

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 WORK SUMMARY

- A. The work of this section includes, but is not limited to the furnishing and installing the following materials, per project specifications and drawings, or as directed by bentonite waterproofing manufacturer:
1. Bentonite panel waterproofing membrane.
 2. Bentonite geotextile waterproofing membrane.
 3. Prefabricated drainage composite
 4. All applicable accessory products.

1.2 SYSTEM DESCRIPTION

- A. Provide bentonite waterproofing and prefabricated drainage composite system to prevent the passage of liquid water and install without defects, damage or failure.
- B. Waterproofing shall consist of the following:
1. Biodegradable corrugated kraft board containing one pound per square foot of granular sodium bentonite.
 2. Two high strength geotextiles interlocked encapsulating minimum 1.10-lbs per square foot granular sodium bentonite.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, with complete general and specific installation instructions, recommendations, and limitations.
- B. Product Samples: Submit representative samples of the following for approval:
1. Panel waterproofing membrane
 2. Geotextile waterproofing membrane
 3. Prefabricated drainage composites
- C. Waterproofing Warranty: Submit a sample copy of the Manufacturer's Waterproofing warranty complete with all coverage's, limitations, and conditions.
- D. Material Certificates: Submit certificate(s) signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements. Submit certification that waterproofing system and components, drainage and protection materials are supplied by a single-source manufacturer.

- E. Contractor Certificate: Submit written certification that installer has current Approved Applicator status with waterproofing material manufacturer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installing company should have at least three (3) years experience in work of the type required by this section, who can comply with manufacturer's warranty requirements, and who is an Approved Applicator as determined by waterproofing/drainage system manufacturer.
- B. Manufacturer Qualifications: Bentonite waterproofing and all accessory products shall be provided by a single manufacturer with a minimum of 30 years experience in the direct production of bentonite waterproofing systems. Manufacturer shall be capable of providing field service representation during construction, approving an acceptable installer, recommending appropriate installation methods of the bentonite waterproofing and prefabricated drainage system applied.
- C. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field installation to establish procedures to maintain required working conditions and to coordinate this work with related and adjacent work. Verify that final waterproofing and waterstop details comply with waterproofing manufacturer's current installation requirements and recommendations. Pre-con meeting attendees should include representatives for the Owner, Architect, Contractor, waterproofing installer, concrete installer, excavating/backfill contractor, and mechanical and electrical contractors if work penetrates the waterproofing.
- D. Materials: Obtain bentonite waterproofing products and prefabricated drainage materials from a single manufacturer.
- E. Inspection: Manufacturer's representative shall inspect waterproofing installation periodically during application to verify that waterproofing has been installed in accordance with manufacturer's guidelines and recommendations.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Handling: Deliver materials in factory sealed and labeled packaging. Sequence deliveries to avoid delays, while minimizing on-site storage. Handle and store following manufacturer's instructions, recommendations and material safety data sheets. Protect from construction operation related damage, as well as, damage from weather, excessive temperatures and prolonged sunlight. Remove damaged material from site and dispose of in accordance with applicable regulations.
- B. Storage: Do not double-stack pallets during shipping or storage. Protect waterproofing materials from moisture, excessive temperatures and sources of ignition. Provide cover, top and all sides, for materials stored on-site, allowing for adequate ventilation.

1.6 PROJECT CONDITIONS

- A. Substrate Condition: Proceed with work only when substrate construction and preparation work is complete and in condition to receive waterproofing system. All plumbing, electrical, mechanical and structural items to be under or passing through the waterproofing shall be positively secured in their proper positions prior to waterproofing system installation. Substrate preparation shall be per waterproofing manufacturer's guidelines.
- B. Weather Conditions: Perform work only when existing and forecasted weather conditions are within the guidelines established by the manufacturer of the waterproofing materials. Do not apply waterproofing materials in areas of standing or active water; or over ice and snow. The Contractor shall maintain site conditions to remove standing water from precipitation or ground water seepage in a timely manner. Should waterproofing materials be subjected to pre-hydration as a result of prolonged immersion, inspection of the material and written acceptance from manufacturer will be required prior to concrete or backfill placement.

1.7 WARRANTY

- A. Waterproofing Warranty: Upon completion and acceptance of the work required by this section, the waterproofing materials manufacturer shall provide a written five (5) year material warranty. Issuance of Manufacturer's Material Warranty requires the following:
 - 1. Manufacturer's Approved Applicator shall install bentonite waterproofing system and prefabricated drainage composite in full accordance with manufacturer's requirements.
 - 2. Bentonite Waterstop must be installed in all applicable horizontal and vertical concrete construction joints and around applicable penetrations.
- B. Manufacturer's warranty shall be independent from any other warranties made by the Contractor under requirements of the Contract Documents and may run concurrent with said warranties.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Provide bentonite waterproofing membrane and all applicable accessory products as manufactured by Colloid Environmental Technologies Company (CETCO), Arlington Heights, Illinois, or an approved substitution. Phone: (847) 392-5800; Fax: (847) 506-6195; Web-site: www.cetco.com.

2.2 MATERIALS

- A. Sodium Bentonite: Specially selected Wyoming granular sodium bentonite with 90% passing through a 20-mesh sieve and less than 10% passing through a 200-mesh sieve. Sodium bentonite shall have a 2 gram free swell minimum volume of 16 cc and a maximum fluid loss of 18 ml in de-ionized water.
- B. Bentonite Panel Waterproofing

1. Type 1 Panels: 1 lb. per square foot of specially treated granular sodium bentonite contained inside a biodegradable, corrugated kraft board measuring 48" x 48" x 3/16" thick.
2. Type 1-C Panels: same as Type 1 panels with the printed side of the kraft board treated with a clear, water-resistant coating.
3. Bentonite Geotextile Waterproofing Membrane: 4' x 15' roll of interlocked geotextiles encapsulating a minimum 1.10-lbs per square foot of granular sodium bentonite. Composite shall consist of one woven and one nonwoven polypropylene geotextile, interlocked using a needle-punching process that produces several interlocks per square inch over the entire area of the product. Typical membrane performance properties:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>TYPICAL VALUE</u>
Hydrostatic Pressure Resistance	ASTM D 5385 mod.	231 ft.
Permeability	ASTM D 5084	1 x 10 ⁻⁹ cm/sec.
Grab Tensile Strength	ASTM D 4632	95 lbs.
Puncture Resistance	ASTM D 4833	100 lbs.
Low Temperature Flexibility	ASTM D 1970	Unaffected at -25°F
Peel Adhesion to Concrete	ASTM D 903 mod.	15 lbs. /in.

C. Accessory Waterproofing Products: All accessory waterproofing materials shall be provided by the bentonite waterproofing manufacturer or shall have manufacturer's written approval for substitution.

1. Bentonite Sealant: Trowel grade sodium bentonite compound used as a detailing mastic around penetrations, corner transitions and grade terminations.
2. Bentonite Tubes: 2" diameter x 2' long, water soluble tube container filled with granular sodium bentonite.
3. Granular sodium bentonite.
4. Seam Tape: 2" wide butyl rubber sealant tape.
5. Termination Bar: Min. 1" wide aluminum bar with pre-punched holes on 12" centering for fastening.

D. Prefabricated Drainage Composite

1. Vertical: Aquadrain 15XP - 4-ft by 52-ft roll of a three-dimensional polypropylene drainage core with a nonwoven geotextile adhered to one side to allow water passage while restricting soil particles. Composite includes a thin polyethylene sheet on the back of the drainage core.
 - a. Compressive Strength: 15,000 psf
 - b. Water Flow Rate: 20 gpm/ft
 - c. Thickness: 7/16"

E. Deck Sub-Surface Drainage

1. Horizontal: Aquadrain 20H - 4-ft by 52-ft roll of a three-dimensional polypropylene drainage core with a nonwoven geotextile adhered to one side to allow water passage while restricting soil particles.
 - a. Compressive Strength: 21,000 psf
 - b. Flow Rate: 18 gpm/ft.

- c. Thickness: 7/16"

PART 3 - EXECUTION

3.1 SUBSTRATE INSPECTION AND CONDITIONS

- A. The installer shall examine conditions of substrates and other conditions under which this section work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturer's warranty requirements. General substrate conditions acceptable for the waterproofing installation are listed below. For conditions not covered in this Section, contact the waterproofing manufacturer for guidance.
- B. Concrete Walls: Cast-in-place concrete to receive waterproofing shall be of sound structural grade with a smooth finish, free of debris, oil, grease, laitance, dirt, dust, or other foreign matter which will impair the performance of the waterproofing and drainage system and which do not comply with manufacturer's warranty requirements.
 - 1. Form fins, ridges, and other protrusions shall be level and smooth with monolithic concrete surface. Honeycombing, aggregate pockets, tie-rod holes and other voids shall be completely filled with non-shrink cementitious grout and level with monolithic concrete wall surface.
- C. Gravel Sub-Grade: Aggregate sub-grades shall consist of 3/4" stone or smaller and be rolled flat, free from any protruding sharp edges.
- D. Mechanical Or Other Penetrations: Mechanical, structural, or architectural materials that will pass through the plane of the waterproofing membrane shall be properly installed and secured in their final position prior to installation of the waterproofing system.

3.2 SURFACE PREPARATION

- A. Remove dirt, debris, oil, grease, cement laitance, or other foreign matter which will impair or negatively affect the performance of the waterproofing and drainage system.
- B. Protect adjacent work areas and finish surfaces from damage or contamination from waterproofing products during installation operations.

3.3 GENERAL INSTALLATION GUIDELINES

- A. Comply with contract documents and manufacturer's product data, including product application and installation instructions.
- B. Prevent bentonite waterproofing products from hydrating before material is contained with backfill or concrete. When threat of rain is imminent, installed bentonite products not already contained by backfill should be covered with polyethylene sheeting to decrease the chance of

hydration. Remove polyethylene prior to overburden or backfill operations. After any precipitation, standing water should be pumped away from waterproofing as soon as possible.

3.4 BENTONITE PANEL INSTALLATION

- A. Use Type 1 Panels or Type 1-C Panels (one-side coated).
- B. Trowel Bentonite sealant over all concrete construction joints 1/8" thick by 3" wide. Form Tie holes or recesses shall be completely filled with non-shrink cementitious grout. Trowel bentonite sealant 1/8" thick over each grouted form tie hole.
- C. Trowel 3/4" continuous fillet of bentonite sealant in all inside corner transitions.
- D. Install bentonite panels with the printed side facing installer and the print oriented horizontally. Turn Panel with print vertically oriented when transitioning around inside and outside wall corners.
- E. Starting at a wall base corner, bend Volclay Panel along 1/3 panel "Starter Line" (printed on panel) and install with the kraft board corrugations and print vertically oriented. Cut the Panel at the bottom edge of the "Starter Line" so that the Panel can be extended 6" onto the footing. Secure Panels with washer-head fasteners along each edge. After installing corner Panel, install all succeeding Panels with kraft board corrugations and print horizontally oriented - continuing Panel onto footing minimum 6". Overlap all adjoining edges minimum 1-1/2". When applicable, the base Panel course shall overlap the underslab waterproofing a minimum 6" to form a continuous waterproofing layer.
- F. Stagger vertical Panel overlap joints of succeeding courses by folding the next courses corner Panel on the 2/3 panel "Lap Line" (printed on panel) and install overlapping lower Panel course minimum 1-1/2". After installing corner Panel, install all succeeding Panels with kraft board corrugations and print horizontally oriented - overlapping adjoining edges minimum 1-1/2".
- G. Penetration: On flat surface cut Panel to fit around penetration. Immediately seal cut Panel edge by applying water with cloth or sponge prior to panel installation. After Panel is installed around penetration, trowel 3/4" thick fillet of bentonite sealant around the penetration and extending onto Panel 1-1/2" at a 1/8" minimum thickness.
 1. Multiple Penetrations: Trowel 1/2" thick layer of bentonite sealant covering entire area between penetrations and extend layer outside of penetration area minimum 3" to allow Panels to overlap. At base of each penetration apply 3/4" fillet of bentonite sealant over the main bentonite sealant layer. Cut Panels and overlap bentonite sealant layer a minimum 1-1/2".
- H. Continue Panels up to grade line. Terminate Panels at grade under a 12" wide strip of UV resistant flashing secured with a rigid termination bar fastened 12" on center. Seal top edge of termination detail with UV resistant caulk. Consult manufacturer's representative or manufacturer when special conditions exist.
- I. Repair any small Panel damage by applying a 1/2" thick layer of Bentonite sealant. Repair any large Panel damage by placing a new panel into position.

3.5 BENTONITE GEOTEXTILE WATERPROOFING MEMBRANE INSTALLATION

- A. Place geotextile directly on properly prepared substrate (white geotextile side down; dark gray geotextile side up facing installer) with adjoining edges overlapped a minimum of 4". Stagger sheet end seams a minimum of 24". Mechanically fasten or staple geotextile membrane as required to prevent movement from construction operations or concrete placement. When the slab is poured in sections, extend geotextile a minimum 12" beyond the slab edge to enable proper overlapping.
- B. Install waterproofing system where shown on drawings in accordance with manufacturer's detail for specific project condition(s).
- C. Slab Penetrations: For all pipe, rebar, structural or other penetrations install waterproofing system in accordance with manufacturer's standard detail for specific project condition(s).
- D. Inspect finished geotextile installation and repair any damaged material prior to concrete slab placement.
- E. Before placing concrete, lay bentonite tubes against the inside face of the wall at the wall/footing transition. Bentonite tubes should be positioned end-to-end forming a continuous line. Manually place a shovel of concrete over bentonite tubes to hold them in position prior to main concreting operation.

3.6 PREFABRICATED DRAINAGE COMPOSITE INSTALLATION

- A. Vertical
 - 1. Install the bottom course of Aquadrain 15XP sheet drainage (plastic core side against the wall) with the 15XP bottom core edge in contact with the footing. Secure sheet drain to wall with washer-head fasteners.
 - 2. Install subsequent courses of Aquadrain 15XP sheet drainage in a shingle overlap style to finished grade or as shown on the project drawings. Prior to subsequent course, seal top and side core edges by tucking the products extra fabric edge flap behind the core before securing with washer-head fasteners. Install drainage sheet panels overlapped, bottom edge of higher course installed to the outside of the lower course to shed water like a roof shingle. Seal all outward overlap core edges by securing extra fabric flap with tape or general construction adhesive to filter fabric of previously installed sheet.
 - 3. Around penetrations and other details, cut sheet drainage composite to fit and wrap extra filter fabric around open core edge to prevent soil from entering core.
 - 4. 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" on center.

3.7 BACKFILL EXCAVATED CAST-IN-PLACE CONCRETE WALLS

- A. Care should be used during backfill operation to avoid damage to the waterproofing system. Follow generally accepted practices for backfilling and compaction. Backfill should be added in 6" to 12" lifts and compacted to a minimum 85% Modified Proctor density. Protection

course required with gravel backfill. Limit gravel backfill to <3/4" angular aggregate with fines.

3.8 CLEAN UP

- A. Clean areas where adjacent finished surfaces are soiled by work of this Section. Remove all tools, equipment and remaining product on-site. Dispose of section work debris and damaged product following all applicable regulations.

END OF SECTION 071700