Postgraduate Certificate in Structural Steel Design

Steel Truss Design

A - Analysis, Axial Force

Analysis: The process of calculating the internal forces, displacements, and reactions in a structure due to external loads. In steel truss design, analysis is crucial to ensure the structure can withstand the applied loads without excessive deformation or failure.

Axial Force: A force that acts along the length of a member, either in tension or compression. In steel truss design, members are often subjected to axial forces due to external loads. Proper analysis ensures that these forces are within the capacity of the steel members.

B - Bearing, Bolt, Buckling

Bearing: The pressure or force exerted by a structural member on the support it rests upon. In steel truss design, bearings must be carefully considered to distribute loads evenly and prevent excessive deformation or failure of the supports.

Bolt: A fastener used to connect two or more steel components. Bolts are typically tightened to a specific torque to ensure proper clamping force and load transfer between connected members.

Buckling: A phenomenon where a slender structural member fails due to excessive compressive force, leading to a sideways deflection. In steel truss design, buckling can be mitigated through appropriate selection of member size, material, and end connections.

C - Camber, Compression, Connections

Camber: The intentional upward curvature built into a steel truss member to counteract the effects of dead loads and compensate for potential deflections. Proper camber design ensures that the truss remains level upon installation and during service life.

Compression: A force that acts to shorten or reduce the length of a structural member. In steel truss design, members subjected to compressive forces must be designed to resist buckling and ensure structural integrity.

Connections: The points where steel truss members are joined together. Connections can be bolted, welded, or riveted and must be designed to transfer loads efficiently and ensure structural stability.

D - Deflection, Diagonal, Dead Load

Deflection: The displacement or bending of a structural member due to external loads. In steel truss design, deflection must be controlled to prevent excessive deformation and ensure serviceability requirements are met.

Diagonal: A diagonal member in a truss that connects two nodes, typically providing stability and resistance to tension or compression forces.

Dead Load: The permanent, static load that a structure experiences due to the weight of its own components and any attached materials, such as roofing or cladding. Dead loads must be accounted for in steel truss design to ensure structural stability and safety.

E - Eccentricity, Efficiency, Elastic Design

Eccentricity: The offset or distance between the line of action of a load and the centroid of a member. Eccentricity can lead to additional bending moments and must be considered in steel truss design.

Efficiency: The ratio of a truss's actual strength to the theoretical strength of an ideal truss. A more efficient truss design utilizes less material while maintaining structural integrity.

Elastic Design: A design approach that ensures a structure remains within its elastic range, allowing it to return to its original shape upon removal of external loads. Elastic design is a fundamental principle in steel truss design to ensure long-term structural stability and safety.

F - Factory Production Control, Fatigue, Flange

Factory Production Control: A quality management system that ensures the consistent production of steel truss components in a manufacturing setting. Proper factory production control helps maintain structural integrity and ensures compliance with relevant standards and regulations.

Fatigue: The progressive and cyclic weakening of a material due to repeated loading and unloading. In steel truss design, fatigue can be a critical consideration for structures subjected to cyclic loads, such as wind or traffic.

Flange: The horizontal portion of an I-shaped or H-shaped steel beam that resists most of the bending stresses. In steel truss design, flange dimensions and connection details are essential factors in ensuring structural stability and efficiency.

G - Gantry, Gusset Plate

Gantry: A supporting framework used to lift and move heavy loads, often utilized during the erection of steel trusses.

Gusset Plate: A thick plate used to connect and reinforce the joints in a steel truss. Gusset plates distribute loads between connected members and help ensure structural integrity.

H - Haunch, Hanger

Haunch: A tapered or enlarged portion of a beam or column designed to resist increased loads or moments at a specific location.

Hanger: A tension member used to support the weight of a horizontal or sloping beam, often found in roof

trusses.

J - Joint, Jane-Ville

Joint: The point where two or more steel members are connected. Joints must be designed to efficiently transfer loads and maintain structural stability.

Jane-Ville: A method for determining the forces in a statically indeterminate truss using the method of consistent deformation.

K - Knee Brace, Knowns, Kinetic Energy

Knee Brace: A diagonal or angled brace used to provide additional stability and resistance to lateral loads in a truss or frame.

Knowns: In steel truss design, knowns refer to the quantities and parameters that are explicitly given or can be readily determined, such as member lengths, loads, and support reactions.

Kinetic Energy: The energy possessed by a body in motion. In steel truss design, kinetic energy can be a factor in dynamic load analysis, such as assessing the impact of wind or seismic forces.

L - Lateral Restraint, Live Load, Load Factor

Lateral Restraint: A component or system designed to restrict the lateral movement or deflection of a steel truss member. Lateral restraints help ensure structural stability and maintain serviceability requirements.

Live Load: A variable, time-dependent load that a structure experiences during its service life, such as occupancy, furniture, or snow. Live loads must be accounted for in steel truss design to ensure structural stability and safety.

Load Factor: A factor used in structural design to account for uncertainties and variabilities in load estimation. Load factors help ensure that a structure can withstand its design loads with a specified level of safety and reliability.

M - Moment, Material Grade, Member

Moment: The bending effect caused by an external load or force, expressed in terms of force times distance (Fd). Moments can be either positive (sagging) or negative (hogging) and must be considered in steel truss design to ensure structural stability and safety.

Material Grade: The specific type or category of steel used in a truss member, characterized by its mechanical properties, such as yield strength, ultimate strength, and ductility. Material grade is a critical factor in steel truss design, as it determines the member's load-carrying capacity.

Member: An individual component or element in a steel truss, typically identified by its shape, size, and position within the overall structure.

N - Nodal Point, Node

Nodal Point: A point where two or more steel truss members intersect or connect. Nodal points are crucial in steel truss design, as they represent points of load transfer, support reaction, and stability.

Node: A point within a steel truss where two or more members intersect or connect. Nodes are often the locations of joints, gusset plates,