



AEI International Student Design Competition Competition Program

Introduction

The Architectural Engineering Institute of the American Society of Civil Engineers is pleased to announce the annual AEI International Student Design Competition.

The emphases of the competition are the development and integration of innovative and original solutions to the competitions design challenges, collaboration, and peer review, all of which are critical to building design and construction. Students are encouraged to work together in multidisciplinary teams and consider how the engineered systems enhance and integrate with each other and the architecture of the building. Through the competition process, students will demonstrate the knowledge and skills that will make them valuable building industry professionals. The challenging conditions specified for the competition will encourage the participants to think creatively and provide innovative solutions.

Architectural Engineering Institute

The Architectural Engineering Institute (AEI) was created by ASCE in 1998 to be the professional home of architectural engineers and to address the needs of the architectural engineering profession. The mission of AEI is "to serve the building community by promoting an integrated, multi-disciplinary approach to planning, design, construction, and operation of buildings and by encouraging excellence in practice, education, and research of architectural engineering." AEI is the home for all professionals in the building industry. AEI provides a multi-disciplinary national forum for members of, but not limited to, the architectural engineering, structural, mechanical, electrical, and architectural communities.

Since students are expected to be the next generation of members, supporting student activities is of strategic importance for the future of AEI. AEI has supported existing student chapters and encouraged the creation of new ones at Institutions offering Architectural Engineering programs. Since student membership is free, the AEI student membership represents the majority of the student population of the architectural engineering programs.

For more information on AEI, visit www.asce.org/aei



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Eligibility

The competition is open to both graduate and undergraduate students enrolled in the accredited architectural engineering programs and programs actively seeking accreditation by EAC/ABET. Each team shall be supervised and advised by faculty advisors. Teams from non-accredited architectural engineering programs will be allowed to partner with students in an accredited architectural engineering program or with students in a program actively seeking accreditation by EAC/ABET. Students enrolled in a non-accredited architectural engineering program may be members of the team but may not be the team leader.

It is anticipated that teams will consist of 2-3 students per category and teams may include a maximum of ten (10) participants. Participants are limited to competing on only one team and teams are prohibited from using help from students not officially listed on the team.

A team leader shall be designated as the point-of-contact for the purposes of the competition and shall be responsible for all correspondence and submittals. The team leader shall be a graduate or undergraduate student in an ABET-accredited architectural engineering program or a program actively seeking accreditation by EAC/ABET. In addition, each team leader must be a member of an AEI student chapter in good standing. In order to be in good standing, the AEI student chapter must provide current contact information and submit a chapter report as required by the AEI Student Bylaws.

AEI membership is required for all team members and will be verified by AEI/ASCE staff. There is no cost for AEI student membership. To complete AEI student membership, please visit <https://www.asce.org/communities/student-members>. Be sure to choose AEI as your complimentary technical Institute!

There is no limit to the number of teams that each program may register and have participating in the competition process. However, each program is limited to having only one (1) team submit a final written report for the competition. If a school has more than one team registered, the determination of which team will submit their final written report for the competition is at the discretion of each individual school program and the associated faculty advisors. Each team submitting a project to the competition must be working on their own unique design solution.

The official list of team participants shall be submitted at the time of registration and confirmed at both the time of the electronic submittal and prior to finalist presentations. Any changes to the team composition must be submitted in writing by the team's faculty advisor with appropriate justification in advance of the electronic submittal. Any changes should be communicated to both the competition chairperson and AEI staff and must be approved by the AEI International Student Design Competition Committee.



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Competition Website

For additional information on the AEI International Student Design Competition and to see a list of current competition sponsors, please visit <http://aeisdc.org>.

Student Team Registration

Student teams, interested in participating in the AEI International Student Design Competition, must register online by the deadline listed in the Competition Program Addendum. There is no cost to register a team.

Please review all Eligibility requirements prior to registering a student team.

During registration, the following information will be required:

- Name and contact information of team leader
- Name(s) and contact information of faculty advisor(s)
- Names and contact information of team members
- AEI membership numbers for all team members
- Indicate which categories the team will submit. Submissions are **required in the building integration** category **and one or more of the following** four categories: **structural systems**; **mechanical systems**; **lighting/electrical systems**; and **construction management/methods**

To register, please visit <http://aeisdc.org>. (Information on AEI SDC team registration will be sent to AE Department Heads and Faculty Advisors.)

After the registration process is completed, teams will be assigned a team number to be used on all correspondence and submittals. Teams will also be forwarded building specific documentation upon registration. **Please Note:** the building information provided may be modified from the actual project, specifically for the purpose of the competition, and does not necessarily reflect all aspects of the original building design.



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Competition Guidelines

The building shall be designed to integrate and optimize on a life cycle basis all major high performance attributes, including energy conservation, environment, safety, building security, structural and material durability, accessibility, cost-benefit, productivity, sustainability, functionality and operational considerations.

As a part of their written submissions, teams are asked to address overall building system design issues and describe how the engineered systems work with and complement the other engineering disciplines and architecture.

It is not the intent of the competition to provide a prescriptive list of items to be submitted for each area. The submittal is intended to be similar to a design development submittal in content. Submittals should be developed to the level that communicates the design intent while demonstrating that the solutions have been thoughtfully developed to the point of at least proof of concept with supporting calculations, are innovative, of high quality, are realistic, and functional within the scope outlined in the competition requirements.

Integration is defined as both the process of working together as a design/construction team and the physical result of integrated materials and systems in the building, including the use of advanced engineering techniques and tools for design coordination, interference and conflict checks and constructability. Therefore, the integration submittal should describe the team organization and process, address the interactions between the architecture, the engineered systems, and the construction, and provide rationale for the decisions made to arrive at the proposed design/construction solutions. The design team should evaluate the economic viability of major design/construction decisions in order to adhere to design intent and the construction budget.

The structural design submittals should demonstrate how the structural system design works with and complements the other engineering disciplines and architecture. Structural solutions should include design of the building lateral force resisting system, gravity system, and the foundation system that are part of the primary load path. Members and sub-systems (as applicable to the yearly scope) within these systems need to be technically designed and evaluated based on appropriate codes, standards, and industry practices. The determination of structural loading applicable to the location where the project is and to meet competition challenges needs to be established. Additionally, material selections and performance criteria (strength and serviceability) need to be established, achieved and justified by the team. The various impacts of the major structural design decisions should be evaluated to stay in line with the competition goals and the budget. Designs in each system should include: location, arrangement, and sizing of the systems as illustrated through images, models, plans, sections, elevations and/or tables. Representative details of connections and components should be included that convey the team's concept and understanding of the system.



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The mechanical design submittals should demonstrate how the mechanical systems work with and compliment the other engineering disciplines and architecture. The mechanical design should provide, for the entire building, a level of detail demonstrating the basic design intent for HVAC (heating, ventilation, and air conditioning) systems, building management and control systems (BMCS), plumbing design (including storm water design), fire suppression systems, and potential renewable energy sources. The economic impacts of the major mechanical design decisions should be evaluated throughout the design to stay in line with the design intent and the construction budget. Mechanical systems and associated infrastructure shall be sized to support the expected operational needs in the building. The mechanical design submittals should include a description of the mechanical systems that will serve the building. Plans of main mechanical spaces (e.g., mechanical rooms) and any other areas the team feels are justified to illustrate the mechanical solutions. The design team should consider the location of mechanical spaces and any vertical transportation of MEP systems in the building, as well as their effects on both the architecture and engineering.

The electrical design should demonstrate the basic design intent for building power distribution, lighting design and controls, fire alarm system infrastructure, data/security infrastructure, and alternative energy generation. The economic impacts of the major electrical design decisions should be evaluated through life-cycle cost analysis and other criteria to comply with design intent and the construction budget. Electrical power systems and associated infrastructure shall be sized to support the expected operational needs in the building. The electrical design submittals should communicate how the electrical systems work with and compliment the other engineering disciplines and architecture. The design team should examine the location of electrical spaces and routing of electrical systems in the building, especially how both affect the architecture and other disciplines. Drawings could include floor plans, schematics/diagrams, and details of the power, lighting, and special systems to illustrate design intent.

The construction submittals should demonstrate site specific safety measures, constructability challenges, site logistics, jurisdictional requirements specific to the building and its location, scheduling logic, and estimating judgment. The construction solution should also provide and validate a logical project specific delivery method, site logistics planning including lean concepts, any needed project phasing, a critical path schedule including critical component and sequencing, and a defensible series of Level 1, Level 2, and Level 3 estimates. Teams should also demonstrate life-cycle cost justifications in selecting building systems, materials, Value Engineering suggestions, and sustainable design ideas.

To the extent that the existing building systems designs are known or discovered by the competition teams, teams should not submit a design that is the same as, or a minor variation of, the majority of the existing systems without the inclusion of substantial analyses of other possible solutions and written justifications for keeping the original solution.



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The architecture, including the facade configuration, may be modified and the floor plan can be slightly rearranged. For any room size changes and significant plan changes, teams shall provide appropriate rationale and justification, including adherence to code compliance requirements. Gross square footage must be maintained. The exact final dimensions of the building shall be determined by the teams within the limitations mentioned. Actual zoning requirements for the site must be followed. Please refer to the **Competition Addendum** for additional requirements and challenges.

Requests for Information

Registered student teams may submit Requests for Information (RFI) to obtain clarifications or resolve potential ambiguities. RFIs should be submitted to aei@asce.org and responses will be provided by the AEI International Student Design Competition Committee and posted to the competition website. Teams should not contact the building stakeholders for information.

Code Information

It is the responsibility of the teams to research and apply the proper design codes as applicable by the governing jurisdiction.

Student teams are asked to submit any additional questions regarding the design or building codes as Requests for Information (RFIs) and not to contact the building department and officials directly. Student teams are permitted to incorporate industry practice recommendations or industry standards that are not included in the specific building code for this project, as long as these items are clearly noted in the submissions.

Written Submission Requirements

Teams should concentrate on communicating their design decisions and solutions and provide the calculations and details to support these decisions. The project shall be approached in a code compliant manner and in such a way as to ensure constructability within the given site and logistical constraints. Each team is required to include the Integration category in their submittal.

Additionally, each team shall submit in at least one of the discipline specific, technical categories:

- **Structural**, including the foundations, walls, lateral, floor, and roof framing systems
- **Mechanical**, including HVAC, plumbing, and fire protection systems
- **Lighting/Electrical**, including power, lighting, and related systems
- **Construction**, including delivery method, preliminary project planning, budget and schedule.



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The submittal report shall include the following items in 8.5x11 format:

- Cover page identifying AEI assigned project team number and submission categories entered
- Table of Contents
 - Table of Contents may include hyperlinks to document sections
- Executive Summary for the entire project and a statement concerning the project goals and requirements (1 page maximum)
- Codes & Standards (1 page maximum)
- Summary Narrative(s) for each category (15 pages maximum for each category; teams entering all categories would have a maximum of 75 pages of summary narrative; 15 pages for each of the Integration, Construction, Lighting/Electrical, Mechanical and Structural)
 - Summary Narratives should include:
 - Discipline-specific Executive Summary (1 page maximum)
 - Statement of goals
 - Description of how the design challenges were met
 - Description of innovative solutions to the design challenges
 - Description of systems/solutions
 - Rationale for system selections and solutions
 - Summary Narratives may include some graphics (charts, graphs, renderings, models and partial plans or details); however, large or full scale plans should not be included in the narrative section of the report submittal

Additionally, the following may be submitted as supporting documents in each category.

- Supporting Documentation (10 pages maximum for each category; pages may be either 8.5x11 or 11x17; each 11x17 sheet will be equivalent to two pages)
 - Design criteria, methodology, and assumptions
 - Calculations
 - References and resources
- Drawings (10 page maximum for each category; pages may be any size between 11x17 to 30x42; PDF format is allowed)
 - Plans, sections, and elevations
 - Typical details and/or details to highlight design elements
 - Rendered views of project and/or design elements and systems
 - Related large format schedules and/or tables

Each entry shall include the AEI team registration number on all submittal pages. **Submissions that include team member names or school identification marks will be disqualified from the competition.**



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Submittals should include drawing information as noted above that communicates the general size and location of the systems used in the design. Details and rendered views should be included to highlight to the jury the major design elements, integration, innovation and understanding of the systems used in the submittal.

Please note that information does not need to be repeated in multiple sections and that teams are allowed to cross reference between their various sections of the report and with the supporting documentation and drawings.

The entries are expected to be submitted in electronic, PDF format. The written submittal should be considered as an integrated, single document. Teams are encouraged to use readily available graphic and image compression techniques to manage large size drawings, graphics, and renderings contained in the electronic submissions.

Presentation Requirements

The teams that are selected to present as finalists for the competition shall prepare an electronic presentation as a minimum. Presentation format information and limitations of the presentation facility will be provided at the time of finalist notification.

Prior to the beginning of the first team presentation, all teams shall submit a USB drive containing a final copy of their electronic presentation. Teams will not be allowed to edit their presentations after the USB drive is submitted.

The teams that are asked to participate at the finals will present their entire projects at one time. The jury will be allotted time for questions at the end of each team presentation. It is not required that all members of the team participate in the presentation to the jury; however, any or all team members may be present to assist with answering questions from the jury.

At the time of the final presentations, teams may provide supporting materials to the jury that will help demonstrate how the challenge was addressed. Some examples of supporting material are models, computer demonstrations, etc. that can be viewed by all jury members at one time.

Team member names and school identification marks may be used during the final presentations.

Important Note

All entries shall be the sole property of the Architectural Engineering Institute (AEI) and submitted materials will not be returned. AEI reserves the right to use or publish some or the entire materials in publications. By entering, the entrant grants a royalty-free license to AEI to use any copyrighted material related to the awards program only. Such right includes publication of photographs and



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names of recipients without compensation to entrants. Entrant must obtain and submit any rights to publish photographs or figures used in their material obtained from third parties or other publications.

Jury

The jury will be selected by the AEI International Student Design Competition Committee and will consist of volunteers representing architectural engineering options.

The jury will review the written submissions received and will select the finalist teams who will present. The jury will also be responsible for selecting the award winners during the finalist presentations.

Evaluation Criteria

For both the written submittal and finalist presentations, all teams are required to describe the project challenges that were met, and the innovative systems included in their submittals. The submitted design shall address the project guidelines as stated in the Competition Program and Addendum.

The jury will focus on the Executive Summary and Summary Narrative portions of the written submittal during the review and selection of the finalist teams. The calculations and information in the supporting documentation section is provided as supplementary information for review by the jury, as needed.

Additional criteria that will be used for evaluating the team's submittals by the jury include:

- Demonstration of an integrated and collaborative design while implementing appropriate architectural engineering decision-making strategies. Submissions should show integration between the engineered systems, construction scope, and the architectural systems of the building. Additionally, teams shall demonstrate the collaboration and integration process between team members and disciplines to achieve their solutions.
- Implementation of design/construction strategies and solutions that are original, innovative, and forward thinking. The submission shall be original (not copied solutions) and include representative and appropriate innovations in the building's design and construction that improve quality, efficiency, performance, and value. Innovative solutions must contain supporting evidence that demonstrates proof of concept and the ability to function as intended. Acceptable evidence may include: precedence studies, hand calculations, simulations/modeling, literature studies, or any combination of these or other relevant items.
- Demonstration of engineered systems' technical functionality as part of the building should be discussed. Adherence to common and reasonable national and local building codes and standards must be addressed and identified to highlight intended performance of the



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solutions towards meeting the project challenges. Designs and processes need to be shown at proof-of-concept level to demonstrate that they were engineered.

- Sensitivity to and consideration of realistic budgetary constraints, including life-cycle cost and payback analyses for major system components. Adherence to a reasonable construction schedule and budget, including plans and concepts to ensure safety of the site and surrounding areas.

Evaluation criteria, used by the jury for the written submission and finalists' presentations, will be made available to the student teams.

The initial written submittals will be reviewed by the jury to determine the teams who will be asked to present in the finals.

Awards

To qualify for all awards, the team must be represented in person at the finalist presentations.

First and second place winners will be awarded in the integration category. Additionally, first and second place winners will be awarded in each of the discipline specific technical categories: construction, lighting/electrical, mechanical, and structural.

Innovation awards will be awarded to the teams that best address the challenges presented in the Competition Program Addendum. The Innovation awards are at the jury's discretion and are not tied to any technical category.

Faculty/Professional Responsibility

All submissions are expected to be the students' own work under faculty supervision and advisement. Faculty and/or professional consultants shall not directly participate in the design work. The extent of faculty and/or professional consultant involvement shall be limited to answering questions, providing references, general guidance, and providing general feedback.

Individual schools and/or programs may offer course credit for participation in the competition.

It is anticipated that the teams will have meetings on a regular basis with their faculty advisor starting as soon as the beginning of the fall semester of the university's academic year. Teams should have several key submittals to their faculty advisors and peers throughout the project. It is anticipated that the student teams will work on preliminary designs in the fall semester and present their preliminary designs for peer review to their faculty and fellow students prior to the competition's written submission. It is recommended that finalist teams present their projects to their faculty advisors and peers prior to the finalist presentations to the jury.



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AEI 2024 Forum Registration & Travel Reimbursement

Finalist teams will be reimbursed for a portion of their travel, conference registration, and hotel expenses. The reimbursements are intended to ease the financial obligations of the presenting team members and one faculty advisor. The actual reimbursement amount is dependent on the required travel distance/mode of transportation and will be determined by the AEI International Student Design Competition Committee. It should not be expected that full reimbursements for registration and expenses will be provided for an entire team.

Teams will be required to submit required receipts and an expense form for any reimbursement.

Team members and faculty advisors will be responsible for registering for the Forum on their own. **Please note:** *early bird registration rates may expire prior to notification that a team has been selected as a finalist.*

Addendum

In addition to the Competition Program outlined in this document, a project-specific addendum will be provided annually to address:

- The Competition Challenge(s)
- Building Information
- Competition Timeline