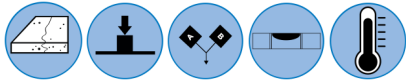


CRACKBOND® LR-321



LR-321

LR-321LPL

LR-321G

Product Description

CRACKBOND® LR-321 family products are two-component, high modulus structural epoxy formulations designed to repair cracks in concrete. Due to their ultra-low viscosities, LR-321 and LR-321LPL are perfect for gravity-feed repair of fine to medium size cracks. LR-321G, however, has a thixotropic gel-like consistency, and is ideal for medium blind-side crack repair, as it flows when under pressure and gels once injection stops. The usable temperature range is between 50 °F and 100 °F (10 °C and 38 °C).

General Uses & Applications

- Crack injection for concrete repair
- Bonding agent for fresh to hardened concrete or hardened to hardened concrete
- Non-shrink and moisture insensitive allows for installation in most applications

Advantages & Features

CRACKBOND LR-321 & LR-321LPL

- Pressure injection of fine to medium size cracks of approximately 1/8 in. to 1/4 in. (3.2 mm to 6.4 mm) width
- Self-leveling, low viscosity and surface tension allows product to deeply penetrate into cracks

CRACKBOND LR-321G

- Pressure injection of medium size cracks of approximately 1/4 in. to 3/8 in. (6.4 mm to 9.5 mm) width
- Variable viscosity formula facilitates use in cracks which cannot be fully sealed

Availability: Adhesives Technology Corp. (ATC) ULTRA-BOND products are available through select distributors providing all your construction needs. Please contact ATC for a distributor near you or visit our website to search by zip code.

Color & Ratio:

- LR-321 and LR-321LPL - Part A (Resin): Clear, Part B (Hardener): Amber, Mixed: Amber; Mix ratio: 2:1 by volume
- LR-321G - Part A (Resin): White, Part B (Hardener): Black, Mixed: Gray; Mix ratio: 2:1 by volume

Storage & Shelf Life: 24 months in unopened containers stored in dry conditions between 55 °F (13 °C) and 80 °F (27 °C).

Installation & Coverage: Manufacturer's Printed Installation Instructions (MPII) are available within this Technical Data Sheet (TDS). Due to occasional updates and revisions, always verify that you are using the most current version of the MPII. In order to achieve maximum results, proper installation is imperative.

Clean Up: Always wear appropriate protective equipment such as safety glasses and gloves. Clean uncured materials from tools and equipment with mild solvent. Cured material can only be removed mechanically.

Limitations & Warnings:

- Do not thin with solvents, as this will prevent cure
- Not intended to repair cracks subject to movement
- Product not designed to stop seeping or flowing water, however it may be applied in moist or damp environments as long as standing water is removed
- New concrete should be a minimum of 28 days old prior to application

Safety: Please refer to the Safety Data Sheet (SDS) for CRACKBOND products published on our website or call ATC for more information at 1-800-892-1880.

Specification: The epoxy repair material shall be a two component, 2:1 ratio, epoxy adhesive system. When cured 7 days and at a temperature of 60 °F (16 °C), the epoxy adhesive shall have a minimum compressive strength of 9,000 psi (62.1 MPa) per ASTM D695 and a minimum tensile strength of 5,000 psi (34.5 MPa) per ASTM D638. The epoxy adhesive shall be CRACKBOND LR-321, CRACKBOND LR-321LPL or CRACKBOND LR-321G from Adhesives Technology Corp., Pompano Beach, Florida.

STANDARDS & APPROVALS

LR-321 & LR-321LPL
ASTM C881-14 TYPE I, II*, IV & V *
Grade 1 Class C

AASHTO M235

(See ATC website for current list of Department of Transportation approvals throughout the United States)

*With exceptions

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ORDERING INFORMATION

TABLE 1: CRACKBOND LR-321, LR-321LPL & LR-321G Adhesive, Dispensing Tools and Mixing Nozzles

Package Size	6.1 oz. (180 ml) Cartridge	15.9 oz. (470 ml) Cartridge	102 oz. (3.0 L) Bulk Unit Gallon	102 oz. (3.0 L) Bulk Unit Gallon	15.9 oz. (470 ml) Cartridge
Product	LR-321			LR-321LPL	
Part #	A6-LR321N	A16-LR321	BUG-LR321	BUG-LR321LPL	A16-LR321G
Manual Dispensing Tool	TM9HD	TM16HD	N/A	N/A	TM16HD
Pneumatic Dispensing Tool	N/A	TA16HD-A	N/A	N/A	TA16HD-A
Case Qty.	12	10	1	1	10
Pallet Qty.	1,116	720	75	75	720
Pallet Weight (lbs.)	888	1,077	747	747	1,163
Recommended Mixing Nozzle	T58CBSEZ	T58CBSKEZ	N/A	N/A	T58CBSKEZ



TM9HD



TM16HD



TA16HD-A



T58CBSKEZ



A16-LR321



BUG-LR321LPL



A16-LR321G



MATERIAL SPECIFICATION

TABLE 2: CRACKBOND LR-321, LR-321LPL & LR-321G performance to ASTM C881-14^{1,2,3}

Property	Cure Time	ASTM Standard	Units	Sample Conditioning Temperature		
				60 °F (16 °C)		
				Class C		
				LR-321	LR-321LPL	LR-321G
Gel Time - 60 Gram Mass ⁴	----	C881	min	27	55	20
Viscosity	----		cP	500	200	4,500
Pot Life ^{5,6}	----		min	19	45	N/A
Compressive Yield Strength	7 day	D695	psi (MPa)	10,150 (70.0)	10,800 (74.5)	9,000 (62.1)
Compressive Modulus			psi (MPa)	300,000 (2,068)	-----	-----
Tensile Strength		D638	psi (MPa)	7,230 (49.8)	8,000 (55.2)	5,000 (34.5)
Tensile Elongation			%	4.4	2.7	1.0
Bond Strength Hardened to Hardened Concrete	2 day	C882	psi (MPa)	1,580 (10.9)	1,800 (12.4)	1,250 (8.6)
	14 day		psi (MPa)	2,950 (20.3)	3,300 (22.8)	-----
Bond Strength Fresh to Hardened Concrete	14 day		psi (MPa)	1,720 (11.9)	-----	-----
Heat Deflection Temperature	7 day	D648	°F (°C)	120 (48.9)	121 (49.4)	125 (51.7)
Water Absorption	14 day	D570	%	0.3	0.49	0.26
Linear Coefficient of Shrinkage	48 hr	D2566	%	0.0003	0.003	0.002

TABLE 3: CRACKBOND LR-321 & LR-321G WORKING TIME^{1,2,3}

Base Material Temperature	Working Time
°F (°C)	
50 (10)	45 min
75 (24)	30 min
100 (38)	22 min

- Working times are approximate, may be linearly interpolated between listed temperatures and are based on cartridge / nozzle system performance.
- Application Temperature: Substrate and ambient air temperature should be from 50 °F to 100 °F (10 °C to 38 °C).
- LR-321LPL is sold in bulk packaging only, therefore cartridge / nozzle system performance was not evaluated.

- Results based on testing conducted on a representative lot(s) of product. Average results will vary according to the tolerances of the given property.
- Full cure time is listed to obtain the give properties for each product characteristic.
- Results may vary due to environmental factors such as temperature, moisture and type of substrate.
- Gel time may be lower than the minimum required for ASTM C881.
- Property not referenced in ASTM C881.
- Pot life is measured as the workable and applicable time of 1.0 gallon (3.8 L) when mixed.

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INSTALLATION INSTRUCTIONS (MPII)

Surface Preparation

Surface preparation will be dependent upon the application of the product. Old concrete must be clean and profiled or textured. New concrete should be a minimum of 28 days old. All dirt, oil, debris, wax, grease or dust must be removed. Prepare the surface mechanically using a scarifier, sandblast, shotblast or other equipment that will give the surface profile needed for the application. A roughened surface is imperative for good adhesion. Always be sure the bonding surfaces are prepared in advance before starting a new cartridge or mixing product. If at all possible, schedule dispensing to consume an entire cartridge at one time with no interruption of epoxy flow. For bulk, mix only enough product that can be used within the pot life, see Table 2.

Cartridge Preparation



Shake the cartridge vigorously for 60 seconds, then stand cartridge upright for at least 1 minute allowing any bubbles to rise to the top. **NOTE:** This step is not necessary for CRACKBOND LR-321G.



Insert cartridge into the dispenser. Make sure it is properly positioned with the shoulder of the cartridge flush with the front/top bracket of the dispenser. Point upward at about a 45° angle. Remove the plastic cap and plug from the top of the cartridge.

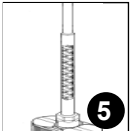


Continue to point the upward away from yourself and others while slowly applying pressure to dispenser moving any bubbles and product up through the nozzle until it reaches the tip. Dispense this first full stroke of material into disposable container. The cartridge is now purged and ready for flow control installation.



NOTE: The flow control supplied with the recommended nozzle should not be used for CRACKBOND LR-321G.

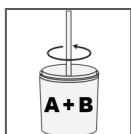
CRACKBOND LR-321 and CRACKBOND LR-321LPL: Find the flow control inside the threaded end of the mixing nozzle attached to a tape strip. Insert flow control into the two holes at the top of the cartridge where the product comes out. Make sure it is securely seated in place. Install mixing nozzle onto cartridge. Holding the dispenser straight up, slowly apply pressure to the dispenser moving any bubbles and product up through the nozzle until it reaches the tip. Tilting only slightly, dispense this first full stroke of material into a disposable container.



CRACKBOND LR-321G: Attach the mixing nozzle and dispense the first full stroke of material into a disposable container. The cartridge is now ready for use.

NOTE: Schedule dispensing to consume an entire cartridge at one time with no interruption of flow to prevent material from hardening in mixing nozzle. If you have any problems in dispensing product, replace the nozzle; the product may have begun to cure in the nozzle which will affect the mix ratio. Never transfer a used nozzle to a new cartridge. Repeat the cartridge balancing steps listed above after replacing the nozzle.

Mix Instructions for Bulk Packaging



Thoroughly stir each component separately before mixing them together. Mix only the amount of material that can be used before the working time expires. Proportion parts by volume into a clean pail at the exact and proper mix ratio for that product. (For CRACKBOND LR-321 family use 2 parts by volume of component "A" and 1 part by volume of component "B").

Mix thoroughly with a low speed drill (400 – 600 rpm) with a mix paddle attachment (i.e. a jiffy mixer). Carefully scrape the sides and the bottom of the container while mixing. Keep the paddle below the surface of the material to avoid entrapping air. Proper mixing will take at least 3 minutes.

Bonding Agent Applications

Bonding fresh concrete to hardened concrete or when used as a bonding agent for repairing concrete spalls: Using a brush, roller or airless sprayer, apply an even coat of the bulk mixed CRACKBOND LR-321 to the clean and prepared concrete surface. While the epoxy is still tacky, place fresh concrete over the top of the mixed epoxy.

Spall Repair Applications

To avoid a feathered edge, cut around the spall into sound concrete with a grinder or circular saw using a diamond or concrete abrasive blade. The edge cut should be equal to the maximum depth of the spall or to at least, a minimum depth of 3/4 in. (19 mm). Chip out all loose concrete within the entire spall to a minimum depth of 3/4 in. (19 mm). Follow surface preparation instructions above to clean the spall. Estimate the amount of bulk product needed and mix Part A and Part B, 2 to 1 by volume. Mix part A and B thoroughly. Slowly add 3-4 parts by volume of kiln-dried sand or aggregate of choice and mix well, pour and trowel until smooth/level. **Note:** The low viscosity of LR-321 and LR-321LPL will aid in wetting out aggregate to create a repair mortar. Maximum mortar thickness is 1.5 in. (38 mm) per lift.

INSTALLATION INSTRUCTIONS (MPII)

Gravity Feed Crack Repair for Horizontal Applications

CRACKBOND LR-321 and CRACKBOND LR-321LPL are formulated for fine to medium cracks. 0.0025 in. to 0.125 in. (0.06 mm to 3.2 mm). For best results, cut a groove to open up the crack using an abrasive or diamond blade to a width of 1/8 in. (3.2 mm) and minimum depth of 3/8 in. (9.5 mm). Use wire brush to abrade and then blow out the crack to remove all dust, dirt, grease, wax, oil or any other contaminants. Pour or inject CRACKBOND into the crack and its self-leveling ability will fill the entire area. Repeat application if necessary to completely fill crack. Follow the cartridge preparation set-up. For medium cracks, use CRACKBOND LR-321G.

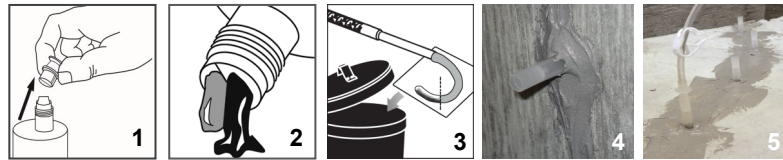
Low Pressure Crack Injection for Vertical, Horizontal and Overhead Structural Repair

Before repairs are attempted, **examine the crack** to determine the type of repair that is required. Cracks in concrete and wood members are classified as either dynamic (moving) or static (dormant). Static cracks may occur from a one-time overload event such as an earthquake or flood. For static cracks in a structure that is to be rehabilitated, structural crack injection is recommended. By contrast, dynamic cracks are those which are caused by inadequate design, seasonal heaving, temperature swings or repeated over-loading. Dynamic cracks CANNOT effectively be repaired using crack injection. Dynamic cracks can be sealed using a flexible repair material such as CRACKBOND JF-311 (horizontal cracks).

Crack Injection Preparation

Clean the surface surrounding the crack with a wire brush to achieve proper bond. Remove all dust, debris, oil and any other contaminants from the crack by blowing out with clean, oil-free compressed air. For best results crack must be dry at the time of injection. If water is seeping from crack, steps must be taken to stop the flow of water in order to achieve desired repair.

Capping Paste Cartridge Preparation



- 1 MIRACLE BOND® 1310 is the perfect product to be used as a capping paste for crack injection. Its non-sag/fast-set properties are ideal for rapid installations (horizontal, vertical and overhead). Unscrew plastic cap from threaded end of cartridge and remove plug. Place cartridge into dispenser.
- 2 Balance the cartridge by dispensing a small amount of material into a disposable container until both materials flow evenly from the cartridge. Part A is white, Part B is dark gray.
- 3 Attach the mixing nozzle to the cartridge of MIRACLE BOND 1310 and dispense a small amount of material until uniform gray color without streaks is achieved.
- 4 Place and secure injection ports, or port bases, with the capping paste material. Port spacing should be approximately 6 -12 in. (152 - 305 mm) apart (typically the width of the concrete member). Do not allow the epoxy to block the passage between the port and the crack face.
- 5 Place additional MIRACLE BOND 1310 between the ports making sure the entire face of the crack is sealed off and ports are securely fastened to the concrete. If the crack is evident and accessible on the back side of the concrete member, seal with capping paste. Note: MIRACLE BOND 1450 may also be used as an alternative capping paste.

Port Information



Syringe Surface Mount Reservoir Port (50 ml) – Reservoir port that provides continuous injection of up to 50 ml of material using rubber bands to apply constant plunger pressure. Syringe reservoir is filled and re-filled manually then attached to the mounted base.



Spring Auto Injected Reservoir Port (25 ml) – Reservoir port provides continuous injection of up to 25 ml of material using spring tension within the injector. This port can be refilled directly with our standard Low Viscosity Mixing Nozzle part T38XL without removing from base mount.



CR Port SS – Standard crack injection port. Included in Crack-Kit. The CR Port SS contains a stainless steel ball bearing to help prevent leaking during vertical and overhead injections.

INSTALLATION INSTRUCTIONS (MPII)

Pump and Pneumatic Dispensing

DO NOT EXCEED 40 psi (0.28 MPa) PRESSURE TO THE PNEUMATIC DISPENSING TOOL OR INJECTION PUMP. An air pressure regulator MUST be used with a pneumatic dispenser. Start at a low setting and gradually increase pressure as needed until desired epoxy flow is achieved. Use maximum 40 psi (0.28 MPa) air pressure. Excessive pressure may result in cartridge plunger leakage.

Begin the injection process from the lowest port on a vertical surface moving up the wall. On horizontal surfaces, begin at the widest part of the crack (as marked prior to capping) and move outward. Inject epoxy into port until you either get flow from adjacent port or until epoxy stops flowing.

Allow injection resin to cure for at least 24 hours. Ports and capping material can be removed with a chisel and/or grinder. Note: Some cracks may take more time to inject, especially hair-line cracks. Cracks may be smaller in width (or larger) than they appear from the surface.

Dispensing and Injection Tips

For basement walls where back side of concrete is not accessible, inject with slightly higher viscosity CRACKBOND LR-321G. This is a unique thixotropic gel that will feed into small cracks and bridge the back side without runoff.

DO NOT dispense epoxy through gelled mixing nozzle. If epoxy gels in nozzle, replace nozzle before continuing.

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