



U.S. DEPARTMENT OF ENERGY

**Solar Decathlon**

**Design Challenge**

## **2024 Design Challenge Rules**

August 2023

## List of Acronyms

AH	Attached Housing
ANSI	American National Standards Institute
Btu	British thermal unit
DOE	U.S. Department of Energy
EB	Education Building
EDT	Eastern Daylight Time
EST	Eastern Standard Time
EUI	energy use intensity
ERI	Energy Rating Index
HERS	Home Energy Rating System
HPwES	Home Performance with ENERGY STAR®
HVAC	heating, ventilating, and air conditioning
kBtu	kilo-British thermal unit
MB	Multifamily Building
NREL	National Renewable Energy Laboratory
pv	photovoltaic
RESNET	Residential Energy Services Network
SF	Single-Family Housing
USCS	United States Customary System

## Foreword—Why Solar Decathlon Design Challenge?

Buildings account for 40% of total energy consumption in the United States, and 20% of global energy consumption.<sup>1</sup> Through direct use of fossil fuels and fossil fuel-produced electricity, buildings have a substantial impact on the environment and long-term resource availability. Beyond environmental impact, buildings are a focal point for emerging crises related to environmental justice, affordability, health, disaster risks, and water shortages.

Shifting the paradigm from resource-intensive to zero energy buildings requires a skilled workforce of design professionals with interdisciplinary skills and diverse experiences to apply high-performance strategies to both deep energy retrofits and new construction. This demands whole building design for existing and new buildings that leverages comprehensive building science and addresses energy efficiency, indoor air quality, occupant experience, human health, optimized mechanical systems, embodied and operational carbon, affordability, resilience, and resource conservation. However, professional curricula and degree programs across the United States and around the world are inconsistent, with many lacking the resources needed to adequately address these complex issues.

To help address this gap, the U.S. Department of Energy (DOE) Solar Decathlon® Design Challenge focuses on two critical goals: to incorporate high-performance building design strategies into curricula, and to inspire students to pursue sustainable building careers. Designed to support educational programs in training the next generation of building design professionals, the Solar Decathlon's 10 Contests aim to transform the building industry by challenging student teams to design zero energy ready buildings and address complex real-world issues—energy insecurity, food systems, waste streams, climate change, carbon emissions, and social inequities—through whole building design.

Design Challenge outcomes demonstrate substantial success toward these goals, including:

- Participation by more than 6,000 students from 218 collegiate institutions across 47 U.S. states and 32 countries and since 2014
- 728 Participant Teams from across the world since program inception
- A network of more than 1,000 industry partners
- 25% of 2023 Design Challenge projects focused on retrofit or renovation to address climate impacts of existing building stock
- 92% of Design Challenge students surveyed recommend participation to their peers.

A movement has started. The Solar Decathlon Design Challenge is equipping the next-generation building workforce with the skills and passion to create future-ready buildings.

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<sup>1</sup> U.S. Energy Information Administration. April 2021. “Monthly Energy Review,” Table 2.1. <https://www.eia.gov/totalenergy/data/monthly/>

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# 1 Challenge Overview

This document outlines the Rules and evaluation criteria for teams competing in the Solar Decathlon Design Challenge, a collegiate competition with 10 Contests that challenges student teams to design innovative, high-performance, low-carbon buildings powered by renewable energy.

Over one to two semesters, Design Challenge participants prepare creative solutions that address real-world issues in the building industry. The experience offers students a unique opportunity to:

- Experience zero energy building design firsthand.
- Address complex challenges in decarbonizing the buildings industry, including the need for existing building retrofits.
- Exchange design strategies with other teams around the world.
- Collaborate and network with industry experts.
- Learn from national thought leaders and collegiate peers.
- Engage with organizations about careers related to improving the built environment.

All registered teams are invited to present their initial designs to expert jurors at a virtual Semifinal Competition Event, at which Finalist Teams will be selected. Finalists are invited to compete in person at the Solar Decathlon Competition Event, where Division Winners and Grand Winners are announced. Project materials from winning teams are published on the [Solar Decathlon website](#). The competition and winners are promoted through a variety of outreach efforts, which provide participants and their collegiate institutions with opportunities to share their work. Select winners may receive further invitations to present at industry conferences following the Solar Decathlon Competition Event. Collegiate institutions that participate in the Design Challenge are recognized as leaders who are preparing career-ready professionals with cutting-edge skills. Sponsors gain national and local recognition, and industry partners who collaborate with teams interact with promising future design and construction professionals.

## 1.1 Summary of Important Dates

The following are key milestones for the 2024 Design Challenge:

- **August 2023:** 2024 Design Challenge Rules are released and [Team Registration](#) opens.
  - Teams can begin work on their design at any time.
  - To complete the registration process, teams use the [Submission Site](#), an online platform for teams to submit deliverables, access competition resources, and receive competition updates from the organizers.
  - Once a team completes the registration process, they are officially a Participant Team in the Design Challenge. All teams are accepted into the competition.
  - Resources are provided on the [Submission Site](#) to support Participant Teams throughout the competition, including an on-demand Building Science Education course, competition webinars, and technical analysis software.
- **October 18, 2023, 5 p.m. EDT:** Team Registration is due on the [Submission Site](#).
  - The Team Registration must indicate which Division the team intends to enter. The team may change their Division selection up until the Semifinal Submission.
- **December 5, 2023, 5 p.m. EST:** Teams submit an *optional* Project Summary via the [Submission Site](#).
  - Teams will receive feedback on project compliance to Rules requirements based on this submission.
- **January 2024:** An updated version of the Solar Decathlon 2024 Design Challenge Rules is released with minor clarifications and any needed adjustments.
- **February 20, 2024, 5 p.m. EST:** Semifinal Submission deliverables are due on the [Submission Site](#). These include:
  - Updated Project Summary
  - 10-Minute Presentation Slides
  - Final Division selection
  - Building Science Education completion from each student on the team, or equivalency waiver from faculty.
- **February 23–24, 2024:** Virtual Solar Decathlon Semifinal Competition Event
  - All Participant Teams present to industry expert jurors during the virtual Solar Decathlon Semifinal Competition Event and are evaluated against criteria indicated in this Rules document.
  - Up to 10 Finalist Teams per Division are selected to advance and compete in the Competition Event, contingent on their completion of Final Submission deliverables.

- Teams not selected as Finalists are encouraged to complete their Final Submission deliverables and continue as Exhibition Teams. More details on Exhibition Teams can be found in Section 5.6.2.
- **February 29, 2024, 5 p.m. EDT:** Teams that are not selected as Finalists during the Semifinal Competition Event are required to submit a Letter of Intent if they intend to continue competition participation as an Exhibition Team. No action is required by Finalist Teams to continue their participation.
- **April 2, 2024, 5 p.m. EDT:** Key components of the Final Submission deliverables are submitted via the Submission Site. These include:
  - Updated Project Summary
  - Design Narrative
  - Video Pitch
  - Team Photos
  - Supplemental Documentation (optional).
- **April 16, 2024, 5 p.m. EDT:** Division Presentation Slides and Grand Jury Presentation Slides are submitted via the Box links indicated in Section 6.
- **April 19–21, 2024: Solar Decathlon Competition Event**
  - Teams participate in the hybrid Solar Decathlon Competition Event. On-site activities for Finalist and Exhibition Teams are held at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, USA.
  - Finalist Teams present to industry expert Jurors for Division Winner selection on Saturday.
  - Exhibition Teams present to industry expert Reviewers for feedback and are invited to participate in all Competition Event activities.
  - Students and faculty optionally present posters and other physical exhibits to share ideas with peers.
  - Design Challenge winners are announced.

## 2 Building a Team

### 2.1 Team Requirements

The competition is open to U.S.-based and international collegiate institutions. “Collegiate institution” refers to any school of postsecondary or higher education, including two-year schools, such as community colleges; technical colleges; four-year colleges and universities; and graduate schools. Teams should abide by the following criteria:

- Each team must be associated with a collegiate institution and include at least one Faculty Advisor.
  - Multiple collegiate institutions may combine to form a team.
  - One Faculty Advisor may counsel multiple teams.
- Each collegiate institution may submit up to four Team Registrations but may **not** have more than one team in any Division.
- Each team must have at least three students (see Section 2.2 for student qualifications).
  - One student must be designated as the Student Team Lead.
  - There is no maximum number of student team members.
- At least one student and one faculty member from each Finalist Team are required to participate in the hybrid Competition Event.

### 2.2 Student Qualifications

Designing a building is interdisciplinary and requires a variety of skillsets. The strongest teams are interdisciplinary, composed of students from a variety of degree programs and backgrounds. Student team members can be from any discipline and any level of collegiate schooling, including undergraduate, graduate, and Ph.D. students. Teams may also include students from more than one collegiate institution. Past successful teams have included students who majored in fields such as architecture, building science, business, construction management, economics, engineering, interior design, physics, policy, public health, sociology, and sustainability.

In addition, students must meet the following:

- Students are limited to participating in one team for the Design Challenge competition year; however, a collegiate institution may have more than one team.
- Each student must be pursuing a degree and enrolled in at least one class between the Team Registration deadline and the Competition Event. Students who meet this qualification and graduate in December 2023 are still eligible to compete.

### 2.3 Faculty Advisor Role

The Faculty Advisor, with assistance from the Student Team Lead, is responsible for communicating competition details provided by the organizers to the team members. The Faculty Advisor can be a full-time, part-time, or adjunct faculty member associated with a collegiate institution. A team may have more than one Faculty Advisor for their project; one Faculty Advisor may counsel multiple teams.



At least one Faculty Advisor must be designated to serve as a primary contact and support student teams by:

- Providing overall competition guidance and adhering to the Design Challenge Rules.
- Ensuring all student team members complete the Building Science Education course, or providing an equivalency waiver if the core curriculum includes comparable building science training. The Faculty Advisor should encourage students to access relevant training materials.
- Providing necessary information to team members participating in the Competition Event.

The Faculty Advisor may also designate one or more industry professionals to serve as an Acting Advisor to a student team. The Acting Advisor supports the team's participation by fulfilling some or all of the responsibilities mentioned above. Acting Advisors are intended to serve as additional leadership for teams and help faculty manage their team's engagement and participation. Acting Advisors can be industry professionals who are not faculty or associated with a collegiate institution. Faculty Advisors are expected to confirm with the organizers that an Acting Advisor is supporting their team. All teams are still required to designate at least one Faculty Advisor but may be additionally supported by one or more Acting Advisors.

## **2.4 Industry Engagement**

Engagement with industry professionals can provide real-world perspective that helps inform teams' design decisions. Successful teams often engage with several industry professionals who have a wide range of expertise, such as architects, builders, city officials, contractors, energy auditors, building performance modelers, engineers, financial analysts, manufacturers, community advocates/organizers, and tradespeople in areas such as site development, codes, construction, building materials, mechanical systems, lighting systems, financing, and sales.

Teams are encouraged to engage with industry professionals who can provide support, donations, or professional guidance. These industry professionals are not permitted to complete any project work on a team's behalf; students remain responsible for design, detailing, documentation, construction, operation, and all other competition activities.

### **2.4.1 Design Partners**

Design Partners represent a specific type of industry engagement. Design Partners are individuals or organizations that have a planned major retrofit or new construction project in their building portfolio and serve as a client to a student team, working with them to develop a zero energy design option for the project. For example, a school district that is planning a major retrofit to an existing school could be a Design Partner and work with a team to receive a zero energy design and cost analysis for the retrofit. Teams also benefit from working on a design project with real programmatic and budget constraints. Teams are encouraged to secure their own Design Partner, in addition to other types of industry engagement. The Design Partner should:

- Provide teams with building program and plan, including basic project information and requirements.

- Engage with the team over the course of the competition for design programming, iterative schematics, and feedback.

## 2.5 Mentor Program

The Mentor Program pairs Solar Decathlon alumni from any previous competition year with current Design Challenge Participant Teams to share best practices learned through their experiences.

- All teams may request a mentor in the Team Registration and will be paired with mentors based on availability; teams are not guaranteed a mentor.
- Mentors provide support to student teams during the competition period, which may include nontechnical review and feedback on project management, direction, deliverables, and presentation.
- Mentors are not permitted to complete any project work on a team's behalf.
- Student teams are responsible for leading the relationship with their mentor and are expected to keep mentors updated on project progress and outcomes.

## 3 Project Requirements

Design submissions are required to meet the following specifications:

- The team must select a specific location or site, with an assessment of local characteristics including geography, geology, and planning and zoning considerations to provide context for the building design and its relationship to the surrounding community.
- Projects must be substantially different from any submitted to DOE competitions in the past.
- The design must comply with zero energy building requirements, outlined in Section 3.1.
- The design must comply with Division requirements, outlined in Section 3.2.
- The team must address criteria for all 10 Solar Decathlon Contests, outlined in Section 4.
- Teams should identify and adhere to applicable codes for the building's expected jurisdiction.
  - These include local, state, and national codes and standards governing topics such as minimum bedroom size, fire protection requirements, classroom size, and restroom locations and quantities, along with other specific requirements.
  - If there are conflicts between the Design Challenge requirements and local regulations, the local regulations supersede, and teams should clearly document these local regulations in their project submissions. If there are multiple governing codes applicable to the project, one code path must be selected and justified.
- United States Customary System (USCS) units of measurement are required.
  - A submission with both metric units and USCS units is acceptable.

- If metric units are used, state USCS units first, followed by metric equivalents in parentheses—example: 125 feet (ft) (38.1 meters [m]).
- Heating and cooling units should be provided in Btu or Btu/ft<sup>2</sup> depending on the context. Electricity units may be given in kWh; however, if describing the whole building performance or mixing heating with electricity, Btu should be used.

### 3.1 Zero Energy Building Requirements

Reducing and offsetting building energy consumption with renewable sources is integral to decreasing the environmental impacts of carbon. As a central project requirement, a design project submission must be a zero energy building. For the Design Challenge, a zero energy building is defined as a high-performance building with a renewable energy system that offsets the building's total annual non-renewable energy consumption. The method for calculating zero net energy takes source energy factors into account, and off-site renewable energy discount factors when necessary.<sup>2</sup>

The pathway to a zero energy building begins by reducing the energy needs of the building such that renewable energy can meet the remaining load. Renewable energy must be integrated into the project. After maximizing on-site renewable energy generation, off-site renewable energy options, such as participating in a community-scale renewable energy project or specifying utility-provided renewable power, can be used.

#### *Evaluating Building Energy Performance*

Energy analysis is invaluable for predicting energy performance and evaluating trade-offs to achieve energy goals. Energy analysis can be conducted using a variety of software programs. Free tools and resources for these calculations are offered on the [Submission Site](#).

#### *Home Energy Rating System Index*

The residential building industry commonly uses the Home Energy Rating System (HERS) Index to indicate energy efficiency. A lower score signifies a more energy-efficient home. To determine the score, homes are compared to a benchmark based on a designed model home of the same size and shape as the rated home. The HERS score can be calculated using any Residential Energy Services Network (RESNET)-accredited HERS software.

HERS rating software calculates heating, cooling, hot water, lighting, and appliance energy loads; consumption; and costs for new and existing single-family and multifamily homes. Software licenses for RESNET-accredited programs are provided to teams to establish a comparison to the target reference home benchmark. This software will be required to make a target reference home comparison, as outlined in [DOE Zero Energy Ready Home requirements](#).

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<sup>2</sup> For more details on source energy factors and off-site renewable energy discount factors, refer to ASHRAE Standard 228, available at <https://www.ashrae.org/technical-resources/bookstore/ansi-ashrae-standard-228-standard-method-of-evaluating-zero-net-energy-and-zero-net-carbon-building-performance>.

## Energy Use Intensity

Commercial building energy consumption is often evaluated based on the energy use intensity (EUI), which is measured as the total energy consumed annually divided by the gross floor area (kilo-British thermal unit [kBtu]/ft<sup>2</sup> or kilowatt-hours/m<sup>2</sup>).

EUI can be calculated with respect to source energy as well as site energy. Site energy is measured at the boundary of the site, often by electric or natural gas meters. Source energy accounts for all the upstream losses associated with converting and transporting energy to the building site. In the case of electricity, it is based on a fuel mix and the mining/extraction of those resources, the power plant losses, and the losses with transmission and distribution of electricity. Source energy is calculated by taking the site energy and applying a site-to-source multiplier for each energy source<sup>3</sup>:

$$Energy_{source} = Energy_{site} * Conversion\ factor_{site\ to\ source}$$

Target EUIs based on source energy for Multifamily Buildings and Education Buildings are shown in Table 1 in Section 3.5. These EUI values include all building loads, including plug loads; heating, ventilating, and air conditioning (HVAC); and lighting. Plug loads include vertical transportation and any other load in the building. The targets do not include exterior lighting loads, which are covered Table 2 in Section 3.5.

## 3.2 Project Selection for Carbon Impact

Across all Divisions, teams may develop either a retrofit or new construction building design. Applying zero energy solutions to both existing and new construction buildings is critical to decarbonizing the built environment. By 2040, approximately two-thirds of the building stock will be buildings that exist today<sup>4</sup>; students in the Design Challenge are strongly encouraged to explore zero energy solutions for existing buildings.

Teams are expected to examine the carbon impact of their project selection and design approach. A buildings' carbon impact can be examined through the lens of both embodied and operational carbon. Embodied carbon refers to the emissions associated with the sourcing, processing, manufacturing, transporting, assembling, maintaining, and disposing of materials.<sup>5</sup> Operational carbon refers to the emissions from a building's energy consumption through its operations.<sup>6</sup> Retrofits of existing buildings can represent a significant opportunity to reduce embodied carbon compared with new construction, while increasing the building's energy efficiency, reducing operational costs, and improving the occupant experience. On the other hand, new construction provides an opportunity to minimize operational carbon by optimizing the building design and to meet specific client or community needs.

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<sup>3</sup> See "[A Common Definition for Zero Energy Buildings](#)" for methodology in calculating EUI and source energy from site energy.

<sup>4</sup> Architecture 2030. 2023. "Why the Built Environment." <https://architecture2030.org/why-the-building-sector/>

<sup>5</sup> National Renewable Energy Laboratory. August 2022. "Integrating Embodied Carbon Knowledge for Design Decisions." <https://www.nrel.gov/docs/fy22osti/83204.pdf>

<sup>6</sup> Carbon Leadership Forum. December 2020. "Embodied Carbon 101." <https://carbonleadershipforum.org/embodied-carbon-101/>

Teams are expected to provide a defensible rationale for selection of a retrofit or new construction project to meet their stated goals. Teams are also expected to assess the overall carbon impact of their building through the Life-Cycle Contest; detailed Contest criteria are included in Section 4.6. In addition to Contest criteria, Jurors will evaluate the team’s justification for their selection of a new construction versus retrofit project, and how the proposed design contributes to global emissions reductions. More details on evaluation criteria can be found in the rubrics included in Sections 5.4.1 and 5.5.1.

### 3.3 Project Selection for Community Impact

To achieve decarbonization goals, creative solutions for buildings in different communities must be explored. Applying zero energy solutions to buildings that benefit underserved populations is critical to equitably transform the built environment. Students in the Design Challenge are strongly encouraged to explore zero energy solutions for “equity-eligible buildings,”<sup>7</sup> which can be defined as follows:

- Buildings located within [Climate and Environmental Justice Screening Tool](#) (CEJST)-designated and/or DOE-designated [Justice40 census tracts](#), federally recognized tribal lands, and U.S. territories.
- Affordable housing and housing occupied by low-income residents<sup>8</sup>.
  - This can include subsidized affordable housing, naturally occurring affordable rental housing, and homes occupied by low-income households.
- Underserved commercial, nonprofit, and public buildings.
  - This can include buildings used by businesses that serve disadvantaged communities, buildings used by nonprofit organizations that provide localized community services, and Title I schools.

Teams are expected to assess how the building supports and aligns with the priorities of the occupants and their local communities, including addressing the need for affordability, through the Community Contest; detailed Contest criteria are included in Section 4.9.

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<sup>7</sup> A full definition of equity-eligible buildings can be found in the U.S. Department of Energy’s Buildings Upgrade Prize Rules, see

<https://www.herox.com/protected/91/1152/attachment:8QUFLfKk2WVj1dCDq9iaF4yAAJjQ8cDPoPeepoVTWc>

<sup>8</sup> HUD defines affordable housing as “housing on which the occupant is paying no more than 30 percent of gross income for housing costs, including utilities.” See <https://archives.hud.gov/local/nv/goodstories/2006-04-06glos.cfm>.

## 3.4 Divisions

Design Challenge Divisions represent different residential and commercial building types. Teams must specify a single Division in which they will participate.

### Residential Divisions

#### ***Single-Family Housing***

The Single-Family Housing (SF) Division is defined as one to two dwelling units within a single building.

- Retrofit of existing building or new construction allowed.
- Independent, detached structure.
- Building size: 300–4,500 ft<sup>2</sup> (28–418 m<sup>2</sup>) per dwelling unit.
- Retrofit energy performance requirements:
  - Meets [DOE Zero Energy Ready Home National Program Requirements](#)<sup>9</sup> with exceptions defined by<sup>10</sup>:
    - [Energy Star Guidance for Homes and Buildings Undergoing Gut Rehabilitation](#).
- New construction energy performance requirements:
  - Meets [DOE Zero Energy Ready Home National Program Requirements](#)<sup>9</sup>.

#### ***Attached Housing***

The Attached Housing (AH) Division is defined as multiple dwelling units within a single building.

- Row homes or flats, 3–12 dwelling units; building is up to 3 stories above grade.
- Retrofit of existing building or new construction allowed.
- Building size: 500–2,500 ft<sup>2</sup> (46–232 m<sup>2</sup>) per dwelling unit.
- Retrofit energy performance requirements:
  - Meets [DOE Zero Energy Ready Home National Program Requirements](#),<sup>9</sup> with exceptions defined by<sup>10</sup>:

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<sup>9</sup> If Energy Rating Index (ERI) target requirements for the project cannot be met, an alternative compliance method must be provided and is subject to review by the jury at time of deliverable submission.

<sup>10</sup> Retrofits are currently not covered under the DOE Zero Energy Ready Home National Program Requirements. To qualify a retrofit as zero energy ready, the target reference home benchmark shall be the same as the target used for new construction.

- [Energy Star Guidance for Homes and Buildings Undergoing Gut Rehabilitation.](#)
- New construction energy performance requirements:
  - Meets [DOE Zero Energy Ready Home National Program Requirements.](#)<sup>9</sup>

## Commercial Divisions

### **Multifamily Building**

The Multifamily Building (MB) Division is defined as a structure that contains multiple dwelling units.

- Minimum of 8 dwelling units.
- Minimum of 4 stories.
- Retrofit of existing building or new construction allowed.
- Building size: 350–2,000 ft<sup>2</sup> (33–186 m<sup>2</sup>) per dwelling unit.
- Up to 50% of total area may be devoted to commercial use, such as retail, office, and industrial.
- For retrofit and new construction projects: To meet the zero energy building requirements, the source EUI target before renewables must be less than that shown in Table 1 in Section 3.5.<sup>11</sup>

### **Education Building**

The Education Building (EB) Division is defined as an educational facility for students and includes permanent provisions for food service, recreation, offices, classrooms, and other support functions, such as mechanical spaces, circulation, and restrooms.

- Retrofit of existing building or new construction allowed.
- Any combination of grade levels in the range from pre-kindergarten to 12<sup>th</sup> grade.
- For retrofit and new construction projects: To meet the zero energy building requirements, the source EUI target before renewables must be less than that shown in Table 1 in Section 3.5.<sup>11</sup>

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<sup>11</sup> If EUI target requirements for the project cannot be met, an alternative compliance method must be provided and is subject to review by the jury at time of deliverable submission.

### 3.5 Resources to Evaluate Building Energy Performance

The following tables are provided to evaluate building energy performance as outlined in Section 3.1.

**Table 1. Source Energy<sup>12</sup> Use Intensity Targets for Multifamily<sup>13</sup> and Education<sup>14</sup> Buildings**

Climate Zone <sup>15</sup>	Multifamily Building <sup>13</sup> Source EUI (kBtu/ft <sup>2</sup> -yr)	Education Building <sup>14</sup> Source EUI (kBtu/ft <sup>2</sup> -yr)
0A	82	66
0B	86	67
1A	78	63
1B	81	64
2A	76	61
2B	69	57
3A	71	54
3B	67	55
3C	67	50
4A	67	53
4B	65	52
4C	64	49
5A	81	54
5B	65	53
5C	59	48
6A	71	60
6B	67	55
7	71	63
8	76	67

<sup>12</sup> For the methodology for calculating source energy, see “[A Common Definition for Zero Energy Buildings.](#)”

<sup>13</sup> Based on the total building targets for the “Advanced Energy Design Guide for Multifamily Buildings: Achieving Zero Energy”; see <https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download>.

<sup>14</sup> Adapted from the “Advanced Energy Design Guide for K–12 School Buildings: Achieving Zero Energy”; see <https://www.ashrae.org/technical-resources/aedgs/zero-energy-aedg-free-download>.

<sup>15</sup> Based on the IECC climate zone map, see <https://basel.pnnl.gov/images/iecc-climate-zone-map>.



**Table 2. Exterior Lighting Allowances for Multifamily and Education Buildings**

Exterior Location	Lighting Power Allowance	Controls
Entry doors	13 watts/linear foot of doorway	Dusk to dawn, reduction of 75% when no motion detected
Exterior stairs	0.70 watt/ft <sup>2</sup>	Dusk to dawn, reduction optional depending on local codes
Walkways	0.10 watt/ft <sup>2</sup>	Dusk to dawn, reduction of 75% when no motion detected
Driveways and parking lots	0.04 watt/ft <sup>2</sup>	Dusk to dawn, reduction of 75% when no motion detected

## 4 Contests

Solutions developed by Solar Decathlon teams innovate across all 10 Contest areas, demonstrate mastery of building science fundamentals, and highlight creative approaches to whole-building design. All Contests are equally weighted and should be addressed through a seamless, integrated building solution that can transform the built environment.

The 10 Contests are outlined in Table 3. Jurors evaluate how well teams meet or exceed criteria for each Contest using provided design and technical documentation, project plans, reports for required analyses, and the quality and content of their presentations. Detailed evaluation criteria for each Contest are provided in the following sections (Sections 4.1–4.10).

Teams are expected to address all 10 Contests through their building solutions. However, unique considerations exist for new construction and retrofit designs that teams are encouraged to explore. The following are key unique considerations for each project type.

**Table 3. Contests**

Solar Decathlon Contests
1. Architecture
2. Engineering
3. Envelope
4. Efficiency
5. Grid-Interactivity
6. Life-Cycle
7. Health
8. Market
9. Community
10. Presentation

### *New Construction Projects*

- Embodied carbon emissions for full site development and production of building materials, and operational carbon emissions for building lifespan.
- Defensible rationale for why new construction is a better solution compared to retrofit or renovation to meet project goals.

### *Retrofit Projects*

- Existing deficiencies in selected building, including safety and accessibility considerations, that impact occupant health and well-being.
- Adjusted estimation of operational carbon emissions that reflects the impact of energy conservation measures.
- Defensible rationale for why retrofit or renovation is a better solution compared to new construction to meet project goals.

## 4.1 Architecture

### *Contest Intent*

This Contest evaluates the building architecture for creativity in matching form with function, overall integration of systems, and ability to deliver outstanding aesthetics and functionality both inside and outside the structure.

### *Design Challenge Criteria*

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Careful consideration of specified site, including views, drainage, regionally appropriate materials, and preservation of architectural styles</li> <li>• Integration of building form and function, including exterior and interior architecture with respect to the target market, climate, and zero energy building goals</li> <li>• Quality of the design and appearance, including floor plan and interior details for flow, furnishings, storage, linkages to outdoors, and efficient use of space.</li> </ul>	<p>The team successfully addressed the Architecture Contest intent and criteria.</p>

## 4.2 Engineering

### Contest Intent

This Contest evaluates the design and effective integration of the innovative, high-performance systems needed for a zero energy building, including mechanical, electrical, plumbing, and structural engineering systems.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Approach to engineering design of active building systems, including structural, mechanical, electrical, and plumbing, that optimize long-term performance to satisfy occupant needs</li> <li>• Justification of engineering system choices to meet project goals</li> <li>• Detailed documentation and load calculations that clearly outline the techniques used and convey the design intent</li> <li>• Demonstration of innovation through the application of new, unique, or atypical technologies or engineering solutions that improve on the status quo.</li> </ul>	<p>The team successfully addressed the Engineering Contest intent and criteria.</p>

## 4.3 Envelope

### Contest Intent

This Contest evaluates the envelope design strategies, including air tightness, thermal performance, and durability, as well as balancing comfort with optimized system performance.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Building enclosure integration of all four building science control layers (e.g., thermal, air, bulk moisture, and moisture vapor), including foundation, walls, roof, and penetrations, that is appropriate to site-specific conditions and executed in the design details</li> <li>• Analysis and responsiveness of design to current and future climatic risks, including weather and other natural events</li> <li>• Balanced exploration of performance, durability, and carbon impacts of materials selected in envelope design</li> <li>• Effective use of passive design strategies to reduce active system capacity requirements, and meet heating, cooling, ventilating, and lighting needs.</li> </ul>	<p>The team successfully addressed the Envelope Contest intent and criteria.</p>

## 4.4 Efficiency

### Contest Intent

This Contest evaluates the whole-building operational efficiency from successful modeling to application of active and passive systems.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<b>Teams should address the following in their project:</b>	<b>The evaluation statement is scored on a 1–6 scale.</b> <i>The evaluation rating scale is included in Section 5.2.</i>
<ul style="list-style-type: none"><li>• Exploration of whole-building energy performance relative to a target, focusing on optimal efficiency of active and passive systems</li><li>• Realistic models and calculations, including projected operational savings, that inform design decisions related to energy and water usage</li><li>• Maintenance and operability assessments of building systems to verify long-term energy savings, building function, and consider occupant needs</li><li>• Evaluation of operational carbon emissions that examines the building's energy sources.</li></ul>	The team successfully addressed the Efficiency Contest intent and criteria.

## 4.5 Grid-Interactivity

### *Contest Intent*

This Contest evaluates the building’s ability to minimize operational carbon by interacting with the grid, demonstrating resiliency during disruptions, and aligning with the supply, demand, and fuel mix constraints of the local utility.

### *Design Challenge Criteria*

Criteria	Juror Evaluation Statement
<b>Teams should address the following in their project:</b>	<b>The evaluation statement is scored on a 1–6 scale.</b> <i>The evaluation rating scale is included in Section 5.2.</i>
<ul style="list-style-type: none"><li>• Integration of building energy system strategies to withstand and recover from identified resilience risks, including grid disruptions.</li><li>• Analysis of utility rates and grid fuel mix to minimize carbon impact and align energy supply and demand</li><li>• Innovative energy management solutions within the building that are responsive to grid conditions.</li></ul>	The team successfully addressed the Grid-Interactivity Contest intent and criteria.

## 4.6 Life-Cycle

### Contest Intent

This Contest evaluates the building’s energy and carbon impacts throughout the entire building life cycle, from raw material extraction through operation to end of life.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Material selections and design decisions, including analysis and iteration showing decision process starting in the concept stage with a focus on reducing embodied and operational carbon.</li> <li>• Life cycle assessment performed within a consistent framework that demonstrates realistic inputs and assumptions (e.g., intended service life, functional requirements) and measures the building’s embodied environmental impacts</li> <li>• Discussion of trade-offs among upfront, operational, and end-of-life environmental impacts (e.g., energy, greenhouse gas emissions).</li> </ul>	<p>The team successfully addressed the Life-Cycle Contest intent and criteria.</p>



## 4.7 Health

### Contest Intent

This Contest evaluates the building's capability to safeguard occupant health and quality of life through system and space designs that optimize comfort, safety, and indoor air quality.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Comprehensive material and appliance selection, operational details, and construction practices that optimize occupants' quality of life, health, and well-being, and minimize the introduction of toxins into air and water.</li> <li>• Advanced building control technologies for appliances, equipment, security, and lighting systems that provide comfort, convenience, and safety</li> <li>• Complete indoor environmental quality strategy that prioritizes indoor air quality and whole building ventilation, and identifies strategies for spot ventilation and filtration</li> <li>• Acoustical design strategies for controlling unwanted interior and exterior noise.</li> </ul>	<p>The team successfully addressed the Health Contest intent and criteria.</p>

## 4.8 Market

### Contest Intent

This Contest evaluates the project’s potential to transform the built environment and serve as a catalyst for change in future projects through scalability and likelihood of adoption by the target market and industry.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Thorough market analysis and realistic cost estimates, including operational and maintenance, that optimize appeal to target market and financial feasibility, and leverage relevant financial assistance mechanisms including grants, tax incentives, and other subsidies</li> <li>• Potential commercial impact of the proposed design including considerations of scalability, replicability, and buildability, and any barriers to large-scale adoption</li> <li>• Engagement of industry, including Design Partners, to ground project in real-world perspectives and constraints</li> <li>• Responsiveness and marketability of applied technologies and solutions to occupant and market needs.</li> </ul>	<p>The team successfully addressed the Market Contest intent and criteria.</p>

## 4.9 Community

### Contest Intent

This Contest evaluates how the building supports and aligns with the priorities of the occupants and their local communities, including addressing the need for affordability.

### Design Challenge Criteria

Criteria	Juror Evaluation Statement
<p><b>Teams should address the following in their project:</b></p>	<p><b>The evaluation statement is scored on a 1–6 scale.</b>  <i>The evaluation rating scale is included in Section 5.2.</i></p>
<ul style="list-style-type: none"> <li>• Engagement of community to identify and respond to needs and goals of local community</li> <li>• Innovative approaches that promote equity in the built environment, support affordability for intended occupant, and contribute to economic development, including considerations of local workforce and materials</li> <li>• Interactions that benefit intended occupant and community, including considerations of neighborhood conditions, land-use patterns, cultural preservation, and access to transportation systems and other community amenities</li> <li>• Consideration of potential risks, including displacement of intended occupants and surrounding community, due to project implementation.</li> </ul>	<p>The team successfully addressed the Community Contest intent and criteria.</p>

## 4.10 Presentation

### *Contest Intent*

This Contest evaluates the team’s ability to educate, inspire, and motivate when communicating their real-world solutions to jurors, project stakeholders, and the public.

### *Design Challenge Criteria*

Criteria	Juror Evaluation Statement
<b>Teams should address the following in their project:</b>	<b>The evaluation statement is scored on a 1–6 scale.</b> <i>The evaluation rating scale is included in Section 5.2.</i>
<ul style="list-style-type: none"><li>• Clarity and coherence of project submissions, including written and multimedia materials</li><li>• Engaging and professional presentation to Jurors that conveys key points of design and demonstrates command of design solution</li><li>• Ability to build interest in project approach by effectively communicating the value proposition and impact to different audiences across all deliverables and presentations.</li></ul>	The team successfully addressed the Presentation Contest intent and criteria.

## 5 Evaluation Process

Teams are evaluated across multiple competition stages. These stages include the evaluation of deliverables and presentations to industry expert Jurors.

### 5.1 Evaluation Process Summary

The evaluation process for the competition is summarized in Table 4. Detailed descriptions of each competition stage are outlined in later subsections.

**Table 4. Competition Evaluation Process Summary**

Competition Stage	Timeline	Evaluation Process Summary
<b>Project Summary (optional)</b>	December 5, 2023	Evaluation of initial Project Summary deliverable to gain preliminary feedback.
<b>Semifinal Competition</b>	February 20, 2024 <i>(Semifinal Submission deadline)</i> February 23–24, 2024 <i>(Semifinal Competition Event)</i>	Evaluation of Semifinal Submission deliverable and 10-minute presentation to Jurors. Up to 10 Finalist Teams are selected in each Division.
<b>Final Submission</b>	April 2, 2024 <i>(Final Submission deadline)</i> April 16, 2024 <i>(Division Presentation and Grand Jury Presentation slides deadline)</i>	Evaluation of Final Submission deliverable.
<b>Competition Event</b>	April 19–21, 2024	Evaluation of 15-minute presentation to Jurors. Winning teams are selected in each Division. Division winners present to Grand Jury to determine Grand Winner.

### 5.2 Evaluation Rating Scale

The following scale is used to evaluate team submissions and presentations to juries. The scale will be used by Jurors to complete the evaluation rubrics included in Sections 5.4 and 5.5. Evaluation rubrics are intended to provide additional guidance around the competition evaluation process and do not represent an exhaustive list of all considerations for teams or Jurors; for example, compliance with Rules requirements is considered across all competition stages. Scores will not be released to teams at any stage of the competition.

**Table 5. Evaluation Scale**

1	2	3	4	5	6
Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree

## 5.3 Project Summary

### *Evaluation Process*

The first competition stage is the Project Summary, which consists of an optional deliverable. The Project Summary provides an opportunity to submit preliminary information about a team's project. Though optional, it is highly recommended that teams submit the Project Summary to gain preliminary, qualitative feedback to improve and iterate upon their design. It also familiarizes teams with the submission process and how to comply with Rules requirements.

It is understood that the first submission of the Project Summary might be based on considerations and aspirations, or be otherwise tentative and subject to change in future submissions. The organizers will provide feedback on the following:

- Compliance with Rules requirements and Division definition
- Submission formatting compliance.

### *Deliverables*

See Section 6.1 for a full description of deliverable submission requirements.

- Project Summary submitted via the [Submission Site](#) by December 5, 2023.

## 5.4 Semifinal Competition

### *Evaluation Process*

The second competition stage is the Semifinal Competition, which consists of a deliverable and presentation to Jurors. The Semifinal Competition Event is a virtual event during which all Participant Teams present to panels of industry expert Jurors to compete for selection as Finalist Teams that advance to the final stage of the competition.

Through the Semifinal Submission deliverable and Semifinal Competition Event presentation, teams are not expected to convey a fully completed design; however, teams are expected to demonstrate their project's potential, as well as substantial progress and a plan toward design completion.

Teams are evaluated based on the following process:

- Teams submit the Semifinal Submission deliverables via the [Submission Site](#) by February 20, 2024, at 5 p.m. EDT.
- Each Participant Team will present a live, virtual 10-minute presentation to a panel of Division jurors, each with 1–2 industry experts.
  - There will be an 8-minute Question and Answer (Q&A) period with Division jurors following each team's presentation.
- Up to 10 Finalist Teams per Division are selected by Jurors to compete in the Competition Event based on evaluation of their deliverable and presentation.
- Teams receive written feedback from Division Jurors via the [Submission Site](#) within two weeks of the Semifinal Event.

- Regardless of finalist selection, all Participant Teams are encouraged to complete Final Submission deliverables, with non-finalist teams continuing as Exhibition Teams. See Section 5.6.2 for more details on Exhibition Teams.

### 5.4.1 Evaluation Rubric

Jurors individually evaluate each team’s deliverable and presentation within their Division according to the evaluation rubric in Table 6. The criteria included in Table 6 differ from those included in the rubric shown in Section 5.5 for the Final Submission deliverable and Competition Event presentation.

Possible scores correspond to the Evaluation Rating Scale included in Section 5.2. Selection of Finalist Teams is informed by the review and scoring of deliverables and presentations; final decisions are determined at the sole discretion of the Jurors. Scores will not be released to teams.

**Table 6. Evaluation Rubric: Semifinal Submission and Semifinal Competition Presentation**

Criteria	Juror Evaluation Statement
<b>Project Approach: 90% Weight</b> <i>Weight distributed evenly across criteria</i>	
<b>Design Goals</b>	The team successfully addressed the design goals and impact on design strategies.
<b>Target Market</b>	The team successfully addressed the target market, building occupant characteristics, and impact on design strategies.
<b>Local Climate</b>	The team successfully addressed the local climate, and related building science considerations and impact on design strategies.
<b>Building Codes and Standards</b>	The team successfully addressed the relevant building codes or standards and impact on design strategies.
<b>Plan for Final Submission</b>	The team successfully addressed a specific plan towards project completion.
<b>Competition Intent: 10% Weight</b> <i>Weight distributed evenly across criteria</i>	
<b>Building Science</b>	The team demonstrated a strong understanding and application of building science in the design.
<b>Project Selection for Carbon Impact</b> <i>See Section 3.2 for details.</i>	The team demonstrated a strong understanding of the embodied and operational carbon impacts of their project and provided strong justification for a retrofit or new construction design.

## ***Deliverables***

See Section 6.2 for a full description of deliverable submission requirements.

- Project Summary
- 10-Minute Semifinal Presentation Slides.

## ***Presentation Format***

- Each Participant Team will present to a panel of Division jurors in the following format:
  - 10-minute virtual presentation is given live. No recorded presentations will be permitted.
  - 8-minute Q&A period with Division jurors will follow each team's presentation.
- There is no limit to the number of student presenters during the 10-minute presentation and Q&A.
- Presentation slides will be submitted before the event. Teams are expected to share and advance their own slides during the 10-minute presentation.

## **5.5 Final Submission**

### ***Evaluation Process***

The third competition stage is the Final Submission, which consists of a deliverable. The Final Submission deliverable fully documents the final design.

Teams are evaluated based on the following process:

- Teams submit the Final Submission deliverables via the [Submission Site](#) by April 2, 2024.
- Jurors individually review all Final Submission deliverables within their assigned Division and determine preliminary scores for each team.
  - Preliminary scores are modified by the jurors based on the live Division presentations and associated Q&A period during the Competition Event.

### ***5.5.1 Evaluation Rubric***

The evaluation rubric below will be used by Jurors to evaluate the Final Submission deliverable and Competition Event presentation. Detailed criteria and Juror evaluation statements are included across each Contest in Section 4.1–4.10; the table below represents a summary of the criteria and evaluation statements. Scores correspond to the Evaluation Rating Scale included in Section 5.2. Selection of winning teams is informed by the review and scoring of deliverables and presentations; final decisions are determined at the sole discretion of the Jurors. Scores will not be released to teams.



**Table 7. Evaluation Rubric: Final Submission and Competition Event Presentation**

Criteria	Juror Evaluation Focus
<b>Contests: 90% Weight</b> <i>Weight distributed evenly across ten Contests</i>	
<b>Architecture Contest</b> <i>See Section 4.1 for suggested content.</i>	The team successfully addressed the Architecture Contest intent and criteria.
<b>Engineering Contest</b> <i>See Section 4.2 for details.</i>	The team successfully addressed the Engineering Contest intent and criteria.
<b>Envelope Contest</b> <i>See Section 4.3 for details.</i>	The team successfully addressed the Envelope Contest intent and criteria.
<b>Efficiency Contest</b> <i>See Section 4.4 for details.</i>	The team successfully addressed the Efficiency Contest intent and criteria.
<b>Grid-Interactivity Contest</b> <i>See Section 4.5 for details.</i>	The team successfully addressed the Grid-Interactivity Contest intent and criteria.
<b>Life-Cycle Contest</b> <i>See Section 4.6 for details.</i>	The team successfully addressed the Life-Cycle Contest intent and criteria.
<b>Health Contest</b> <i>See Section 4.7 for details.</i>	The team successfully addressed the Health Contest intent and criteria.
<b>Market Contest</b> <i>See Section 4.8 for details.</i>	The team successfully addressed the Market Contest intent and criteria.
<b>Community Contest</b> <i>See Section 4.9 for details.</i>	The team successfully addressed the Community Contest intent and criteria.
<b>Presentation Contest</b> <i>See Section 4.10 for details.</i>	The team successfully addressed the Presentation Contest intent and criteria.
<b>Competition Intent: 10% Weight</b> <i>Weight distributed evenly across criteria</i>	
<b>Building Science</b>	The team demonstrated a strong understanding and application of building science principles throughout their design.
<b>Project Selection for Carbon Impact</b> <i>See Section 3.2 for details.</i>	The team demonstrated a strong understanding of the embodied and operational carbon impacts of their project and provided strong justification for a retrofit or new construction design.

### **Deliverables**

The Final Submission deliverables are the same for both Finalist and Exhibition Teams:

- Project Summary (updated)
- Design Narrative
- Supplemental Documentation (optional)
- Video Pitch
- 3 Project Images.

See Section 6.4 for a full description of deliverable submission requirements.

## 5.6 Solar Decathlon Competition Event Presentation

### *Evaluation Process*

The Solar Decathlon Competition Event, to be held April 19–21, 2024, is the culmination of the competition and consists of a presentation to Jurors. The Competition Event provides a rich experience for participants to present their final design projects to industry experts, engage in networking opportunities, listen to thought leader speakers, and connect with both peers and leading experts in the building industry. Finalist Teams compete for Division and Grand Winner Awards, and Exhibition Teams present to reviewers for feedback.

#### **5.6.1 Finalist Teams**

Based on performance in the Solar Decathlon Semifinal Competition Event, up to 10 Finalist Teams in each Division are invited to compete at the Competition Event.

The evaluation process for Finalist Teams is as follows:

- Finalist Teams present to a jury panel of 2–3 industry experts during the Competition Event.
- Division Juror panels select first-place, second-place, and third-place award winners in each Division based on the criteria included in the evaluation rubric in Section 5.5 and compliance with Rules requirements.
- The first-place team for each Division delivers a live presentation at the Awards Ceremony for evaluation by the Grand Jury, which chooses a Grand Winner according to the process described in Section 5.7.
  - The Grand Juror Presentation will be 8 minutes in length.
  - No time is reserved for questions during the Awards Ceremony.
- Division Jurors develop written feedback for the teams that is shared via the [Submission Site](#) within two weeks of the Competition Event’s conclusion.

### *Presentation Format*

- Each Finalist Team will deliver a live 15-minute Division Presentation to a panel of 2–3 industry expert Jurors, with an additional 12 minutes for questions.
  - No pre-recorded presentations will be permitted.
- Each Finalist Team may have a maximum of 5 student team members present.
  - Teams may have a combination of virtual and in-person student presenters, but no more than 5 students can present.
  - Additional team members may participate in the Division Presentation Q&A.
  - For teams attending the event in person, the 5 student presenters do not need to be the same students as those attending in person.
  - All team members may attend the Competition Event virtually.
  - One Faculty Advisor or Acting Advisor may attend the Competition Event in person but may not participate in the presentation or Q&A period.

## *Deliverables*

See Section 6.4 for a full description of deliverable submission requirements.

- 15-Minute Division Presentation Slides
- 8-Minute Grand Jury Presentation Slides.

### **5.6.2 Exhibition Teams**

Teams that are not selected as Finalist Teams at the Semifinal Competition are encouraged to complete their Final Submission deliverable as an Exhibition Team. Exhibition Teams will present and gain feedback on their project from a panel of industry experts at the Competition Event. Exhibitions Teams are not eligible for Division Winner or Grand Winner Awards.

The evaluation process for Exhibition Teams is as follows:

- Following the Semifinal Competition, Exhibition Teams are required to submit a Letter of Intent according to the requirements outlined in Section 6.3. The Letter of Intent indicates the teams' intent to continue competition participation as an Exhibition Team.
  - Teams must submit their Letter of Intent by the deadline on February 29, 2024, at 5 p.m. EST in order to participate as Exhibition Team. The Letter of Intent is subject to review by the organizers and will not be accepted if it is missing required information or submitted after the deadline.
    - All students are encouraged to finish their design projects, regardless of participation as an Exhibition Team.
- Exhibition Teams must submit complete Final Submission deliverables according to the requirements outlined in Section 6.3 by the deadline on April 2, 2024, at 5 p.m. EDT.
  - Deliverables submitted by Exhibition Teams are subject to organizer review for completion and clarity. If deliverables are incomplete according to competition requirements, Exhibition Teams will not be permitted to continue participation and will be notified by the organizers.
- A maximum of one student and one Faculty Advisor or Acting Advisor are invited to attend the Competition Event in person at NREL. All team members are invited to participate virtually.
- Exhibition Teams will present to a reviewer panel during the event. The reviewers will provide feedback based on the criteria included in the evaluation rubric in Section 5.5 and compliance with Rules requirements.
- Reviewers develop written feedback for the teams that is shared via the [Submission Site](#) within two weeks of the Competition Event's conclusion.

### *Presentation Format*

- Each Exhibition Team will deliver a 15-minute presentation live to a panel of 2–3 industry expert reviewers, with an additional 12 minutes for questions.

- Faculty Advisors and Acting Advisors may not participate in the team’s presentation or Q&A.
- Each team may have a maximum of 5 student team members present to reviewers.
- Only one student and one Faculty Advisor or Acting Advisor from each Exhibition team are invited to attend the Competition Event in person; up to four other team members may present virtually.
  - Additional team members may participate virtually during the Q&A portion.

## 5.7 Grand Jury Award

The Grand Jury selects one Grand Winner from among the first-place teams in each Division based on the presentations given during the Awards Ceremony.

The Grand Jury enters the review process with the understanding that all the first-place winners have demonstrated a design that represents the quality expected for zero energy buildings. The Grand Jury is tasked with evaluating which project is most inspiring. The 8-minute summary presentations of the design are evaluated against the following criteria:

- Appeal to the target market, community, and occupants
- Architectural functionality and constructability
- Responsiveness of design to building science factors
- Consideration of embodied and operational carbon in project design
- Financial feasibility
- Innovation
- Presentation quality within specified time limit.

The Grand Jury evaluates if the team successfully addressed each criterion according to the evaluation rating scale shown in Table 5 to facilitate its selection of the Grand Winner.

## 5.8 Bonus Awards for Creativity

Bonus Awards are non-monetary certificates given to teams in addition to the Grand Winner Awards and the Division Awards. These are intended to recognize the excellence, professionalism, hard work, and enthusiasm that teams demonstrate beyond the required deliverables, and are selected by the organizers during the Competition Event. These may recognize excellence in areas such as:

- |                           |   |
|---------------------------|---|
| ● Team Spirit             | ● Design Partner Engagement                 |
| ● Team Virtual Background | ● Engaging Poster or Exhibit                |
| ● Team Name               | ● Addressing Environmental Justice          |
| ● Team Photo              | ● Engagement at Competition Event           |
| ● Social Media Engagement | ● First Complete Design Narrative Submitted |
| ● First-Time Team         | ● Innovative Retrofit Project               |
| ● Team Showcase Award     | ● Director’s Award.                         |
| ● Industry Engagement     |   |

## 6 Deliverables

Throughout the Design Challenge, each team must submit scheduled deliverables for evaluation of its progress and design. The deliverables, file naming conventions, and due dates are below. Deliverable deadlines are firm; submissions will not be accepted after 5 p.m. EDT or EST on the dates mentioned below.

**Table 8. Summary of Deliverables, File Naming Conventions, and Due Dates**

Deliverable	File Name	File Size	File Type	Submit To
<b>December 5, 2023</b>				
Project Summary (2 pages)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SUMMARY_2023-12-05.pdf	Less than 10 MB	Single, bookmarked PDF	<a href="#">Submission Site</a>
<b>February 20, 2024</b>				
Updated Project Summary (2 pages)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SUMMARY_2024-02-20.pdf	Less than 10 MB	Single, bookmarked PDF	<a href="#">Submission Site</a>
10-Minute Presentation Slides	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SEMIPRES_2024-02-20.pdf	Less than 100 MB	PDF or PPTX	<a href="#">Submission Site</a>
<b>February 29, 2024 (Exhibition Teams only)</b>				
Letter of Intent (Exhibition Teams only)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_LOI_2024-02-29.pdf	Less than 10 MB	PDF	<a href="#">Box</a>
<b>April 2, 2024</b>				
Updated Project Summary (2 pages)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SUMMARY_2024-04-02.pdf	Less than 10 MB	Single, bookmarked PDF	<a href="#">Submission Site</a>
Design Narrative (Up to 60 pages)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_NARRATIVE_2024-04-02.pdf	Less than 150 MB	Single, bookmarked PDF	<a href="#">Submission Site</a>
Supplemental Documentation (optional)	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SUP_2024-04-02.pdf	Less than 50 MB	Single, bookmarked PDF	<a href="#">Submission Site</a>
Video Pitch	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_PITCH_2024-04-02.[EXTENSION]	Less than 200 MB	.mov or .mp4	<a href="#">Submission Site</a>
Project Images	PHOTO1, PHOTO2, TEAMPHOTO e.g. 24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_PHOTO1_2024-04-02.pdf	Minimum resolution: 1920 x 1080 pixels	.jpg, .tiff, or .png	<a href="#">Submission Site</a>
<b>April 16, 2024</b>				
15-Minute Division Presentation Slides	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_DIVPRES_2024-04-16.[EXTENSION]	Less than 100 MB	PDF or PPTX	<a href="#">Box</a>
8-Minute Grand Jury Presentation Slides	24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_GRANDPRES_2024-04-16.[EXTENSION]	Less than 100 MB	PDF or PPTX	<a href="#">Box</a>

Note that a “bookmarked” PDF means the file has each major header bookmarked for easy viewing. This makes it easier for the jurors and reviewers to move around within lengthy and technical deliverables. As an example file, please see the bookmarks for this Rules document PDF. Guidance for creating a bookmarked PDF is provided on the [Submission Site](#).

See Sections 6.1–6.4 for the requirements for each Design Challenge deliverable, as well as submission instructions.

### ***Naming Files for Submissions***

Please use the approved file naming convention below for all submissions; to use the example below, replace each item in brackets [ ], including the brackets themselves, with the appropriate information for your team. For example, the Project Summary naming convention is:

24DC\_[DIVISION]\_[SHORT COLLEGIATE INSTITUTION NAME]\_SUMMARY\_2023-12-05.pdf

For the NREL team competing in the Attached Housing Division, the file name should be:

24DC\_AH\_NREL\_SUMMARY\_2023-12-05.pdf

## **6.1 Project Summary Submission Instructions**

The Project Summary communicates key aspects of the design project through a high-level description of the project and its highlights. Teams submit the Project Summary as a stand-alone document, developed via the Project Summary template found on the [Submission Site](#). Past Project Summaries can be viewed on [past Design Challenges webpages](#), and an example is provided on the [Submission Site](#).

For each deliverable submission phase, the Project Summary should follow the formatting outlined below. It is understood that for the first submission of the Project Summary, the details might be based on considerations and aspirations, or be otherwise tentative and subject to change in future submissions. The initial Project Summary will be revised for subsequent submissions.

### ***Project Summary Format Requirements***

<input type="checkbox"/> Paper size: Standard 8.5 inches (in.) × 11 in. (216 millimeters [mm] × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts)
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> Maximum length: 2 pages

### ***Project Summary Content Requirements***

<b>Project Summary</b>
<input type="checkbox"/> List the project name, team name, Division, and collegiate institution(s) in the header.
<input type="checkbox"/> Replace the logo in the upper right with the team or collegiate institution's logo.
<input type="checkbox"/> Replace the building image with one or two graphics that best represent the project.
<input type="checkbox"/> Provide a concise description of the project, including a brief identification of the target market.
<input type="checkbox"/> Describe the relevance of the project to the goals of the competition.
<input type="checkbox"/> Summarize the design strategy and relevant key points.
<input type="checkbox"/> List the relevant project data, including cost estimates.
<input type="checkbox"/> Provide technical specifications for the project.
<input type="checkbox"/> Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each Contest: <ol style="list-style-type: none"><li>1. Architecture</li><li>2. Engineering</li><li>3. Envelope</li><li>4. Efficiency</li><li>5. Grid-Interactivity</li><li>6. Life-Cycle</li><li>7. Health</li><li>8. Market</li><li>9. Community.</li></ol>

## **6.2 Semifinal Submission Instructions**

Teams submit the Semifinal Submission deliverables via the [Submission Site](#). These deliverables provide an interim submission to demonstrate each team's progress and likelihood of completing the final design submission. If a team conducts an internal competition and creates multiple projects, only one Semifinal Submission per team can be submitted and reviewed for acceptance as a Finalist Team.

Semifinal Submission deliverables include:

- Updated Project Summary
- 10-Minute Semifinal Presentation Slides.

### ***Project Summary Format Requirements***

<input type="checkbox"/> Paper size: Standard 8.5 in. × 11 in. (216 mm × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts); add page numbers for reviewer convenience.
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> Maximum length: 2 pages, including tables and figures

***Project Summary Content Requirements***

<b>Project Summary</b>
<input type="checkbox"/> List the project name, team name, Division, and collegiate institution(s) in the header.
<input type="checkbox"/> Replace the logo in the upper right with the team or collegiate institution’s logo.
<input type="checkbox"/> Replace the building image with one or two graphics that best represent the project.
<input type="checkbox"/> Provide a concise description of the project, including a brief identification of the target market.
<input type="checkbox"/> Describe the relevance of the project to the goals of the competition.
<input type="checkbox"/> Summarize the design strategy and relevant key points.
<input type="checkbox"/> List the relevant project data, including cost estimates.
<input type="checkbox"/> Provide technical specifications for the project.
<input type="checkbox"/> Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each of the following Contests: <ol style="list-style-type: none"><li>1. Architecture</li><li>2. Engineering</li><li>3. Envelope</li><li>4. Efficiency</li><li>5. Grid-Interactivity</li><li>6. Life-Cycle</li><li>7. Health</li><li>8. Market</li><li>9. Community.</li></ol>

***Semifinal Presentation Slides Format Requirements***

<input type="checkbox"/> File type: PDF and/or PPTX (Presentation Slides must have an aspect ratio of 16:9.)
<input type="checkbox"/> To ensure that all electronically submitted materials work with the organizers’ presentation computers, teams should embed all videos in the team submission.
<input type="checkbox"/> File name: <ul style="list-style-type: none"><li>o 24DC_[DIVISION]_[SHORT COLLEGIATE INSTITUTION NAME]_SEMIPRES_2024-02-20.pdf</li></ul>



## 6.3 Letter of Intent for Exhibition Teams

The Letter of Intent is required for teams to continue competition participation as an Exhibition Team if they are not selected as Finalists during the Semifinal Competition Event. The Letter of Intent outlines the team’s intent to participate as an Exhibition Team and plan for completion of the Final Submission deliverable.

### *Letter of Intent Format Requirements*

<input type="checkbox"/> Paper size: Standard 8.5 inches (in.) × 11 in. (216 millimeters [mm] × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts)
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> Maximum length: 1 page

### *Letter of Intent Content Requirements*

<input type="checkbox"/> List the project name, team name, Division, and collegiate institution(s).
<input type="checkbox"/> Describe the team’s intent to continue competition participation as an Exhibition Team.
<input type="checkbox"/> Outline the team’s plan for completing the Final Submission deliverable.

## 6.4 Final Submission Instructions

The Final Submission demonstrates the culmination of each team’s design work and provides the final materials needed to evaluate the project.

Final Submission deliverables include:

1. Project Summary (updated)
2. Design Narrative
3. 3 Project Images
4. Video Pitch
5. 15-Minute Division Presentation Slides.
6. 8-Minute Grand Jury Presentation Slides.

Teams also have the option to submit Supplemental Documentation, further detailed in Section 6.4.4. The Project Summary, Design Narrative, and Video Pitch will be reviewed by jurors and used to determine preliminary scores prior to the Competition Event.

The submission instructions for the Final Submission deliverables are detailed below.

### **6.4.1 Project Summary**

Teams must submit the Project Summary via the [Submission Site](#). The Project Summary should be updated as needed to reflect the final parameters of the design. It must follow the requirements below:

### ***Project Summary Format Requirements***

<input type="checkbox"/> Paper size: Standard 8.5 inches (in.) × 11 in. (216 millimeters [mm] × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts)
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> Maximum length: 2 pages

### ***Project Summary Content Requirements***

<b>Project Summary</b>
<input type="checkbox"/> List the project name, team name, Division, and collegiate institution(s) in the header.
<input type="checkbox"/> Replace the logo in the upper right with the team or collegiate institution's logo.
<input type="checkbox"/> Replace the building image with one or two graphics that best represent the project.
<input type="checkbox"/> Provide a concise description of the project, including a brief identification of the target market.
<input type="checkbox"/> Describe the relevance of the project to the goals of the competition.
<input type="checkbox"/> Summarize the design strategy and relevant key points.
<input type="checkbox"/> List the relevant project data, including cost estimates.
<input type="checkbox"/> Provide technical specifications for the project.
<input type="checkbox"/> Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each of the following Contests: <ol style="list-style-type: none"><li>1. Architecture</li><li>2. Engineering</li><li>3. Envelope</li><li>4. Efficiency</li><li>5. Grid-Interactivity</li><li>6. Life-Cycle</li><li>7. Health</li><li>8. Market</li><li>9. Community.</li></ol>

#### **6.4.2 Summary Slide**

Teams must submit the Summary Slide via the [Submission Site](#). The Summary Slide must follow a template provided by the organizers, intended to summarize the key project points, project goals, and project impact.

#### ***Summary Slide Format Requirements***

<input type="checkbox"/> File type: PPTX (Presentation Slides must have an aspect ratio of 16:9.)
<input type="checkbox"/> Content aligns with template provided via the <a href="#">Submission Site</a> .
<input type="checkbox"/> Maximum file size: <ul style="list-style-type: none"><li>○ 100 MB</li></ul>

### 6.4.3 Design Narrative

Teams must submit the Design Narrative via the [Submission Site](#). This deliverable fully documents the design project with narratives describing how the design addresses all Contest criteria, with supporting imagery and technical documentation, such as renderings, construction details, and energy analysis. The Design Narrative is limited to 60 pages, including appendices, and must contain all the information the team deems essential to effectively communicate its competition solution to the Jury. A summary and discussion of analytical results should be provided in the Design Narrative. Supporting information—such as detailed calculations or equipment data sheets—should be relegated to Supplemental Documentation. Citations may be in the team’s chosen format, but they should be consistent throughout the submission.

#### *Design Narrative Format Requirements*

<input type="checkbox"/> Paper size: Standard 8.5 in. × 11 in. (216 mm × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts)
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> Limit content to no more than 60 pages; the cover, back page, and table of contents are not included in this count
<input type="checkbox"/> Number pages; front-matter page numbers can use Roman numerals (e.g., i, ii, iii)
<input type="checkbox"/> Construction drawings: 11 in. x 17 in. (279 mm x 432 mm), ANSI B

#### *Design Narrative Content Requirements*

<b>Front Matter</b>
<input type="checkbox"/> Cover (list collegiate institution, team name, and Division name)
<input type="checkbox"/> Table of Contents
<input type="checkbox"/> List of Tables and/or List of Figures (as applicable)
<b>Section 1: Design Constraints and Goals (up to 4 pages)</b>
<input type="checkbox"/> Design Constraints Description, including timeline, budget, community setting, climate, building science considerations, codes, occupant characteristics, etc. (1–3 pages)
<input type="checkbox"/> Design Goals, including rating systems, energy targets, occupant experience, operational cost, etc. (1 page)
<b>Section 2: Contest Narratives, including relevant images and figures (up to 27 pages)</b>
<input type="checkbox"/> 1. Architecture
<input type="checkbox"/> 2. Engineering
<input type="checkbox"/> 3. Envelope
<input type="checkbox"/> 4. Efficiency
<input type="checkbox"/> 5. Grid-Interactivity
<input type="checkbox"/> 6. Life-Cycle
<input type="checkbox"/> 7. Health
<input type="checkbox"/> 8. Market
<input type="checkbox"/> 9. Community.

<b>Appendices</b>	
<input type="checkbox"/>	A. Design renderings ( <b>up to 5 pages</b> )
<input type="checkbox"/>	B. Construction documentation highlights ( <b>up to 20 pages</b> )
<input type="checkbox"/>	a. Site plan
<input type="checkbox"/>	b. Representative floor plan(s) with dimensions
<input type="checkbox"/>	c. Building elevations
<input type="checkbox"/>	d. Building sections, including building science control layers
<input type="checkbox"/>	e. Interior details, including a rendered floor plan showing typical furniture layout and option details on finishes, cabinetry, and other fixtures
<input type="checkbox"/>	f. Wall, window, door, floor, and roof details, including building science control layers, schedule, and specifications
<input type="checkbox"/>	g. Mechanical plans and schedules, <sup>16</sup> indicating equipment locations and specifications, as well as load calculations and heating and cooling system capacity diagrams (Btu/hr·ft <sup>2</sup> , tons/ft <sup>2</sup> , or kilowatt/m <sup>2</sup> )
<input type="checkbox"/>	h. Plumbing plans and schedules, <sup>16</sup> including fixture locations, piping system layout and design, and equipment location and specifications
<input type="checkbox"/>	i. Electrical and lighting plans and schedules, <sup>16</sup> including installed lighting (watt/ft <sup>2</sup> or watt/m <sup>2</sup> ) levels, control systems, and renewable systems
<input type="checkbox"/>	C. Energy performance (HERS Index rating and/or EUI target) ( <b>up to 4 pages</b> )
<input type="checkbox"/>	Zero energy design compliance
	1. Show summary calculations and methods used to satisfy zero energy definitions according to ASHRAE Standard 228.
<input type="checkbox"/>	For Residential: ZERH Target Home - HERS Index Rating Documentation Summary
<input type="checkbox"/>	1. Perform a HERS Index analysis to include the home with and without the renewable energy system.  <i>For teams pursuing alternative HERS compliance path, include justification and discussion of method to measure energy performance that includes reference to the HERS index/ZERH target home.</i>
<input type="checkbox"/>	For Commercial: EUI Target Documentation Summary
<input type="checkbox"/>	1. Summarize major inputs for the energy model, including envelope characteristics, lighting power densities, plug load densities, HVAC sizing capacities, HVAC system efficiencies, and overview equipment schedules.
<input type="checkbox"/>	2. Demonstrate compliance with the Division definition. EUI should be provided in both site and source metrics. Show summary calculations of the potential for on-site or off-site renewable energy to offset the annual energy consumption of the building on a source basis.

<sup>16</sup> Teams should indicate system type, size, and quantity; however, full system layout and specifications are not required.

#### 6.4.4 Supplemental Documentation

Teams submit Supplemental Documentation via the [Submission Site](#). Supplemental Documentation is optional and may not be more than 100 pages. This document includes additional documentation to support the team’s design goals and submission, such as energy analysis reports, financial analysis details, equipment specifications, quantity takeoffs, supplemental construction details, or supporting design calculations. Jurors have a limited amount of time to review the entire submission. They might not read the Supplemental Documentation in detail or at all, and they are not expected to open any hyperlinks in this material.

##### *Supplemental Documentation Format Requirements*

<input type="checkbox"/> Paper size: Standard 8.5 in. × 11 in. (216 mm × 279 mm), ANSI A
<input type="checkbox"/> Formatting: Single-spaced, 11-point font for body text; diagrams may have smaller fonts
<input type="checkbox"/> Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
<input type="checkbox"/> File type: Single, bookmarked PDF
<input type="checkbox"/> Limit content to no more than 100 pages
<input type="checkbox"/> Number pages

#### 6.4.5 Video Pitch

Each team must submit a 90-second Video Pitch via the [Submission Site](#). This deliverable provides the opportunity to tell a story about the project and highlight key design aspects in a short amount of time. Teams may be creative in how they chose to develop their Video Pitch.

Each team’s Video Pitch will be reviewed by jurors prior to the Competition Event as part of the Final Submission. Content from the winning teams will be shared via Solar Decathlon social media following the Competition Event. Unlike the live 8-minute presentation to Juries, there is no limit on the maximum number of team members who can participate in the Video Pitch.

##### *Video Pitch Format Requirements*

<input type="checkbox"/> Length: 90 seconds or less
<input type="checkbox"/> File type: .mov or .mp4

#### 6.4.6 Project Images

Each team must submit 3 project images: 2 images that best represent the project, such as renderings, drawings, photographs of scale models, or other team-generated content, and at least one image of your team. These images must be submitted via the [Submission Site](#). Organizers use images to recognize individual team performance, to integrate into event materials, or for outreach, as appropriate.

### ***Project Images Format Requirements***

<input type="checkbox"/> Ensure all images have a minimum resolution of 1920 x 1080 pixels.
<input type="checkbox"/> Ensure the images have an aspect ratio of 16:9.
<input type="checkbox"/> Submit the images as files such as .jpg, .tiff, or .png.

### **6.4.7 Division Presentation Slides**

Teams develop a set of slides for the Competition Event, to be used for 15-minute Division presentations, and 8-minute Grand Jury presentations if the team is selected as a first-place Division winner. The Presentation Slides are submitted via a Box link provided on the [Submission Site](#).

### ***Division Presentation Slides Format Requirements***

<input type="checkbox"/> File type: PDF and/or PPTX (Presentation Slides must have an aspect ratio of 16:9.)
<input type="checkbox"/> To ensure that all electronically submitted materials work with the organizers' presentation computers, teams should embed all videos in the team submission.
<input type="checkbox"/> Maximum file size: <ul style="list-style-type: none"><li>○ 100 MB</li></ul>

### **6.4.8 Grand Jury Presentation Slides**

Finalist Teams develop one set of slides for the Competition Event, to be used for Division presentations, and Grand Jury presentations if the team is selected as a first-place Division winner. The Presentation Slides are submitted via a Box link provided on the [Submission Site](#).

### ***Grand Jury Presentation Slides Format Requirements***

<input type="checkbox"/> File type: PDF and/or PPTX (Presentation Slides must have an aspect ratio of 16:9.)
<input type="checkbox"/> To ensure that all electronically submitted materials work with the organizers' presentation computers, teams should embed all videos in the team submission.
<input type="checkbox"/> Maximum file size: <ul style="list-style-type: none"><li>○ 100 MB</li></ul>

### **6.4.9 Optional Poster or Exhibit for the Competition Event**

Teams are invited to optionally create a poster or physical exhibit that showcases their design project. Posters and exhibits will be displayed for all attendees to view at the Competition Event. These materials are entirely separate from the jury evaluation process and will not be considered in the selection of Division or Grand Winners. Teams are responsible for transporting materials.

### ***Poster or Exhibit Guidelines***

<input type="checkbox"/> Materials may be posters or physical exhibits, such as full architectural scale models or models of key design features (e.g., wall sections). Teams must notify organizers if power supplies are needed for their exhibit; availability of supplies is not guaranteed.
<input type="checkbox"/> Materials must be self-standing and pose no hazards or safety concerns to surroundings or viewers.

# Glossary

## **Acting Advisor**

An industry professional designated by the Faculty Advisor to support faculty in leading the team's competition participation.

## **Attached Housing**

Multiple dwelling units within a single building

## **Challenge**

Either of two avenues for team participation in the Solar Decathlon competition: the Design Challenge and/or the Build Challenge

## **Competition**

All aspects of the Solar Decathlon related to the Challenges, the 10 Contests, and the scoring of those Contests within each Challenge

## **Competition Event**

The period when Finalist Teams are presenting to juries and related activities

## **Contest**

Like the Olympic decathlon, the Contests evaluate a building's design for creativity, overall integration of systems, and ability to deliver outstanding aesthetics, efficiency, and functionality

## **Design Challenge**

A Challenge of the Solar Decathlon competition that tasks teams to design and present complete building designs

## **Design Challenge Manager**

The head Rules Official responsible for writing and enforcing the Rules and conducting the Design Challenge

## **Design Narrative**

A 60-page maximum Design Challenge deliverable that is part of the final deliverable submission; the Design Narrative provides a complete submission to be reviewed by jurors in advance of the competition

## **Design Partner**

An organization or client that has a planned construction, major retrofit project, or new construction project in their building portfolio and serves as a client to a student team, working with them to develop a zero energy design option for the project

## **Director**

The organizer representing the U.S. Department of Energy who has final decision-making authority regarding all aspects of the Solar Decathlon

**Division**

A category based on building type in which a team competes

**Division Jury**

A group of jurors evaluating a Division of the Build Challenge or a Division of the Design Challenge

**Dwelling Unit**

A dwelling unit is a single unit that provides complete independent living facilities for one or more people, including permanent provisions for living, sleeping, eating, cooking, and sanitation; see the [2021 International Energy Conservation Code \(IECC\)](#) for more information.

**Education Building**

An educational facility for students that includes permanent provisions for food service, recreation, offices, classrooms, and other support functions, such as mechanical spaces, circulation, and restrooms

**Exhibition Team**

Participant Team that is not selected as a Finalist but submits a final design submission and is invited to participate in the final Competition Event; Exhibition Teams are not eligible for Division or Grand Winner Awards, but will gain feedback and participate in competition activities.

**Faculty Advisor**

A faculty member who serves as a primary contact for a team and is responsible for communicating competition details from organizers to team members, as well as overseeing and closely engaging with the team

**Finalist Teams**

Participant Teams that are selected to present their final design to Division Jurors at the Competition Event

**Floor Area**

The sum of the floor areas of the spaces within the building, including basements<sup>17</sup>; the floor area is measured from the exterior faces of the exterior walls or from the centerline of walls separating buildings. For more information, see [ANSI Z765-2003](#) and [ASHRAE 90.1-2019](#).

**Finished Area**

The sum of the finished and conditioned areas measured at the floor level to the exterior finished surface of the outside walls

**Grand Jury**

A group of Jurors evaluating the first-place Division Winners of the Design Challenge

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<sup>17</sup> Floor area is sometimes referred to as the finished floor area or gross floor area.



**Industry Partner**

Industry professional who offers their expertise and experience to the project

**Juror**

An organizer selected by the appropriate Challenge Manager to participate as a member of a specific Division Jury

**Multifamily Building**

A blend of residential and commercial building area

**Interdisciplinary Team**

An educationally diverse team that includes students from more than one field of study, including but not limited to engineering, architecture, graphic design, construction, and interior design

**Single-Family Housing**

A residential new construction or retrofit for one to two dwelling units

**Organizer**

A DOE or NREL employee, subcontractor, or observer working on the project

**Participant Team**

A team officially registered and participating in the Solar Decathlon Design Challenge

**Submission Site**

An online site that includes official competition communications and guidelines; accessible by all teams and organizers

**Project Summary**

A two-page, high-level description of the project with key takeaways and introductions of the team and collegiate institution; a preliminary Project Summary is submitted early in the competition and is updated in later deliverables.

**Resilience**

The ability to anticipate, withstand, respond to, and recover from disruptions

**Rules**

All principles or regulations governing conduct, action, procedure, arrangement, etc., for the duration of the project; this document is the “Rules document.”

**Rules Official**

An organizer authorized to interpret the Rules and officiate one or more of the Contests

**Sponsor**

A business or organization that provides funds or in-kind services for the competition

**Staff**

An individual working for the organizers whose role is not described elsewhere in these definitions

**Team**

The combination of team members representing a single entry to a Solar Decathlon Challenge

**Team member**

An enrolled student, faculty member, or other person who is affiliated with one of the participating collegiate institutions and is integrally involved with a team's project activities

## Appendix A: Resources

This appendix lists key resources. Additional resources and software are available on the [Submission Site](#).

### [U.S. Department of Energy](#)

The mission of DOE is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions. Energy Department resources include:

- [Building America Solution Center](#)  
The Building America Solution Center provides access to expert information on hundreds of high-performance construction topics, including air sealing and insulation, HVAC components, windows, indoor air quality, and more. [Program checklists](#) are provided to aid in construction of comfortable, healthy, durable, and efficient homes.
- [Building Science Advisor](#)  
The Building Science Advisor is a no-cost, web-based tool that provides expert guidance on the moisture durability and energy efficiency of new and retrofit wall assembly designs.
- [Zero Energy Ready Home Program Guidelines](#)  
DOE Zero Energy Ready Homes are verified by a qualified third party and are at least 40%–50% more energy efficient than a typical new home. This generally corresponds to a Home Energy Rating System (HERS) Index Score in the low- to mid-50s, depending on the size of the home and region in which it is built.
- [Low-Income Energy Affordability Data \(LEAD\) Tool](#)  
The DOE's Low-Income Energy Affordability Data (LEAD) tool is an online, interactive platform that provides estimated household energy data based on income, energy expenditures, fuel type, and housing type. Users can download visuals and data associated with different geographies, housing, and energy characteristics.
- [Inflation Reduction Act Financial Assistance](#)  
DOE provides guidance around the [45L Tax Credits for Zero Energy Ready Homes](#) and the [179D Commercial Buildings Energy-Efficiency Tax Deduction](#).
- [Advanced Energy Retrofit Guide for K-12 Schools](#)  
The Advanced Energy Retrofit Guide for K-12 Schools presents general project planning guidance and financial payback metrics for energy efficiency measures.

### [National Renewable Energy Laboratory](#)

NREL specializes in the research and development of renewable energy, energy efficiency, energy systems integration, and sustainable transportation. NREL resources include:

- [PVWatts](#)  
This tool estimates the energy production and cost of energy of grid-connected photovoltaic (PV) energy systems throughout the world. It allows homeowners, small

- building owners, installers, and manufacturers to easily develop estimates of the performance of potential PV installations.
- [A Guide to Zero Energy and Zero Energy Ready in K-12 Schools](#)  
This guide provides information about the process of designing, constructing, and operating a zero energy/ready school building.

### ASHRAE

ASHRAE is dedicated to advancing the arts and sciences of HVAC and refrigeration to serve humanity and promote a sustainable world. ASHRAE resources include:

- [ASHRAE Advanced and Zero Energy Design Guides](#)  
The Design Guides offer designers and contractors the tools needed to achieve significant energy savings compared to buildings that meet the minimum requirements of Standard 90.1-2004. Currently, Zero Energy Design Guides are available for all Commercial Divisions.

### National Institute of Building Sciences

The National Institute of Building Sciences created the Whole Building Design Guide to share information across industry, academic, and federal partners to advance high-performing facilities. National Institute of Building Sciences resources include:

- [Whole Building Design Guide](#)  
The Guide presents the philosophy of the integrated design approach and design objectives for whole building design, and includes guides for building envelope design.

### PHIUS+

PHIUS is a non-profit organization dedicated to making high-performance passive buildings the mainstream standard. PHIUS provides training and certification programs for building professionals, conducts high-performance building research, certifies passive buildings, and offers [software and resources](#).

- [PHIUS CORE REVIVE](#)  
PHIUS CORE REVIVE is an above code program for certification of retrofit building projects with special attention is given to moisture considerations. Resources provide calculation methods for determining internal surface temperature to avoid critical surface humidity and condensation in walls, which is highly relevant for retrofit projects.

### U.S. General Services Administration

This mission of the General Services Administration is to deliver the best customer experience and value in real estate, acquisition, and technology services to the government and the American people.

- [Sustainable Facilities Tool](#)  
The U.S. General Services Administration has created the Sustainable Facilities Tool to help identify upgrades and energy conservation measures to enhance commercial building sustainability.