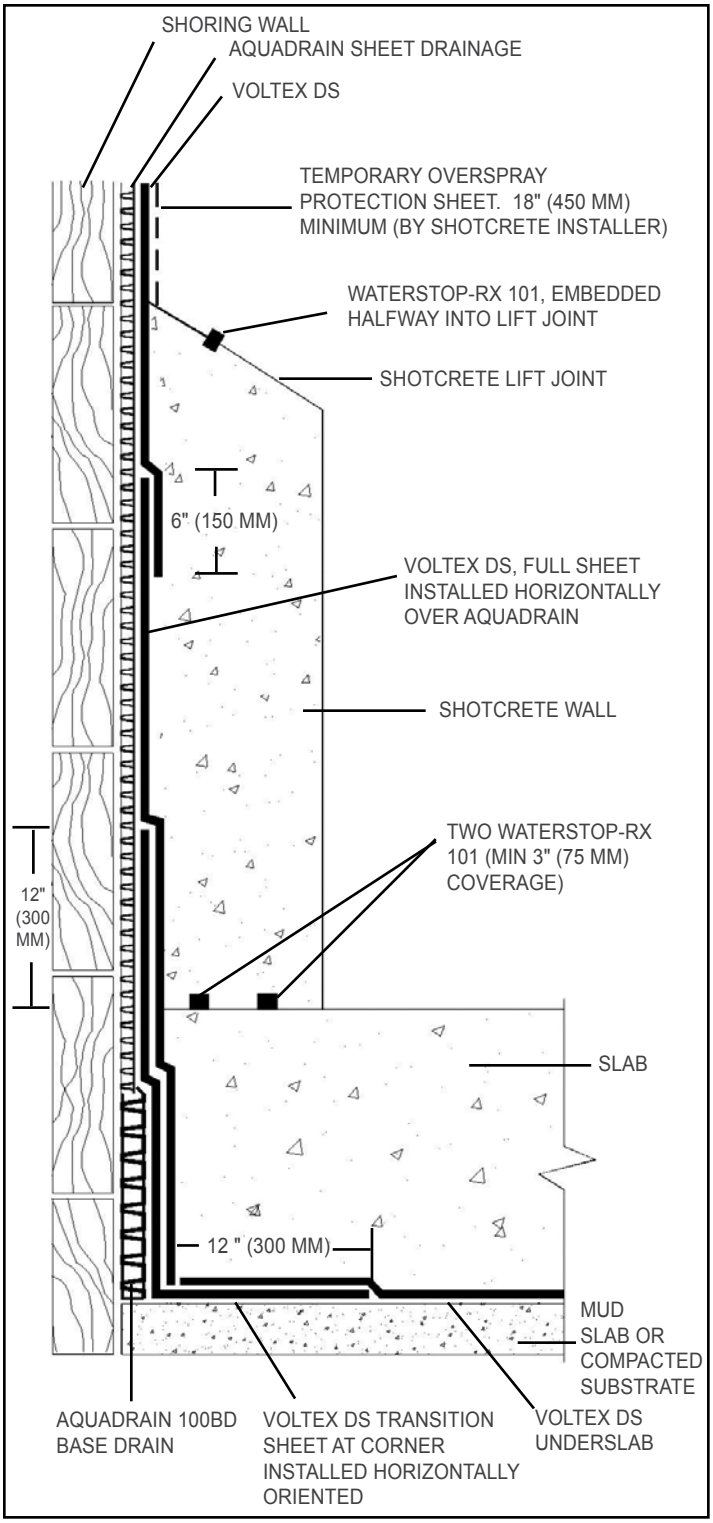

Figure NH3-1: NON-HYDROSTATIC SHOTCRETE WALL
Transition requires Voltex DS sheet installed horizontally over Aquadrain at the corner to extend 12" (300 mm) onto underslab substrate. Then install another Voltex DS sheet to lagging wall (horizontally oriented) over corner transition sheet. Install the underslab Voltex DS sheet to the slab/wall corner overlapping the Voltex DS transition sheet a minimum 12" (300 mm).

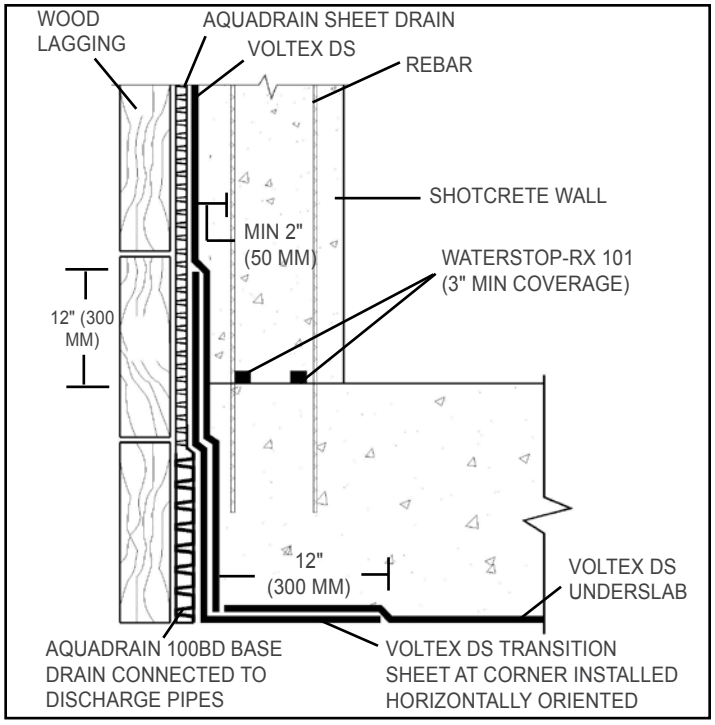

Figure NH3-2: SLAB TO WALL TRANSITION
Voltex DS sheet installed at the corner should extend past the height of the top of the finished slab level a minimum 12" (300 mm) and extend under the slab 12" (300 mm).

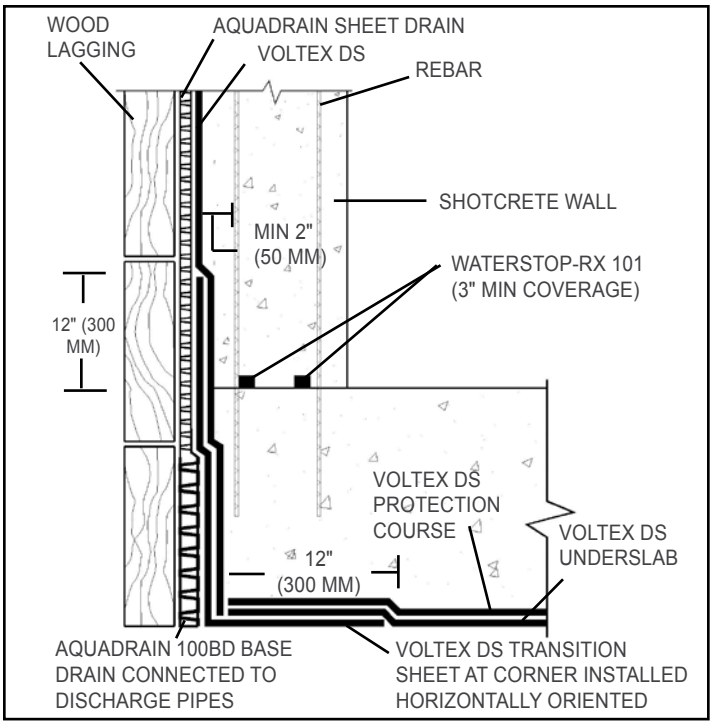

Figure NH3-2A: VOLTEX DS PROTECTION LAYER
As specified to provide protection, install a second course of Voltex DS over the first course of Voltex DS in lieu of concrete protection slab

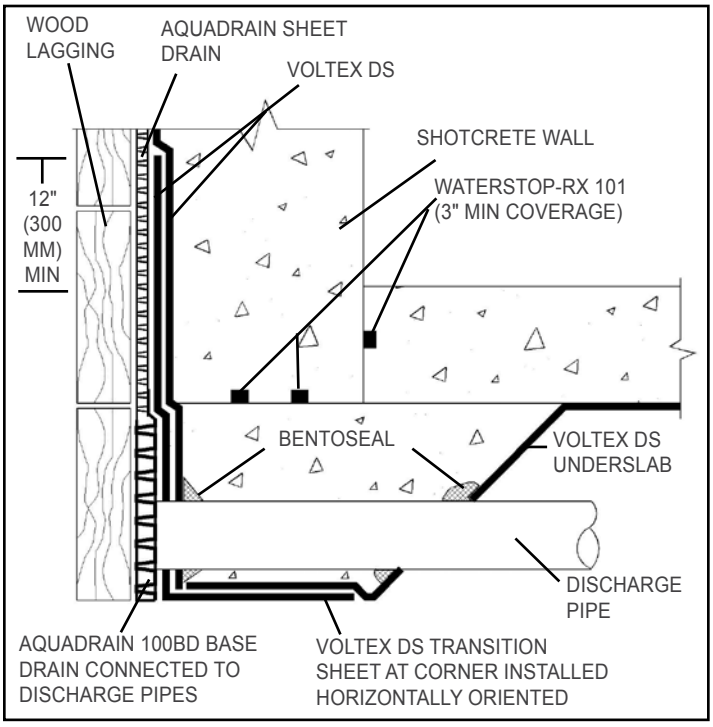

Figure NH3-3: AQUADRAIN 100BD DISCHARGE PIPE
Connect Aquadrain 100BD to water discharge pipes using 100BD accessory connectors.

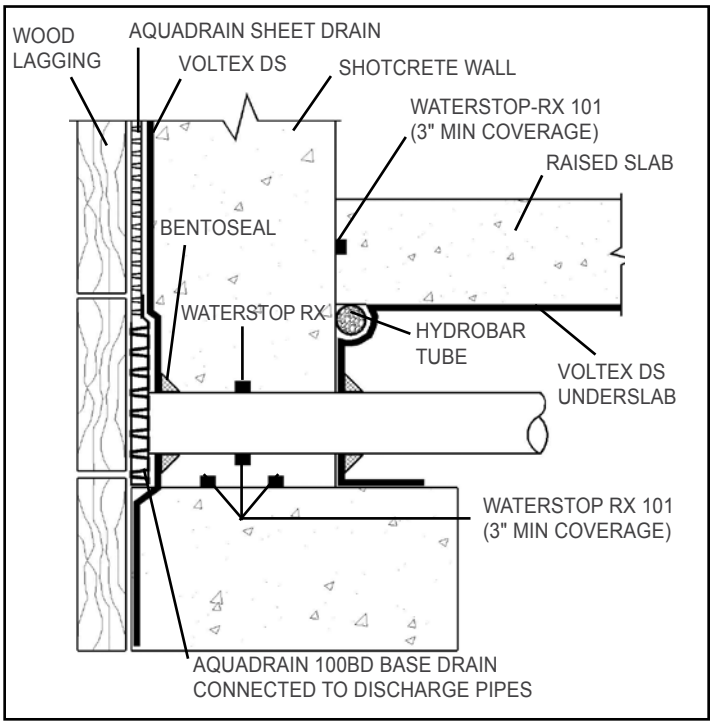

Figure NH3-4: RAISED SLAB CONDITION
Connect Aquadrain 100BD to water discharge pipes using 100BD accessory connectors.

SECTION - NH4
SHORING WALL

For HydroShield Warranty eligibility, CETCO requires that all heavily reinforced columns and pilasters integrated with or attached to the structural shotcrete foundation wall be formed and cast-in-place (Figure NH4-1). It is extremely difficult to place and consolidate shotcrete behind heavy or closely spaced steel reinforcement. Require the cast-in-place columns and pilasters be constructed prior to the connecting shotcrete walls. This will limit the possibility of overspray contamination to the column steel reinforcement and the column sides create a stable form surface to apply the adjacent shotcrete walls.

Membrane Installation: Install Voltex DS sheet to shoring wall (dark gray geotextile side facing installer), over Aquadrain sheet drainage, overlapping top edge of the previously installed Voltex DS corner transition a minimum 6" (150 mm) (Figure NH3-1). Overlap all adjacent sheet edges a minimum 6" (150 mm). Secure edge overlaps with both washer-head fasteners placed maximum 24" (600 mm) on center and pneumatic staples placed 6" (150 mm) on center within 1" (25 mm) of overlap edge. Secure center line of Voltex DS sheets to shoring wall with pneumatic staples or washer-head fasteners as required to hold membrane tight against shoring wall.

After the bottom horizontal course, Voltex DS sheets can be installed either vertically or horizontally oriented. Continue installation up wall until finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 12" (300 mm). Do not allow horizontal Voltex DS overlap joint to run at same elevation of the shotcrete lift joint. Plan by chalk lining the location of lift joint lines.

Inspect finished Voltex DS installation and repair any damaged material prior to shotcrete placement. Assure Voltex DS overlap is not separated during shotcrete placement.

Tie-Back Covers: Select appropriate size TB-Boot to fit over tie-back plate and allow proper concrete coverage per project requirements. TB-Boot should fit entirely over tie-back head without the tie-back plate or cables in direct contact with the TB-Boot. Prior to TB-Boot installation, fill voids in retention wall substrate and tie-back head assembly with spray foam (min. 20 PSI) or non-shrink grout. Install and secure Aquadrain drainage composite course per manufacturer's guidelines to soil retention wall prior to installing TB-Boot.

Fill pre-formed of TB-Boot with 2-part urethane spray foam (min. 20 PSI) and place over tie-back head before foam sets up. Secure TB-Boot to soil retention system with washer-head fasteners along the outside edge of the flat base. Apply ¼" (6mm) thick by 3" (75mm) wide continuous ring of Bentoseal onto the flat base just to the outside of the ½" (12mm) raised collar. Install Voltex DS membrane overlapping the entire flat base to the ½" (12mm) raised collar. Secure the Voltex DS sheet edge with washer-head fasteners just outside the ½" (12mm) raised collar so that the fasteners pass through the Bentoseal ring; typical fastener spacing 6" (150mm) on center. Do not install fasteners or puncture TB-Boot inside of the ½" raised collar. Complete detail by applying continuous counter flashing of Bentoseal along Voltex DS field sheet edge.

For soil nail rod and plate assemblies, install applicable TB-Boot over assembly and fasten to shoring wall through Aquadrain. Install Voltex DS with Bentoseal detailing per TB-Boot installation guidelines herein.

Penetrations: Install a cut collar of Voltex DS tightly around the penetration; extending Voltex DS around penetration a minimum 12" (300 mm) radius. Apply Bentoseal over Voltex DS collar around penetration; extending Bentoseal a minimum 3" (75 mm) radius at minimum ¼" (6 mm) thickness. Then install main course of Voltex DS membrane tightly around the penetration. Finally, detail around penetration with ¾" (18 mm) thick cant of Bentoseal mastic. With sleeved penetrations, fill the gap between the pipe and the sleeve with Department of Transportation (DOT) non-shrink grout or 2-part polyurethane spray foam (min. 20 psi) and install mechanical seal (by Others) around the pipe (Figure NH4-5A).

Rebar Anchorage: Install Bentoseal ¾" (18 mm) thick around outward end of all rebar anchorage penetrating Voltex DS. Then install a length of Waterstop-RX around the shaft of the rebar anchorage (Figure NH4-6) securing it with plastic zip tie or rebar wire.

Waterstop: As part of Division 3 Shotcrete Work, the shotcrete contractor shall install one strip of Waterstop-RX 101 into each shotcrete lift joint, and two strips of Waterstop-RX 101 at all construction cold joints regardless of whether the joint will encounter hydrostatic or non-hydrostatic conditions. Applicable construction cold joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place columns; and daily shotcrete lift joint stops. Refer to Waterstop-RX product literature for installation guidelines.

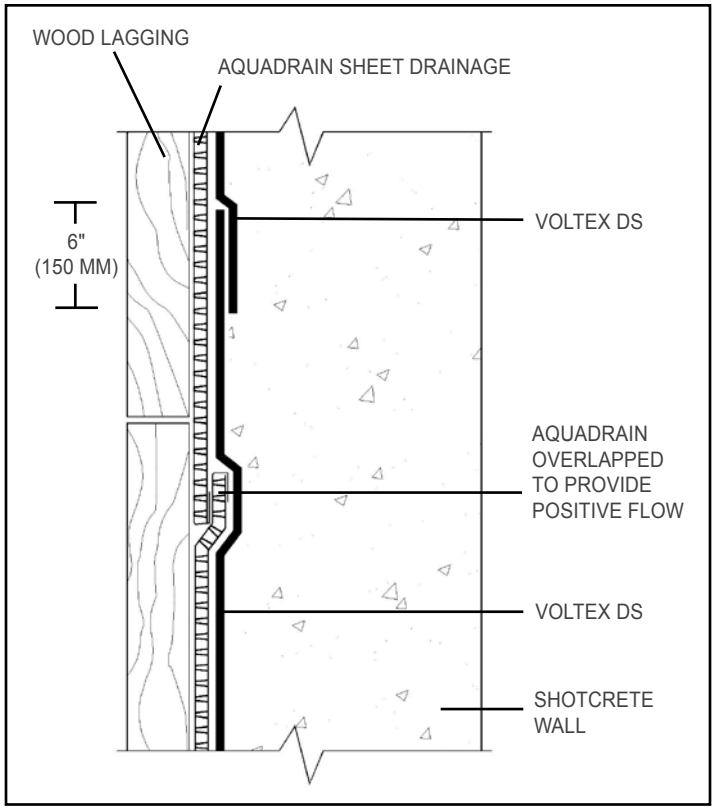

Figure NH4-2: OVERLAP VOLTEX DS EDGES 6"
Overlap all Voltex DS membrane edges a minimum 6" (150 mm). Fasten membrane edges 6" (150 mm) on center with staples within 1" (25 mm) of membrane edge.

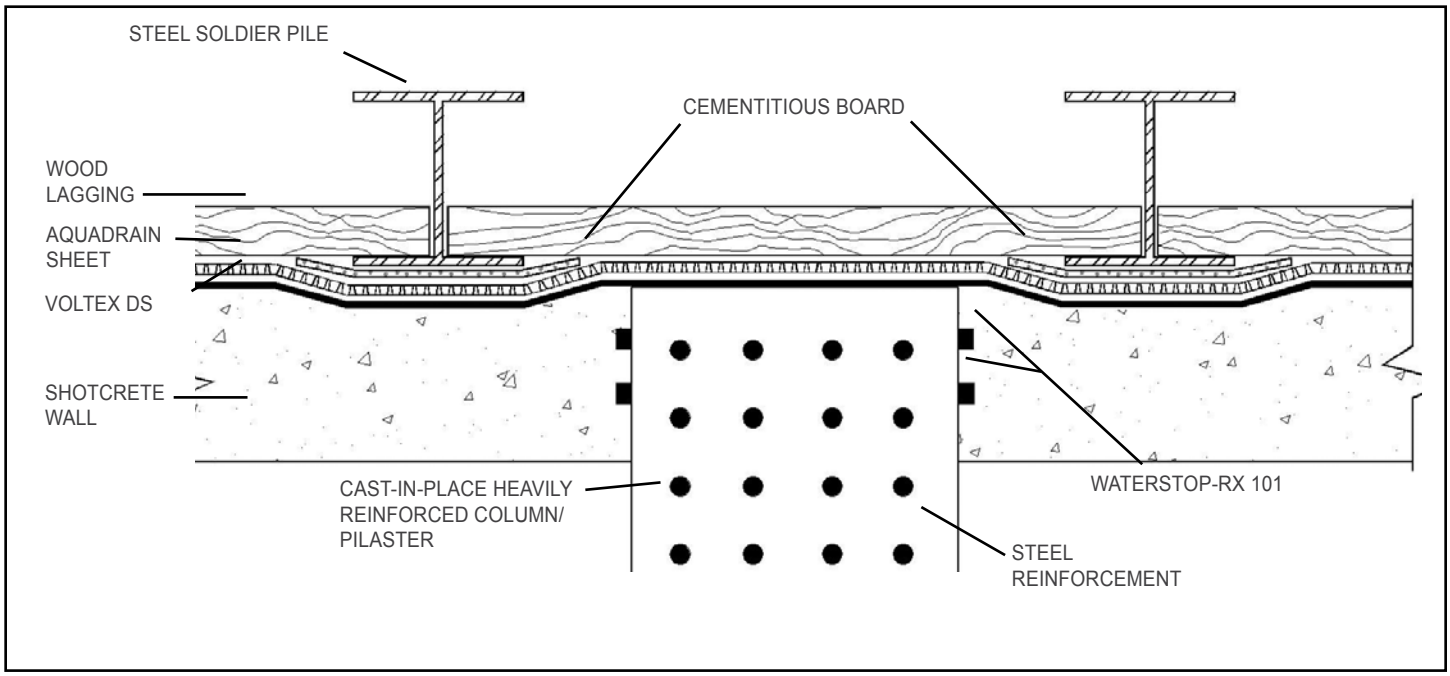

Figure NH4-1: CAST-IN-PLACE STRUCTURAL COLUMNS AND PILASTERS
CETCO HydroShiled eligibility requires that these structural components be cast-in-place (Figure H4-1). Sequence integrated cast columns and pilasters prior to spraying the connecting or adjoining shotcrete walls in order to minimize the impact of overspray and maintain the cleanest surface possible to pour against in these locations.

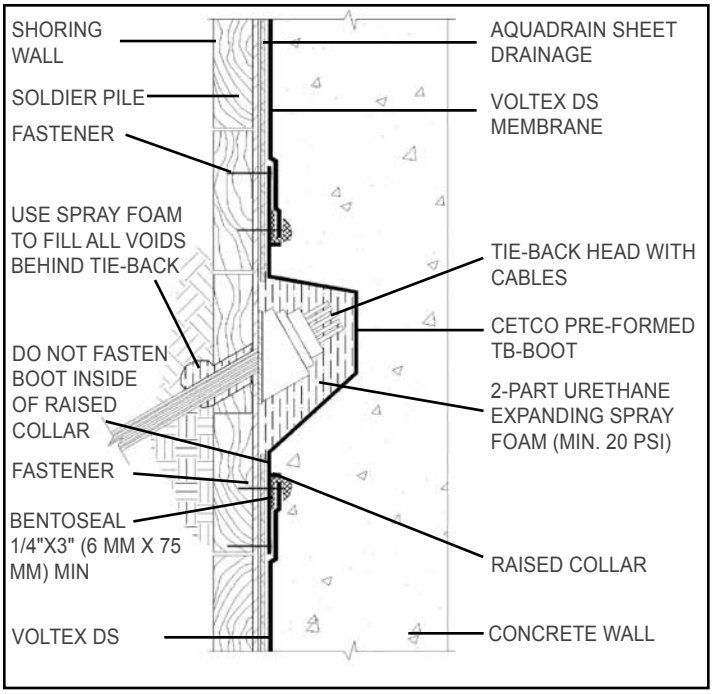

Figure NH4-3: TIE-BACK DETAIL
Install TB-Boot centered over tie-back then install main course of Voltex DS with Bentoseal detailing. Do not fasten boot inside of raised collar around center formed area.

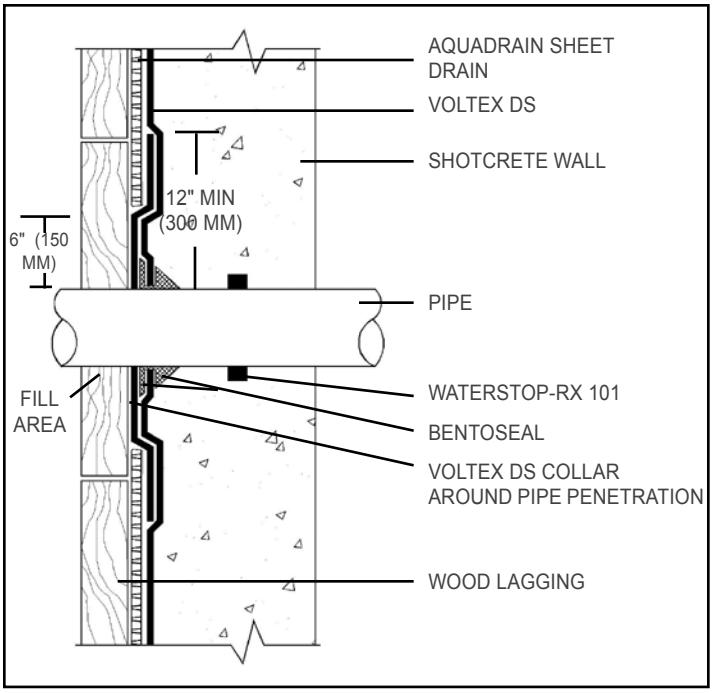

Figure NH4-5: WALL PENETRATION
Cut and secure Voltex DS tightly around penetrations and then apply Bentoseal ¾" (18 mm) ring around penetration and extend over membrane a minimum 6" (150 mm) radius at minimum ¼" (6 mm) thickness.

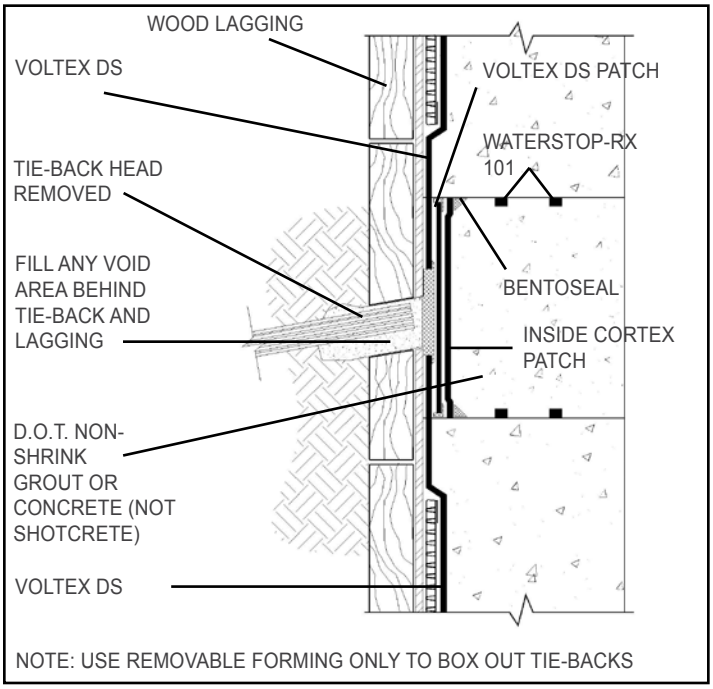

Figure NH4-4: TIE-BACK BOX OUT DETAIL
After tie-back head removal, complete detail by installing Voltex DS patch, Bentoseal, inside Cortex patch and Waterstop-RX. Only use D.O.T. approved non-shrink grout or concrete to fill box out (no shotcrete).

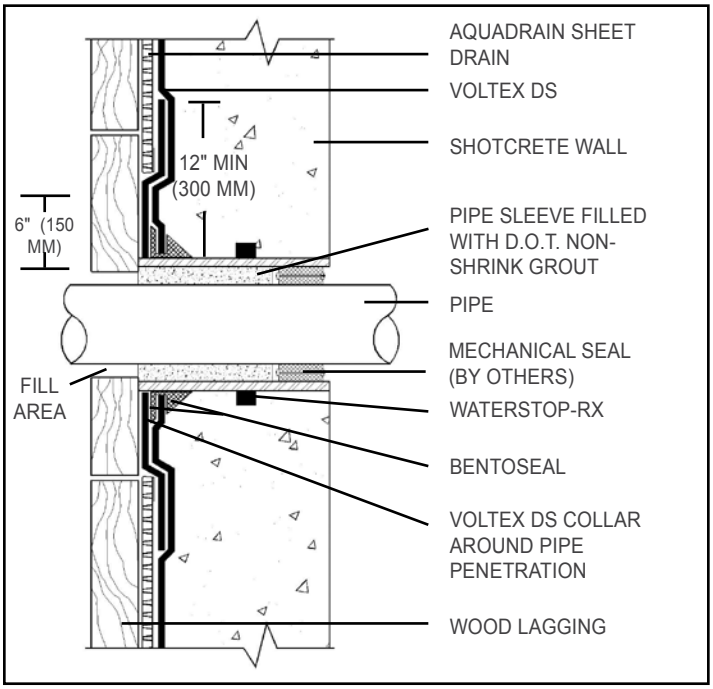

Figure NH4-5A: SLEEVED WALL PENETRATION
Cut and secure Voltex DS tightly around penetrations and then apply Bentoseal ¾" (18 mm) ring around penetration and extend over membrane a minimum 6".

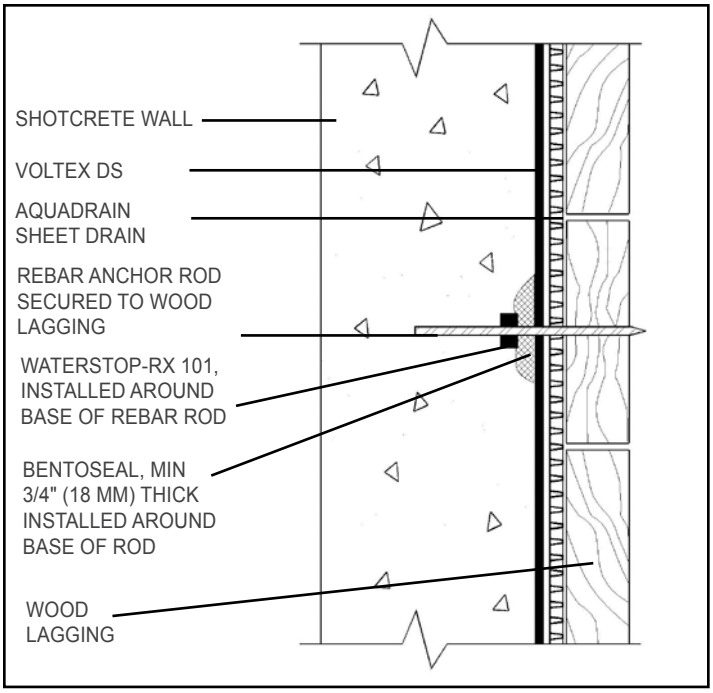

Figure NH4-6: REBAR ANCHORAGE
Install Bentoseal ¾" (18 mm) thick around all rebar anchorage penetrating Voltex DS. Then install a length of Waterstop-RX around the shaft of the rebar anchorage secured with plastic zip tie or rebar wire.

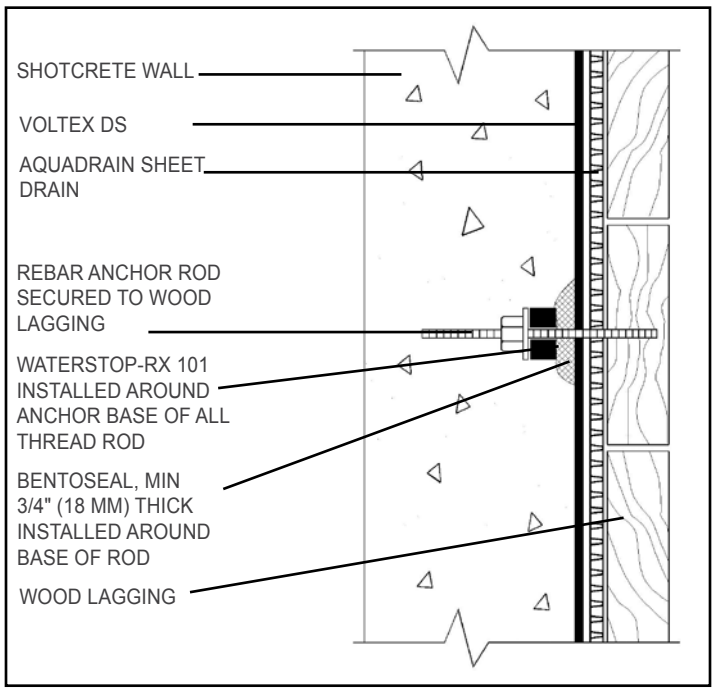

Figure NH4-6A: REBAR ANCHORAGE (ALL THREAD)
Install Bentoseal ¾" (18 mm) thick and Waterstop-RX 101 around all rebar anchorage penetrating Voltex DS. Tighten nut and fender washer down all thread rod until compressing RX-101.

SECTION - NH5
BACKFILLED WALLS

For backfilled walls constructed with shotcrete applied against single-sided removable form, install course of Voltex DS to the exterior surface of the shotcrete wall followed by course of Aquadrain drainage composite with operable Aquadrain 100BD collection and discharge system. Install waterproofing only after inspection and repair of shotcrete wall surface. Shotcrete wall should be sound and without any defects including non-consolidated or irregular surface areas.

Prior to waterproofing, install line of Hydrobar Tubes at the wall/footing corner. Install base course of Voltex DS membrane horizontally oriented (dark gray geotextile side against shotcrete) with the bottom edge extending out onto the footing a minimum 6" (150 mm). As applicable, terminate bottom edge with termination bar and Bentoseal or extend Voltex DS to overlap underslab waterproofing a minimum of 6" (150 mm). Secure Voltex DS with washer-head fasteners and overlap sheet edges minimum 4" (100 mm). Apply CETCO Seamtape to all Voltex DS overlap seams (Figure NH5-1).

After the bottom horizontal course, Voltex DS sheets can be installed either vertically or horizontally oriented. Continue Voltex DS installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum of 12" (300 mm). Do not allow horizontal Voltex DS overlap joints to run at same elevation as the shotcrete lift joint lines. Install Aquadrain drainage composite course directly over Voltex DS as specified.

Refer to Section - NH6 for applicable grade termination detailing and backfill operation guidelines.

Inspect completed waterproofing installation and repair any damaged material prior to backfilled placement.

NOTE: Reinforced shotcrete walls shall conform to ACI 506 Core Grade 1 or 2. Do not use stay-in-place concrete forming; use removable forming products only.

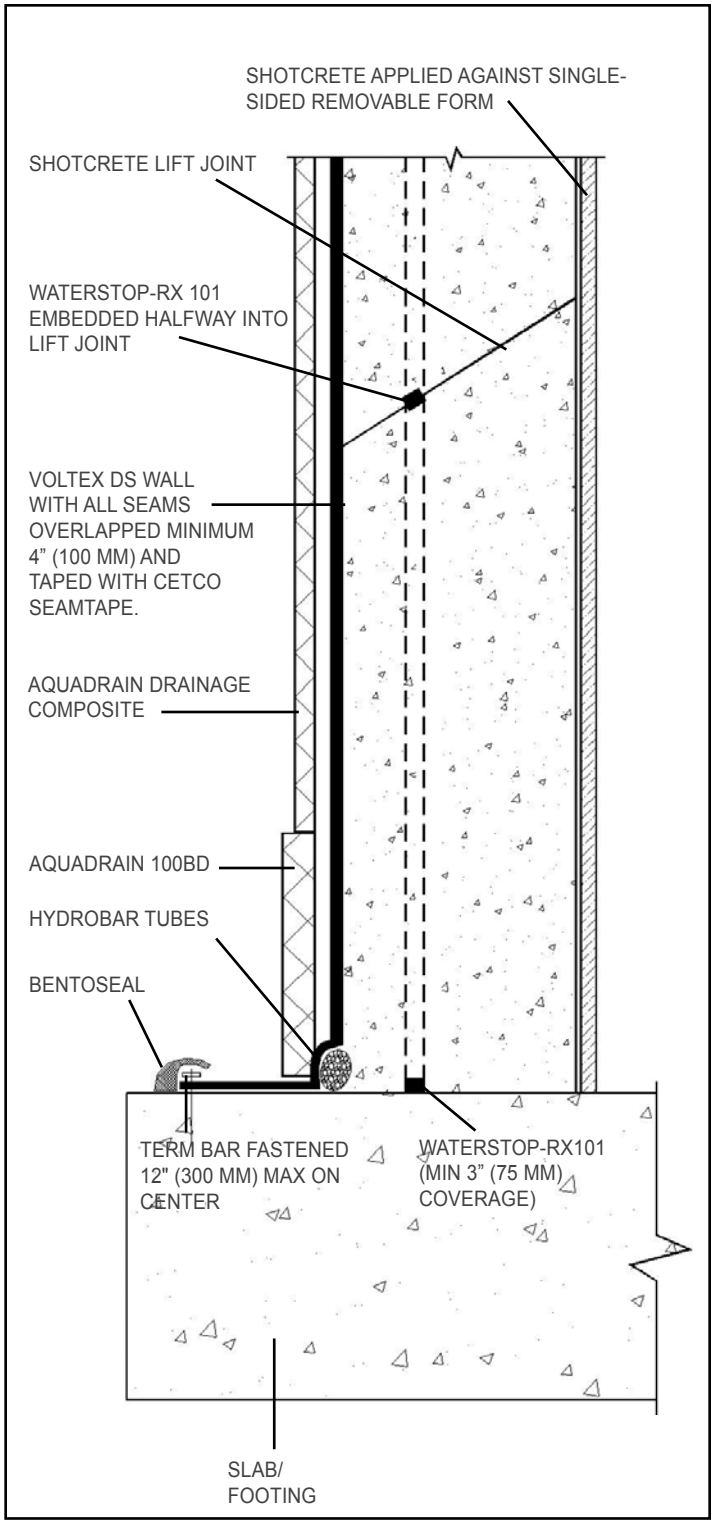

Figure NH5-1: NON- HYDROSTATIC BACKFILLED SHOTCRETE WALL
After form removal and surface prep, install course of Voltex DS to exterior surface of shotcrete wall with all seams overlapped minimum 4" (100 mm) and taped with CETCO Seamtape.

SECTION - NH6 EXCAVATION, BACKFILL & GRADE TERMINATION

Coordinate with excavation and backfill operations conducted under Division 31 Work to remove the top few wood lagging members and top of the steel soldier piles per local building code or as specified. Identify and repair any waterproofing and drainage sheet damaged by excavation and removal of soldier pile heads and lagging.

Terminate Voltex DS at grade elevation detail with metal termination bar fastened 12" (300 mm) on center to exterior of shotcrete wall. Install 1/2" (12 mm) thick, continuous bead of CETSEAL on top edge of Voltex DS system. Secure drainage sheet to shotcrete wall. Fully adhere 18" (450 mm) wide GF-40SA grade flashing strip to concrete wall with bottom edge overlapping top of Voltex DS termination minimum 4" (100 mm) (Figure NH6-1). Complete detail with 3/8" (10 mm) bead of CETSEAL along top edge and overlap seams of GF-40SA grade flashing strip.

Care should be used during backfill operation to avoid damage to the drainage and waterproofing system. Division 31 backfill Work should follow generally accepted practices for backfilling and compaction of soil. Backfilled soils should be added in 6" to 12" (150 - 300 mm) lifts and compacted to a minimum 85% Modified Proctor density. Compacted aggregate backfill should be limited to 3/4" (18 mm) or less in size; non-washed gravel with fines included.

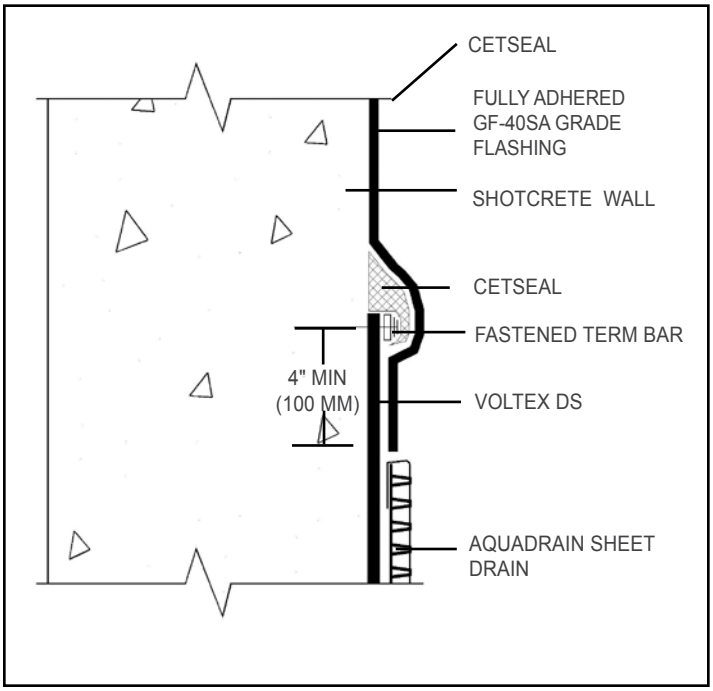

Figure NH6-1: FULL ADHERED GRADE FLASHING
Fully adhere 18" (450 mm) wide GF-40SA grade flashing strip to concrete wall with bottom 4" (100 mm) overlapping top of Voltex DS installation.

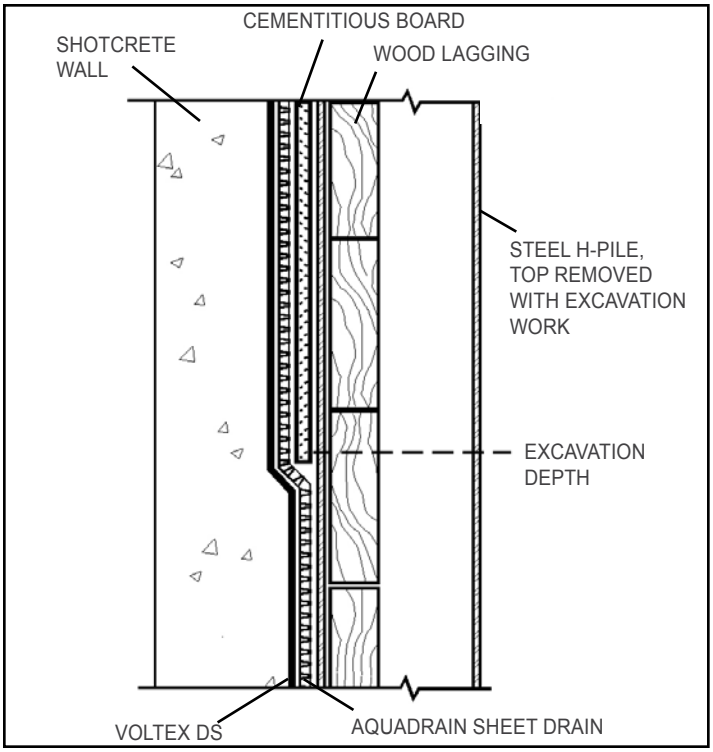

Figure NH6-2: WALL EXCAVATION AT GRADE
Cementitious board protects waterproofing during excavation and removal of steel pile top and wood lagging

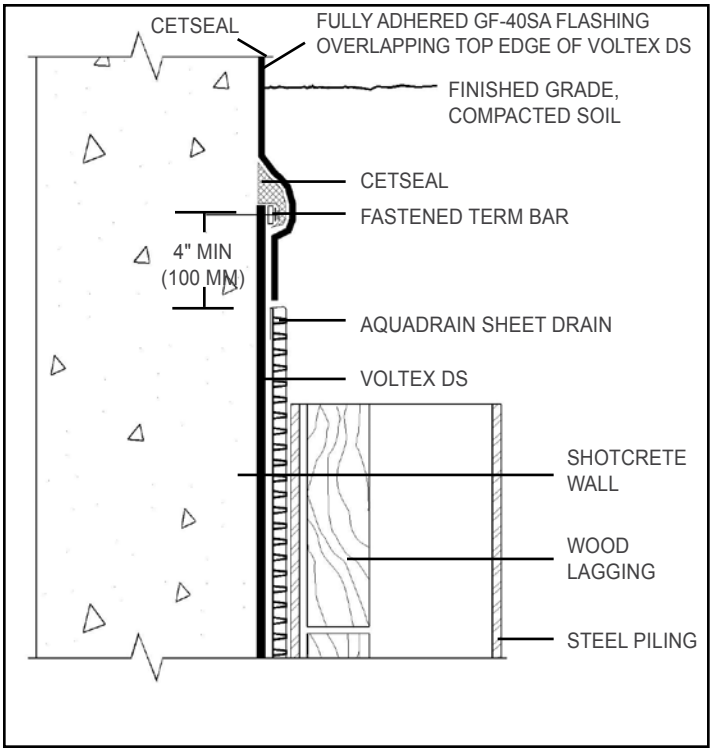

Figure NH6-3: GRADE TERMINATION
Terminate Voltex DS at grade detail with metal termination bar fastened 12" (300 mm) on center and apply CETSEAL centered on top edge system then install GF-40SA grade flashing detail .

SHOTCRETE PHOTO LIBRARY

PHOTO 1: KICKER FORM AT BASE OF SHOTCRETE WALL
Photo illustrates shotcrete placed in 24" (600 mm) kicker form without air velocity being consolidated by vibration.

SHOTCRETE PHOTO LIBRARY

PHOTO 2: SHOTCRETE FOUNDATION WALL
Photo illustrates shotcrete structural foundation wall being applied against Voltex DS/Cortex waterproofing system installed on wood lagging shoring retention wall above 24" (600 mm) kicker formed wall base.

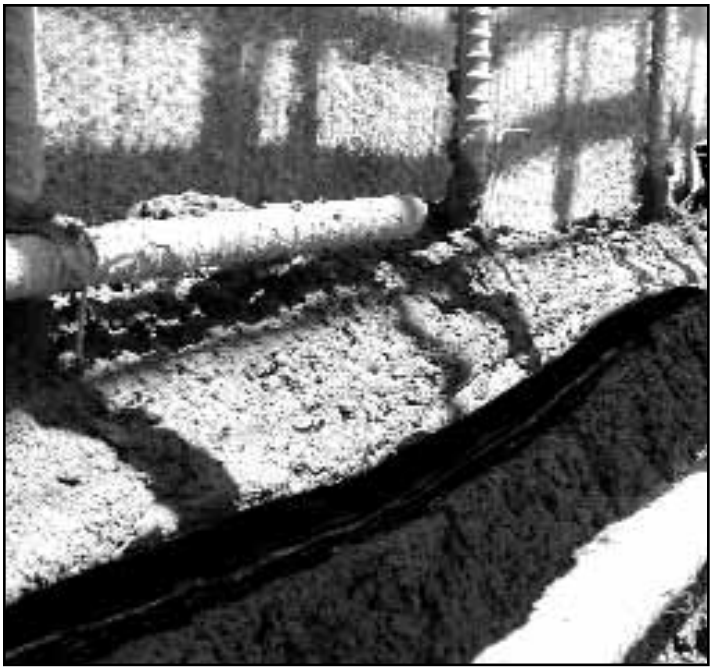

PHOTO 3: SHOTCRETE LIFT JOINT
Strip of Waterstop-RX 101 embedded in shotcrete lift joint by the shotcrete crew during the short work stoppage that allows the vertical work to continue without sloughing. Note how protective sheeting (removed) kept shotcrete overspray from contaminating Voltex DS for next lift work.

PHOTO 4: REBAR ANCHORAGE DETAILING
Trowel Bentoseal 3/4" (18 mm) thick, by 3" (75 mm) radius over Voltex DS at base of rebar anchor rod and then install strip of Waterstop-RX 101 around rod.

PHOTO 5: TB-BOOT OVER (HYDROSTATIC)
For Hydrostatic conditions, install TB-Boot over tie-back then install main course of Voltex DS with Bentoseal detailing.

PHOTO 6: TB-BOOT (NON-HYDROSTATIC)
For non-hydrostatic conditions, install TB-Boot over tie-back after Aquadrain drainage composite course; then install Voltex DS with Bentoseal detailing.

PHOTO 7: SHOTCRETE CORE GRADE 1
Shotcrete specimens are solid; there are no laminations, sandy areas or voids. Small air voids with a maximum diameter of 1/8" and a maximum length of 1/4" are normal and acceptable. Sand pockets, or voids, behind continuous reinforcement steel are unacceptable. The surface against the form of bond plane shall be sound, without a sandy texture or voids.

PHOTO 8: SHOTCRETE CORE GRADE 2
Shotcrete specimens shall have no more than two (2) laminations or sand areas with dimensions not to exceed 1/8" thick by 1" long. The height, width and depth of voids shall not exceed 3/8". Porous areas behind reinforcement steel shall not exceed 1/2" in any direction except along the length of the reinforcing steel. The surface against the form or bond plane shall be sound, without a sandy texture or voids.

IMPORTANT NOTICE
REGARDING SHOTCRETE DESIGN AND INSTALLATION

The performance of the Voltex DS waterproofing system described herein is dependent upon the shotcrete structural foundation wall being properly designed and constructed. It is important that all the elements which will aid in providing a well designed and correctly executed shotcrete job be written into the project specifications. Shotcrete Specification Section should explicitly detail type of shotcrete process, contractor and nozzleman experience and qualifications, materials, design mix, admixtures, acceptance/rejection criteria, quality and method of substrate preparation, steel reinforcing details and anchorage, construction joints, finish, curing procedure as well as the quality assurance methods and requirements that will be employed.

Require that shotcrete walls be placed in strict accordance with ACI 506.2-95 Core Grade 1 or 2, which includes, but not limited to, gunning all walls from the bottom up to their full design thickness in a single application, maintaining the lift height to a maximum of 4 feet (1.2 m), dampening absorptive substrates before placing shotcrete, removing rebound and sand pockets, properly encasing steel reinforcement, and properly curing the shotcrete installation. Stay-in-place forming products should not be used; use only conventional removable concrete forms.

As a condition of HydroShield warranty eligibility on shotcrete foundation wall applications, CETCO requires independent, third party inspection services hired by owner; to monitor shotcrete placement and to ensure that the shotcrete grades and minimum design requirements specified are met through a well executed, independently administrated quality assurance process. Also, specify the shotcrete subcontractor to have a minimum of three (3) years successful experience in structural shotcrete work of similar scope, mix type, and project size. Require shotcrete subcontractor to submit written evidence giving qualifications and experience of foreman, delivery equipment operator, nozzle helper (rebound cleaner), and nozzleman certifying that each has experience with the specified shotcrete mix type and the application technique required for the Work. Require that the nozzleman be ACI 506.3R-91 certified or other equivalent certification.

CONTACT CETCO FOR A COMPLETE LIST OF SHOTCRETE SPECIFICATION REQUIREMENTS TO COMPLY WITH ELIGIBILITY OF HYDROSHIELD WARRANTY. CONSULT WITH CETCO FOR APPLICATIONS NOT COVERED HEREIN.

CETCO®
phone: 800·527·9948 ■ 847·851·1800
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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: Voltex DS waterproofing system is not an expansion joint material. Expansion joints shall be the responsibility of Others.

MARCH 2010
(SUPERSEDES ALL PREVIOUS VERSIONS)