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Challenges in Blindside Waterproofing

Presented to BCBEC, Vancouver BC. January 16th 2020

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Today's Objectives

Management of Below Grade Blindside Waterproofing

- Identify common difficulties/problems for waterproofing installation and performance
- Determine methods to avoid/prevent /solve problems
- Communication & coordination with All impacted parties
- Implement & communicate QAP

- **A geo-environmental technologies provider**

- World's largest Bentonite mining company
- Minerals, polymers, construction materials and services



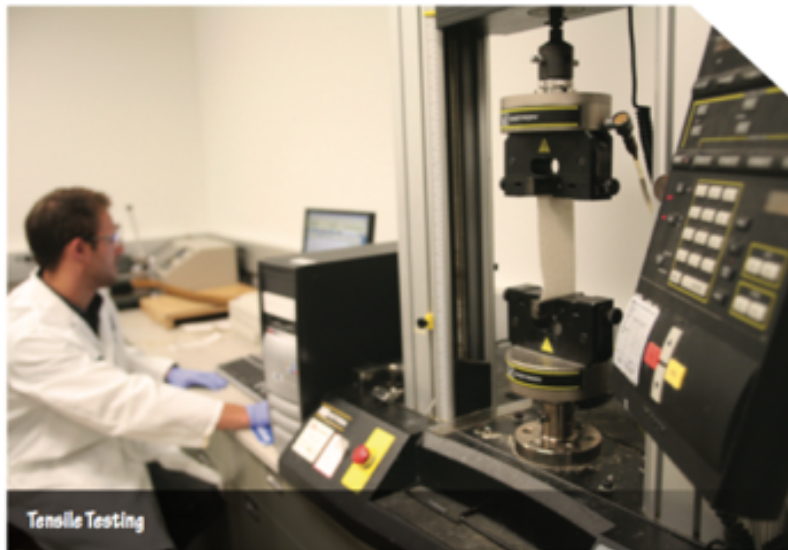
- **156 Worldwide Production Locations**

- 28 countries
- 12 R&D Centers
- 4'000 Employees

Strong RnD & QA/QC focus



- **Analytical Laboratory Testing**
 - Mineral and Chemical Analysis
 - Physical Property Testing
 - Solidification / Stabilization Treatability
 - Water and Sludge Analysis
- **Polymer Chemistry R & D**
 - Super-absorbent polymers and alloys
 - Rubber compounds



- **Disciplines**
 - Chemistry: 37
 - Biochemists: 4
 - Polymer science: 6
 - Colloid science: 5
 - Geologists: 6
- **Degrees**
 - Bachelors: 39
 - Masters: 6
 - PhDs: 15
- **375 Active Patents**



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Active and passive waterproofing

Passive

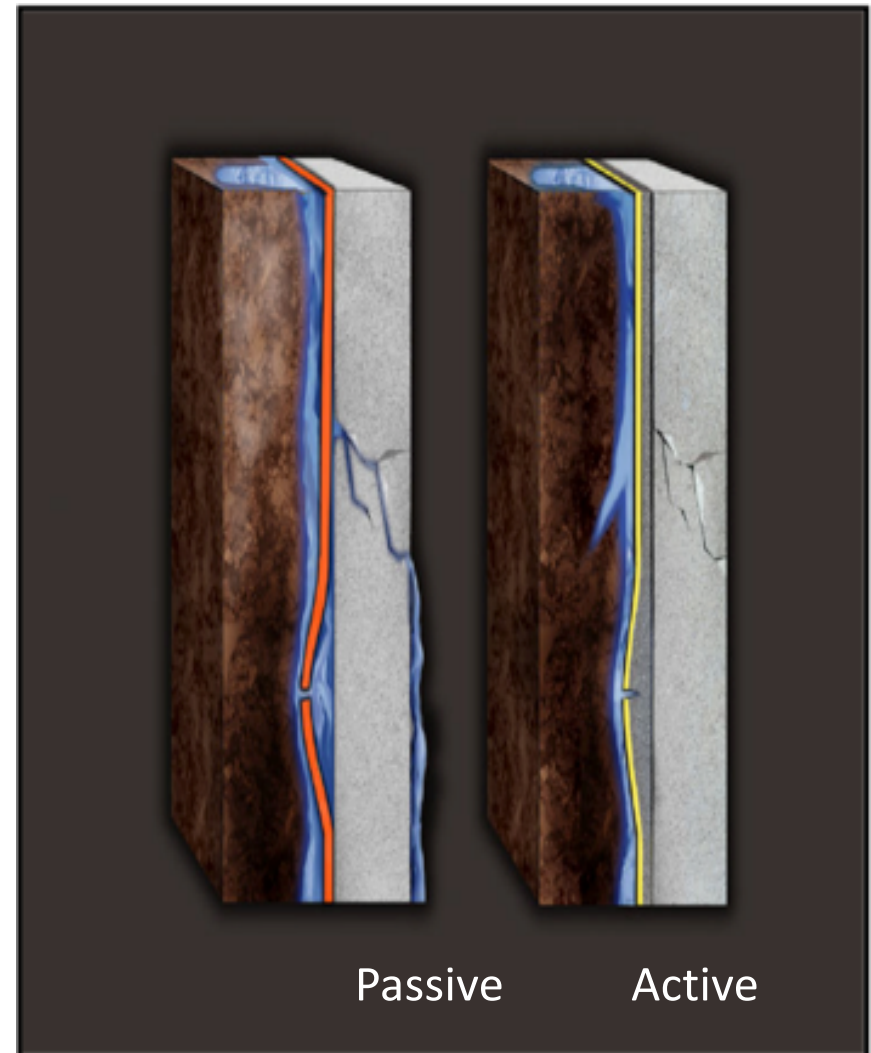
- Non swelling water barrier

Active

- Self-sealing and self-healing
- Compressive seal when confined

Best practice

- Combination of both

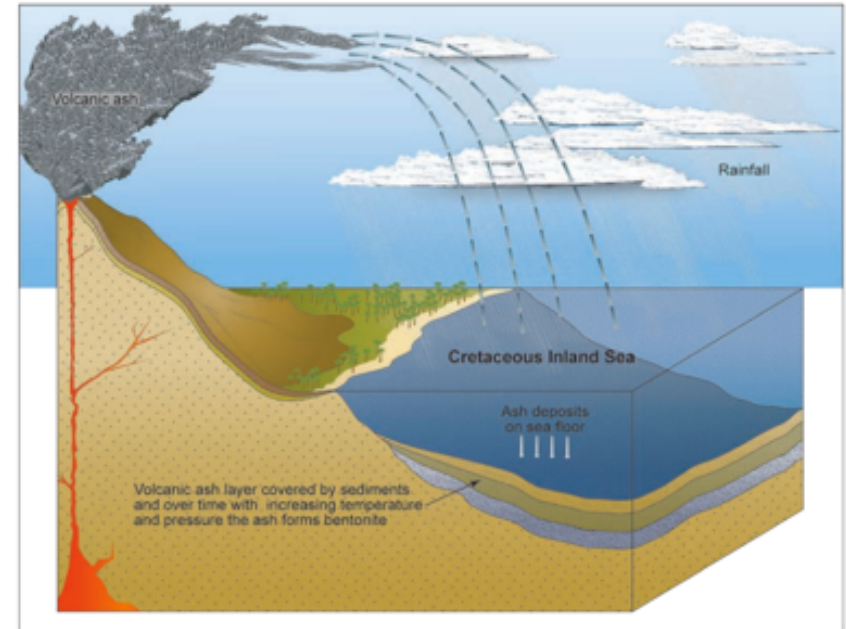




CETCO®

Sodium Bentonite

- Montmorillonite, kiln dried
- 100 % inert, lasts forever
- Swell 15x, unconfined
- Technology used in our 5 year systems
- Terminated 12" below grade
 - insures product stability





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Sodium Bentonite seals when hydrated and is dispersive

When hydrated:

- bentonite expands
- conforms to irregular surfaces, penetrations
- infiltrates cracks and voids in concrete





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Super Absorbent Polymer (SAP)

- ❑ **Better barrier than bentonite**
 - ❑ 20x > swell
 - ❑ 10x less permeable
- ❑ **90% less product used**
- ❑ **Salt and contamination resistant**
- ❑ **Terminated 12" below grade**
- ❑ **Not loose or granular**
- ❑ **Hybrid system (bentonite x SAP)**
- ❑ **Technology used in our 10-15 year systems**



Below Grade Waterproofing

Waterproofing Methods

- **Positive Side (backfilled walls)**
- **Blind Side (property line walls)**
- **Negative Side (remedial injections)**



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Positive Side Backfilled Walls





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Blind Side Property Line Walls





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Negative Side Remedial Injections



Where the Problems Commonly Occur

- Substrate
- Wall Placement Methods
- Detailing
- Water Management
- Other Trades/Damage



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PROPERTY LINE

WHAT WE WANT AND WHAT WE GET



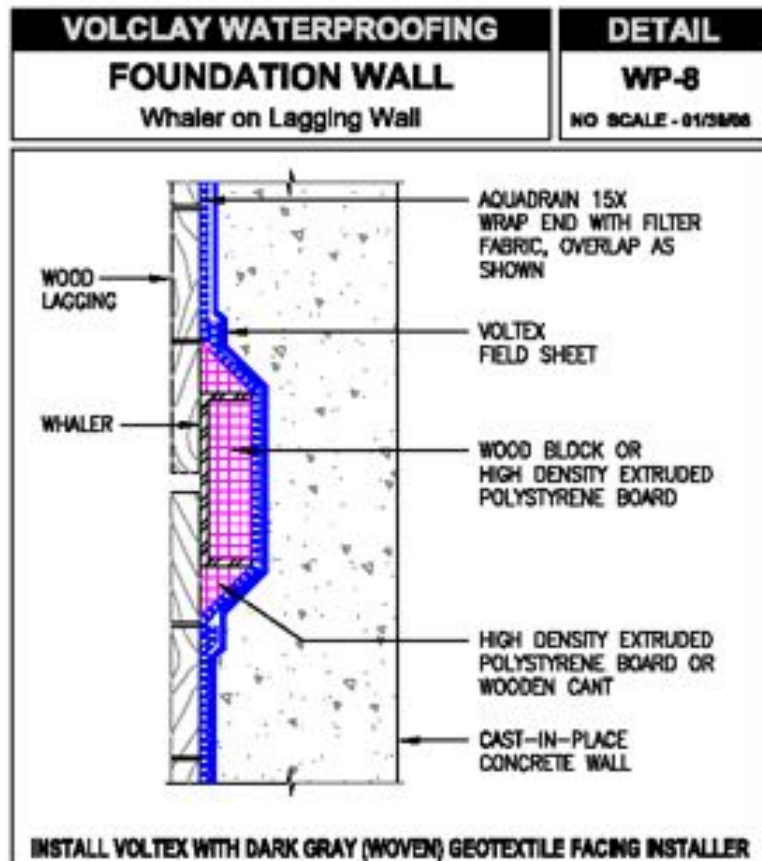
Good Substrate = No Leaks



Soldier Pile & Lagging (internal bracing)



Whalers



*The information is based on data not necessarily considered to be true and accurate. The information is shown to the owner, construction, architect, and various project participants upon their completion. CR-100 does not contain the results of an independent audit. It is not to be used as a basis for litigation. Please contact CR-100 with any questions or comments. For the information, CR-100 understands that parties are not required to follow the rules. The information is not to be used as a basis for litigation. The information is not to be used as a basis for litigation.

**Courtyard Marriot
Washington, DC**

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WILSON'S MOUTHWALL GROUP

1000 West 10th Street, Suite 1000, Waco, TX 76798
 Tel: 817.868.8888 Fax: 817.868.8888 <http://www.mca.com>
 1000 10th St.



Soldier Pile & Lagging (external bracing)



Tie-Back Head

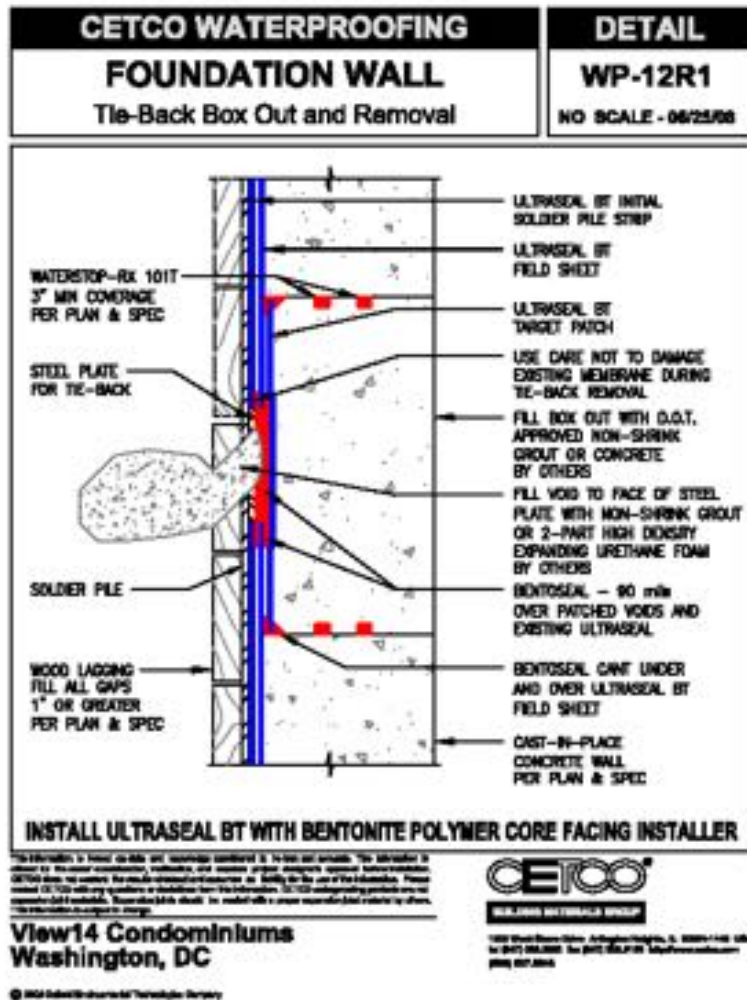


Full Depth Block out



FULL DEPTH BLOCK-OUTS

THEY ALWAYS LOOK BETTER ON PAPER





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Ineffective Tie-Back Detailing



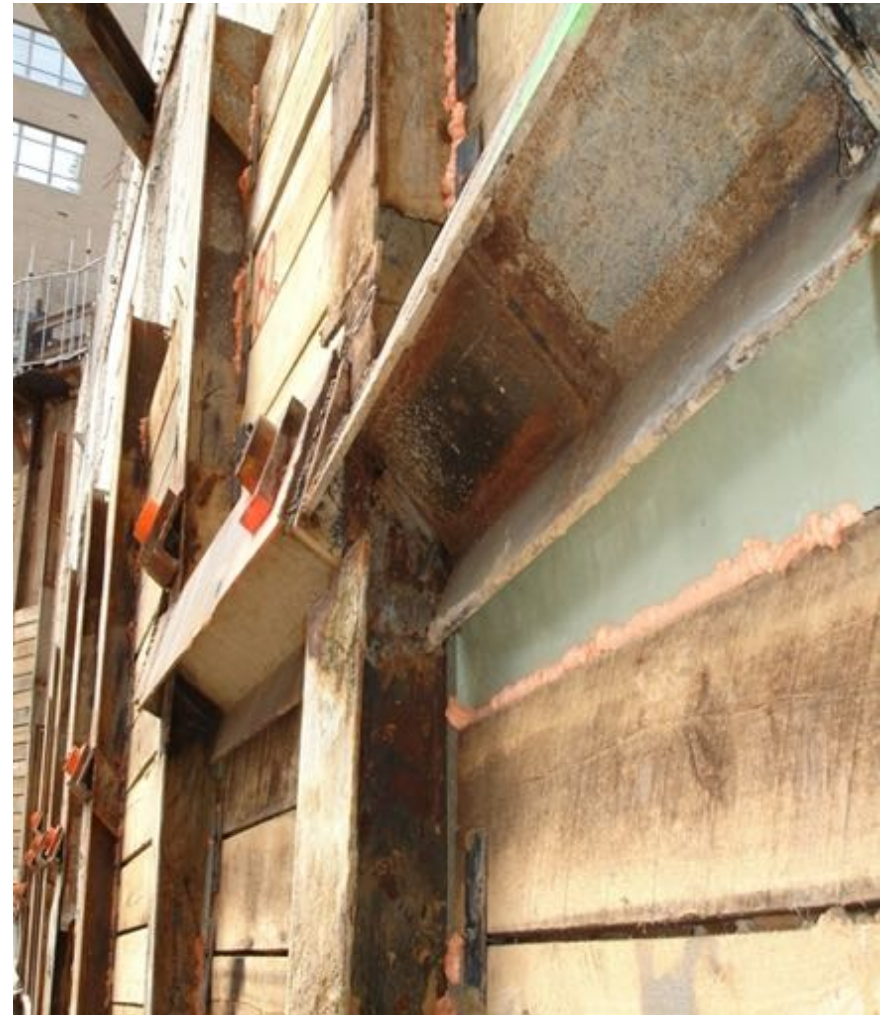
Simple and Effective



Front lagged Wall



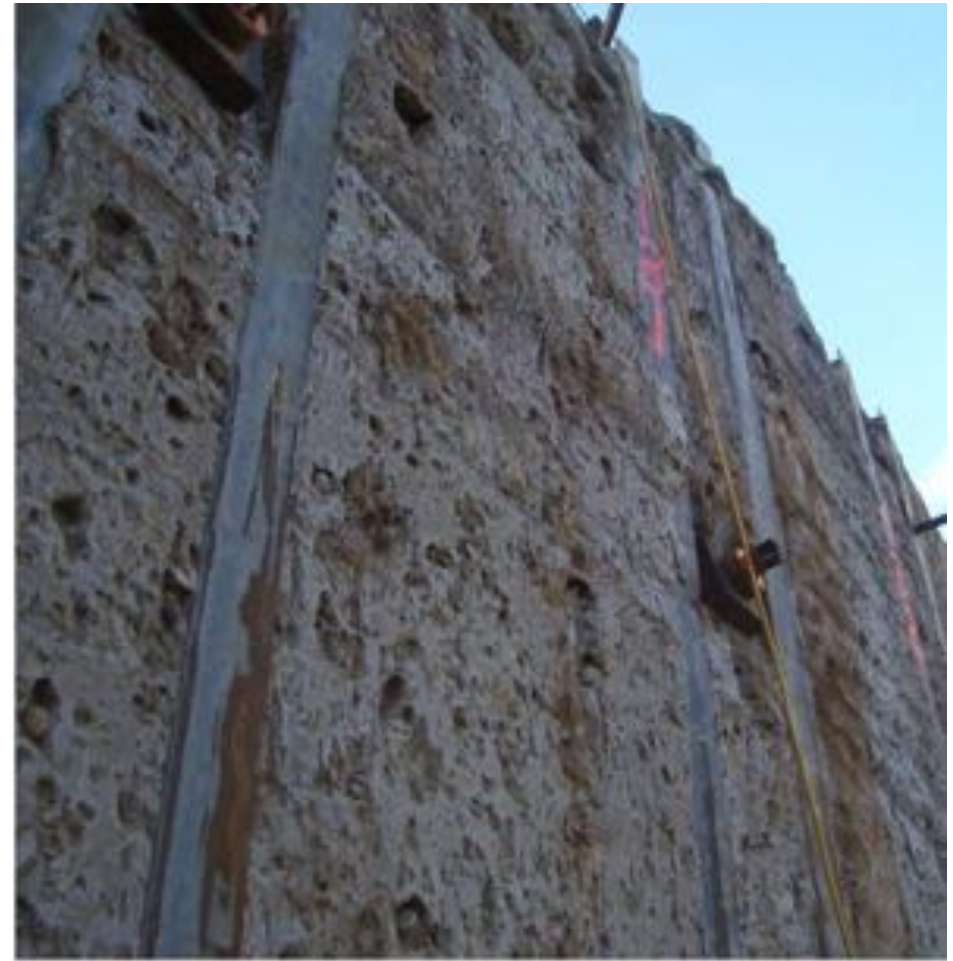
Back Lagged Wall



LAGGING/RETAINING WALL: TIME CONSUMING AND COSTLY



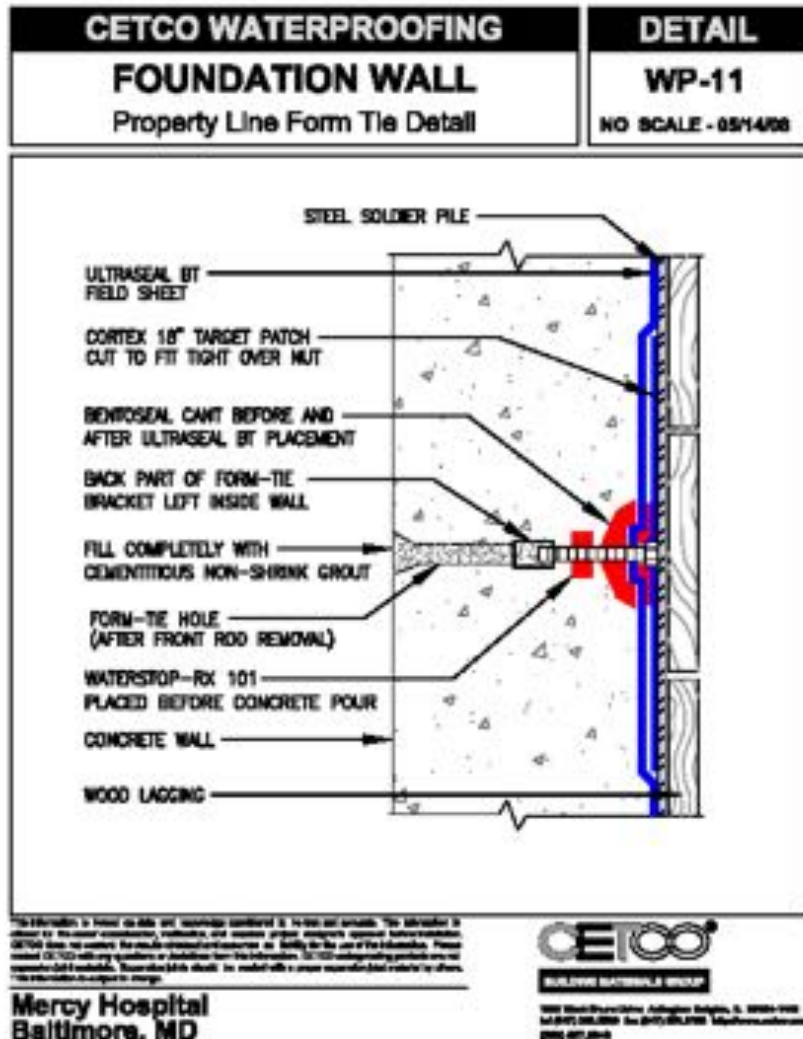
LAGGING/RETAINING WALL: LOOKS CAN BE DECEIVING



TIE ROD SLEEVES ARE TROUBLE !



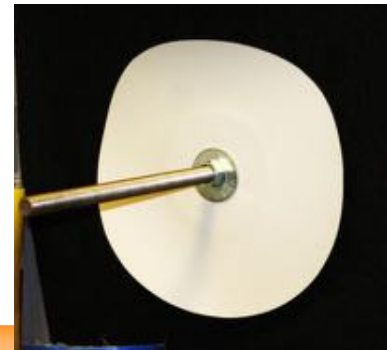
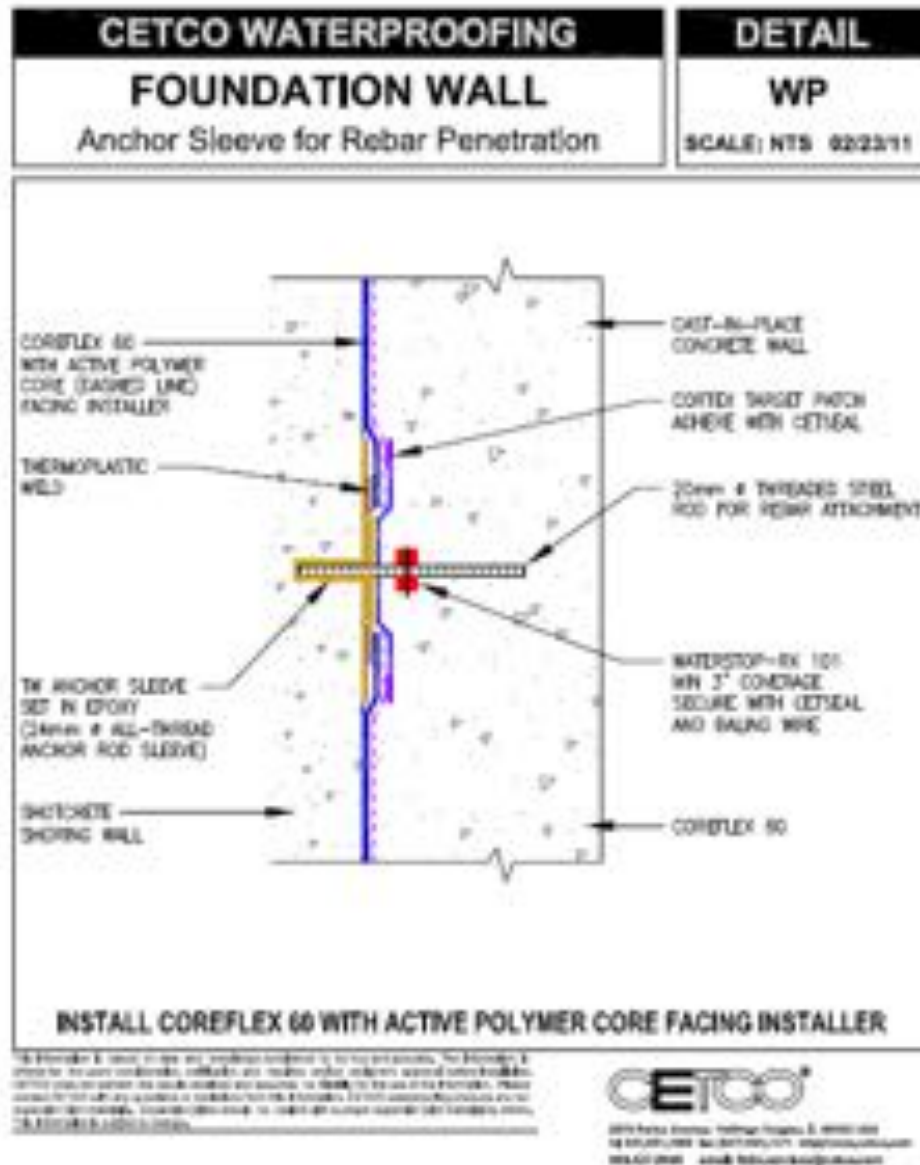
Pre-Fab Tie Rods – Fast and Dry



Penetrating Rebar Braces



Penetration-less Rebar Braces



Wall Placement Methods

- **Cast in place**
 - Poured in place
 - Wet mix
 - High consolidation
- **Shotcrete**
 - Dry mix
 - Quick and Cost effective
 - Sprayed concrete
 - Low consolidation

Cast in Place Concrete





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Shotcrete



Shotcrete





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Shotcrete overspray





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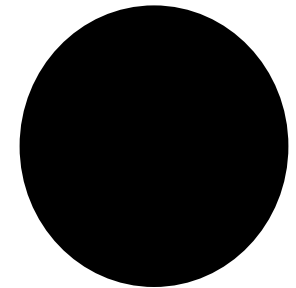
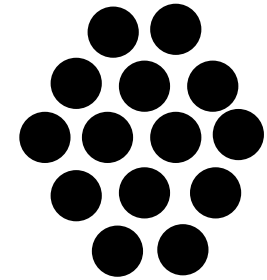
Other Construction Concerns

- **Grounding Cables**
- **Rebar Supports**
- **Damage**
- **Concrete Joint Stops**
- **Adequate Notice to Waterproofing Installer**



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This will Leak



GROUNDING: THE SOLUTION

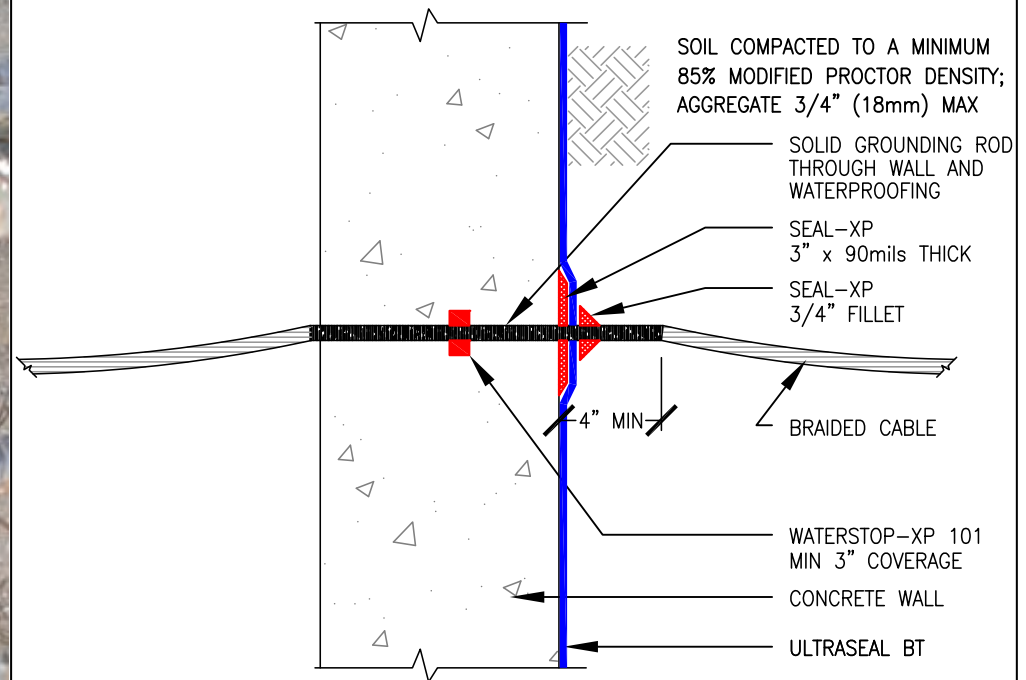


FOUNDATION DETAIL

Solid Grounding Rod

WP-9

SCALE: NTS 06/13/16



INSTALL ULTRASEAL BT WITH WHITE POLY LINER FACING INSTALLER

Pronged/Clawed Rebar Supports



Concrete Brick Support





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Post Install Damage





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Quality Control and Quality Assurance

A recommended standard for best practice

START HERE:

SPECIFICATION

Specify proper waterproofing system based on individual project conditions/needs

Define the waterproofing Process: Include QC Cross-Reference Trades [Retaining Wall, Concrete, Backfill, etc]

Substrate Requirements – Tolerances

Handling of Non-Standard Conditions

Outline Quality Assurance Program

Quality Control and Quality Assurance

A recommended standard for best practice

Long-term Performance



Independent Inspection



Applicator Program



Design Assistance





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DESIGN ASSISTANCE

provides a wide range of value-added assistance and technical expertise to your design team.

Water Sample Compatibility

- **CONDUCTIVITY TEST**

(ASTM D 1125)

- **pH TEST**

(ASTM D 1293)

- **FREE SWELL TEST** volumetric swelling ability

clay to monolithic (ASTM D 5084)

- **FLUID LOSS TEST** sealing performance

231 FT (ASTM 5385)





Sound Guidance

- **Design & review**
- **Specification recommendation**
- **Type of system**
 - Construction Methodology
 - Job specific conditions (water test results)
 - Geotechnical Report



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DESIGN ASSISTANCE

provides a wide range of value-added assistance and technical expertise to your design team.

Sound Guidance

- **Job-Specific CAD Details**
 - eliminates field decisions
- **Aligns design and construction teams**
- **All site conditions detailed and reviewed at pre-construction conference**





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Example of Site Specific Details: Tie-backs



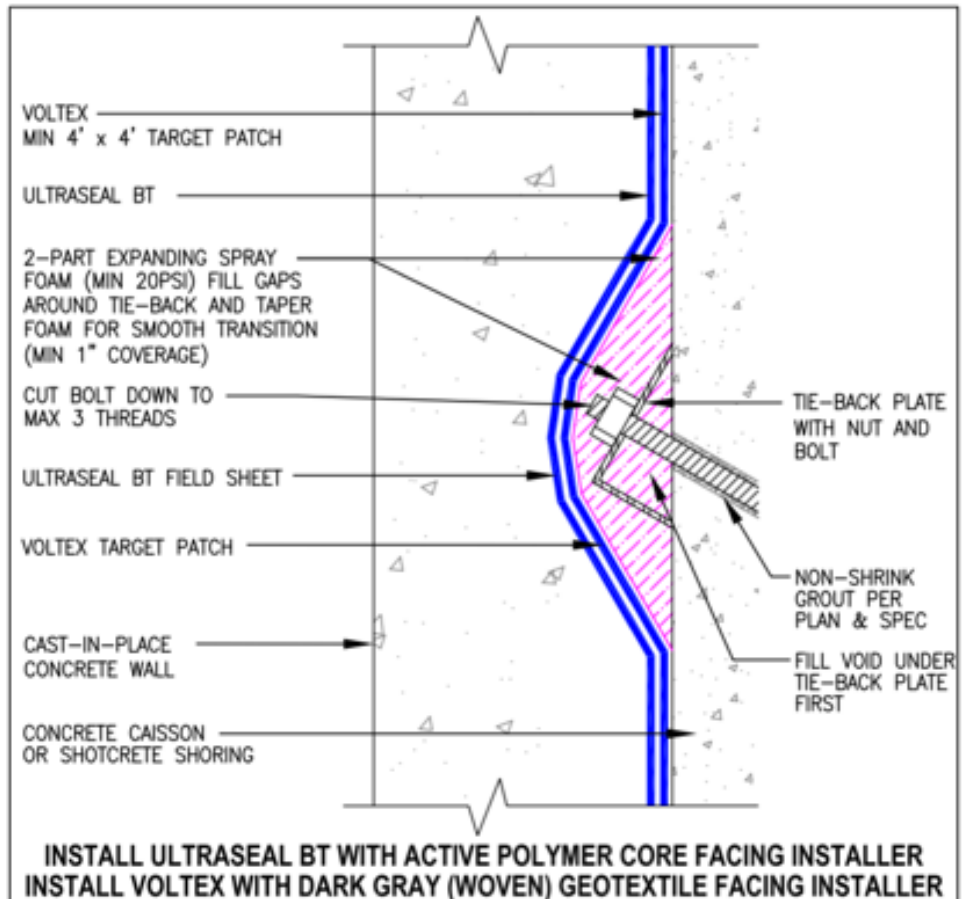
CETCO WATERPROOFING PROPERTY LINE WALL

2-Part Foam over Tie-Back

US-03

WP-3R1

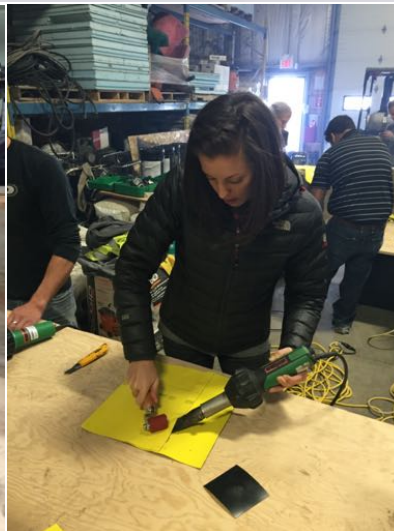
SCALE: NTS 09/28/15





APPLICATOR PROGRAM

To ensure the best results for a successful project, the best solution is to have a trained, experienced applicator install a properly designed waterproofing system.



- Job specific training and current certification
- Program encourages experienced local partners with proven performance



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INDEPENDENT INSPECTION

Be sure what you specify is what you get. Third-party independent inspection.

Certified Review

- **Required certification process**
- **Verification of installation**
 - 100 % review
 - Reports go directly to CETCO and complete design and construction team





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LONG-TERM PERFORMANCE

Four "fine-print" factors to consider when evaluating a warranty program.

Performance warranty

- No dollar limit on any required repairs
- Single source from manufacturer
- No additional charge





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<https://sforce.co/30ot8UV>

Participant Registration



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Provider

CETCO

Provider Number

J251

Course Name

Challenges of Blindside Waterproofing

Course Id

BSW125

Date

3/13/2019

First Name:

Last Name:

AIA Member?

AIA Membership Number:

Email Address:

I Attended



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Thermoplastic / APC



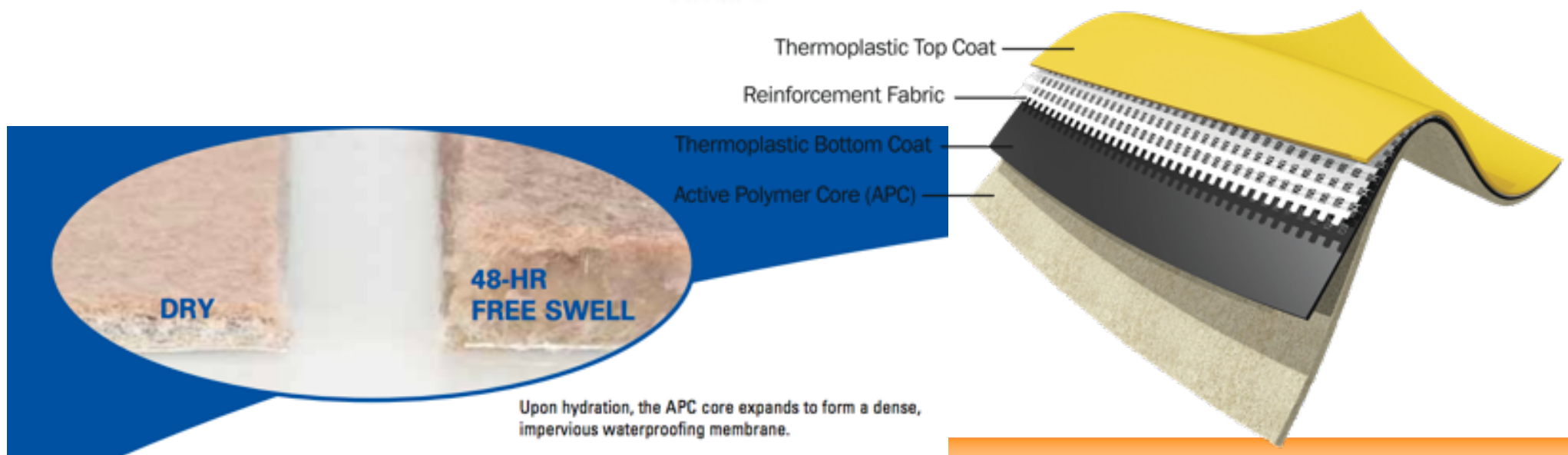
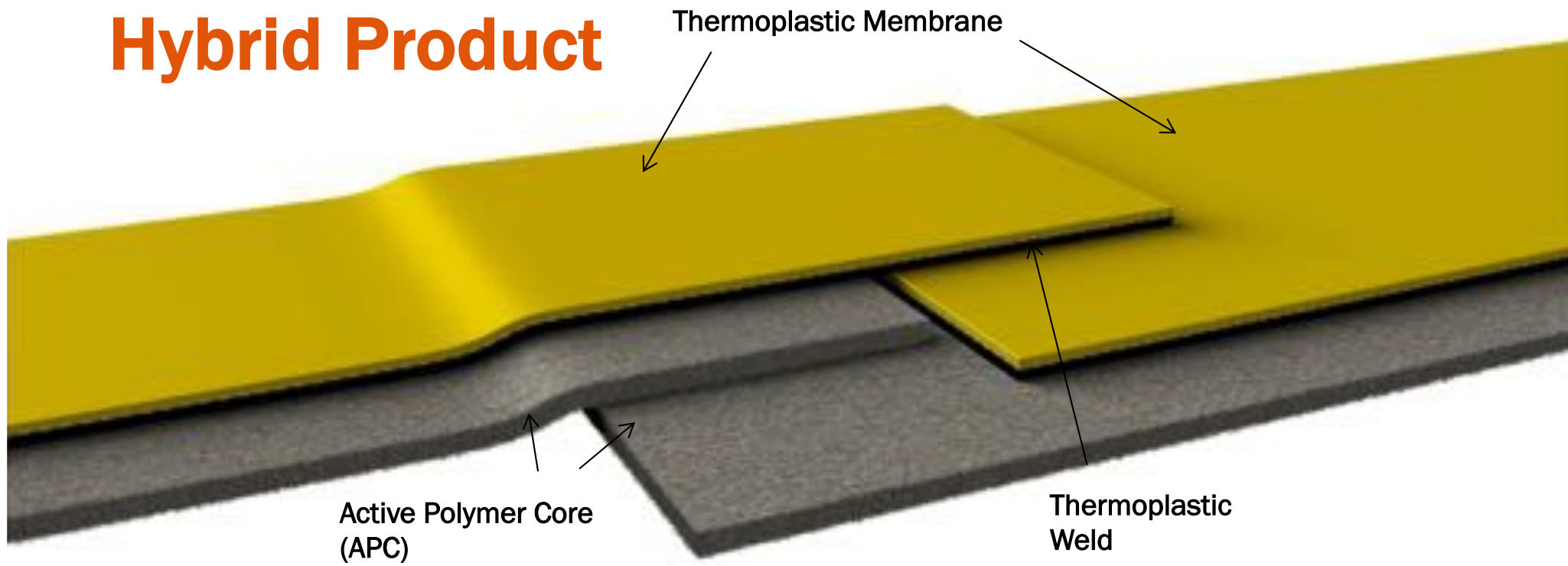
- Active Polymer Core (APC) technology
- 60 mil reinforced thermoplastic membrane
- Heat welded seams
 - Dual system (active/passive)
- Ideal shotcrete system
- Ideal for restoration
- Class A vapor retarder
 - ASTM E 1745





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Hybrid Product



Eg. in the Field, Manulife, Calgary AB

- **40ft below the water table**
- **50'000 SF, 6 level below-grade parkade**
- **Shotcrete foundation walls**



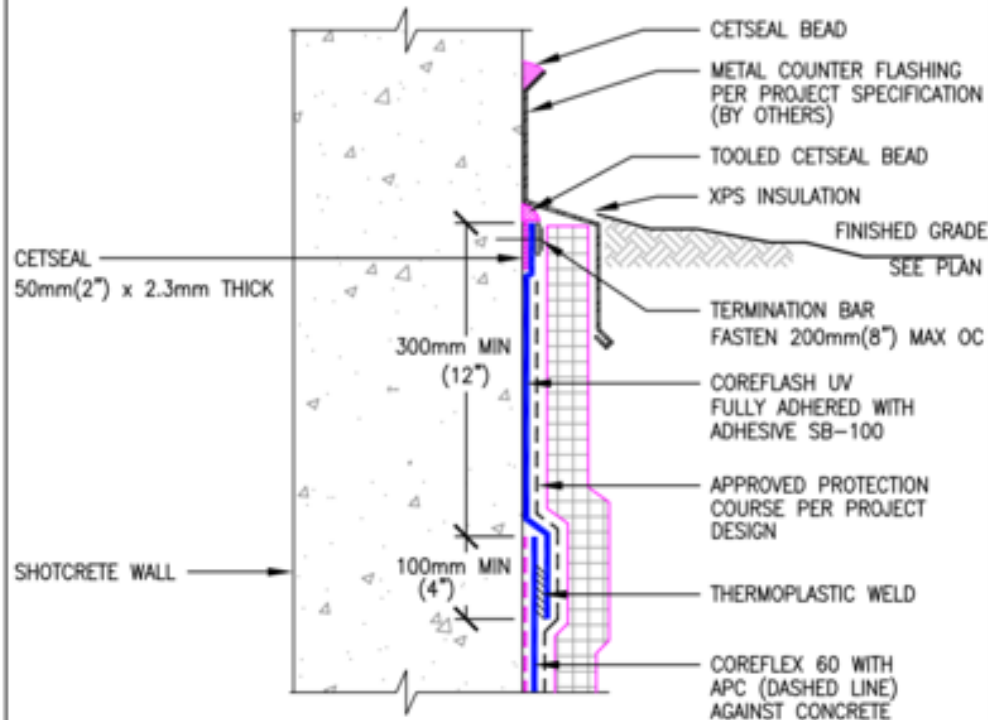
Eg. from the Field, Manulife, Calgary AB

BACKFILLED SHOTCRETE

Grade Termination

WP-12R2

SCALE: NTS 11/17/14



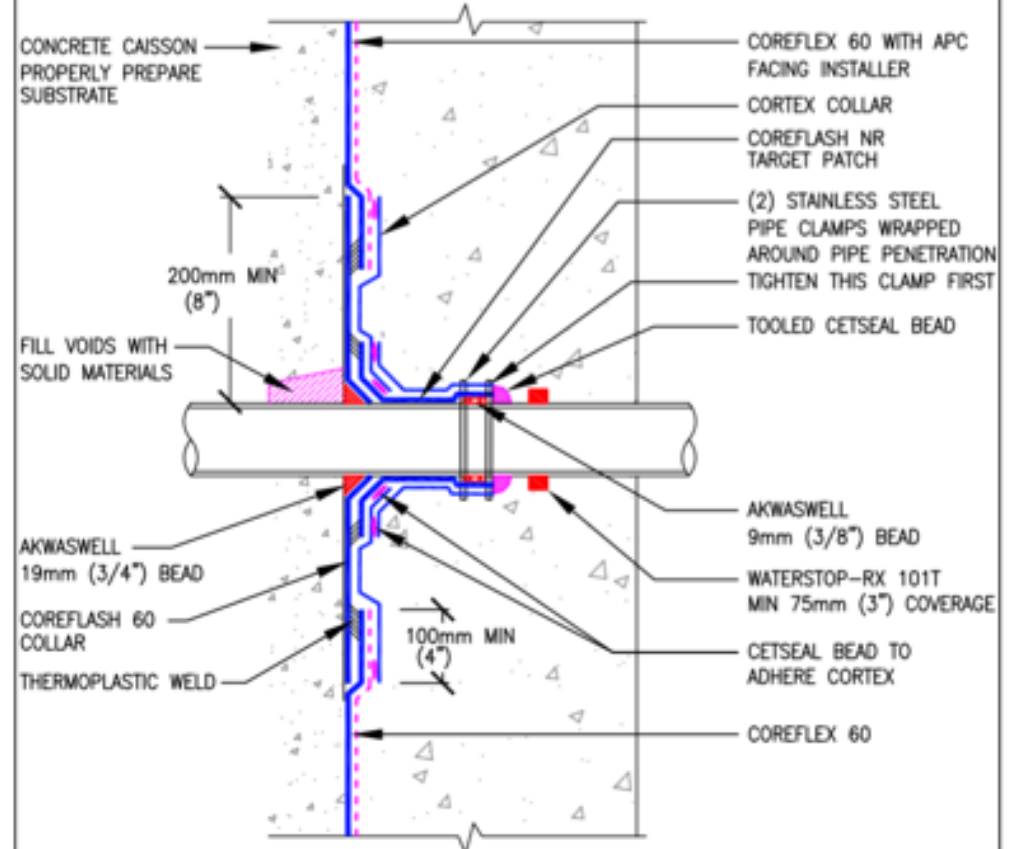
INSTALL COREFLEX 60 WITH YELLOW MEMBRANE FACING INSTALLER

PROPERTY LINE SHOTCRETE

Pipe Penetration

WP-8R1

SCALE: NTS 10/24/14



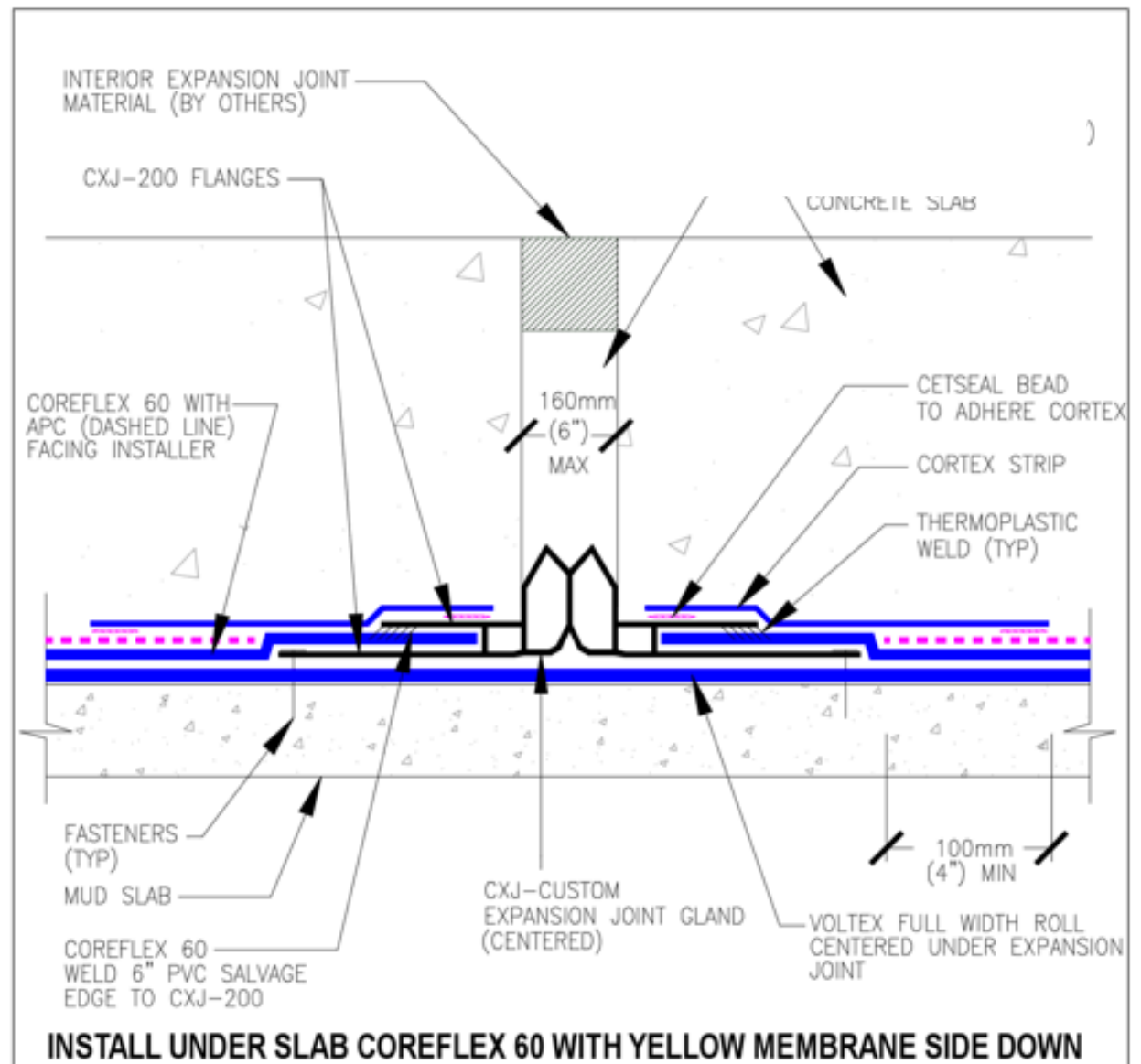
INSTALL COREFLEX 60 WITH YELLOW MEMBRANE FACING CAISSON



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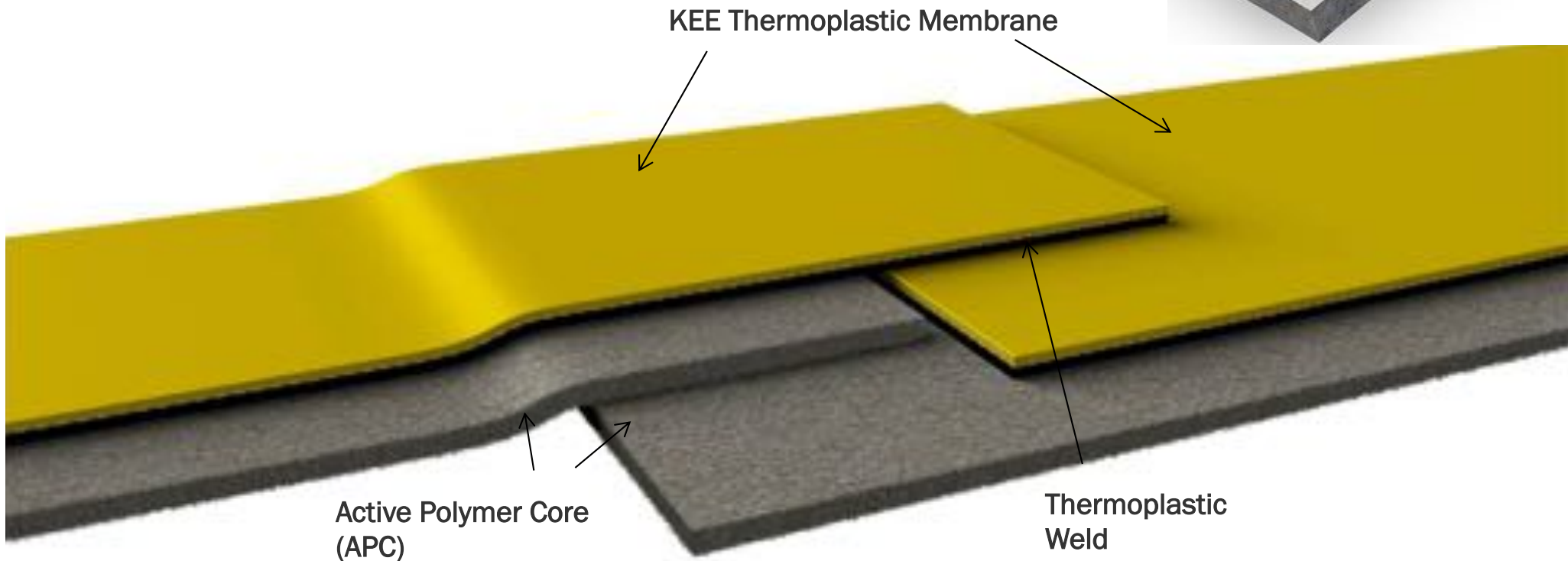
Other

accessories such as expansion joint



WATERPROOFING SYSTEMS- GREEN ROOF

HYBRID SYSTEM- DUAL MEMBRANE





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T-Series Thermoplastic PVC Tunnel Waterproofing





An active waterproofing membrane featuring XP technology for exceptional performance in a wide-range of ground water conditions, including high saline environments



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Sea water installation





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Sea water installation





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Sea water installation

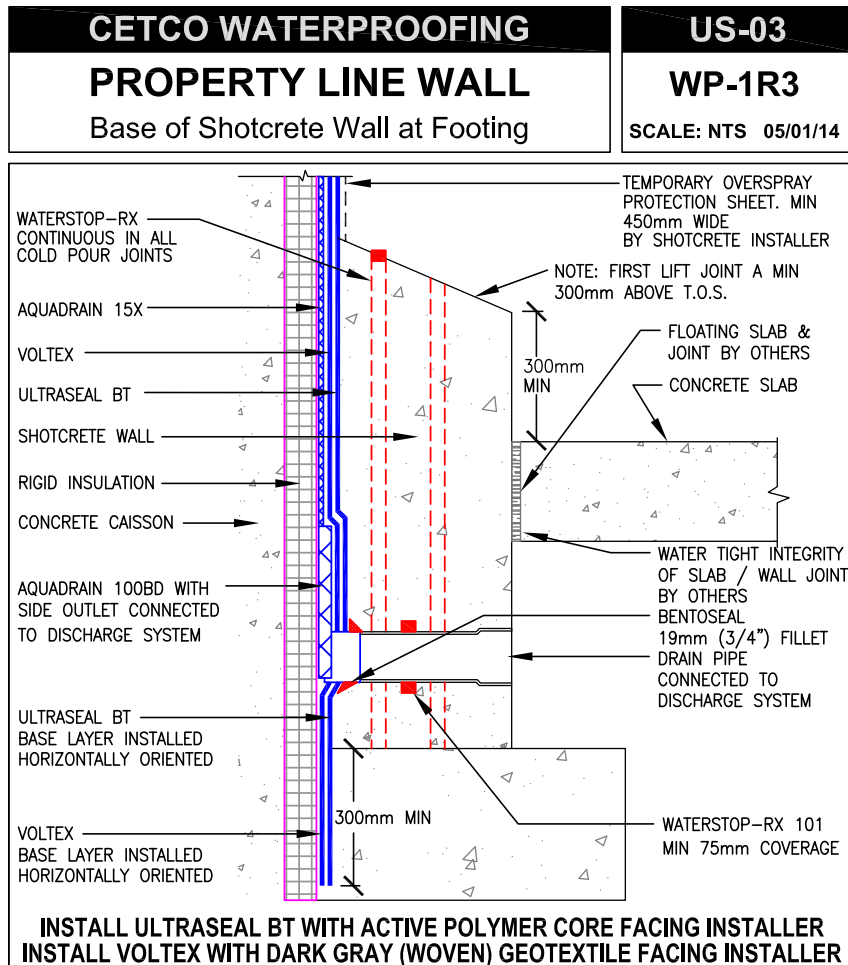


Brookfield Place

- 40ft below the water table
- 80,000 SF, 6 level below-grade parkade
- Shotcrete foundation walls



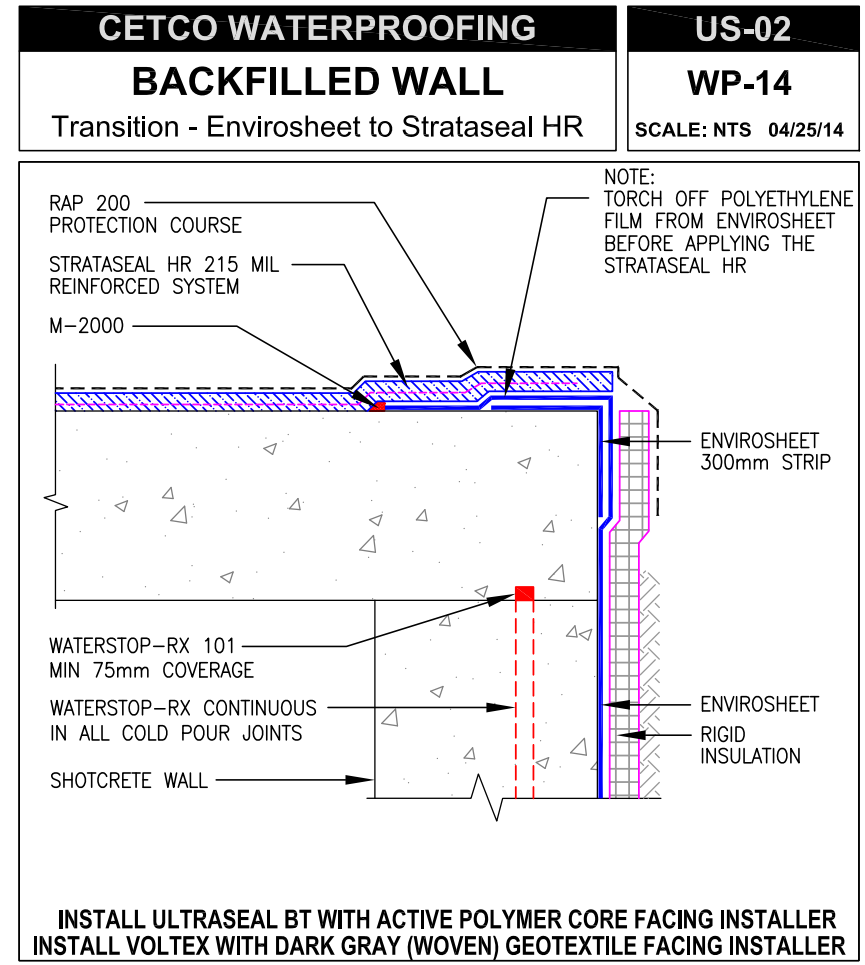
Brookfield Place - Details



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**Brookfield Place
Calgary, AB**

CETCO®
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tel 847.851.1800 fax (847) 851.1371 <http://www.cetco.com>
800.527.9948 email: field.services@cetco.com



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Bentonite Geotextile



- **Confined**
- **Two geotextiles enclosing Sodium Bentonite (1lbs/SF)**
- **Extremely durable**
- **Designed to have concrete placed directly onto membrane**
- **Comes in two forms:**
(with and without added PE passive liner)



Installation

- ✓ Any weather condition
- ✓ Mechanically fastened
- ✓ Designed for blindside
- ✓ Under slab





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VOLTEX DS WATERPROOFING

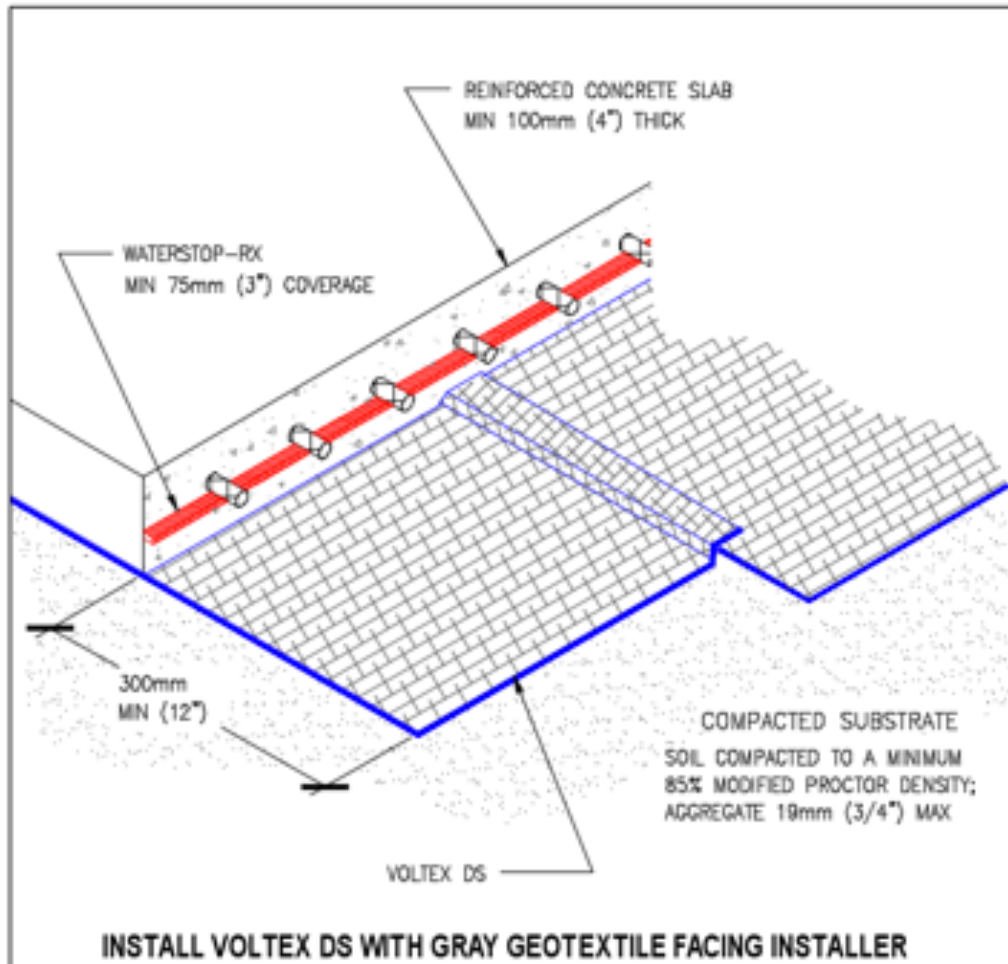
FOUNDATION SLAB

Structural Slab on Compacted Substrate

DS-01

WP-1

SCALE: NTS 29/11/16



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Orchid by Beedie,
Richmond, BC

VOLTEX DS WATERPROOFING

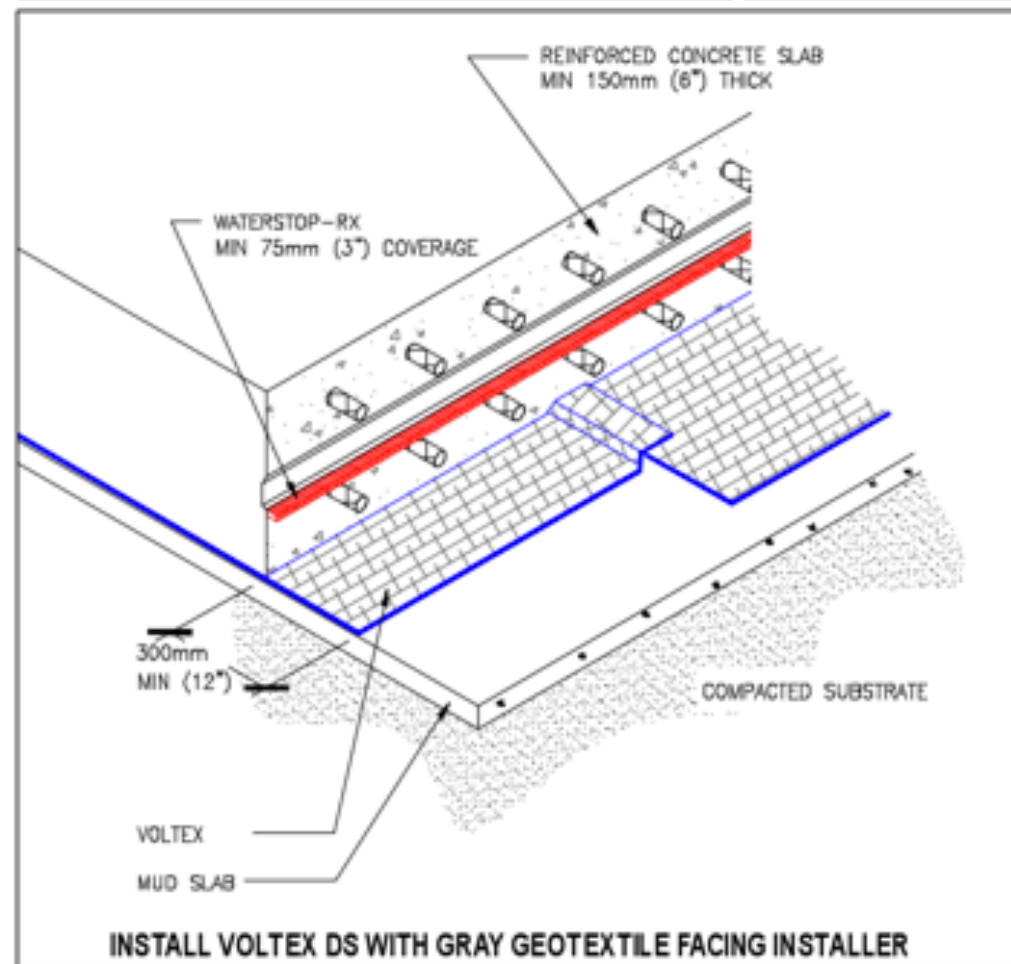
FOUNDATION SLAB

Structural Slab on Mud Slab

DS-01

WP-2

SCALE: NTS 29/11/16



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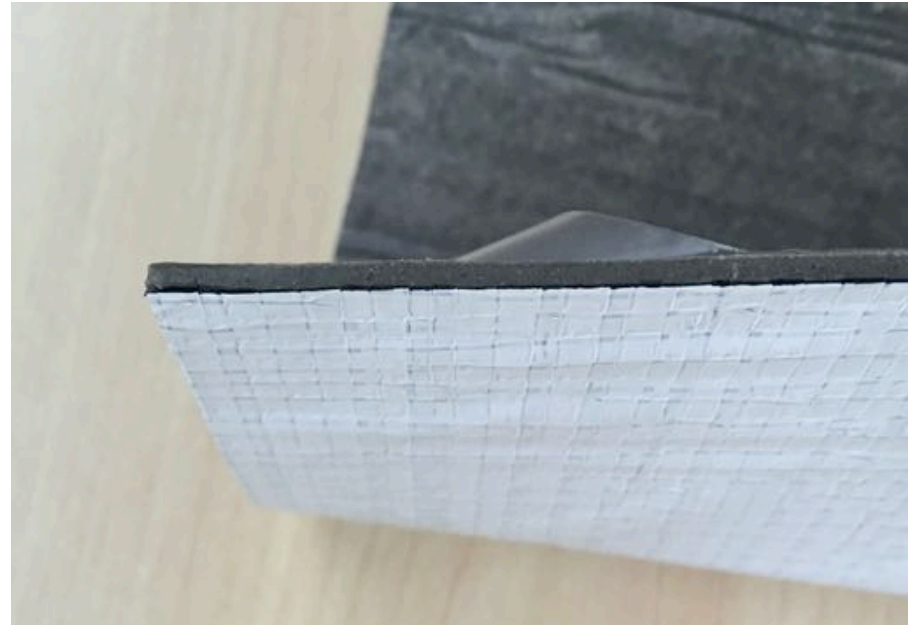
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800.527.9948 email: field.services@cetco.com

Orchid by Beedie,
Richmond, BC

Bentonite Composite



- **Identical membrane composite as Waterstop RX**
- **Unconfined**
 - bentonite/rubber
 - HDPE laminated liner
 - siliconized release film
- **Mechanically fastened**





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Underslab to wall transition



Expanding Bentonite Composite Waterstop

**The FIRST
expanding strip
waterproofing**

**Stop water ingress
through
construction joints**

Fills voids



Expanding Bentonite Composite Waterstop

- **Millions of linear ft worldwide each year**
- **Advantages:**
 - forms compressive seal
 - ease of installation
 - reasonable cost

Myriad of applications:

- residential
- commercial
- industrial (sewage treatment)





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Expanding Bentonite Composite Waterstop



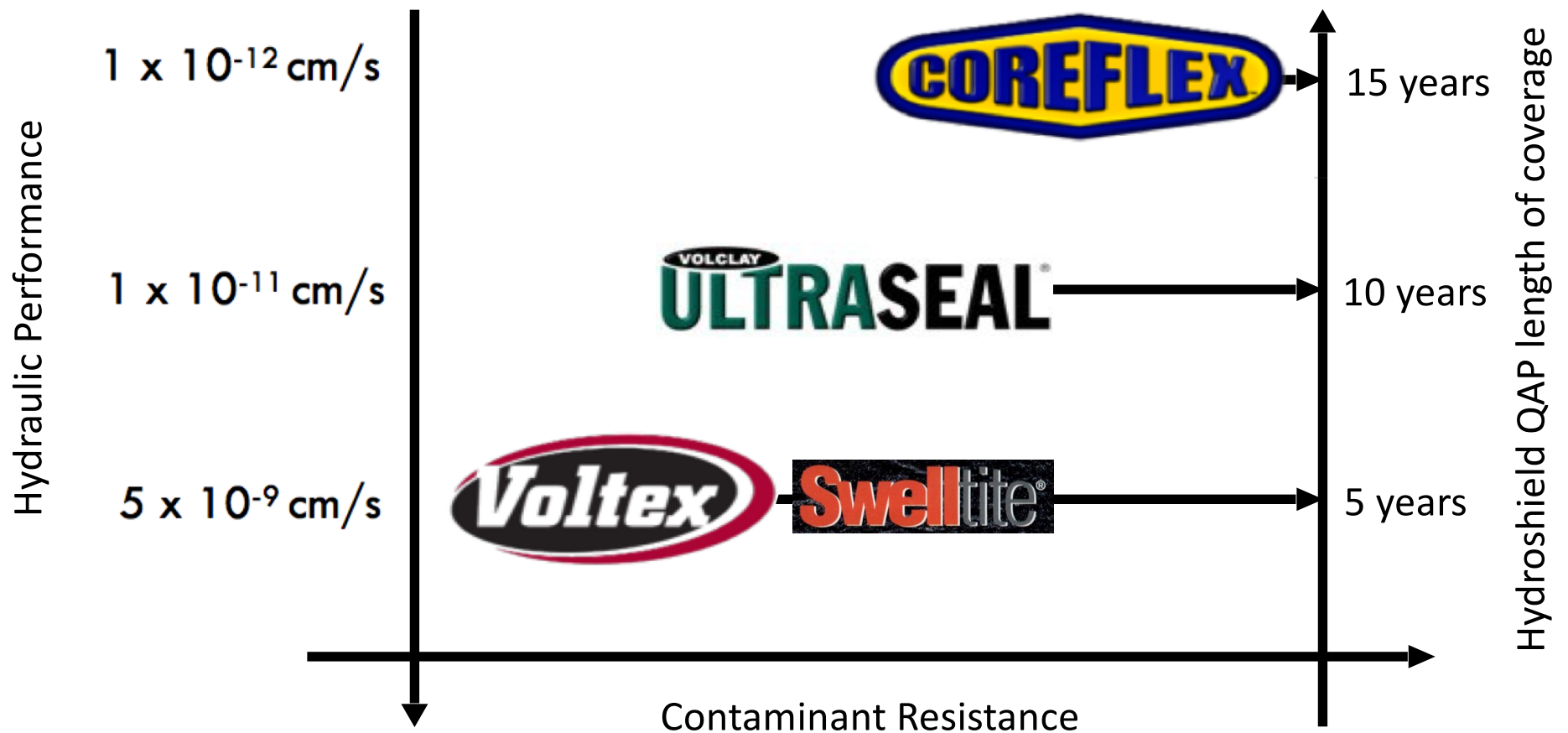
When hydrated:

- **Expands 4x its size**
- **Poorly consolidated concrete**
 - When confined:
controlled expansion



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Our products' warranty eligibility



Summary chart representing the characteristics of eight selected below-grade waterproofing products and associated warranties.

								
Unlimited warranty	✗	✗	✗	✗	✗	✗	✗	✓
Material and Labour	✗	✗	✗	✗	✓	✓	✓	✓
No temperature restriction	✗	✗	✗	✓	✗	✗	✗	✓
No rain / humidity restriction	✗	✗	✗	✗	✗	✓	✓	✓
Suitable substrate voids ≤1"	✗	✗	✗	✗	✓	✗	✓	✓
3rd party quality control	✗	✗	✗	✗	✗/✓	✓	✗	✓
Job-specific design	✗	✗	✗	✗	✓	✗	✗	✓
No extra charges	✓	✓	✓	✓	✗	✗	✓	✓



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Performance based specification

Warranty Guarantee Letter of Commitment

Project: _____

Tender #: _____

Subject: _____

Date: _____

We the undersigned, acknowledge and agree that subject to the terms described below are jointly and severally responsible for any and all costs for repairs reasonably required in connection with any failure or defect in the waterproofing system for the above mentioned project. This warranty is a single source warranty covering both materials and labor by the manufacturer for a period of () years from date of substantial completion. This warranty is to be a no dollar limit warranty to perform the required repairs during the warranty period. The undersigned will perform any or all repair work required or the repair work will be carried out by another contractor at the cost to the undersigned.

Type of Waterproofing: _____

Acceptance Date: _____

Hydrostatic Conditions

Application Type	5 Year Hydroshield	10 Year Hydroshield	15 Year Hydroshield
CIP Backfilled Wall	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex
CIP Blindside Wall	Voltex DS	Ultraseal BT	Coreflex
Shotcrete Backfilled Wall	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex
Shotcrete Blindside Wall		Ultraseal and Cortex	Coreflex
Underslab	Voltex DS	Ultraseal SP	Coreflex
Tunnel Roof / Plaza Deck	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex

Non-Hydrostatic Conditions

Application Type	5 Year Hydroshield	10 Year Hydroshield	15 Year Hydroshield
CIP Backfilled Wall	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex
CIP Blindside Wall	Voltex or Voltex DS	Ultraseal BT	Coreflex
Shotcrete Backfilled Wall	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex
Shotcrete Blindside Wall	Voltex DS, Aquadrain 15x, Aquadrain 100BD	Ultraseal BT, Aquadrain 15x, Aquadrain 100BD	Coreflex
Underslab	Voltex or Voltex DS	Ultraseal SP	Coreflex
Tunnel Roof / Plaza Deck	Swelltite w/ Seamtape	Ultraseal BT w/ Seamtape	Coreflex