

SETATHANE[®] POLYOL EMULSIONS



SETATHANE[®] D E 2656

SETATHANE[®] D E 2761

SETATHANE[®] E 2000

SETATHANE[®] E 2762

SETATHANE[®] E 2017

KEY FEATURES

- ▶ Excellent stability
- ▶ “Ready-to-mix”
- ▶ High solids and low viscosity
- ▶ Low odor
- ▶ Phthalate free options
- ▶ Rapidly renewable content
- ▶ Near zero VOC

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經銷商：台亨貿易有限公司 TEL：02-26488226 FAX：02-26489811

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TECHNICAL FEATURES

- Excellent stability
- “Ready-to-mix”
- High solids and low viscosity
- Low odor
- Phthalate free options
- Rapidly renewable content
- Near zero VOC

SUGGESTED USES

SETATHANE® D E technology, a 3-pack PU-/ cementitious hybrid technology, offering extraordinary resistance against chemicals and mechanical wear in heavy duty chemical-/ industrial surroundings. Also suitable for demanding applications in the Food, Beverage and Dairy Industry, where resistance against thermal shock from steam cleaning is required.

TYPICAL PROPERTIES (NOT SPECIFICATIONS)

	E 2000	D E 2656	D E 2761	E 2762	E 2017
Weight Solids, %	70	70	70	70	70
Viscosity, cP	350 max	350-1000	350-1000	350-1000	350-1000
HEW as supplied	210	565	680	551	733
VOC, g/L	near zero	near zero	near zero	near zero	near zero
Butyl Benzyl Phthalate-Free	No	Yes	Yes	Yes	Yes

INTRODUCTION

SETATHANE® D E natural oil-based polyol emulsions are combined with methylenediphenyl diisocyanate (MDI) and cement to form urethane mortars for seamless, self-leveling, industrial floor toppings. In this 3K system, the water introduced by the addition of the SETATHANE® D E polyol emulsion reacts with the MDI forming an amine and CO₂. Reactive fillers (like hydrated lime) in the cement component immediately convert the CO₂ to calcium carbonate, while the amine reacts further with the MDI to form polyurea. The formation of polyurea is the primary reaction.

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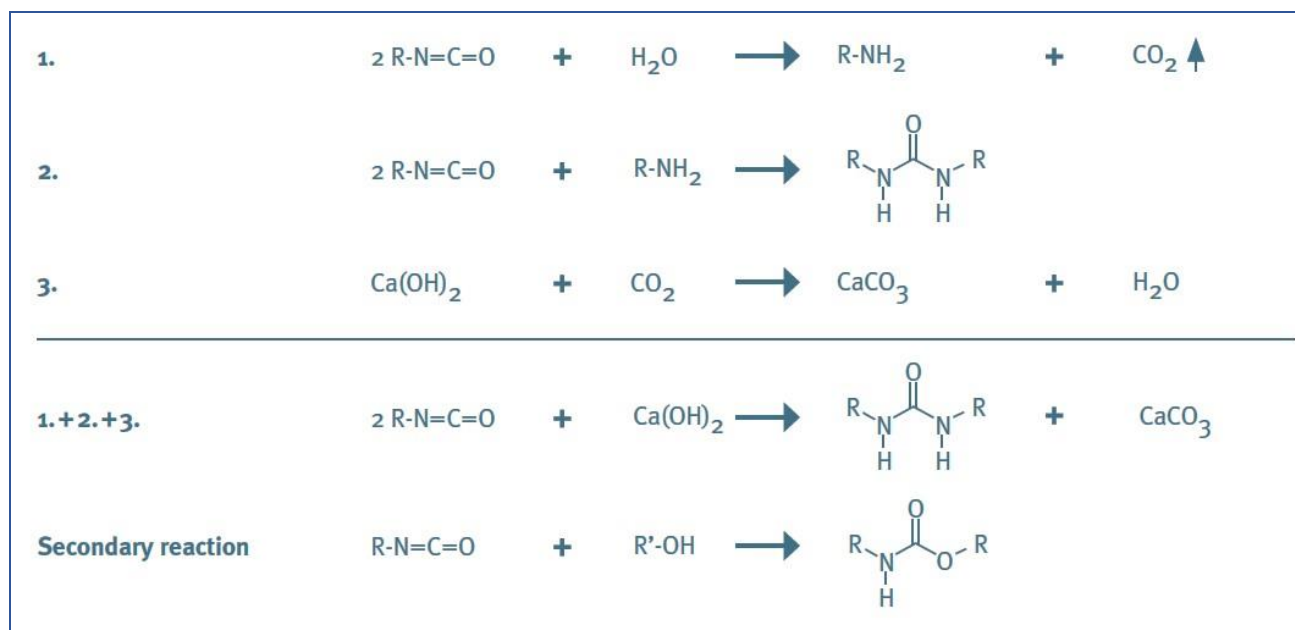
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A secondary reaction also occurs between the polyol and MDI to form polyurethane. This produces a robust polyurea/polyurethane hybrid industrial floor topping with outstanding thermal shock and chemical resistance.



The SETATHANE® polyol emulsions are available in four grades that are supplied as “ready-to-mix” for self-leveling compounds, mortars and screeds.

A key differentiating feature of SETATHANE® D E 2656, D E 2761 and E 2762, is that they do not contain phthalate plasticizers. SETATHANE® E 2017 is also butyl benzyl phthalate-free.

Phthalates, such as butyl benzyl phthalate (BBP), have been identified as chemicals of concern by the EPA. Although there is no current regulation banning the use of phthalates in urethane mortars in the US, the use of phthalates is banned in Europe, and there is an emerging need for phthalate-free options for building owners and architects interested in obtaining green building certification.

PERFORMANCE

What makes urethane mortar systems the preferred type of flooring for heavy duty industrial flooring, is their extraordinary durability and chemical resistance. Their cementitious composition also makes them resistant to temperature variations, which makes them ideally suited for the food and beverage and dairy industries where steam cleaning is mandatory.

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The performance of the SETATHANE® emulsions was evaluated at low and high aggregate loading levels. At low level loading, the polyol : polyisocyanate : aggregate ratio was 1 : 1 : 1.1 by volume as supplied. High level loading ratios was 1 : 1 : 3.4.

The results demonstrate high compressive strength, high flexural strength, high tensile strength and high abrasion resistance at both low and high aggregate loading levels. However, the best performance was achieved at the lower aggregate loading level.

Konig hardness, Shore D hardness and abrasion resistance were measured at the low aggregate loading level. The results show that the E 2000, E 2762 and D E 2656 exhibit good early hardness development, with the E 2762 showing the best abrasion resistance. The D E 2761 exhibited the longest pot life.

Aggregate loading level	E 2000		D E 2656		D E 2761		E 2762	
	Low	High	Low	High	Low	High	Low	High
Pot life, min	13	N/A	13	N/A	15	N/A	13	N/A
Konig Hardness, 16 hrs/24 hrs	20/32	N/A	13/20	N/A	7/8	N/A	17/22	N/A
Shore D Hardness, 1 day/7 days	73/80	N/A	70/77	N/A	61/78	N/A	73/81	N/A
Taber abrasion, mg	102	102	106	93	126	126	117	126
Tensile, PSI	>1000	>700	>1100	>680	>1100	>680	>950	>650
Flexural, PSI	>2400	>1650	>2150	>1600	>2050	>1600	>2200	>1500
Compressive, PSI	>7500	>6000	>6000	>5400	>6500	>5800	>6500	>5500
VOC, g/L	near zero		near zero		near zero		near zero	
Phthalate-free	No		Yes		Yes		Yes	

POT-LIFE AND WORKING TIME

One of the challenges with urethane mortar systems, is formulating a system that maximizes the benefit of fast return to service without negatively impacting the application properties. Once the polyol and isocyanate components are combined, the reaction to form polyurea and polyurethane bonds begins, and the viscosity of the system begins to rise quickly.

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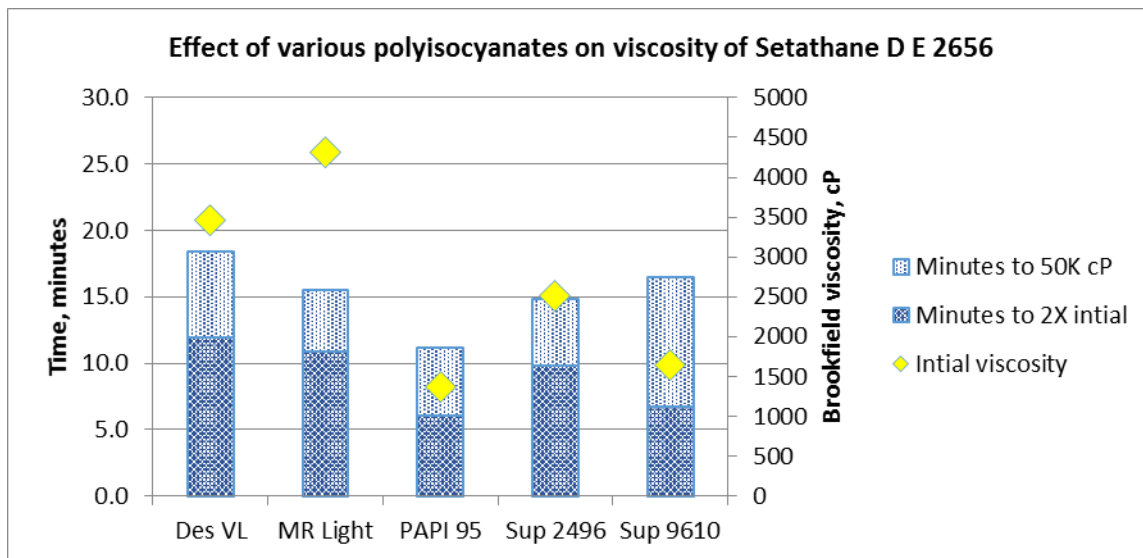
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The pot-life can be defined as the point at which the initial viscosity doubles. It's at this point, that the system will begin to lose the ability to flow and level. Beyond ~50K cP, the viscosity of the system continues to rise very rapidly to a point that it can no longer be applied.

The graphs below demonstrate how various polyisocyanates can have varying effects on the pot life and estimated working time of the D E 2656 and D E 2761. The initial viscosity is represented by the yellow diamonds on the secondary y-axis, and the time to reach the pot life (2X initial) and the working time (50K cP) are represented by the stacked bars on the primary y-axis.

The D E 2761 exhibits a longer pot life and working time, which means that it will exhibit excellent flow and leveling and be easy to apply.

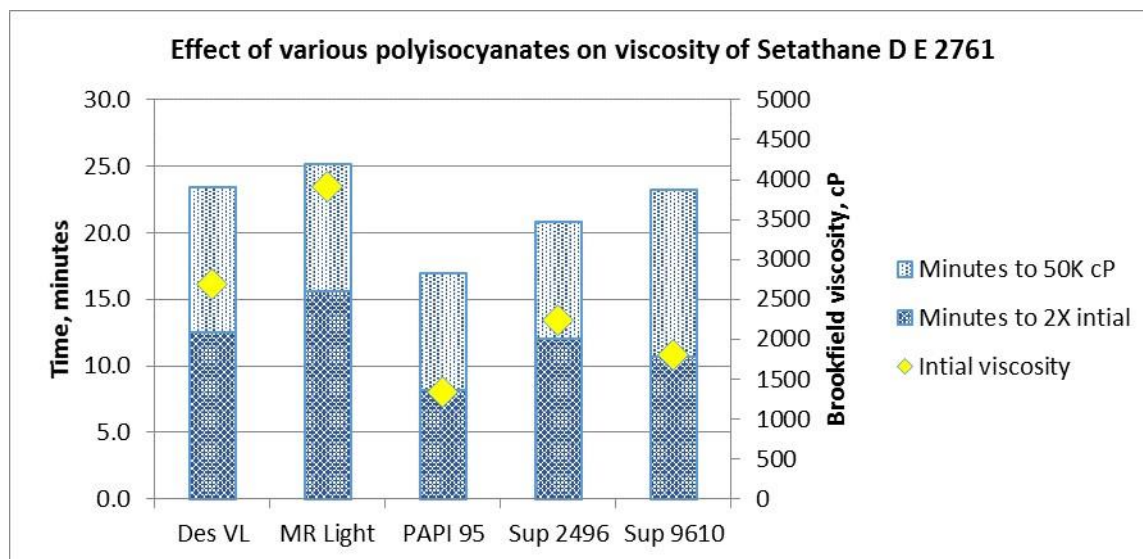


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CHEMICAL RESISTANCE

The SETATHANE® D E shows no effect from a 24 hour spot test with tap water, isopropyl alcohol, 25% sulfuric acid and 25% caustic (NaOH). In water soak tests for 10 days at 150 °F, it shows only a 1-1.5% weight increase and the Shore D hardness only decreases by 2 points from ~83 to ~81.

FORMULATION INSTRUCTION

Component 3 must be premixed to ensure optimal distribution of cement and hydrated lime. The quartz sand is placed in a forced action mixer. The white paraffin oil, pigment, quartz powder, cement and hydrated lime are slowly mixed in. The filler composition is then mixed for approximately 15 min.

PROCESSING / APPLICATION

Joints must be cut into the substrate to anchor the coating. This allows stresses, which occur due to the different coefficients of thermal expansion of concrete and coatings formulated with Setathane polyol emulsions, to be absorbed without causing damage.

The best performance for the SETATHANE® D E system uses a primer under the 3K mortar. The SETATHANE® D E 2766 makes a good primer for this. Some customers will use an epoxy primer instead. Emulsions have also shown good PATTI numbers with the failure at the concrete. All primers must be tested to determine their performance.

The SETATHANE® D E has been used without primers as a one coat slurry finish. Adhesion should be checked to ensure it gets good bonding to the concrete.

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For application, thoroughly premix components 1 and 2, place mixture in a mixer (forced action) and stir in component 3 until homogeneous. Overall mixing time should not exceed 3 minutes.

The mortar is applied with battens and floating trowels up to a thickness of approximately 9 mm and should be structured using a roller.

It may be walked on the next day, but the mortar should be cured for at least 7 days at approximately 23 °C before it is exposed to chemicals.

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APPENDIX

SETATHANE® D E 2656
3K MORTAR FOR 3/8" THICKNESS
 (can also be used for SETATHANE® D E 2761, E 2762, and E 2017)

SUGGESTED STARTING FORMULATION

3K-PU mortar application thickness 8-10 mm		NVM %	BY Wt.
SETATHANE® D E 2656	allnex	59.85	85.50
Component 2			
Desmodur™ VL	Covestro	100.40	100.40
Component 3			
White Portland Cement		88.60	88.60
Hydrated Lime		27.30	27.30
Panther Creek sand 12/20	Manley Brothers	241.20	241.20
Panther Creek sand 30/50	Manley Brothers	293.90	293.90
Panther Creek sand 8/16	Manley Brothers	160.00	160.00
Chrome Oxide Green GN	Lanxess Pigments	1.20	1.20
Renopal W 118 white paraffin oil	Fuchs Oil	<u>1.90</u>	<u>1.90</u>
	TOTAL	974.35	1000.00
Mix Ratio: NCO to OH ratio		Approx. 4/1	
Mixing ratio component 1 : 2 : 3 by weight		1 : 1.18 : 9.52	
Typical Paint Properties			
Binder/extender and pigment ratio		1: 5	
Working time at 23° C		18 minutes	
Dry-Through		Overnight	

SETATHANE® E 2762 or SETATHANE® D E 2761 can also be used in this formulation. It is important to keep the volume ratio at 1/1 by volume. The 2761 will have longer pot-life (better working time), better flow and levelling and slower cure; it takes 24 hours or slightly more to walk-on. The 2762 will have the better flow and faster cure than the 2656. The pot-life for the 2762 is equal to or better than the 2656. SETATHANE® E 2017 provides a good balance of flow, levelling, and working time while minimizing outgassing.

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