



## CONCRETE DAMAGE IN BALCONY DECKS

In the last dozen years, the detection and remediation of concrete deterioration has become an industry unto itself. The source of the problem is primarily attributable to the brutal environment along the coast. Coastal air has a high humidity content and also a high calcium chloride (salt) content. Most high-rise and mid-rise buildings are constructed of either pre-cast or poured-in-place concrete. In both cases, concrete is a porous substance. When the "skin" (paint surface) of the building is not fully waterproofed, the concrete absorbs the moisture from the air and the dissolved salt regularly deposited on exterior surfaces from sea spray. This causes the embedded steel reinforcing bars ("rebar") to rust. When steel rusts, the iron is converted to iron oxide and it expands. This expansive force causes pieces of the concrete to break off the building, commonly known as "spalling."

By the time spalling is detected, there is often significant damage already done to the reinforcing steel structure of the building. Mr. May has consulted on several projects where the reinforcing steel structure of a balcony has deteriorated to the point where it is a life safety hazard. This condition is especially prevalent where very porous lightweight aggregates were used in the concrete mix for the balconies.

Further contributing to the problem faced by many associations is defective design and/or construction, which compounds the likelihood of structural deterioration. One common defect is "negative sloping" balconies, where the water that accumulates on the balcony (usually from wind-driven rain) does not "slope-to-drain," but rather "ponds" on the balcony. This causes rain water to seep in through the concrete, which hastens the rusting of the reinforcing bars.

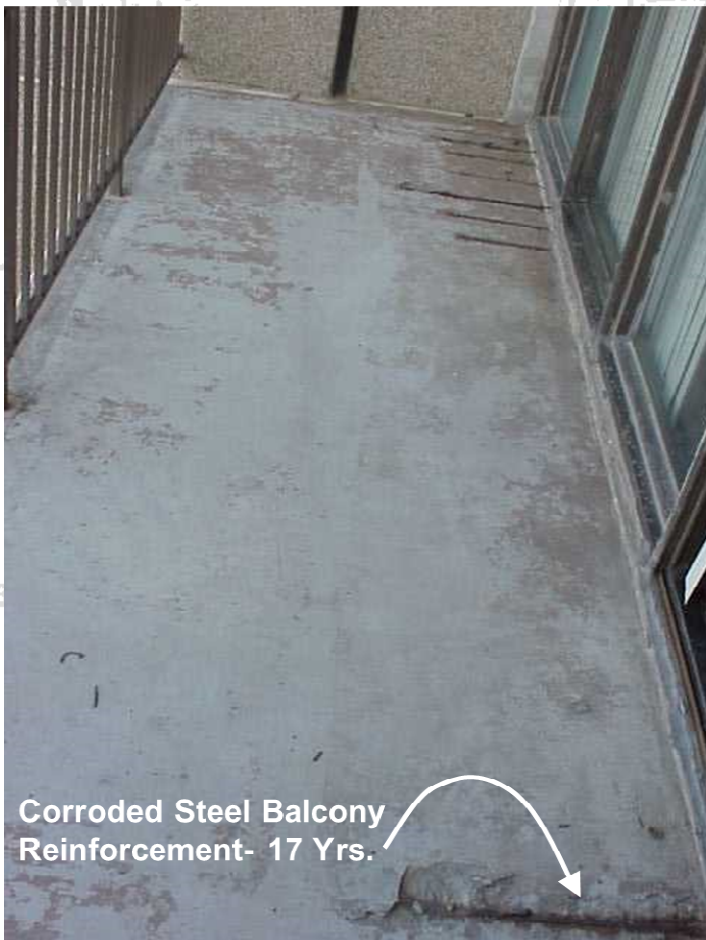
Another common defect contributing to accelerated deterioration is insufficient concrete thickness over reinforcing steel. The building code, for example, requires a minimum of : inches of concrete coverage. More is better for corrosion control. There have been cases where the thickness of the concrete over the reinforcing steel is as little as  $\frac{1}{8}$  of an inch.

Finally, a common cause of accelerated deterioration is the placement of indoor/outdoor carpeting on concrete balconies. In many cases, carpeting was provided by the developer, or has been installed by dwelling unit owners over the years. Most coastal architects and engineers will advise that carpeting is not a preferable covering for concrete balconies. Carpeting traps salt laden water on the concrete surface, greatly enhancing the potential for destruction of the embedded reinforcing bars. In some cases, even after a building has been waterproofed, the placement of carpeting on the coating will void the manufacturer's warranty.

Three experts confirm gradual disaster of doing nothing to ameliorate the deleterious effects of salt on concrete.

"Balcony slabs normally form an integral part of the floor slab within the building and the concrete forming balcony slabs is therefore of the same quality as the concrete forming the floor slab. Thus a minor problem that is often present in balcony slabs, unrelated to salt, is the absence of entrained air from the concrete and the related susceptibility of the surface of the concrete to scaling as a result of being subjected to cycles of freezing and thawing while in a saturated condition. The potential for surface deterioration of this type to occur is greatly increased both by poor drainage and by outdoor carpeting on the balcony slab." by Paul Belanger, P. Eng.

"Carpeting on balconies is never recommended. For the long term performance and maintenance of the structural integrity of the concrete, carpeting the balconies is one of the worse things that can be done. Carpet on concrete is especially bad in oceanfront locations. The carpet serves to trap salt laden water and moisture on top of the concrete for extended periods of time.



The long term impact of carpet on the balcony slabs is detrimental to the steel reinforcing embedded in the concrete. Unfortunately, most balcony slabs are cast-in-place concrete which is more susceptible to moisture intrusion than pre-cast concrete, because it is less dense and the steel is often misplaced too close to the surface. Sea salt deposited on the balconies does not wash off because of the carpet. The carpet increases the contact time for salt laden moisture to penetrate the surface of the concrete balconies. Salt is 50% chlorine and the chlorides from the sea salt seep into the upper surface of the concrete balconies. Once the chlorides reach the embedded steel reinforcing it creates an electrical flow in the concrete. This rapidly degrades the steel causing it to oxidize (rust). As



steel corrodes, it expands (between 2 and 5 times its original volume) bursting the concrete covering the steel in a process known as spalling.

While removing the carpet won't reverse the damage done, it is imperative to remove the carpet to reduce the rate at which future corrosion occurs and to inspect the current damage."

By architect David L. May, Jr., AIA

It's the Board's fiduciary duty to take reasonable steps to maintain the Common Elements, which will almost always include the structure of the building. Perhaps, Judge Hugh Glickstein of the Fourth District Court of Appeal summed it up best when he said (although in the context of a condominium association whose legal rights against the developer had expired due to the Statute of Limitations): This case points up the necessity that Condominium Associations, as soon as the unit owners take over control, engage professional engineers or architects to determine whether the buyers received all that they thought they had bought. The likelihood is remote that volunteer unit owner-directors, however well-meaning, can ascertain as well as trained experts can whether the development buildings have structural integrity. *Conquistador Condominium VIII Association, Inc. v. Conquistador Corp.* 500 So. 2d 346 (Fla. 4th DCA 1987) [Glickstein concurring. Based upon the foregoing factors, it is our belief that every association should periodically consult with a Professional Architect or Engineer for the purpose of evaluating the condition of the building, and obtaining recommendations for preventive maintenance. It is said that an ounce of prevention is worth a pound of cure, or as the man in the transmission company commercial says: "pay me now or pay me later." by attorney Steven B. Lesser.