



SRO1280 - Crack Repair and Injection Static Crack Repair

Scope

The document covers the repair of 'static' (stable) cracks in both horizontal and vertical concrete, brick and masonry surfaces.

Advice from a structural engineer is recommended to determine whether the cracks are 'static' or 'dynamic'. Ardex have no systems for the repair of dynamic cracks as these may be a sign of instability in the structure.

Assumptions

- Concrete has been aged for at least 28 days
- Mortar or screeds must be cured for at least 7 days
- The substrate to be repaired must be dry with no water present on the surface or in the cracks

Systems Covered

- Slab and Footpath Repair (Crack Injection) [ARDEX RA 56](#)
- Crack Injection – (Small Spalls and Large Cracks) [ARDEX RA 88 Plus](#)
- [ARDEX T-Port](#) System in conjunction with injection epoxies [ARDEX RA 56](#), [ARDEX RA 142](#), [ARDEX RA 144](#) and [ARDEX RA 146](#)
- [Ardex Concrete Crack Lock](#) Carbon Fibre Crack Bridging Stitch

Product Range (Summary)

[ARDEX RA 56](#) (Crack width ranges from hairline to 12mm when directly injected or 12mm – 75mm when used for small spall repairs): Low Viscosity Rigid Hybrid Polyurethane Crack and Spall Repair. It can also be used for spall repairs when mixed with aggregate (clean dry medium-grade sand). This product is trafficable in 20 Minutes.

This product is 2-component hybrid polyurethane adhesive with rapid curing which means minimal down-time in time critical applications.

(254 ml Single Cartridge – Dispensed with a 300 mL 'Heavy Duty' Cartridge Gun)

[ARDEX RA 88 Plus](#) (Crack/Spall width range 5mm – 76mm, depth range 13mm – 16mm): High Viscosity Multi-Purpose Epoxy Repair Adhesive. (Two component ceramic blend epoxy). It is designed for small spall repairs.

This product is suitable for horizontal, vertical and overhead use. It has a fast cure time (2 hours approx.) and it can be used on almost any substrate. E.g. Metal, concrete, brick, wood, stone, block and other substrates. It can also be used for repairing holes, spalls and cracks in concrete, repairing rotted wood, installing anchor bolts and repairing hand rails. It can also be used to repair pool tiles underwater.

(254 mL Single Cartridge– Dispensed with a 300 mL 'Heavy Duty' Cartridge Gun)

[ARDEX RA 142](#) (0.05mm – 3.0mm): Super Low Viscosity Structural Concrete Crack Injection Epoxy. Suitable for hairline cracks due to its low viscosity. It is generally used



for repairs in horizontal concrete and masonry. It is ideal for shear fracture repairs on interior and exterior concrete slabs.

Can be used to repair 'spalls' but care must be taken to remove a 'feather edge' first.

(470mL Dual Cartridge Pack – Dispensed with a 470 mL 'Heavy Duty' Dual Cartridge Gun)

ARDEX RA 144 (3.0mm – 6.0mm): Low Viscosity Structural Concrete Crack Injection Epoxy. Pressure Injection and gravity feed structural crack repair in horizontal cracks and masonry. Ideal for shear fracture repairs on interior and exterior concrete slabs.

(470 mL Dual Cartridge Pack – Dispensed with a 470 mL 'Heavy Duty' Dual Cartridge Gun)

ARDEX RA 146 (6.0mm – 10.0mm): Blind Side Crack Injection Epoxy Gel. Used for the structural repair of medium to large cracks. It is ideal for pressure injected blind-side crack repairs such as basement or foundation walls or parking garages.

It can be used to repair vertical cracks when using injection ports in conjunction with a capping paste (Ardex RA88). It has exceptional bonding and sealing capabilities for interior and exterior slabs.

(470mL Dual Cartridge Pack – Dispensed with a 470mL 'Heavy Duty' Dual Cartridge Gun)

ARDEX T-Port Injection System: These ports have convenient flexible rubber bladders which act as resin reservoirs to allow continuous filling of cracks without constant 'gunning' of the epoxy.

Ardex Check Window: Is a translucent viewing window for determining the progress of the injection product through the crack.

Ardex Concrete Crack Lock (Carbon Fibre Crack Bridging Stitch): This is a revolutionary new product designed to be part of a superior Crack Repair System. The Concrete Crack Lock (CCL) has been engineered to stop cracks from growing in concrete slabs, poured walls, masonry, concrete block foundations, columns, industrial buildings, bridges and foundations. The CCL system is designed for cracks of various sizes under virtually any circumstance. It can also be used to increase seismic strength to repairs after an earthquake.

Once installed the CCL permanently bonds both sides of the crack together. Due to the unique shape of the CCL and the preparation of the concrete, the tensile strength of the carbon fibre is relied upon as well as the epoxy bond strength along its length.



Slab and Footpath Repair (Crack Injection) **Ardex RA 56, ARDEX RA 142, Ardex RA 144 and Ardex RA 146**

Surface Preparation

The concrete must be clean and completely dry. New concrete must be a minimum of 28 days old. The surfaces to be treated must be sound and clean with no paint, dirt, grease, wax, oil, or any other contaminant present. Smooth surfaces should be mechanically roughened before application.

Crack repair (for hairline cracks) requires saw cutting along the crack in order to allow the insertion of the nozzle. This would generally result in the creation of a triangular 'equilateral chase' of side length 15mm along the length of the crack.

It is not necessary to further open or widen a crack (beyond the triangular 'chase') unless it is suspected to be very deep hence requiring the insertion of backer rods to control loss of product deep into the crack.

Cartridge Set-Up (Ardex RA 56)

The cartridge should be kept in an upright position to prevent material from leaking from cartridge.

1. Shake the cartridge vigorously for 10 seconds then stand the cartridge upright for 1 minute.
2. Insert the cartridge into caulking gun. The cartridge should be held in a slightly upright position while slowly dispensing a small amount of material (15mL) into a disposable container. This material should be discarded. The remaining material in the cartridge is regarded as properly mixed and suitable for crack injection. The instructions regarding the installation of the flow control should be followed. The mixing nozzle is secured onto the cartridge by threading in a clockwise direction.

Product Application (Ardex RA 56)

1. Use the product by dispensing with slow, steady strokes. While holding the dispenser at about a 45° angle, slowly dispense the material up through the nozzle and dispose of 1-2 trigger pulls (20mL approx.).
2. Gun the material into the widened 'V – chased' channel taking care not to cause overflow onto the surrounding substrate.
3. Allow the material to seep into the crack and find its level.
4. Excess product can be scraped from the surface with a flat edge scraper.
5. If the slab is to be painted or coated, it recommended that fine particle size clean dry sand is sprinkled into the surface of the wet [ARDEX RA 56](#). Excess sand can be broomed or vacuumed off once the [ARDEX RA 56](#) has cured. This will provide a 'mechanical key' for the paint or coating to adhere to.

For larger repair areas a dry bagged aggregate may be added. This is done by mixing up to 3 parts aggregate to 1 part of the mixed [ARDEX RA 56](#).

Note: The cartridge is fully dispensed when the plunger reaches 75% of its length.



Cartridge Set-up (Ardex RA 142, Ardex RA 144 and Ardex RA 146)

Whilst preparing the cartridge, keep in an upright position to prevent material from leaking from the cartridge.

1. Shake the cartridge for 1 minute then stand the cartridge upright for 1 minute to allow any bubbles to rise to the top.
2. Place cartridge into the dispenser, and hold the dispenser pointing upward at about 45° angle. This will prevent the product from running out due to its low viscosity. Remove the plastic cap and plug. The instructions regarding the installation of the flow control should be followed.
3. Dispense enough material into a disposable container until both resin and hardener flow evenly (15mL approx.).

Product Application (Ardex RA 142, Ardex RA 144 and Ardex RA 146)

1. Use the product by dispensing with slow steady strokes. While holding the dispenser at about a 45° angle, slowly dispense the material up through the nozzle and dispose of 1-2 trigger pulls (20mL approx.).
2. Gun the material into the widened 'V – chased' channel taking care not to cause overflow onto the surrounding substrate.
3. Allow the material to seep into the crack and find its level.
4. Excess product can be scraped from the surface with a flat edge scraper.
5. If the slab is to be painted or coated, it recommended that fine particle size clean dry sand is sprinkled into the surface of the wet [ARDEX RA 142](#), [ARDEX RA 144](#) and [ARDEX RA 146](#). Excess sand can be broomed or vacuumed off once the product has cured. This will provide a 'mechanical key' for the paint or coating to adhere to.

Note: The cartridge pack is fully dispensed when the plunger reaches the end of the composite tube.

Crack Injection – Small Spalls and Large Cracks Ardex RA 88 Plus

Surface Preparation

Old concrete must be clean and profiled or textured. New concrete must be a minimum of 28 days old. Before using [ARDEX RA 88 Plus](#), make sure that the surfaces to be bonded are sound and clean with no dust, dirt, grease, wax, oil, or any other contaminant present. Smooth surfaces should be mechanically roughened with a wire brush or sand paper before application.

Crack repair may require saw cutting along the narrower sections of the crack in order to allow the insertion of the nozzle and avoid a 'feather edge'. This would generally result in the creation of a square-faced 'rectangular chase' of depth 13mm – 16mm and width 5mm - 20mm along the length of the crack.

Cartridge Set-Up

1. Unscrew the plastic cap and remove the plug.
2. Place the cartridge into a heavy-duty 300mL caulking gun.
3. Dispense the first 10mL of product into a disposable container. At this point both materials should flow evenly from the cartridge.



4. Attach the mixing nozzle to the cartridge and dispense a small amount of material (20mL approx.) until a consistent colour with no streaks is obtained.

Note: Deeper or larger masses than those recommended will generate excessive heat which can result in swelling of the repair, smoking, and possibly cracking from the high heat generated by the chemical reaction.

Crack and Hole Repairs

[ARDEX RA 88 Plus](#) can be used for repairing cracks and holes in concrete, masonry and mortar. The typical size range for these repairs is:

Width: 5mm – 20mm

Depth: 13mm – 16mm

Length: 5mm - maximum size to match expansion joint panel size

Spall Patching Applications (Small Spall Repairs Only)

If [ARDEX RA 88 Plus](#) is to be used, the spall should be ground down to at least 13mm, but no greater than 16mm deep and a maximum of 76mm wide. A feathered edge should be avoided by cutting around the spall into sound concrete with a grinder or circular saw using a diamond or concrete abrasive blade so the entire depth of the spall is consistent square edge depth (13mm – 16mm). Surface preparation instructions should be followed in order to create a clean spall area.

For patching either concrete or wood surfaces, the void should be filled with the [ARDEX RA 88 Plus](#) epoxy to just above the surface level. It should then be smoothed with a straight edge scraper to achieve a flush finish.

If the repaired spall is to be painted or coated, it recommended (but not essential) that a fine particle size clean dry sand be sprinkled into the surface of the wet [ARDEX RA 88 Plus](#). Excess sand can be brushed or vacuumed off once the [ARDEX RA 88 Plus](#) has cured. This will provide a 'mechanical key' for the paint or coating to stick to.

Note: The cartridge is fully dispensed when the plunger reaches halfway.

Curing

[ARDEX RA 88 Plus](#) can receive paint or other architectural coatings after curing for a minimum of 2 to 3 hours. It can be opened to full traffic after 2 to 3 hours or after the coating has cured, whichever is longer.



ARDEX T-Port System in conjunction with injection epoxies ARDEX RA 142, ARDEX RA 144 and ARDEX RA 146

General

The T-Port system is generally used for vertical or overhead application where the liquid crack repair mortar could 'run out' of the crack. It can also be used on horizontal cracks where deep penetration is required.

It is recommended that the bonding surfaces are prepared in advance before starting a new cartridge or mixing product. If possible, schedule dispensing to consume an entire cartridge at one time with no interruption of the flow.

Injection Products

The resins most suitable for [ARDEX T-Port](#) injection are [ARDEX RA 142](#) and [ARDEX RA 144](#) low viscosity liquid epoxy injection resins. The faster curing [ARDEX RA 142](#) generates a higher exothermic temperature and requires more care.

Surface Preparation

Old concrete must be clean and completely dry with no presence of moisture. It must also be profiled or textured.

It is recommended that the surfaces to be bonded are sound and clean. This means there must be no dust, dirt, grease, wax, oil, or any other contaminant present. Smooth surfaces should be mechanically roughened with a wire brush or sand paper before application.

Crack Injection System for Vertical Cracks – Required System

Before repairs are attempted, the crack should be analysed to determine the type of repair that is required.

Cracks in concrete and wood members are classified as either active (moving) or dormant. Dormant cracks may occur with one-time overload events such as earthquakes or floods. For dormant cracks in a structure that is to be rehabilitated, structural crack injection is recommended. By contrast, active cracks are caused by inadequate design, seasonal heaving and temperature swings or repeated overloading.

Note: Ardex have no systems for treating active (dynamic) cracks.



Preparation

Clean the surface immediately surrounding the crack with a wire brush to achieve a 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 in order to achieve desired repair.

[ARDEX RA 84](#) or [ARDEX RA 88 Plus](#) is ideal to be used as a capping paste for the crack injection procedure. Place and secure injection ports with [ARDEX RA 84](#) or [ARDEX RA 88 Plus](#), taking care not to leave any pin-holes. Holes are drilled (8mm – 10mm diameter) in the locations along the crack where the T-Ports will be installed. Port spacing should be approximately 15 – 30cm apart (typically the thickness of the concrete member). Do not allow the epoxy to block the passage between the port and the crack face. Place additional [ARDEX RA 84](#) or [ARDEX RA 88 Plus](#) between the ports making sure the entire face of the crack is sealed off and ports are securely rigidly to the concrete. If the crack is evident and accessible on the back side of the concrete member, seal with capping paste. See [ARDEX RA 84](#) or [ARDEX RA 88 Plus](#) for cartridge set-up.

Cartridge Set-up (Ardex RA 142, Ardex RA 144 and Ardex RA 146)

Whilst preparing the cartridge, keep in an upright position to prevent material from leaking from cartridge.

1. Shake the cartridge for 1 minute then stand the cartridge upright for 1 minute to allow any bubbles to rise to the top.
2. Place the cartridge into the dispensing gun then hold it pointing upward at a 45° angle. This will prevent the product from running out due to its low viscosity. Remove the plastic cap and plug.
3. Dispense enough material into a disposable container until both resin and hardener flow evenly (15ml approx.).

Crack Repair (Injection of Repair Material)

1. Insert the flow control port and then the nozzle to the top of the cartridge. Attach the tube assembly to the barbed end of the nozzle.
2. While holding the dispenser at a 45° angle, slowly dispense the material up through the nozzle and dispose of 1-2 trigger pulls (20mL approx.).
3. Attach the other end of the tubing to the bottom injection port. Dispense the epoxy with slow steady strokes into the port until there is flow from an adjacent port or until the epoxy stops flowing. Plug the port injected into then attach the tubing to an adjacent port. Continue with this procedure until the operation is complete.

Note: The cartridge pack is fully dispensed when the plungers reach the end of the composite tube.



Dispensing and Injection Tips

Pneumatic Dispenser

This must be used with an air pressure regulator. Start at a low setting and gradually increase the pressure as needed until the desired epoxy flow is achieved. Use a maximum 275kPa (40psi) of air pressure. The use of excessive pressure may result in cartridge plunger leakage and can overfill the ports.

For basement walls (where the back side of the concrete is not accessible) the slightly higher viscosity [ARDEX RA 146](#) is injected. This is a unique thixotropic gel that will feed into small cracks and bridge the back side without runoff.

Do not dispense the epoxy through a gelled mixer nozzle. If the epoxy gels in the nozzle, replace the nozzle before continuing.

Important Notes

A point to be considered is that when the rapid curing epoxy resins are used, they generate significant heat at the gelling point, which can and has caused over-filled rubber bladders to fail and spray hot liquid resin. Measurements indicate that the RA 142 resin reaches temperatures exceeding 130°C in a filled bladder which can cause significant burns to skin if a splash occurs.

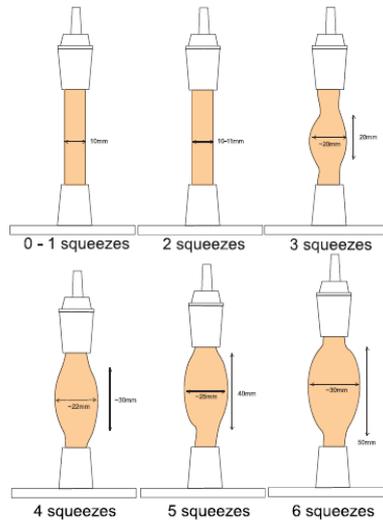
When injecting the resin into the T-Ports, it is recommended that only a maximum of four (4) full squeezes of the gun trigger are performed at a time to fill the reservoir bladder.

This amount of resin will result in a marble sized distension (swelling) of the rubber bladder to around 20mm in diameter. The bladder must not be filled to form a 'sausage shape'.

Some schematics are shown below depicting the sorts of sizes and shapes obtained from injecting progressively higher amounts of resin as measured by trigger squeezes.

If the bladder rapidly deflates then clearly the resin is dispersing, but if it retains a marble shape then the resin is not clearing and extra resin should not be injected.

All of these recommendations are made assuming that the T-Ports that have been correctly stored out the sun and away from high temperatures. It also assumes that they are within their shelf lives. It should be noted that UV light, high temperatures and exposure to solvents and other aggressive chemicals age the rubber more rapidly.



Schematic diagram showing the approximate dimensions for full squeezes of gun trigger.

Ardex Concrete Crack Lock Carbon Fibre Crack Bridging Stitch

Surface Preparation

The surface of the concrete must be clean and free of loose debris. Lay out the individual crack locks by marking the crack every 200mm to 300mm. The crack locks are then 'traced' at each location after being oriented at roughly 90° to the crack. The angle is varied slightly at each location in order to reinforce the crack from moving in all directions.

Once the layout is complete, cut across the crack ensuring that the cut is at the full depth for the entire length. The blade should be set at around 12mm deep to cover over the CCLs. Once the cuts are made, mark the ends along the cut and drill 13mm holes at each end. It is possible to insert the CCL into the prepared substrate prior to installation of the epoxy paste. This can be done to check if the insertion space is dimensionally correct.

Note: If this is done it is wise to wrap some tape (e.g., pallet strapping) around the CCL to allow its easy removal.

Tools Required

Any tool that will accept a diamond saw blade suitable for cutting concrete will work to make the cuts across the crack. A tuck point grinder or slotting tool with dust shroud is the best option regarding dust minimisation while allowing the depth of the cut to be set. Use any hammer drill with a 13mm diameter masonry drill bit to drill the holes. Larger bits can be used but will require additional epoxy to fill the larger holes.



Application

Clean all loose debris from the preparation and fill with an approved ARDEX Epoxy Paste such as [ARDEX RA 88 Plus](#) (vertical applications) or [ARDEX RA 142](#), [ARDEX RA 144](#) or [ARDEX RA 146](#) (horizontal applications). Once the preparation is filled with epoxy, insert the Crack Lock and scrape any excess epoxy off the surface. This material can be worked into the crack between the CCLs. The crack needs to be filled by this method or by injection to stop any movement between the opposite sides of the crack.

Disclaimer:

The recommendation selected is based upon questions answered on the ARDEX Australia website. This recommendation is designed as a general application for your described situation and should not be considered site specific documentation for general distribution. Always consult the latest relevant ARDEX Technical Bulletins and information on the product packaging and/or product data sheets (available on the ARDEX Website). Australian and other relevant standards should be followed during installation. If you have any further questions or would like further clarification please contact the ARDEX Technical Services Hotline on 1800 224 070 (9am to 5pm Monday to Friday).