CONSTRUCTION PATHOLOGY

Construction pathology can be understood as the part of Engineering that studies the symptoms, mechanism, causes and origins of construction defects.

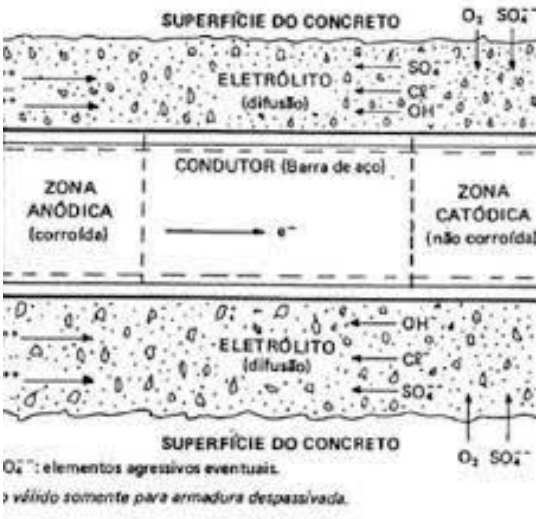
Therapy involves studying the correction and solution of these pathological problems.

Pathological symptoms, with rare exceptions, present characteristic external manifestations, from which the nature, origin and mechanisms of the phenomena involved can be deduced, as well as the likely consequences can be estimated.

Mechanism:

Every pathological problem, called, in legal language, a hidden defect or construction defect, occurs from a process, a mechanism.

For example, the corrosion of reinforcement in reinforced concrete is an electrochemical phenomenon, which can be accelerated by the presence of external (environmental) or internal (incorporated into the concrete) aggressive agents. For corrosion to occur, there must be oxygen (air), humidity (water) and the establishment of a corrosion cell, which only occurs after the depassivation of the reinforcement.



Corrosion cell in reinforced concrete

Source : Helene, 1986

Corrosion problems normally occur with greater incidence during the use stage.

Certain problems, such as those resulting from alkaline aggregate reactions, only appear with intensity after six to twelve years, that is, much later than the “Habite-se period”

> “The lack of maintenance causes small pathological manifestations, which would have a low recovery cost, to evolve into situations of unsatisfactory performance with unhealthy environments, poor aesthetic appearance, possible structural insecurity and high recovery costs”.

1. PROBLEM ANALYSIS

We consider that to analyze the problem, all documentation must be identified, in addition to the investigation process, so that the diagnosis is accurate and the choice of solution is effective.

"Many of the structural diseases do not manifest themselves clearly or are covered up by others, and may go unnoticed. Therefore, the more careful and in-depth this phase of the report is, the greater the success rates and efficiency of the indicated solution"

We also consider that **if it is not possible to close the diagnosis in some cases**, specific technological tests should be included separately, such as esclerometry, ultrasound, load tests and the extraction of testimonies.

2. TESTS/FIELD SURVEY

The data collection stage is extremely delicate and must be carried out by an experienced engineer, a specialist in the pathology of Concrete Structures, who is capable of characterizing with the utmost rigor whether or not special measures are necessary.

This is the step that will provide the necessary support so that the analysis can be done correctly:

- Analytical classification of the environment (aggressiveness)
- Visual survey and measurements of the structure
    - Corrosion of reinforcement, niches
    - Permeability, Resistivity, chloride content, corrosion potential (ASTM C 876), polarization (ASTM G57), carbonation, covering, macropiles/micropiles, leakage currents
- Detailed survey of pathological symptoms (deformation measurements, evaluation of chlorides and other agents, measurements of cracks and fissures (position, extension, opening), section loss measurements.
    - Beams (flexural cracks, shear cracks, upper part flexure, concrete crushing, torsional cracks, concert crushing by torsion, hydraulic shrinkage cracks
    - Columns (localized compression cracks or buckling of the reinforcement, cracks due to ruptures at the top of the columns
    - Slabs (flexural cracks, cantilever flexural cracks, hydraulic shrinkage cracks, punching.

    - Walls (settlement, bending, traction cracks)
    - Others necessary
- Analysis of the original project, modification and expansion projects.
- Carrying out tests, including in laboratories.
- Determination of residual deflections, deformations if necessary.
- Dimensional verification of elements, geotechnical investigation, foundations.

3. USUAL RECOVERY TECHNIQUES

For each typical manifestation identified, we request that a diagnosis and alternative for correction be carried out, including design and calculation memory (if reinforcement).

- Substrate preparation (manual scarifying, grinding disc, mechanical scarifying, demolition, manual sanding, electric sanding, manual brushing, wet or water jet, cutting disc, pickling, removal of oils and grease, saturation with water)
- Superficial, localized, deep repair procedures, reinforcement and amendments, treatment and injection of cracks, metal sheets, mortars, concrete
- Cathodic process control

4. RESULTS

We consider that the results presented via report will be complete in all aspects mentioned with the following points covered.

- Delimitation of compromised areas (complete identification and anodic areas) or passive zones
- Structure monitoring
- Corrosion intensity and speed identified.
- Non-destructive methods
- More suitable repairs
- Precise definition of the parts of the structure in which reinforcement will be necessary and the extent of this intervention.
- Indication of the need or not to adopt shoring procedures.
- Assessment of the level of safety of the structure.