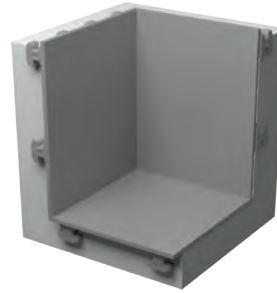
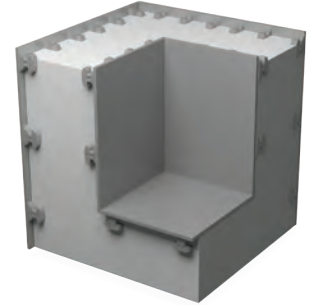


STUDLINER™

High Density Polyethylene Liner



SINGLE-WALL CONTAINMENT



DUAL-WALL CONTAINMENT

GENERAL INFORMATION

US FUSION & Specialty Construction offers GSE StudLiner™, a high density polyethylene (HDPE) concrete embedment liner used in a wide range of applications to protect concrete from corrosion, erosion and mechanical damage. US FUSION & Specialty Construction has successfully incorporated StudLiner™ in many wastewater products to enhance their performance and longevity. The StudLiner™ is available in 3mm (118mil) or other thicknesses.

StudLiner™ demonstrates excellent resistance to chemical and biological attack that would otherwise degrade concrete over time. By incorporating StudLiner™ into a design, the life expectancy of a structure will increase considerably. This results in lower long term maintenance costs.

The GSE StudLiner™ incorporates approximately 110 studs per square foot, which provides the highest liner pull-out strength available from any thermoplastic concrete system, and allows for minimal lateral movement due to thermal expansion and contraction. Studs are formed during the extrusion process and are an integral part of the sheet.

GSE StudLiner™ products have been manufactured since 1986. StudLiner production starts with the highest quality resin blended with prime grade carbon black or colored pigment, UV stabilizers and antioxidant to ensure the product will have a long life. GSE StudLiner™ must pass stringent quality testing requirements and inspection prior to product shipment.

DESIGN CONSIDERATION

Cast in place applications typically involve installing pre-fabricated panels on the job site. StudLiner™ sheets can be pre-fabricated into many different geometric configurations and panel sizes. StudLiner™ panels are attached to concrete forms with studs facing into the pour area. Concrete will be poured or injected and the studs are securely fastened into the concrete surface. Once the concrete cures, the forms are then removed and the adjacent StudLiner™ panels are welded together.

Pre-cast concrete structures involve pre-fabricated panels or tubes used for applications such as basins, sumps, trenches, manholes and wet wells. Panels are fabricated to the specified dimensions for molding. Once adjoining pre-cast panels are in place, the adjacent StudLiner panels can be extrusion welded or electro fusion welded together to create a continuous barrier system.

StudLiner™ is also available to rehabilitate structures. Panels can be fabricated and then installed in establishing form work. Grout will be injected into the interstitial space and the studs are permanently locked into place.

If you have an upcoming project, please contact US FUSION & Specialty Construction.

APPLICATIONS

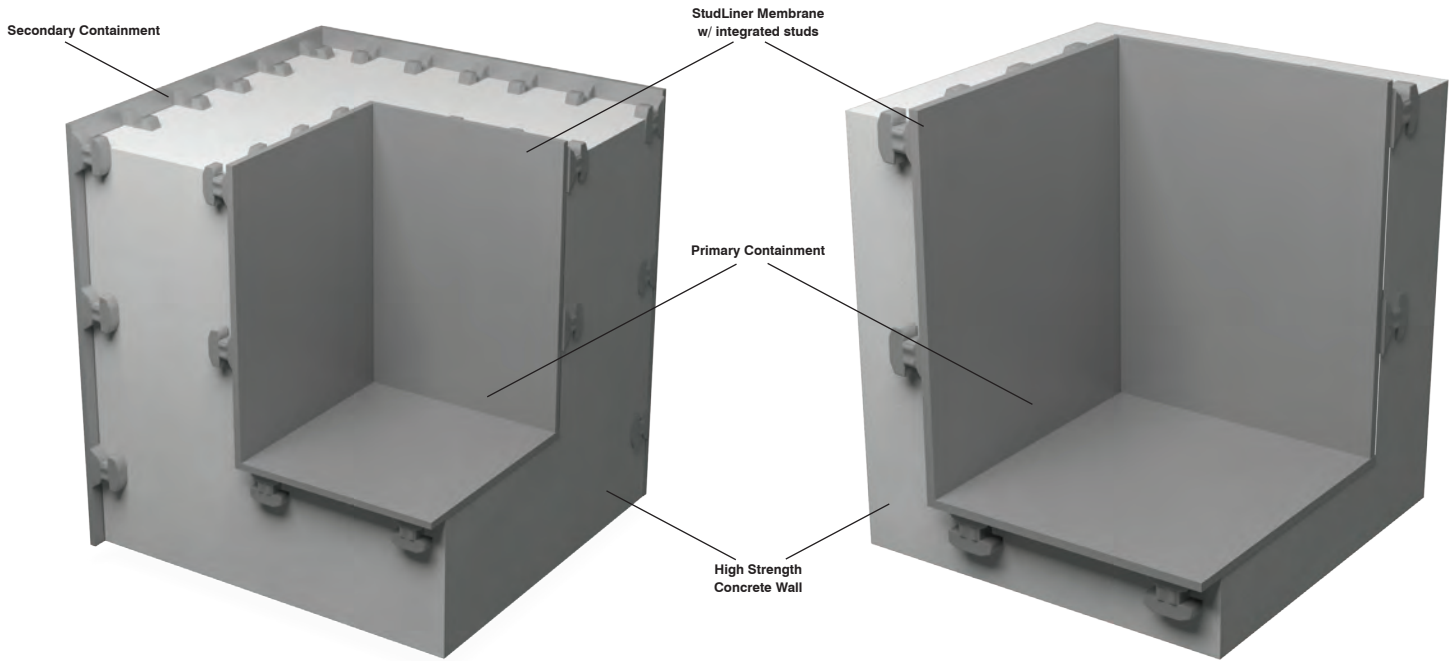
US FUSION & Specialty Construction's team of experienced professionals are available to match project requirements with a cost-effective concrete protection solution. StudLiner is designed to be used in plumbing, industrial, municipal and other markets. Below are industry examples:

- Wastewater Treatment Facilities
- Acid Neutralization Systems
- Wet Wells & Pump Liftstations
- Grease Interceptors
- Sand-Oil Interceptors
- Junction Boxes
- Manholes
- Electrical/Communication Pullboxes
- Spill Containment Dikes
- Tunnels
- Methane & Vapor Barriers
- Above & Below Ground Tanks
- Vaults



DUAL WALL CONTAINMENT

SINGLE WALL CONTAINMENT



SPECIFICATIONS

GSE StudLiner™ is a high density polyethylene (HDPE) embedment liner that protects against chemical and mechanical damage to concrete structures.

US FUSION & Specialty Construction StudLiner is manufactured with approximately 110 studs per square foot to guarantee high pullout strength and provide excellent stress distribution, especially during temperature changes and pressure buildup.

StudLiner™ can be installed over an exposed surface of a new or existing concrete structure, and it will provide a life expectancy that is five times greater than that of an unprotected structure.

TESTED PROPERTY	TEST METHOD	FREQUENCY	NOMINAL VALUE			
Product Code			STU	STU	STU	STU
Black			020N001	030N001	040N001	050N001
Gray			STU	STU	STU	STU
			020N031	030N031	040N031	050N031
Thickness, mm (mil)	ASTM D 5199	Every 5th roll	2.00 (80)	3.00 (120)	4.00 (160)	5.00 (200)
Density, g/cm ³	ASTM D 1505	1/100,000 ft ²	0.94	0.94	0.94	0.94
Tensile Properties	ASTM D 6693					
Strength at Yield, lb/in ² (MPa)	Type IV, Dumbbell	1/100,000 ft ²	2,200 (14.5)	2,200 (14.5)	2,200 (14.5)	2,200 (14.5)
Elongation at Break, %	G.L. = 2.0 in (50 mm)		500	500	500	500
Stud Pull-Out Strength ¹ , lb/ft ² (kN/m ²)		1/product	>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)
Carbon Black Content/Pigment Content, %						
Black (carbon)	ASTM D 1603, modified	1/100,000 ft ²	2-3	2-3	2-3	2-3
Gray (pigment)	ASTM D 5630, modified		1.5-2.5	1.5-2.5	1.5-2.5	1.5-2.5
Carbon Black Dispersion ²	ASTM D 5596	1/100,000 ft ²	Note 2	Note 2	Note 2	Note 2
Notched Constant Tensile Load, hours	ASTM D 5397	1/formulation	400	400	400	400
Coefficient of Linear Thermal Expansion, per °C	ASTM D 696	1/product	1.20E-04	1.20E-04	1.20E-04	1.20E-04
Low Temperature Brittleness, °C	ASTM D 746	1/product	-77	-77	-77	-77
Dimensional Stability, % (each direction)	ASTM D 1204	1/product	±1.0	±1.0	±1.0	±1.0
Water Absorption, %	ASTM D 570	1/product	0.1	0.1	0.1	0.1
Water Vapor Transmission, (g/m ² /day)	ASTM E 96	1/product	<0.01	<0.01	<0.01	<0.01
Roll Width, ft (m)			8 (2.44)	8 (2.44)	8 (2.44)	8 (2.44)
Roll Length, ft (m)			246 (74.97)	213 (64.91)	196 (59.73)	196 (59.73)
Roll Area, ft ² (m ²)			1,968 (182.83)	1,704 (158.30)	1,568 (145.67)	1,568 (145.67)

NOTES:

¹Note: Concrete must have compressive strength of at least 5,000 lb/in² (34,500 kPa).

²Note: Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from category 3.

