GALAXIE

Injection Resin Techniques

1. Introduction

Left alone, a leaking crack rarely heals itself. Water finds the path of least resistance, and once it gets behind concrete it corrodes steel, washes out fines, and starts a cycle of freeze-thaw damage that turns a hairline into a structural problem. Polyurethane and acrylic injection resins have been the go-to fix for this in Australia for decades — they go in liquid, they find the water, and they seal the crack from the inside without touching a jackhammer.
This guide is written for contractors and applicators who want straight answers on which resin to use and how to use it. It covers leaking cracks, expansion joints, construction joints and pipe penetrations using Galaxie injection resin systems.

2. Factors Influencing Material Selection

Picking the wrong resin is the most common reason injection jobs fail. Before you mix anything, you need to know:

- **Cause of the Crack —** Has the movement stopped? A crack that's still moving needs a flexible resin. Inject rigid epoxy into an active crack and it'll re-open beside the repair within months.
- **Crack Breathing —** Concrete cracks open and close with temperature and moisture every single day. A resin that can't stretch with that movement will crack and let water back in. Check elongation specs before you specify.
- **Wet or Dry —** Hydrophilic resins actually need moisture to work properly and will swell into a wet crack. Hydrophobic foams react with water to expand but can get washed away in very fine cracks with high flow. Know your leak before you choose your resin.
- **Strength vs Flexibility —** Structural cracks that need load transfer back across the crack face need a rigid epoxy. Leaks that just need to stop, or joints that need to keep moving, need a flexible gel. Using a rigid material where you need flex is asking for a callback.
- **Crack Width and Layout —** Sub-0.2 mm cracks need a near-water viscosity resin to penetrate at all. Branching or intersecting cracks in unknown construction are tricky — do a flush test with water first to understand where it goes before you commit resin.

3. Types of Structural Cracks

3.1 Structural Movement Cracks

Every concrete structure moves. That movement concentrates at the weak points — joints, changes in section, embedded steel and existing cracks. Temperature swings, material differences between concrete and steel, long spans with no control joints, and gradual creep over decades all add up. Understanding what's driving the movement tells you whether the crack is live or dormant and whether you need flex or rigidity in your repair.

3.2 Settlement Cracks

Settlement cracks show up when the ground moves — after heavy rain saturates fill, when groundwater gets pumped down nearby, when adjacent excavation disturbs the founding material, or simply because inadequate compaction under a slab is finally catching up. They tend to run diagonally and they tend to widen at one end. Inject them, yes, but if the ground hasn't stabilised first you'll be back.

3.3 Shrinkage Cracks

Shrinkage cracks are concrete's factory defect — every pour produces them to some degree. Restrained elements crack hardest: walls that can't shorten freely, slabs on grade held back by friction, beams held at both ends. Surface map cracking can often be left alone, but through-cracks that let water get to the steel need treating. The ones that form in the first few hours while concrete is still plastic are particularly leaky and often overlooked until the structure is in service.

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3.4 Vibration-Induced Cracks

Vibration on its own rarely cracks good concrete, but it's very good at making existing fine cracks worse — progressively widening them and shaking loose material out of the faces. If you're injecting a crack near machinery or under a road that's still live, don't use a rigid epoxy. It'll debond under the cyclic load. Use a low-modulus flexible resin that can absorb the movement without failing.

3.5 Relative Movement and Crack Breathing

The maths on fine active cracks is sobering. A crack that's 0.1 mm wide and opens 0.05 mm is cycling through 50% width change every time temperature shifts. Inject that with a resin that has 20% elongation and it'll split on the first warm day. For fine active cracks, elongation matters more than strength. If the resin can't stretch with the crack it's just a plug waiting to fail.

4. Leak Types and Sealing Methods

4.1 Volume and Pressure Considerations

- **Seepage and Damp Cracks —** That slow, spreading damp patch on a basement wall. Use a low-viscosity hydrophilic PU gel or Galaxie AC200 acrylic at low pressure. The trick here is patience — inject slowly and let the resin travel the full crack length before it gels.
- **Active Dripping Leaks —** A defined drip or stream through a crack or joint. Flush with water first to confirm the crack path and get the faces wet — that moisture is what drives the PU reaction. Then inject Galaxie PU CUT or PU FLEX. The foam chases the water and expands into the void behind the crack face.
- **High-Volume Flowing Leaks —** Water pouring through a crack or failed penetration can't be injected directly — it'll wash the resin out before it can react. Drill relief holes alongside the leak to divert the flow first. Once the pressure at the crack face is manageable, work from low to high with a fast-catalyst PU, progressively cutting off each pathway until the leak closes.
- **High Hydrostatic Pressure Leaks —** Deep basements and water-retaining structures can be under significant hydrostatic head. You can't inject against full pressure — drill relief ports first to bleed the pressure down. Then do it in two passes: a fast-foam first pass to bulk-seal the crack, followed by a low-viscosity gel to finish off the fine pathways the foam couldn't reach.
- **Porous Concrete and Honeycombing —** Honeycombed or poorly compacted concrete is like a sponge — it takes a lot of resin and has no defined crack path. Tighten your packer spacing to 100–150 mm and use Galaxie AC200 acrylic for its near-water viscosity. Budget for multiple passes. You're impregnating the matrix, not just sealing a line.
- **Complex Cracks and Joints —** Old structures and unknown construction details can surprise you. Branching cracks, filled voids and intersecting joints don't always behave predictably. Flush with water at each packer before injecting resin — watch where the water comes out and you'll understand the crack map. Then step-grout from one end: inject, wait for travel to the next packer, move on.

5. Selecting the Right Injection Resin

One of the most common injection mistakes is using a rigid repair on a crack that's still moving. The repair holds but the concrete cracks either side of it within a season. Galaxie resins cover the full range — from fast-foam PU for active leaks through to structural epoxy for dead cracks — so you can match the material to the actual condition rather than using whatever's on the truck.

Situation	Recommended Resin	Key Property
Active leaking crack	Galaxie PU Cut / RS / Flex/ SF	Water reactive
Expansion joint / waterstop	Galaxie PU Flex	High elongation foam
Fine seeping crack	Galaxie AC 200/300	Ultra-low viscosity acrylic

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Structural crack reinstatement	Galaxie EP LV	Moisture-tolerant epoxy
Dry / dormant crack, epoxy injection	Galaxie SLV / LV + Galaxie Injectors	Rubber-band low-pressure syringe system

6. Injection Process — Leaking Cracks

This is the standard procedure for PU injection into an actively leaking crack. The same sequence applies to walls, slabs, retaining structures and below-ground construction joints.

Step 1 — Surface Preparation

Wire-brush the crack face and blow it clear with compressed air. Knock off any efflorescence, loose concrete and old sealant. If water is running out, let it drain — don't try to dry the surface completely. For hydrophilic PU resins a damp face is an advantage, not a problem.

Step 2 — Drill and Install Injection Packers

Drill packer holes at 45° to the surface so that the drill intersects the crack at mid-depth. Hole diameter should match the packer being used (typically 12–16 mm). Space packers at approximately 2/3 of the wall thickness apart — e.g. 150–200 mm centres in a 250 mm wall. Install mechanical or adhesive injection packers and confirm they are seated securely. For dry or dormant cracks being injected with Galaxie SLV or LV epoxy, Galaxie Injectors (rubber-band syringe units bonded to the crack face with Galaxie UEP paste) can be used as an alternative to drilled packers, delivering constant low pressure across multiple ports simultaneously without a pump.

Step 3 — Flush the Crack

Push clean water through each packer with a hand pump. You're clearing debris, wetting the crack faces, and proving that the packer holes actually intersect the crack and communicate with each other. Water coming back clear at an adjacent packer means you're in the right spot and the path is open. No travel between packers means you need to add one in between.

Step 4 — Inject the Resin

Start at the lowest packer and work up. Connect the pump, start at low pressure and increase gradually — 0.5 to 3.0 MPa is the typical working range depending on how tight the crack is. You're done at each packer when resin appears at the next one or the crack stops accepting volume. Cap that packer, move to the next, repeat. Don't rush it.

Step 5 — Allow Cure and Finish

Leave it alone for at least 30–60 minutes before touching the packers. PU systems can feel set on the outside while still reacting in depth. Once cured, pull the packers, grind the holes flush or fill with a compatible mortar or PU sealant. Walk the whole crack length and look for any spots still weeping. If you find them, add a packer and go again.

7. Expansion Joint and Waterstop Repair

Expansion joints leak more often than cracks, and they're harder to fix permanently because the joint is supposed to keep moving. A lot of failed waterstops get patched with rigid sealant and leak again within a year. Galaxie PU SF is the right product here — it cures to a high-elongation elastic foam that can keep cycling with the joint without tearing itself apart.

Procedure

- **Surface Preparation —** Remove the old sealant completely — don't just inject over the top of it. Chase out any deteriorated waterstop material and loose concrete from the joint cavity. Blow it clean.
- **Drill and Install Packers —** Drill at 45° from each face of the joint so your holes intersect the waterstop plane. Alternate sides — left, right, left, right — at roughly 200 mm centres. This gives you overlapping coverage across the full joint depth rather than a line of parallel holes that miss sections.
- **Pre-Seal the Joint Face —** Before injecting anything, seal across the open joint face with hydraulic cement or a compatible PU sealant. Without this the resin just blows straight out of the joint under pressure. It's a temporary seal — you're just containing the resin long enough for it to cure.
- **Flush and Confirm Connectivity —** Same as crack injection — flush with water first. Confirm water travels between adjacent packers before you load resin into the pump. If a packer is isolated, it either missed the waterstop plane or the hole is blocked.
- **Resin Injection —** Inject Galaxie PU SF progressively from one end. It's a foam that keeps expanding after you stop injecting, so don't over-pump — watch for resin at the adjacent packer and move on. The cured foam bonds to the concrete faces and remains elastic across the full joint length.
- **Finishing —** Once cured, pull the packers and fill the holes with a movement-compatible PU sealant — not epoxy paste. If the joint is exposed to UV, foot traffic or vehicles, apply a surface sealant over the top for long-term protection.

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8. Equipment

The resin is only half the job. Using the wrong equipment — wrong pump, wrong packer size, wrong mixing ratio — is just as likely to cause a failure as using the wrong product. Make sure you have:

- **Single-Component PU Pump —** A piston pump with a working range of 0.5–8 MPa, a readable pressure gauge, a pressure relief valve, and fittings that match your packer type. A pump without a working gauge is guesswork.
- **Packers —** Mechanical expansion packers for drilled holes — 12 mm or 16 mm depending on your drill. Diameter must match the hole or they'll blow. For cracks with good surface access, surface-bonded port packers avoid drilling altogether and work well on thinner sections.
- **Galaxie Injectors —** For dry cracks getting epoxy, Galaxie Injectors are a practical alternative to a pump. Each one is a syringe, plunger and flange bonded to the crack face with UEP paste — the rubber bands do the work, holding constant pressure while you move along the crack loading the next one. You can have a dozen injecting simultaneously without touching them. They don't work on wet or actively leaking cracks.
- **Flushing Equipment —** A separate hand pump or small grout pump just for water flushing. Keep it separate from your injection equipment — water in a resin pump causes problems that aren't always obvious until you're mid-job.
- **Mixing Equipment (Two-Component Systems) —** Acrylic and epoxy resins need a twin-piston two-component pump or a properly sized static mixer gun. Ratio accuracy is everything — an off-ratio mix won't cure properly no matter how long you wait. Check the ratio output before you start each day.
- **PPE —** Chemical-resistant gloves and safety glasses as a minimum on every job. Add respiratory protection in confined spaces, basements and anywhere with limited ventilation. Check the SDS for the specific product you're using — requirements differ between PU, acrylic and epoxy systems.

9. Common Questions

Why is the resin coming straight back out of the crack face instead of penetrating?

The crack face isn't sealed between the packers. Resin will always take the path of least resistance — if the face is open, it comes back out rather than travelling into the crack. Seal the full length of the crack surface with epoxy paste or hydraulic cement before injecting, leaving only the packer ports open.

My packer keeps blowing out under pressure. What's going wrong?

Either the drill hole is oversize for the packer, the concrete around the hole is crumbling or carbonated, or the packer hasn't been seated fully. Try a larger diameter packer, or redrill in a better spot. In badly deteriorated concrete, a surface-bonded port packer bonded with epoxy paste avoids the drilled-hole problem entirely.

There's no resin travelling between packers. How do I know the crack is connected?

Do a water flush test before loading resin. Push water through each packer with a hand pump and watch the adjacent ones. No travel means the crack is either blocked, the packer holes don't intersect the crack, or the crack is discontinuous at that point. Add intermediate packers at half spacing and flush again. If you're still getting nothing, your drill angle may be missing the crack — check you're drilling at 45° and deep enough to intersect mid-wall.

The resin is gelling inside the packer before it even gets into the crack. What's causing that?

Substrate temperature is the usual culprit — in hot weather or in a substrate that's been baking in the sun, the reaction accelerates sharply. Reduce catalyst dosage, switch to the EST (Extended Set Time) grade if available, or do the injection early in the morning before the structure heats up. If active water is present and you're getting a lot of it into the packer, that can also accelerate things. Check the resin temperature before you start.

The leak has come back a few weeks after injection. Why didn't it hold?

A few possibilities. The resin didn't reach the full length of the crack — there's still an uninjected section acting as a bypass. The crack is still active and moving, and a rigid repair has re-cracked alongside the injection zone. Or the original cause of the leak (hydrostatic pressure from inadequate drainage) hasn't been addressed. Re-map the crack carefully, add intermediate packers where the resin didn't travel, and check whether you need a more flexible resin. If the crack is live, switch from rigid to flexible gel.

Can I inject a crack that's underwater or fully submerged?

Yes, with the right resin. Hydrophilic PU resins are specifically designed to react with water and will foam and seal in fully wet or submerged conditions. Acrylic resins also work well underwater. What you can't do is inject epoxy into a submerged crack — epoxy won't bond to a wet surface and won't cure properly. If the crack is submerged, use Galaxie PU CUT or Galaxie AC200.

How do I know when I've injected enough resin into a packer?

Two signals: resin appears at the adjacent packer, or the current packer stops accepting volume at your working pressure. Either means the void behind that packer is full. Don't keep pumping once you hit refusal — you're just building pressure without filling anything new, and you risk splitting the concrete or blowing a packer.

What's the difference between Galaxie PU CUT, PU FLEX and PU SF? When do I use each?

PU CUT is a fast-reacting hydrophilic foam for cutting off active flowing or dripping leaks quickly. PU FLEX is a slower, more elastic hydrophilic gel for cracks that need a flexible long-term seal — expansion joints, moving cracks, waterstop repairs. PU SF is a TDI-based single-component foam with exceptional elongation, our top performer for high-movement joints and difficult expansion joint applications where nothing else has held. For dry structural cracks use Galaxie EP LV or SLV epoxy. For fine seeping cracks or porous concrete, Galaxie AC200 acrylic gives you the lowest viscosity of anything in the range.

When should I use acrylic resin instead of polyurethane?

Acrylic resin — Galaxie AC200 — is the right call when you need near-water viscosity to penetrate very fine cracks or honeycombed concrete that PU foam simply can't reach. It's also

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non-toxic once cured, which matters if you're working near potable water infrastructure, aquatic environments or anywhere with environmental sensitivity. The trade-off is that acrylic doesn't expand the way PU does, so it relies on full penetration rather than expansion to fill the void.

I've injected the crack but there's still a damp patch on the surface. Is that normal?

Give it time. A crack that's been leaking for months has saturated the surrounding concrete. The injection seals the source but the residual moisture in the concrete matrix takes days or weeks to dry out, even with the leak stopped. If the damp patch is growing or new water is appearing, the crack has a section that wasn't reached — mark the boundaries of the wet area and add packers at the edges of the injected zone.

10. Health & Safety

Every Galaxie injection product has an SDS — read it before you open the container, not after something goes wrong. The key points across PU, acrylic and epoxy systems are:

- Gloves and eye protection every time, no exceptions. Uncured resins are skin and eye irritants and some are sensitisers — once you're sensitised, even trace exposure can trigger a reaction.
- PU resins based on isocyanates — including TDI-based products such as Galaxie PU SF — must not be used in enclosed spaces without supplied-air respiratory protection. Under Australian WHS regulations, isocyanates are listed in Schedule 14 as requiring health monitoring for workers with ongoing exposure. The WES for TDI is 0.02 ppm TWA. If you are injecting in a basement, pit or confined space, ventilation is not optional.
- Acrylic resins including Galaxie AC200 are non-toxic but the monomers are flammable — no ignition sources and keep the area ventilated. This is also one of the genuine advantages of acrylic over PU when working in sensitive environments such as near potable water infrastructure.
- Have an eyewash station within reach. Resin in the eye is a medical emergency, not a rinse-and-continue situation.
- No eating, drinking or smoking in the work area while resins are open.
- Anyone handling isocyanate-based PU resins needs to understand sensitisation. Initial exposure may produce no symptoms. Subsequent exposure — even at sub-threshold concentrations — can trigger occupational asthma. A sensitised worker cannot continue working with isocyanates. Train your crew, document it, and keep records.
- Mixed resin waste and contaminated packaging must be disposed of as chemical waste under your state EPA requirements. Don't tip liquid waste into drains or stormwater. Cure it solid first if possible before disposal.

Done right, injection resin repairs last. Done wrong — wrong product, wrong prep, wrong pressure — they fail within a season and cost more to fix second time. If you're unsure about the right approach for your job, contact Galaxie Construction Chemicals for technical support before you start.

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