

## 1.5 CAUSES FOR DETERIORATION OF CONCRETE STRUCTURES.

The following are the causes of failure of structure:

### a) Occurrences incidental to construction stage.

This could be attributed to

1. Local settlement of sub grade.
2. Movement of formwork.
3. Vibrations.
4. Internal settlement of concrete suspension.
5. Setting Shrinkage.
6. Premature removal forms.

### b) Drying Shrinkage

### c) Temperature stresses

This may be due to

1. Difference in temperatures between the inside of the building with its environment.
2. Variation in internal temperature of the building or structure.

### d) Absorption of moisture by concrete

### e) Corrosion of reinforcement

This could be caused by

1. Entry of moisture through cracks or pores.
2. Electrolytic action

### f) Aggressive action of chemical

### g) Weathering action

### h) Action of shock waves

**i) Erosion**

**j) Poor design details at**

1. Re-entrant corners
2. Changes in cross section
3. Rigid joints in precast elements
4. Deflections

This lead to

1. Leakage through joints
2. Inadequate drainage
3. Inefficient drainage slopes
4. Unanticipated shear stresses in piers, columns and abutments etc
5. Incompatibility of materials of sections
6. Neglect in design

**k) Errors in design**

**l) Errors in earlier repairs**

**m) Overloading**

**n) External influences such as**

1. Earthquake
2. Wind
3. Fire
4. Cyclones etc.

**Design and construction flaws:**

Design of concrete structures governs the performance of concrete structures. Well Designed and detailed concrete structure will show less deterioration in comparison with poorly designed and detailed concrete, in the similar condition. The beam-column joints are particularly prone to defective concrete, if detailing and placing of reinforcement is not done properly. Inadequate concrete cover may lead to carbonation depth reaching up to the reinforcement, it was increasing the risk of corrosion of the reinforcement.

**Environmental effects:**

Micro-cracks present in the concrete are the sources of ingress of moistures atmospheric carbon di-oxide into the concrete which attack reinforcement and with various ingredients of concrete. In aggressive environment concrete structure will be severely reduces.

**Poor quality material used:**

Quality of materials, to be used in construction, should be ensured by means various

Tests as specified in the IS codes. Alkali-aggregate reaction and sulphate attack results In early deterioration. Clayey materials in the fine aggregates weaken the mortar Aggregate bond and reduce the strength. Salinity causes corrosion of reinforcing bars as well as deterioration of concrete.

**Quality of supervision:**

Construction work should be carried out as per the laid down specification. Adherence to specified water-cement ratio controls strength, permeability durability of concrete. Insufficient vibration may result in porous and honey combined concrete, whereas excess vibration may cause segregation.

**Deterioration due to corrosion:**

Spalling of concrete cover

Cracks parallel to the reinforcement

Spalling at edges

Swelling of concrete

Dislocation

Internal cracking and reduction in area of steel reinforcement.

✓ Choice of course of action for the restoration of structure.

**1.1.10.1 Flowchart for Assessment procedure for damaged structure**

