



## A guide to condo parking garage maintenance

Corporations can maximize their return on investment by preserving waterproofing



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By Michael Pond

Data suggests that a condominium corporation should expect to spend between \$100 and \$500 per parking stall per year in order to keep its parking garage in good working order and build up savings for long-term renewal of the garage's moisture protection systems. That's the equivalent of \$15,000 to \$75,000 per year — or \$8 to \$42 per month per stall — for a building with 150 parking stalls. So, where should that money be spent and how does a corporation maximize its return on investment?

What follows are ways in which a condominium board and property manager can best spend the operating budget and reserve fund on parking garage maintenance and repair and on that of the associated moisture-protection systems.

But first, here's a very basic chemistry and physics lesson:

The reinforced concrete parking structure is the most common type of parking facility in use today. Its durability is influenced greatly by the effectiveness of the waterproofing system(s) used to protect it from moisture and chlorides. There are several ways in which these two elements attack and damage reinforced concrete.

Reinforced concrete deteriorates when hydrogen dioxide (water) and calcium chloride (salt) come into contact with a ferrous metal (iron-based alloy) such as carbon steel and forms iron oxide (rust). The iron oxide occupies a greater volume of space than the original metal alloy, thereby exerting an expansive pressure on the concrete surrounding the steel.

In reinforced parking structures, carbon steel is generally found in the embedded reinforcing steel or rebar. Concrete has excellent compressive strength characteristics but very poor tensile strength characteristics. So the expansion of the rust results in the concrete delaminating from the embedded reinforcing steel, thus reducing the effective depth of the slab at the delamination location and thus the structural or load-carrying capacity of the suspended parking deck. If left unchecked, ongoing corrosion-related deterioration could eventually lead to significant structural integrity concerns, including eventual partial or total collapse of the parking structure.

As may be apparent, the goal of parking structure maintenance and protection is to limit the extent to which the parking structure deteriorates and is exposed to moisture and chloride attack. Limit the deterioration and exposure in order to limit the cost of repairing the parking structure.

The waterproofing industry has a wide spectrum of moisture mitigation and protection systems that can assist in limiting or slowing the rate of deterioration caused by moisture and chlorides. Traffic deck coatings, expansion joint glands, joint and crack sealants, cathodic protection, penetrating sealers, and corrosion inhibitors are only a few of the systems available.

Engineers and architects can play their part as well, by designing durable parking structures. They balance construction cost premiums with material thicknesses, depth of concrete cover over rebar, drainage slopes, and high-quality concrete-mix designs.

So while the design of parking structures is essentially a fixed and unchangeable constraint, waterproofing systems can be effectively managed. A comprehensive approach involves annual maintenance and operating programs as well as periodic capital renewal projects, including the repair and replacement of the moisture protection systems.

Consider the following measures and strategies to maintain the performance of a waterproofing system and mitigate the deterioration of a parking garage structure:

**Flush and clean the floor drains and drain pipes in a parking garage at least twice a year.** This allows salt-laden water brought in by vehicles to be quickly discharged from the surface of the parking deck to the storm or sanitary drainage system. Cleanouts should also be installed on the underside of the slab, and drain bodies should include operable grates and removable sediment buckets for easy cleaning. Also power wash the entire parking deck. Removing crystalized salts from the deck mitigates chloride contamination of the concrete.

**Perform annual inspections of the moisture protection systems.** Make note of leaks on the underside of the slab, excessive wear in the traffic deck coating, tears or adhesive failures of the joint sealants, or signs of standing water around drains. Hire a contractor to periodically repair any observed defects.

**Limit the use of sodium chloride, calcium chloride and magnesium chloride as a de-icing salt for snow melting.** These types of salts have particularly deleterious properties that accelerate deterioration of reinforced concrete structures. Consider using calcium magnesium acetate, potassium acetate, urea, or sand instead.

**Hire qualified companies to undertake a detailed condition assessment of a parking garage's structure and moisture-protection systems.** Experienced and qualified firms have the resources and the tools to assess and identify non-visual structural deficiencies as well as establish the current condition of the waterproofing system and its anticipated remaining service life. Invite them to review a garage on a three-year cycle. *Do not rely solely on the reserve fund study to establish replacement timelines for a garage's moisture-protection systems. Detailed assessments are required to gather the pertinent information.*

**Plan to implement a targeted or localized rehabilitation program of the moisture protection systems at least once prior to full system replacement.** Allocate money from the reserve fund to overcoat drive lanes, locally repair the traffic deck coating, replace damaged or clogged drains, and refresh the garage in order to realize the full service life of its waterproofing system.

**Replace the moisture-protection systems before the salts and moisture can erode the integrity of the underlying structure.** It's a fallacy that if the levels of concrete deterioration are low, then the moisture protection system doesn't need to be replaced. Waterproofing systems can appear to be in good shape, but they may have lost their ability to resist the penetration of salt-laden water. Once chlorides penetrate the thin layer of concrete that protects the embedded reinforcing steel, they are very difficult to remove and will only increase in concentration, and therefore destructive capabilities, as the structure ages.

In the end, a corporation's reserve fund makes the financial contingencies required to maintain the value of its capital assets and allows owners to live their lives in a comfortable and secure environment. It can be an unnerving experience to wonder whether a corporation's reserve fund is adequately funded for inevitable future repairs and renewals, and how its asset will be viewed by prospective buyers when owners are ready to sell their units. Do not spend it on large structural repair programs in the parking garage; rather, maintain the moisture protection systems and take heed from those with the experience and resources to help a corporation plan for the future.

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