

1.3 Deterioration Of Stones

The various natural agents such as rain, heat, etc. and chemicals deteriorate the stones with time.

- Rainwater
- Temperature changes
- Wind
- Frost
- Atmospheric impurities
- Vegetable growth
- Living organism
- Chemical agent

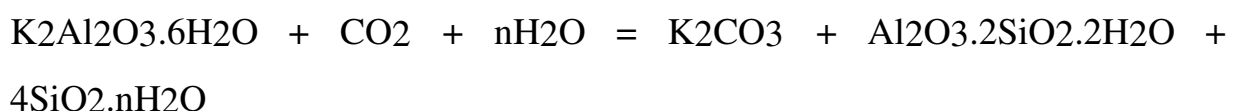
1. Rain

Rain water acts both physically and chemically on stones. The physical action is due to the erosive and transportation powers and the latter due to the decomposition, oxidation and hydration of the minerals present in the stones.

Physical Action: Alternate wetting by rain and drying by sun causes internal stresses in the stones and consequent disintegration.

Chemical Action: In industrial areas the acidic rain water reacts with the constituents of stones leading to its deterioration.

Decomposition: The disintegration of alkaline silicate of alumina in stones is mainly because of the action of chemically active water. The hydrated silicate and the carbonate forms of the alkaline materials are very soluble in water and are removed in solution leaving behind a hydrated silicate of alumina (Kaolinite). The decomposition of feldspar is represented as



(Orthoclase) (Alkaline carbonate) (Kaolinite) (Hydrated silicate)

Oxidation and Hydration: Rock containing iron compounds in the forms of

peroxide, sulphide and carbonate are oxidized and hydrated when acted upon by acidulated rain water. As an example the peroxide—FeO is converted into ferric oxide—Fe₂O₃ which combines with water to form FeO.nH₂O. This chemical change is accompanied by an increase in volume and results in a physical change manifested by the liberation of the neighboring minerals composing the rocks. As another example iron sulphide and siderite readily oxidize to limonite and liberates sulphur, which combines with water and oxygen to form sulphuric acid and finally to sulphates.

2. Frost

In cold places frost pierces the pores of the stones where it freezes, expands and creates cracks.

3. Wind

Since wind carries dust particles, the abrasion caused by these deteriorates the stones.

4. Temperature Changes

Expansion and contraction due to frequent temperature changes cause stone to deteriorate especially if a rock is composed of several minerals with different coefficients of linear expansion.

5. Vegetable Growth

Roots of trees and weeds that grow in the masonry joints keep the stones damp and also secrete organic and acidic matters which cause the stones to deteriorate. Dust particles of organic or nonorganic origin may also settle on the surface and penetrate into the pores of stones. When these come in contact with moisture or rain water, bacteriological process starts and the resultant micro-organism producing acids attack stones which cause decay.

6. Mutual Decay

When different types of stones are used together mutual decay takes place. For example when sandstone is used under limestone, the chemicals brought down from limestone by rain water to the sandstone will deteriorate it.

7. Chemical Agents

Smokes, fumes, acids and acid fumes present in the atmosphere deteriorate the stones. Stones containing CaCO_3 , MgCO_3 are affected badly.

8. Lichens

These destroy limestone but act as protective coats for other stones. Molluses gradually weaken and ultimately destroy the stone by making a series of parallel vertical holes in lime stones and sandstones.

