

2.COLOSSUS

HOME

Guess, what is the first thought when it comes to Civil Engineering? Yes, it is **Structures**, the spotlight of Colossus. The basis of a good structure lies in the mix of innovation, analysis, and the determination to create an identity. This edition of ENGINEER offers a hands-on experience in building an innovative structure using aluminium sections.

PROBLEM STATEMENT

Construct a cable-stayed bridge assembly with required specifications and description as given below:-

Design Specifications

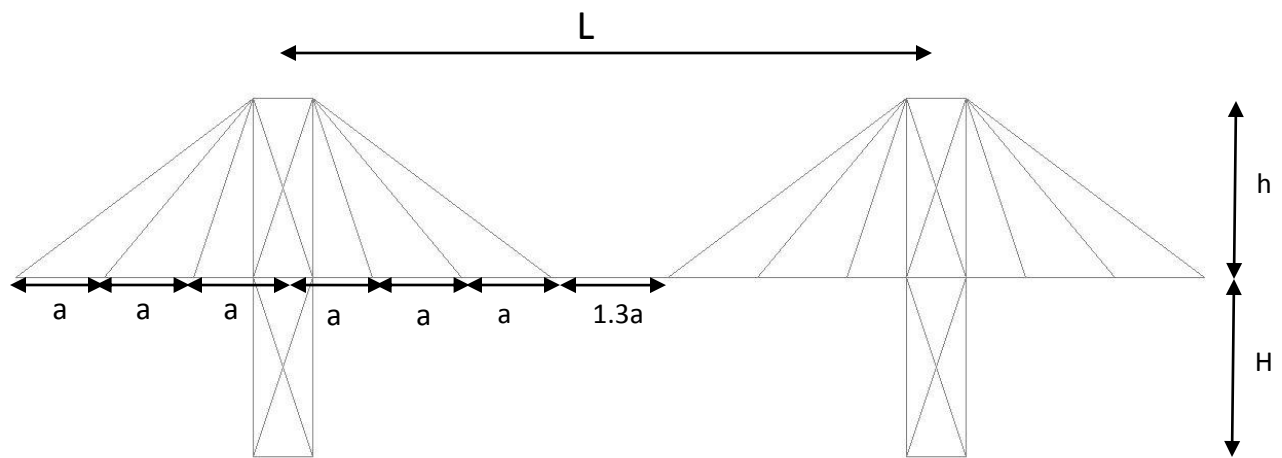
- Minimum height of pylons (below deck, H) should be greater than 300mm.
- The maximum dimension of base section of pylons should be $120 \times 250 \text{ mm}^2$.
- Bridge should have two pylons.
- Centre to centre length between the pylons (L) should lie between 900 mm to 1200 mm.
- Minimum width of the deck should be 200 mm.
- $h/L > 1/5$, where 'h' is height of pylons above the deck.
- The outer girders of the deck are connected to the pylons, each with three inclined cables either side of the pylons. All cables of a girder should be in the same plane.
- The panels length 'a' should be same for all panels(except middle panel length = $1.3 \times a$).
- Cable configurations should be either fan-type, harp-type or mixed-type.

- Provide base at the ends of the cantilever portion of span and at the middle portion of the span for loading.

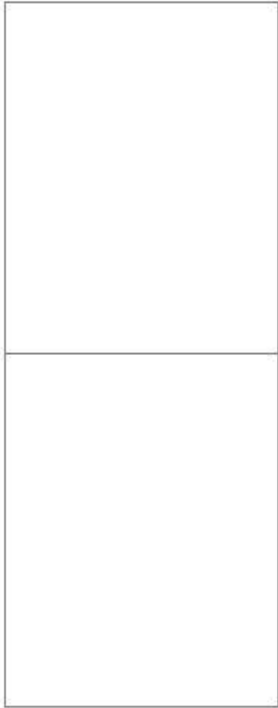
Materials Provided:

- Only L-sections and nut-bolts can be used for the fabrication. Available L-sections are: 10x10x1mm and 15x15x1mm
- Hack saw will be provided during fabrication.
- Drilling tools will be provided as per requirement.
- 1 mm diameter steel wire will be provided as cable-wire.
- Base to anchor the columns with details given below.

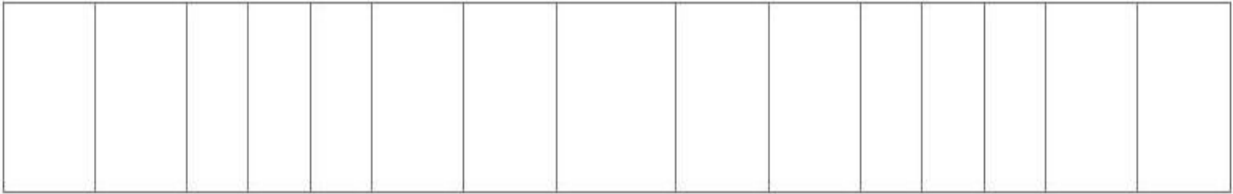
The rough diagrams of cable-stayed bridge are given as:-



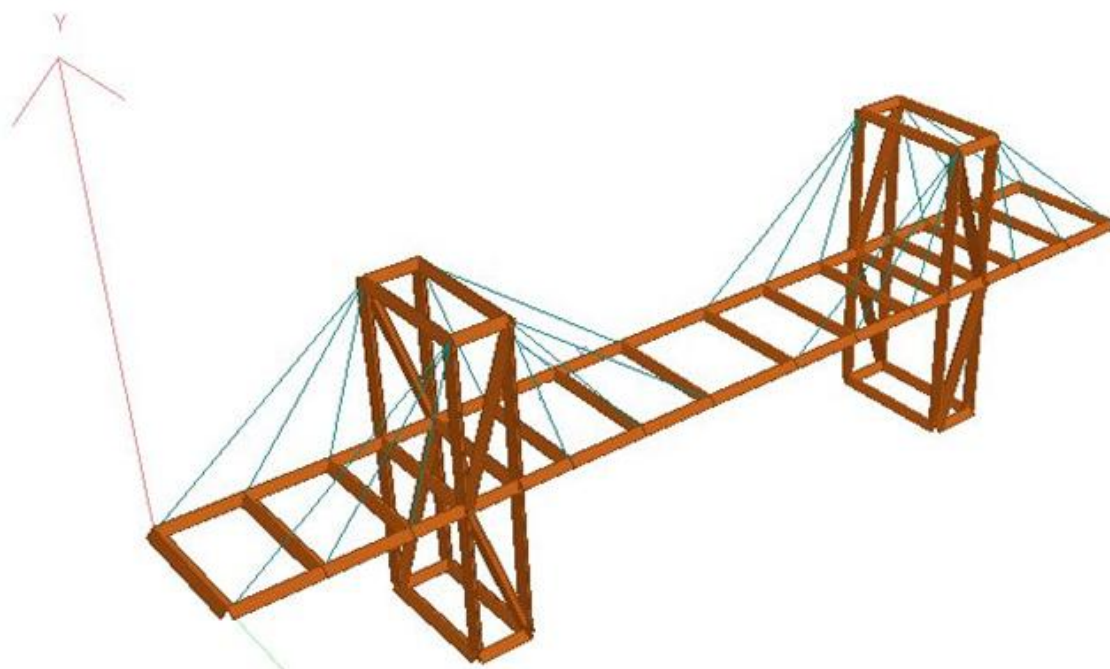
SIDE VIEW



FRONT VIEW

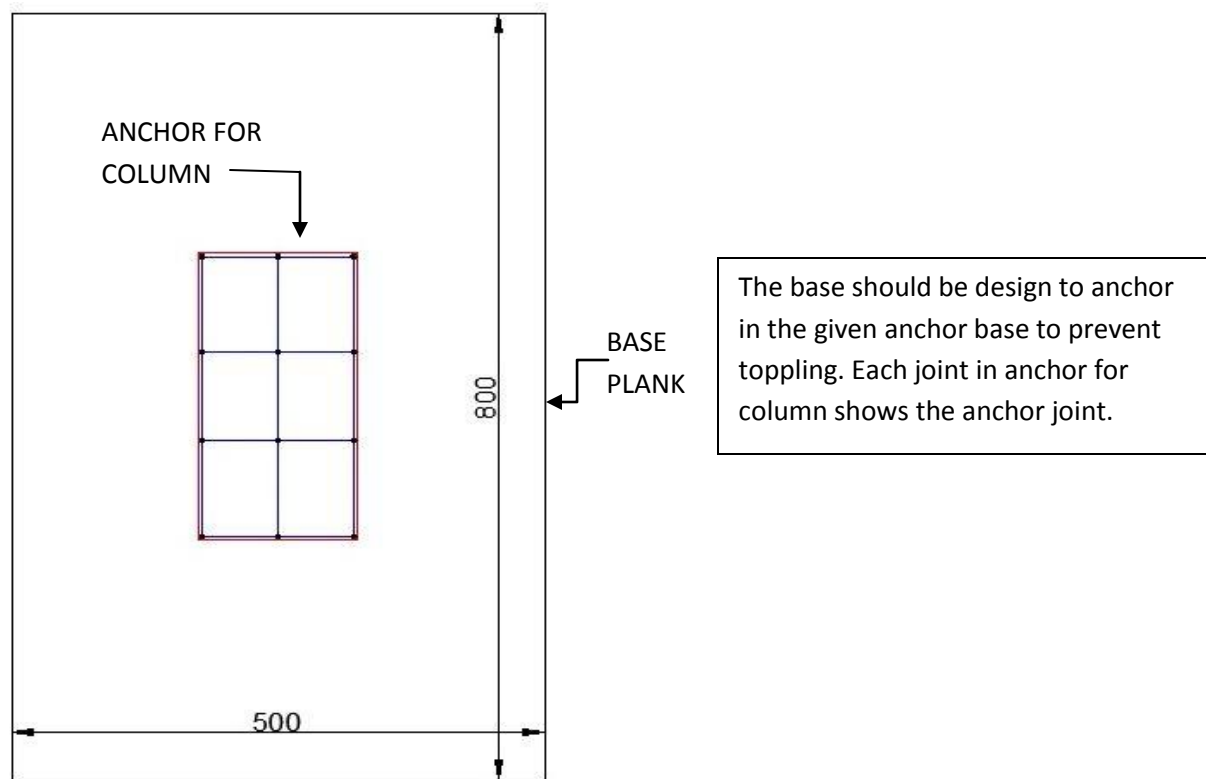


TOP VIEW



3-D VIEW

DETAILS OF ANCHOR FOR THE BASE:



TESTING AND EVALUATION

The designed structure will be tested in two ways

1. Centre of the span is loaded first and should carry a minimum of 15 Kg weight, then cantilever part will be loaded and it should carry a minimum of 7.5 Kg.
2. After successful completion of part one, the central span loading will be increased till failure.

Evaluation Criteria:

1. Load testing on the structure will carry 50% weightage.
2. Total cost analysis and working hour carries 30% weightage.
3. 20% weightage will be given for the design and presentation in Stage I.

Evaluation will be done by done by following formulae:

$$points = \frac{\left(15 + \frac{P}{1.15}\right) * L^2 * H^{0.5}}{C^{2.5} * \Delta * A * h^2}$$

Where,

P = additional load applied after 15 Kg, in Kg

A = base area of column, in mm²

Δ = maximum deflection at the point under load, in mm

L = centre to centre length between the pylons, in mm

H = height of pylons below the deck, in mm

H = height of pylons above the deck, in mm

C = total cost of structure, in units

Calculation of cost:

1. L-section = 35 units/m
2. Nut and bolts = 2 units per peace
3. Steel wire = 20 units/m
4. Labour-cost = 20 units/man/hour

EVENT FORMAT

The event has three stages:

Stage I Teams are expected to send their design and tender document in MS-

word document, AutoCAD drawings etc, through email. Teams will be shortlisted based on these documents. Preference will be given to the team with innovative and economical design. Designs have to be submitted by 18th October 2013.

Stage II Shortlisted teams will be invited to the Engineer'13 and are required to give a power point presentation explaining their design methodology, analysis, and economics. The teams should justify why their design is unique. Judges would prefer to see the design analysis of the structures done using STAADPro or SAP during the presentation.

Stage III After the presentation, participants can build their structure according to their respective designs, using the materials and tools supplied by the organizers. After completion of construction, the structure will be tested in the presence of the team.

Last date for submission of design and tender is 19th October 2013

Details expected in the tender

- Analysis and design of the structure in word document.
- Amount of materials required and the total cost of the materials. The tender should also give the total number of man hours required to complete the construction in terms of cost and time in word document.
- Plan and elevation of the structure in AutoCAD drawing format or any 2D or 3D rendering.

ELIGIBILITY

- Each team can include a maximum of three members. They need not be from same institution.
- All members of the team should be enrolled as students in an educational institute.
- No person can be a part of more than one team.

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