Postgraduate Certificate in Structural Steel Design

Design of Steel Plate and Box Girders

AASHTO: American Association of State Highway and Transportation Officials, a organization that develops standards and guidelines for transportation infrastructure in the United States, including the design of steel plate and box girders.

Box girder: A type of bridge girder that consists of a hollow box-shaped cross-section, made of steel plates. It is often used in long-span bridges due to its high strength-to-weight ratio and resistance to torsional forces.

Camber: The intentional curvature provided to a steel plate or box girder during construction to counteract the effects of dead load deflection and ensure that the structure is in a level position when it is in service.

Compression flange: The top or bottom horizontal flange of a steel plate or box girder that is designed to resist compressive forces.

Connections: The components and details used to connect steel plate and box girders to each other and to other structural elements, such as bearings, supports, and diaphragms.

Corrosion: The gradual destruction of steel by chemical or electrochemical processes, which can weaken the material and reduce its load-carrying capacity.

Diaphragm: A horizontal or vertical steel plate that is used to transfer lateral forces between steel plate and box girders and to provide stability and rigidity to the structure.

Fatigue: The process of progressive damage and failure of a material under cyclic loading, which can lead to cracking and fracture of steel plate and box girders.

Flange: A horizontal or vertical plate that forms part of the cross-section of a steel plate or box girder and provides additional strength and stiffness to the structure.

Haunch: The portion of a steel plate or box girder that is located between the web and the flange and is designed to resist shear and bending forces.

Hanger: A steel member that is used to support the weight of a steel plate or box girder and transfer it to the substructure.

Haunch depth: The vertical distance between the bottom of the haunch and the bottom of the web of a steel plate or box girder.

Live load: The temporary or moving loads that are placed on a bridge, such as vehicles, pedestrians, and wind.

Moment of inertia: A measure of the resistance of a cross-section to bending, which is calculated as the sum of the products of the areas of each element and the square of its distance from the neutral axis.

Neutral axis: The axis of a cross-section that passes through the centroid of the area and is neither in compression nor in tension under bending.

Painting: The application of protective coatings to steel plate and box girders to prevent corrosion and maintain their structural integrity.

Plate girder: A type of bridge girder that consists of a series of vertical and horizontal steel plates that are connected to each other to form a stiff and strong structural element.

Shear lag: The phenomenon where the distribution of stress in a steel plate or box girder is not uniform and the stress is concentrated near the loaded area, leading to a reduction in the load-carrying capacity of the structure.

Shear stud: A threaded steel rod that is welded to the top or bottom flange of a steel plate or box girder and is used to transfer shear forces between the girder and the concrete deck of a bridge.

Stiffeners: The vertical or horizontal plates that are used to reinforce and strengthen the webs and flanges of a steel plate or box girder, and to prevent local buckling and deformation.

Strain hardening: The process of increasing the strength and hardness of a material by subjecting it to plastic deformation, which can improve the fatigue resistance of steel plate and box girders.

Tension flange: The top or bottom horizontal flange of a steel plate or box girder that is designed to resist tensile forces.

Transverse stiffener: A vertical plate that is used to reinforce and strengthen the web of a steel plate or box girder and to prevent buckling and deformation under transverse loads.

Ultimate load: The maximum load that a steel plate or box girder can carry before it fails or collapses.

Web: The vertical plate that forms the central part of the cross-section of a steel plate or box girder and is designed to resist shear forces.

Web crippling: The local buckling and failure of the web of a steel plate or box girder under concentrated loads, which can reduce the load-carrying capacity of the structure.

Web post: A vertical plate that is used to connect the web and the flange of a steel plate or box girder and to prevent web crippling and deformation under transverse loads.

Web stiffener: A horizontal plate that is used to reinforce and strengthen the web of a steel plate or box girder and to prevent buckling and deformation under longitudinal loads.

Web thickness: The vertical distance between the top and bottom surfaces of the web of a steel plate or box girder, which affects the strength and stiffness of the structure.

Web yielding: The local buckling and deformation of the web of a steel plate or box girder under high loads, which can reduce the load-carrying capacity of the structure.

Weld: The fusion of two or more pieces of steel by melting and joining them together, which can improve the strength and durability of steel plate and box girders.

Weld access hole: A small hole that is provided in the web of a steel plate or box girder to allow access for welding the flange and the web together, which can improve the strength and durability of the structure.

Weld toe: The sharp corner at the intersection of the web and the flange of a steel plate or box girder, which is a critical location for fatigue cracking and failure.

Yield strength: The stress at which a material begins to yield or deform plastically under load, which is an important property for the design and analysis of steel plate and box girders.