

# LORD® 304 Epoxy Adhesive

## Description

LORD® 304 adhesive is a general purpose, high viscosity, two-component epoxy adhesive system used for applications that require gap filling or non-sag characteristics on a vertical surface. This adhesive system provides excellent adhesion to prepared metals, fiberglass reinforced plastics (FRP), phenolic, wood, prepared rubber and other materials. LORD 304 adhesive can be either room temperature cured or heat cured for faster processing.

## Features and Benefits

**Durable** – provides load bearing properties equal to or greater than the materials being bonded.

**Environmentally Recommended** – contains no solvent, nonflammable and virtually odorless.

**Environmentally Resistant** – resists moisture, sunlight and weathering.

**Temperature Resistant** – performs at temperatures from -30 to +250°F (-34 to +121°C).

**Chemically Resistant** – resists dilute acids, alkalis, solvents, greases and oils.

**Excellent Engineering Properties** – provides low shrinkage, good creep properties and low water absorption.

**Non-Sag** – remains in position when applied on vertical or overhead surfaces, allowing for greater process flexibility.

## Application

**Surface Preparation** – Remove soil, grease, oil, fingerprints, dust, mold release agents, rust and other contaminants from the surfaces to be bonded by solvent degreasing or alkaline cleaning.

On metal surfaces which are free of oxidation, use an isopropyl alcohol wipe. If necessary, use an abrasive material to remove tarnish. Always follow abrasion by a second cleaning to ensure removal of loose particles.

When bonding cured rubber, allow LORD 7701 adhesion enhancer/surface modifier to flash off before applying LORD 304 adhesive. Prime glass and ceramic surfaces with LORD AP-134 adhesion enhancer/surface modifier to promote adhesion.

Handle prepared surfaces carefully to avoid contamination. Assemble as soon as possible.

## Typical Properties\*

	<b>304-1 Resin</b>	<b>304-2 Hardener</b>
Appearance	Grey Paste	Off-white Paste
Viscosity, P @ 77°F (25°C) Brookfield HBF Helipath, 1 rpm	40,000 - 400,000 T-Bar Spindle E	20,000 - 100,000 T-Bar Spindle C
Density lb/gal (kg/m <sup>3</sup> )	11.5 - 12.3 (1378 - 1474)	8.4 - 9.0 (1007 - 1078)
Flash Point (Closed Cup), °F (°C)	185 (85)	>200 (>93)

\*Data is typical and not to be used for specification purposes.

# LORD TECHNICAL DATA

**Mixing** – Thoroughly mix the proper amount of resin and hardener until uniform in color and consistency. Be careful not to whip excessive air into the adhesive system.

Heat buildup due to an exothermic reaction between the two components will shorten the working time of the adhesive. Mixing smaller quantities will minimize heat buildup. Do not use any adhesive that has begun to cure.

**Applying** – Apply the mixed adhesive to bond surfaces using automatic meter/mix/dispense equipment or any convenient tool such as a stiff brush, spatula or trowel. If using automatic meter/mix/dispense equipment, gear pumps are not recommended due to the high viscosity of this product.

For general use, a film thickness of approximately 0.02 inch (0.51 mm) is recommended. To control bondline thickness, a small amount of solid glass beads can be added into the mixed adhesive.

Join the parts in such a way as to avoid entrapped air. Apply only enough pressure to ensure good wetting of the adhesive on both surfaces. Squeezing a little adhesive out at the edges is usually a sign of proper

assembly. It is not necessary to clamp the assembly unless movement during adhesive cure is likely. Maximum adhesion will occur only with parts which mate well without the need for excessive clamping pressure during cure. Excessive clamping may squeeze too much adhesive from the bond area which can result in a poor bond.

**Curing** – LORD 304 adhesive will cure to full strength in 24-48 hours, provided that the adhesive, substrates and ambient temperature are 65°F (18°C) or higher.

Higher temperatures will provide faster cure times; however, the bondline temperature should not exceed 325°F (162°C). Elevated temperature cure produces the highest bond strengths and impact resistance. Firm recommendations of cure times and temperatures depend on material composition and heating methods.

Once the adhesive has cured, it can be filed, sanded, machined or otherwise handled in the same way as a light metal. Paint, lacquers, enamels and other coatings can be applied to cured adhesive.

## Typical Properties\* of Resin Mixed with Hardener

Mix Ratio, Resin to Hardener

General Purpose, -30 to 250°F (-34 to 121°C)  
Mixed Stress Joint Design

by Volume 1:1.3

by Weight 1:1

High Temperature, 50-250°F (10-121°C)  
Shear Stress Joint Design

by Volume 1.5:1

by Weight 2:1

Low Temperature, -40 to 100°F (-40 to 38°C)  
Peel Stress Joint Design

by Volume 1:2.6

by Weight 1:2

Solids Content, % 100

Working Time, hr @ 75°F (24°C)  
54 g mass 1-2

Time to Handling Strength, hr 8-16

Mixed Appearance Grey Paste

Cured Appearance Grey

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# LORD TECHNICAL DATA

## Typical Cured Properties

Tensile Strength at Break, psi (MPa) ASTM D882-83A, modified	4360 (30.1)
Elongation, % ASTM D882-83A, modified	10
Young's Modulus, psi (MPa) ASTM D882-83A, modified	146,000 (1007)
Glass Transition Temperature, °F (°C) ASTM E1640-99, by DMA	133 (56)

## Bond Performance

Substrates	Cold Rolled Steel to Cold Rolled Steel Lap Shear psi (MPa)	Aluminum to Aluminum Lap Shear psi (MPa)	SMC to SMC Lap Shear psi (MPa)	Natural Rubber to Cold Rolled Steel 45° Peel pli (N/mm)	SBR to SBR T-Peel pli (N/mm)
Test @ Room Temperature Failure Mode	2790 (19.2) A	2190 (15.1) A	590 (4.1) FT	50 (8.8) 65R/8C/A	113 (19.8) 34R/SB
Test @ Hot Strength, 180°F (82°C) Failure Mode	370 (2.5) A	295 (2.0) A	230 (1.6) A	—	—
Test after 7 days in H <sub>2</sub> O @ 130°F (54°C) Test after 24 hours Failure Mode	3000 (20.7) A	2900 (20.0) A	770 (5.3) FT	28 (4.9) A	113 (19.8) R
Test after 14 days Salt Spray Exposure Test Immediately Failure Mode	2620 (18.1) A	1950 (13.4) A	885 (6.1) 92FT/A	18 (3.1) A	113 (19.8) 17R/SB
Test after 14 days @ 100°F (38°C), 100% RH Test Immediately Failure Mode	2070 (14.3) A	1620 (11.2) A	610 (4.2) FT	30 (5.3) 17R/A	63 (11.0) 30R/SB/A
Test @ -30°F (-34°C) Failure Mode	1550 (10.7) A	920 (6.3) A	580 (4.0) FT	69 (12.1) 70R/10C/A	107 (18.7) 50R/C

### Substrate

Cold Rolled Steel and Aluminum  
Sheet Molded Compound (SMC)  
Styrene Butadiene Rubber (SBR)  
Natural Rubber

### Surface Treatment

MEK Wipe, Grit Blast, MEK Wipe  
30-grit Sandpaper, Dry Rag Wipe  
Primed with LORD 7701 Surface Treatment  
Primed with LORD 7701 Surface Treatment

### Bonded Parameters

Metal Lap Shears  
SMC Lap Shears  
T-Peels  
45° Peels

### Bond Area

1.0"x0.5"  
1.0"x1.0"  
1.0"x3.0"  
1.0"x1.0"

### Film Thickness

0.010"  
0.030"  
0.020"  
0.020"

### Cure

72 hr @ RT  
72 hr @ RT  
72 hr @ RT  
72 hr @ RT

### Mix Ratio

1:1 by Weight  
1:1 by Weight  
1:1 by Weight  
1:1 by Weight

### Failure Mode Definition

Adhesive Failure  
Cohesive Failure  
Fiber Tear  
Rubber Failure  
Stock Break

### Abbreviation

A  
C  
FT  
R  
SB

# LORD TECHNICAL DATA

**Cleanup** – Clean excess adhesive on the bonded assembly, as well as the equipment, prior to the adhesive cure with hot water and detergent or an organic solvent such as ketones. Once adhesive has cured, heat the adhesive to 400°F (204°C) or above to soften the cured adhesive. This allows the parts to be separated and the adhesive to be more easily removed. Some success may be achieved with commercial epoxy strippers.

## Shelf Life/Storage

Shelf life is two years from date of manufacture when stored at 40-80°F (4-27°C) in original, unopened container.

LORD 304-1 resin will crystallize if exposed to temperatures below 40°F (4°C), resulting in a lumpy or grainy appearance. If resin exhibits any indication of crystallization, heat material to 80°F (27°C) for 6 hours, mixing occasionally by hand. Be sure to scrape down sides and bottom of container. Continue to heat and mix until material is smooth and homogenous. Allow material to reach room temperature before application.

## Cautionary Information

Before using this or any LORD product, refer to the Safety Data Sheet (SDS) and label for safe use and handling instructions.

*For industrial/commercial use only.* Must be applied by trained personnel only. Not to be used in household applications. Not for consumer use.

Values stated in this technical data sheet represent typical values as not all tests are run on each lot of material produced. For formalized product specifications for specific product end uses, contact the Customer Support Center.

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