

Assumptions for Flexure Theory and Bending of Beam

What are positive moment, negative moment and reinforcement regarding beam?

A moment that causes compression on top surface of a beam and tension on the bottom surface will be called a positive moment. A moment that causes tension on top surface of a beam and compression on the bottom surface will be called a negative moment. The steel provided in the positive moment region is called positive reinforcement and the steel provided in the negative moment region is called negative reinforcement.

Slab reinforcement: Main reinforcement: Used to resist bending moment due to Live and dead load.

Shrinkage and temperature reinforcement: Used to prevent cracking from shrinkage/contraction of the concrete due to water loss from concrete mass at different stages, temperature variation and differential thermal gradient.

What are the assumptions for flexure theory in beam design?

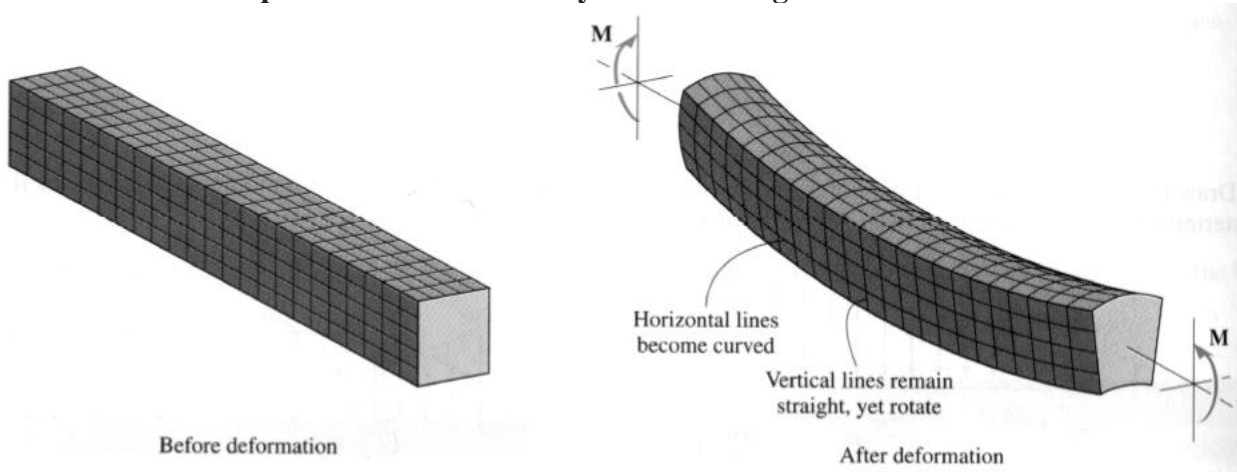


Figure: Initially straight beam and the deformed bent beam

There are three basic assumptions for flexure

- I. Sections perpendicular to the axis of bending which are plane before bending remain plane after bending.
- II. The strain in the reinforcement is equal to the strain in the concrete at the same level.
- III. The stresses in the concrete and reinforcement can be computed from the strains using stress- strain curves for concrete and steel.

Additional

- IV. The tensile strength of concrete is neglected in flexural strength calculations (ACI sec. 10.2.5).
- V. Concrete is assumed to fail when the compressive strain reaches a limiting value.
- VI. The compressive stress strain relationship for concrete may be assumed to be rectangular, trapezoidal, parabolic or any other shape that results in prediction of strength in substantial agreement with results of comprehensive tests (ACI 10.2.6).