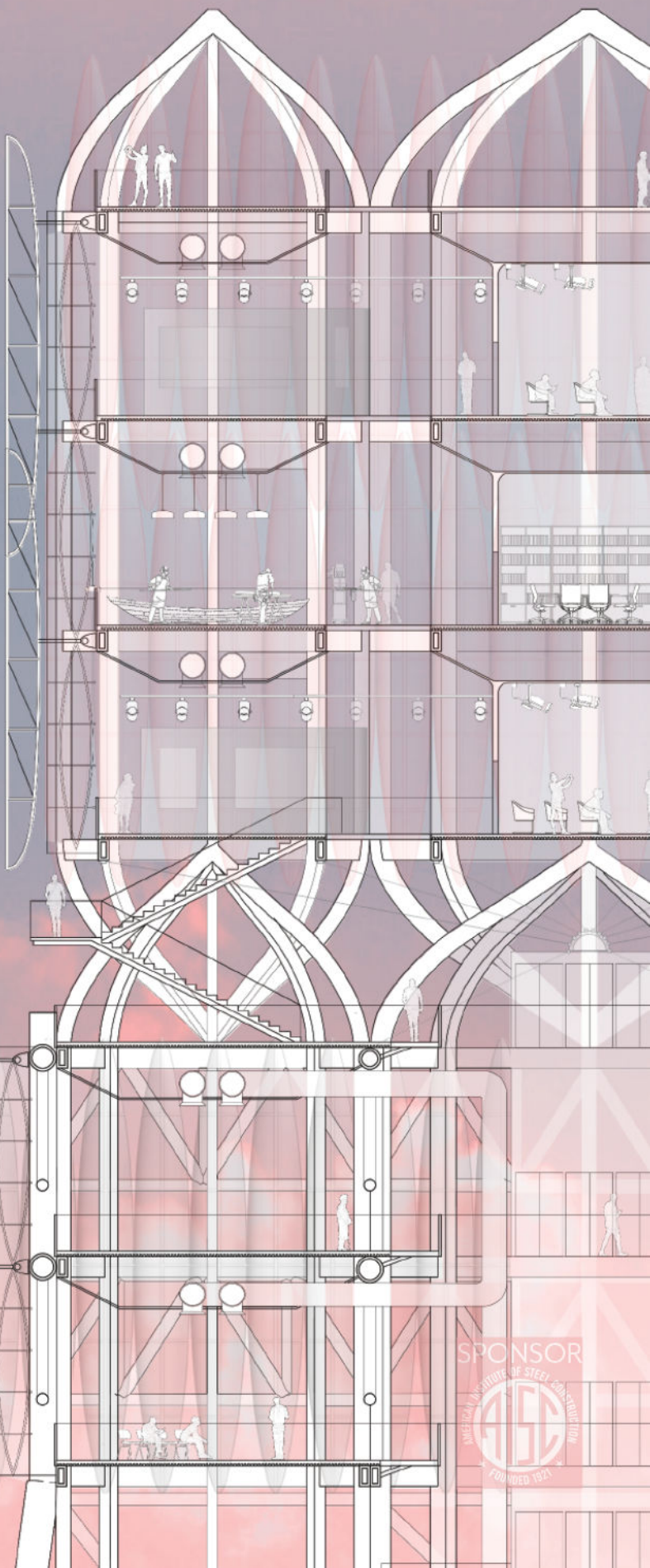
STEEL DESIGN

2024 STUDENT COMPETITION



PROGRAM

SPONSOR

2024 STEEL DESIGN STUDENT COMPETITION
24th Annual ACSA/AISC Student Competition

Category I
STEEL INNOVATION CENTER

Category II
OPEN

The Association of Collegiate Schools of Architecture (ACSA) is pleased to announce the 24th Annual Steel Design Student Competition for the 2023-2024 academic year. Administered by the Association of Collegiate Schools of Architecture (ACSA) and sponsored by the American Institute of Steel Construction (AISC), the program is intended to challenge undergraduate and graduate students, working individually or in teams, to explore a variety of design issues related to the use of steel in design and construction. Steel must be used as the primary structural material and contain at least one space that requires long-span steel structure, with special emphasis placed on innovation in steel design.

THE OPPORTUNITIES

The 2024 Steel Design Student Competition will offer architecture students the opportunity to compete in two separate categories:

Category I STEEL INNOVATION CENTER
Design a Steel Innovation Construction Center in downtown St. Louis, MO. The site is part of the Construction Innovation District & Master Development just south of the Gateway Arch. Program spaces include areas for exhibition, fabrication, training, and community outreach. Steel is the primary material.

Category II OPEN
Offers architecture students the opportunity to select a site and building program using steel as the primary material. This competition category permits the greatest amount of flexibility for any building type.

Students may not enter both categories of the competition.

The competition allows students to explore the many functional and aesthetic uses for steel as a building material and structural system. Steel is an ideal material for multi-story building because it offers the greatest strength-to-weight ratio. In addition, steel can be constructed quickly and for all project site types with the use of labor-saving prefabrication methods such as kit-of-parts, panelization, and modular construction. A building built with steel is potentially more flexible and adaptable to allow for a change in program, occupancy, and loading needs over time.

CRITERIA FOR JUDGING
Criteria for the judging of submissions will include the following:

- Creative use of structural steel in the design solution
- Successful response of the design to its surrounding context
- Successful response to basic architectural concepts such as human activity needs, structural integrity, and coherence of architectural vocabulary.

Submissions must clearly represent the selected program. In addressing the specific issues of the design challenge, submissions must clearly demonstrate the design solution's response to the following requirements:

- An elegant expressive understanding of the material–structural steel–deployed with maximum innovative potential with a minimum of one long-span space
- A strong conceptual strategy translated into a coherent integrated design proposal
- An articulate mastery of formal concepts and aesthetic values
- A compelling response to the physical and cultural context of the scheme
- A mature awareness of and an innovative approach to sustainability as a convergence of social, economic and environmental issues
- A thorough appreciation of human needs and social responsibilities

ADVANTAGES OF STEEL
Structural steel offers a number of benefits in building design including the capacity to bear great loads in tension and compression, high resiliency and performance under harsh and difficult conditions, such as earthquakes and hurricanes, and the ability to span great distances with minimal material. Steel can be shaped by many processes and projects may include standard rolled sections, curved re-rolled sections, or custom profiles, castings and digitally generated components. Steel can be prefabricated and delivered for site assembly, and it can be erected quickly, under almost any weather condition to meet tight construction schedules.

Steel can be easily modified during the life cycle of a building to accommodate changing occupant requirements. As the most recycled material in the world, steel is an environmentally sound building material choice. Today, structural steel is 97% recycled with the primary source being automobiles. Architects praise the natural beauty of steel and are excited about exposing it in the design of their structures to emphasize grace, slenderness and strength, and in their building envelopes to enhance environmental performance and aesthetic character.

Category I – STEEL INNOVATION CENTER

The global pandemic disrupted construction and illustrated many of the AEC industry's inefficiencies, redundancies, and limitations. This project is for the design of a new, national steel construction innovation center, to be located in the heart of the mid-West, where members of the AEC could research, exhibit, integrate, and teach construction innovations. Explorations at the steel innovation center could include: how to incorporate digital tools such as CAD/CAM processes, robotics, BIM, paperless delivery methods, virtual and augmented reality, and AI? How might steel construction add to sustainability discussions such as future proofing, climate resilience, energy performance, embodied carbon and energy of building materials, and energy generation? How might our buildings ensure the health and wellness of their occupants? How to integrate new building materials and details, assembly techniques, and construction methods?

Steel is an ideal structural system for this building. It allows for large openings, sunlight and easy airflow, flexible layouts, and innovative approaches to services. Steel can be easily modified during the life cycle of a building to accommodate changing requirements. This competition asks students to consider how steel can be used in a resilient manner for a center focused on innovation for the steel and construction industry.

Site

The site is in St. Louis, MO along the Mississippi River just to the south of the Gateway Arch and is part of the city's future development of Gateway South. It is a wedge-shaped lot bounded the river's levee wall on the east, the highway overpass on the north, the elevated rail lines to the west, and the elevated steel lines and MacArthur Bridge to the south. All permanently occupied spaces with equipment must be located west or above the levee wall to minimize flood damage from the River. It is possible, but not required, to cantilever or span over the levee wall up to the property line indicated. The area is located within a flood zone and flood resilience must be maintained, however the levee wall, also known as the Mural Mile, can be reconfigured or moved away from the River, or made taller if desired. The site is highly visible from Congressman William L. Clay, Sr. Bridge, or I-55/I-64. The MacArthur Bridge only serves rail traffic.

Access to the site should include pedestrian, bicycles, cars, large 18-wheeler trucks, and construction vehicles such as concrete trucks, boom cranes, fork lifts. The site is fairly flat. The site's interior topography can be manipulated, but must meet the existing street grading and maintain flood resilience.

Gateway South Development

The project is just south of the Arch, part of the Construction Innovation District & Master Development in Downtown St. Louis, MO, and is conceived of as a construction capital or hub. According to Good Developments Group, the owner and developer of the innovation district, the area to be renovated and revitalized is "dedicated to the improvement of the design and construction industry through the use of advanced sustainable manufacturing technologies and the co-location of industry innovators." The neighboring existing masonry warehouses and former manufacturing buildings are to be renovated and reimagined. The district will have a variety of uses, including manufacturing, workforce training, housing, and entertainment. Solutions for this project should communicate the spirit of Gateway South's technology, integration, community, and innovation.

Note: We strongly discourage student visits to the site; the area is currently unmonitored and access could be restricted.

PROGRAM

The steel innovation center is to support a wide range of functions and users. Its primary purpose is to provide hands-on opportunities for full scale construction steel research and training. Large vehicles, trailers, and construction equipment should be able to fully access the fabrication and training spaces. Building users will include researchers, staff, teachers, trainees, tour groups, and interested public. A small daycare is to provide on-site support for staff and students. Daycare access is a primary stumbling block for people entering the training program. The building should balance the need for construction equipment access and circulation with safety for the public and daycare children.

The following is a list of programmatic spaces that must be included in the building. Solutions should observe the given spaces and sizes within a range of plus or minus ten percent.

Program Space

Community Area

Community Exhibit/Entertainment Area		5,000 sq. ft.
Community Lobby and Reception		1,000 sq. ft.
Public Restrooms		2,000 sq. ft
Restrooms for visitors, including family restrooms.		
Services at 20%		1,600 sq. ft.
including corridors, mechanical, and other service spaces		
Community Area Subtotal		*9,600* sq. ft.

Steel Innovation Fabrication

Three Open Bays:	14,400 sq. ft. each	43,200 sq. ft.
40’ height clearance minimum under the structure and 30’ clear under the crane with an area of 60’ x 240’ served by a crane or some system that easily moves steel pieces and prefabricated elements. Provide overhead doors for access to the exterior yard.		
Interior Loading/Unloading		3,000 sq. ft.
Exterior truck loading area large enough for semi-trucks to maneuver, separate from the exterior yard. Two loading dock doors: for semis, plus an access door to the interior loading/unloading area.		
Four Workshop/Laboratory	5,000 sq. ft. each	20,000 sq. ft.
40’ minimum interior clearance height under the structure, with 30’ clear under any crane equipment		
Two Locker Areas	500 sq. ft. each	1,000 sq. ft.
Restrooms for researchers and trainees, including family restrooms.		
Services at 10%		6,720 sq. ft.
including mechanical and corridors		
Innovation Fabrication Subtotal		*73,920* sq. ft.

Exterior Yard (not to be included in the building total)	40,000 sq. ft. (exterior space)
20% to be covered for equipment storage.	

Classrooms and Offices

Training Room		10,000 sq. ft.
Flexible, tall space for various hands-on training that might include welding, bolting, CNC operation, etc.		
Four Classrooms	600 sq. ft. each	2,400 sq. ft.
Six Offices	120 sq. ft. each	720 sq. ft.
Copy Room		120 sq. ft.
Storage Room		120 sq. ft.
Lunchroom		400 sq. ft.
Two Locker Areas	250 sq. ft. each	500 sq. ft.
Restrooms for researchers and trainees, including family restrooms.		
Two Daycare Spaces	1,500 sq. ft. each	3,000 sq. ft.
One area for playing and another for sleeping.		
Daycare Bathroom		500 sq. ft.
Daycare Drop-off Area		
Daycare Protected Exterior Play		1000 sq. ft. (exterior space)
Not to be included in the building total.		
Services at 20%		3,552 sq. ft.
including corridors, mechanical, and other service spaces		
Classrooms and Office Subtotal		*21,312* sq. ft.

BUILDING TOTALS **104,832 sq. ft.**

Additional Program Considerations

Consider daylight, security and safety for the daycare, connection to the exterior areas, and resilience for the facility spaces and equipment.

- Site Space and Requirements
- Parking for 40 cars
- Parking for 10 visitor cars and a school bus
- Daycare Drop-off
- Exterior Daycare Play Area
- Fabrication Yard
- Loading Area

Construction Type

The project must be conceived in structural steel construction and must contain at least one space/element that requires long-span steel structure, with special emphasis placed on innovation in steel design. The most compelling proposals will inevitably integrate the use of steel into the design of the project at multiple levels, from primary structure to building envelope and tectonic details.

CATEGORY II – OPEN

The ACSA/AISC 2024 Steel Design Student Competition also offers architecture students the opportunity to participate in an open competition with limited restrictions. With the approval of a sponsoring faculty member, students may select a site and building program.

- The Category II program should be of equal complexity as the Category I program.
- Students entering Category II must submit a written building program, including a brief description of the building type, gross square footage, and project location, as part of the online submission in the Program Edits (copy/paste text box).

Restrictions

To enter the open competition students may select any building occupancy other than an innovation or museum building.

Students may not enter both categories of the competition.

Construction Type

The design project must be conceived in structural steel construction and must contain at least one space/element that requires long-span steel structure, with special emphasis placed on innovation in steel design. The most compelling proposals will inevitably integrate the use of steel into the design of the project at multiple levels, from primary structure to building envelope and tectonic details.

RESOURCES

An intention of all ACSA competitions is to make students aware that research is a fundamental element of any design solution. Students are encouraged to research material properties and methods of steel construction, as well as precedent projects that demonstrate innovative use of structural steel.

Steel Construction References

1. AISC website: aisc.org
2. Modern Steel Construction: This authoritative monthly magazine is made available online free of charge. This magazine covers the use of fabricated structural steel in the variety of structural types. It presents information on the newest and most advanced applications of structural steel in a wide range of structures. Issues of Modern Steel Construction (1996 - Present) are available online. Visit Modern Steel Construction to view them.
3. Terri Meyer Boake. Understanding Steel Design: An Architectural Design Manual. (Birkhäuser 2013)
4. John Fernandez. Material Architecture. (Spon Press, 2006)
5. Victoria Bell and Patrick Rand. Materials for Design 2. (Princeton Architectural Press, 2014)
6. Shulitz, Habermann, Sobek. Steel Construction Manual. (Birkhäuser Basel 2000)
7. Annette LeCuyer. Steel and Beyond. (Birkhäuser Basel 2003)
8. Sutherland Lyall. Remarkable Structure: Engineering today's Innovative Buildings. (Princeton Architectural Press, 2002)

Innovation Center / Museum / Multiuse References

1. David L Lawrence Convention Center, Pittsburgh, PA, Rafael Vinoly Architects, PC, New York, NY, Architectural Record, 2004 May, pg.154-159, Modern Steel Construction, 2004, July, pg. 30-35
2. Seattle Public Library, Seattle, Washington, Office for Metropolitan Architecture/LMN Architects Architecture, 2004, July, pg. 39-47, Civil Engineering, 2003, March, pg. 64-67., Modern Steel Construction, May 2005. pp 48-49
3. Boston Convention and Exhibition Center, HNTB Architecture, New York, NY, Rafael, Vinoly Architects, New York, NY, Primary Group, Boston, MA, Modern Steel Construction, 2005, pg. 24-26
4. Issues of Modern Steel Construction (1996 - Present) are available online. Visit: https://www.aisc.org/modernsteel/ website to view them.

Steel Innovation and Workforce References

For manufacturing:

1. Workforce video: Ironworkers Local 5 – this landing page promo-video shows actual steel manufacturing, training and welding.
2. Why Manufacturing: Lincoln Electric
3. Lincoln Electric Virtual Factory - slower-moving
4. Video Tour of Baker Industries, a Lincoln Electric Company - this video provides specific dimensions and machinery descriptions. As well as steel 3D printing.

For structural steel fabrication:

1. Steel Fabrication: A Virtual, Detailed Tour of the Steel Fabrication Process
2. Conewago Manufacturing's Steel Fabrication Virtual Shop Tour - AISC Certified
3. VIP Structural Steel Workshop Tour Bay 2 & 0, Bromley Christchurch

COMPETITION GUIDELINES (Category I & Category II)

SCHEDULE

April 10, 2024	Registration Deadline (free registration)
June 5, 2024	Submission Deadline
Summer 2024	Winners Announced
Fall 2024	Publication of Summary Book

AWARDS

The design jury will meet in Summer 2024 to select winning projects and honorable mentions. Winners and their faculty sponsors will be notified of the competition results directly. A list of winning projects will be posted on the ACSA web site at www.acsa-arch.org and the AISC web site at www.aisc.org.

Winning students and their faculty sponsors will receive cash prizes totaling $20,000 with distribution as follows:

Category I **Steel Innovation Center**		Category II **OPEN**	
First Prize		*First Prize*	
Student	$4,000	Student	$4,000
Faculty Sponsor	$1,500	Faculty Sponsor	$1,500
Second Prize		*Second Prize*	
Student	$2,000	Student	$2,000
Faculty Sponsor	$1,000	Faculty Sponsor	$1,000
Third Prize		*Third Prize*	
Student	$1,000	Student	$1,000
Faculty Sponsor	$500	Faculty Sponsor	$500

A limited number of honorable mentions may also be awarded at the jury's discretion. Prize-winning submissions will be exhibited at the 2025 ACSA Annual Meeting and the 2025 AIA National Convention as well as published in a competition summary publication.

ELIGIBILITY

Because the support of AISC is largely derived from steel companies whose markets are mainly in the U.S., the ACSA/AISC Steel Design Student Competition is open to students and/or student teams from ACSA Full and Candidate Member Schools, as well as ACSA Affiliate Members Schools from the U.S., Canada, and Mexico only.

The competition is open to upper level students (third year or above, including graduate students). All student entrants are required to work under the direction of a faculty sponsor. Entries will be accepted for individuals as well as teams. Teams must be limited to a maximum of five students. Submissions should be principally the product of work in a design studio or related class.

USE OF STEEL

Steel must be used as the primary structural material. Design proposals must contain at least one space/element that requires long-span steel structure, with special emphasis placed on innovation in steel design. The most compelling proposals will inevitably integrate the use of steel into the design of the project at multiple levels, from primary structure to building envelope and tectonic details.

BUILDING CODE
Refer to the International Building Code and the local zoning ordinance for information on parking requirements, height restrictions, setbacks, easements, flood, egress and fire containment. All proposals must be designed to meet requirements for accessibility; for guidelines, refer to the Americans with Disabilities Act and the principles of Universal Design.

REGISTRATION
A faculty sponsor is required to enroll students online (available at www.acsa-arch.org) by April 5, 2022. Registration can be done for your entire studio or for each individual student or team of students participating. Students or teams wishing to enter the competition on their own must have a faculty sponsor, who should complete the registration. There is no entry or submission fee to participate in the competition. Each registered student and faculty sponsor will receive a confirmation email that will include information on how the student(s) will upload final submissions online. Please add the email address competitions@acsa-arch.org to your address book to ensure that you receive all emails regarding your submission.

During registration the faculty will have the ability to add students, add teams, assign students to teams, and add additional faculty sponsors. Registration is required by April 10, 2024, but can be changed, edited, and added to until a student starts a final submission; then the registration is no longer editable.

FACULTY RESPONSIBILITY
The administration of the competition at each institution is left to the discretion of the faculty within the guidelines set forth in this document. Work on the competition should be structured over the course of one semester during the 2023-2024 academic year.

Each faculty sponsor is expected to develop a system to evaluate the students' work using the criteria set forth in this program. The evaluation process should be an integral part of the design process, encouraging students to scrutinize their work in a manner similar to that of the jury.

DIGITAL SUBMISSION FORMAT
Submissions must be presented on four 20" x 20" digital boards. All boards are required to be uploaded through the ACSA website as Portable Document Format (PDF) or image (JPEG) files. The names of student participants, their schools, or faculty sponsors, must NOT appear on the boards, or in the project title or project title file name(s).

DESIGN ESSAY or ABSTRACT
A brief essay, 300 words maximum, is required as part of the submission describing the most important concepts of the design project. Keep in mind that the presentation should graphically convey the design solution and context, and not rely on the design essay to convey a basic understanding of the project. The names of student participants, their schools, or faculty sponsors, must NOT appear in the design essay. This abstract is included in the final online submission, completed by the student(s) in a simple copy/paste text box.

PROGRAM SUMMARY
A program summary, 250 words maximum, diagram/text of spaces and areas is required as part of the submission. All interior and exterior spaces are to be included; total net and gross areas are required.

REQUIRED SUBMISSION DOCUMENTS

- Submissions must include (but are not limited to) the following required drawings:
- Three-dimensional representations - in the form of axonometrics, perspectives showing the proposal in its context, montages and/or physical model photographs – to illustrate the character of the project;
- Site plan showing proposal in its context of surrounding buildings and topography, together with details of access/circulation;
- Building/site sections sufficient to show site context and major spatial and program elements;
- Floor plans to show program elements, spatial adjacencies and navigation strategies;
- Large scale drawing(s), either orthographic or three dimensional, illustrating:
    - the use and detailing of steel for building structure and/or envelope
    - integrated design

Incomplete or undocumented entries will be disqualified. All drawings should be presented at a scale appropriate to the design solution and include a graphic scale. The site plan should include a north arrow.

ONLINE PROJECT SUBMISSION

The student is required to submit the final entries that must be uploaded through the ACSA Competition website at www.acsa-arch.org by 11:59 pm, Pacific Time, on June 10, 2024. If the submission is from a team of students, all student team members will have the ability to upload the digital files. Once the final submit button is pressed no additional edits, uploads, or changes can be made. You may “save” your submission and return to complete. Please note: The submission is not complete until the “complete this submission” button has been pressed. For team projects, each member of team projects may submit the final project, but each project should be submitted only once. Once the final submission is uploaded and submitted, each student will receive a confirmation email notification.

The final submission upload must contain the following:

- Completed online registration including all team members and faculty sponsors,
- Each of the four 20”x20” boards uploaded individually as a high resolution Portable Document Format (PDF) or image (JPEG) file,
- A design essay or abstract (300 words maximum),
- A program summary diagram/text of spaces and areas (250 words maximum).

The names of student participants, their schools and faculty sponsors must NOT appear on the boards, abstract, program summary, or in the file name.

Winning projects will be required to submit high-resolution original files/images for use in competition publications and exhibit materials. By uploading your files, you agree that the Association of Collegiate Schools of Architecture (ACSA) has the rights to use your winning submission, images and materials in a summary publication, online and in promotional and exhibition resources. ACSA will attribute authorship of the winning design to you, your team, faculty and affiliation. Additionally, you hereby warrant that the submission is original and that you are the author(s) of the submission.

COMPETITION ORGANIZERS

Administrative Organization
Association of Collegiate Schools of Architecture (ACSA)
Leading Architectural Education and Research
ACSA is a nonprofit, membership association founded in 1912 to advance the quality of architectural education. The school membership in ACSA has grown from 10 charter members to over 250 schools in several membership categories. These include full membership for all accredited programs in the United States and government-sanctioned schools in Canada, candidate membership for schools seeking accreditation, and affiliate membership for schools for two-year and international programs. Through these schools, over 5,000 architecture faculty members are represented. In addition, over 500 supporting members composed of architecture firms, product associations and individuals add to the breadth of interest and support of ACSA goals. ACSA provides a major forum for ideas on the leading edge of architectural thought. Issues that will affect the architectural profession in the future are being examined today in ACSA member schools.

Sponsor
The **American Institute of Steel Construction** (AISC), headquartered in Chicago, is a non-partisan, not-for-profit technical institute and trade association established in 1921 to serve the structural steel design community and construction industry in the United States. AISC's mission is to make structural steel the material of choice by being the leader in structural-steel-related technical and market-building activities, including: specification and code development, research, education, technical assistance, quality certification, standardization, market development, and advocacy. AISC has a long tradition of service to the steel construction industry providing timely and reliable information.

Membership to AISC is free to university faculty and full-time students, and AISC membership provides valuable benefits. Information can be found at www.aisc.org/universityprograms.

FOR MORE INFORMATION
Program updates, including information on jury members as they are confirmed, may be found on the ACSA web site at www.acsa-arch.org/competitions.
Additional questions on the competition program and submissions should be addressed to:

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Competition Program written and developed by: Dana Gulling, North Carolina State University, along with ACSA & AISC.

Image Credits: 2022 Steel Design Students Competition Winner, 1st Place, Category II: Open
Project Title: Tomols | Student: Ron Patanavin, | Faculty Sponsor: Thomas Fowler, California Polytechnic State University