ULTRASEAL® AB WATERPROOFING MEMBRANE

PRODUCT MANUAL FOR SHOTCRETE FOUNDATION WALLS

THIS INSTALLATION MANUAL IS SPECIFICALLY FOR SHOTCRETE FOUNDATION WALL CONSTRUCTION

THE MANUAL IS DIVIDED INTO TWO SECTIONS: HYDROSTATIC AND NON-HYDROSTATIC CONDITIONS

SAFETY WARNING: This manual does not purport to address Environmental, Health, and Safety (EHS) concerns, if any, associated with the use of the referenced products and technologies. It is the responsibility of the user of this manual to establish and use appropriate EHS practices, procedures, Personal Protective Equipment (PPE), and determine the applicability of all regulatory and job site specific EHS requirements prior to performing work. Please refer to current Safety Data Sheet for EHS information.

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

THIS MANUAL CONTAINS THE GUIDELINES FOR TYPICAL INSTALLATION OF ULTRASEAL AB WATERPROOFING MEMBRANE ON FOUNDATION SHORING WALLS, WHERE SHOTCRETE WILL BE APPLIED AS THE STRUCTURAL WALL. THIS MANUAL DOES NOT COVER THE INSTALLATION OF ULTRASEAL AB WITH CAST-IN-PLACE CONCRETE APPLICATIONS. FOR APPLICATIONS NOT COVERED IN THIS MANUAL, CONSULT WITH YOUR DESIGN PROFESSIONAL. BEFORE INSTALLING ULTRASEAL AB, 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 handheld nozzle, after all the ingredients are mixed to project specification.

Application of shotcrete can create difficult conditions for ensuring 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 bond that normally occurs between the ULTRASEAL® AB and shotcrete.

Unlike cast-in-place (form-and-pour) concrete, the success in applying shotcrete is mostly dependent on the skill and experience of the shotcrete installation crew, especially the nozzlemen. 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. It is recommended that all shotcrete nozzlemen be certified through the American Concrete Institute's (ACI) established shotcrete nozzlemen certification program.

Furthermore, even properly applied shotcrete is more likely to develop shrinkage cracks than cast-in-place (form-and-pour) 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 ACI 506 R-16.

To address the difficult conditions of waterproofing shotcrete, CETCO has developed special product installation guidelines for design professionals to consider when specifying the ULTRASEAL AB membrane 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 groundwater level or historical high water table per project's geotechnical report.

Non-hydrostatic conditions exist when the project's geotechnical report has determined that no groundwater table exists or the elevation of the below-grade foundation is 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

ULTRASEAL® AB is a unique waterproofing membrane comprised of a polyethylene liner and an advanced Active Polymer Core (APC) layer integrally bonded to an aggressive pressure sensitive adhesive that locks the membrane to concrete. The active hydrophilic polymer APC layer swells and seals against water ingress while the aggressive adhesive bond to concrete prevents migration of water. This advanced membrane combines two proven technologies into one membrane to provide excellent waterproofing performance.

The aggressive adhesive bond is formed by pouring concrete directly against the membrane. The bond provides lateral water migration resistance continuously across the exterior surface of the concrete and ensures ULTRASEAL AB remains bonded to the concrete. Unlike other adhesive-bonding membranes, the APC Technology layer can seal small punctures and tears in the membrane resulting from construction activities conducted after the initial membrane installation. This active waterproofing sealing performance, in conjunction with the continuous adhesive bond, prevents water movement between the ULTRASEAL AB membrane and the concrete.

The APC Technology layer works by forming a very low permeable membrane layer upon contact with water. When hydrated, unconfined APC can swell many times its dry volume. When confined by backfill or concrete the swell is controlled, forming a dense, impervious waterproofing layer. The swelling action of the APC technology resists high levels of groundwater contaminants and can seal small concrete cracks caused by ground settlement, concrete shrinkage, or seismic action.

ULTRASEAL AB contains zero VOC's, can be installed in almost any weather condition, and most importantly has proven effective in both hydrostatic and non-hydrostatic conditions.

ASSOCIATED SYSTEM PRODUCTS

AKWASEAL®: Polyurethane grout injected into CETINJECT waterstop hose.
AQUADRAIN®: Foundation drainage composite consisting of a molded profile core and a filter fabric.
CEMENTITIOUS BOARD: 12 mm (½") thick cementitious wall board for protection of waterproofing during the removal of steel soldier pile cap and top lagging boards.
CETINJECT: Grout hose injection waterstop.
CXJ-200/CXJ-400: Extruded thermoplastic dual-cell center gland expansion joint with integrated side flashings.
TERMINATION BAR: Min. 25 mm (1") wide aluminum bar with pre-punched holes on 300 mm (12") centering for fastening.
VOLTEX®: Waterproofing membrane consisting of sodium bentonite between a woven and non-woven geotextile used to provide a performance substrate system.
WATERSTOP-RX®: Active, swelling concrete joint waterstop used around penetrations and applicable concrete joints. Swells upon hydration.

ACCESSORIES

AKWASWELL: Polyurethane-based caulk grade, single component hydrophilic swelling sealing/adhesive.
BENTOSEAL®: Trowel grade compound used to detail around penetrations, corner transitions and terminations.
CETSEAL: Multi-purpose, single component polyether moisture cure sealant/adhesive.
ENVIROSHEET: Self-adhered membrane for grade terminations and thru-wall flashing.
HYDROBAR® TUBES: Water soluble film tubing filled with bentonite, used at the footing/wall intersection.
SEAMTAPE: Premium tape used to seal overlapped membrane edges of ULTRASEAL AB.
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.

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

LIMITATIONS OF ULTRASEAL AB

Use ULTRASEAL AB with reinforced shotcrete walls, conforming to ACI 506.2-95 Core Grade 1 or 2; minimum 200 mm (8") thick, applied from the bottom up to their full design thickness in a single application with lift heights limited to a maximum 1.2 m (4'). Do not use stay-in-place concrete forming; use removable forming products only.

ULTRASEAL AB is not designed for above grade or unconfined waterproofing applications. Waterproofing products should not be installed in standing water or over ice. If groundwater 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. COREFLEX® or ULTRASEAL® XP may be required if contaminated groundwater or saltwater conditions exist.

ULTRASEAL AB is not designed for split-slab deck construction or to waterproof expansion joints. Do not use ULTRASEAL AB on masonry block foundation walls. Refer to other product manuals for installation instructions and limitations regarding underslab and cast-in-place (form-and-pour) concrete applications. Refer to CETCO's warranty documents for guidelines, eligibility, coverage and protocol. NOTE: Illustrations herein are not to scale.

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

INSTALLATION GUIDELINES FOR HYDROSTATIC CONDITIONS

This section of the manual covers the installation of the ULTRASEAL® AB waterproofing membrane on foundation shoring walls where shotcrete will be applied as the structural wall under hydrostatic groundwater conditions. Hydrostatic condition means that the base of the structure will be constructed below the historical high groundwater elevation as determined by the project geotechnical report. Before installing ULTRASEAL AB, read the installation guidelines to gain familiarity with specific procedures and applications.

SECTION - H1 GENERAL GUIDELINES

Install ULTRASEAL AB waterproofing membrane with the adhesive bond coat side (APC) facing the installer so that the shotcrete will be against the adhesive bond coat side. **On shoring walls to receive shotcrete, install ULTRASEAL AB with minimum 150 mm (6") sheet edge overlaps fastened with washer-head fasteners placed maximum 600 mm (24") on center.** Install washer-headed fasteners within 25 mm (1") of sheet edge to tightly secure membrane overlap to the shoring wall. Secure center line of ULTRASEAL AB sheets to shoring wall with washer-head fasteners as required to hold membrane tight against shoring wall (Figure H1-1). Additional fasteners can be used to secure the membrane tight to the shoring wall where necessary.

Prior to installing adjacent ULTRASEAL AB sheets, apply continuous 9 mm (3/8") bead of AKWASWELL along top and side edges of the installed ULTRASEAL AB sheet. Install AKWASWELL so it will be confined within the 150 mm (6") membrane edge overlap (Figure H1-1).

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.

ULTRASEAL AB 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. ULTRASEAL AB can also be tied into CXJ-200/CXJ-400 Expansion Joints. Refer to CXJ Expansion Joint installation guide for expansion joint installation instructions.

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

Substrate Preparation: Shoring wall should be in good condition to receive waterproofing membrane. 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 per project design. With lagging, interior surface of boards should be uniform and tight together with gaps less than 25 mm (1"). Gaps in excess of 25 mm (1") should be filled with cementitious grout per project design or CETCO approved 2-part spray closed cell polyurethane foam, minimum 20 psi compressive strength. For applications not covered in this manual consult with the project design professional.

SECTION – H2 VOLTEX® BASE

At the underslab-to-wall transition, first install ULTRASEAL AB membrane horizontally oriented (adhesive bond coat side facing the installer) with a minimum 300 mm (12") of the bottom portion extending out onto the substrate (Figure H2-1). Secure ULTRASEAL AB membrane edges to shoring wall with washer-head fasteners maximum 600 mm (24") on center. Overlap all adjacent sheets edges a minimum 150 mm (6"). The top membrane edge of this ULTRASEAL AB transition installation

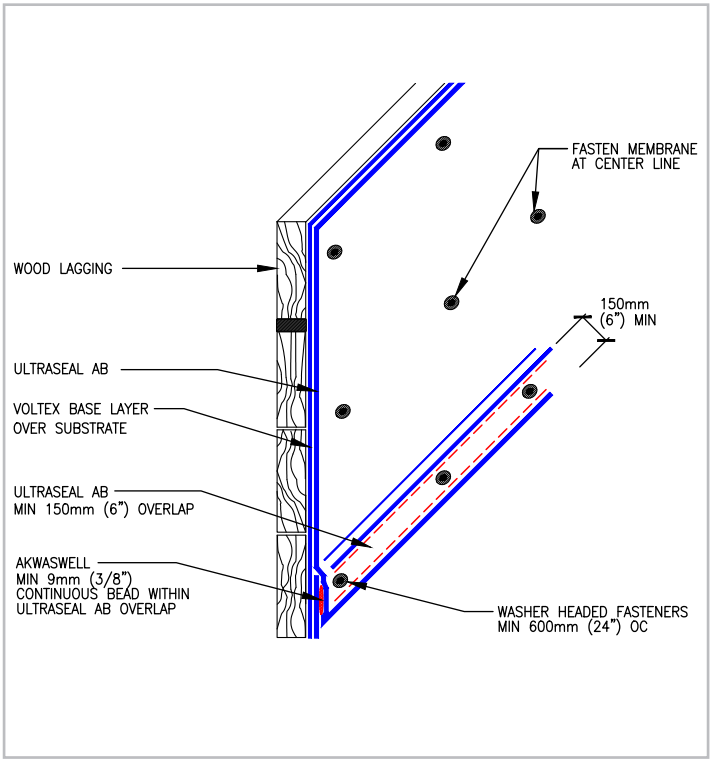

Figure H1-1: GENERAL WALL INSTALLATION
Install base VOLTEX base layer onto shoring then install ULTRASEAL AB layer directly over base VOLTEX layer with washer-head fasteners placed maximum 600 mm (24") on center

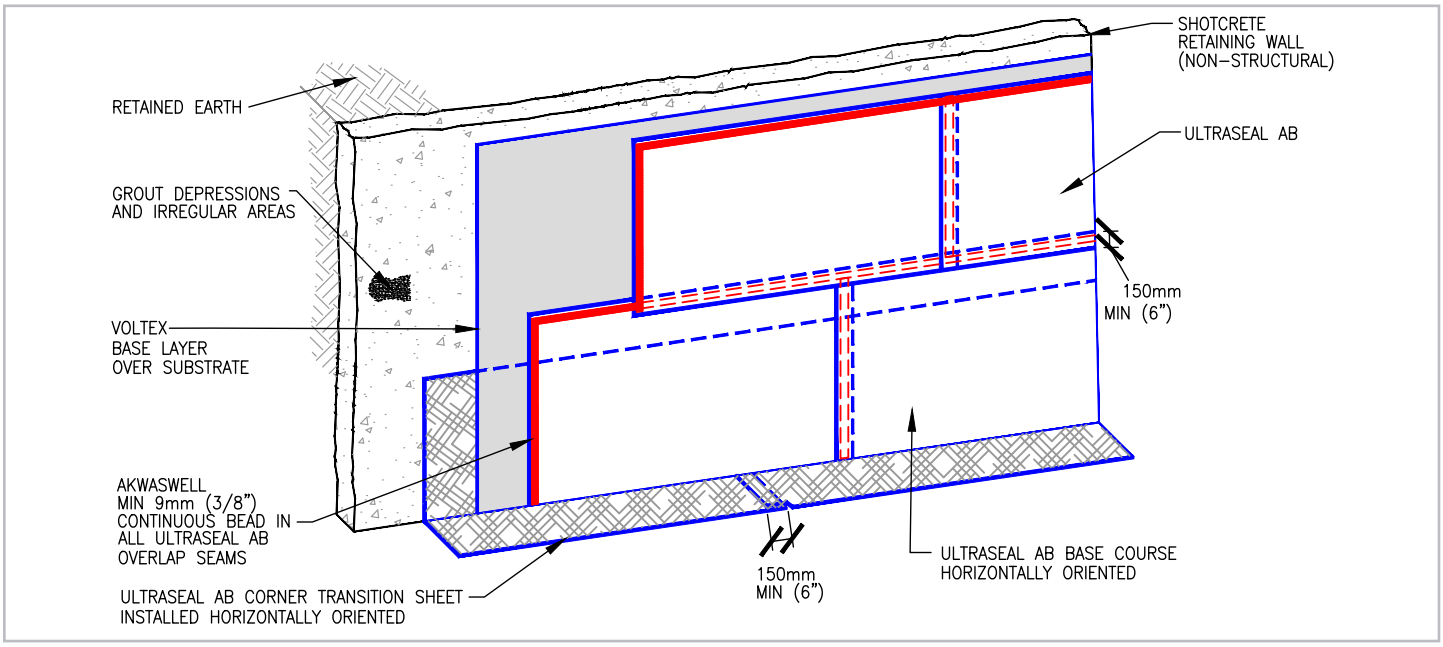

Figure H2-1: VOLTEX base layer installed onto shoring wall prior to ULTRASEAL AB

must extend a minimum 300 mm (12") above the finished slab elevation. Thus, as required, install a second full sheet of ULTRASEAL AB to meet the 300 mm (12") requirement above the slab elevation.

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

The shotcrete foundation wall should be constructed with wet mix shotcrete spray installation techniques according to ACI 506R-16. Shotcrete cores should conform to ACI 506.2-95 Section 1.7 with Core Grades of 1 or 2.

Employ substrate methods to stop water flowing through shoring wall prior to base VOLTEX® layer installation. If only water seepage, install 1.5 mm (6-mil) polyethylene sheeting over the seepage area prior to installing the base VOLTEX layer. Polyethylene sheeting should extend from seepage elevation to base of wall to protect entire base VOLTEX layer installation at that area.

Cementitious Board: Prior to installing base VOLTEX layer to finished grade detail, install 12 mm (½") thick cementitious wall board centered over steel soldier pile from finished grade elevation to a minimum of 150 mm (6") below specified depth that the top of steel soldier pile and wood lagging will be removed (Figure H2-2).

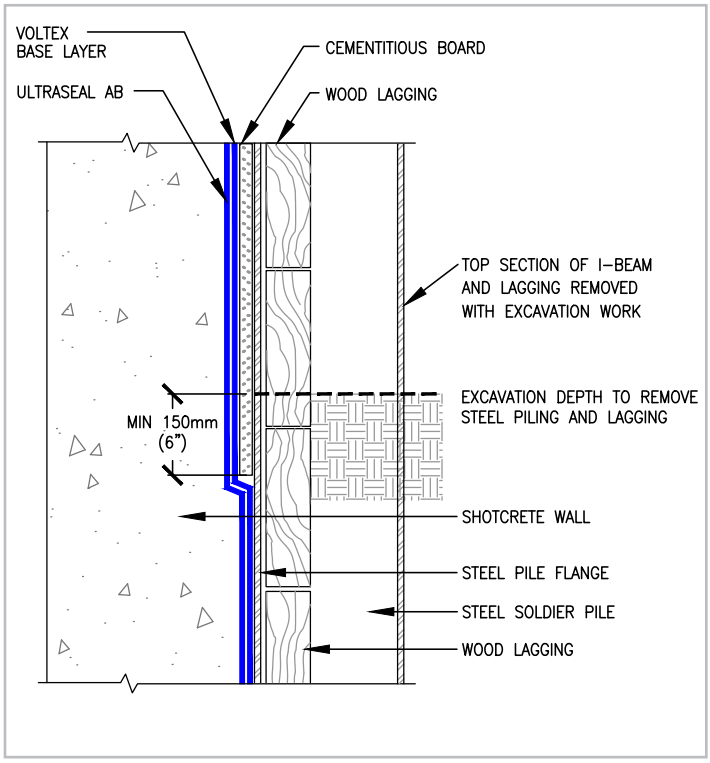

Figure H2-2: CEMENTITIOUS BOARD AT GRADE
Install cementitious board strip over steel piling at grade to protect waterproofing during removal of top lagging timbers and top of steel pile (typically with acetylene torch). Remove cement board before backfilling

ULTRASEAL® AB WATERPROOFING MEMBRANE
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SECTION – H3
SLAB TO WALL TRANSITION

At base of shoring wall, install ULTRASEAL® AB waterproofing sheet over the base VOLTEX base layer previously installed onto the shoring wall following procedure in Section H2, page 4. Install ULTRASEAL AB base course sheet horizontally oriented (adhesive bond coat side facing the installer) with the bottom edge extending down to the wall/slab transition corner as shown in Figure H3-1. Secure ULTRASEAL AB to lagging wall with washer-head fasteners maximum 600 mm (24") on center along edges and down center of sheet to secure firmly. Overlap adjacent ULTRASEAL® AB sheet edges a minimum 150 mm (6"). Maintain a minimum 50 mm (2") spacing between ULTRASEAL AB and reinforcement steel. Prior to installing adjacent ULTRASEAL AB sheets, apply a 9 mm (3/8") bead of AKWASWELL along top and side edges of the installed ULTRASEAL AB sheet. Install AKWASWELL so it will be confined within the 150 mm (6") membrane edge overlap.

Continue ULTRASEAL AB installation along base of wall with sheets horizontally oriented. Overlap adjacent ULTRASEAL AB sheet edges a minimum 150 mm (6").

Install under slab ULTRASEAL AB membrane extending to corner (adhesive bond coating side facing installer), fully overlapping the 300 mm (12") horizontal tail of the ULTRASEAL AB corner transition membrane installed at the wall base. Secure corner edge of membrane with washer-head fasteners or pneumatic staples 300 mm (12") on center.

NOTE: Shotcrete foundation walls should be constructed with wet mix shotcrete spray installation techniques according to ACI 506R-16. Shotcrete cores should conform to ACI 506.2-95 Section 1.7 with Core Grades of 1 or 2.

SECTION – H4
SHORING WALL

Membrane Installation: Install ULTRASEAL AB sheet to shoring wall over the VOLTEX® base layer (adhesive bond coat side facing installer) with the bottom edge overlapping top edge of the ULTRASEAL AB corner transition work a minimum 150 mm (6"). Secure sheet edges to shoring with washer-head fasteners placed maximum 600 mm (24") on center within 25 mm (1") of sheet edge. Prior to installing adjacent ULTRASEAL AB sheets, apply continuous 9 mm (3/8") bead of AKWASWELL along

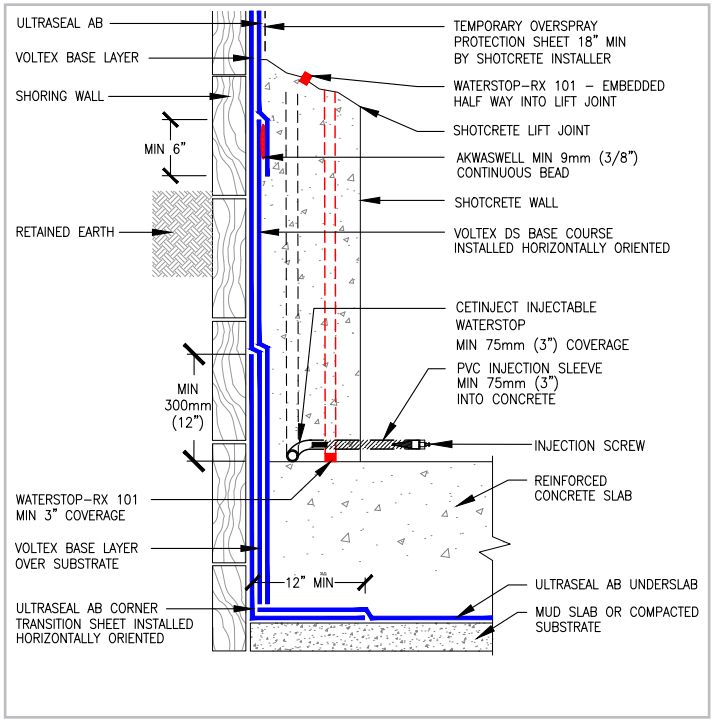

Figure H3-1: SHOTCRETE WALL
Install ULTRASEAL AB corner transition sheet horizontally oriented onto shoring wall behind VOLTEX base layer and extend the underslab ULTRASEAL AB sheet to the slab/wall corner overlapping the ULTRASEAL AB corner transition sheet a minimum 300 mm (12") onto the substrate

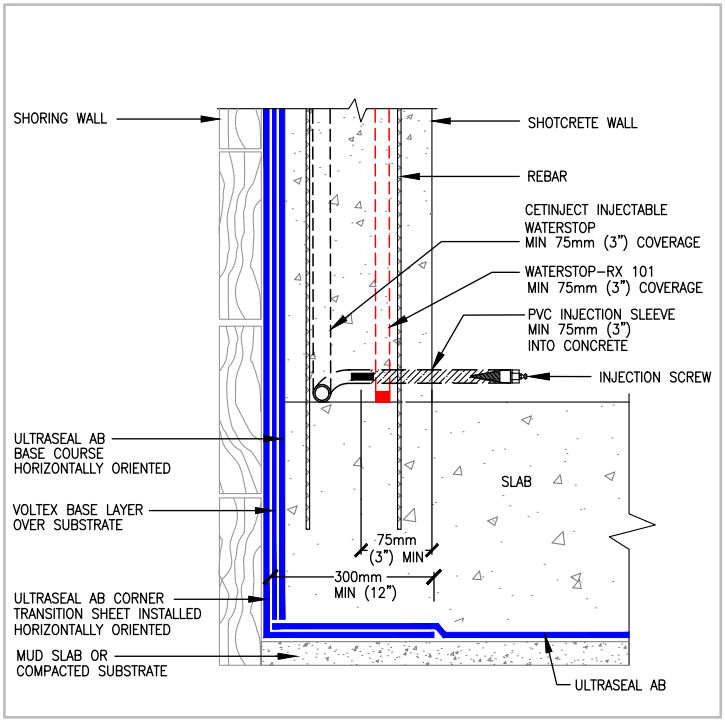

Figure H3-2: HYDROSTATIC CONDITIONS
Install one strip of CETINJECT and one strip of WATERSTOP-RX 101 in all concrete construction joints located within foundation levels determined to be completely or partially within the groundwater table

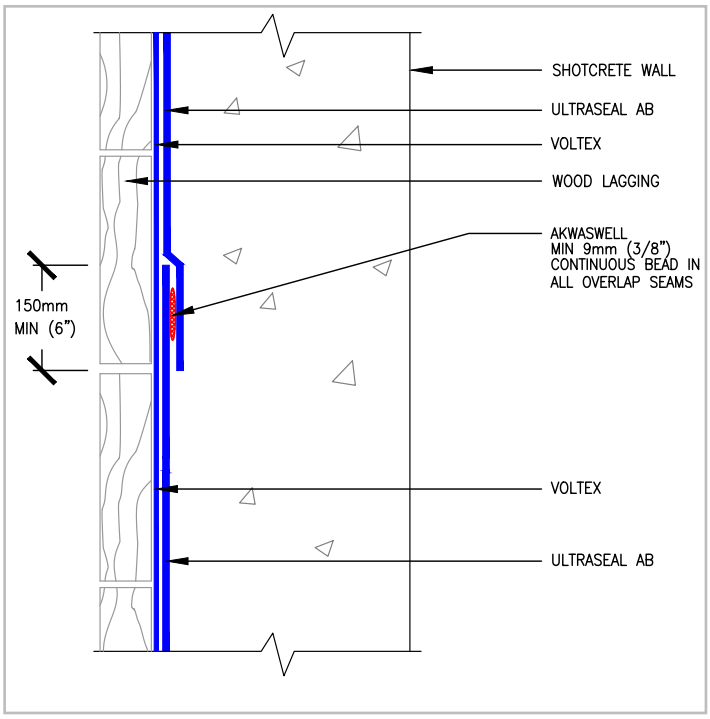

Figure H4-1: APPLY AKWASWELL IN OVERLAPS
Prior to installing adjacent ULTRASEAL AB sheets, apply continuous 9 mm (3/8") bead of AKWASWELL along top and side edges of previously installed ULTRASEAL AB sheet

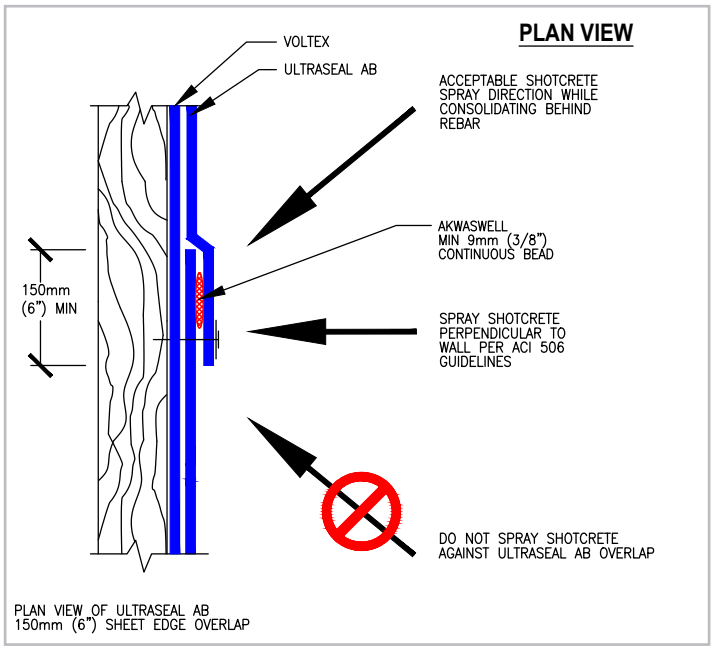

Figure H4-2: SHOTCRETE SPRAY DIRECTION
Shotcrete gunning should be applied straight against the wall per ACI 506. Do not allow shotcrete to be sprayed against ULTRASEAL AB overlap as illustrated above.

top and side edges of the installed ULTRASEAL AB sheet. Install AKWASWELL so it will be confined within the 150 mm (6") membrane edge overlap (Figure H4-1).

Secure center line of ULTRASEAL AB sheets to shoring wall with washer-head fasteners as required to hold membrane tight against shoring wall.

After the bottom horizontal transition sheet course, ULTRASEAL AB sheets can be installed either vertically or horizontally oriented. Continue ULTRASEAL AB installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 300 mm (12").

Do not allow horizontal ULTRASEAL® AB overlap joints to be positioned at same elevation as the shotcrete lift joints. Plan by chalk lining the location of shotcrete lift joint lines to maintain minimum 150 mm (6") space from ULTRASEAL AB overlap joints.

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

Columns/Pilasters: As it is extremely difficult to place and consolidate shotcrete behind heavy or closely placed steel reinforcement typical within integrated or attached columns and pilasters, CETCO recommends that these structural components be cast-in-place (form-and-pour).

Shotcrete Columns/Pilaster Detailing Requirements: Columns/pilaster which are to be integrated or attached to shotcrete foundation walls and placed by shotcrete application, install ULTRASEAL AB vertically oriented extending minimum 150 mm (6") beyond the width of the column/pilaster on each side. Install the vertically oriented ULTRASEAL AB membrane overlapping the base horizontal course and adjacent installed ULTRASEAL AB membrane a minimum 150 mm (6"). Install a continuous 9 mm (3/8") diameter bead of AKWASWELL confined within all ULTRASEAL AB membrane overlaps.

CETINJECT grout hose injectable waterstop must then be installed in a serpentine pattern against the ULTRASEAL AB at the location of the column/pilaster maintaining a minimum 75 mm (3") of concrete coverage. Install CETINJECT tubes up the wall in a 450 mm (18") wide serpentine pattern for all levels of the project built completely or partially within the groundwater table (Figure H4-3).

Install and inject the CETINJECT grout hose injectable waterstop per the CETINJECT installation guidelines.

Cast-in-place (form-and-pour) column/pilaster detailing requirements: Install ULTRASEAL AB vertically oriented starting 150 mm (6") beyond the width of the column/pilaster location to each side. The vertically installed ULTRASEAL AB must be installed overlapping the base horizontal course and adjacent installed ULTRASEAL AB membrane the typical 150 mm (6"). A continuous 9 mm (3/8") bead of AKWASWELL must be placed confined within all ULTRASEAL AB membrane overlaps.

ULTRASEAL® AB WATERPROOFING MEMBRANE

FOR SHOTCRETE FOUNDATION SHORING WALLS

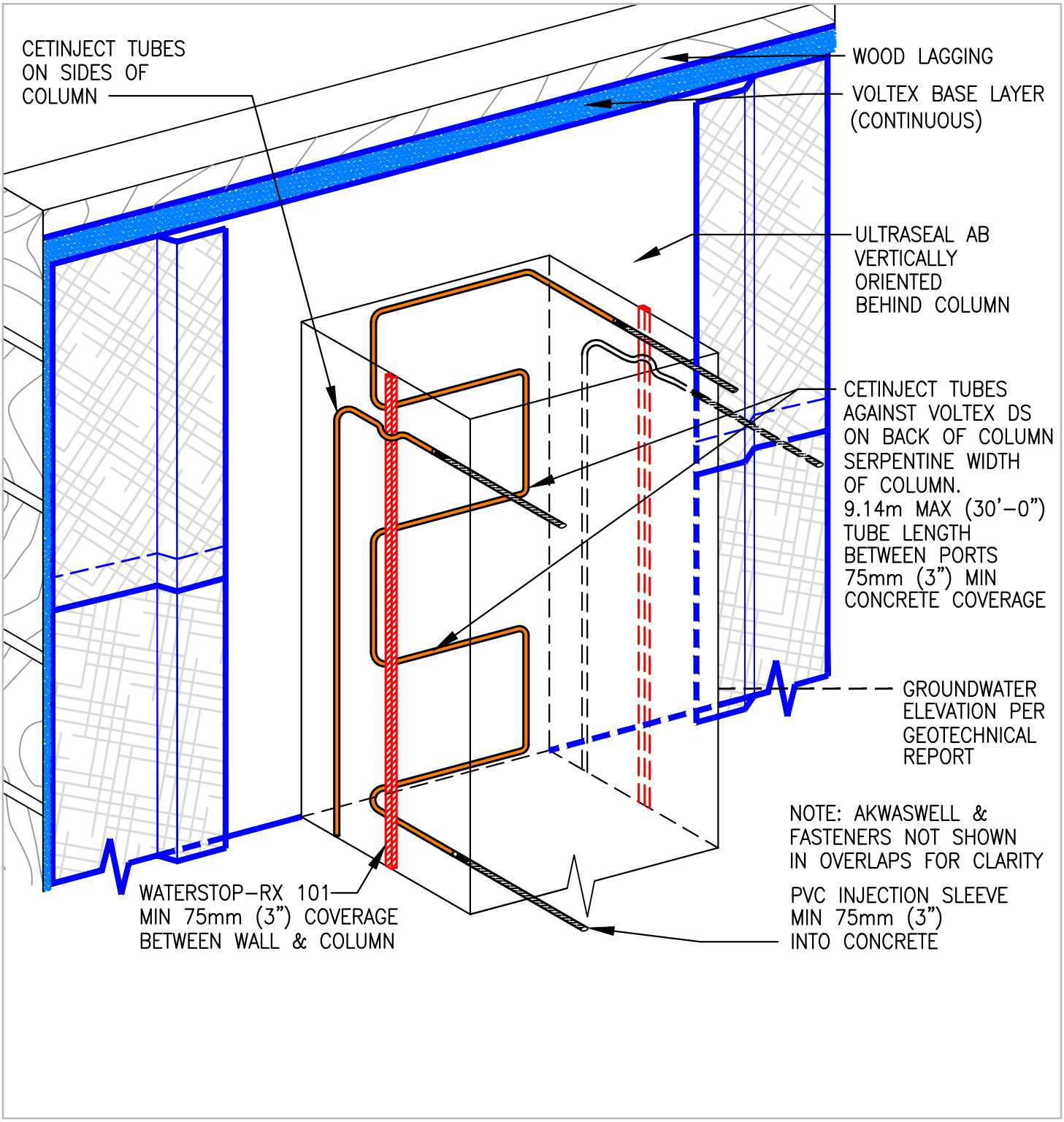

Figure H4-3: SHOTCRETE COLUMNS AND PILASTERS

For shotcrete columns/pilasters install ULTRASEAL AB membrane vertically oriented behind the location of columns and pilasters. Install CETINJECT injectable waterstop hose in a serpentine pattern onto the ULTRASEAL AB behind shotcrete columns and pilasters

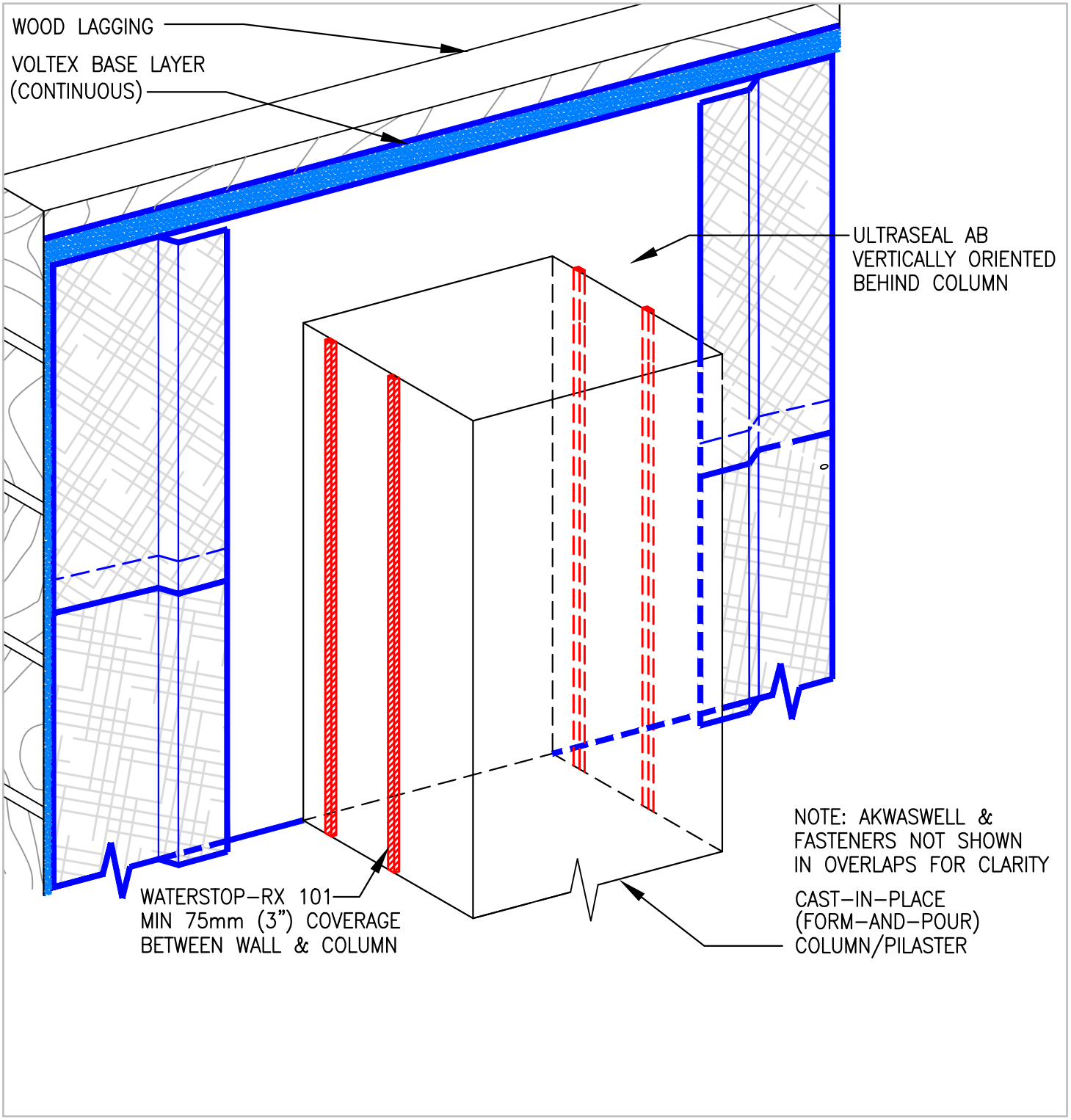

Figure H4-3A: CAST-IN-PLACE (FORM-AND-POUR) COLUMNS AND PILASTERS
For cast-in-place columns/pilasters install ULTRASEAL AB membrane vertically oriented behind the location of columns and pilasters. Install 2 rows of WATERSTOP-RX along the cold joints on each side of the column/pilaster

ULTRASEAL® AB WATERPROOFING MEMBRANE
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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 (Figure H4-4). Prior to TB-BOOT installation, fill voids in retention wall substrate and tie-back head assembly with spray foam (min. 20 psi) or cementitious grout per project design.

Secure TB-BOOT to soil retention system with washer-head fasteners along the outside edge of the flat base. Apply 6 mm (¼") thick by 75 mm (3") wide continuous ring of BENTOSEAL® onto the flat base just to the outside of the 12 mm (½") raised collar. Install base VOLTEX® layer overlapping the entire flat base to the 12 mm (½") raised collar and trowel a 6 mm (¼") thick by 75 mm (3") wide continuous ring of BENTOSEAL® over the VOLTEX base layer.

Then install ULTRASEAL® AB membrane overlapping the entire flat base to the 12 mm (½") raised collar. Secure both the VOLTEX and ULTRASEAL AB sheet edge with washer-head fasteners just outside the 12 mm (½") raised collar so that the fasteners pass through the BENTOSEAL ring; typical fastener spacing 150 mm (6") on center. Do not install fasteners or puncture TB-BOOT inside of the 12 mm (½") raised collar. Complete detail by applying continuous counter flashing of BENTOSEAL along ULTRASEAL AB field sheet edge.

For soil nail rod and plate assemblies, install applicable TB-BOOT over assembly and fasten to shoring wall. Install base VOLTEX layer and then ULTRASEAL AB with BENTOSEAL detailing per TB-BOOT installation guidelines herein (Figure H4-4A).

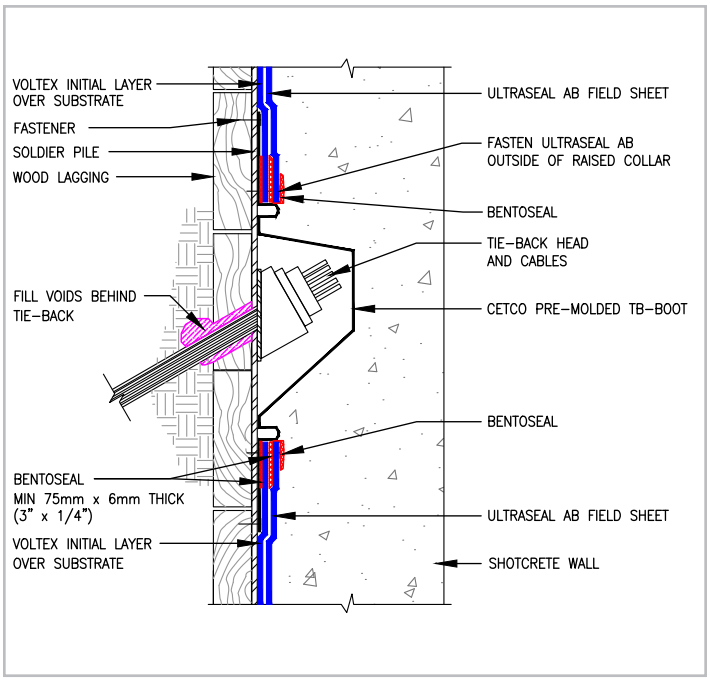

Figure H4-4 TIE-BACK DETAIL
Install TB-BOOT centered over tie-back then install ULTRASEAL AB with BENTOSEAL® detailing. Do not fasten boot inside of raised collar around center formed area

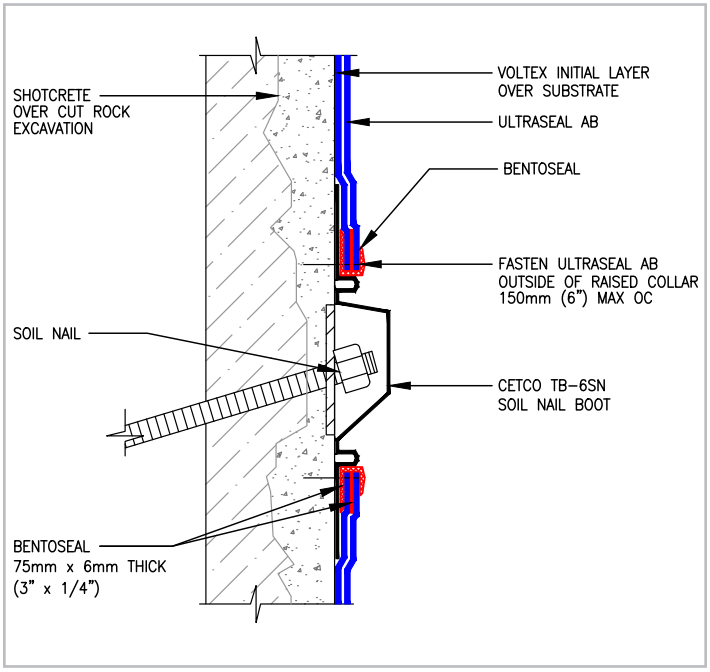

Figure H4-4A SOIL-NAIL DETAIL
Install TB-BOOT centered over soil-nail then install ULTRASEAL AB with BENTOSEAL detailing. Do not fasten boot inside of raised collar around center formed area

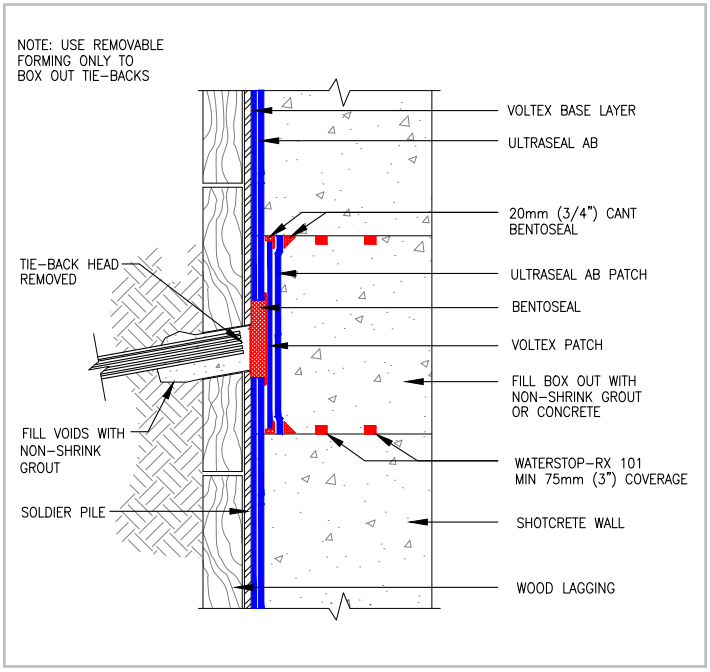

Figure H4-4B BOXED OUT TIE-BACK DETAIL
After Tie-back head removal, fill all voids in and behind area with non-shrink grout. Apply BENTOSEAL over area of cut tie-back. Install VOLTEX and ULTRASEAL AB patches in place with BENTOSEAL cants in corners. Install 2 rows of WATERSTOP-RX in box out

Penetrations: Cut base VOLTEX layer and ULTRASEAL AB tight around all penetrations through the membrane.

Apply BENTOSEAL over base VOLTEX layer around penetration; extending BENTOSEAL a minimum 75 mm (3") radius at minimum 6 mm (¼") thickness. Then install main course of ULTRASEAL AB membrane tightly around the penetration over base VOLTEX layer. Detail around penetration with 20 mm (¾") thick cant of BENTOSEAL mastic. Finally, install WATERSTOP-RX® around the pipe maintaining Min. 75 mm (3") concrete coverage (Figure H4-5). With sleeved penetrations, fill the gap between the pipe and the sleeve with D.O.T. approved non-shrink grout and install mechanical seal (by Others) around the pipe (Figure H4-5A).

Rebar Anchorage: Install a bead of AKWASWELL 9 mm (3/8") thick around all rebar anchorage penetrating ULTRASEAL® AB. 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, install one strip of WATERSTOP-RX 101 into each shotcrete lift joint. For all levels of the project built completely or partially within the groundwater elevation, install one strip of CETINJECT hose waterstop and one strip of WATERSTOP-RX 101 in all concrete construction joints. Install the CETINJECT as the outward most strip; towards shoring wall. For all levels of the project built completely above the groundwater elevation, install two strips of WATERSTOP-RX 101 in all concrete construction joints. Applicable construction joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place (form-and-pour)/shotcrete columns; and daily shotcrete lift joint stops. Refer to WATERSTOP-RX and CETINJECT product literature for installation guidelines.

All CETINJECT injectable waterstops must be injected with AKWASEAL® chemical grout once concrete has cured for a minimum of 28 days or after receiving the project's engineers written approval.

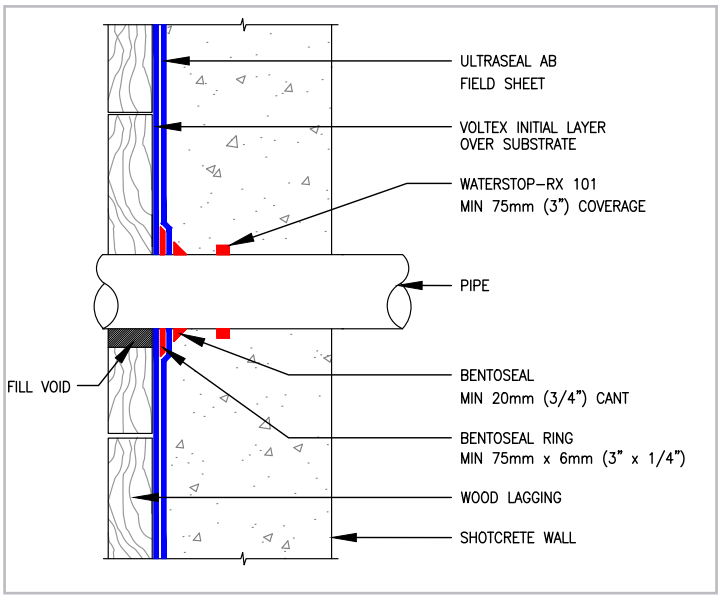

Figure H4-5: WALL PENETRATION
Cut and secure VOLTEX® & ULTRASEAL® AB tightly around penetrations and then apply BENTOSEAL® 75 mm (1/4") ring around penetration extending over membrane a minimum 75 mm (3"). Install a 20 mm (3/4") cant of BENTOSEAL over field sheet of ULTRASEAL AB.

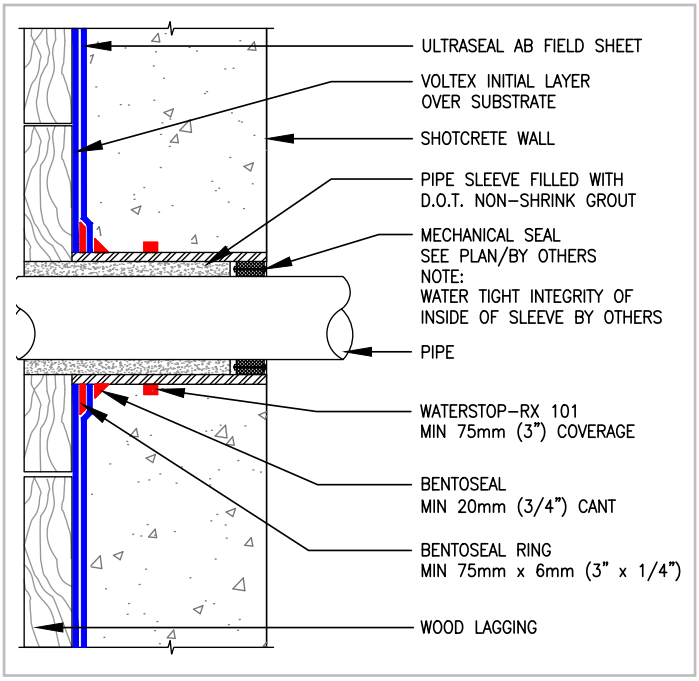

Figure H4-5A: SLEEVED WALL PENETRATION
Cut and secure VOLTEX & ULTRASEAL AB tightly around penetrations and then apply BENTOSEAL 75 mm (1/4") ring around penetration extending over membrane a minimum 75 mm (3"). Install a 20 mm (3/4") cant of BENTOSEAL over field sheet of ULTRASEAL AB. Fill sleeve with D.O.T. approved non-shrink grout.

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

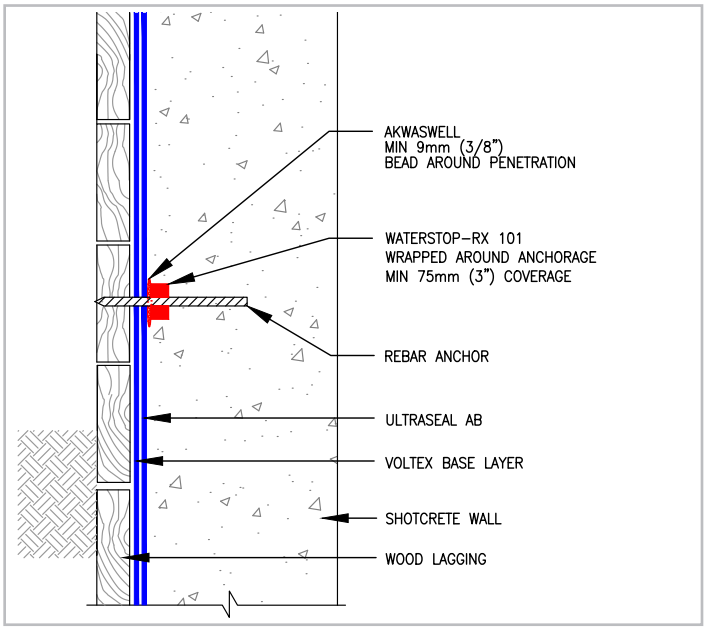

Figure H4-6: REBAR ANCHORAGE
Install an AKWASWELL 9 mm (3/8") bead around all rebar anchorage penetrating ULTRASEAL AB. Then install a length of WATERSTOP-RX® around the shaft of the rebar anchorage secured with plastic zip tie or rebar wire

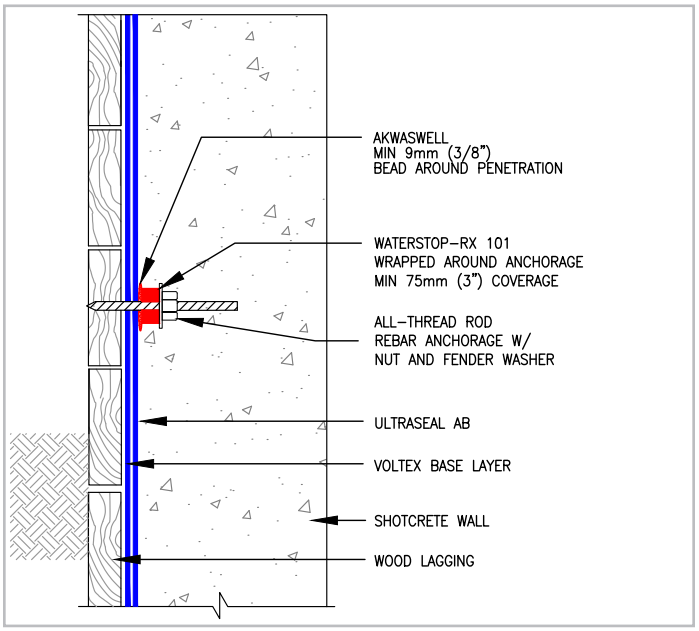

Figure H4-6A: REBAR ANCHORAGE (ALL THREAD)
Install an AKWASWELL 9 mm (3/8") bead around the all-thread rod penetrating ULTRASEAL AB. Installed a nut and wash to assist in confining the membrane. Then install a length of WATERSTOP-RX around the shaft of the rebar anchorage secured with plastic zip tie or rebar wire

SECTION – H5
BACKFILLED WALLS

For shotcrete foundation walls in backfilled wall applications, the installation of the VOLTEX base layer identified in section H2 is not required.

Install waterproofing only after inspection and repair of the backfilled shotcrete wall. Backfilled shotcrete walls should be sound and without any defects including non-consolidated or irregular surface areas. All areas found to need repair should be filled with D.O.T. approved non-shrink grout. For smaller defects and irregularities, BENTOSEAL® can be troweled over the defects to provide a smooth and planar surface.

For backfilled walls constructed with shotcrete applied against single-sided removable form, install course of ULTRASEAL AB (adhesive bond coat side to receive concrete) to the exterior surface of the shotcrete wall.

Prior to waterproofing, install line of HYDROBAR® TUBES at the wall/footing corner. Install base course of ULTRASEAL AB membrane horizontally oriented with the bottom edge extending to overlap underslab waterproofing a minimum of 150 mm (6"). Secure ULTRASEAL AB with washer-head fasteners and overlap sheet edges minimum 50 mm (2"). Apply CETCO SEAMTAPE to all ULTRASEAL AB overlap seams.
After the bottom horizontal course, ULTRASEAL AB sheets can be installed either vertically or horizontally oriented. Continue ULTRASEAL AB installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 300 mm (12"). Do not allow horizontal ULTRASEAL AB overlap joints to be positioned at at same elevation as the shotcrete lift joints. Plan by chalk lining the location of joint lines to maintain minimum 150 mm (6") space from ULTRASEAL AB overlap joints.

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.

Waterstop: As part of Division 3 Shotcrete work, install one strip of WATERSTOP-RX 101 into each shotcrete lift joint. For all levels of the project built completely or partially within the groundwater elevation, install one strip of CETINJECT hose waterstop and one strip of WATERSTOP-RX 101 in all concrete construction joints. Install the CETINJECT as the outward most strip; towards shoring wall. For all levels of the project built competely above the groundwater elevation, install two strips of WATERSTOP-RX 101 in all concrete construction joints. Applicable construction joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place (form-and-pour)/shotcrete columns; and daily shotcrete lift joint stops. Refer to WATERSTOP-RX and CETINJECT product literature for installation guidelines.

All CETINJECT injectable waterstops must be injected with AKWASEAL® chemical grout once concrete has cured for a minimum of 28 days or after receiving the project's engineers written approval.

NOTE: Shotcrete foundation walls should be constructed with wet mix shotcrete spray installation techniques according to ACI 506R-16. Shotcrete cores should conform to ACI 506.2-95 Section 1.7 with Core Grades of 1 or 2.

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 ULTRASEAL AB and base VOLTEX® at grade detail by fastening washer head fasteners 300 mm (12") on center to exterior of shotcrete wall (Figure H6-1). Install a continuous tooled bead of CETSEAL or M-2000 centered on top edge of ULTRASEAL AB/VOLTEX membrane. Fully adhere ENVIROSHEET flashing strip to concrete wall with bottom edge overlapping top of ULTRASEAL AB/VOLTEX termination minimum 150 mm (6"). Complete detail with tooled bead of CETSEAL or M-2000 along top edge of ENVIROSHEET 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.

Backfill shall be placed and compacted to minimum 85% Modified Proctor Density promptly after waterproofing has been installed. Closely coordinate with contractor responsible for backfill work by informing them each time a waterproofed area is ready for backfill. Backfill shall consist of compactable soil or angular aggregate 20 mm (¾") or less and free of debris and sharp objects. Care should be used during backfill operation to avoid damage to the waterproofing system.

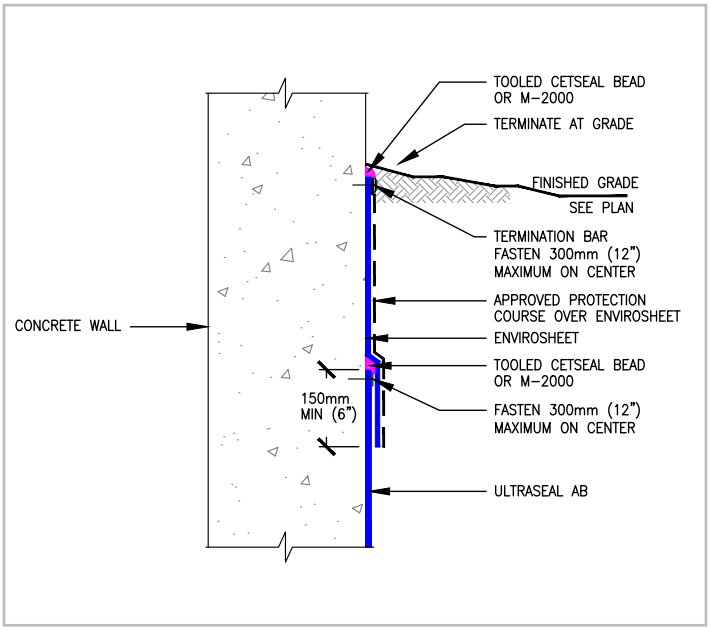

Figure H6-1: TERMINATION DETAIL
Overlap ENVIROSHEET 150 mm (6") over ULTRASEAL AB and terminate with termination bar fastened 300 mm (12") OC. Complete detail with tooled bead of CETSEAL or M-2000. (VOLTEX base layer Not Shown)

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

INSTALLATION GUIDELINES FOR NON-HYDROSTATIC CONDITIONS

This section of the manual only covers the installation of the ULTRASEAL® AB waterproofing membrane 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 groundwater elevation as determined by the projects geotechnical report. Before installing ULTRASEAL AB, read these installation guidelines to gain familiarity with specific procedures and applications.

SECTION – NH1 GENERAL GUIDELINES

Install ULTRASEAL AB waterproofing membrane with the adhesive bond coat side facing the installer so that the shotcrete will be shot against the adhesive bond coat side.

On shoring walls to receive shotcrete, install ULTRASEAL AB with minimum 150 mm (6”) sheet edge overlaps fastened with washer-head fasteners placed 600 mm (24”) on center within 25 mm (1”) of sheet edge to tightly secure entire overlap assembly to the shoring wall.

Secure center line of ULTRASEAL AB sheets to shoring wall with washer-head fasteners as required to hold membrane tight against shoring wall.

ULTRASEAL AB waterproofing system installation on a non-hydrostatic shotcrete foundation wall requires that the AQUADRAIN drainage composite 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, in lieu of AQUADRAIN, install a base course of VOLTEX® over the shoring wall prior to installation of the ULTRASEAL AB waterproofing system per Section H2 - Voltex Base.

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.

ULTRASEAL AB 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. ULTRASEAL AB can also be incorporated with CXJ-200/CXJ-400 Expansion Joints to create a warranty eligible, solution for waterproofing the below grade expansion joint. Please refer to the CETCO CXJ Expansion Joint Installation Guide for installation instructions.

Shoring Wall: Shoring wall should be in good condition to receive waterproofing membrane. 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 per project design. With lagging, interior surface of lagging boards should

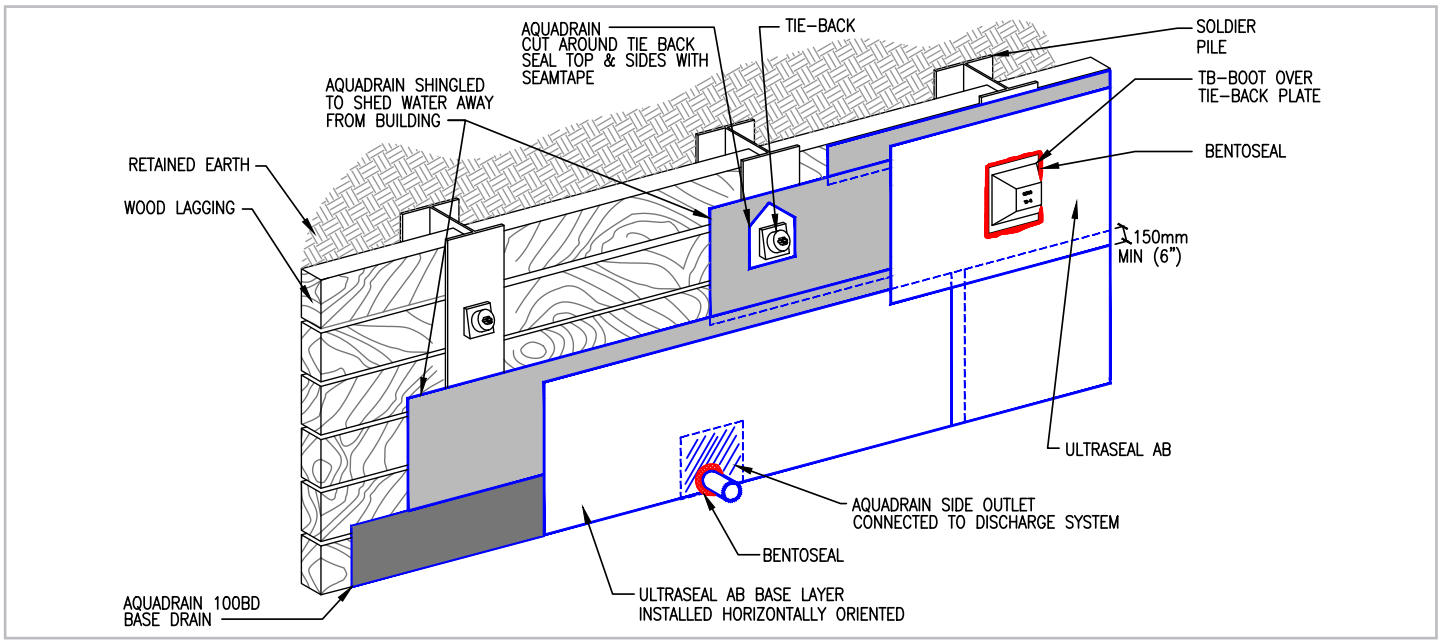

Figure NH1-1: AQUADRAIN SHEET DRAINAGE INSTALLED ONTO SHORING WALL PRIOR TO ULTRASEAL AB
Install AQUADRAIN sheet drainage over shoring wall prior to installing ULTRASEAL AB waterproofing membrane. AQUADRAIN should be applied from base of wall to grade level unless otherwise specified per project documents

be uniform and tight together with gaps less than 25 mm (1”). Gaps in excess of 25 mm (1”) should be filled with cementitious grout per project design or CETCO approved polyurethane foam (20 psi min.). For applications not covered in this manual consult with the project design professional.

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 50 mm (2”) 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 50 mm (2”) 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 600 mm (24”) on center.

Install subsequent rolls of AQUADRAIN sheet drainage to within 300 mm (12”) 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 washer-head fasteners.

Prior to installing AQUADRAIN sheet drainage composite near grade detail, install 12 mm (½”) thick cementitious wallboard centered over metal soldier pile from finished grade elevation to a minimum of 150 mm (6”) below specified depth of soldier pile removal (Figure NH2-2). Cementitious wall board 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 300 mm (12”) on center with the fabric wrapped.

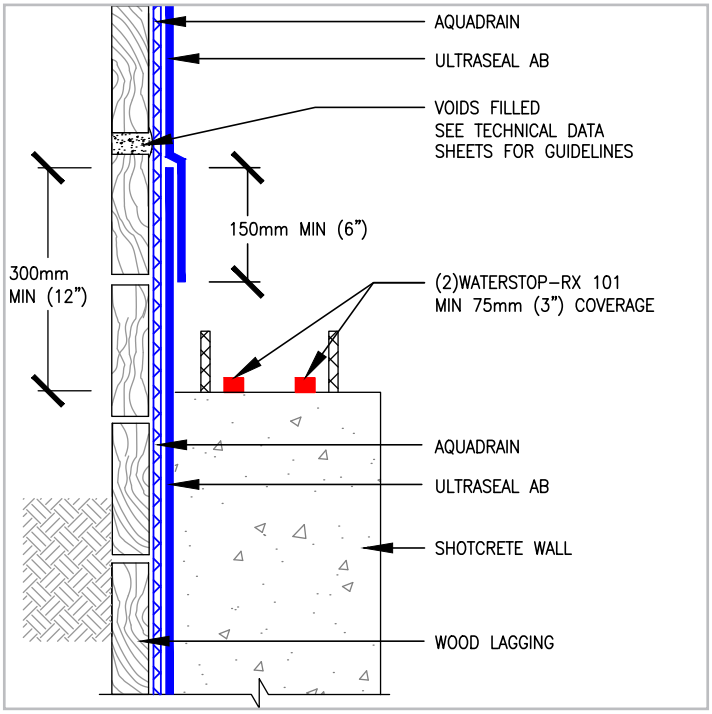

Figure NH2-1: OVERLAP ULTRASEAL AB EDGES 6”
Overlap all ULTRASEAL AB membrane edges a minimum 150 mm (6”). Fasten membrane edges 600 mm (24”) on center within 25 mm (1”) of membrane edge

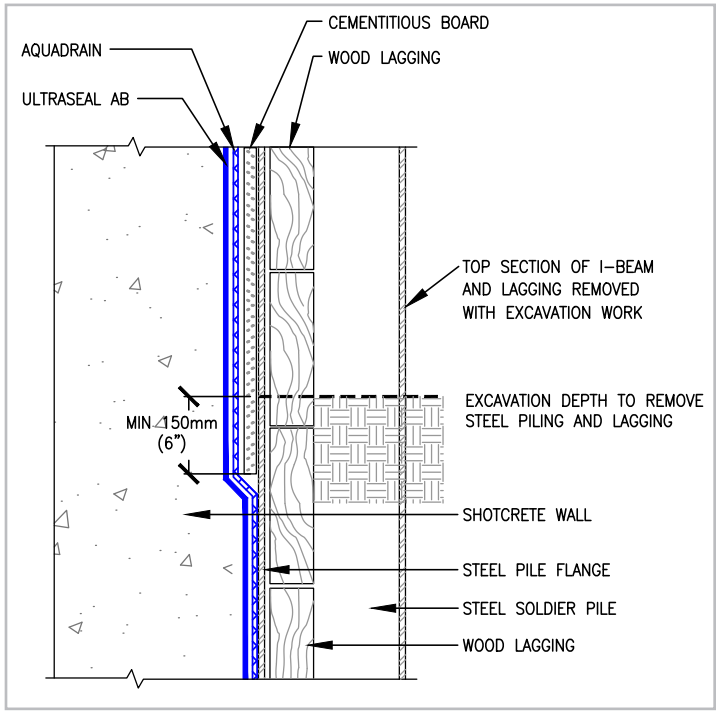

Figure NH2-2: WALL EXCAVATION AT GRADE
Cementitious board protects waterproofing during excavation and removal of steel pile top and wood lagging

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

SECTION – NH3
SLAB TO WALL TRANSITION

Starting at the base of the shoring wall, install ULTRASEAL® AB waterproofing over the AQUADRAIN® drainage system previously installed in accordance with Section NH2.

For the slab to wall corner transition, install ULTRASEAL AB sheet horizontally oriented (adhesive bond coat side facing installer) with a minimum 300 mm (12") of the bottom edge extending out onto the horizontal substrate. The top edge of the sheet must extend a minimum 300 mm (12") above the finished slab surface. Secure ULTRASEAL AB sheet to lagging wall with washer-head fasteners maximum 600 mm (24") on center. Overlap edges of adjacent ULTRASEAL AB sheets a minimum 150 mm (6").

Install second ULTRASEAL AB sheet course horizontally oriented (adhesive bond coat side facing installer) onto the lagging wall over the corner transition sheet, with the bottom edge extending down to the wall/slab transition corner. Secure ULTRASEAL AB to lagging wall with washer-head fasteners maximum 600 mm (24") on center. Overlap edges of adjacent ULTRASEAL AB sheets a minimum 150 mm (6") within 25 mm (1") of sheet edge.

Install underslab ULTRASEAL AB membrane extending to corner transition (adhesive bond coat side up), overlapping the 300 mm (12") ULTRASEAL AB tail extending from ULTRASEAL AB corner transition sheet installed at the wall base. Secure corner edge of membrane with washer-head fasteners or pneumatic staples 300 mm (12") on center.

NOTE: Shotcrete foundation walls should be constructed with wet mix shotcrete spray installation techniques according to ACI 506R-16. Shotcrete cores should conform to ACI 506.2-95 Section 1.7 with Core Grades of 1 or 2.

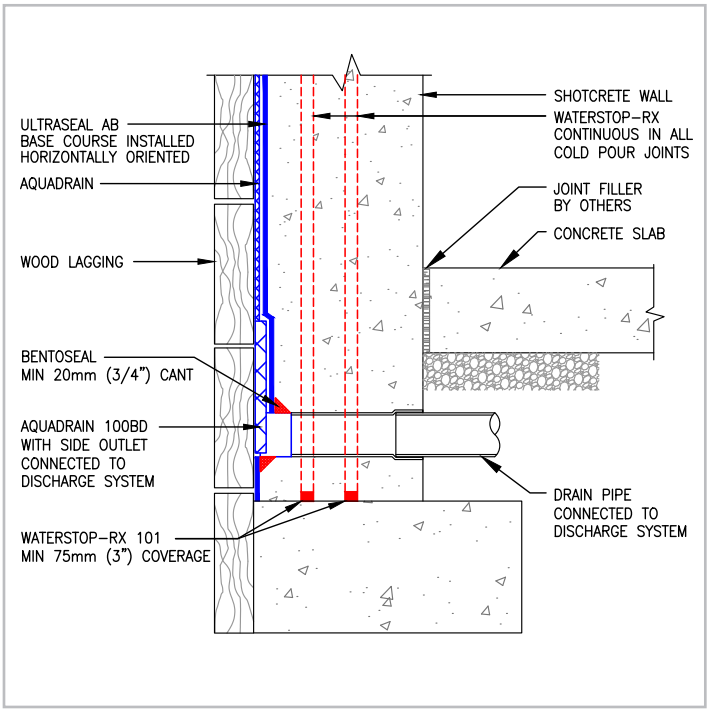

Figure NH3-1: AQUADRAIN 100BD DISCHARGE PIPE
Connect AQUADRAIN 100BD to water discharge pipes using 100BD accessory connectors

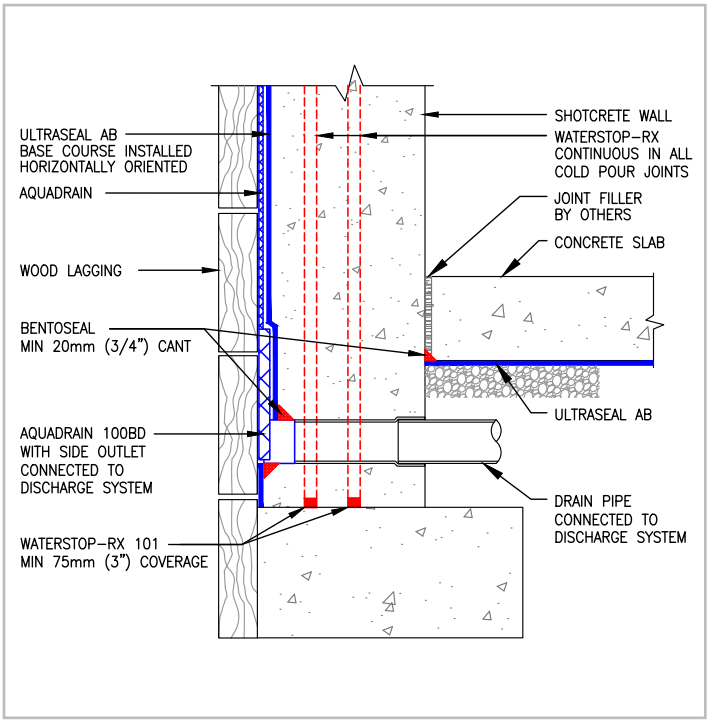

Figure NH3-2: RAISED SLAB CONDITION
Connect AQUADRAIN 100BD to water discharge pipes using 100BD accessory connectors

SECTION – NH4 SHORING WALL

Membrane Installation: Install ULTRASEAL AB sheet to shoring wall over the AQUADRAIN drainage composite (adhesive bond coat side facing installer) with the bottom edge overlapping top edge of the ULTRASEAL AB corner transition sheet a minimum 150 mm (6”). Secure sheet edges to shoring with washer-head fasteners placed maximum 600 mm (24”) on center within 25 mm (1”) of sheet edge.

Secure center line of ULTRASEAL AB sheets to shoring wall with washer-head fasteners as required to hold membrane tight against shoring wall.

After the bottom horizontal transition sheet course, ULTRASEAL® AB sheets can be installed either vertically or horizontally oriented. Continue ULTRASEAL AB installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 300 mm (12”). **Do not allow horizontal ULTRASEAL AB overlap joints to be positioned at at same elevation as the shotcrete lift joints. Plan by chalk lining the location of shotcrete lift joint lines to maintain minimum 150 mm (6”) space from ULTRASEAL AB overlap joints.**

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

Columns/Pilasters: As it is extremely difficult to place and consolidate shotcrete behind heavy or closely placed steel reinforcement typical within integrated or attached columns and pilasters, CETCO recommends that these structural components be cast-in-place (form-and-pour).

Shotcrete Columns/Pilaster Detailing Requirements: Columns/pilaster which are to be integrated or attached to shotcrete foundation walls and placed by shotcrete application, install ULTRASEAL AB vertically oriented extending minimum 150 mm (6”) beyond the width of the column/pilaster on each side. Install the vertically oriented ULTRASEAL AB membrane overlapping the base horizontal course and adjacent installed ULTRASEAL AB membrane a minimum 150 mm (6”). Install a continuous 9 mm (3/8”) diameter bead of AKWASWELL confined within all ULTRASEAL AB membrane overlaps located behind column/pilaster.

Cast-in-place (form-and-pour) column/pilaster detailing requirements: Install ULTRASEAL® AB vertically oriented starting 150 mm (6”) beyond the width of the column/pilaster location to each side. The vertically installed ULTRASEAL AB must be installed overlapping the base horizontal course and adjacent installed ULTRASEAL AB membrane the typical 150 mm (6”).

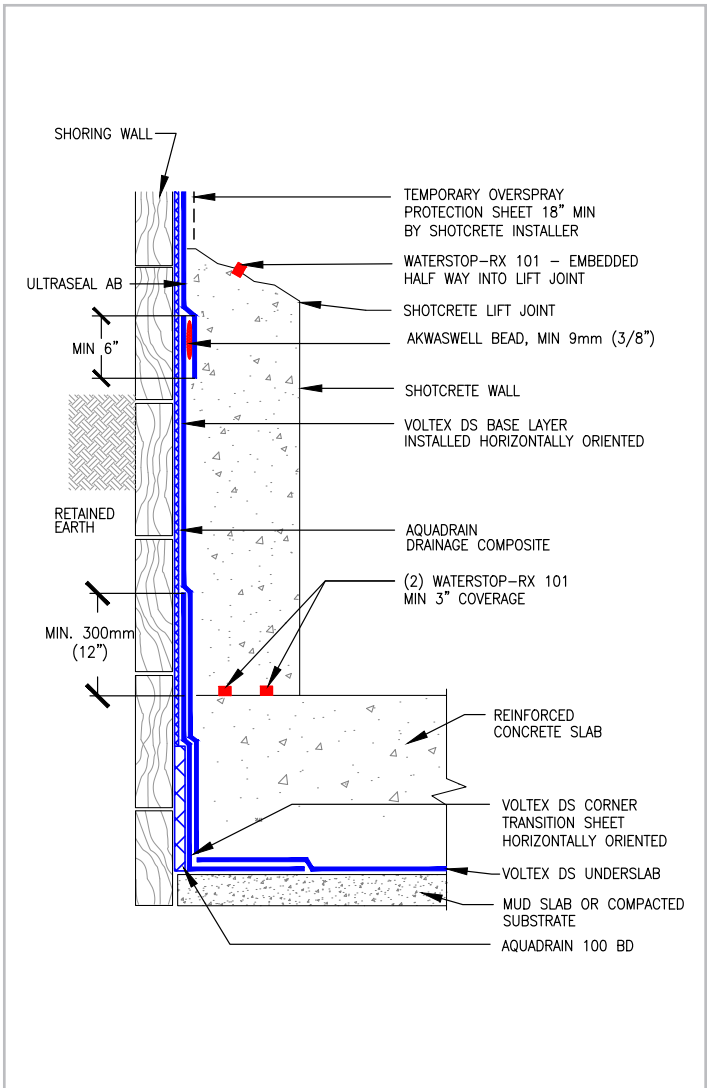

Figure NH4-1: NON-HYDROSTATIC SHOTCRETE WALL
Transition requires ULTRASEAL AB corner transition sheet installed horizontally over AQUADRAIN at the corner to extend 300 mm (12”) onto underslab substrate. Then install ULTRASEAL AB base layer to lagging wall (horizontally oriented) over corner transition sheet. ULTRASEAL AB base layer shall extend above the slab to wall joint a minimum of 300 mm (12”). Install the underslab ULTRASEAL AB sheet to the slab/wall corner overlapping the ULTRASEAL AB transition sheet a minimum 300 mm (12”). Typical ULTRASEAL AB membrane overlaps must be a minimum 150 mm (6”). A single WATERSTOP-RX shall be embedded into all lift joints. Two rows of WATERSTOP-RX shall be installed in cold joints, maintaining a minimum 75 mm (3”) concrete coverage. Temporary protection shall be installed to protect ULTRASEAL AB membrane from shotcrete overspray. AQUADRAIN 100BD must be connected to operable discharge pipe (Not shown)

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

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 cementitious grout per project design (Figure NH4-2).

Secure TB-BOOT to soil retention system over AQUADRAIN drainage composite with washer-head fasteners along the outside edge of the flat base. Apply 6 mm (¼") thick by 75 mm (3") wide continuous ring of BENTOSEAL® onto the flat base just to the outside of the 12 mm (½") raised collar. Install ULTRASEAL AB membrane overlapping the entire flat base to the 12 mm (½") raised collar.

Secure ULTRASEAL AB sheet edge with washer-head fasteners just outside the 12 mm (½") raised collar so that the fasteners pass through the BENTOSEAL ring; typical fastener spacing 150 mm (6") on center. Do not install fasteners or puncture TB-BOOT inside of the 12 mm (½") raised collar. Complete detail by applying continuous counter flashing of BENTOSEAL along ULTRASEAL AB field sheet edge.

For soil nail rod and plate assemblies, install applicable TB-BOOT over assembly and fasten to shoring wall (Figure NH4-2A). Install ULTRASEAL AB with BENTOSEAL detailing per TB-BOOT installation guidelines herein.

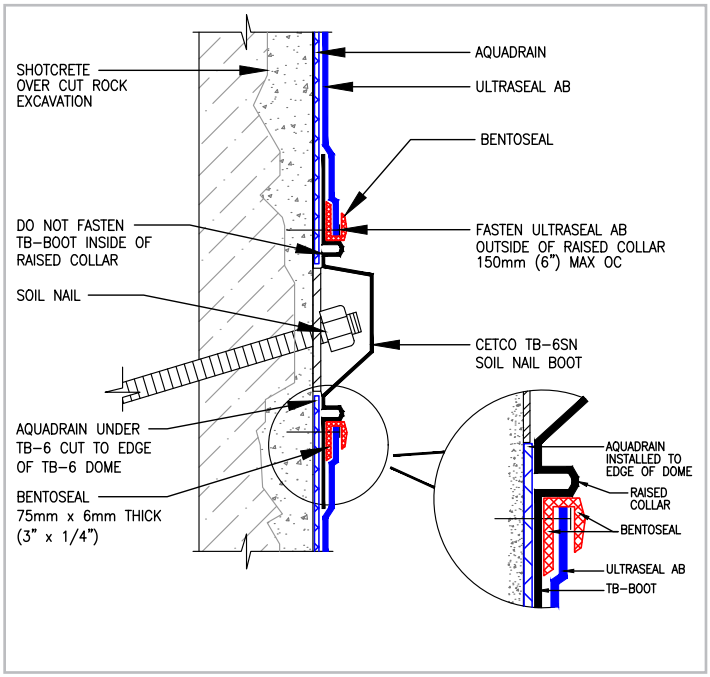

Figure NH4-2A: SOIL-NAIL DETAIL
Install TB-BOOT centered over soil-nail then install main course of ULTRASEAL AB with BENTOSEAL detailing. Do not fasten boot inside of raised collar around center formed area

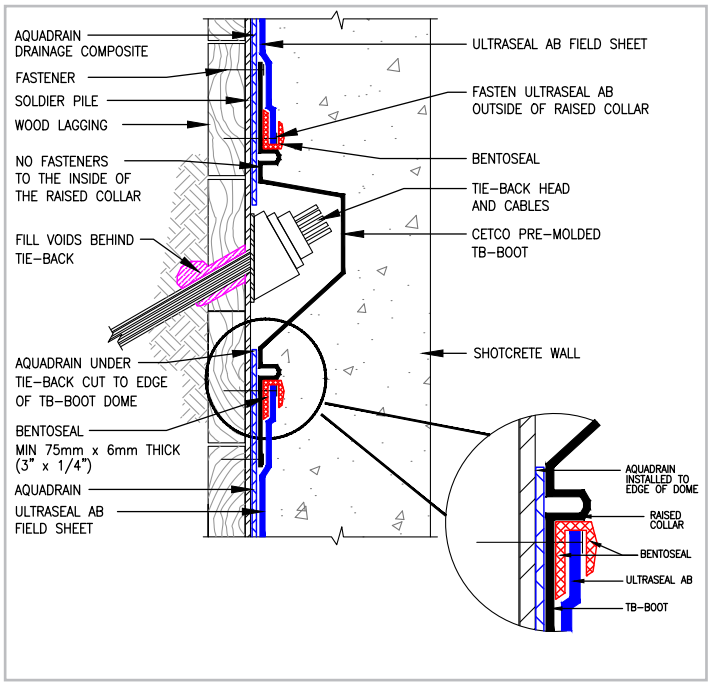

Figure NH4-2: TIE-BACK DETAIL
Install TB-BOOT centered over tie-back then install main course of ULTRASEAL AB with BENTOSEAL detailing. Do not fasten boot inside of raised collar around center formed area

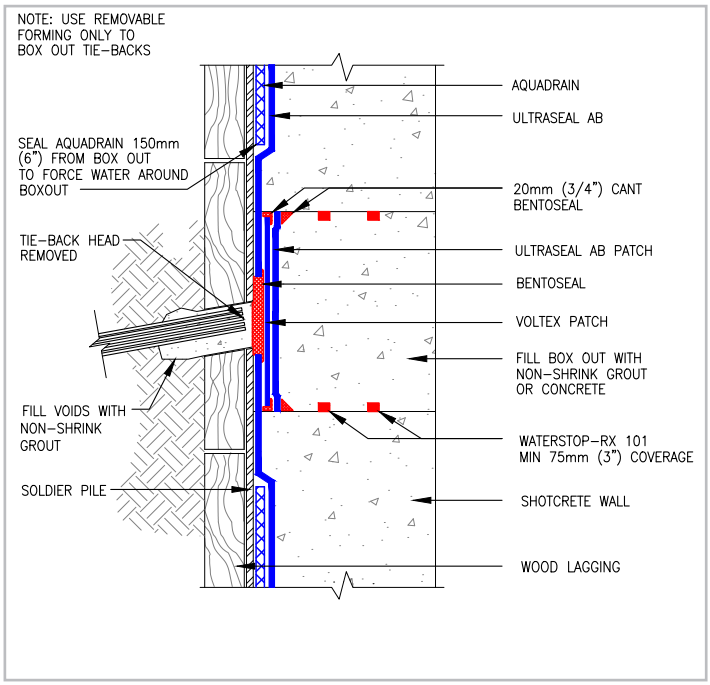

Figure NH4-2B: BOXED OUT TIE-BACK DETAIL
After Tie-back head removal, fill all voids in and behind area with non-shrink grout. Apply BENTOSEAL over area of cut tie-back. Install VOLTEX and ULTRASEAL AB patches in place with BENTOSEAL cants in corners. Install 2 rows of WATERSTOP-RX in box out

NON-HYDROSTATIC

Penetrations: Install a cut collar of ULTRASEAL AB tightly around the penetration; extending ULTRASEAL AB around penetration a minimum 200 mm (8") radius. Apply BENTOSEAL over ULTRASEAL AB collar around penetration; extending BENTOSEAL a minimum 75 mm (3") radius at minimum 6 mm (¼") thickness. Then install main course of ULTRASEAL AB membrane tightly around the penetration. Finally, detail around penetration with 20 mm (¾") 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 and install mechanical seal (by Others) around the pipe (Figure NH4-3A).

Rebar Anchorage: Install a bead of AKWASWELL 9 mm (3/8") thick around all rebar anchorage penetrating ULTRASEAL AB. Then install a length of WATERSTOP-RX® around the shaft of the rebar anchorage (Figure NH4-5) securing it with zip tie or rebar wire.

Waterstop: **As part of Division 3 Shotcrete work, install one strip of WATERSTOP-RX 101 into each shotcrete lift joint. In all construction joints, install two strips of WATERSTOP-RX 101.** Applicable construction joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place (form-and-pour)/ shotcrete columns; and daily shotcrete lift joint stops. Refer to WATERSTOP-RX product literature for installation guidelines.

For HYDROSHIELD™ warranty eligibility with non-hydrostatic conditions, install one strip of CETINJECT hose waterstop and one strip of WATERSTOP-RX 101 in the slab to wall concrete construction joint. Install the CETINJECT as the outward most strip; towards shoring wall. For all other construction joints, install two strips of WATERSTOP-RX 101 (Figure NH4-4).

All CETINJECT injectable waterstops must be injected with AKWASEAL® chemical grout once concrete has cured for a minimum of 28 days or after receiving the project's engineers written approval.

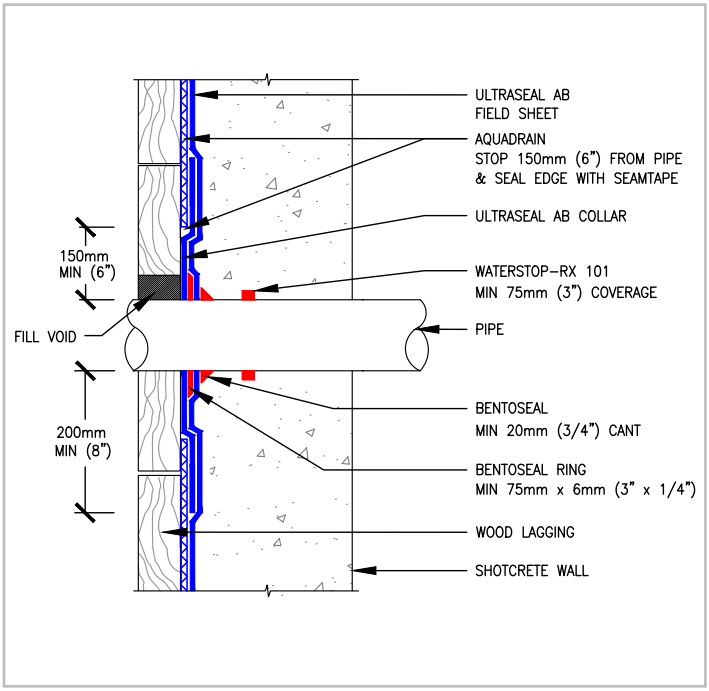

Figure NH4-3: WALL PENETRATION
Cut and secure ULTRASEAL® AB tightly around penetrations and then apply BENTOSEAL® 6 mm (1/4") ring around penetration and extend over membrane a minimum 75 mm (3")

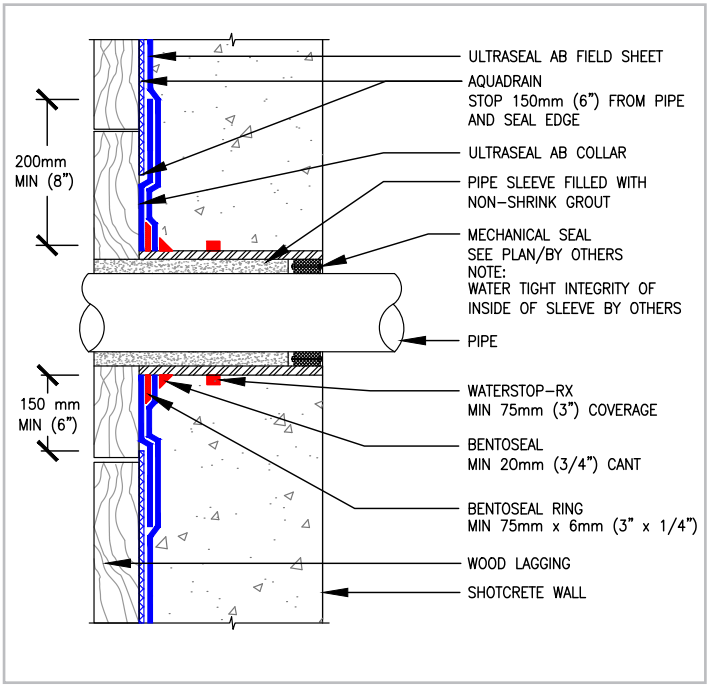

Figure NH4-3A: SLEEVED WALL PENETRATION
Cut and secure ULTRASEAL AB tightly around penetrations and then apply BENTOSEAL 6 mm (1/4") ring around penetration and extend over membrane a minimum 75 mm (3")

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

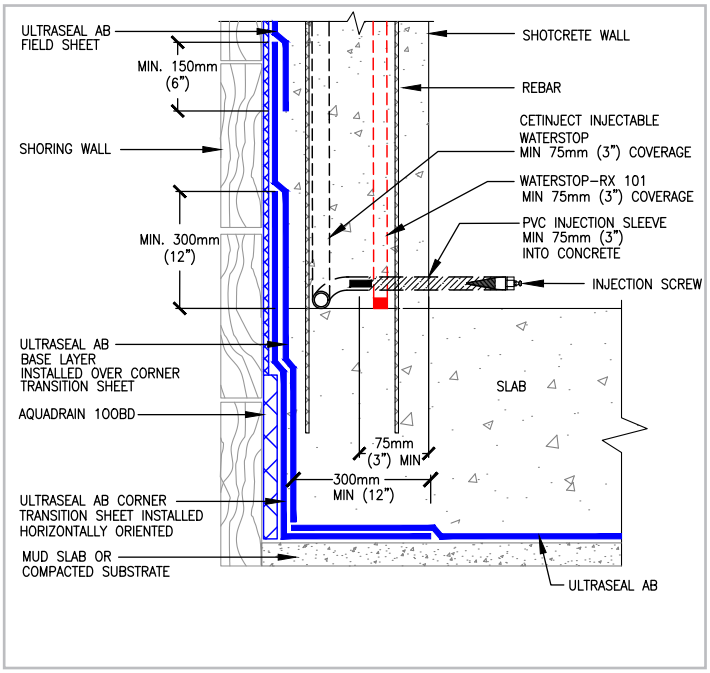

Figure NH4-4: NON-HYDROSTATIC CONDITIONS (HYDROSHIELD™)

For HYDROSHIELD™ warranty eligibility with non-hydrostatic conditions install one strip of CETINJECT hose waterstop and one strip of WATERSTOP-RX 101 in the slab to wall concrete construction joint. Install the CETINJECT as the outward most strip. For all other construction joints, install two strips of WATERSTOP-RX 101

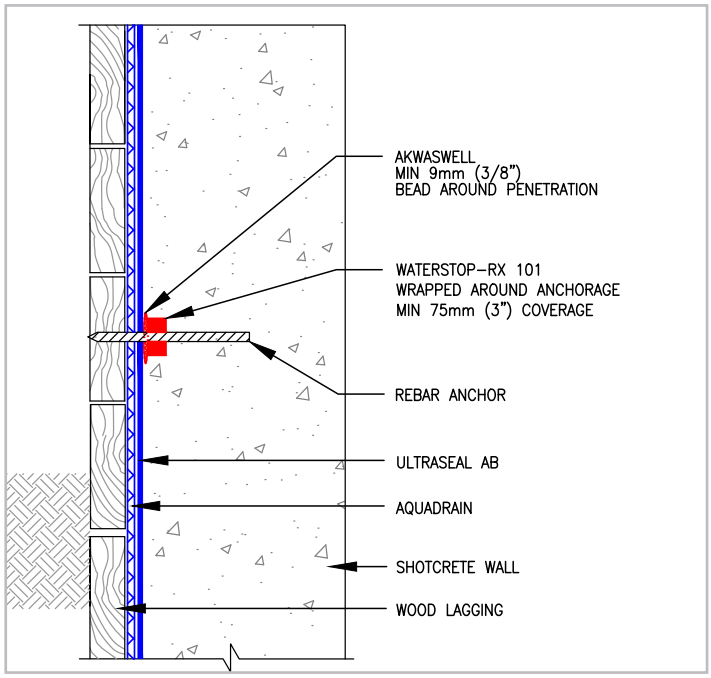

Figure NH4-5: REBAR ANCHORAGE

Install AKWASWELL 9 mm (3/8") thick bead around all rebar anchorage penetrating ULTRASEAL® AB. Then install a length of WATERSTOP-RX® around the shaft of the rebar anchorage secured with plastic zip tie or rebar wire

SECTION – NH5
BACKFILLED WALLS

Install waterproofing only after inspection and repair of the backfilled shotcrete wall. Backfilled shotcrete walls should be sound and without defects including unconsolidated or irregular surface areas. All areas found to need repair should be filled with D.O.T. approved non-shrink grout. For smaller defects and irregularities, BENTOSEAL® can be troweled over the defects to provide a smooth and planar surface.

For backfilled walls constructed with shotcrete applied against single-sided removable form, install course of ULTRASEAL AB (Adhesive bond coat side to receive concrete) to the exterior surface of the shotcrete wall.

Prior to waterproofing, install line of HYDROBAR® TUBES at the wall/footing corner. Install base course of ULTRASEAL AB membrane horizontally oriented with the bottom edge extending to overlap underslab waterproofing a minimum of 150 mm (6"). Secure ULTRASEAL AB with washer-head fasteners and overlap sheet edges minimum 50 mm (2"). Apply CETCO SEAMTAPE to all ULTRASEAL AB overlap seams.

After the bottom horizontal course, ULTRASEAL AB sheets can be installed either vertically or horizontally oriented. Continue ULTRASEAL AB installation up wall to finished grade elevation detail, or as specified, staggering all sheet roll ends of adjacent courses a minimum 300 mm (12").

Do not allow horizontal ULTRASEAL AB overlap joints to be positioned at at same elevation as the shotcrete lift joints. Plan by chalk lining the location of joint lines to maintain minimum 150 mm (6") space from ULTRASEAL AB overlap joints.

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

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

Waterstop: As part of Division 3 Shotcrete work, install one strip of WATERSTOP-RX 101 into each shotcrete lift joint. In all construction joints, install two strips of WATERSTOP-RX 101. Applicable construction joints include the shotcrete wall to slab/footing; vertical formed work edge joints; shotcrete to cast-in-place (form-and-pour)/shotcrete columns; and daily shotcrete lift joint stops. Refer to WATERSTOP-RX product literature for installation guidelines.

For HYDROSHIELD™ warranty eligibility with non-hydrostatic conditions, install one strip of CETINJECT hose waterstop and one strip of WATERSTOP-RX 101 in the slab to wall concrete construction joint. Install the CETINJECT as the outward most strip; towards shoring wall. For all other construction joints, install two strips of WATERSTOP-RX 101 (Figure NH4-4).

All CETINJECT injectable waterstops must be injected with AKWASEAL® chemical grout once concrete has cured for a minimum of 28 days or after receiving the project's engineers written approval.

NOTE: Shotcrete foundation walls should be constructed with wet mix shotcrete spray installation techniques according to ACI 506R-16. Shotcrete cores should conform to ACI 506.2-95 Section 1.7 with Core Grades of 1 or 2.

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 ULTRASEAL AB at grade elevation detail by fastening membrane 300 mm (12") on center to exterior of shotcrete wall. Install continuous tooled bead of CETSEAL or M-2000 on top edge of ULTRASEAL AB membrane. Secure drainage sheet to shotcrete wall. Fully adhere ENVIROSHEET flashing strip to concrete wall with bottom edge overlapping top of ULTRASEAL AB termination minimum 150 mm (6") (Figure NH6-1). Complete detail with a tooled bead CETSEAL or M-2000 along top edge of the ENVIROSHEET flashing strip.

Backfill shall be placed and compacted to minimum 85% Modified Proctor Density promptly after waterproofing has been installed. Closely coordinate with contractor responsible for backfill work by informing them each time a waterproofed area is ready for backfill. Backfill shall consist of compactable soil or angular aggregate 20 mm (¾") or less and free of debris and sharp objects. Care should be used during backfill operation to avoid damage to the waterproofing membrane.

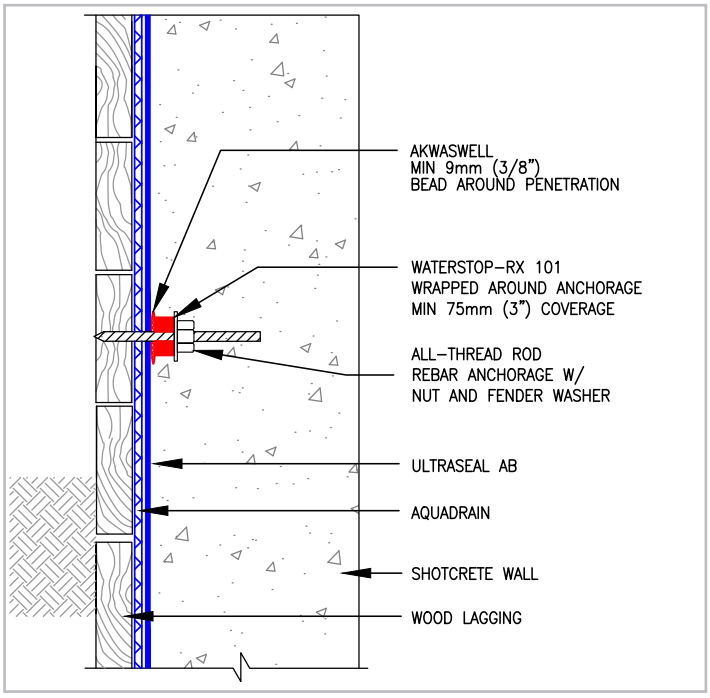

Figure NH4-5A: REBAR ANCHORAGE (ALL THREAD)
Install AKWASWELL 9 mm (3/8") thick bead and WATERSTOP-RX 101 around all rebar anchorage penetrating ULTRASEAL AB. Tighten nut and fender washer down all thread rod until compressing RX-101

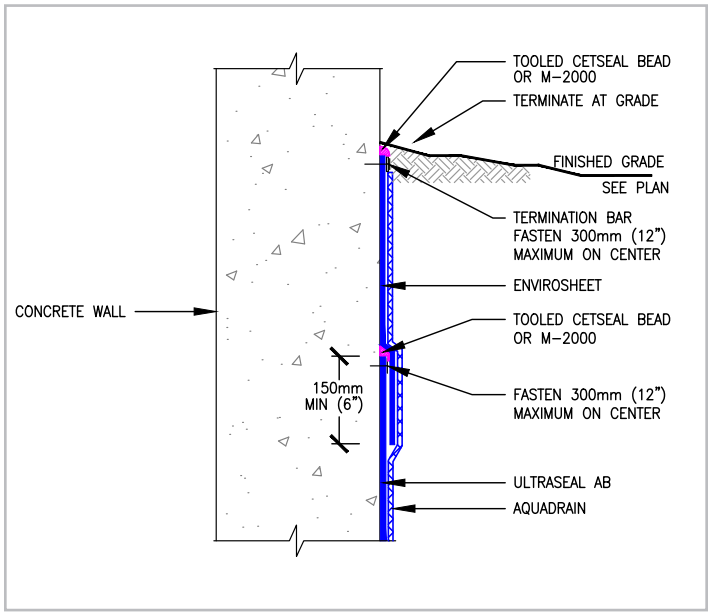

Figure NH6-1: TERMINATION DETAIL
Overlap ENVIROSHEET 150 mm (6") over ULTRASEAL AB and terminate with termination bar fastened 300 mm (12") OC. Complete detail with tooled bead of CETSEAL or M-2000. (VOLTEX base layer NOT SHOWN)

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

PHOTO 1: 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 ULTRASEAL® AB for next lift work.

PHOTO 2: REBAR ANCHORAGE DETAILING
Place AKWASWELL 9 mm (3/8”) thick over ULTRASEAL AB at base of rebar anchor rod and then install strip of WATERSTOP-RX 101 around rod

PHOTO 3: ULTRASEAL AB MEMBRANE CLOSEUP
ULTRASEAL® AB shown in photo illustrates the clear Advanced Bond coating over the membranes APC.

PHOTO 4: CETINJECT KIT
Orange tube shows the CETINJECT injection tube (Orange) with an injection sleeve (clear tube) connected. Injection screw with zerk fitting (black screw) is shown screwed into the injection sleeve

ULTRASEAL® AB WATERPROOFING MEMBRANE
FOR SHOTCRETE FOUNDATION SHORING WALLS

IMPORTANT NOTICE REGARDING SHOTCRETE DESIGN AND INSTALLATION

The performance of the ULTRASEAL® AB waterproofing membrane 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 1.2 m (4'), 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™ Quality Assurance Program 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™ QUALITY ASSURANCE PROGRAM. FOR APPLICATIONS NOT COVERED IN THIS MANUAL CONSULT WITH THE PROJECT DESIGN PROFESSIONAL .

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, information provided herein, 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 agreed specifications 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: ULTRASEAL AB waterproofing system is not an expansion joint material.

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FORM: PM_ULTRASEAL_AB_SHOTCRETE_AM_EN_202010_V1