

TECHTHANE[®] 685 HIGH BUILD ELASTOMER SPRAY LINING

DESCRIPTION

TECHTHANE 685 is a high-build, high-solids, batch-mix urethane elastomer lining applied with standard airless spray equipment. 685 forms a seamless, highly elastomeric lining that flexes with expansion and contraction, seals seams, and bridges gaps. 685 resists corrosion from many acidic and caustic solutions, and abrasion from small particles. 685 bonds highly to prepared substrates. As an aliphatic-hybrid urethane-urea, 685 has better hydrolytic stability, UV stability, and resistance to many chemicals than aromatic urethanes/polyureas, and is not affected by moisture during application as are standard urethanes. Individual coats of up to 60 mils (1.50 mm) DFT can be applied to vertical surfaces without sag, making it for most applications a one-coat system. Typical applications involve corrosion protection and seamless containment in the transportation, waste/wastewater, mining, power generation, and pulp/paper industries.

PROPERTIES OF CURED LINING

Typical physical properties of TECHTHANE 685 sprayed and cured under normal conditions are as follows:

PROPERTY	VALUE ^a
Hardness, Shore A (ASTM D2240)	85
Tensile Strength (ASTM D412)	2,700 psi (18.50 MPa)
Elongation (ASTM D412)	500 %
100% Modulus (ASTM D412)	650 psi (4.50 MPa)
Tear Strength, Die-C (ASTM D624)	350 pli (61.30 kN/m)
Tear Strength, Split (ASTM D470)	70 pli (12.25 kN/m)
Film Density (ASTM D792)	0.93 g/cm ³
Abrasion Resistance, wet fine particle (Sand Slurry)	400% > steel
Adhesion, linear peel, to prepared substrates (ASTM D429)	65 pli (11.40 kN/m)
Surface Finish (Subjective)	semi-gloss
Color	see 'Availability'

PROPERTIES OF LIQUID COMPONENTS

Typical properties of TECHTHANE 685's liquid components are as follows:

PROPERTY	PART 'A'	PART 'B'	MIXED (A+B)
Solids Content, by volume, %	100	28.00	64.00
Weight, lbs./gal. (g/L)	8.65 (1037)	8.55 (1025) ^b	8.60 (1030)
Viscosity, cps/mPs @ 75°F (24°C)	32,500	500	1,300
Flash Point, TCC, °F (°C)	> 212 (100)	24 (-4)	24 (-4)
VOC, lbs./gal. (g/L)	0	5.40 (647)	2.70 (324)

APPLICATION SUMMARY (See following pages for further application information)

PROPERTY	
Application Environment	50-120°F (10-48°C), 0-100% R.H.
Application Equipment	single-component airless, 30:1+ recommended
Mix Ratio, A:B	1:1 by volume
Pot Life	60-70 minutes @ 75°F (24°C)
Coverage	1,050 mils/ft. ² /gal. (0.64 mm ² /L)
Per Coat Vertical/Horizontal Build, DFT	10-60 mils (0.25-1.50 mm)
Maximum Lining Thickness, DFT	250 mils (6.25 mm) ^c
Recoat Window, direct-to-basecoat (unprepped)	1-6 hours @ 75°F (24°C) for ultimate adhesion 6-18 hours @ 75°F (24°C) for 50 pli (8.75 kN/m) +

CHEMICAL COMPATIBILITY

TECHTHANE 685 is usable with a wide variety of chemicals and solutions, with compatibility typically best within the pH range of 2-12. Following is a brief overview of chemical compatibility:^d

CONTACT	BRIEF	SUSTAINED
Acid, Hydrochloric 5%	G	G
Acid, Phosphoric 10%	G	G
Acid, Phosphoric 30%	G	F
Acid, Sulfuric 10%	G	G
Acid, Sulfuric 30%	G	F
Ammonium Hydroxide	G	G
Fuel Oils	G	G
Gasoline	G	G
Water / Salt Water	G	G
Water, Chlorinated 1 ppm	G	G
Water, Chlorinated 4 ppm	G	F
Sodium Hydroxide 10%	G	G
Solvents	G-F	F-P

G: Good F: Fair P: Poor

TEMPERATURE COMPATIBILITY

TECHTHANE 685 is generally suitable for use in dry service up to 180°F (82°C), and wet or humid service up to 150°F (65°C). Chemicals and other variables may affect elevated temperature performance and adhesion. Although 685 becomes more rigid at lower temperatures, it remains flexible below -40°F (-40°C).

ABRASION RESISTANCE

For fine-particle slurry and impingement abrasion resistance, TECHTHANE 685 has shown to be superior to many other materials. The figures below are results of the *Sand Slurry Abrasion Test*, the most relevant test for elastomeric materials and wet, fine-particle abrasion.^e A relative volume loss of 25 for TECHTHANE 685 indicates an abrasion resistance approximately 400% greater than steel:

MATERIAL	RELATIVE LOSS FROM ABRASION	RESISTANCE, AS % OF STEEL
TECHTHANE 180	5	2000
TECHTHANE 90SS-MB	15	665
UHMW Polyethylene	22	454
TECHTHANE 685	25	400
A.R. Steel	62	161
304 Stainless Steel	82	122
Carbon Steel	100	100
H.D. Polyethylene	218	-218
PVC	532	-532
6061 Aluminum	1042	-1042

ADHESION

TECHTHANE 685 requires substrates be properly prepared and primed to achieve its reliable, high adhesion. With the appropriate preparation and primer, adhesion is typically 65-100 pli (11.50-17.50 kN/m) to steel substrates and 40-100 pli (7.00-17.50 kN/m) to concrete, aluminum, and composite substrates.

COVERAGE

The theoretical dry coverage of sprayed TECHTHANE 685 is 1,050 mils/ft.²/gal (0.66 mm/m²/L). For example, approximate coverage is as follows:

1,050 ft. ² /gal. @ 1 mil	0.66 m ² /L @ 1.00 mm
35.0 ft. ² /gal. @ 30 mils	0.33 m ² /L @ 2.00 mm
17.5 ft. ² /gal. @ 60 mils	0.22 m ² /L @ 3.00 mm
8.4 ft. ² /gal. @ 125 mils	0.16 m ² /L @ 4.00 mm
4.2 ft. ² /gal. @ 250 mils	0.13 m ² /L @ 5.00 mm

Note: Actual coverage rates vary by application and equipment.

SUGGESTED LINING THICKNESS

SERVICE TYPE	THICKNESS (DFT)
sealing, general corrosion	30-40 mils (0.75-1.00 mm) +
crack-bridging, light abrasion	60 mils (1.50 mm) +
moderate abrasion, impact	100 mils (2.50 mm) +
heavy abrasion, impact	250 mils (6.25 mm) + ^f

APPLICATION ENVIRONMENT

TECHTHANE 685 is best applied between 50-120°F (10-48°C). TECHTHANE 685 is not affected in application by humidity and can be applied with 0-100% humidity (Substrate corrosion may be a problem at high humidity levels, however).

CURE TIME

The time required for TECHTHANE 685 to cure and form a strong bond depends on lining temperature and thickness. Cure is faster with higher temperatures and thin coats, and slower with lower temperatures and thick coats. Also, a same thickness lining built with many thin coats cures faster than one built with fewer thick coats. For reference, cure times for a single, 60 mil (1.50 mm) WFT coat at selected constant temperatures are listed below. Applicators / end users must adjust their times accordingly.

CURE	50°F (10°C)	75°F (24°C)	100°F (38°C)
gel (recoat minimum)	2 hrs.	1 hr.	30 min.
tack-free	6 hrs.	3 hrs.	1.5 hrs.
75%	6 days	3 days	2 days
95% ('full')	12 days	8 days	4 days

75% cure is normally sufficient for immersion and light impact, and 95% cure for more severe use. TECHTHANE 685 will continue to strengthen and have greater physical properties after aging several weeks. Coated items should be put into service only after sufficient cure.

AVAILABILITY

PACKAGING: 2, 10, and 100 gallon sets.

COLOR: Gray, tan, blue, black, orange, yellow, green, and white. Custom colors available.

EQUIPMENT

TECHTHANE 685 is best applied with standard, industrial-grade, air-powered, airless spray equipment. Following is a list of general equipment guidelines:

COMPONENT	REQUIREMENT
Spray Machine Pump	Single-component, Air-powered
Air:Fluid Pressure Ratio	23:1 minimum, 30:1+ recommended
Packings	Teflon
Ground	Earth Ground
Spray Hose	Heavy-duty Industrial
Size	1/4"-3/8" (6.00-9.00 mm)
Core	Teflon or Nylon
Pressure Rating	3,000 psi (20 MPa)
Conductivity	Conductive
Spray Gun	Single-component Airless
Tip Size	0.021"-0.031" (0.50-0.80 mm)

A 'Jiffy Mixer' or similar on an air drill is required for mixing the components.

APPLICATION INSTRUCTIONS

Surface Preparation

For proper, high adhesion, TECHTHANE 685 should only be applied to surfaces that have been properly prepared. In most cases this means cleaning, gritblasting, re-cleaning, and priming. The following is a brief overview of surface preparation requirements – refer to the appropriate TECHGRIP™ primer's Product Data Bulletin for additional instructions.

Metal: Detergent wash, grind down edges to a 1/8" (3.00 mm) radius, grit-blast, clean, prime with TECHGRIP M3, C2, or C1/FG1 combination.

Concrete: Let age 28 days, water blast, allow to dry, fill large holes with TECHGRIP C1, fill cracks with T150 caulk, prime with C2 or C1/FG1 combination.

FRP/Epoxy: Clean, grind down edges to a 1/8" (3.00 mm) radius, sand or grit blast, clean, prime with TECHGRIP FG1.

Cured Urethane Elastomer: Clean with MEK or detergent, abrade, wipe with MEK, prime with TECHGRIP E1.

Rubber: Detergent wash, abrade, clean with MEK, prime with TECHGRIP R1 or E1, spot test prior to full-scale use.

Fabric/Cloth: No surface preparation is normally required for clean, open-weave fabrics.

Mixing Components

1) Re-mix the Part 'B' component thoroughly prior to each use, and also the Part 'A' component if it has, or may have been, exposed to cold temperatures. This is especially important if less than the entire container is to be mixed at one time.

2) Measure out equal amounts of Part 'A' and Part 'B' by volume, for example, 1 gallon Part 'A' and 1 gallon Part 'B'. Measure carefully to ensure the best possible product. (To make pouring Part 'A' easier, nail a hole in the Part 'A' lid and / or warm the container to 100°F (38°C) - *Note: Do neither to the Part 'B' pail.*)

3) Add the Part 'B' into the Part 'A' container. Make sure to get all of the Part 'B' out of its container.

4) Blend the mixture thoroughly with a Jiffy mixer on an air drill at high speed. Reach all parts of the container, taking care to blend in the material along the side walls and in the corners of the container. Half-way into mixing, stop and scrape the side walls, bottom, and corners of the container with a straight-edge to blend-in any unmixed Part 'A' material sticking there, and thoroughly blend the entire container again. *Ensure a good mix by blending longer than appears necessary.* (Complete mixing time is normally about 5 minutes for a 5 gal./ 20L mix.)

5) Transfer the mixture into a neutral container. It is ready to be sprayed at this point.

Pot Life

The pot life of mixed TECHTHANE 685 varies by material temperature:

TEMPERATURE	POT LIFE
50°F (10°C)	90-110 min.
75°F (24°C)	60-70 min.
100°F (38°C)	45-55 min.

Note: Coats applied at the beginning of the pot life will be smoother and denser than coats applied at the end of the pot life. For smoothest surface appearance, apply the last coat(s) with a freshly-mixed batch.

Application

1) Set the spray machine to the lowest air pressure that gives a good pattern with the spray tip being used (typically -60 psi with a 0.025" tip).

2) Apply coats in an even, overlapping manner, thoroughly wetting out the surface, but avoiding runs and sags that occur when areas are applied too thick. Apply a maximum of 80 wet mils (2.00 mm) per coat.

Let each base coat solidify prior to applying any additional coats. Be sure that recoats are in accordance with 'RECOAT TIME AND PREPARATION' on the following page.

3) When finished coating, let the coated surface properly cure prior to handling or placing into service.

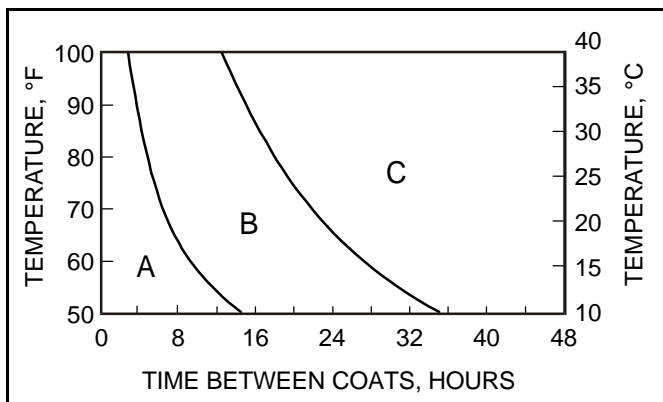
Recommendations:

- Round off inside corners with TECHTHANE T150 caulk prior to coating.
- Overlap flange and lip edges.
- Avoid leaving coating-substrate interface seams exposed to service.
- Rotate moveable objects on a turning fixture for fastest build, most consistent coverage, and best surface finish.
- Topcoat with TECHTHANE 90SS-FF or 98SS-FF for a high gloss finish.

Note: Do not apply 685 when the temperature of the substrate is less than 5°F (2.8°C) above the dew point, when the ambient temperature is below 50°F (10°C), or when the substrate is expected to become wet prior to application.

Recoat Time and Preparation

Elapsed time and surface temperature determine the level of surface preparation required to get a reliable, strong bond between coats of TECHTHANE 685. In most cases, no extra preparation is required -- additional coats can be applied directly over previous coats. However, if a new coat is to be applied to an old coat outside of its 'no-prep' 'Recoat Window,' than various levels of surface preparation are required to ensure the *highest level* of adhesion. The chart below is provided as a general guide in determining the recommended preparation level. To use the chart, move up from the appropriate 'Time Between Coats' and across from the appropriate 'Temperature' listing - the resulting point identifies what preparation is required, as stated below the chart. If in doubt, use the greater preparation level.



AREA RECOMMENDED PREPARATION BEFORE RECOATING

A	No preparation required
B	Wipe surface with MEK, allow to evaporate
C	Buff, prime with TECHGRIP E1, allow to dry to firm tack

CLEAN UP

Use toluene or xylene work well for cleaning uncured TECHTHANE 685 from mixing and application equipment. Cured 685 must be soaked for removal. To ensure continued proper application of 685, spraying and mixing equipment should be flushed and cleaned immediately after use to prevent build-up of cured 685 on internal parts.

Dispose of used containers in accordance with local, regional, and national regulations.

STORAGE AND SHELF LIFE

Store TECHTHANE 685 containers in a cool, dry area away from potential exposure to heat, sources of ignition, direct sun, or large variations in temperature. Under these conditions, the shelf life of unopened containers is 1 year minimum from date of shipment. Opened containers should be resealed quickly.

SAFETY

TECHTHANE 685 Part 'B' and the Part 'A' and 'B' mixture are flammable. Avoid exposure of the product to sparks, flames, and heat sources. Use only non-sparking motors and equipment throughout application of TECHTHANE 685.

TECHTHANE 685 Part 'A' contains isocyanates (aliphatic), and Part 'B' contains amines and solvents. Avoid overexposure by inhalation, eye contact, skin contact, or ingestion. To reduce inhalation potential, use only in well-ventilated areas that minimize exposure to product and wear proper respiratory protection. For indoor or confined areas, forced-air ventilation is required to draw vapor away. While working in confined areas such as enclosed or narrow tanks, fresh-air breathing equipment is required. In applications with *adequate* ventilation, approved chemical cartridge masks designed for organic vapors are acceptable when used in accordance with their guidelines. To avoid eye contact, chemical splash goggles must be worn. To avoid skin contact, impervious protective clothing must be worn. Wash thoroughly after application.

Refer to the Material Safety Data Sheet (MSDS) for further information prior to use of this material. MSDS available 24 hrs. at www.urethane.com/msds.

FOR INDUSTRIAL USE ONLY.

a) Figures are based on sprayed specimens of 60–125 mils (1.50–3.00 mm) DFT, cured 7–21 days at 75°F (24°C) average, and are typical of actual applicator field results. NOTE: These figures should not be compared with 'best-case' sprayed figures or figures based on cast, poured, or thin-film/drawn-down laboratory specimens processed and cured under unrealistic, optimum conditions as done by other manufacturers.

b) Varies by color choice. Contact your representative if mixing by weight.

c) Total thickness can be greater by applying thinner coats and/or allowing extra time between each coat. Contact your representative for more information.

d) Users are advised to conduct their own tests prior to use. For more extensive, general compatibility information, refer to 'Chemical Compatibility of TECHTHANE.'

e) The Sand Slurry Abrasion Test is used to estimate the abrasion resistance of materials to solutions containing fine, abrasive particles. In the test, materials are subjected to an abrasive sand/water solution for several hours. After thorough drying, their volume lost to abrasion is measured and compared to steel. Field service results show the test to be an accurate indicator of actual service performance for all fine abrasives. Note: Taber and other tests designed for hard materials and dry, sliding abrasion are not relevant to this type of product nor the type of abrasion to which they are typically subjected, and provide no useful data to this effect.

f) For severe abrasion applications, use of a more abrasion-resistant TECHTHANE product should be considered.

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