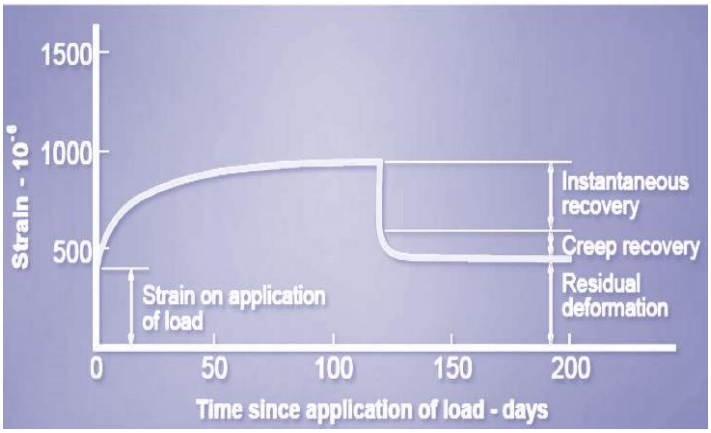
# • Creep of Concrete

Creep is time dependent deformations of concrete under permanent loads (self-weight). When concrete is subjected to compressive loading it deforms instantaneously. This immediate deformation is called instantaneous strain.

Now, if the load is maintained for a considerable period of time, concrete undergoes additional deformations even without any increase in the load. This time-dependent strain is termed as creep.




•Creep of concrete stored under such conditions (creep is simply taken as an increase in strain above the initial elastic strain) that no shrinkage or swelling takes place.

If a specimen is drying while under load, it is usually assumed that creep and shrinkage are additive; creep is thus calculated as the difference between the total time deformation of the loaded specimen and the shrinkage of a similar unloaded specimen stored under the same conditions through the same period.

•If a sustained load is removed, the strain decreases immediately by an amount equal to the elastic strain at the given age, generally lower than the elastic strain on loading.

This instantaneous recovery is followed by a gradual decrease in strain, called creep recovery (Fig. above).

The recovery of creep is not complete, and creep is not a simply reversible phenomenon, so that any sustained application of load, even only over a period of a day, results in a residual deformation.

# Creep

## • Factors influencing creep

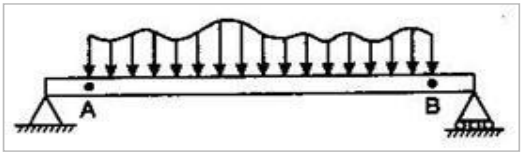
1. **Strength of concrete** : creep is inversely proportional to the strength of concrete at the time of application of the load.
2. **Applied stress level**: There is a direct proportion between creep and applied stress. (There is no lower limits of proportionality because concrete undergoes creep even at very low stress: Higher the stress higher will be the creep).
3. **Ambient relative humidity**: creep increases with the reduction in the relative humidity.
4. Modulus of elasticity of aggregate: the higher the modulus of elasticity the less is the creep.
5. **Water-cement ratio**: creep increases with the increases in w/c ratio. (All other factors which are affecting the water/cement ratio are also affecting the creep)
6. **Age of concrete**.: The rate of creep rapidly decreases with time. The time taken by a concrete structure to attained creep is 5 years.
7. **Cement content in concrete :** The amount of paste content and its quality is one of the most important factors influencing creep: A poorer paste structure undergoes higher creep.
8. **Temperature :** The rate of creep increases with temperature

## • Effects of creep

1. Creep affects strains and deflections and often also stress distribution, but the effects vary with the type of structure.
2. In reinforced concrete, creep results in a gradual transfer of load from the concrete to the reinforcement.
3. In reinforced concrete beams, creep increases the deflection with time and may be a critical consideration in design.
4. In all concrete structures, creep reduces internal stresses due to nonuniform shrinkage, so that there is a reduction in cracking.
5. In mass concrete, creep in itself may be a cause of cracking when a restrained concrete mass undergoes a cycle of temperature change due to the development of the heat of hydration and subsequent cooling.

# Effects of creep on concrete structures

- Creep property of concrete will be useful in concrete structures to reduce the internal stresses due to non -uniform load or restrained shrinkage .




- In mass concrete structures such as dams, on account of differential temperature conditions at the interior and surface, creep is harmful and by itself may be a cause of cracking in the interior of dams