

PROTECTING EXTERNAL CONCRETE WALLS: YOUR QUESTIONS ANSWERED

Damaged external walls can lead to major structural problems in concrete buildings, especially those exposed to harsh weather conditions, and potentially undermine the waterproofing system. The LRWA addresses the most common queries relating to this issue and offers advice on treating and protecting concrete parapets and facades.

What can damage concrete?

Generally, three basic origins can cause damage to concrete including:

1. Chemical - for example, an alkali aggregate reaction (AAR), aggressive chemical exposure, bacteria or efflorescence.
2. Mechanical - for example overloading, movement or vibration.
3. Physical - for example, thermal movement, erosion, abrasion and shrinkage.

What can damage reinforced concrete?

Often and more seriously, there may be defects due to deterioration of reinforcement. This is usually caused by:

- 1. Carbonation** - This is the loss of the protective passivation pH value of the concrete. Concrete naturally will have a pH of 12-13 which passivates the steel surface preventing deterioration.

Progressive reaction between the CO₂ in the atmosphere and calcium hydroxide in the concrete reduces the pH level to around 9. This is still alkaline but not now sufficiently so to offer the necessary protection, so the steel corrodes, expands and exerts sufficient pressure to break off sections of concrete exposing the steel to yet further damage.

How quickly the carbonation will progress and become damaging is dependent on a number of factors including the concrete quality, depth of cover, prevailing

atmosphere and general RH level, etc. It is possible to know how far carbonation has penetrated and predict the rate of anticipated progression using simple testing.

2. Chlorides - Dissolved chlorides from marine environments or de-icing salts at concentrations as low as 0.2-0.4% can also negate the passivation layer and cause the steel to rust. This often forms severe pitting in the reinforcement.

3. Electrical current - This is caused by differing metals creating a cell.

The most likely to be seen regularly associated with roof works is carbonation, unless the structure is very near the sea. However, if any of these issues are not corrected, there could be damage to the concrete portion itself and immediate failure of a component due to loss of the reinforcement's tensile load contribution.

Any of the deterioration causes will be exacerbated by other factors such as cracking, which however small may allow more direct routes for gasses like CO₂ or chemicals such as chlorides. Any of the causes of damage to concrete or reinforcement may occur in isolation or in combination.

What products can I use to prevent carbonation and protect reinforced concrete external walls?

There is a wide range of liquid coatings and penetration systems available offering long-term protection not only against carbonation but water ingress, atmospheric chemicals and other forms of deterioration including the growth of mould, fungi and algae.

These products are usually but not exclusively water-based and often acrylic. Each will offer slightly different features and benefits but broadly speaking can protect a wall from anti-carbonation and other penetrating causes for deterioration for up to 15 years.

Importantly, they should be vapour permeable allowing substrate moisture to escape preventing blistering and enabling the structure to breath.

Additional benefits of liquid coatings are that they are UV stable and elastomeric so can withstand thermal and structural movement, eliminating the risks of cracks and can be used to bridge existing cracks as well.

Different colours as well as fast-drying and textured options are also available.

Can liquid coatings be used on tiled concrete walls?

Yes, always consult the manufacturer's information but generally, liquid coatings can be used on external tiled walls. Reduction in water penetration and subsequent freeze thaw cycles ensures that the tiles remain bonded to the structure, minimising future maintenance.

What do I need to consider before specifying an anti-carbonation coating?

Carbonation protection may be provided for prevention in new structures or as part of a repair scheme to an existing structure providing the concrete is not already showing evidence that the carbonation zone is beyond the reinforcing bars. At this point, more extended repair systems could be used.

Correctly identifying the problem is essential to provide the right solution. Ascertain, with the services of an expert if necessary, that the problem is carbonation either in isolation or acting in combination with other deterioration factors.

Establish whether repairs to the reinforcement are required and if concrete needs to be replaced and why - for example, is it purely for aesthetic reasons or to replace cover, restore strength etc. This will help you to select the correct repair materials. Again, consult a professional engineer or manufacturer for assistance.

For the coating, you need to establish whether only carbonation protection is required or if you need to factor in other qualities such as resistance to specific chemicals for example.

To be effective, anti-carbonation coatings should comply with EN 1504 – 9, achieve an equivalent air resistance of at least 50m to CO₂ and be sufficiently vapour permeable allow normal movement of moisture out of the structure

Before specifying an anti-carbonation coating, we advise examining the site and noting the existing coatings, defects and contamination. The areas' moisture content should also be measured to ensure it complies with the manufacturer's surface condition requirements usually found on the data sheet. Take advice from the manufacturer of the coating and if possible, apply it in a reasonable sized trial area for your client's approval before using on the entire surface.

Also consider third party accreditations which guarantee the products meets certain quality standards including those which have a European Technical Assessment (ETA), British Board of Agrément (BBA) and BDA certifications from KIWA.

For more information or advice, please contact us at technical@lrwa.org.uk