Saint Venant Principle

When considering loads applied to corroded structures, **St Venant's Principle**, which is used to describe how loads and stresses behave in an axially loaded element, may be a consideration The original concept developed by the French elasticity theorist Adhemar Jean Claude Barre de Saint-Venant, is as follows:

Suppose the forces operating on a tiny section of an elastic body's surface are replaced by another statically equivalent system of forces acting on the same portion of the surface. Saint Venant Principle is essential for GATE exam as well. In that case, this redistribution of loading creates significant changes in stresses locally. Still, it has no effect on stresses at distances that are huge about the linear dimensions of the surface on which the forces are altered.

This increase in stress, also known as a stress riser, occurs during abrupt changes in the material's cross-section.

Simple Explanation of Saint Venant Principle

Saint-Venant's Principle basically asserts that stress measured at any point on an axially loaded cross-section is uniform if it is far enough away from the point of load application or if there is any discontinuity in the member's cross-section. In other words, when we compute stress using conventional methods, i.e.,

$$\sigma = P / A$$

we assume that we are sufficiently far from the point of application or any discontinuity for the normal stress to be uniform.

When a point load is applied to a surface, the stress is concentrated at the point of application and eventually equalizes as the distance from the point increases. This stress increase, also known as a stress riser, occurs when the material's cross-section changes abruptly.

Application of St Venant's Principle to Thin Structures

It is commonly known that Saint-Venant's Principle can not be applied to thinner constructions such as shells, beams, and trusses; in the same manner, it can be to a more "solid" object. St Venant's Principle is also extensively used in forming MCQ-based questions the GATE question paper.

Because the load routes in a thin structure are significantly more limited, disturbances go further than expected. This is the same behavior as the hole in the last illustration but more pronounced.