

An aerial photograph of a concrete housing development, showing a grid of concrete structures with some greenery and a central square area. A green horizontal bar is at the top of the image.

HABITAT

**DESIGN
COMPETITION**

CLIMATE POSITIVE CONCRETE HOUSING

PROGRAM

2022 HABITAT: DESIGN COMPETITION

Climate Positive Concrete Housing

INTRODUCTION

In response to the simultaneous crises of Housing, Climate and Equity, this competition challenges students to envision the ideal Habitat home in one of seven North American regions. The Association of Collegiate Schools of Architecture (ACSA) is pleased to announce the **HABITAT Design Competition: Climate Positive Concrete Housing** for the 2021-2022 academic year. The competition is a partnership between the National Ready Mixed Concrete Association (NRMCA) and Habitat for Humanity International, Inc. The Habitat Design Competition: Climate Positive Concrete Housing is based on the Habitat for Humanity U.S. Construction standards for affordable, resilient, sustainable & accessible homes. The competition will challenge students, working individually or in teams, to explore a variety of design issues related to the use of concrete in design and construction of a Habitat home.

THE CHALLENGE

The 2022 Habitat Design Competition: Climate Positive Concrete Housing challenges students to design affordable multi-unit housing in one of seven North America regions. The need for affordable housing types has never been greater. Populations are fluctuating, given the cost of living, change to commuting, and a range of quality-of-life options. Today's housing problems are difficult, but architects are in a unique place to envision innovative solutions to the housing crisis that affects us all.

NRMCA members through the Build with Strength initiative will donate concrete for the construction of Habitat projects and will work directly with local Habitat organizations to support home builds across North America. Habitat works toward a vision by building strength, stability and self-reliance in partnership with families in need of decent and affordable housing. Habitat homeowners help build their own homes alongside volunteers and pay an affordable mortgage.

SITE / CLIMATE

Students will select one of 7 regions with differing climates to create a design that meets the minimum requirements of Habitat for Humanity U.S. Construction standards. Jurors will select a winner from each of the 7 regions. The regions focus on North America (US, Canada & Mexico):

North:	Canada & Alaska
West:	Hawaii, California, Oregon, Washington, Idaho, Nevada, Arizona, Montana, Colorado, New Mexico, & Utah
West Central:	Minnesota, Missouri, Iowa, Kansas, North Dakota, South Dakota, Oklahoma, Texas, & Nebraska
Gulf:	Alabama, Florida, Louisiana, Mississippi, Puerto Rico, Arkansas, Mexico & Caribbean
East Central:	Michigan, Indiana, Tennessee, Ohio, Illinois, Kentucky, Wisconsin
Mid Atlantic:	Pennsylvania, DC, South Carolina, North Carolina, Georgia, Virginia, Maryland, & Delaware
Northeast:	Massachusetts, New York, New Jersey, Vermont, New Hampshire, Maine, Rhode Island, & Connecticut

CONCRETE

In its simplest form, concrete is a mixture of paste and aggregates. The paste, composed of portland cement and water, coats the surface of the fine and coarse aggregates. Through a chemical reaction called hydration, the paste hardens and gains strength to form the rock-like mass known as concrete. Concrete is one of the world's oldest building materials, and for good reason: concrete is easily transportable in its liquid state and can be formed into large structures on site. It is poured as a liquid but hardens like rock, resists fire and water, and can be recycled. Exposed concrete also absorbs atmospheric carbon, locking it into the concrete permanently. Twice as much concrete is used in construction around the world as all other materials put together.

Methods of concrete construction may include:

- Traditional poured-in-place concrete with reusable wood or metal formwork.
- Insulating concrete form systems (ICFs), which is a builder-friendly wall system. ICFs are a variation of poured-in-place concrete construction, and have been used on many new homes across every region and deliver a superior building envelope that is cost-effective and 100% recyclable.
- Concrete masonry systems (CMS) are familiar to most people because they have been used for such a long time. All types of low-rise buildings are made with these materials. The resilient exterior of exposed units provides a durable finish in demanding environments.
- Interlocking-block technology and bamboo-reinforced concrete that have been used to build thousands of Habitat homes in the Philippines, Thailand, and other areas prone to hurricanes and earthquakes. These result in more flexible, resilient homes.
- Tilt-up concrete gets its name from the manner in which construction occurs: by lifting or tilting panels with a crane to form the walls of buildings. Panels can be produced in many shapes and sizes, including flat and curved sections. Concrete placement is fast and easy because it is done on the ground.
- Precast concrete is widely used in low- and mid-rise apartment buildings, hotels, motels, and nursing homes. The concrete provides superior fire resistance and sound control for the individual units and reduces fire insurance rates.

“Ready mixed” refers to concrete that is batched for delivery from a central plant instead of being mixed on the job site. Each batch of ready-mixed concrete is tailor-made according to the specific requirements of the project and is delivered to the site in a malleable condition, usually in the cylindrical trucks often known as “concrete mixers.” Concrete is not the same as cement, which is just one component of concrete along with water, aggregates such as rock, sand or gravel and various admixtures that can enhance both the sustainability and other characteristics of concrete.. New aggregates are being produced that absorb enough carbon dioxide to create a carbon negative material. In other words, the option to create concrete that serves as a carbon sink, permanently storing anthropogenic carbon in the hardened product. It is important to note that with the implementation of these technologies at scale, coupled with the use of supplemental cementitious materials (SCMs) such as slag and fly ash, a more widespread use of concrete can drive down the total of carbon dioxide emitted into the atmosphere from other sources including logging, deforestation, and the manufacture and long distance transportation of other building products.

Climate Positive Concrete is achieved by integrating a variety of innovations and tools to sequestering carbon and utilizing it to improve climate conditions with building materials. Exposed concrete in buildings absorbs atmospheric carbon through a process commonly referred to as recarbonation or carbon uptake. This naturally occurring process locks the carbon into the concrete permanently. Concrete offers

architects practicing today and the next generation of architects the chance to select a building material that moves beyond zero embodied carbon. Concrete offers a critical path toward climate stability because of its inherent carbon storage properties.

SUSTAINABILITY

Architects play a crucial role in addressing both the causes and effects of climate change through the design of the built environment. Sustainability involves not only energy efficient, or net-zero emission structures, but also construction methods, means and materials that have a low, or even negative embodied carbon. As we face the climate crisis, it is critical to realise that we have very little time to offset the carbon dioxide created by the construction and use of buildings with future reductions of CO₂. Therefore the competition entries will be judged on their successful inclusion of low or negative embodied carbon strategies in materials and construction processes.

AWARDS

Jurors will select one winner from each of the 7 regions, in addition to a selected number of honorable mentions, all at the discretion of the jury. A total of **\$20,000** USD is distributed, by ACSA, in the following manner to the winners:

Each Region	Student	\$2,000
	Faculty Sponsor	\$800

Additionally, the winning designs will be made available for Habitat affiliates from each of the 7 regions as examples in its Habitat “shared plan library,” which is available to all domestic Habitat affiliates, provided that the design winners comply with all terms and conditions of such library.

Entrants who submit winning designs will also have the opportunity to further develop and construct their designs at local Habitat affiliates (pending monetary support, construction feasibility and approval). Competition organizers cannot guarantee use or construction of any of the winning designs, but will make every effort to further develop the designs with winning designers for real-life inhabitants.

ELIGIBILITY

The Habitat Design Competition: Climate Positive Concrete Housing is open to students from all ACSA member schools around the world. All student entrants are required to work under the direction of a faculty sponsor from an ACSA member school. Entries will be accepted for individual as well as team solutions. Teams must be limited to a maximum of five individuals.

FACULTY SPONSOR

The intent of this competition is to provide an academically rigorous design challenge suitable for integration into the curriculum of an architectural design studio or course. Curriculum integration is not a requirement of competition guidelines but is strongly encouraged. The administration of the competition at each institution is left to the discretion of the faculty within the guidelines set forth in this document.

CRITERIA FOR JUDGING

Criteria for the judging of submissions will include: concrete as the primary structural material, creative and innovative use of climate positive concrete in the design solution, successful response of the design to its surrounding context, the creative and clear approaches to designing a Habitat home.

Submissions must clearly address the requirements of the program. In addressing the specific issues of the design challenge, submissions must demonstrate the proposals response to the following requirements:

- A strong conceptual strategy resolved in a coherent, integrated design proposal;
- The designed housing's suitability for families;
- An understanding of the physical characteristics of the site and the local climate;
- A compelling response to the physical, emotional, and cultural needs of the inhabitants;
- A clear understanding and resolution of concrete construction and assembly;
- An informed position on vernacular and historic precedent;
- A demonstrated use of low or negative embodied carbon in materials as well as construction processes.

PROGRAM

The 2022 Habitat Design Competition: Climate Positive Concrete Housing challenges students to design affordable multi-unit housing (minimum of four units with a maximum of twelve units) in one of seven North America regions. Students are encouraged to explore creative and innovative approaches to programmatic arrangement and distribution. Designs must also include use of sustainable and climate positive concrete solutions, including both current and new technologies and processes designed to reduce embodied carbon and sequester carbon dioxide.

Entrants should choose a site on which to design four to twelve units in any combination of unit sizes listed. Following are the maximum home sizes required for any program area or the combined programs of the home(s):

- One-bedroom or Studio: 600 square feet with one full bathroom
- Two-bedroom: 1,000 square feet with 1.5 bathrooms
- Three-bedroom: 1,200 square feet with 2 full bathrooms
- Four-bedroom: 1,400 square feet with 2 full bathrooms
- Five-bedroom: 1,700 square feet with 2.5 bathrooms

Space allocation should be appropriate to the design proposal, the needs of the client, and location or site constraints. Innovative (nontraditional) housing must meet families' needs and comply with all Accessibility, Durability and Sustainability standards.

Interior Program Spaces

- Sleeping areas – minimum of 1
- Bathroom facilities – minimum of 1 (toilet, lavatory, bath or shower)
- Kitchen area for food preparation
- Living area for relaxation / socialization

Accessibility

- Provide a fully accessible (no-step) route to the accessible entrance;
- Interior Doorways should have a 34-inch net clear opening;
- Interior Hallways with doors into rooms must be at least 42 inches wide and hallways without doors must be at least 40 inches wide;
- Main floor must include a full bathroom with a 5-foot turning circle;
- Kitchen must provide a clear 5-foot turning circle;
- Any staircases need a minimum width of 40 inches. For accessibility, prioritize straight stair designs over stairways with turns or landings.

Durability

- Use a continuous load path design to connect all structural components of the house;
- The home should be designed with resiliency in mind.
- Complete plans should include site plan, floor plan, cross sections and exterior elevations;
- Develop a stormwater plan and flooding mitigation in designs;

Sustainability

- Homes should meet or exceed the current Environmental Protection Agency ENERGY STAR for New Homes program or U.S. Green Building Council (USGBC) LEED rating standards;
- Competition entries will be judged on their successful inclusion of low or negative embodied carbon strategies in materials and construction processes.

Exterior Program Spaces

Consideration should be given to the relationship between interior and exterior spaces of the home and what role exterior space should play in the design of the home. Transportation and connectivity should be addressed as an integral component of the overall design strategy. Appropriate space should be allocated for issues such as vehicle parking (bike /car /other) where required. Garages should *not* be included unless required by local ordinance or if they will provide tangible benefits. Designs that include spatial ideas promoting community, both within the project and the local community adjacent to the project are encouraged.

The competition criteria is based in part on measures provided by Habitat for Humanity which meet Habitat's U.S. design priorities, including accessibility, hazard-resilience, and energy efficiency.

Code Information

Refer to the International Residential Code and local zoning ordinances for information on height restrictions, setbacks, easements, flood, and life safety requirements. Consideration should be given to issues of Accessibility and the principles of Universal Design.

RULES

Registration

A faculty sponsor is required to enroll students online (available at www.acsa-arch.org) by April 13, 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 13, 2022, but can be changed, edited, and added to until a student starts a final submission; then the registration is no longer editable.

Registration Steps:

1. Faculty log into the ACSA website,
2. Click the "Register your Students NOW" button,
3. Select the 2022 Habitat Competition from the submission type dropdown menu & Click "Enter",
4. Select "Individual Registration" to add individual student. Click "Save and Continue". You will need to know each student's first & last names, email, & institution, which are all required fields for each student,
5. Select "Team Registration" if this is a team registration, you may add additional students by clicking "Add Student" to the same submission to this team, teams must be limited to a maximum of five students,
6. Once the individual student or team is complete, Click "Submit",
7. Repeat steps 3 – 6 for each individual or team.

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 2021-2022 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 30" digital boards, no more than 20MB. All boards are required to be uploaded through the ACSA website as 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, 150 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. The program summary is included in the final online submission, uploaded by the student(s) in a simple copy/paste text box.

Required Submission Documents

Submissions must include (but are not limited to) the following required drawings:

- Site plan (with north arrow) showing proposal in its context of surrounding buildings and topography, together with details of access/circulation;
- Floor plans, for each unit, to show program elements, spatial adjacencies and navigation strategies;
- Street elevations, building elevations, site sections, and building sections sufficient to show site context and major spatial and program elements;
- 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;
- Large scale drawing(s), either orthographic or three dimensional, illustrating:
 - the use and detailing of concrete 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.

Online Project Submission

After the faculty sponsor completes the online registration, each student will receive a confirmation email, which will include a link to complete the online 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 1, 2022. 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”x30” boards uploaded individually as high resolution JPEG files, no more than 20MB each,
- A design essay or abstract (300 words maximum)

- A program summary diagram/text of spaces and areas (150 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.

Schedule

April 13, 2022	Registration Deadline (free registration)
June 1, 2022	Submission Deadline
Summer 2022	Winners Announced

RESOURCES

Entrants are encouraged to research references that are related to both the topic of the competition and precedent projects that demonstrate innovative use of concrete such as those listed below. An intention of all ACSA competitions is to make students aware that research is a fundamental element of any design solution.

Resources

- [Sustainable Concrete: The Role of Performance-based Specifications](#)
- [Concrete Innovations](#)
- [Substantial global carbon uptake by cement carbonation](#)
- [The 411 on Recycled Concrete: Uses, Benefits, and How To](#)
- [Portland-Limestone Cement and Sustainability](#)
- [Concrete's Role in Carbon Capture, Utilization and Storage \(CCUS\)](#)
- [MIT Concrete Sustainability Hub](#)
- [CarbonBuilt](#)
- [CarbonCure's Concrete Solution - Concrete Technology Reducing Carbon Impact](#)
- [Solidia - Making Sustainability Business As Usual](#)
- [Blue Planet - Economically Sustainable Carbon Capture](#)
- [Smart Home America](#)

Build with Strength

www.buildwithstrength.com

National Ready Mixed Concrete Association

Founded in 1930, the National Ready Mixed Concrete Association is the leading industry advocate. Our mission is to provide exceptional value for our members by responsibly representing and serving the entire ready mixed concrete industry through leadership, promotion, education and partnering to ensure ready mixed concrete is the building material of choice.

The mission of Build with Strength, an initiative of the National Ready Mixed Concrete Association, is to educate the building and design communities and policymakers on the benefits of ready mixed concrete and encourage its use as the building material of choice for low- to mid-rise structures. No other material can replicate concrete's advantages in terms of strength, sustainability, durability, safety and ease of use.

Habitat Resources

<https://www.habitat.org/>

Habitat for Humanity ®

Habitat for Humanity is a global nonprofit housing organization working in local communities across all 50 states in the U.S. and in approximately 70 countries. Habitat's vision is of a world where everyone has a decent place to live.

Habitat works toward our vision by building strength, stability and self-reliance in partnership with families in need of decent and affordable housing. Habitat homeowners help build their own homes alongside volunteers and pay an affordable mortgage.

Association of Collegiate Schools of Architecture

www.acsa-arch.org

Administrative Organization

Association of Collegiate Schools of Architecture

Leading Architectural Education and Research

The Association of Collegiate Schools of Architecture 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 6,000 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.

Partner Organizations

Portland Cement Association

www.cement.org

Insulating Concrete Forms Manufacturers Association

<https://icf-ma.org/>

National Concrete Masonry Association

<https://ncma.org/>

American Concrete Pumpers Association

<https://www.concretepumpers.com/>

Concrete Reinforcing Steel Institute

<https://crsi.org/>

Ready Mixed Concrete Research & Education Foundation

<https://rmc-foundation.org/>

National Stone Sand & Gravel Association

<https://www.nssga.org/>

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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