

NATIONAL AWARD COMPETITION FOR STUDENTS 2021



Civil/Structural Engineering Students For Best Innovative Structural Steel Design

Competition Theme :
Iconic Steel Roof Structure over An Open-Air Theatre & Stage



Institute for Steel Development & Growth

Announcement for NACS (C) 2021
NATIONAL AWARD SCHEME FOR CIVIL/STRUCTURAL ENGINEERING STUDENTS
FOR BEST INNOVATIVE STRUCTURAL STEEL DESIGN
THEME: ICONIC STEEL ROOF STRUCTURE OVER
AN OPEN-AIR THEATRE & STAGE

THE INSTITUTE

The Institute for Steel Development and Growth (INSDAG) is a non-profit making member-based organization, promoted and established at Kolkata by the Ministry of Steel, Government of India and the main steel producers of the country. Some of the major roles of the Institute are: awareness about benefits of steel and steel usage; preparing guidebooks, handbooks to facilitate cost effective design and construction by professionals; upgrading competence and skills of professionals by organizing refresher courses / training; communicating the benefits of steel vis-à-vis other competitive materials through life cycle cost studies etc.; regular interaction with Bureau of Indian Standards, Indian Road Congress and RDSO (Railways) for expediting revision in steel related codes for efficiency and cost effectiveness; providing requisite thrust to increased usage of steel and a host of other activities.

**To work in unison
with all the
stakeholders
in the Steel Industry
so as to evolve
ways & means for
more efficient
use of steel
and provide
optimum value
to the
customer**

THE COMPETITION

This National Level "Competition for Civil / Structural Engineering Students for Best Innovative Structural Steel Design" organized by INSDAG is entering into 21st consecutive year. This Competition aims at enkindling the thoughts and skills of the students to come up with efficient designs reiterating the multifarious advantages of steel intensive construction such as flexibility in design, economic and ecological benefits, speedy construction, cost effectiveness, life cycle cost benefit etc.

Owing to the keen interest generated among the students, INSDAG is pursuing the task of arranging an interesting and challenging competition every year for the students of Civil / Structural Engineering studying in the Colleges all over India with a view to recognize, appreciate and finally reward the talents of would-be Civil / Structural Engineers for "Excellence in Structural Steel Design".

THE BRIEF

The Brief on the subject of the Competition is available in this brochure along with the **Announcement**.

THE PRIZE

1st Prize (1 no.)	:	Rs. 45,000/- + Certificate
2nd Prize (2 nos.)	:	Each Rs. 30,000/- + Certificate
3rd Prize (2 nos.)	:	Each Rs. 20,000/- + Certificate

Participation certificate will be provided to all the eligible participants.

ELIGIBILITY

The " **Competition** " is open to all the **final year / pre-final year Civil/Structural Engineering Students** from any AICTE approved University / Engineering College in India offering Full Time Undergraduate & Post Graduate Degree Courses.

- **UG students: Team of maximum 4 (four) students in the team**
- **PG students: 1(one) PG + maxm. 3(three) UG students or 2 PG students in one group**

THE SELECTION

Four Zonal Selection Committees (one each from the East, West, North and South Zones) consisting of renowned academics and professional engineers are entrusted the task of preliminary screening of the entries received in each zone. In this **Initial Round**, 16 (sixteen) best entries will be selected (4 from each zone) based on overall merit of the proposals, in accordance with the criteria formulated by the Committees.

16 individuals/groups of the short-listed entries will be invited to Kolkata to present important aspects of their entry before the **Central Selection Committee** during the **Final Round** of Competition expected to be held **January 2022 in Kolkata**. The top five proposals will receive the **Prizes**.

ENTRY / APPLICATION (SOFT COPY FOR THIS YEAR ONLY)

The **last date to send Expression of Interest (EOI) is 21st September 2021 and final Entry** for the Zonal Round of Competition is **15th October, 2021**. The Expression of Interest (EOI) shall be sent to **INSDAG, Kolkata** and the entries shall be **directly sent to the respective Zonal Coordinators through email** at the addresses mentioned hereafter **with intimation to INSDAG**.

The Zonal Coordinators

NORTH ZONE (J&K, Punjab, NCR, Haryana, UP, MP, Uttarakhand, HP)

Dr Veerendra Kumar, Professor & HOD
Department of Civil Engineering
Indian Institute of Technology, BHU
Varanasi 221005, U.P.

Email : vkumar1655@yahoo.co.in
vkumar.civ@itbhu.ac.in

SOUTH ZONE (Kerala, TN, AP, Telengana, Karnataka)

Dr. R. Senthil

Professor & Head
Department of Civil Engineering
Anna University, Chennai - 600 025

Email : senthilr68@gmail.com

EAST ZONE (WB, Bihar, Jharkhand, Odisha, Assam, Chhattisgarh, Tripura, Meghalaya, Manipur, Arunachal Pradesh)

Dr. Saroj Mandal, Professor & Former Head

Department of Civil Engineering
Jadavpur University, Kolkata-700032

Email: mailto:sarojmandal@rediffmail.com;
saroj.mandal@jadavpuruniversity.in

WEST ZONE (Rajasthan, Gujarat, Maharashtra, Goa)

Dr. Meera Raghunandan

Assistant Professor
Department of Civil Engineering
Indian Institute of Technology, Bombay
Powai, Mumbai – 400076

Email: meerar@iitb.ac.in
meerar@civil.iitb.ac.in

All Submission in Soft Copy Only

Expression of Interests (EOI) and Intimation for Submission to INSDAG shall be sent to the following address:

Email: ins.steel@gmail.com ;
insdag@rediffmail.com

Contact : Nibedita Dey (9830566354)

SUBMISSION

The participants are advised to send their entries / applications containing the following:

1. General Arrangement and Design drawings showing Plan, Elevation and Sectional views highlighting the structural systems of the proposed structure. (Recommended scale for detail views should not be less than 1: 10). Submission in soft copy(PDF & AutoCAD).
2. Detail drawing(s) showing Structural Steel details: any truss members, portal frames, beams, column, bracings, claddings, etc. in accordance with 'Design Scope'. All drawings should be drawn in AutoCAD or similar software.

3. Drawing sizes should be **A3** only and should be presented in soft copies (AutoCAD and PDF).
4. Design calculations (A4 size paper) should be complete in all respects and neatly presented. Use of standard analysis software like STAAD Pro SAP 2000 etc. is desirable. **Design checks for the selected sections (atleast one from each type) shall be presented manually preferably in Excel spreadsheets. Analysis of at least one frame/truss must be done in 2D.** Connection design, typical detail of important junction, splice details and detail sketches with proper dimensions must be submitted.
5. All computer input and output files are to be submitted in soft form only.
6. A brief write-up (Max. 2000 words, duly typed on A4 size paper) on the work (consisting of considerations / assumptions, description of the proposal, highlights / special features, etc.) duly authenticated by HOD / Principal/guiding faculty shall be submitted.
7. No Perspective views, walkthroughs (videos) are required and it will not carry any marks.
8. A brief resume of the student(s) / applicant(s) containing name, address, phone / fax / e-mail, name of University / College, year of study and registration / roll number of the participant(s), and recent passport-size photographs (for each participant) should be submitted in soft copy only.
9. Scan copy of a certification from the Principal / HOD / Registrar of his / her Institute on office pad declaring bonafides under office seal / stamp should also be submitted.

OTHER RULES

1. **To be eligible for participation in the Competition it is essential for each student to enroll himself / herself as a student member of INSDAG before submitting application/entry to the respective Zonal Coordinators.**
2. Originality of work is essential and the application will be disqualified, if found otherwise.
3. The decision of the Expert Committees will be final and binding. Canvassing in any form will lead to disqualification.
4. Outstation (Institutions situated outside greater Kolkata) candidates appearing for the Final Round of Competition at Kolkata will be reimbursed with to-and-fro Air Conditioned (AC) 3-Tier/Chair Car Rail Fare by the shortest route on production of proof of travel. Accommodation in Guest House / Hotel will be considered depending upon availability.
5. Family members and relatives of Expert / Selection Committee and INSDAG Employees are debarred from taking part in this Competition.
6. All the entries / proposals received by INSDAG at all stages of the above Competition will be treated as property of INSDAG and will not be returned to the participants. Moreover, INSDAG will not take any responsibility in case of missing of any documents / communications from any side while in transit.

BRIEF OF NACS (C) 2021

INTRODUCTION

Considering the safety regulation and social distancing norms of COVID-19, an outdoor theatre for different programs will be an option to give relaxation and enjoyment to the audiences. Especially in this year of pandemic where people got exhausted with lockdown stress and less movement and social gatherings, an open air theatre can bring good interaction and connection between the performers with audiences who can be ensured safety with reduced seating.

APPOINTMENT AS CONSULTANT

INSDAG wishes to provide most economical and aesthetically pleasing schemes and all relevant design and detail drawings thereof, to the Urban Authority.

Considering that you have been appointed as a structural consultant for this project and have been asked to furnish structural solution for **“Iconic Steel Roof Structure over An Open-Air Theatre & Stage”**, and the task is to prepare a report that should have the following scope:

1. Development of an Economical and Aesthetic structural scheme within the specified requirement.
2. Structural design engineering and Detail drawings for the developed structural scheme.
3. Bill of materials.

FACILITIES

Client/ Architect has specified the following requirements for the proposed project:

1.	Site Location	:	Kolkata, West Bengal
2.	Total length of the Open-Air Theater (Curved) with Stage	:	As shown in the Diagram.
3.	Column/ Trestle/ Any Support Structure Location	:	Outside / Backside of the theatre and Stage (Enough open space around the OAT)
4.	Column/ Trestle/ Any Support Structure Shape	:	As per Design. No Limitation
5.	Type of Roof Structure	:	Cantilever /Space Frame/Cable Supported/Tensile Membrane or any other Roof Structure. Roof over Seating area and Stage may be separated or overall one roof covering whole area
6.	Depth of Roof Structure	:	As per Design. No Limitation.
7.	Roofing	:	Colour Coated Steel Sheet/ Any Suitable Material
8.	Span of Roof Structure	:	Based on the Design. No Limitation
10.	Minimum Clear height below lowest roof member	:	Min 6 m above the stage floor level, Min 8.5 m Top seat level of OAT & Min 10.5 m from OAT floor
11.	Side walls	:	No side walls to be designed. There is railing around the OAT as shown in the Sketch
12.	Overhang	:	Minimum 1.5 m if overhang is provided to cover the OAT and Stage without considering the inclination of rain and sunrays.

MATERIALS FOR CONSTRUCTION

1.	Foundation system	:	R.C.C. of minimum grade M25
2.	Structural members like columns, beams, members and bracing systems	:	Structural steel of mild steel (grade E250BR) or high tensile steel (grade E350 / E410)
3.	Roof & Cladding if any	:	Standard Colour Coated Steel Sheet/material for Tensile structure/ Any suitable material

STANDARD SHAPE OF THE STRUCTURE

While considering the shape and arrangement of the Structure, aesthetics, economy as well as structural integrity of the entire system has to be considered. The shape and orientation of the structure shall be such so as to attain maximum benefit out of all the natural resources available surrounding the structure.

DESIGN LOADS

1. Dead Load:

Dead load will be the weight of the structure itself along with all permanent weight carried by it as per IS 875- Part 1(latest version)

2. Live Load:

Live load - as per IS: 875 Part 2 –Latest version

3. Wind Load:

Basic wind speed to be as per latest IS: 875 Part 3- Latest version (Please check against Site location).

4. Seismic Load:

Seismic Zone to be considered as per latest IS: 1893-latest version (Please check against Site location).

5. Other Loads:

Temperature variation of 15°C has to be considered. Please consult relevant specification for other specific loads and action points. Electrical and other allied loads from bottom of roof structure: 20 kg per sq. meter.

GUIDELINES

The following guidelines should be taken into consideration:

1. Items designed in accordance with design scope, should be checked for axial, bending, bearing stresses etc. as applicable. Equivalent stresses and any other stresses necessitated by the relevant codes should also be calculated.
2. Deflection calculated should be within stipulations given in relevant IS code.
3. For designing of Base Plates and Foundation Bolts, grade of concrete to be considered as mentioned above.
4. For foundation design consider Safe Bearing Capacity as 150.0 kN/m² at 3.0m from GL. No tension in bearing pressure due to uplift for DL+WL condition is allowable.
5. For basic parameters of the OAT and stage see attached sketch.
6. While selecting the steel sections for use, please refer INSDAG website or any manufacturer's website for availability.

DESIGN SCOPE

For designing the building, the following scope of work needs to be undertaken:

1. Layout Plan, Elevation and Sectional views should show the arrangement facilities provided.
2. Beams & Columns: **Parallel Flange sections** [refer IS 12778] in place of MB Sections [refer IS 808], built-up sections, Tubular Sections [refer IS 1161 and IS 4923]. Latest versions of all the IS codes to be used. **Use of parallel flange sections in place of MB Sections will give extra credit point the participants.**
3. Truss members if any: IS 808, IS 1161 and IS 4923.

4. Connections: All connections shall be either welded connection or bolted connection using mild steel or high tensile black bolts, turned bolts or HSFG bolts.
5. The design and detailing of the following items shall be done:
 - a. Analysis of the structure in 2D or 3D as applicable.
 - b. Foundation System
 - c. All Columns / trestles and Girders / Beams
 - d. All Truss members, Posts, Purlins and Girts
 - e. All Bracings, Struts and cables / steel ropes.
 - f. Connection designs for Critical joints
 - g. Any other members conceived in the scheme.
6. Bill of Materials: A bill of materials (in A4 sheet) should be prepared for all items under design scope to determine the quantity of materials required.

EXCLUSIONS

Structural bearings for supports and all allied services like electrical fittings.

DESIGN STANDARDS

1. Design

Latest version of code and standards are to be used

- Steel design - IS: 800
- Concrete design - IS: 456
- Live load - IS 875 Part 2
- Wind load - IS 875 Part 3
- Seismic load - IS: 1893

2. Material

- Rolled sections and plates- IS: 2062
- SHS/RHS - IS: 4923
- CHS - IS: 1161

3. Welding

- Symbols for welding - As per IS: 813 – Latest version
- Weld joint details - As per IS: 9595 – Latest version

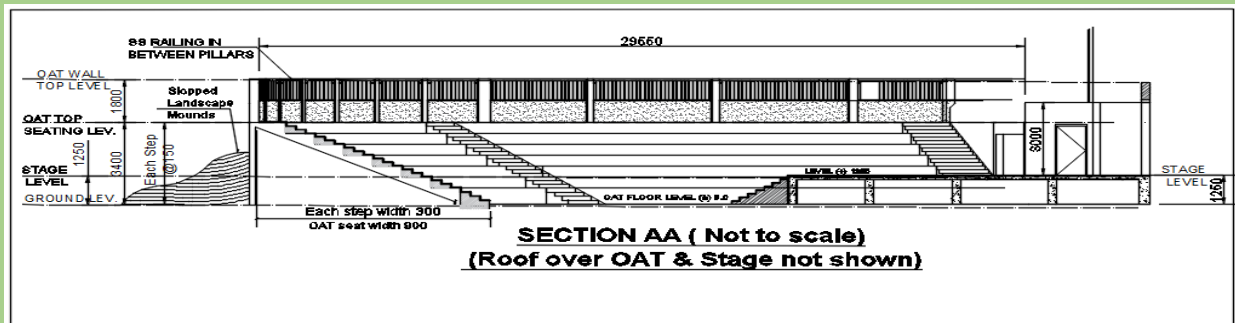
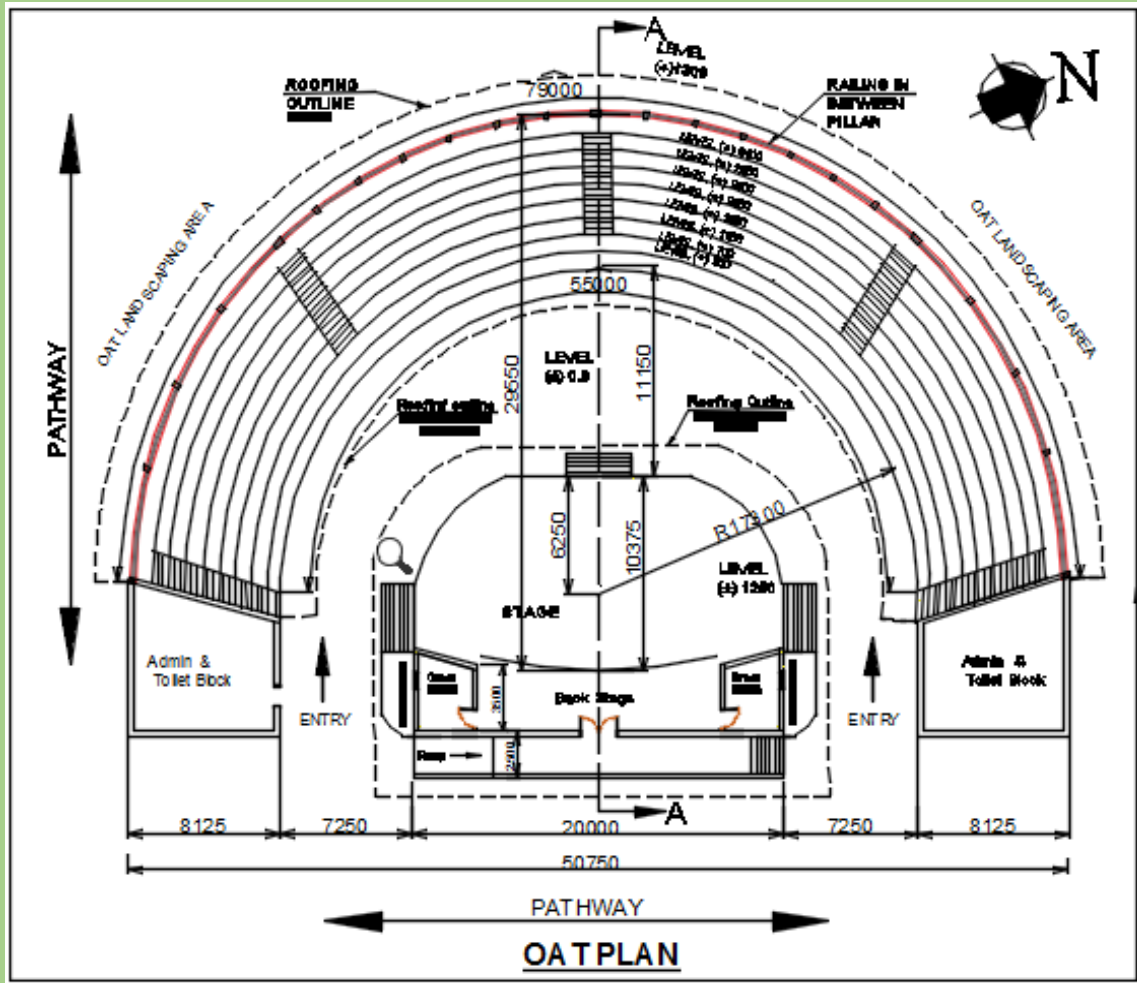
4. Fasteners

- High strength structural bolts - As per IS: 3757 – 1985 & IS: 4000 – 1992
- Foundation bolts - As per IS: 5624 – 1993

Checklist for Submission

Sl. No	Description
1	Content page for report and all submissions
2	All pages and drawings are to be numbered
3	Full report (with content list and proper manner) in PDF along with separate soft copies of drawings(PDF in report and separate AutoCAD file), input and output files of analysis, excel spreadsheets for design checks etc
4	Bonafide certificate
5	Student details along with photos.

Schematic Drawing



Visit us at www.steel-insdag.org

The Announcement and the Brief of this year's competition is available at INSDAG website for free downloading