

Apollo Institute of Engineering and Technology

Assignment

Branch: CIVIL

Subject: Design of Steel Structures (2180610)

ASSIGNMENT -1

Design of Industrial Building

1. Explain various components of an industrial building with suitable sketches. Also, state the factors to be considered for the planning and site selection of an industrial building.
2. Workshop by considering dead load, live load and wind load. The workshop is situated in plain terrain at Delhi and it has total plan dimension of 20 m x 45 m. The truss has total 10 segments. Consider span of truss 20 m, spacing of truss as 4.5 m (c/c), pitch of truss as 1/6, height of building (upto bottom chord of truss) as 15 m, roof sheets of weight 120 N/m², 15 % of opening in wall area, design life for structure as 50 years and terrain with numerous closely spaced obstructions having the size of structures up to 8 m in height. Assume ISMC100 for purlin. Consider important load combinations and also calculate the uniformly distributed load on purlin based on critical load combination.
3. A seven storey building square in plan with floor height 3 m each and 5 bays of 5 m along both the direction is to be constructed at Bhuj. Evaluate wind forces as per IS-875(III) and plot its distribution diagram along the height.
4. An industrial building roof is to be constructed using howe type trusses of 18 m placed at 5.0 m c/c spacing at Ahmedabad. Workout an appropriate truss configuration and purling spacing. Design continuous type purlin only.

ASSIGNMENT -2

Design a gantry girder

1. Design a gantry girder for an industrial shed having plan dimension 16m X 48m. Use following data: (i) Crane capacity=250 kN (ii) Crane weight =8 kN/m (iii) Crab Weight= 30 kN (iv) Wheel base=2.0m (v) Span of gantry girder=6m (vi) Minimum hook distance from the centre of the girder is 1.0 m.
2. Design a gantry girder for following data ...
Span 5.6m simply supported
Span and weight of crane girder 18m, 138kN
Type and capacity of crane ... EOT, 160kN

Weight of trolley 37kN
Minimum approach of hook 1.20m
Wheel base 2.30m
Weight of rail 0.28kN/m

3. Design a gantry girder without lateral restraint along its span carrying EOT crane of capacity 200 kN & center to center distance between column is 10 m. Consider Span of crane girder = 18 m, Wheel spacing = 3.5m, Weight of rail 0.4 kN/m, Weight of crab = 50 kN, Minimum hook approach = 1.2 m. Weight of crane girder = 180 kN. Use Fe 410 steel. Only show the check for shear and moment only for the section.

ASSIGNMENT - 3

Design plate girder

1. Design a welded plate girder for a simply supported bridge deck 20 m in span subjected to a point load of 200 kN at distance 5 m from both ends in addition to the imposed load of 20 kN/m and dead load excluding self weight is 20 kN/m., Provide only end stiffeners and avoid the intermediate transverse stiffener. Use simple post critical method.
2. A simply supported welded plate girder of span 25m is subjected to service load of 60kN/m UDL and two fixed point loads of 250 kN each spaced at 8.5m from each supports. Design the plate girder cross section. Provide all required checks for cross section as per IS code provision. Apply curtailment of flanges
3. A simply supported plate girder for 20 m span is to be design to carry 40kN/m superimposed dead load, and central point load of 450kN. Maximum plate length available is 10 m. Design cross section of the girder and provide required checks as per IS code provisions. Furnish details in L/S and C/S.

ASSIGNMENT - 4

Foot over bridge

1. A foot over bridge is to be designed for the following requirements: (i) Type of truss-N type (ii) Span = 20 m (iii) Live load = 5 kN/m² (iv) Way width = 2.5 m (v) Truss height = 2.0 m. Take Dead weight of truss 1.2 kN/m. Design a cross beam and a bottom chord.
2. A foot over bridge has a span of 28m and width 3.5m. It carries a pedestrian load of intensity 4kN/m². Using a suitable truss geometry find the force carried by the end segment and the segment near centre of top chord member. Design that near centre. Design a typical cross girder.

3. A steel foot over bridge at railway junction is to be design for 24 m span with 4.0 m width. Prepare structural layout and design one cross beam and top chord member near middle of the span.
4. A foot over bridge is of span 16m and pedestrian load of 3 kN/m² . The clear distance between two trusses is 3.2m and truss height is 2.0m. Take dead weight of truss is 1.1kN/m. Assume suitable configuration of truss. Design & detail a cross beam and a horizontal member at support.

ASSIGNMENT - 5

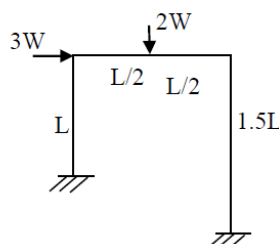
Connections

1. Explain the following connections with neat sketches: beam to beam web angle connection, beam to column flange seat angle connection, moment resistant beam to column connections.
2. Design an unstiffened web angle bolted connection for a beam ISMB300 which transfers a factored end shear of 210 kN to the flange of a column ISHB350 (@67.4 kg/m). Consider M20 bolts of property class 4.6.
3. An ISMB 300@ 433.6 N/m beam has to be connected to the flange of an ISHB 200@ 392.4 N/m column with 20 mm dia bolt. Design unstiffened seated connection for a factored beam reaction of 120 kN. Consider seat angle 150 x 75 x 12 mm and clearance between the beam end and column = 3 mm.
4. A column ISHB 200@ 392.4 N/m has to support a beam ISHB 300@ 433.6 N/m. The beam transmits a factored end reaction of 100 kN. Design an unstiffened welded seat connection. Consider seat angle 100 x 75 x 10 mm and clearance between the column flange and beam = 5 mm.
- 5.

ASSIGNMENT - 6

Plastic Design

1. A fixed beam of '2L' m in span, is subjected uniformly distributed load of 'W' on left half of beam. Determine the collapse load if beam has uniform cross-section.
2. Compute the collapse load in portal frame shown below.



3. Compute the collapse load for the portal frame shown in Fig.1 and design the members if factored $W_u = 72 \text{ kN}$ and f_y of steel is 250 MPa .

