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SPECIFICATION GUIDELINE FOR GEOMEMBRANE LININGS FOR EARTHEN SECONDARY CONTAINMENT AREAS, BASINS, PONDS, AND RESERVOIRS WITH GEOTHANE® 5020

1.0 SCOPE

1.1 This specification covers the requirements for surface preparation and application of a **GEOTHANE 5020** elastomeric polyurethane geomembrane system for lining secondary containment, basins, ponds and reservoirs on earthen or heavily contaminated concrete or steel substrates.

2.0 GENERAL REQUIREMENTS

2.1 The specific Geomembrane system and surface preparation requirements will depend upon the type and conditions of the surfaces to be lined.

2.2 All substrates must be dry prior to the application of the Geomembrane system.

2.3 Application of the geomembrane system should not take place if precipitation or fog is expected.

2.4 Application should not be done if the surface temperature is less than 5°F (3°C) above the dew point.

2.5 The applicator shall be experienced with both material application and surface preparation. The installer shall supply all labor, materials, equipment and incidentals required to provide a complete geomembrane system as indicated on drawings and as specified in this guide.

2.6 Coating materials shall be stored off the ground in a dry place at 50 – 80°F (10 – 27°C).

2.7 Geotextile materials must be covered and protected from the weather at all times prior to their installation. **The geotextile fabric must remain dry prior to and during installation.**

2.8 A geotechnical survey shall be conducted to determine the suitability of the proposed site. This survey should detect the presence of organic wastes, other decomposing materials, and soil instability that can be detrimental to the geomembrane systems performance. Once the suitability of the site has been established, proceed with the development of an excavation plan based on the overall containment structure design.

3.0 MATERIALS

3.1 GEOTEXTILE FABRIC

3.1.1 Only geotextiles which have been tested and approved by ITW Futura Coatings are recommended. These geotextiles are pretreated on one side to facilitate the application of polyurethane or polyurea coatings. Non-tested geotextiles may shrink, tear or be incompatible with the coating material.

3.1.2 Selection of a geotextile for the system depends upon the type and condition of the substrate and the end use of the system.

3.1.3 Recommendation: Non-woven polypropylene, “sized” on one side.

3.1.3.1 Light Duty: 3.5 to 4 ounces per square yard.

3.1.3.2 Standard Duty: 6 to 6.5 ounces per square yard.

3.1.3.3 Heavy Duty: 7 to 8 ounces per square yard.

3.2 PRIMER

3.2.1 Required for tie-in to substrates other than soil.

3.2.1.1 Steel

3.2.1.1.1 **FUTURA-BOND 610 HS** – 65% solids, two component urethane primer.

3.2.1.2 Concrete

3.2.1.2.1 **FUTURA-BOND 415** – 65% solids, two component, water borne epoxy.

3.3 TOPCOAT

3.3.1 **GEOTHANE 5020** – 100% solids, fast cure, aromatic, two-component modified urethane elastomer. Applied using heated plural component spray equipment.

4.0 SURFACE PREPARATION

4.1 Soil

4.1.1 After excavation (if required), the soil shall be compacted to a smooth surface, free of holes, rocks, stumps, debris or sharp protrusions of any sort.

4.1.1.1 This may mean that soil removal, screening and/or replacement will be required to assure proper surface conditions.

4.1.1.2 A layer of sand or smooth gravel can be used if the native soil is unsuitable.

4.1.1.3 If a layer of clay, sand or gravel is specified under the membrane, it shall be placed at a uniform depth on compacted soil.

4.1.1.4 Sterilize areas of potentially harmful plant life.

4.1.2 Slope of Sides

4.1.2.1 The slope will vary with site conditions and shall be determined according to good engineering practice.

4.1.2.2 Slopes should preferably be no steeper than 4:1, especially if the liner will be covered with a layer of soil or other material. If space is limited, a slope as steep as 3:1 is acceptable for exposed membranes; however, the danger of earth instability and sliding under the liner is increased.

4.1.3 Anchor Trench

4.1.3.1 Excavate a 12” deep (min) x 18” wide (min) anchor trench around the perimeter of the basin to secure the geomembrane liner.

4.1.3.2 If the excavation is to contain liquid, this anchor trench must be above the liquid level.

5.0 GEOTEXTILE INSTALLATION

5.1 Applicator training is required and spray equipment must be approved by ITW Futura Coatings Technical Service Department.

5.2 All surfaces shall be dry and free of any foreign objects that may damage the liner.

5.3 The geotextile rolls shall be kept covered and protected from the weather until ready for installation.

5.4 Only geotextile panels for the day’s spraying shall be spread.

5.5 Do not place or roll geotextile panels onto wet substrates at any time. Plastic sheet may be laid between the substrate and the geotextile if this condition occurs.

5.6 Anchor the geotextile panels to the substrate using U-shaped anchoring nails with a 6-8 inch length and a width of at least 2 inches. Anchors should be spaced so that there are sufficient numbers to hold the Geotextile fabric firmly on the soil substrate.

5.6.1 Weights such as sand bags can be used to keep the geotextile in place during installation.

5.7 All panels shall be overlapped a minimum of 8 inches on all longitudinal and transverse joints.

5.7.1 Particular attention should be paid to fitting the lining with a full six inch overlap along the bottom of any sloped walls where they meet the bottom of the basin.

5.8 Care must be taken to insure that the geotextile is positioned to conform to surface irregularities as much as possible. Uniform wrinkling of the geomembrane is considered normal and acceptable, however excessive wrinkles must be avoided.

5.9 The Geotextile fabric shall extend over the outside edge of the basin, into and across the bottom of the anchoring trench.

5.10 The Geotextile fabric shall be cut to fit all corners so that no area will have more than 3 layers of fabric.

5.11 There shall be no air pockets under the fabric and no bulky areas with too many layers.

6.0 APPLICATION

6.1 Seams

6.1.1 Overlap the field Geotextile sheets a minimum of 8 inches

6.1.2 Fold back the overlapping sheet to match the edge of the overlapped sheet.

6.1.3 Spray apply a 25 – 30 mil wet coat of Geothane 5020 to the field sheet and the back side of the overlap sheet.

6.1.4 Immediately fold the overlap sheet onto the field sheet insuring that the Geotextile is smoothed out leaving no gaps or air bubbles.

6.1.5 Immediately spray apply another 25 – 30 mils of Geothane 5020 over the joined seam.

6.1.5.1 The seaming operation is at least a 2 – 3 man operation.

6.2 Field Sheets

6.2.1 Spray apply a “tack” coat of approximately 25 – 30 mils of Geothane 5020 over the Geotextile.

6.2.1.1 The “tack” coat is required in order to properly seal the Geotextile sheet prior to the application of the full build coat application.

6.2.2 Allow the “tack” coat to cure until it can be walked on (~ 4-5 minutes @ 75°F).

6.2.3 As soon as the “tack coat” can be walked on, spray apply the remaining Geothane 5020 required to meet the specification.

6.2.3.1 A minimum of 80 mils dry film thickness of Geothane 5020 (including the Geotextile fabric) is required on Geotextile. Film thickness measurements are taken in the field of the sheet and not at seams (seams will always have greater dry film thickness).

6.2.4 Geotextile extending into an anchoring trench shall be completely coated with Geothane 5020 at the specified dry film thickness.

6.2.5 Steps must be taken to avoid more than three (3) layers of Geotextile in any area.

6.2.6 Fish mouths are not acceptable and should be eliminated with a hand tool or with a Geotextile/Geothane 5020 patch.

6.2.7 Air pockets are not acceptable and should be corrected while the Geothane 5020 is still wet.

6.2.8 Areas of incompletely coated Geotextile are not acceptable.

6.2.9 At the end of the workday, approximately two (2) feet of Geotextile shall be left uncoated and protected from moisture to form a joint for the following days work.

6.2.10 Caution must be taken to keep the Geotextile free of debris at all times.

6.2.11 Smoking shall not be allowed on the liner, and foot wear should only be soft rubber soled shoes.

6.2.12 Contractor shall take precautions to protect the liner during any subsequent back-filling or other construction operations. A layer of uncoated Geotextile maybe be specified over the completed membrane for this purpose.

6.2.13 In earth excavations, installation of the liner over organic waste or other decomposing material should be avoided due to gas development under the liner. If the liner must be installed where gassing is a concern, a vent system should be installed.

6.2.13.1 One method of venting is to slope the bottom of the excavation upward toward the sides. This allows rising gas to flow to the edge of the membrane where it escapes through vent flaps placed about fifty (50) foot spacing above the waterline of the slope. A 4-6 inch base of smooth gravel, or a non-woven Geotextile may be used under the membrane to facilitate gas migration.

7.0 INSPECTION AND QUALITY ASSURANCE

7.1 It will be the Application Contractor's responsibility to perform first line inspection of all aspects of the surface preparation and lining application work and to assure conformance with all pertinent specifications. The Application Contractor's supervisor shall not participate in the physical work, but should limit his activities to supervision, coordination and communication with the Owner's site personnel, and to thorough inspection of the surface preparation and lining installation work.

7.2 The Application Contractor shall provide a daily record of all application process information, including temperatures, relative humidity, dew point, procedures and inspection data.

7.3 All of the Application Contractor's work to be performed and material to be supplied under the contract shall at all time be subject to inspection by the Owner's engineer or inspector who shall be allowed complete access for examining said work. This person may reject work not complying with the specifications. Inspections will be conducted after execution of each phase of work.

7.4 The Application Contractor shall be aware that after preparing the surface and before laying the Geotextile fabric or the application of Geothane 5020 to a complete section of work, the section will be made available for inspection and approved by the Owner's engineer or by the representatives of the Owner.

7.5 Dry Film Thickness Measurement:

7.5.1 The **GEOTHANE 5020** shall have a dry film thickness of no less than 80 mils.

8.0 SAFETY

8.1 Read the Material Safety Data Sheet (MSDS) and container labels of the materials being used for detailed health and safety information.

8.2 The Application Contractor will establish the number of air exchanges per hour required to maintain a safe working atmosphere during all phases of work. The Application Contractor will include details of his safety program for working in tanks with his bid, complete with a list of equipment used to test organic vapor and/or oxygen levels in the vessels.

8.3 All abrasive blasters, all applicators and their helpers will wear appropriate respiratory protection equipment. The type of respiratory protection will depend upon the nature of the application and material hazard, and shall eliminate dust, fumes, mists, organic vapors, acids and alkaline contaminants.

8.4 The Application Contractor must comply with all Federal, State and Local regulations pertaining to safety, environmental protection and other pertinent regulations.

Figure 1

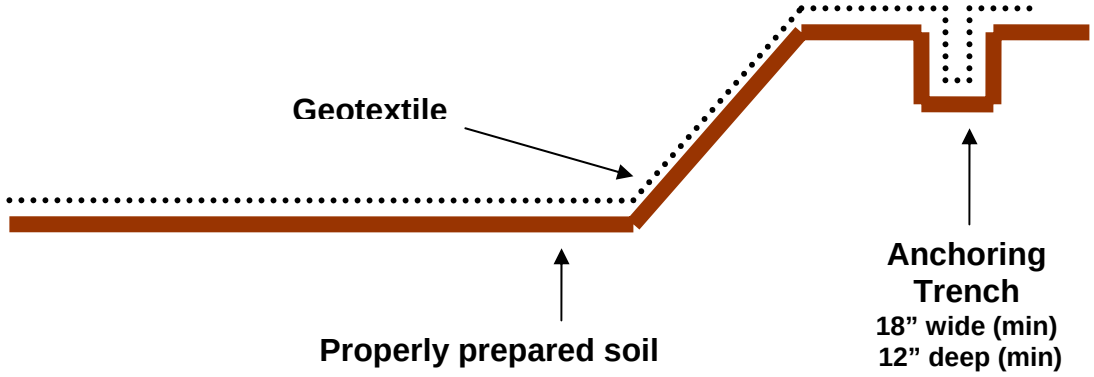

Figure 2

1. Properly prepared and primed steel, concrete or other recommended substrate.
2. Approximately 15 mils dft of elastomeric polyurethane or polyurea
3. Soil
4. Specified Geotextile fabric
5. Geothane at specified dry film thickness