1. **Euler-Bernoulli Beam Theory:**
    - Assumption: This is the most basic beam theory and assumes that the beam is slender (long compared to its cross-sectional dimensions) and that plane sections remain plane after deformation.
    - Key Feature: It neglects shear deformation and assumes that the bending occurs only in the vertical plane.
    - Applicability: Suitable for analyzing beams with small deformations and for which shear effects are not significant.
2. **Timoshenko Beam Theory (Shear Deformation Beam Theory):**
    - Assumption: This theory relaxes the assumption of Euler-Bernoulli theory by considering shear deformation effects. It assumes that the shear strain is not neglected, which is important for short and stubby beams.
    - Key Feature: It accounts for the warping effect due to shear deformation and is more accurate for beams with high shear forces or short spans.
    - Applicability: Suitable for beams where shear deformation effects cannot be neglected.
3. **Reissner-Mindlin Beam Theory (Kirchhoff-Love Beam Theory):**
    - Assumption: Similar to Timoshenko theory, it considers shear deformation but assumes that the cross-sections remain flat after deformation.
    - Key Feature: It allows for the modeling of thick beams and is well-suited for analyzing beams with moderate thickness.
    - Applicability: Suitable for beams with moderate thickness where both bending and shear deformations are significant.

These beam theories are progressively more accurate but also more computationally expensive. The choice of which theory to use depends on the specific characteristics of the beam being analyzed and the level of accuracy required for the analysis. In practice, engineers often choose a beam theory that strikes a balance between accuracy and computational efficiency based on the particular application.