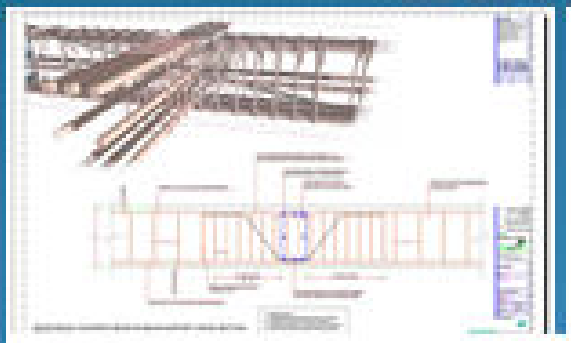
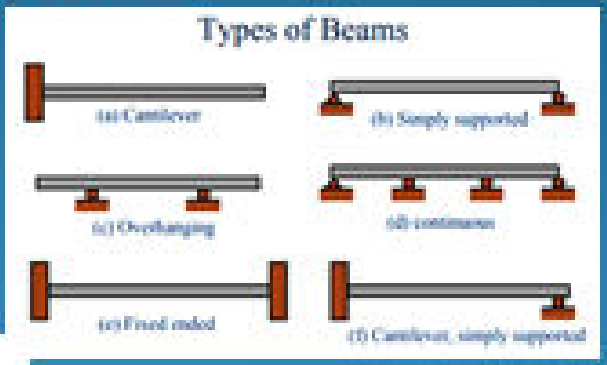
DIFFERENT TYPES OF BEAMS





Prepared by
Eng- Rasty Ali Maruf
Card No - 6754

DIFFERENT TYPES OF BEAMS

INTRODUCTION:

A **beam** is a structural element that is capable of withstanding load primarily by resisting against bending force.

Different types of beams are used in construction of building and structures. These are horizontal structural element that withstand vertical loads, shear forces and bending moments. Beams transfer loads imposed along their length to their end points to walls, columns, foundations, etc.

In this article, different types of beams used in building construction will be discussed based on their manner of support, cross-section shape (profile), length, and their material.

Types of Beams in Constructions :

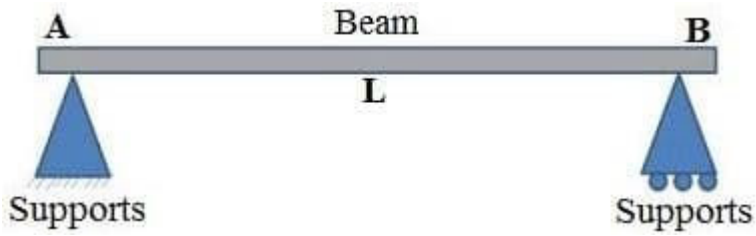
There are different types of beams which are classified based on the following conditions

1. Based on Support Conditions
2. Based on Construction Materials
3. Based on Cross-Section Shapes
4. Based on Geometry
5. Based on Equilibrium Condition
6. Based on Method of Construction
7. Others

Based on Support Conditions :

1. Simply Supported Beam

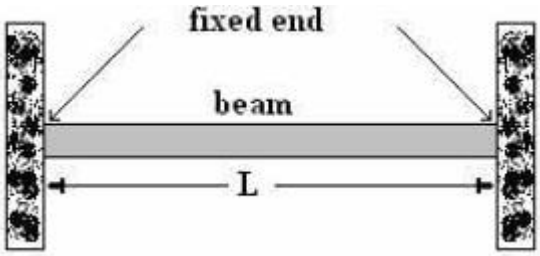
It is the one of the simplest structural elements that both ends are rest on supports but are free to rotate. It contains pinned support at one end and roller support at the other end. On the basis of assign load, it sustains shearing and bending.



Simply Supported Beam

2. Fixed Beam

It is supported at both ends and fixed to resist rotation. It is also called a built-in beam. The fixed ends produce fixing moments other than the reactions.



Fixed Beam

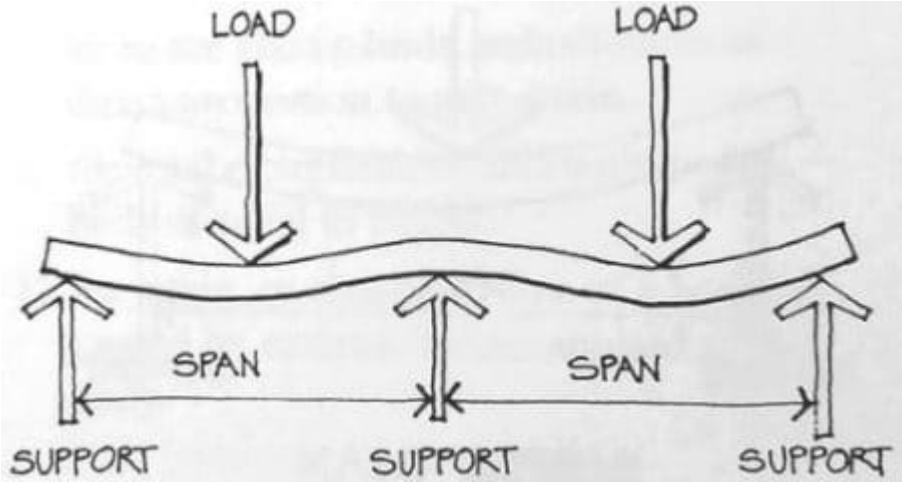
3. Cantilever Beam

If a beam is fixed at one end and set to be free at the end, it is termed as cantilever beam. The beam distribute the load back to the support where it is forced against with a moment and shear stress. Cantilever beams allow the creation of a bay window, balconies, and some bridges.

Cantilever Beam

4. Continuous Beam

A continuous beam has more than two supports distributed along its entire length



Based on Construction Materials :

5. Reinforced Concrete Beams

It is constructed from concrete and reinforcement as shown in Fig. 5.

6. Steel Beams

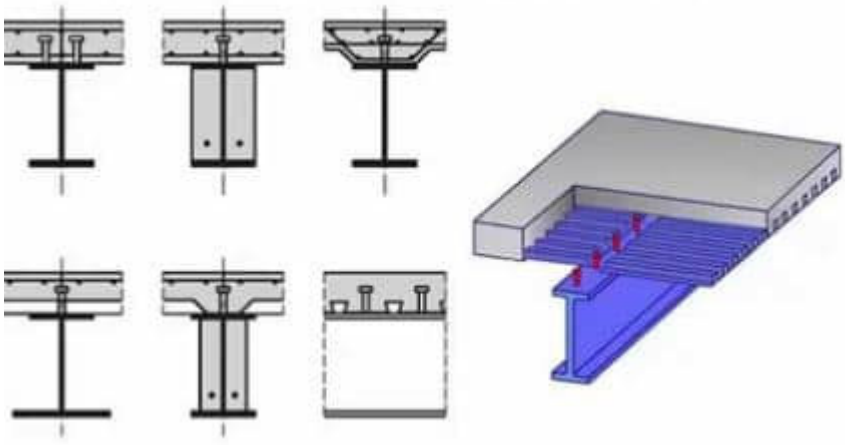
It is constructed from steels and used in several applications.

7. Timber beams

This type of beam is constructed from timber and used in the past, but its application is significantly declined now.

8. Composite Beams

Composite beams are constructed from two or more different types of materials such as steel and concrete, and various valid cross sections have been utilized as shown in fig.8.



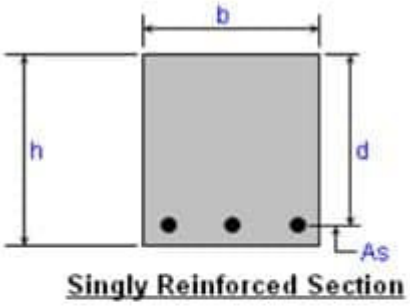
Based on Cross-Section Shapes :

Several cross sectional shapes of beams are available and used in different parts of of structures. These beams can be constructed from reinforced concrete, steel, or composite materials:

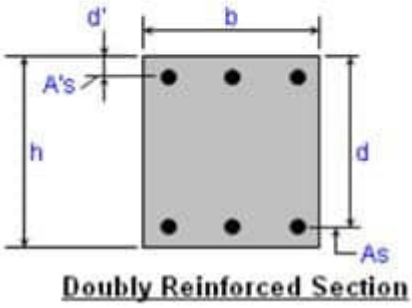
Reinforced concrete cross sectional shapes include:

9. Rectangular beam

This type of beam is widely used in the construction of reinforced concrete buildings and other structures.



Singly Reinforced Section

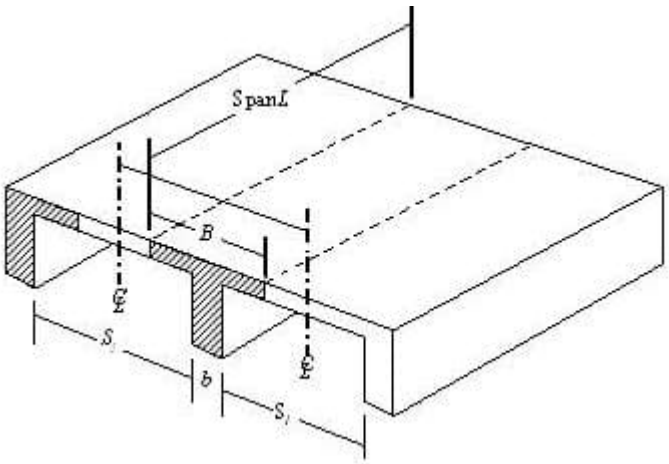


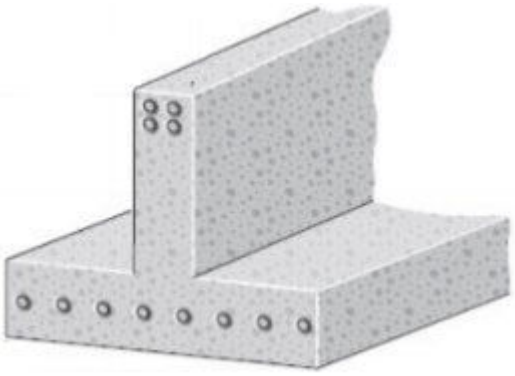
Doubly Reinforced Section

10.T-section beam

This type of beam is mostly constructed monolithically with reinforced concrete slab. Sometimes, Isolated T-beam are constructed to increase the compression strength of concrete.

Added to that, inverted T-beam can also be constructed according to the requirements of loading imposed.





T-section beam

11. L-section beam

This type of beam is constructed monolithically with reinforced concrete slab at the perimeter of the structure, as illustrated in Fig. 10.

Steel cross sectional shapes include:

There are various steel beam cross sectional shapes. Each cross sectional shape offer superior advantages in a given conditions compare with other shapes.

Square, rectangular, circular, I-shaped, T-shaped, H-shaped,C-shaped, and tubular are examples of beam cross sectional shapes constructed from steel.

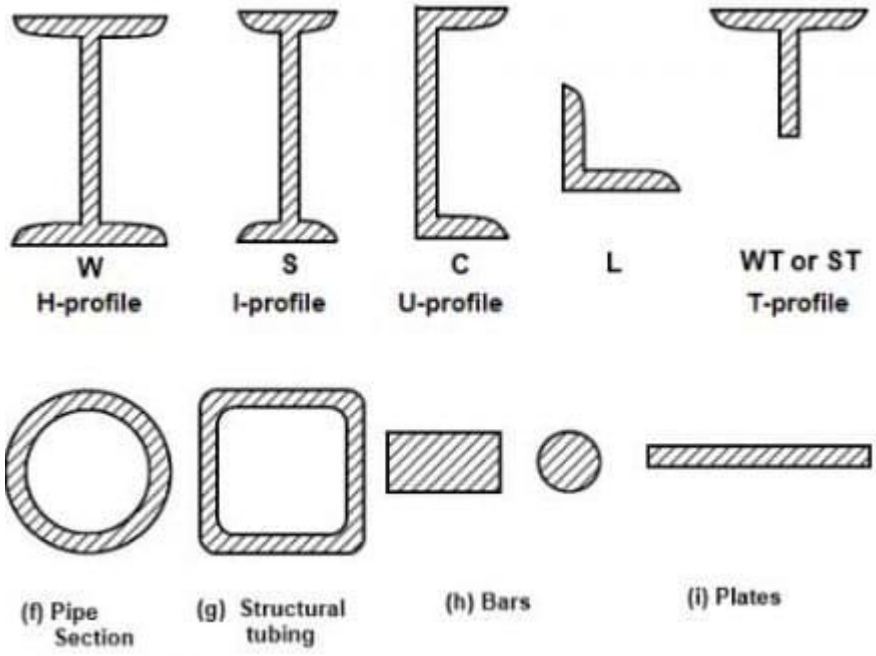


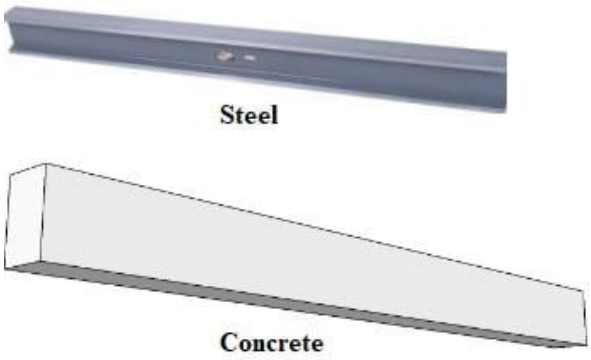
Fig. 12: Steel beam cross sectional shapes

Different types of beams based on cross sectional shapes constructed from composite materials are shown in Fig. 8.

Based on Geometry

12. Straight beam

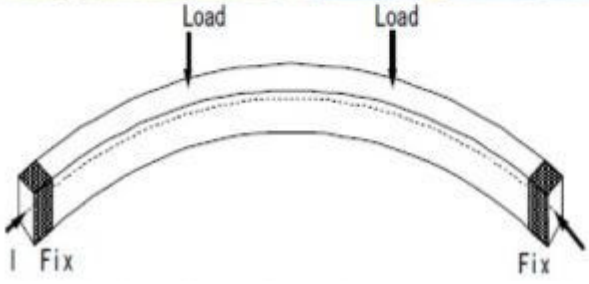
Beam with straight profile and majority of beams in structures are straight beams.



Straight beam

13. Curved beam

Beam with curved profile, such as in the case of circular buildings.



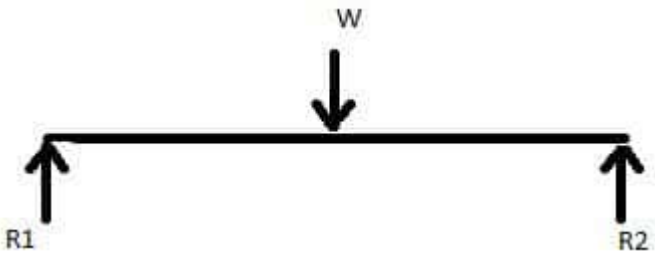
14. Tapered beam

Beam with tapered cross section.

5. Based on Equilibrium Condition :

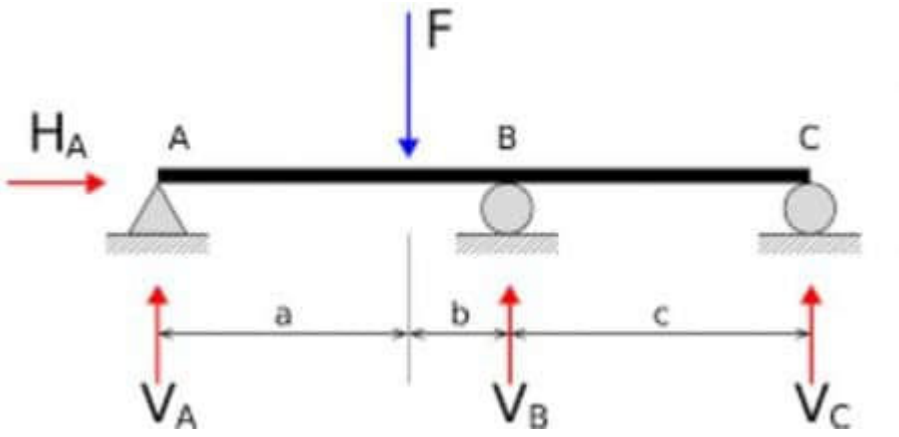
15. Statically determinate beam

For a statically determinate beam, equilibrium conditions alone can be used to solve reactions, i.e the number of unknown reactions are equal to the the number of equations.



16. Statically indeterminate beam

For a statically indeterminate beam, equilibrium conditions are not enough to solve reactions. So, the analysis of this type of beam is more complicated than that of statically determinate beams.



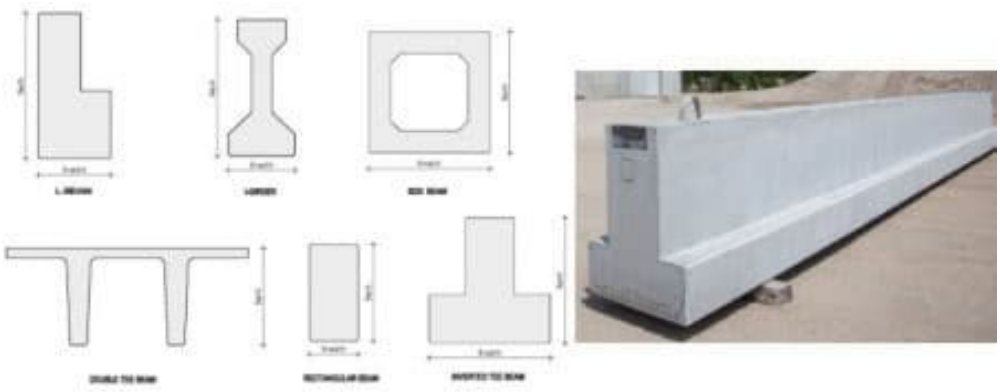
Based on Method of Construction :

17. Cast In-situ Concrete Beam

This type of beam is constructed on project site. so, forms are initially fixed then fresh concrete is poured and allowed to be hardened. Then, loads will be imposed.

18. Precast Concrete Beam

This type of beam is manufactured in factories. So, the construction condition is more controllable compare with on-site construction. Consequently, the quality of concrete of the beam will be greater. Various cross sectional shapes can be manufactures such as T- beam, Double T-beam, Inverted T-beam and many more.



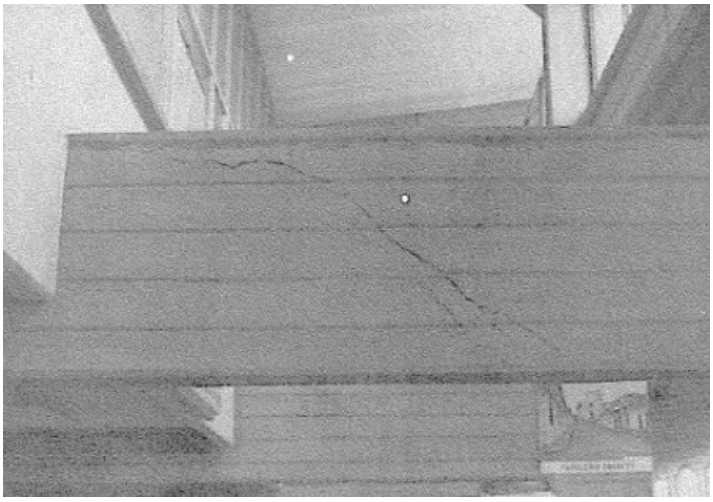
19. Prestressed Concrete Beam

This type of beam constructed by stressing strands prior to applying loads on the beam. Pre-tensioned Concrete beam and post-tensioned Concrete Beam are variations of pre-stressed concrete beam.

Others

20. Deep Beam

beams that have large depths, and its clear span to depth ratio is less than 4 according to ACI Code. Significant amount of the load is carried to the supports by a compression force combining the load and the reaction. Consequently, the strain distribution is no longer considered linear as in the case of conventional beams.



21. Girder

Beams that take heavy loads, generally steel sections are used.