Normally Consolidated Soil: A soil that has never experienced a vertical effective stress that was greater than its present vertical effective stress is called a normally consolidated (NC) soil.

Overconsolidated Soil: A soil that has experienced a vertical effective stress that was greater than its present vertical effective stress is called an overconsolidated (OC) soil.

When the effective pressure on the specimen becomes greater than the maximum effective past pressure, the change in the void ratio is much larger, and the $e$–log $\sigma'$ relationship is practically linear with a steeper slope ($b$ to $c$) or ($f$ to $g$).

This relationship can be verified in the laboratory by loading the specimen to exceed the maximum effective overburden pressure, and then unloading and reloading again ($c – d – f – g$).
Normal Consolidated and Overconsolidated Soils

• Preconsolidation pressure: the maximum effective past pressure, which can be determined as follow (Casagrande, 1936):

1. Establish point \( a \), at which the \( e - \log \sigma' \) plot has a minimum radius of curvature.
2. Draw a horizontal line \( ab \).
3. Draw the line \( ac \) tangent at \( a \).
4. Draw the line \( ad \), which is the bisector of the angle \( bac \).
5. Project the straight-line portion \( gh \) of the \( e - \log \sigma' \) plot back to intersect line \( ad \) at \( f \). The abscissa of point \( f \) is the preconsolidation pressure, \( \sigma_c' \).

• The overconsolidation ratio: \( OCR = \frac{\sigma_c'}{\sigma'} \)
  - The OCR for an OC soil is greater than 1.
  - Most OC soils have fairly high shear strength.
  - The OCR cannot have a value less than 1.

\[ \sigma_c' = \text{preconsolidation pressure} \]
\[ \sigma' = \text{effective vertical pressure} \]
Normally Consolidated and Overconsolidated Soils

Consolidation characteristics of normally consolidated clay of low to medium sensitivity

Consolidation characteristics of overconsolidated clay of low to medium sensitivity