2.5 I – Shaped girders

The depression at the center of a beam of length *l* and breadth *b* and thickness *d* under a given load M at its midpoint is givenas

$$y = \frac{ml^2}{4bd^3Y}$$

Hence to reduce the bending for a given load, Y of the beam should be large, *b* and *d* of the beam must also be large. The length *l* should be a small as possible.

Since the depression *y* is inversely proportional to d^3, the depression can be reduced more effectively by increasing the thickness *d* rather than increasing the breadth *b* of the beam.

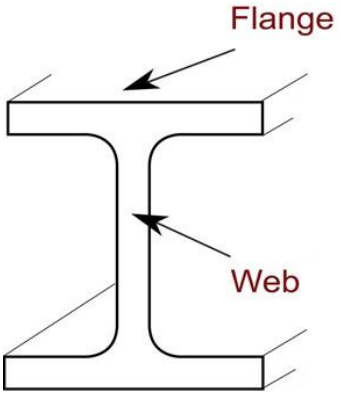
But on increasing the thickness, unless the load is at the center, the beam may bend. This is called buckling of the beam. To prevent buckling, a large load bearing surface is required.

Hence, the beam is designed to have a large thickness to minimize bending and large load bearing surface to prevent buckling. It is known as I section beam (or) girder. The cross-sectional view is in the shape of I.

Girder is a metallic or compound structure beam used for building bridges and the framework of large buildings. It can be classified into three types. Theyare,

- I – Shapedgirder
- Plategirder
- Boxgirder

A large load bearing surface of girder is composed of two load-bearing flanges separated by a stabilizing web to prevent the buckling is called I – shaped girder. The web resists shear forces, while the flanges resist most of the bending moment experienced by the beam.



It has high moment of inertia and stability in bending moment. So, they do not get twisted and tilled easily.

Advantages

- Top and bottom layer of the beam must be withstanding maximum stress.

- As the stress around the neutral layer is small, material in these regions can be moved without loss of efficiency.
- Economically cheap.
- It provides a high bending moment.
- It is made of steel because of high young's modulus.

Applications

- Iron girders used in buildings are made of I section.
- It is also used in I section of railway tracks.