

## 2.3 CRACKING OF CONCRETE

Majority of cracks occur when the building or its components is subjected to external forces which are greater than those which it can withstand. Cracks may also acquire if the materials used in the building is of poor quality and the construction is not carried out in accordance with relevant drawings, prescribed job specification.

Cracking will occur whenever the tensile strain, to which concrete is subjected, exceeds the tensile strain capacity of the concrete. The tensile strain capacity of concrete varies with age and with the rate of application of strain.

Two Major types,

Structural cracks

Non- Structural cracks

### **Structural cracks**

Structural cracks may arise due to various reasons such as incorrect design, overloading of the structural components or other similar factors. Structural cracks endanger the stability of the building, and may be difficult to rectify.

### **Non- Structural cracks: (hair line cracks)**

These are generally due to internal forces develop in the building materials due to moisture variation, temperature variation, the effects of gases ,liquids and solids.

### **Cracking:**

Before hardening cracks after hardening cracks Pre-hardening cracks

### **Before hardening cracks**

#### **Drying:**

Plastic shrinkage, Settlement shrinkage, Bleeding, Delayed curing.

#### **Constructional:**

Formwork movement, Excess vibration, sub grade settlement, Finishing.

### **Early frost damage:**

### **After Hardening: cracks Usage of Unsound materials:**

Cement, aggregate, excess silt, Mud and Dust

### **Thermal effects:**

Heat of hydration, External temperature, Joints in concrete, elevated temperature, Freezing, Moisture moments, Transition zone, Biological process, structural design deficiency.

### **Chemicals attack:**

Sulphate attack,

Alkali aggregate reaction Acid attack,

Sea water (chlorides), Carbonation, Fluorides attack, corrosion of reinforcement.  
Corrosion of reinforcement

### **Structural failure:**

Excessive tensile stress due to load

Building settlement, excessive load, vibration earthquakes and insufficient reinforcement

### **Pre Hardening cracks: Constructional movement**

- |                                  |                                    |
|----------------------------------|------------------------------------|
| 1) Sub grade.                    | 5) Formwork.                       |
| 2) Settlement sub grade.         | 6) Movement of formation.          |
| 3) Moisture changes in subgrade. | 7) Swelling of wood.               |
| 4) Control of sub grading.       | 8) Construction of adequate forms. |

### **Setting shrinkage cracks:**

Plastic shrinkage Chemical reaction

Cracks occurs soon after placing and under moist condition

**Drying shrinkage cracks:**

Drying shrinkage

Rapid drying while setting occurs

Cracking of exposed surface due to high wind, low humidity

Temperature differences

Improper protection

**Settlement Shrinkage:**

Reinforcement movement during placing of concrete

Settlement of concrete during setting

Dense mixers with low water content

Adequate compaction of low lift

