

LINABOND®

Permanil™ Linathane™

High Performance Coating



PRODUCT DESCRIPTION

Linathane™ is a high solids high-strength, extremely chemical resistant polyurethane/polyurea. It is primarily intended for protection of concrete and steel in corrosive environments as well as for containment of liquids and gases. It sets very quickly eliminating a great deal of the potential for pinhole formation and permeability, since the reaction time is short - with the material "setting" in a matter of minutes. It exhibits excellent adhesion without a primer on most substrates, but it also works well with a variety of specialty primers which can enhance performance (such as corrosion inhibition on steel) over certain substrates under special conditions and requirements.

It is easy to apply, sets very quickly and has excellent resistance to acid and sulfides. It has chemical resistance which exceeds that required of extruded PVC linings in wastewater "chemical bath" testing and exceeds PVC in many other areas of chemical resistance. It is very strong (tensile strength of @13,000 psi) and is very tough as well. Both set time and cure time are relatively short, allowing structures to be returned to service very quickly. It becomes tack-free in less than 20 minutes and becomes extremely tough in 72 hours at room temperature. This material may go through a slight "brittle" stage while curing. Keeping the structure warm for several hours will eliminate this phenomenon, if desired. Heating for a few hours is recommended in cold environments.

While no liquid-applied coating will ever have the reliably impermeable nature of an extruded lining in the field, this material has many uses for the less critical environments.

MIXING INSTRUCTIONS

Linathane™ can be applied by 1:1 plural component pump equipment designed specifically for application of 2 component materials and approved by Linabond. The 1 to 1 ratio makes application extremely forgiving. However, Digital Ratio Monitoring should be required in the project specification to assure proper application ratio. Spray guns should be of the impingement mixer type and should be self-cleaning, due to the extremely fast set time of this material. This material can be dispensed through a two part caulking gun with disposable "static mixers" for very small jobs, like joint filling, and has a work life of 5 to 10 minutes. It should not be hand mixed and trowelled, because pot life is extremely short. Please remember that this material is designed to allow the return of the structure to service in a matter of minutes, and minimize environmental application difficulties during application. **It is essential to have a material which sets quickly, and which has been tested in the most adverse environments - DURING the formulation process.**

USES

Use Linathane™ for manholes, wet wells, tanks, tank cars, reservoirs, dams, containment, penstocks and many other uses where a very rigid high modulus, yet tough, low permeability, high performance coating is desired.

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(U.S. Patents #4,792,493 #5,268,392 & #5,389,692 with others pending - U.S. and

Typical Product Data:

Tensile strength:	13,000 psi
Elongation	>2%
Shore "D" hardness	79
Volumetric Ratio	1:1

PRECAUTIONS

Please read MSDS sheet before use. This material is intended for professional use only. Use with adequate eye, skin and respiratory protection and always provide ventilation in closed areas. Respirators should be approved for organic vapors. Keep vapor concentration below TLV limits. Overexposure may lead to skin, eye or respiratory irritation. It is toxic by ingestion. Avoid contact of this material with open flame. Chemical resistant gloves and eye protection are recommended.

STORAGE and TRANSPORTATION

Avoid freezing temperatures. Keep away from open flame and store at temperatures of approximately 40 to 90 degrees F.

During transportation, care should be exercised to avoid puncturing the product containers. Also, storage containers and/or trailers should not be left in desert heat above 120 degrees Fahrenheit for more than 3 months during shipment, nor should it be exposed to temperatures below freezing for more than 3 months.

These materials are intended for use only by applicators trained and competent in the use of plural component materials and equipment.

Permanil™ Linathane™

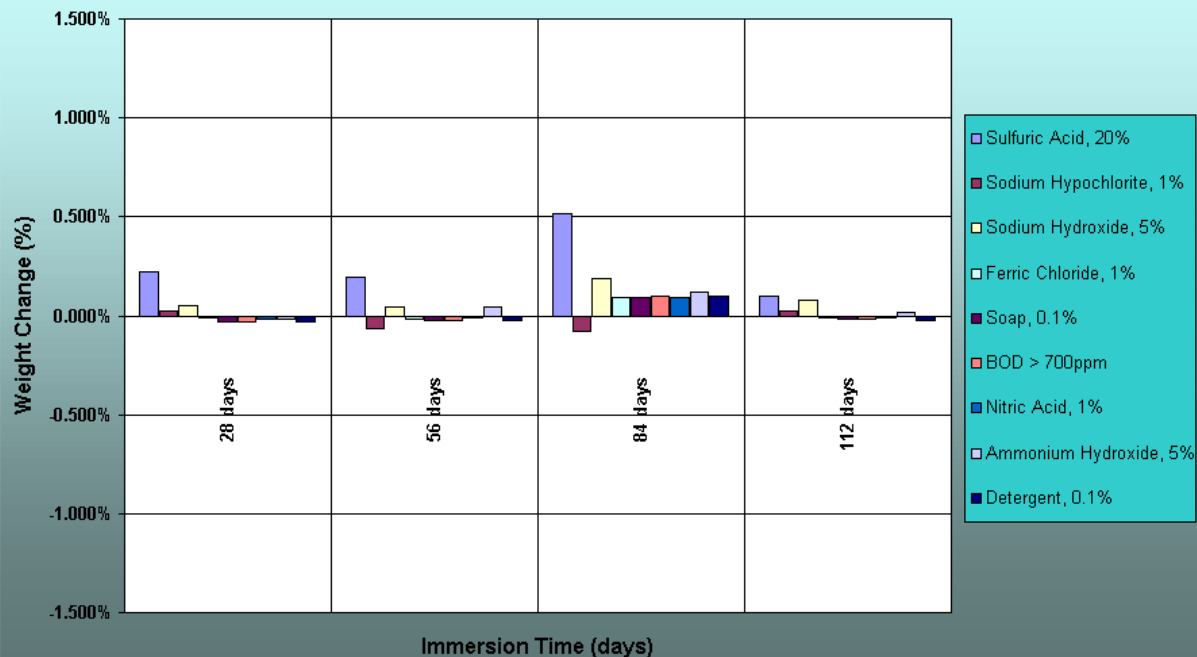
CHEMICAL RESISTANCE TEST DATA - PERCENT WEIGHT CHANGE

CHEMICAL BATH	DAYS IMMERSED				Requirements*
	28	56	84	112	
Sulfuric Acid, 20%	0.22%	0.20%	0.52%	0.10%	(+/-) 1.5 %
Sodium Hypochlorite, 1%	0.02%	-0.07%	-0.08%	0.03%	(+/-) 1.5 %
Sodium Hydroxide, 5%	0.05%	0.04%	0.19%	0.08%	(+/-) 1.5 %
Ferric Chloride, 1%	-0.01%	-0.01%	0.09%	-0.01%	(+/-) 1.5 %
Soap, 0.1%	-0.03%	-0.02%	0.09%	-0.02%	(+/-) 1.5 %
BOD > 700ppm	-0.03%	-0.02%	0.10%	-0.02%	(+/-) 1.5 %
Nitric Acid, 1%	-0.02%	-0.01%	0.10%	-0.01%	(+/-) 1.5 %
Ammonium Hydroxide, 5%	-0.02%	0.04%	0.12%	0.02%	(+/-) 1.5 %
Detergent, 0.1%	-0.03%	-0.02%	0.10%	-0.02%	(+/-) 1.5 %

Notes: * As per Standard Specifications for Public Construction (Greenbook), Section 210-2, Requirements for Protective Plastic Liners.

The tables to the left show the results of the chemical resistance tests which were conducted on the Linabond Permanil Linathane Material, according to the Standard Specifications for Public Construction (Greenbook), Section 210-2; Requirements for Protective Plastic Liners. As you can see, the material far exceeds the requirements for constant immersion in wastewater, based on an expected 50 year design life. In addition, the material will withstand a very wide range of extremely corrosive materials which would severely damage nearly any extruded liner available for a wastewater structure, in effect, increasing the durability of the entire system far beyond a conventional wastewater protective membrane.

LINABOND PERMANIL LINATHANE CHEMICAL RESISTANCE TEST DATA



This bar chart provides a graphical illustration of the effects of specific chemicals on the Permanil Linathane Material. The entire white area of the chart represents the allowable range per the Green Book, indicating that the material has quite a considerable safety margin. It is highly unlikely that anything which is ever likely to be found in a wastewater structure will have a significant effect on this material.

Permanil™ Linathane™

Tensile and elongation tests (ASTM D-412) conducted at the test laboratories of A.G. Bayer, Inc, in Pittsburgh, Pennsylvania on Friday, October 1, 1999 on the Linathane Permanil Coating Material:

These tests were conducted on an Instron Corporation Series IX Automated Materials Testing System:

Sample Rate (pts/secs): 20.0000
Crosshead Speed: 20.0000 in/min
Humidity (%) 35 %
Temperature 72° F

	Strain @ break (psi)	Elongation @ break (%)
Minimum	13,440.000 psi	2.013
Maximum	14,246.667 psi	3.570
Mean	13,843.334	2.792
Standard Deviation	570.4	1.101
CV	4.120	39.440
Minimum	13,440.000	2.013
Maximum	14,246.667	3.570

These test results are for internal information only. Please do not release this information to the public or to persons working outside of your Agency.