POLYUREA-GEOTEXTILE SYSTEM: 911FC- FOR CONTAINMENT APPLICATION METHOD STATEMENT

General Parameters

Custom Linings Industrial Coating Polyurea 911FC System is commonly used in combination with specific geotextile products in waterproofing, primary containment, secondary containment and other project applications. This product combination forms a system that provides an extremely durable, seamless liner-membrane with a versatile and wide range of possible applications. This system is commonly used as:

- Below slab waterproofing (placed prior to forming and pouring of concrete)
- On grade liner for reservoirs, waste water plants, aqua farms, lakes and dams
- On grade liner for secondary containment in tank farms and industrial plants
- On grade liner for containment of waste or processing materials at oil wells/storage sites
- On grade liner for containment of refuse at disposal sites
- On grade liner for containment of waste at hazardous disposal site
- Disposable liner for transportation of toxic and/or nuclear waste or by-products
- Containment of nuclear dusts and airborne particulates

Geotextiles and polyureas have been utilized in composite form for 7-10 years combining the polyurea with common geotextile fabrics. These composite systems worked well as the geotextile fabrics resist deterioration in contact with soil contaminants and moisture. The composition of the common geotextile fabrics bond well to the polyureas but this composite system resulted in a layered membrane and required fairly high dry film thicknesses (dft) levels of polyurea coating to encapsulate the fibers of which these fabrics were manufactured. Innovations in manufacturing processes using olefins have resulted in new geotextile mesh or needle punched fabrics that require much lower polyurea dft levels in forming the composite, which results in much lower polyurea consumption levels and lower overall costs. Bonding of polyureas to olefins can only be accomplished using special primers, which initially limited the use of the newer geotextiles with polyureas. Through utilization of only specific geotextile weaves and polyureas with slower gel times, bonding is achieved essentially through a mechanical bond with the geotextile olefins instead of through a more common chemical bond. (See graphics below for details)

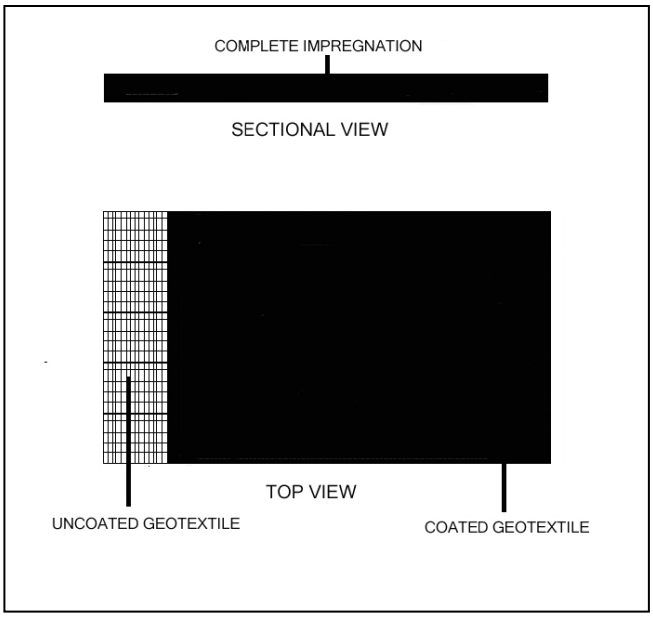


FIGURE 1: OLEFIN MESH POLYUREA COMPOSITES

Figure 1 on the left shows a top view and sectional view of a special olefin geotextile and polyurea combination. The sectional view shows that the polyurea coating spray applied to the surface of the geotextile mesh impregnates the voids within the mesh fabric dwells through and around the mesh fibers creating a solid polyurea membrane reinforce with olefin mesh. Although there is no chemical bond the two products are in essence a single product with extremely high physical properties. Standard dft required is 25 mils/0.6 mm nominal or greater.

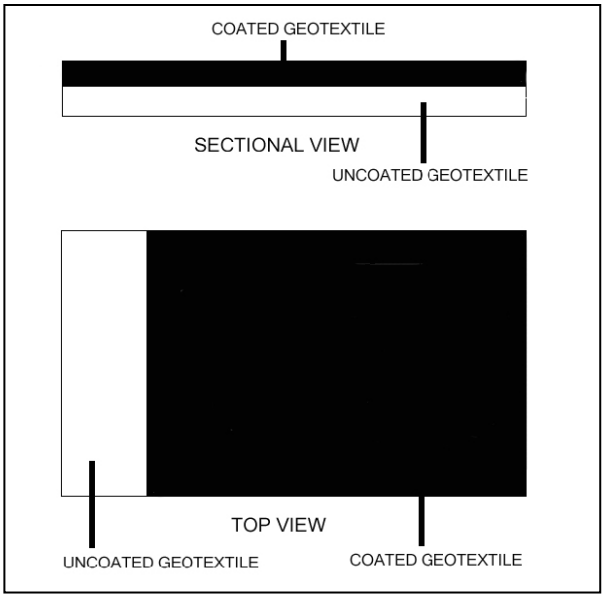


FIGURE 2: FABRIC POLYUREA COMPOSITES

Figure 2 on the left shows a top view and sectional view of a common geotextile fabric and polyurea combination.

The sectional view shows that the polyurea coating spray applied to the surface of the geotextile fabric encapsulates the surface fibers only providing a bond to the fabric but the resulting composite is clearly layered and not monolithic.

The completed composite is sound and strong but de-lamination can occur over time.

Standard dft required is 60 mils/1.5mm nominal or greater.

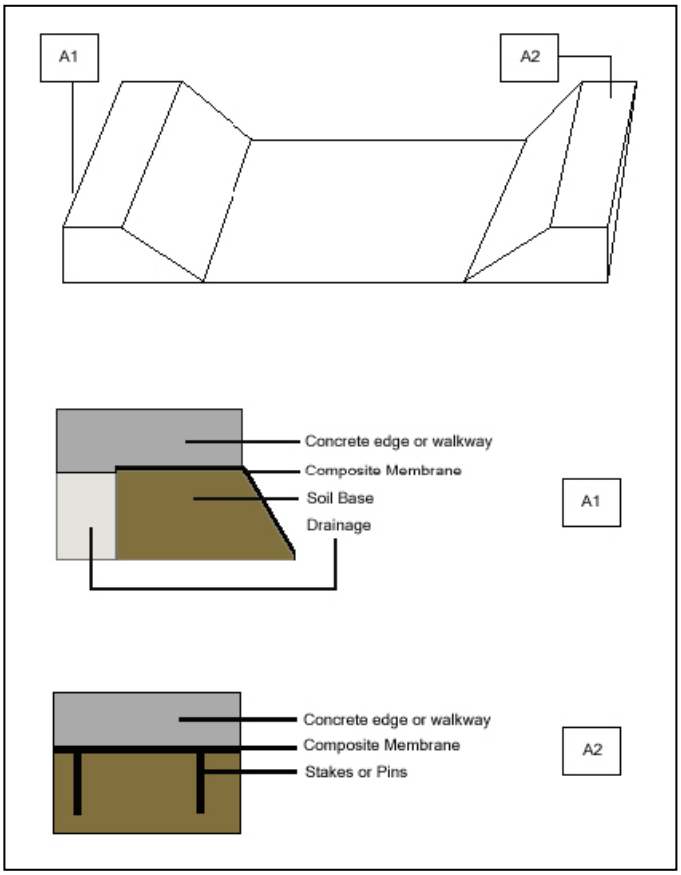
Both of the above products will perform well in applications and both have been utilized historically. The critical difference between the two applications from a technical standpoint is that one provides a layered product and the other provides a completely integrated monolithic product. Both of the above methods provide a seamless surface as the fabrics are overlapped and the coating is spray applied to the surface burying seams below the surface. Both of the above products will perform well in applications and both have been utilized historically. The critical difference between the two applications from a technical standpoint is that one provides a layered product and the other provides a completely integrated monolithic product and layers are a common failure point to all coatings. The critical difference from a cost standpoint is that common fabrics require 60 mils/1.5mm polyurea thickness or greater to totally encapsulate the surface fibers of the geotextile fabric and the other requires far less polyurea thickness at 30 mils/.6mm or greater.

The formulation of Custom Linings Polyureas utilized, the formulation of Custom Linings Primer utilized (if required) and the requisite dry film thickness levels (DFT) are specified for each project individually dependent on the specific project use, abuse levels, erosion requirements, submersion levels, ultraviolet exposure levels, etc. Custom Linings 911FC would be used where UV exposure and related color stability are not an issue (in most cases a dark color is specified, and will darken but not yellow) in exposed areas above waterlines where color stability is specified, a color stable aliphatic or aspartic would be utilized. In all cases the gel time of the product must be a slower formulation (7-18 seconds) as faster gel times will not allow for good impregnation into the mesh or fabric. Custom Linings specified high pressure product formulations must be utilized in these type applications and the application will be carried out by a Certified Custom Linings Qualified Application Team using specific equipment systems.

A list of certified applicators is available by calling Custom Linings Corporate Office at 719-395-4414.

METHOD STATEMENT FOR POLYUREA AND GEOTEXTILE COMPOSITES

Surface Preparation



Regardless of the Custom Linings product formulation or system utilized, proper surface preparation techniques must be accomplished prior to the application of the products utilized. These surface preparation requirements vary dependent on each projects unique condition. In some cases only minimal surface preparation is required.
For on grade applications, the surface must be cut and graded to provide no more than 30% gradients from base to top termination at just below final grade. The grade should be compacted and depending on soil conditions fill may be required (based on desired strength of surface).
For applications on concrete or other substrates, the surface should be sound and free of debris and other contaminants prior to installation of the geotextile mesh or fabric.

Note: Some concrete applications may require only a primer and not an accompanying layer of geotextile fabric.

Note: Proper termination at final grade points around the installation perimeter should be anchored and fixed to avoid slipping or sagging. In applications where no perimeter concrete walkway, curb, or structure is designed (see comments under installation of fabric or mesh directly below). In applications where concrete walkways, curbs or structures are designed, the grading should include cutting at termination points so that the installed composite is below the concrete (concrete can be placed on top of the composite) or mechanically fastened, staked or otherwise fixed in place.

Note: This application is primarily used for primary and secondary containment of fluids of all kinds. Perimeter termination edges should be installed so that rainwater or other drainage does not flow below the composite, which could cause the soil-bases to erode or allow large quantities of water to flow beneath the membrane. As with any construction, proper considerations for drainage and sub surface waters must be addressed at the design stage.

Geotextile Mesh or Fabric Installation

After completion of surface preparation, the fabric installation will begin by laying out the fabric (provided in rolls) with each successive pass overlapping the previous pass. The resulting overlap should be 4 inches/100mm minimum. The fabric can be staked in place if desired or on slopes where movement is probable. When the fabric is installed an allowance must be made for shrinkage of up to 3%. This shrinkage allowance is accomplished my pulling of the fabric to create raised wrinkles every 2-3 yards in either direction. These wrinkles will disappear when the completed system coating application cures. Failure to allow for this shrinkage will either cause lifting of the system as it tightens and/or pulling away from terminations at the perimeter due to shrinkage.

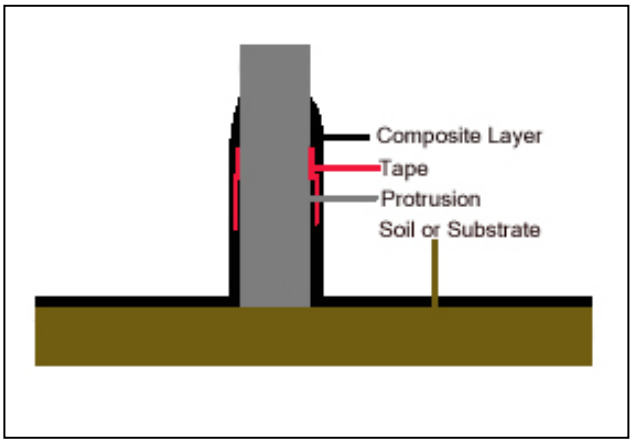


FIGURE 3 PROTRUSION TERMINATIONS

In many installations protrusions will be encountered. In tank farms and other secondary containment applications, there may be many pipes, metal racks and rails and other items in the containment area. In these instances, simply slit the fabric and wrap around the protrusion at grade (providing the 4in/100mm overlap in all cases), allowing enough fabric to wrap around the protrusion to a height either above final fluid design levels or as high as possible on the protrusion.

Tape the termination to the pipe or structural component providing a temporary bond to the substrate (always prepare steel or concrete substrates to remove loose material, dust and debris and prime the area above the fabric termination point). When applying the coating the coating will be applied beyond the tape edge onto the substrate locking the fabric in place and denying fluid ingress.

Note: The fabric that is applied to the surface of the protrusion can be a combination of the base fabric (slit, cut and rolled up) or can be pieces of scrap material wrapped around the protrusion and overlapped onto the horizontal base surfaces (100mm minimum). When coating is applied the layered fabrics will join together becoming part of a single seamless composite membrane.

Polyurea Coating Application

Only Custom Linings Polyurea high-pressure formulations are compatible in this application type. High pressure formulations require the use of special equipment systems, the requirements of these systems are clearly indicated on each individual Custom Linings Product Data Sheet. Aromatic formulations are most commonly used with Custom Linings systems. 911FC is the formulation recommended in the majority of the applications. Specify extended gel times (from 8-20 seconds) in all cases to allow for penetration of the coating material into the mesh or fabric. Do not use fast gel formulations (2-7 seconds) as penetration will be minimized due to the fast set times.

Choose high pigment loaded darker colors with Aromatics to avoid yellowing (darker colors will darken and not yellow under direct ultra-violet exposures). If color stability is critical to the end user, areas exposed to constant ultra-violet exposure should be top-coated with either an aspartic or aliphatic polyurea formulation. In lakes and water containment applications these areas would include perimeter walkway surfaces (anti-slip textured) and areas above the water-line.

Custom Linings 911FC Polyurea

In these applications, the coating products are applied in conjunction with the fabric installation to connect overlapping sheets of geotextile as the fabrics are installed. After placement and overlapping, apply Custom Linings 911FC using a Custom Linings specified Plural Component Polyurea Proportional Spray unit. Material must be applied at 175F. and 2300 psi. (accomplished with equipment).

Apply the polyurea coating to the overlap areas first joining the adjacent sheets of geotextile to each other. Fold the fabrics every 1-2 yards slightly to allow for tightening of the composite system caused by shrinkage (approximately 3%) prior to coating the entire surface.

After an area of geotextile is placed, folded and joined, complete the coating process by covering the entire geotextile surface to the desired dry film thickness. Product dries immediately and may be recoated within 12 hours. Where the 12 hour recoat window is exceeded the surface to be recoated must be wiped down thoroughly with MEK immediately prior to recoating.

Aromatic products will be applied throughout the entire surface to be coated including ramps, slopes, terminations, protrusions and even in areas with constant ultraviolet exposures. In high UV exposure areas where appearance or color is important, Custom Linings offers a topcoat that may be used. The topcoat is very stable and can be applied immediately after the polyurea. When applying anti-slip surfaces in these areas this is accomplished during this step.

Prepare base Polyurea substrate with MEK wash if more than 12-hours have elapsed since application (see notes below). Apply 20 mils Polyurea using High Pressure Plural Component Heated High Pressure Polyurea Proportional Spray unit. Material must be applied at 175F at 2300 psi (accomplished by equipment). Apply material using elevated spray technique delivering to the surface using atomization broadcast method until a stipple non slip profile is achieved meeting the clients requirement (non-slip profile is adjustable) until the desired DFT is achieved. Product dries immediately and may be walked on after 5 minutes of coating. A minimum DFT of 20 mils is recommended for Non–Slip profile. In areas of high ultra-violet exposures use Custom Linings 912 (Aliphatic Polyurea) or a color stable topcoat if required.

Note 1
Custom Linings Polyureas allow for a single monolithic application to any desired DFT level. In ambient temperatures of 75F, recoating can be performed within 12-hours of the layer being top-coated. Recoating within this window will provide a monolithic (nonlayered) finished system. When recoating beyond the allowable period of 12-hours, either an inter-coat adhesion primer (Custom Linings Polyepoxy 21) or a

chemical wipe using MEK must be accomplished. When using MEK, simply apply the MEK to complete saturation of the surface and allow drying prior to application of the secondary coat. Note that these same methods are utilized when beginning work a day following previous application work. Overlap areas from the previous days work must use the same inter-coat primer or MEK wipe to a minimum overlap of 12 inches/300mm onto the previous days work.
Final coating DFT levels are determined by the projects specific requirements including any provision of warranty by Custom Linings, its agents or affiliates, for the project.

Physical Properties of Custom Linings 911FC Geotextile Composite System

Property	**Test Method**	**Result**
Hardness (0s)	ASTM D2240-81	Shore D 48
Hardness (10s)	ASTM D2240-81	Shore D 40
Tensile Strength—(psi)	ASTM D638	4426.6
Elongation—(%)	ASTM D638	429
Modulus (100%)—(psi)	ASTM D638	693.8
Modulus (300%)—(psi)	ASTM D638	1005
Load—(lb)	N/A	46.97
Tear Strength—(pli)	ASTM D624	755.1
Tabor Abrader—H-18 Wheel	1,000 cycles, 1,000 gram load	113.4 mg loss
CS-17 Wheel	1,000 cycles, 1,000 gram load	9.6 mg loss
MVT(perm)	ASTN-E96-80	0.0964

PERSONAL SAFETY REQUIREMENTS
Observe the site owners established safety policy at all times and obey all written and verbal instructions from site managers and representatives.

Wear all personal protective equipment at all times including hard hat, safety glasses, boots, gloves, supplied air respirators and masks as required.

When preparing and applying coatings and chemical materials all personal protective equipment must be worn including: gloves, safety glasses, supplied air respirators and protective paper masks as required. When using high pressure plural component spray equipment, all personnel working in the application area must wear double filter breathers with OSHA ratings or supplied air respirators.

NOTES AND CLARIFICATIONS

All Custom Linings Polyurea coatings are 100% solids and contain no solvents or VOC's (Volatile Organic Compounds).

MSDS for all products detailed within this method statement are available and must be posted during application work.

Disclaimer
This method statement is provided as a guideline and basic tool for the understanding of common polyurea application methodology. This statement is not intended for use as a project specification. Every project has variables in climate, surface contaminants, substrate quality and construction schedules, which must be identified and addressed within a formal technical specification, prepared specifically for each individual project. Project specifications are provided to our distributors and affiliates or clients on a case-by-case basis and only after provision of complete details from the end-user, which are incorporated into each individual technical specification we write.

END OF METHOD STATEMENT