

Mechanics of plate fixation

Stiffness of composite beam systems

Tasks

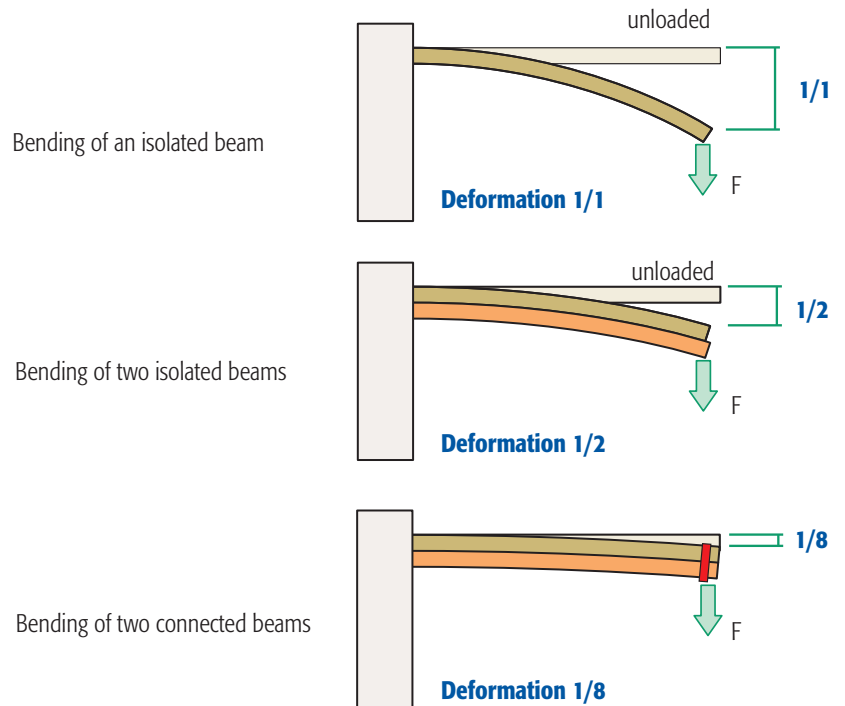
Compare stiffness of beam models

Learning outcomes

- Describe the bending stiffness of isolated beams with respect to composite beams
- Recognize plate fixation of fractures as a composite beam system
- Describe importance of plate position on overall stiffness of internal fixation using plates

Take-home message

- Plate alone is relatively weak
- Stiffness of plate depends on bending direction
- Important increase of bending stiffness when bone and plate are tightly connected
- Composite system with plate on tension side is the most rigid construct under the condition that the fracture can be axially loaded



In plate osteosynthesis stiffness¹ and strength² depend on these elements

Bone	- Cross-section - Quality of bone
Fracture	- Simple versus comminuted fracture - Contact versus noncontact situation
Plate	- Cross-section - Material - Bending direction
Screws	- Anchorage - Number and position - Length of the plate
Fixation	- Splinting - Compression

¹stiffness = the ability of a material to withstand deformation

²strength = the ability of a material to withstand destruction