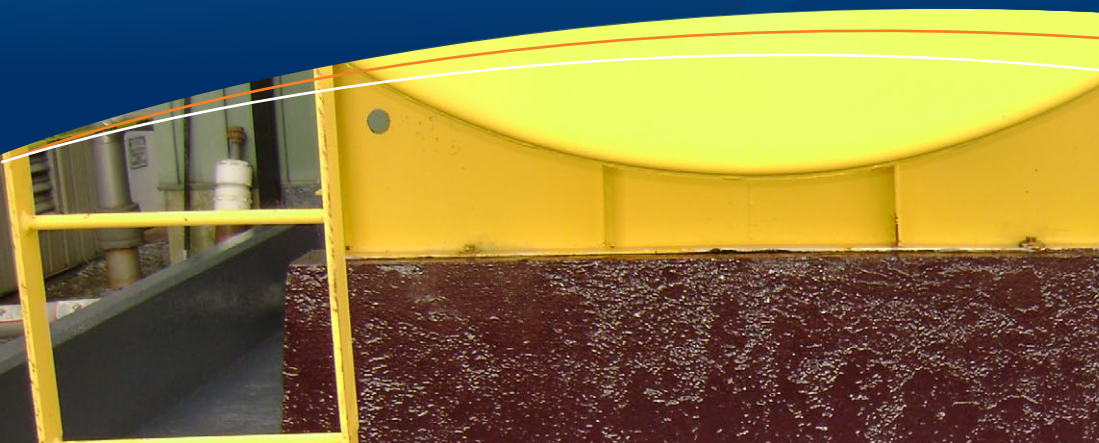


IN FOCUS: Chemical Attack



SECONDARY CONTAINMENT REPAIR AND PROTECTION

Appropriate secondary containment has long been a legal requirement in many countries, particularly around tanks, storage vessels and other plant equipment containing hazardous liquids. Regulations (such as the Control of Pollution Regulations 2001 in England) are enacted to establish preventative measures. By not complying with these regulations, companies run the risk of being heavily fined, sometimes to the extent of incurring criminal proceedings.

Brick, rendered block and concrete bunds are commonly used as secondary containment systems to protect the environment from spills of corrosive and toxic chemicals. These materials are cost-effective and provide good structural strength. However, they can be easily permeated due to their porosity. They also have poor chemical resistance, making them susceptible to deterioration through chemical attack. In addition, concrete in particular is highly prone to cracking due to substrate movement and freeze-thaw cycles. If deterioration is not addressed early, the concrete's structural integrity will suffer, which can result in contamination of the surrounding areas and ground water.



98% sulphuric bund in need of repair

Bund protection and repair challenges

Technologies commonly used for containment area protection include tiles, fibreglass linings and coatings. Tiles and linings offer good chemical resistance but tend to be quite rigid and susceptible to cracking and delamination.

Coatings are available in vast varieties with different degrees of chemical resistance, flexibility, longevity and application complexity. High performance coatings have been known to offer better value for money over time.

Where chemical protection has failed, the unprotected porous substrate has a potential to deteriorate rapidly and let the chemical substance penetrate through it. Repairs utilising concrete are lengthy due to the necessary preparations and cement's 28-day cure time. In addition, new concrete adheres poorly to old concrete, creating weak areas in the secondary containment.

A repair system that facilitates faster turnaround and offers in-service longevity, therefore, comes as a welcome alternative. >>



Acid attack at 49°C/120°F

Issue 107

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CONCRETE REPAIR WITH BELZONA

Like for like concrete repairs can take 28 days to cure leading to a lengthy downtime. Belzona Magma Polymers solidify within a few hours and achieve their full chemical resistance properties in days.



Coupled with outstanding chemical resistance and adhesion levels greater than concrete's cohesive strength, Belzona polymer mortars allow for:

- » Fast repair and turnaround
- » Cost-effective solution
- » Proven longevity

Belzona 4111 (Magma-Quartz)	Rebuilding of surfaces subject to impact and abrasion
Belzona 4141 (Magma-Build)	Light weight repair material for vertical surface rebuilding
Belzona 4181 (AHR Magma-Quartz)	Where maximum chemical and/or heat resistance is required
Belzona 4131 (Magma-Screed)	Screeding for larger areas



Advanced coating and composite systems

Belzona barrier coatings and polymer mortars were first used for bund repairs in the 1980s. Belzona Magma Polymers offer adhesion to concrete that is stronger than the concrete's cohesive strength. Belzona mortars and coating systems can solidify within a few hours and achieve their full chemical resistance properties in days.

In addition to repairing deteriorated containment areas, Belzona can prevent the problem from ever occurring with the use of protective coatings. Coatings adhere equally well to various substrates including concrete, metals, tiles and existing coatings. Coupled with the ability to resist a wide range of chemicals including all concentrations of caustic and sulphuric acid up to 98%, Belzona offers a lasting solution where other technologies have failed.

Why choose Belzona coatings and composites?

- Application is simple and fast, using conventional hand tools
- Materials are 100% solids and will not shrink after cure
- Excellent adhesion prevents delamination and premature failure
- Outstanding proven chemical resistance
- Environmentally friendly
- Downtime and repair costs are dramatically reduced

Where can Belzona polymer mortars be applied?

Belzona materials will adhere well to most substrates and have been used as a repair and protection system for:

- Chemical containment areas
- Concrete sumps and tanks
- Concrete supports and upstands
- Plinths
- Culverts and waterways
- Fluid handling equipment
- Vessels and pipework

In a nutshell, Belzona systems are suitable to be used everywhere where chemicals are stored and transported.

Which chemicals can Belzona materials withstand?

Belzona materials withstand a vast range of chemicals at different temperatures and

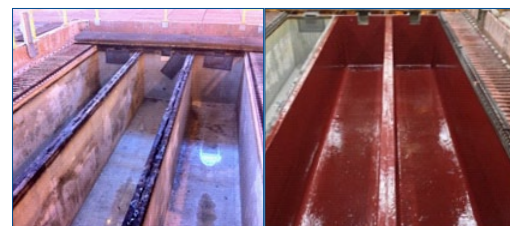
concentrations. Materials are tested against a broad range of chemicals. Results are recorded in the chemical resistance chart, made available for each Belzona product expected to come into contact with aggressive chemicals.

[Belzona 4311](#), for example, can be applied for continuous immersion service in 98% sulphuric acid, 30% ammonia, sodium hydroxide, fuel oil and many other aqueous and hydrocarbon liquids.

Complete repair and protection solution

The range of Belzona Magma Polymers facilitate a complete secondary containment rebuilding, strengthening and protection solution. ■

Chemical attack - before and after Belzona application



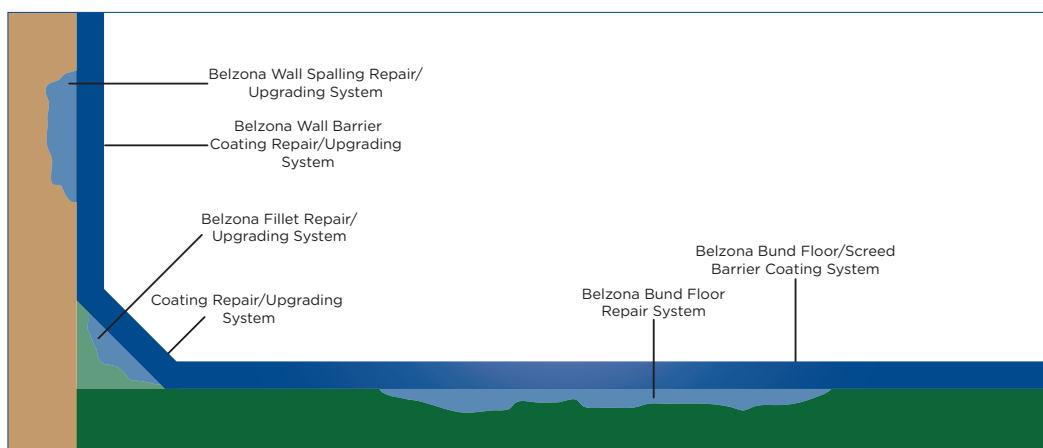
[Furniture rails at copper mine protected from CuSO4 electrolyte](#)



[Badly deteriorated acid sump repaired](#)



[Through-wall damage repaired on pickle tank containing 36% hydrochloric acid](#)



KEEP COMING BACK FOR MORE

Eight years of Belzona protection after competitor failure

The protective coating system at an Alabama power plant failed, allowing sulphuric acid to deteriorate the secondary containment area. Chemical leakage in turn contaminated the surrounding environment.

As a solution to this problem, a competitor system was applied, but failed within the first two years in service. This premature failure prompted the asset owner to seek a proven lasting solution. Since the acid tank itself had already been coated with [Belzona 4311](#) and remained in service with no incidents for 12 years, the customer decided to coat the surrounding concrete with Belzona.

The damaged concrete areas were repaired with [Belzona 4111](#), a fast curing polymer mortar. First of all, the existing failed coating was completely removed. All loose concrete was chiselled away and the whole area was thoroughly cleaned. To achieve maximum adhesion to the substrate, Belzona 4911 conditioner was used. [Belzona 4111](#) was then applied at a minimum thickness of 6mm. A

straight edge was used to even out the surface before compacting and smoothing using a steel trowel.

The acid side of the containment area was then coated with [Belzona 4311](#) and the caustic side with [Belzona 5811](#), a material best suited for chemical resistance to lighter compounds. The application was revisited after eight years in service, and minor touch-up repairs were all that was needed. ■



Sulphuric acid (right) and caustic (left) containment areas



Concrete damage due to system failure



Coated area after eight years in service

SURFACE PROTECTION WITH BELZONA

Belzona supplies a range of protective barrier coatings that offer chemical resistance to a broad range of chemicals at various concentrations.



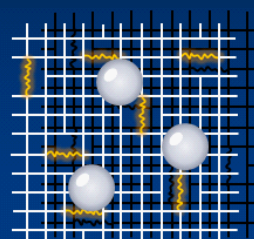
Belzona polymer coatings are simply applied at a thickness of approximately 500 microns (20 mils). These coatings provide seamless protection and eliminate the risks of undetected delamination and corrosion of the underlying substrate. Visual inspection of thin-applied coatings is sufficient to determine that chemical protection is indeed intact.

Belzona 4311 (Magma CR1)	Maximum chemical resistance to a broad range of chemicals
Belzona 4331 (Magma CR3)	Maximum resistance to organic acids and solvents
Belzona 4341 (Magma CR4)	Maximum resistance to hot inorganic acids
Belzona 5811 (Immersion Grade)	Resistance to dilute aqueous solutions

NEW CHEMICAL PROTECTION WITH ADDED FLEXIBILITY

Introduced in 2014, after four years of development and testing, [Belzona 4361](#) combines the desired chemical properties with the sufficient flexibility to remain intact if a crack appears in the underlying substrate.

- Good flexibility/ crack bridging properties
- Excellent overall chemical resistance
- Good adhesion to concrete and steel
- Solvent-free
- Good usable life
- Low surface bloom and good cure over a range of ambient temperatures
- Application by brush



Flexible segments in the polymer chain of [Belzona 4361](#) to add flexibility



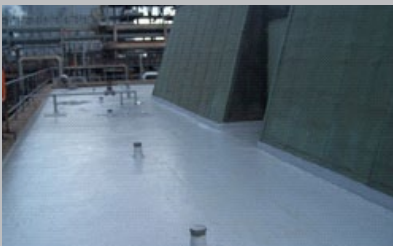
PREVENT THE DAMAGE FROM EVER OCCURRING

Since the early 1990s, Belzona barrier coatings have been applied to new build containment areas to protect them from a wide range of chemicals, including phosphoric and sulphuric acid.



Belzona offers a lasting solution where other technologies have failed.

Belzona is not just a product manufacturer but strives to provide a complete supply and apply package through its Global Distribution network. This network was specifically created to provide clients with direct access to Belzona quality products, specialist application services, inspection services and supervision. It is Belzona's mission to meet the specialist repair and protection needs in its target industries and markets worldwide.



BADLY DEGRADED BUND NOW GOOD AS NEW

Caustic containment area repaired and protected

A premium spirits distiller in the UK required a repair and protective system for a caustic chemical containment area after the existing fibre glass system had failed.

A Belzona Authorised Contractor was approached to provide a long-term solution. On preparing the surface and removing the fiber glass lining it became evident that the concrete substrate had badly degraded and required extensive repair. [Belzona 4131 \(Magma Screed\)](#) and [Belzona 4141 \(Magma Build\)](#) were used to repair the degraded sections of the walls to bring the banded area back to its original state.

The concrete floor surface was skimmed to a depth of 6mm and 50mm x 50mm fillets were installed to all horizontal and vertical corners of the bund with [Belzona 4131](#) and [Belzona 4141](#). A two coat system of [Belzona 5811 \(Immersion Grade\)](#), a high performance barrier coating, ideally suited to this application providing protection from the effects of the disclosed chemicals, was then applied to the internal and external walls of the bund along with the floor. ■



Containment area prior to application



Concrete substrate repairs



Completed application



Issue No. **107**



Click here to find your local Belzona Representative

