



# **SNS COLLEGE OF TECHNOLOGY**



**AN AUTONOMOUS INSTITUTION**

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**COIMBATORE**

## **DEPARTMENT OF CIVIL ENGINEERING**

**19CET304-DESIGN OF STEEL STRUCTURES**

**III YEAR / VI SEMESTER**

**Unit 5 :Plate Girder**



- A plate girder is a type of steel beam commonly utilized in constructing bridges.
- Plate girders are suitable for carrying heavy loads due to their increased depth and stiffness compared to other beam types.







## Plate Girders Definition

Plate girders are structural elements commonly used in bridge construction, industrial buildings, and other large structures. They consist of welded steel plates that form a deep, rectangular section capable of supporting heavy loads. Plate girders offer several advantages, including their high strength-to-weight ratio and flexibility in design.

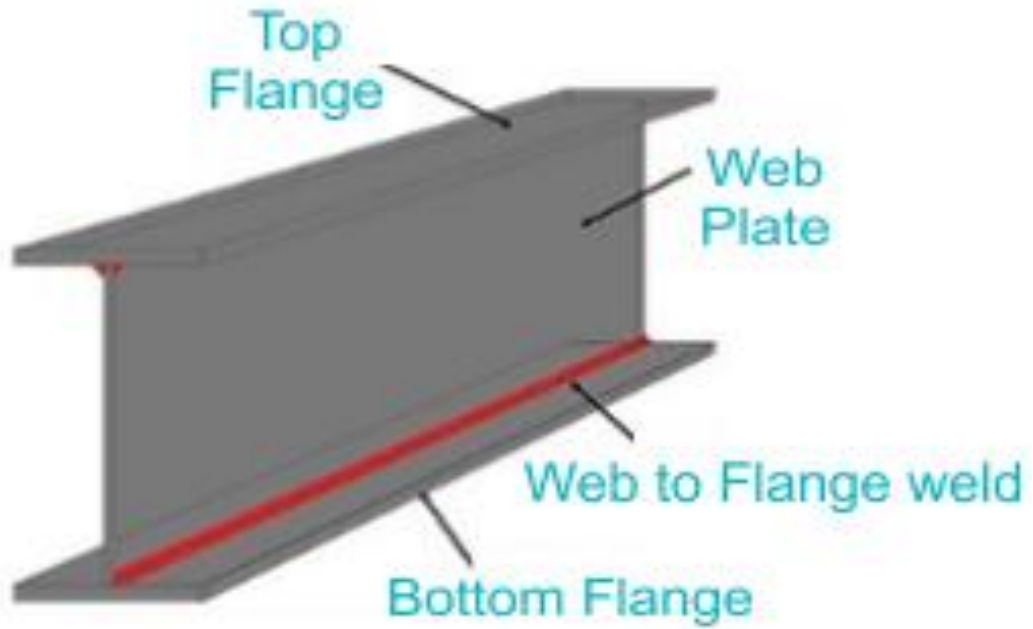


## What are Plate Girders?

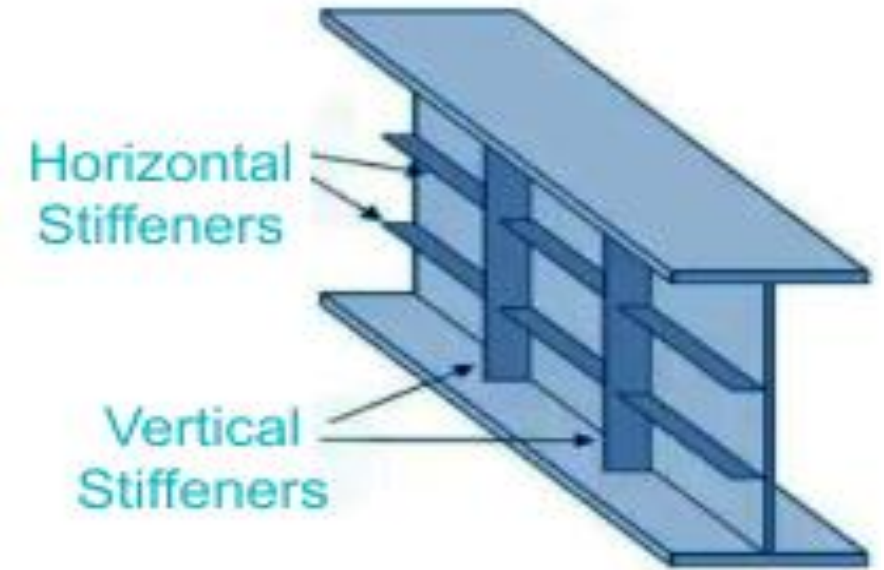
Plate girders in steel structures are built-up beam sections designed to support massive vertical loads over long spans with bending moments greater than the moment resistance of readily available rolled sections. The plate girder is a built-up beam composed of two flange plates fillet welded to a web plate to form an I-section. A typical plate girder diagram depicting its components is shown below.



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- The top and bottom flanges of plate girders are designed to withstand the axial compressive and tensile forces induced by the applied bending moments, while the web is designed to withstand shear.





## Types of Plate Girders

The plate girders can be of two types:-

### **Riveted Plate Girders**

- They are connected by a mechanical method, [riveted](#), and plates are not welded together.
- In general, the web carries 90% of the shear acting on the riveted plate girders.
- The angle section riveted to the flange stabilises the connection between the web and the flange. Rivets must be designed to withstand horizontal shear.
- The rivets that connect the web and flange angles must be designed for horizontal shear and vertical loads that are applied to the flange when they transfer to the web.





## Welded Plate Girders

- Welded plate girders are the most commonly used type of girder in construction due to their ease of manufacture and efficiency.
- These sections are primarily used in the construction of bridges. The plate girder bridge is extremely stiff and can withstand extremely high loads while resisting lateral movements. This action is visible on railway bridges. Welded Plate Girders are also used to create box type girders.

There are empirical or approximation methods for determining the overall height, flange and web thickness of the welded plate girder



## **Advantages of Plate Girders**

Some of the advantages of the use of plate girders are as follows:-

- They can transfer heavy loads.
- They have greater stability.
- Resistance to fatigue failures is high.
- When compared to truss bridges, they are simpler to build.
- Maintenance of the plate girders is simple.
- They facilitate speedy construction.



## **Disadvantages of Plate Girders**

Apart from the advantages, some disadvantages of the plate girders are as follows:-

- They are not suitable for supporting large spans.
- Architectural appearance is reduced by using plate girders.
- It becomes a little difficult to manage during the placement of the plate girders.

The design must be strictly followed during production



## Applications of Plate Girders

Plate girders are widely used as supporting structures in a variety of applications. They are majorly used in the construction of bridges. Plate girders are most commonly found in railway and road bridges. The majority of the old railway bridges can be identified as plate girder bridges. In addition, box girder bridges, beam bridges, military girder composite bridges, and half-through plate girder bridges are also considered as plate girder uses.

Apart from the construction of bridges, some other applications of plate girders are in the construction of:-

- Cranes
- Lifting structures
- Oil and gas platforms
- Load testing
- Ships
- Gantry beams



THANK YOU