A Brief Summary of Concrete Deterioration and Repair for Laymen.

Concrete is a mixture of water, cement, and aggregates (such as sand and gravel). This mixture dries during a chemical process that results in a very strong material. However, while the concrete is very strong in compression (under direct loads), it is not strong in tension (offsets, pulls or twists).

To make concrete a useful element in construction of buildings, reinforcing steel that is strong in tension is introduced within a concrete beam or column or floor. These materials have been shown over many years to work well compositely, and the steel is protected from corrosion by the natural alkalinity of the concrete.

Engineers have known for a long time that salt- laden water that penetrates the concrete causes the reinforcing steel to corrode (rust) and expand to many times its original size with enough strength **to** delaminate the surrounding concrete. This is shown in the deterioration of many bridges and parking garages in northern climates where salt is used to combat snow and ice. Concrete repair techniques have been developed to address these issues. Note that sidewalks on grade are usually unaffected because they seldom contain steel.

During the 1970's, architects began to design buildings with concrete that was exposed to the elements, as opposed to buildings with concrete frames and protective exterior walls. It has been seen that unprotected concrete cannot weather this exposure, particularly where the environment contains airborne salt from the ocean, where the concrete is not very high quality, and when the reinforcing steel is not adequately protected. (All one needs to do is to look up and down coastal Florida to see the extent of this miscalculation.) „

Concrete repair is a highly technical process. Old delaminated concrete must be removed to expose the reinforcing steel, the steel must be evaluated, and cleaned and resurfaced and protected or replaced, and new "concrete" provided. The new concrete should be carefully chosen to be compatible with the existing, and may be a synthetic/chemical mix rather than ordinary concrete. Care must be taken to assure that the new patched area does not fail by shrinkage or expansion, or does not provide added corrosive conditions due to a chemical imbalance between the new and old materials. Even then the repairs are likely not permanent, but will have a life expectancy of up to 10 years. Any fasteners that are introduced to retain railings, shutters etc., must also be protected to prevent water penetration.

Other methods such as application of chemical penetrants, or provision of small electrical charges can be helpful in minimizing future problems, but these processes are indicated as back-up processes for our problems. Additionally, waterproof coatings will reduce future deterioration provided they appropriate. The Engineer who specifies the repair work will address these issues.

Surface repairs such as caulk or sealants in open cracks will not arrest the deterioration process as it occurs from the interior outward. While it is unlikely that any structural issues currently exist in our building, to ignore the deterioration would be negligent in our view and against the advice of several Professional Engineers that have looked at our building. Left unattended, conditions will only worsen resulting in more costly repairs, more inconvenience to Unit Owners, and perhaps significant structural damage.