SECTION 071700 - BENTONITE WATERPROOFING

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Bentonite waterproofing.

Molded-sheet drainage panels.

Insulation panels.

Patching mortar.

* + - 1. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at Project site.

Before the waterproofing work is scheduled to commence, a conference will be called by the Director’s Representative at the site for the purpose of reviewing the Drawings and the Specifications and resolving all questions.

The conference shall be attended by the Contractor, the authorized waterproofing applicator and the on-site field supervisor, and the waterproofing membrane manufacturer’s Company Field Advisor.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
				5. Submittals Package: Submit the shop drawings, product data, and samples specified below at the same time as a package.
				6. Product Data: For each type of product.

Include construction details, material descriptions, and installation instructions.

* + - * 1. Shop Drawings: Include installation details for waterproofing, penetrations, and interface with other work.
				2. Samples: For each of the following products, in sizes indicated:

Waterproofing: 6 inches square.

Retain subparagraphs below to suit Project.

Protection Course: 6 inches square.

Molded-Sheet Drainage Panels: 6 inches square.

Insulation Panels: 6 inches square.

* + - * 1. Quality Control Submittals:

Membrane Manufacturer’s Qualifications Data:

Letter certifying that the manufacturer has been actively marketing the submitted system for a minimum of 3 years.

Names and addresses of 10 previous waterproofing projects. Include the type and size of each project, and name and telephone number of a contact person at the project location.

Applicator’s Qualifications Data:

Letter certifying that the applicator has been actively installing waterproofing and/or roofing systems for the past 5 years.

Names and addresses of 5 previous waterproofing and/or roofing projects. Include the type and size of each project, the waterproofing and/or roofing manufacturer’s name, and the name and telephone number of a contact person at the project location.

Letter certifying that the supervisor or foreman and the workers applying the waterproofing materials have at least 3 years’ experience in the application of waterproofing and/or roofing materials.

* + - * 1. Contract Closeout Submittals:

Copy of specified warranty.

* + - 1. QUALITY ASSURANCE
				1. Membrane Manufacturer’s Qualifications:

The manufacturer must have been actively marketing a self-adhering rubberized asphalt sheet membrane waterproofing system in the United States for a minimum of 3 years.

The manufacturer’s rubberized asphalt sheet membrane must have previously been installed on a minimum of 10 waterproofing projects of comparable scope and complexity to the Work of this Project.

* + - * 1. Applicator’s Qualifications:

The waterproofing applicator must have been actively installing waterproofing and/or roofing systems for the past 5 years.

The waterproofing applicator must have previously installed and completed a minimum of 5 waterproofing and/or roofing projects of comparable scope and complexity to the Work of this Project.

The person supervising the waterproofing Work of this Project and the workers applying the waterproofing materials shall have had at least 3 years of experience in the application of waterproofing and/or roofing materials.

* + - 1. WATERPROOFING MANUFACTURER’S COMPANY FIELD ADVISOR
				1. The manufacturer of the waterproofing system, issuing the final system guarantee on this waterproofing project, must supply a Company Field Advisor, as a technical representative, with the following minimum qualifications:

Documentation of 5 years of field experience on the same type of waterproofing system.

Documentation of 10 projects where role was a Company Field Advisor; include contact names and phone numbers for each project.

Documentation of attendance at a waterproof specific instructional seminar within the last two years.

It is mandatory to discuss the use of the paragraph below with the client, the division of construction, and perhaps the specified manufacturers, at project inception, particularly on downstate projects. There is a fee associated with the number of hours for a field advisor to be on a project. Include this additional cost in the project estimate beginning with the program estimate.

Edit number of hours and days below depending on size and complexity of project. Four hours per day for 3 days could work as a minimum for a simpler project. More than 4 hours per day for 6 days could work for a larger, more complex project.

* + - * 1. Secure the services of the Company Field Advisor at a minimum of **[ number of hours]** per day for a minimum of **[ number of working days]** for each Phase to inspect the workmanship of the waterproofing system installer.
				2. Company Field Advisor Duties and Responsibilities:

Become familiar with the Contract Documents and approved submittals prior to the pre-waterproofing conference.

Attend the pre-waterproofing conference and the beginning of the actual membrane installation for the purpose of:

Rendering technical assistance to the Contractor regarding installation procedures of the system.

Familiarizing the Director’s Representative with all aspects of the system including inspection techniques.

Answering questions that might arise.

Edit remaining subparagraphs below to suit project complexity and need. Discuss appropriateness of subparagraphs with design project manager and the division of construction.

Attend each bi-weekly meeting.

Be objective, unbiased and impartial in each inspection, recommendation, conversation, action and written report.

Inspect and approve the existing substrate, and related materials as being acceptable for the installation of the waterproofing system.

Ensure proper fastening and termination of membrane, insulation, and related components.

Immediately report non-compliant conditions, if any, to the Director’s Representative.

Provide to the Director’s Representative a written report, submitted prior to leaving the Project Site each day the Company Field Advisor is present. Each daily written report shall contain at a minimum:

Date of report and inspection.

Weather conditions at the start, middle, and end of the workday.

Work performed including Contractor activity, contractor crew size, supervisor’s name, area of activity, and progress and quality of the work as observed.

Discussions with Contractor regarding work anomalies and resolution.

Conditions that are not in compliance with the Contract documents.

Continue documenting non-compliance issues in subsequent reports until the issue has been resolved. Document resolution of non-compliance issues when resolved.

Report to the Director’s Representative in writing failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.

Confirm, after completion of the waterproofing work and based on the Company Field Advisor’s inspections and tests, that the Company Field Advisor has observed no applications procedures in conflict with the specifications other than those that may have been previously reported and corrected.

* + - 1. FIELD CONDITIONS
				1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturer's written instructions and warranty requirements.

Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.

Do not place bentonite clay products in panel or composite form on damp surfaces unless such practice is approved in writing by manufacturer.

* + - * 1. Substrates must be free of voids deeper than 3/8 inch, and free of surface protrusions more than 1/4 inch above the surface.
				2. Limit the removal of existing waterproofing materials to areas that can be temporarily protected within the same day.
				3. Maintain the building in a watertight condition at all time.
				4. Do not apply the waterproofing system in areas where dust is being generated from adjacent work areas. If necessary erect temporary dust barrier or screens to keep the area being waterproofed clean and free of dust and dirt.
			1. WARRANTY
				1. Warranty Extension: The one year period required by Paragraph 9.8 of the General Conditions is extended to 2 years for the Work of this Section. Refer to Supplementary Conditions.

Fill in the blank below once a warranty period has been selected.

* + - * 1. Manufacturer’s Warranty: In addition to the 2 year period specified above, furnish the membrane manufacturer’s printed **[Number of Year ]**Full System Warranty, covering workmanship, and materials, for the Work of this Section.

The warranty shall include, but not be limited to, excavation, repair of leakage and the repair and/or replacement of the waterproofing system as required to correct defects or damage caused by defective materials or workmanship.

Materials shall include the membrane, insulation, fasteners, adhesives and tapes, flashing originally provided by the manufacturer, and all accessory products.

Repair and/or replacement of the waterproofing system shall include the replacement of wet insulation.

Insulation will be considered wet if either of the following exists:

Free water is visible when the insulation is compressed.

No free water is visible when the insulation is compressed, but the insulation is damp to the touch over a large enough area, as determined by the Director’s Representative, to jeopardize the integrity of the wall system and any of its components, or to significantly lower the specified R value of the insulation.

1. PRODUCTS
	* + 1. SYSTEM DESCRIPTION
				1. Waterproofing System: Self-sealing sheet waterproof membrane manufactured to controlled thickness of 150 mils to 200 mils of high density polyethylene (HPDE) and expandable granular Bentonite covered with insulation.
				2. Waterproof membrane must match or be compatible with the existing waterproofing system.
			2. COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE
				1. Composite Polyethylene/Bentonite Membrane with Protective Facing: 150-mil to 200-mil thick membrane consisting of polyethylene geomembrane bonded to a layer of bentonite and with a protective, nonwoven-geotextile facing.

Products: Subject to compliance with requirements, provide one of the following:

Carlisle Coatings & Waterproofings; MiraCLAY GM.

[CETCO, a Minerals Technologies company](http://www.specagent.com/Lookup?uid=123457131901); Voltex.

[Tremco Commercial Sealants & Waterproofing](http://www.specagent.com/Lookup?uid=123457131902); Paraseal.

Approved equivalent.

Puncture Resistance: 130 lbf according to ASTM D4833 or 169 lbf according to ASTM E154.

Vapor Permeance: 0.03 perms according to ASTM E96/E96M.

Tensile Strength: 4000 psi minimum ASTM D 412.

Elongation (HDPE): 700 percent minimum ASTM D 412 Type 4 Dumbell.

Puncture Resistance: 169 lb minimum ASTM E 154.

Resistance to Hydrostatic Head: 150ft. ASTM D751.

Installation Temperatures: -25 degrees F to 130 degrees F.

Warranted crack-bridging capability: 1/8 inch.

* + - 1. PROTECTION COURSE

Retain this article if required. Insert requirements if more than one protection-course type is required by waterproofing manufacturer. Indicate location of each type of protection course on Drawings or by inserts. Delete this article if using molded-sheet drainage panels or insulation drainage panels without protection course.

* + - * 1. Protection Course: Protection mat of type and thickness as recommended in writing by waterproofing manufacturer for each Project condition.

Adhesive: As recommended in writing by waterproofing manufacturer.

* + - 1. MOLDED-SHEET DRAINAGE PANELS

Retain this article if molded-sheet drainage panels are required. Verify acceptability of type of drainage panel with waterproofing manufacturer.

* + - * 1. Nonwoven-Geotextile-Faced Molded-Sheet Drainage Panels: Composite subsurface drainage panel consisting of studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core, with or without a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft..
			1. INSULATION PANELS

Retain this article if insulation drainage panels are required. Verify acceptability of type of drainage panel with waterproofing manufacturer.

* + - * 1. Insulation Panels: Closed cell extruded polystyrene foam boards.

Products: Subject to compliance with requirements, provide one of the following:

Styrofoam by Dupont

Foamular 250 by Owens Corning

Approved equivalent.

Properties:

Compressive Strength: 25 psi minimum.

Thermal Resistivity: 2-inches: R-10.0

Insulation Adhesive: Quick setting adhesive as recommended by the insulation manufacturer, and compatible with the waterproofing membrane.

* + - 1. PATCHING/PARGING MORTAR
				1. Polymer-Modified, Cementitious Patching Mortar: Packaged, dry mix complying with ASTM C 928, that contains a non-redispersible latex additive as either a dry powder or a separate liquid that is added during mixing.

Acceptable Products:

MORTAR-40 CI by Aquafin Inc., www.aquafin.com.

Pro Trowel Mortar by CGM Inc., www.cgmbuildingproducts.com.

Verticoat by Euclid Chemical Co., www.euclidchemical.com.

Speed Crete PM by Euclid Chemical Co., www.euclidchemical.com.

Sealtight Meadow-Patch T1 by W.R. Meadows Inc., www.wrmeadows.com.

Sto Trowel- Grade Mortar CI by Sto Corp., www.stocorp.com.

MasterEmaco N 400 by Master Builders Solutions, www.master-builders-solutions.com.

Approved equivalent.

Coarse Aggregate for Adding to Patching Mortar: Washed aggregate complying with ASTM C33, Size No.8, Class 5S. Add as permitted by patching mortar manufacturer.

* + - 1. ACCESSORIES
				1. For Installation at Horizontal-to-Vertical Junctures: Loose bentonite granules in weatherproof 50 lb. bags and capable of swelling to occupy a minimum volume of 17 ml when 2 grams are dispersed into deionized water.

Acceptable Products:

Tremco

Paraseal Paragranular.

Approved equivalent.

* + - * 1. For Detailing Vertical Junctures and Penetrations: Non-hydrated expandable mastic of trowelable consistency containing not less than 55 percent high swelling Wyoming sodium bentonite.

Acceptable Products:

Tremco

Paraseal Paramastic.

Approved equivalent.

* + - * 1. Fasteners:

Powder shot steel pin having a minimum 3/4" inch diameter washer for use on hardened concrete and grouted masonry substrates.

Steel staples approved by membrane manufacturer.

* + - * 1. Seam Tapes:

Temporary Type: Reinforced temporary joint closure tape 3" wide composed of acrylic adhesive bonded to polyvinyl chloride coated fabric used to protect seams against debris intrusion during backfill and for temporary terminations during periods of exposure to rain.

Permanent Type: "Permanent Seam Tape" reinforced, rubberized-asphaltic waterproofing seam tape 4" inch wide by 60 mils thick for sealing membrane overlaps wherever flood-testing is required and elsewhere as required by Project conditions or designs.

Acceptable Products:

Tremco

Permanent Seam Tape.

Approved equivalent.

Adhesive Type: Non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2 inch wide by 1/8 inch thick for molding form-fit seals around difficult contours and for taping seams within overlaps.

Acceptable Products:

Tremco

Para JT Tape.

Approved equivalent.

* + - * 1. Termination Bar: Extruded aluminum bar with upper flange to receive sealant for terminations at grade line and on parapet walls.

Acceptable Products:

Tremco

Paraseal Paraterm Bar.

Approved equivalent.

* + - * 1. Sealant: One-part gun-grade polyurethane sealant for completing termination seals and other sealing;

Acceptable Products:

Tremco

Vulkem 116 Sealant.

Approved equivalent.

* + - * 1. Waterproofing Flashing: 201/60 polyurethane, liquid-applied, elastomeric waterproofing flashing.

Acceptable Products:

Tremco

TREMproof

Approved equivalent.

* + - * 1. Double Sided Tape: Pressure sensitive, double-sided tape laminate of bentonite sandwiched between a netting and non-woven fabric for wrapping through-concrete imbeds and other detailing.

Acceptable Products:

Tremco

Paraseal Parastick'N'Dry

Approved equivalent.

* + - * 1. Waterstop Strips: Flexible, reinforced, bentonite-laminate waterstop strips 1/2 inch by 1 inch by 20 feet with pressure-sensitive adhesive backing for sealing static cold joints in concrete.

Acceptable Products:

Tremco

Superstop.

Approved equivalent.

* + - * 1. Bonding Agent Primer: Versatile adhesive bonding agent primer formulated for use with tapes and pressure-sensitive waterproofing accessories.
				2. Drainage Mat: Filter fabric laminated to free-draining high-density dimpled polystrene drainage core.

Acceptable Products:

Tremco

TREMDrain,

TREMDrain 1000

TREMDrain 2000NW.

Approved equivalent.

* + - * 1. Protection Course: As recommended by the waterproof system manufacturer.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations and other conditions affecting performance of bentonite waterproofing.
				2. Examine bentonite materials before installation. Reject materials that have been prematurely exposed to moisture.
				3. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.
				4. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. PREPARATION
				1. Clean, prepare, and treat substrates according to manufacturer's written instructions.

Verify requirements for each product in "Formed Concrete Surfaces," "Horizontal Concrete Surfaces," and "Excavation Support and Protection System" paragraphs below.

* + - * 1. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.
				2. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of concrete or the effectiveness of waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.
				3. Excavation Support and Protection System: If water is seeping, use plastic protection sheets or other suitable means to prevent wetting the bentonite waterproofing. Fill minor gaps and spaces 1/8 inch wide or wider with wood, metal, concrete, or other appropriate filling material. Cover or fill large voids and crevices with cement mortar according to manufacturer's written instructions.
				4. Repair brick masonry to provide a suitable surface for the waterproofing membrane. A clean, dry, smooth monolithic surface is required.

If necessary, grind the brick surface to achieve a smooth finish and to remove all sharp projections.

Apply a cemetitious parge coat over the brick masonry prior to applying the waterproof membrane. The overall texture of the parge coat shall closely resemble that of steel trowelled concrete.

Patch the following defects with patching mortar finished flush with the surrounding surface; holes and voids larger than 3/8 inch deep and 1/2 inch long, spalled areas, and cracks wider than 1/8 inch.

Remove all contaminants such as oil, grease, etc., that would impair the bonding of the membrane.

Verify conformance with manufacturer’s requirements.

* + - 1. INSTALLATION, GENERAL
				1. Prepare substrates, voids, cracks, and cavities; and install waterproofing and accessories according to manufacturer's written instructions.

Before installing, verify the correct side of waterproofing that shall face substrate surface.

Apply granular bentonite around penetrations in horizontal surfaces and changes in plane according to manufacturer's details in preparation for bentonite tubes and mastic.

Apply bentonite tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.

Prime concrete substrates. Primer may be omitted on concrete surfaces that comply with manufacturer's written requirements for dryness, surface texture, and freedom from imperfections.

Retain first paragraph below for horizontal applications.

* + - * 1. Apply bentonite tubes continuously on footing against base of wall to be waterproofed.
				2. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts.
				3. Install protection course before backfilling or placing overburden when recommended in writing by waterproofing manufacturer.
			1. INSTALLATION OF COMPOSITE POLYETHYLENE/BENTONITE MEMBRANE

Retain and revise paragraphs in this article to suit Project. Insert other installation conditions if required.

* + - * 1. Install a continuous layer of waterproofing membrane, with ends and edges lapped a minimum of 4 inches unless otherwise indicated. Stagger end joints between membranes a minimum of 24 inches. Seal joints with permanent seam tape.
				2. Below Structural Slabs-on-Grade: Apply waterproofing membrane with polyethylene side down, and staple ends and edges.

Install under footings, grade beams, and pile caps; or continue waterproofing through key joints between footings and foundation walls and extend a minimum of 8 inches up or beyond perimeter slab forms.

Protect waterproofing from damage caused by reinforcing bar supports with sharp edges.

* + - * 1. Slabs: Starting at lowest point, install a continuous layer of waterproofing membrane, with ends and edges lapped a minimum of 4 inches.
				2. Concrete Walls: Apply mastic to form continuous 3/4-inch cant or fillet at intersection of footings and walls.

Starting at lowest point, install a layer of waterproofing membrane horizontally, extending a minimum of 6 inches onto the footing. Lap membrane ends and edges a minimum of 2 inches.

Secure membrane to wall.

Apply mastic to form continuous 3/4-inch layer around penetrations.

Termination at Grade: Extend waterproofing membrane to within 12 inches of finish grade unless otherwise indicated. Secure top edge with termination bar. Apply sealant to top edge of termination bar.

* + - * 1. Excavation Support and Protection (Permanent Shoring): Cut, clean, and treat tiebacks and similar projections. Encase tieback heads, rods, nuts, and plates according to waterproofing manufacturer's written instructions for each configuration. If water is present, cover shoring and lagging with plastic protection sheets; remove plastic sheets before placing concrete.

Starting at lowest point, install a layer of waterproofing membrane, with ends and edges lapped minimum of 4 inches and nailed to shoring.

Inspect and repair waterproofing membrane after reinforcing steel has been placed. Coordinate and control concrete placement to avoid damage to waterproofing.

* + - * 1. Horizontal Roofs, Plazas, and between Slabs: Starting at lowest point, install a layer of waterproofing membrane, with ends and edges lapped a minimum of 3 inches.

Apply mastic to form continuous 3/4-inch cant or fillet at intersection of horizontal and vertical substrates. Extend waterproofing membrane to top of curb or to a minimum of 6 inches above plane of waterproofing; secure with manufacturer's recommended tape.

Clean overlap area and apply waterproof tape, rolling the exposed edge to seal to membrane below.

Turn edges up and seal to vertical surfaces.

Cover waterproofing with a plastic slip-sheet and seal seams with permanent seam tape.

* + - 1. INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

Retain this article if specifying molded-sheet drainage panels in this Section; revise to suit Project.

* + - * 1. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

Retain subparagraph below if board insulation, specified elsewhere, or protection course is installed before installing molded-sheet drainage panels.

For vertical applications, install **[board insulation] [protection course]** before installing drainage panels.

Retain "Molded-Sheet Collector-Panel System" paragraph below if required in lieu of piped subdrainage collection.

* + - * 1. Molded-Sheet Collector-Panel System: Install according to manufacturer's written instructions. Connect to piped subdrainage system.
			1. INSULATION PANEL INSTALLATION

Retain this article if specifying insulation drainage panels in this Section; revise to suit Project.

* + - * 1. Install over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
				2. Ensure that drainage channels are aligned and free of obstructions.

Retain first paragraph below if support is required during backfilling.

* + - * 1. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
				2. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

END OF SECTION 071700