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SECTION 071356

Fluid-injected composite sheet waterproofing

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grout-injected blindside composite sheet waterproofing system applied to the face of soil retention systems to receive shotcrete foundation wall applications.

1.2 RELATED SECTIONS

- A. Division 03 Section "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application, and for qualifications of Installer, including installer approval by manufacturer of composite sheet waterproofing system.
- B. Division 07 Section "Self-Adhering Sheet Waterproofing" for adhesive coated HDPE composite sheet waterproofing for vertical applications [(Preprufe 160R)].
- C. Division 07 Section "Self-Adhering Sheet Waterproofing" for adhesive coated HDPE composite sheet waterproofing for horizontal applications [(Preprufe 300R)].
- D. Division 07 Section "Self-Adhering Sheet Waterproofing" for related applications of modified bituminous sheet waterproofing [(Bituthene System 4000, Bituthene 3000)].
- E. Division 07 Section "Self-Adhering Sheet Waterproofing" for molded sheet drainage panels [(Hydroduct 220)].
- F. Division 07 Section "Cold Fluid-Applied Waterproofing" for latex rubber waterproofing [Procor].
- G. Division 31 Section "Excavation Support and Protection" for permanent below-grade support systems that require blind-side waterproofing.
- H. Division 31 Section "Subdrainage" for related subdrainage piping components.

1.3 REFERENCES

- A. ACI International (ACI):
 1. ACI 506.2 - Specification for Shotcrete.
- B. ASTM International (ASTM):
 1. ASTM D 6525 - Standard Test Method for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products.
 2. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 3. ASTM D 5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
 4. ASTM E 154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- C. SAE International (SAE):
 1. SAE J-400 - Gravelometer Rating Standard Maximum Allowable Paint Chipping.

1.4 SYSTEM DESCRIPTION

- A. A hydrophilic grout-injected composite blindside sheet waterproofing applied directly to soil retention system or to the waterproofing drainage layer placed over the soil retention system, formulated to accept subsequent application of shotcrete. The waterproofing system consists of the following:
 1. Composite sheet consisting of a polymer mesh-reinforced cavity backed by a plastic film facing the soil retention system, and faced with a non-woven, permeable geotextile acting as a shotcrete barrier while allowing grout to bond to the shotcrete.
 2. Grout injection ports installed prior to shotcrete placement to facilitate hydrophilic grout injection.
 3. Hydrophilic grout post-injected under pressure into composite sheet through injection ports left protruding through the shotcrete. The shotcrete side of the membrane enables grout bond with shotcrete across the permeable geotextile.

1.5 ACTION SUBMITTALS

- A. Product Data: Include product specifications and manufacturer's written installation instructions for each type of product indicated.
- B. Shop Drawings: Show extent of composite sheet waterproofing including details of connections to adjacent waterproofing systems.
- C. Samples: For each of the following products, not less than sizes indicated:
 1. Composite Sheet: 6 by 6 inch (150 by 150 mm).
 2. Drainage Panel: 6 by 6 inch (150 by 150 mm).

1.6 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Qualification: Submit proof of manufacturer's qualifications.

- B. Installer's Qualification: Submit Installer training certificate issued by manufacturer of composite sheet waterproofing.
 - 1. Provide a list of successful projects of similar type and scope completed within past five years.
- C. Manufacturer's Environmental Review Letter: Submit letter indicating manufacturer has reviewed project soils and groundwater test reports and sees no compatibility issues with manufacturer's waterproofing system.
- D. Field quality-control reports. Include copy to manufacturer.
- E. Warranty: Sample of manufacturer's standard warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm listed in this Section, with program for Installer training for specified waterproofing system, employing qualified representatives, providing warranty meeting provisions of this Section, and with a minimum of [10] year record of successful waterproofing product performance.
- B. Manufacturer's Representative Qualifications: Representative of manufacturer experienced in the installation of composite sheet waterproofing, qualified to perform waterproofing observation.
- C. Installer Qualifications: An employer of workers trained by manufacturer, including a full-time on-site supervisor with a minimum of [five] years experience installing similar work, able to communicate verbally with Contractor, Architect, and employees, and approved in writing by the composite sheet waterproofing manufacturer.
- D. Source Limitations: Obtain all materials through one source from a listed manufacturer.
- E. Independent Testing Agency: Qualified independent testing agency approved by manufacturer and experienced in observation and inspection of waterproofing systems.
- F. Pre-Installation Conference: Conduct pre-installation conference at the site to coordinate Work of this Section with shotcrete work and related work.
 - 1. Include waterproofing Installer, reinforcing steel Installer, shotcreting Installer, Installers of items penetrating waterproofing, waterproofing consultant, Owner's testing agency, Architect, composite sheet waterproofing manufacturer's representative, Contractor [, Construction Manager] and Owner's representative.
 - 2. Review working conditions and substrate conditions required by composite sheet waterproofing manufacturer.
 - 3. Discuss detrimental conditions that may interfere with satisfactory installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original sealed packages, with manufacturer's label, identifying date of manufacture, and with storage and handling directions.
- B. Store and handle in accordance with manufacturer's instructions.
 - 1. Store at temperatures between 40 to 90 deg. F (4 to 32 deg. C).
- C. Protect from damage from weather and construction operations.
- D. Remove and dispose of damaged material in accordance with applicable regulations.

1.9 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions are within the limits established by the manufacturer.
- B. Proceed with installation only when the substrate construction and preparation work is complete and in a condition to receive composite sheet waterproofing.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard published warranty.
 - 1. Manufacturer's warranty will run concurrent with other warranties. Manufacturer's warranty is separate and independent from other warranties issued by the Contractor or Installer.
- B. Warranty Period: [Five] years from date of waterproofing installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products manufactured by GCP Advanced Technologies Construction Products, (866)333-3726, gcpat.com.
 - 1. Substitutions: Submit requests for substitution to Architect minimum 15 days prior to receipt of bids.

2.2 COMPOSITE SHEET WATERPROOFING SYSTEM

- A. Blindsided, hydrophilic grout-injected composite sheet waterproofing: Basis of Design product: GCP Advanced Technologies Construction Products, Preprufe SCS Waterproofing.
 - 1. Physical Properties of Waterproofing System:
 - a. Resistance to hydrostatic head, ASTM D 5385: 200 ft. (61 m).
 - b. Puncture resistance, membrane minimum, ASTM E 154: 200 lb (890 N).
 - c. Elongation, at ultimate break, ASTM E 154: 200 percent.
 - d. Membrane thickness, minimum, ASTM C 6525: 0.17 (4.3 mm).
 - e. Tensile strength, minimum, ASTM E 154: 300 psi (2.07 MPa).
 - f. Peel adhesion to concrete, minimum, ASTM D 903: 5 lbf/in (880 N/m).
 - g. Impact resistance, membrane, SAE J 400: No change in appearance.
- B. Composite Sheet: A three-part composite sheet consisting of a plastic film backing, a polymer mesh center to maintain a cavity and reinforce the grout, and a protective geotextile fabric that provides a protective barrier but allows the injected grout to bond with the shotcrete.
- C. Hydrophilic Grout: Two-component grout with associated activator components as recommended by manufacturer for application conditions.
- D. Detail Tapes and Covers: Provide detail components as recommended by manufacturer for application conditions.
 - 1. Detail tape: Two-sided adhesive tape for sealing side laps and other details.
 - 2. Geotextile Strip: Semi-permeable geotextile for covering cut edges and roll ends.
 - 3. Termination Tape: Reinforced pressure sensitive tape for sealing cut edges, roll ends, and terminations.
 - 4. Tieback Cover: Two-part cover used to maintain waterproofing integrity at soil retention tieback heads.
 - 5. Port Patch: Rapid curing, portland cement-based product used to repair port holes after injection.
- E. Hydrophilic Sealant: Manufacturer's recommended gun-applied moisture-activated swelling mastic for sealing around pipe penetrations, reinforcing steel, utility conduits, and other waterproofing system penetrations.
- F. Grout Injection Tube Components: Provide grout injection tube components furnished by composite sheet waterproofing manufacturer.
 - 1. Injection Base: Specially designed component used to mechanically attach the injection tube to the membrane.
 - 2. Injection Tube: Flexible tube used to deliver grout to the membrane after shotcrete placement.
 - 3. Injection Packer: Button-head, backflow prevention packer used to connect the grout pump to the injection tube.

2.3 UNDER-SLAB WATERPROOFING SYSTEM

- A. Under-Slab Waterproofing System: Composite sheets of HDPE film, a pressure-sensitive adhesive, and a weather-resistant release liner, compatible with composite sheet waterproofing system.
 - 1. Basis of design product: GCP Advanced Technologies Construction Products, Preprufe 300R.
 - 2. Refer to requirements of Division 07 Section "Self-Adhering Sheet Waterproofing" for material and installation requirements for under-slab waterproofing.

2.4 DRAINAGE PANELS

- A. Molded Sheet Drainage Panels: Pre-fabricated geocomposite drain recommended by manufacturer for use as a combined drainage and protection layer in combination with composite sheet waterproofing.
 - 1. Basis of Design product: GCP Advanced Technologies Construction Products, Hydroduct 220.
 - 2. Refer to requirements of Division 07 Section "Self-Adhering Sheet Waterproofing" for material and installation requirements for molded sheet drainage panels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Project site prior to installation of drainage layer and composite sheet waterproofing to ascertain that conditions are ready to accept Work.
- B. Examine the soil retention system for compliance with manufacturer's requirements and requirements of this Section:

1. Prepare written examination report in cooperation with the testing agency noting conditions adversely effect installation or long term performance of composite sheet waterproofing. Submit report.
 2. Consult manufacturer's representative and Architect for corrective actions required for adverse conditions.
 3. Do not proceed with installation until adverse conditions are corrected.
- C. Verify that manufacturer's approved below-slab sheet membrane waterproofing is in place and ready to be connected to composite sheet membrane.
- D. Verify that work of other Installers that will penetrate membrane sheet waterproofing is complete and rigidly installed.

3.2 PREPARATION

- A. Coordinate adjacent work to ensure proper conditions for installing the waterproofing system and to prevent damage to waterproofing after installation.
- B. Remove dirt, debris, oil, grease or other foreign matter which will impair or negatively affect the performance of the waterproofing [and drainage system].
- C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions are within the limits established by the manufacturer.

3.3 INSTALLATION, GENERAL

- A. Install composite sheet waterproofing in accordance with manufacturer's recommendations and approved shop drawings.
1. Prevent water from penetrating soil retaining system during installation.

3.4 MOLDED SHEET DRAINAGE PANEL INSTALLATION

- A. Install ductile drainage layer in accordance with manufacturer's written instructions.
1. Cover promptly, and do not expose sheet drainage panels to sunlight for more than 14 days.
 2. Coordinate with requirements of Division 31 Section "Subdrainage".

3.5 COMPOSITE SHEET WATERPROOFING INSTALLATION

- A. Install composite sheet with plastic film side facing soil retention system or drainage panel.
- B. Connect with below-slab membrane waterproofing using detail tape, as indicated on manufacturer's details.
- C. Attach the composite sheet to the soil retention system with manufacturer's approved staples.
- D. Ensure that the plastic film extension and the underside of the adjacent composite sheet are clean, dry, and free of contamination before overlapping.
- E. Apply a 2-inch (50 mm) wide strip of detail tape at the center of the plastic film extension the full length of the composite sheet seam. Overlap the seams a minimum of 2-1/2-inches (64-mm), with the geotextile extension facing the shotcrete.
- F. Ensure proper seal by rolling the composite sheet firmly at the seam with a hand roller.
- G. Fasten the composite sheet seam to the soil retention system with manufacturer's approved staples.
- H. Protect composite sheet from damage due to subsequent construction operations.
- I. After assembly of shotcrete bar reinforcement, attach injection port components to composite sheet. Secure injection port tube on steel reinforcement with wire ties.
- J. Following application and curing of shotcrete, inject hydrophilic grout into composite sheet cavity in accordance with manufacturer's instructions. Completely fill cavity; avoid overfilling.
1. Do not inject grout until strength of shotcrete exceeds 1500 psi (10.35 MPa) or 7 days have elapsed from time of application.
 2. Maintain grout at minimum temperature of 50 deg. F (10 deg. C) for 24 hours prior to use. Do not exceed product temperature of 90 deg. F (32 deg. C).
- K. Upon completing injection and curing of grout, cut injection tubes flush with face of shotcrete [and patch with port patch].

3.6 FIELD QUALITY CONTROL

- A. Provide for site visits by qualified manufacturer's representative at times appropriate to the progress of the Work to observe the Work and provide advice and guidance to the composite sheet waterproofing Installer.
- B. The Owner will engage a testing agency approved by the composite sheet waterproofing manufacturer.
 - 1. The testing agency will make inspections, verify qualifications of Installer's personnel, take photographs, and file reports of each project visit. Provide copies of reports and photographs to the Architect [and Construction Manager]. Perform inspections at the following minimum intervals:
 - a. Inspect soil retaining wood lagging prior to application of the waterproofing system.
 - b. Inspect installation of the drainage layer.
 - c. Inspect under slab waterproofing at interface with composite sheet (vertical) waterproofing.
 - d. Inspect composite sheet waterproofing installation at regular intervals; and at completion of installation before start of bar reinforcement.
 - e. Inspect composite sheet after the completion of bar reinforcement installation.
 - f. Inspect attachment of injection port components prior to shotcrete placement.
 - g. Inspect shotcrete placement at regular intervals.
 - h. Inspect during the injection of hydrophilic grout.
 - 2. Notify the Manufacturer's Representative, Architect [, and Construction Manager] of times of planned inspection.
- C. Correct defective work identified by Owner's testing agency in accordance with the manufacturer's instructions and as directed by the Architect.
 - 1. Cost of corrections and subsequent testing and inspection to determine compliance of corrective action shall be at Contractor's expense.

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