

# SIKAPLAN® WATERPROOFING MEMBRANE MASTER SPECIFICATION

## SUGGESTED MASTER SPECIFICATION

### SECTION 07 13 54 THERMOPLASTIC SHEET WATERPROOFING

#### PART 1 GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and division 1 specification sections, apply to this section.

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. PVC sheet waterproofing for below ground structures.
- B. Related Sections include the following:
  - 1. Division 3 Section "PVC Waterstops" for waterstop materials and installation.
  - 2. Division 7 Section "Joint Sealants" for joint-sealant materials and installation.
  - 3. Division 7 Section "Acrylate Resins" for acrylate injection materials and installation.

##### 1.03 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include joints detail, pile head detail, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
  - 1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal supported concrete pavers.
- C. Samples: For the following products:
  - 1. 300-by-300-mm square of waterproofing.
  - 2. Waterstops.
  - 3. Reinjectible Hose.
  - 4. Injection Flanges.
  - 5. Geotextile.
  - 6. Ancillary Accessories as recommended.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing (to include accelerated aging tests).
- G. Warranties: Special warranties specified in this Section.



## **1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: A firm that is approved by waterproofing manufacturer for installation of waterproofing required for this Project.
- B. Source Limitations: Obtain waterproofing materials and protection through one source from a single manufacturer to ensure compatibility. The source of each system component shall be confirmed.
- C. Pre-installation Conference: Conduct conference at Project site.
  - 1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and installation procedures, testing and inspection procedures, protection and repairs.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

## **1.06 PROJECT CONDITIONS**

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

## **PART 2 PRODUCTS**

### **2.01 SHEET WATERPROOFING**

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide the following or similar as approved by the Engineer: [select one of the following in accordance with project conditions]
  - 1. SIKAPLAN WP 1130-15C
  - 2. SIKAPLAN WP 1130-20C
  - 3. SIKAPLAN WP 1130-25C
- C. PVC Sheet shall be 1 layer of loose laid [1.5, 2.0, 2.5]mm thick synthetic PVC twin color geo-membrane. The membrane shall be twin color with signal layer for visual indication when damage occurs as approved by Engineer. The PVC membrane should meet the following physical properties: [values based on 1.5mm membrane]



Property	Test Method	Required Limits
Thickness	ASTM D751	0.059 (1.5mm)
Tensile Strength	ASTM D638	1,600 psi min. (11.1 MPa)
Elongation at Break	ASTM D638	240% min.
Tensile Strength (after heat aging)	ASTM D638/D3045	1,500 psi min. (10.5 MPa)
Elongation at Break (after heat aging)	ASTM D638/D3045	225% min.
Dynamic Puncture Resistance	ASTM D5635	Pass @ 117.7 ft-pd (5 J)
Tearing Resistance	ASTM D1004	21.3 lbf min. (94.7 N)
Static Puncture Resistance	ASTM D5602	Pass @ 56 lbf (250 N)
Water Absorption	ASTM D570	2.0 % (7days @ 70°C)
Seam Strength (% tensile strength)	ASTM D638	90

## 2.02 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
  - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. PVC waterstop: PVC waterstop welded to the PVC membrane to create compartmentalization, for construction, expansion and contraction joints.
- C. PVC fixing disc: Rondels for providing support of the PVC membrane for vertical installation.
- D. Geotextile Leveling Layer: Manufacturer's standard non-woven needle-punched polypropylene geotextile minimum 500g/m<sup>2</sup>.
- E. Separation Layer: Manufacturer's standard non-woven needle-punched polypropylene geotextile minimum 500g/m<sup>2</sup>.
- F. Injection Flanges: Manufacturer's injection flange system for uniform discharge of injection grout within reinjectible membrane compartments.
- G. Pile Head Treatment: Waterbar at 200mm height around the perimeter of the pile, grouted with micro-concrete and sealed by epoxy grout (minimum 15mm thickness).
- H. Metal Termination Bars: Manufacturer's standard stainless-steel or aluminum bars pre-punched, or PVC coated sheet.
- I. Protection Course: Manufacturer's standard non-woven needle-punched polypropylene geotextile minimum 500g/m<sup>2</sup>.
- J. Injection Grouts: Manufacturer's hydrophilic acrylate gel in accordance with specification section 07 92 00
- K. All below grade construction joints shall incorporate the **SikaFuko® VT1** reinjectible hoses which shall be capable of performance in the following manner:
  - 1. The hose should be of a re-injectable nature and be capable of re-injection several times over the life of the structure. The hose shall be cleaned by vacuuming.
  - 2. Installation should be seamless and without cuts and joints when installed at multiple bends / corners / circular paths in congested heavily reinforced concrete.
  - 3. The hose shall be capable of following minute changes in direction and turn corners with ease.
  - 4. The hose shall have 4 No. valves and shall be enclosed in a retaining mesh to avoid displacement of these during injection.



5. The injection resin should be of a re-swellaible type made of an acrylate hydro-gel, capable of being vacuumed out of the hose with water before curing.
6. The injection resin should be of a very low viscosity (3-11 Mpa/s at 20 degrees C.) to enable maximum penetration of very narrow fissures.

The system shall be placed in 10-12 meter lengths with entry port and vent ends terminating in a junction box and shall offer the user the option of vacuuming and re-injection. The junction box shall be placed in vertical elements adjacent to the joint. Should this not be possible the junction box and its cover should be installed flush with the floor level and should be able to tolerate vehicular traffic. The system should be used to seal off the construction joints permanently thus providing protection to the steel reinforcement.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
  1. Verify that substrates to receive waterproofing are clean, sound, smooth, free of fins and sharp edges, loose and foreign matter, oil and grease and anything detrimental to waterproofing membrane. Pitted surfaces must be repaired before membrane installation.
  2. Notify the Engineer in writing of anticipated problems using waterproofing over substrate.
  3. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 SURFACE PREPARATION**

- A. Before commencing Works of this Section and as Works of this Section proceeds, sweep surfaces clean and remove debris, irregularities, standing water and any adhering materials which would impair works.
- B. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- C. Prepare, fill and treat joints in substrates in accordance with manufacturer's recommendations.
- D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions in accordance with manufacturer's recommendations.

### **3.03 COMPARTMENTED, LOOSELY LAID SHEET INSTALLATION**

- A. Extend membrane full height of basement walls and over entire horizontal basement and ground floor area around tie beams. Installation to be as shown on drawings. Extend membrane under trenches, pits and depressions. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.
- B. Horizontal: apply membrane onto surfaces as directed by manufacturer. Lay a 500 g/m<sup>2</sup> non woven needle punched polypropylene geotextile over blinding concrete. Loose lay membrane over geotextile, compartmentalize by welding PVC waterstop at predetermined locations. Lay a 500 g/m<sup>2</sup> non woven needle punched polypropylene geotextile over membrane within pvc waterstop boundaries. Apply additional protection layers as shown on drawings.
- C. Vertical: apply membrane onto surfaces as directed by manufacturer. Secure a 500 g/m<sup>2</sup> non woven needle punched polypropylene geotextile over existing substrate utilizing PVC fixing discs. Loose lay



membrane over geotextile, spot welding to PVC fixing discs for temporary support of vertical membrane. Compartmentalize by welding PVC waterstop at predetermined locations. Secure a 500 g/m<sup>2</sup> non woven needle punched polypropylene geotextile over membrane within PVC waterstop boundaries.

- D. All lap joints of sheets, to be double seam welded, and pressure tested. Thoroughly inspect the completed membrane at the end of each day's work as well as before the placement of protection screed.
- E. For all details of corners, membrane termination, pipe penetration, pile head treatment and the like, refer to the technical documents and approved shop drawings and provide, collars, metal clamps, sealant, etc.
- F. Make watertight seals to all items passing through the membrane such as ties, anchors, pipes, etc. To overcome any water penetration, sealing details to be as manufacturer's recommendations.
- G. Install reinjectable control and injection flanges in all compartments, tack welded to the PVC membrane in accordance with the technical details supplied by the manufacturer. Vent ends must be fixed to the PVC membrane by tack welded PVC strips to keep them in position during construction phases. Each compartment should have a minimum 4 control and injection flanges. Typical compartment size is 900 sq. ft. and shall not exceed 1500 sq. ft. All installations shall be inspected, documented and approved by the manufacturer's certified applicator representative or agent before concrete is placed over it.
- H. Locate and house corresponding colored vent ends in junction boxes. Mount plastic or steel junction boxes securely against formwork or as shown in the technical details supplied by the manufacturer were they will be easily accessible in the finished construction. Place and secure the temporary "knock-out" covers on junction boxes prior to placement of concrete.
- I. Protection screed: apply 50 mm uniform thickness of screed over waterproofing membrane, which is placed horizontally on the concrete blinding. Do not extend the screed over concrete pile caps.
- J. Protection layer: apply 500g/m<sup>2</sup> non woven needle punched polypropylene geotextile on all vertical and sloping surfaces to protect the waterproofing from damages due to placing and the vibrating of the concrete and to reduce drag-down on the membrane by the placing action of the concrete.
- K. Apply full coverage and overlap geotextile where necessary.
- L. Spot-adhere the geotextile to the membrane with daubs of adhesive of type approved by the membrane manufacturer.

### 3.04 PILE HEAD TREATMENT

- A. Ensure that adequate preparation has been carried out to the top of all pile caps to provide a smooth and level surface to accept the membrane waterproofing.
- B. Dress the SIKAPLAN WP1100-20HL2 waterproofing membrane to 200mm height at outer surface of the pile.
- C. Grout with SIKACRETE-114AE micro-concrete and seal with SIKADUR-42 PC at a minimum thickness of 15mm.

### 3.05 FIELD QUALITY CONTROL



- A. Visual inspection of the membrane should be made prior to covering with protection layer to check for damage indicated by breaches in light colored signal layer.
- B. Air pressure tests will be carried out on all double seam welds, acceptable pressure drop in the channel between the two welds with starting pressure of 2 bar after minimum 300 seconds is less than or equal to 20%.
- C. The applicator must be approved by the manufacturer and be able to demonstrate his participation in the manufacturer's training.

### 3.06 PROTECTION AND CLEANING

- A. Do not permit excessive foot traffic or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

### 3.07 COMPARTMENT INJECTION

- A. If any leakage appears within the compartment or near the control and injection vent ends at any time prior to Final Acceptance, inject hydrophilic acrylate gel as a remedial measure to stop such leaks and seal the membrane area of this leaking compartment.
- B. Prepare injection membrane in strict accordance with the manufacturer's printed instructions and specifications regarding mixing, injection procedures, application pot-life and equipment requirements. After injection of the whole compartment clean the vent ends by means of the manufacturer's recommended procedures with clear water and leave the vent ends clean and available for reinjection. Repeat injection if the leaks have not been stopped. Adjust proportions to obtain the necessary setting time in case of compartment size or where running water is present. Piston (no diaphragm) type pumps shall be used with hydrophilic grout.

### 3.08 INJECTION APPLICATION

- A. SIKa INJECTION-306 – Water soluble, hydrophilic acrylate grout.
  - 1. Prepare injection material in strict accordance with the manufacturer's instructions and specifications regarding mixing, injection procedures, pot life and equipment requirements.
  - 2. Inject the sealing material when ambient temperatures are between 45°F and 100°F
- B. Injection Procedures
  - 1. Injection operation shall be in strict accordance with the manufacturer's printed procedures for injection of sealing materials.
  - 2. Remove face-plate from junction box and select vent ends of the leaking compartment. Connect injection adapter to one vent end and leave the others open for release of water and pressure. In vertical areas like walls start grouting from bottom upwards otherwise choose the vent end with the lowest water pressure.
  - 3. Once secure connections are made, begin the injection with the lowest pressure possible. The area of compartment between membrane and concrete will be filled by grout. The water from the compartment will be pushed out by the open vent ends of the compartment and be replaced by



the injection material. The whole injection process will be monitored thru the remaining open vent ends of the same compartment..

4. Once the injection material appears in any of the other vent ends, stop pumping, close that pipe by an injection adaptor and shift the pump to this vent end. Repeat this procedure until all other vent ends are injected and the water in the compartment is fully replaced by grout.
5. To ensure a reinjection, it is necessary to always have uncured grout in the vent ends. If the injection takes longer than the pot-life of the chosen material replace the grout in the injected vent ends by fresh material to keep the vent end full by uncured grout before cleaning them with water.

#### C. Vent End Cleaning

1. If the compartment is fully injected and all the vent ends of the compartment are under pressure with uncured grout begin the cleaning process.
2. Connect the pump to the first vent end adapter, in vertical areas like walls start from bottom upwards, and pump clear water into the vent end. The water will push the uncured grout into the compartment. The uncured grout in the pipe will be pushed into the compartment and replaced by clear water.
3. Shift the pump to the other vent ends of the compartment and repeat the same process until all other vent ends are filled with clear water.
4. Keep the compartment under pressure until the injected grout is fully cured.
5. Disconnect the injection adapters and let the water release.
6. Replace face plate.

#### D. Reinjection Procedures

1. Remove face plate, prepare injection material and pump equipment in accordance with manufacturer's printed material.
2. For reinjection, follow injection procedures as outlined herein in Section 3.07, sections A and B and in accordance with the manufacturer's recommendation.
3. Repeat vent end cleaning as outlined herein Section 3.07, Section C and replace face plate.

## END OF SECTION

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