

COLOSSUS

Colossus provides design and management experience, opportunity to learn fabrication processes, and the excitement of networking with and competing against teams from other colleges and universities.

Problem statement:

Design and fabricate a Basic Arch Bridge assembly with required specifications and description as given below:-

Design Specifications:

- Minimum height of bridge (H) should be 500mm
- Maximum two supports (single span)
- Centre to center length between the supports (L) should lie between 800mm to 1200mm
- The maximum dimension of base section of support should be 10X250 mm
- Minimum width of the deck (W) should be 250 mm
- Each joint should have minimum of two members bolted to the flat section provided.
- Use equal panel length at the center (a)
- Use equal panel length at the ends (b)
- Provide base at the middle portion of the span for loading
- Basic truss configuration can be Warren type, K-Truss type, Howe type or Pratt type.

Materials Provided:

- Only L-sections, flat sections and nut-bolts can be used for the fabrication.

L-section are: 13x13x1mm, 19x19x1mm

Flat section 20mm wide

2mm thick (as gusset plate)

- Hack saw will be provided during fabrication.
- Drilling tools will be provided as per the requirement for bolting, welding is not permitted.
- No additional support or anchorage will be provided during testing.

Schematic Figures:

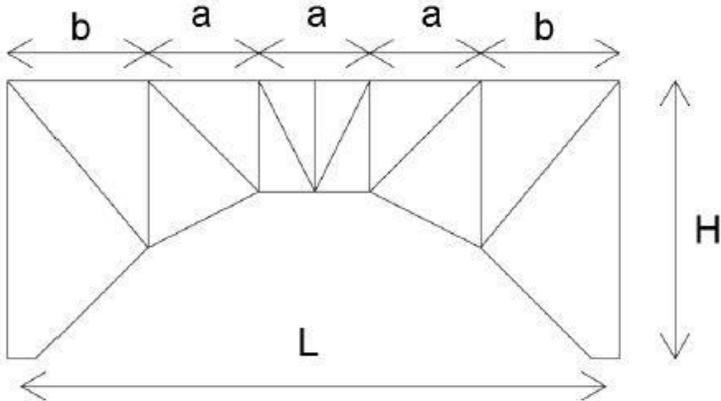


Fig 1: Elevation of the bridge

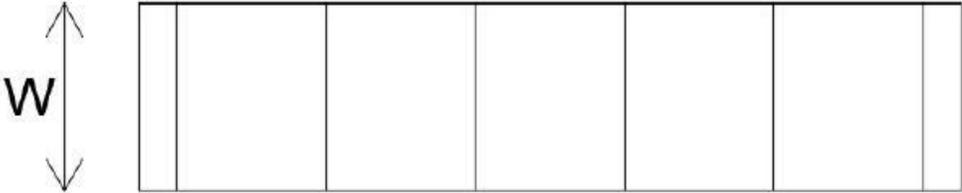


Fig 2: Top View

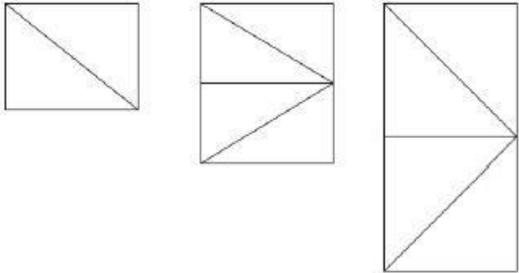


Fig 3: Side View

Testing and Evaluation:

The fabricated model will be tested in two stages

1. Centre of the span is loaded first and should carry a minimum weight of 15 Kg
2. The bridge that qualifies the stage 1 is subjected to an increment in load till the failure and vertical deflection at the middle of the span is noted.

Evaluation Criteria:

1. Ultimate load carrying capacity of the bridge and deflection recorded would carry 80% weightage.
2. Design, specification and presentation would carry 20% weightage.

The overall performance of the bridge will be rated based on Construction cost and Structural Efficiency.

Structural Efficiency:

The bridge with the highest structural efficiency will win in the structural efficiency category.

$$= \textit{Ultimate load Carrying Capacity (Kg)} \times 50,000 (\$/Kg) / \{ \textit{Aggregate deflection (mm)} \times 1,000,000 (\$/mm) + \textit{Weight of Bridge (Kg)} \times 30,000 \}$$

Construction Economy:

The bridge with the lowest construction cost will win the construction economy criteria.

Construction cost is computed as

$$= \textit{Total time (hours)} \times \textit{number of builders (persons)} \times 50,000 (\$/person-hour) + \textit{Cost of materials (\$)} \times 75,000 + \textit{Test penalties (\$)} \times 5,000$$

Calculation of cost:

1. L-section (13x13x1mm) = 10 \$/mm
2. L-section (19x19x1) = 15 \$/mm
3. Flat section (20x2mm) = 50 \$/mm
4. Nut and bolts = 5 \$ per piece

Note: Usage of other materials is prohibited and may lead to test penalties that may range up to 100\$.

Event Format:

The event has three stages:

Stage I:

Teams are expected to send their design and tender document with Institution name and team name and AutoCAD drawing 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 9th October 2018.

Stage II:

Shortlisted teams will be invited to the Engineer'18 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 structure done using STAAD Pro 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. No changes can be made to the design after the presentation. After completion of construction, the structure will be tested in the presence of the team.

Safety is paramount. The competitors, advisers, hosts, and judges take all necessary precautions to prevent injury to competitors, judges, host personnel, and spectators. Risky procedures are prohibited.

Load testing is stopped if sway or deflection exceeds specified limits, or if collapse is imminent. Bridges that cannot be constructed and loaded safely are withdrawn from competition. Students are requested to practice safe fabrication procedures and seek appropriate instruction and supervision.

Details expected in the tender:

- Analysis and design of the structure in word document with College name and team name
- Quantity of material required and the expected total cost. The tender should also give the approximate total number of man hours required to complete the construction
- 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.

Note: In case of any revision to the rules or specifications, are published on the web site <http://www.engineernitk.org/civil.html> and do not appear in this document although they are formal addenda to the rules. Should you have any questions, clarifications please write to rakeshnagasai123@gmail.com, the Submission of design and tender document can also be sent to this email address well within the deadline.

Registration Fee: Rupees 200/- per team

Last date for submission of design and tender documents: 11:59 pm , 9th October 2018.