



# DESIGN CHALLENGE

ديكاتلون الطاقة الشمسية الأفريقي  
**SOLAR DECATHLON**  
**AFRICA** MOROCCO  
المغرب

Solar Decathlon Africa  
Design Challenge 2024  
**COMPETITION RULES**

[www.solardecathlonafrika.com/solar-decathlon-africa-design-challenge](http://www.solardecathlonafrika.com/solar-decathlon-africa-design-challenge)

## Foreword

Buildings wield a tremendous impact, accounting for 40% of total energy consumption and significantly influencing the environment due to their reliance on fossil fuels. However, beyond energy, they address multifaceted challenges such as environmental equity, cost-effectiveness, public welfare, disaster resilience, and limited water resources.

In Morocco, the built environment contributes to a significant 33% of total energy consumption, emphasizing the urgent need for sustainable methodologies. Moreover, across Sub-Saharan Africa, approximately 30-40% of the region's overall energy consumption is attributed to the built environment. In certain urban areas, this ratio escalates to a staggering 40-50%. The ongoing urbanization and population surge in African cities are expected to intensify this situation, underscoring the necessity for implementing sustainable construction practices.

Highlighting the gravity of this situation is the fact that more than 400 million people in Africa currently lack access to electricity, emphasizing the urgent need for sustainable and accessible energy solutions.

A comprehensive understanding of building science, encompassing energy efficiency, indoor air quality, occupant comfort, optimal mechanical systems, environmental impact, affordability, resilience, and resource conservation, is indispensable for effecting this transition.

The Solar Decathlon initiative, supported by the U.S. Department of Energy (DOE), aims to tackle these pressing issues. This program educates and inspires students by integrating innovative construction methods into their curriculum, encouraging them to pursue sustainable professions. Comprising 10 contests, it engages the next generation of design professionals in creating energy-efficient buildings capable of addressing real-world challenges.

The 2019 Solar Decathlon Africa construction competition had a significant effect, promoting experiential learning and cultivating innovation across all fields. By serving as a catalyst for change, it fundamentally altered the architectural environment of Africa, promoting sustainability in all the designs it influenced.

This event transcends mere competition; it propels the continent towards a sustainable architectural future. By fostering innovation and collaboration for sustainable development, it unites students and institutions. This initiative harmonizes the relationship between the continent and its natural environment, offering students practical experiences while exploring cutting-edge technology.

It is more than a competition; it is a catalyst for reshaping Africa's architectural narrative, gradually building sustainable structures. Join in shaping a future for Africa that is ecologically sustainable and economically viable, by participating in sustainable building practices. The ongoing Solar Decathlon Africa Design Challenge equips the next generation with the skills and determination to create structures fit for the future.

## I. Challenge Overview

This document serves as the official Rules for this contest, providing evaluation criteria guiding teams participating in the Solar Decathlon Africa Design Challenge an inspiring collegiate competition comprising 10 Contests. The challenge is to design innovative, high-performance, low-carbon buildings powered by renewable energy, addressing real-world issues in Africa's building industry.

Participation in the Design Challenge offers students a transformative experience, providing opportunities to:

- **Experience Zero Energy Building Design:** Dive into zero energy building design, learning hands-on methodologies.

- **Tackle Complex Challenges:** Address the pressing need for decarbonizing the buildings industry, including retrofitting existing structures.
- **Exchange Strategies Globally:** Collaborate with international teams, exchanging diverse design strategies.
- **Network with Experts:** Engage with industry experts, fostering collaboration and networking opportunities.
- **Learn from Thought Leaders:** Gain insights from national thought leaders and collegiate peers, enhancing knowledge and expertise.
- **Explore Career Opportunities:** Engage with organizations, exploring career pathways related to improving the built environment.

The winning teams have their project materials showcased on the Solar Decathlon Africa website, amplifying their innovative solutions. Through extensive outreach efforts, the competition and its winners are promoted, providing participants and their institutions a platform to highlight their work. Furthermore, select winners may receive invitations to present at industry conferences post the Solar Decathlon Competition Event, expanding their reach and impact within the industry.

Participating collegiate institutions are recognized as trailblazers who nurture career-ready professionals equipped with cutting-edge skills, while sponsors garner national and local recognition. Industry partners collaborating with teams interact with promising future design and construction professionals, fostering invaluable connections.

Solar Decathlon Africa Design Challenge stands not just as a competition but also as a transformative journey shaping the future of Africa's building industry. It is an opportunity for students and institutions to shine on a global platform, driving innovation and sustainability in the built environment across the continent.

## II. Building a Team

### 1. Team Requirements

The competition extends its invitation to both Africa-based and international collegiate institutions, embracing a global community committed to innovative design solutions. “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 one or more collegiate institutions 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 is permitted up to four Team Registrations; however, it's important to note that the regulations regarding team divisions are detailed in the dedicated 'Division' section within this document.
- Each team must have at least three students (see student qualifications Section).
  - ✓ 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 In-person finals.

### 2. Student Qualifications

The process of designing a building is an interdisciplinary project that requires a diverse range of skill sets. The most formidable teams are characterized by their multidisciplinary nature, consisting of students hailing from many degree programs and backgrounds. Student team members might come from diverse academic backgrounds and various levels of higher education, including undergraduate, graduate, and doctoral students. Teams may also include students from many college institutions. Previous successful teams have included students specializing in disciplines such as architecture, building science, business, construction management, economics, engineering, interior design, physics, policy, public health, sociology, and sustainability.

Furthermore, students are required to fulfill the following criteria:

- Students are restricted to joining just one team for the Design Challenge competition; however, a college or university may have up to four teams.
- Every student must be actively working towards a degree and be enrolled in at least one class during the period between the Team Registration deadline and the Competition Event.

### 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 employed full-time or part-time. 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.
- 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.

#### **4. Industry Engagement**

Engagement with industry professionals can provide real-world perspective that help 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, presentation, and all other competition activities.

##### **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.

#### **5. Mentor Program**

The Mentor Program pairs Solar Decathlon alumni from any previous competition year with current Design and build 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 outcome.

### III. Project Requirements

Design submissions are required to meet the following specifications:

- The team must select a specific location or site in Africa, 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 Solar Decathlon competitions in the past.
- The design must comply with zero energy building requirements according to annual basis.
- The design must comply with Division requirements.
- The team must address criteria for all 10 Solar Decathlon Contests.
- 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, except in cases where a natural gas connection is required. 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.*
- Units of measurement.
  - Measurements should be provided with metric units.
  - Energy Units should be provided in kilowatt (kW), kilowatt-hour (kWh) or kilowatt-hour per square meter (kWh/m<sup>2</sup>).

#### 1. Zero Energy Building Requirements

Reducing and offsetting building energy usage in Africa is essential for minimizing environmental consequences and controlling carbon footprints. The Design Challenge mandates the production of zero energy buildings as a major prerequisite for proposal submissions. A zero-energy building, in this sense, refers to a highly efficient construction that incorporates a renewable energy system capable of completely compensating for the building's yearly use of non-renewable energy.

To achieve a zero-energy building in Africa, the first step is to prioritize the reduction of the building's energy requirements. This decrease enables renewable energy sources to effectively meet the remaining energy demand. It is essential to include renewable energy into the project. While it is crucial to maximize the production of renewable energy on-site, it is as important to explore off-site sources for renewable energy. This could include involvement in renewable energy initiatives at the community level or using renewable power sources offered by utility companies.

This customized strategy acknowledges the unique energy situation in Africa and seeks to efficiently use renewable resources, promoting the development of sustainable and energy-conserving structures across the continent.,

#### 2. Evaluating Building Energy Performance

Conducting energy analysis is an essential process for predicting energy efficiency and evaluating trade-offs to achieve energy goals. The NREL (National Renewable Energy Laboratory) provides various energy modeling tools, and one of their significant offerings is the Building Energy Modeling (BEM) tools suite. This suite includes software like [EnergyPlus](#), [OpenStudio](#), and other tools that assist in simulating and analyzing the energy performance of buildings. These easily available materials are specifically designed to assist teams in creating durable and effective building solutions.

Furthermore, it is mandatory for teams to provide an EnergyPlus (v23.2.0) file including their building energy model, which enables the judging panel to assess the energy efficiency of the facility. This document facilitates a comprehensive analysis of the energy dynamics of the building and improves the judges' capacity to evaluate its overall energy efficiency.

### **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 (kilowatt-hours/m<sup>2</sup>).

These EUI values include all building loads, including plug loads; heating, ventilating, air conditioning (HVAC); and lighting. Plug loads include vertical transportation and any other load in the building.

### **3. Project Selection for Carbon Impact**

Teams in all categories are allowed to create plans for constructing new buildings. It is crucial to use zero energy solutions for both kinds of buildings to reduce the carbon emissions associated with the built environment. This highlights the importance of participants in the Design Challenge investigating zero energy solutions that are specially customized for pre-existing structures.

Teams must prioritize doing a thorough study of the carbon footprint associated with their chosen project and design strategy. This study must include both the carbon emissions associated with the production and use of physical products (embodied carbon) as well as the carbon emissions resulting from the day-to-day operations (operational carbon). Embodied carbon encompasses the emissions associated with many stages of a product's life cycle, including material acquisition, processing, manufacture, shipping, assembly, maintenance, and disposal. Operational carbon refers to the emissions that result from a building's energy use throughout its operations. Retrofitting existing buildings offers a substantial chance to decrease the amount of carbon emissions associated with construction, while also increasing energy efficiency, lowering operating expenses, and boosting the well-being of inhabitants. In contrast, new building projects provide an opportunity to reduce operational carbon emissions by optimizing design and meeting unique requirements of clients or communities.

Teams must provide a clear and well-founded justification for selecting either a retrofit or new construction project to achieve their specified goals. In addition, it is crucial to do a comprehensive assessment of the entire carbon footprint of their building, which is a key factor assessed in the Lifecycle Contest. The specific requirements for this competition may be seen in the Contests Section. Furthermore, Jurors will evaluate the team's rationale for selecting their project and the extent to which the suggested design contributes to the reduction of global emissions.

### **4. 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, which can be defined as follows:

- Buildings located within Africa.
- Affordable housing and housing occupied by low-income residents.
  - 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 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.

## IV. Divisions

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

Division name	Division Code to use
<b>DV RD 1 - Residential Division</b>	
Single-Family Housing	
House	SFH
Villa	SFV
Riad	SFR
Multifamily housing	
Multifamily house	MFH
<b>DV CC 2 - Commercial Division</b>	
Multi-unit Building	MUB
<b>DV CM 3 - Community Division</b>	
Education Building	EB

### 1. Residential Divisions

#### a. Single-Family Housing

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

##### i. House (SFH):

The Single-Family Housing Division focuses on providing sustainable housing solutions for one to two dwelling units within a single building, specifically tailored to the needs and context of African families. Key specifications include:

- **Retrofit or New Construction:** Participants in this division can opt for either retrofitting an existing African dwelling or designing a new construction, aligning with cultural and contextual norms.
- **Independent Structure:** The dwellings in this division are designed as independent, detached structures, catering to the cultural preferences, and living patterns of African families.
- **Building Size:** Building sizes typically range from 80 to 140m<sup>2</sup> per dwelling unit, allowing for diversity in design while accommodating the spatial requirements prevalent in African family living. These buildings often comprise multiple stories, featuring ground floors, first floors, second floors, and roofs, providing a multi-level structure that caters to diverse spatial needs.

The Single-Family Housing Division encourages innovative and culturally attuned designs, ensuring that sustainable solutions are integrated into the fabric of African family homes. Participants are invited to explore energy-efficient designs and strategies that resonate with the distinctive needs and cultural heritage of African households.

##### ii. Villa (SFV):

The Villa Housing Division caters to sustainable housing solutions designed specifically for the distinctive needs and lifestyle. The division comprises individual villa structures, ensuring a luxurious and culturally attuned living environment. Key structural specifications include:



- **Retrofit or New Construction:** Participants have the flexibility to choose between retrofitting existing villas or crafting entirely new constructions, aligning with cultural and contextual preferences.
- **Independent Structure:** Villas within this division are characterized as independent, detached structures, embodying the essence of regional architectural and lifestyle preferences.
- **Building Size:** Typically ranging from 200 to 500 m<sup>2</sup> per unit, villas provide ample space for innovative design concepts while respecting the spatial requirements prevalent in this style of living. Comprising ground floors and first floors, these villas offer a generous size range that facilitates the implementation of diverse and imaginative design concepts while honoring the traditional layout characteristic of regional villa living.

### **iii. Riad (SFR):**

The Riad Housing caters to sustainable housing solutions that honor the traditional riad architecture, tailored to meet the distinctive lifestyle of African households. This division focuses on:

- **Retrofit or New Construction:** Participants can choose between retrofitting existing riads or designing new constructions, adhering to cultural and architectural norms.
- **Central Courtyard Design:** Riads are known for their central courtyard or garden, fostering an intimate and communal living environment. This design element is central to the division, promoting an interconnected living space.
- **Building Size:** Typically varying from 150 to 300 square meters per unit, riads allow for innovative design variations while preserving the intimate and interconnected nature integral to riad living. Composed of ground floors and two upper floors, these dwellings offer a size range that encourages diverse and creative design adaptations while maintaining the traditional layout synonymous with riad living, fostering intimacy and interconnection across the different levels.

The Riad Housing Division encourages imaginative designs that blend modern sustainability with the timeless essence of riad architecture. Participants are invited to explore energy-efficient designs and strategies that seamlessly integrate with the cultural heritage and communal living aspects of riads.

## **b. Multifamily housing**

### **i. Multifamily house (MFH)**

The Multi-Unit Housing (MFH) encompasses multiple dwelling units within a single building, tailored to the architectural context and communal living. Key Specifications:

- **Row Homes or Flats:** This division accommodates 8 to 16 dwelling units in a single structure, embodying the essence of communal living prevalent in urban contexts.
- **Building Structure:** The building can rise up to 4 stories above grade, designed to respect the cityscape and urban fabric, whether it's a new construction or a retrofit of an existing building.
- **Building Size:** Each dwelling unit ranges from 46 to 100 m<sup>2</sup>, allowing for diverse living spaces while considering the traditional communal lifestyle.

The Multi-Unit Housing Division encourages innovative designs that harmonize modern living standards with the communal essence of urban dwelling. Participants are encouraged to explore energy-efficient designs and architectural solutions that resonate with the social and cultural fabric of Moroccan communities.

## **2. Commercial Divisions**

### **a. Multi-unit Building (MUB)**

The Multi-unit Building (MUB) Division caters to structures with multiple dwelling units, ensuring functionality, efficiency, and sustainable design across various residential spaces. Key Specifications:

- **Number of Units and Stories:** A minimum of 8 dwelling units, typically spread across a minimum of 4 stories, offering a range of housing options within a single structure.
- **New Construction or Retrofit:** Participants have the option to design new buildings or retrofit existing structures, emphasizing sustainability and energy efficiency.
- **Building Size:** The division encompasses a size range of 33 to 186m<sup>2</sup> per dwelling unit, allowing for varied floor plans and configurations to suit the needs of use.
- **Commercial Allocation:** Up to 50% of the total area may be allocated for commercial use, accommodating spaces like retail outlets, offices, or industrial areas, enhancing the functionality and community appeal of the building.

The Building Division encourages innovative design approaches that focus on sustainable, efficient, and inclusive living spaces, promoting community engagement and comfortable multi-unit living environments.

### 3. Community Divisions

#### a. Education Building (EB)

The Education Building (EB) Division is designed to create sustainable educational facilities that cater to diverse student needs, offering functional spaces for learning, recreation, administration, and support functions. Key Specifications:

- **Building Functionality:** These facilities encompass permanent provisions for food service, recreation, offices, classrooms, and support areas like mechanical spaces, circulation, and restrooms, ensuring a holistic educational environment.
- **Retrofit or New Construction:** Participants have the flexibility to either retrofit existing educational buildings or design new constructions, aligning with zero-energy building requirements to enhance sustainability.
- **Grade Levels:** The division accommodates a wide range of grade levels, spanning from pre-kindergarten to Baccalaureate, allowing for educational facilities catering to different age groups and educational needs.

The Education Building Division aims to foster innovative, sustainable, and efficient educational spaces that provide conducive environments for learning, growth, and community engagement across various grade levels.

## V. Contests

Solutions developed by Solar Decathlon teams should innovate across all 10 Contest areas; demonstrate mastery of building science fundamentals and highlight creative approaches to whole-building design. Addressing all contests is essential to create an integrated building solution capable of transforming the built environment comprehensively.

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.

### 1. Architecture

This Contest focuses on assessing building architecture for its ingenuity in harmonizing form with function, seamlessly integrating systems, and delivering exceptional aesthetics and functionality, both internally and externally, customized for African contexts. The evaluation emphasizes the ability of architectural designs to merge functionality with artistic expression, taking into account the unique environmental, cultural, and societal aspects prevalent across Africa. The goal is to recognize designs that not only showcase creativity but also address the practical needs and cultural resonance of African and Moroccan communities while ensuring outstanding aesthetics and functionality throughout the structure. It is essential to incorporate passive techniques that respect and align with traditional African and Moroccan architectural principles, complementing designs with sustainable and energy-efficient solutions while honoring cultural heritage and environmental context.

<b>ARCHITECTURE</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<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>

### 2. Engineering

This Contest evaluates the design and correct incorporation of high-efficiency technologies that are necessary for the attainment of zero energy buildings. It involves a comprehensive design of mechanical, electrical, plumbing, and structural engineering systems specifically designed for the specific needs of zero energy buildings in various African settings. The primary objective is to evaluate the efficacy of these systems, guaranteeing their productivity, and seamless incorporation into the building's structure. This assessment examines the capacity and dependability of these systems to operate at their highest level in African settings, playing a crucial part in attaining sustainable and energy-efficient constructions.

<b>ENGINEERING</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<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>

### 3. Envelope

This Contest focuses on evaluating envelope design strategies, emphasizing air tightness, thermal performance, and durability tailored specifically for African and Moroccan environments, considering the escalating impact of climate change. The evaluation centers on achieving a balance between comfort and optimized system performance within the building envelope. It prioritizes innovative strategies that not only ensure thermal efficiency and structural durability but also consider the unique climatic conditions prevalent across diverse African and Moroccan regions, factoring in the evolving impact of climate change. The goal is to recognize designs that effectively manage energy consumption, enhance occupant comfort, and withstand the evolving environmental demands of Africa and Morocco, ensuring sustainable and resilient building envelopes that adapt to the changing climate landscape.

	<b>Criteria</b> <i>Teams should address the following in their project:</i>
<b>ENVELOPE</b>	✓ 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.
	✓ Analysis and responsiveness of design to current and future climatic risks, including weather and other natural events.
	✓ Balanced exploration of performance, durability, and carbon impacts of materials selected in envelope design.
	✓ Effective use of passive design strategies to reduce active system capacity requirements, and meet heating, cooling, ventilating, and lighting needs.

### 4. Efficiency

This Contest focuses on evaluating the operational efficiency of entire buildings, spanning from successful modeling techniques to the application of active and passive systems specifically designed for the target environment. The evaluation emphasizes the seamless integration of these systems, encompassing both active and passive strategies. It aims to recognize designs that effectively model and apply systems tailored to the unique climatic and environmental conditions across diverse regions in Africa, including Morocco. The evaluation will be based on a building energy model delivered by the team, emphasizing accuracy and relevance to the respective context. The goal is to highlight designs that demonstrate holistic operational efficiency, combining modeling accuracy with the successful implementation of active and passive systems, contributing to sustainable and efficient building practices in African and Moroccan contexts.

	<b>Criteria</b> <i>Teams should address the following in their project:</i>
<b>EFFICIENCY</b>	✓ Exploration of whole-building energy performance relative to a target, focusing on optimal efficiency of systems.
	✓ Realistic models and calculations, including projected operational savings, that inform design decisions related to energy usage.
	✓ Maintenance and operability assessments of building systems to verify long-term energy savings, building function, and consider occupant needs.
	✓ Evaluation of operational carbon emissions that examines the building's energy sources.

### 5. Water Performance

This Contest evaluates the design and management of on-site water resources to achieve a net-zero water building. In such a structure, the total water consumption aligns with or falls below the aggregate of harvested rainwater usage, recycled water usage, and treated wastewater return to a publicly available source, a critical consideration for regions like Africa and Morocco suffering from water scarcity.

Strategies implemented for reducing water consumption, as well as techniques for on-site water recycling and reuse, play pivotal roles in this evaluation. Recognizing that distinct water end-uses demand varying levels of water quality, customization of filtration and treatment systems based on specific end-uses becomes crucial. The design's water cycle should be meticulously supported by comprehensive water calculations. The emphasis lies in creating a sustainable water management system that minimizes consumption while maximizing reuse and recycling to achieve water self-sufficiency, addressing the pressing issue of water scarcity prevalent in African contexts.

<b>WATER PERFORMANCE</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<ul style="list-style-type: none"> <li>✓ Integration of comprehensive water management strategies ensuring resilience against identified risks and the ability to recover from challenges.</li> <li>✓ Analysis of water consumption patterns, sources, and treatments to minimize environmental impact while aligning water supply and demand effectively.</li> <li>✓ Implementation of innovative water management solutions within the building that adapt to varying conditions, including responsiveness to changing water resource availability.</li> </ul>

## 6. Grid-Interactivity

This Contest assesses a building's capacity to reduce operational carbon by interfacing with the grid, displaying resilience during disruptions, and aligning with the supply, demand, and fuel mix limitations of the local utility within African contexts, making it a considerable challenge to showcase the self-sufficiency of buildings in meeting their energy demands.

The evaluation centers on the building's ability to actively engage with the grid, minimizing carbon emissions while ensuring adaptability and resilience in the face of interruptions. It emphasizes the synchronization of building operations with the constraints and characteristics of local utility systems across diverse regions in Africa. The objective is to recognize designs that effectively integrate with local grids, reducing operational carbon while maintaining resilience and aligning with the supply and demand dynamics of African utilities. This evaluation will be a challenge given the imperative need for buildings to be self-sufficient in meeting their energy demands, considering the significant population without access to the grid in Africa.

<b>GRID-INTERACTIVITY</b>	<b>Criteria</b> <i>Teams should address the following in their project:</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>

## 7. Lifecycle

This Contest evaluates the energy and carbon footprint of buildings across their entire life cycle, encompassing raw material extraction, operational phases, and end-of-life considerations. The evaluation extends beyond operational efficiency to address the comprehensive impact of buildings, considering resource extraction, construction, utilization, and eventual decommissioning or repurposing. The focus lies in recognizing designs that minimize energy consumption and carbon

emissions while accounting for the unique environmental and socio-economic conditions prevalent across diverse African regions. The objective is to highlight designs that prioritize sustainability throughout the building's life cycle, contributing to reduced environmental impact and enhanced resource efficiency in African building practices.

<b>LIFECYCLE</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<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>

## 8. Health

This Contest focuses on assessing a building's ability to prioritize occupant health and enhance quality of life through system and spatial designs that optimize comfort, safety, and indoor air quality. The evaluation emphasizes designs that create comfortable and safe environments, ensuring superior indoor air quality to safeguard the well-being of occupants. It recognizes strategies that cater to the unique climatic, cultural, and societal conditions prevalent across diverse regions. The goal is to identify designs that prioritize occupant health and comfort, offering safe and healthy living spaces while addressing the specific needs and challenges faced in African contexts.

<b>HEALTH</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<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>

## 9. Market

This Contest evaluates a project's potential to revolutionize the built environment and act as a catalyst for change in future projects within Africa. It assesses scalability and the probability of adoption by the target market and industry, emphasizing designs that have the potential to influence and transform the building landscape across diverse regions. The evaluation highlights projects with the capability to inspire change, not only in terms of innovation but also in their practicality and adaptability to the needs of the African market and industry. The goal is to recognize projects that demonstrate scalability and a high likelihood of adoption, paving the way for widespread adoption and sustainable advancements in the African built environment.

<b>MARKET</b>	<b>Criteria</b> <i>Teams should address the following in their project:</i>
	<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.</li> <li>✓ Potential commercial impact of the proposed design including considerations of scalability, replicability, and buildability, and any barriers to large-scale adoption.</li> </ul>

	<ul style="list-style-type: none"> <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>
--	--

## 10. Community

This Contest assesses how a building supports and aligns with the priorities of its occupants and local communities within African and Moroccan contexts. Teams participating in this contest must also promote their projects on social media, engaging people and informing them about the purpose of their building design project. This community engagement through social media is integral in the context of sustainability and net-zero energy buildings.

The evaluation focuses on designs that address the specific needs and aspirations of communities, emphasizing affordability alongside other essential requirements. It aims to recognize projects that actively engage with and support local communities, ensuring affordability while meeting their essential needs and aspirations. The evaluation also emphasizes designs that resonate with the cultural, social, and economic priorities of diverse communities across Africa and Morocco. The goal is to recognize projects that, through active community engagement and support, contribute to sustainability and the development of net-zero energy buildings.

<b>COMMUNITY</b>	<p><b>Criteria</b> <i>Teams should address the following in their project:</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>
------------------	---

## VI. Evaluation Process

Teams undergo evaluation across various competition stages, encompassing the assessment of deliverables and presentations by industry expert Jurors. These stages serve as critical checkpoints in the competition, allowing for a thorough evaluation of each team's work. The evaluation process includes rigorous assessments of team deliverables and presentations, providing opportunities for industry experts to assess and provide feedback on the teams' innovative solutions tailored for African contexts.

### 1. Evaluation Process Summary

The evaluation process for the competition is summarized in Table 1. Detailed descriptions of each competition stage are outlined in later subsections.

Competition Stage	Timeline	Evaluation Process Summary
<b>Project Summary</b>	<b>Team Registration</b> deadline and <b>Project Summary</b> submission: <i>February 2<sup>nd</sup>, 2024</i>	<i>Evaluation of initial Project Summary deliverable to gain preliminary feedback.</i>
<b>Semifinal Competition</b>	<b>Semifinal Design Project</b> submission deadline: <i>March 11<sup>th</sup>, 2024</i> <b>Semifinal Competition</b> virtual event date: <i>April 8<sup>th</sup>, 2024</i>	<i>Evaluation of Semifinal Submission deliverable and 10-minute presentation to Jurors. Up to 10 Finalist Teams are selected in each Division.</i>
<b>Final Submission</b>	<b>Final Full Project</b> submission deadline: <i>May 19<sup>th</sup>, 2024</i>	<i>Evaluation of Final Submission deliverable.</i>
<b>Competition Event</b>	<b>Final Competition</b> in person event date: <i>June 6<sup>th</sup>, 2024</i>	<i>Evaluation of 15-minute presentation to Jurors and 10-minute question-and-answer Winning teams are selected in each Division. Division winners present to Grand Jury to determine Grand Winner.</i>

Table 1. Competition Evaluation Process Summary

### 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 the next Sections. 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.

1	2	3	4	5	6	7	8	9	10
Completely Disagree	Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Agree	Strongly Agree	Completely Agree

Table 2. Evaluation Scale

### 3. Project Summary

#### a. Evaluation Process

The first competition stage is the Project Summary, which consists of a deliverable. The Project Summary provides an opportunity to submit preliminary information about a team's project. 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.

#### **b. Deliverables**

The First Submission deliverables for participating teams are:

1. **PS1** Registration form.
2. **PS2** Team members list.
3. **PS3** Project summary.

*See deliverables Section for a full description of deliverable submission requirements.*

### **4. Semifinal Competition**

#### **a. 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 on time,
- Each Participant Team will present a live, virtual presentation to a panel of Division jurors and industry experts.
  - *There will be a 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.
- All Teams receive written feedback from Division Jurors via email.

#### **b. Evaluation Rubric**

Jurors individually evaluate each team's deliverable and presentation within their division according to the evaluation rubric in Table 3. The criteria included in Table 3. differ from those included in the rubric for the Final Submission deliverable and Competition Event presentation.

Possible scores correspond to the Evaluation Rating Scale included in Table 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.

Criteria	Weight
<b>Project Approach</b>	<b>90%</b>
Design Goals	20%
Target Market	20%
Local Climate	20%
Building Codes and Standards	20%
Plan for Final Submission	20%
<b>Competition Intent</b>	<b>10% Weight distributed evenly across criteria</b>
Building Science	The team demonstrated a strong understanding and application of building science in the design.
Project Selection for Carbon Impact	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.

Table 3. Evaluation Rubric: Semifinal Competition

**c. Deliverables**

The Semifinal Submission deliverables for selected teams are:

1. **SF1** Project Summary (updated)
2. **SF2** Semifinal Presentation Slides.

*See deliverables Section for a full description of deliverable submission requirements.*

**d. Presentation Format**

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

**5. Final Submission**

**a. 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.
- 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 presentations and associated Q&A period during the Competition final Event.*

**b. Evaluation Rubric**

The evaluation rubric below will be used by Jurors to evaluate the Final Submission deliverable and Competition Event presentation. Juror evaluation statements are included across each Contest; the table below represents a summary of the criteria and evaluation statements. Scores correspond to the Evaluation Rating Scale included in Table 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.

Criteria	Weight
<b>Contests</b>	<b>90%</b> <i>Weight distributed across the total Contests score</i>
Architecture	60%
Engineering	
Envelope	
Grid Interactivity	
Lifecycle	
Health	
Market	
Community	
Efficiency	
Water Performance	20%
	20%
<b>Competition Intent</b>	<b>10%</b> <i>Weight distributed evenly across criteria</i>
Building Science	The team demonstrated a strong understanding and application of building science principles throughout their design.
Project Selection for Carbon Impact	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.

Table 4. Evaluation Rubric: Final Submission and Competition Event Presentation

### c. Deliverables

The Final Submission deliverables for Finalist Teams are:

1. **FL1** Project Summary (*updated*).
2. **FL2** Design Narrative.
3. **FL3** Supplemental Documentation (*optional*).
4. **FL4** Video Pitch.
5. **FL5** Project Renders and Images.
6. **FL6** Division Presentation Slides.
7. **GJ1** 10-minute Grand Jury Presentation Slides.

See *deliverables* Section for a full description of deliverable submission requirements.

### d. Presentation Format

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

## 6. Solar Decathlon Africa Design Challenge Competition Event Presentation

### a. Evaluation Process

The Solar Decathlon Africa Design Challenge Competition Event, to be held in June 2024, is the culmination of the competition and consists of a presentation and Q&A. 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.

### **b. Finalist Teams**

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

The evaluation process for Finalist Teams is as follows:

- Finalist Teams present to a jury panel of 3-5 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 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 Grand Jury Award section.

### **c. Presentation Format**

- Each Finalist Team will deliver a live 15-minute Presentation, with an additional 10-minute for questions and answers.
  - No pre-recorded presentations will be permitted.
- Each Finalist Team may have a maximum of five 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.
  - One Faculty Advisor or Acting Advisor may attend the Competition Event in person but may not participate in the presentation or Q&A period.

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

## **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 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 2. to facilitate its selection of the Grand Winner.

## VII. Deliverables

Throughout the Design Challenge, each team must submit scheduled deliverables for evaluation of its progress and design.

Stage	Deliverable	File Name	File Type
Registration & Project Summary	PS1 Registration Form	Online registration at <a href="https://www.solardecathlonafrica.com/solar-decathlon-africa-design-challenge-registration-form-team-lead/">https://www.solardecathlonafrica.com/solar-decathlon-africa-design-challenge-registration-form-team-lead/</a>	Online form
	PS2 Team Members	24SDADC_[DIVISION]_[SHORT TEAM NAME]_PS2_TEAMLIST_date.xlsx	Template spreadsheet
	PS3 Project Summary	24SDADC_[DIVISION]_[SHORT TEAM NAME]_PS3_SUMMARY_date.pdf	Single, bookmarked PDF
Semifinal	SF1 Updated Project Summary	24SDADC_[DIVISION]_[SHORT TEAM NAME]_SF1_SUMMARY_date.pdf	Single, bookmarked PDF
	SF2 Semifinal Presentation Slides	24SDADC_[DIVISION]_[SHORT TEAM NAME]_SF2_SEMIPRES_date.[EXTENSION]	PDF or PPTX
Final	FL1 Updated Project Summary	24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL1_SUMMARY_date.pdf	Single, bookmarked PDF
	FL2 Design Narrative	24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL2_NARRATIVE_date.pdf	Single, bookmarked PDF
	FL3 Supplemental Documentation	24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL3_SUP_date.pdf	Single, bookmarked PDF
	FL4 Video Pitch	24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL4_PITCH_date.[EXTENSION]	.mov or .mp4
	FL5 Project Renders and Images	PHOTO1, PHOTO2, TEAMPHOTO e.g. 24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL5_PHOTO1_date.[EXTENSION]	.jpg, .tiff, or .png
	FL6 Division Presentation Slides	24SDADC_[DIVISION]_[SHORT TEAM NAME]_FL6_DIVPRES_date.[EXTENSION]	PDF or PPTX
Selected Division Finalists	GJ1 Grand Jury Presentation Slides	24SDADC_[DIVISION]_[SHORT TEAM NAME]_GF1_GRANDPRES_date.[EXTENSION]	PDF or PPTX

**Table 5.** Summary of Deliverables & File Naming Conventions.

*Note that a "bookmarked" PDF means the file has each major header bookmarked for easy viewing.*

### 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:

See next Sections for the requirements for each Design Challenge deliverable, as well as submission instructions.

### 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.

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.

#### Format Requirements

- ✓ Paper size: Standard 216 millimeters [mm] × 279 mm
- ✓ Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts)
- ✓ Borders: 0.5-in. (12.7-mm) minimum, except for tables, figures, and images
- ✓ Maximum length: 3 pages

#### PS1 - Project Summary Content Requirements

- ✓ List the project name, team name, Division, and collegiate institution(s) in the header.
- ✓ Replace the logo in the upper right with the team or collegiate institution's logo.
- ✓ Replace the building image with one or two graphics that best represent the project.
- ✓ Provide a concise description of the project, including a brief identification of the target market.
- ✓ Describe the relevance of the project to the goals of the competition.
- ✓ Summarize the design strategy and relevant key points.
- ✓ List the relevant project data, including cost estimates.
- ✓ Provide technical specifications for the project.
- ✓ Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each Contest.

### 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:

- **SF1** Updated Project Summary.
- **SF2** Semifinal Presentation Slides.

#### Format Requirements

- ✓ Paper size: Standard 216 mm √ 279 mm
- ✓ Formatting: Single-spaced, 11-point font for body text ; add page numbers for reviewer convenience
- ✓ Borders: 12.7-mm minimum, except for tables, figures, and images
- ✓ Maximum length: 3 pages, including tables and figures

### SF1 - Updated Project Summary Content Requirements

- ✓ List the project name, team name, Division, and collegiate institution(s) in the header.
- ✓ Replace the logo in the upper right with the team or collegiate institution's logo.
- ✓ Replace the building image with one or two graphics that best represent the project.
- ✓ Provide a concise description of the project, including a brief identification of the target market.
- ✓ Describe the relevance of the project to the goals of the competition.
- ✓ Summarize the design strategy and relevant key points.
- ✓ List the relevant project data, including cost estimates.
- ✓ Provide technical specifications for the project.
- ✓ Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each of the following Contests.

### SF2 - Semifinal Presentation Slides Format Requirements

- ✓ File type: PDF and/or PPTX (Presentation Slides must have an aspect ratio of 16:9.)
- ✓ To ensure that all electronically submitted materials work with the organizers' presentation computers; teams should embed all videos in the team submission.

## 3. 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. **FL1** Project Summary (*updated*).
2. **FL2** Design Narrative.
3. **FL3** Supplemental Documentation (*optional*).
4. **FL4** Video Pitch.
5. **FL5** Project Renders and Images.
6. **FL6** Division Presentation Slides.
7. **GJ1** 10-minute Grand Jury Presentation Slides.

Teams also have the option to submit Supplemental Documentation, further detailed in Supplemental Documentation Section. 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.

### Format Requirements

- ✓ Paper size: Standard 216 millimeters [mm] √6 279 mm
- ✓ Formatting: Single-spaced, 11-point font for body text
- ✓ Borders: 12.7-mm minimum, except for tables, figures, and images
- ✓ Maximum length: 3 pages

### FL1 - Updated Project Summary Content Requirements

- ✓ List the project name, team name, Division, and collegiate institution(s) in the header.
- ✓ Replace the logo in the upper right with the team or collegiate institution's logo.
- ✓ Replace the building image with one or two graphics that best represent the project.
- ✓ Provide a concise description of the project, including a brief identification of the target market.

- ✓ Describe the relevance of the project to the goals of the competition.
- ✓ Summarize the design strategy and relevant key points.
- ✓ List the relevant project data, including cost estimates.
- ✓ Provide technical specifications for the project.
- ✓ Provide project highlights. Briefly explain how the design meets or exceeds the criteria in each of the following Contests:
  1. Architecture
  2. Engineering
  3. Envelope
  4. Efficiency
  5. Water Performance
  6. Grid-Interactivity
  7. Lifecycle
  8. Health
  9. Market
  10. Community.

#### 4. Design Narrative

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, 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.

#### Format Requirements

- ✓ Paper size: Standard.
- ✓ Formatting: Single-spaced, 11-point font for body text (diagrams may have smaller fonts).
- ✓ Borders: 12.7-mm minimum, except for tables, figures, and images.
- ✓ Limit content to no more than 60 pages; the cover, back page, and table of contents are not included in this count.
- ✓ Construction drawings: 279 mm x 432 mm.

#### FL2 - Design Narrative Content Requirements

##### Front Matter

- ✓ Cover (list collegiate institution, team name, and Division name)
- ✓ Table of Contents
- ✓ List of Tables and/or List of Figures

##### Section 1: Design Constraints and Goals

- ✓ Design Constraints Description, including timeline, budget, community setting, climate, building science considerations, codes, occupant characteristics, etc.
- ✓ Design Goals, including rating systems, energy targets, occupant experience, operational cost, etc.

##### Section 2: Contest Narratives, including relevant images and figures



1. Architecture
2. Engineering
3. Envelope
4. Efficiency
5. Water Performance
6. Grid-Interactivity
7. Lifecycle
8. Health
9. Market
10. Community

#### Appendices

- A. Design renderings
- B. Construction documentation highlights
  - a. Site plan
  - b. Representative floor plan(s) with dimensions
  - c. Building elevations
  - d. Building sections, including building science control layers
  - e. Interior details, including a rendered floor plan showing typical furniture layout and option details on finishes, cabinetry, and other fixtures
  - f. Wall, window, door, floor, and roof details, including building science control layers, schedule, and specifications
  - g. Mechanical plans and schedules, indicating equipment locations and specifications, as well as load calculations and heating and cooling system capacity diagrams
  - h. Plumbing plans and schedules, including fixture locations, piping system layout and design, and equipment location and specifications
  - i. Electrical and lighting plans and schedules, including installed lighting watt/m<sup>2</sup> levels, control systems, and renewable systems
- C. Energy performance :EnergyPlus building energy model must be submitted

#### Zero energy design compliance

1. Show summary calculations and methods used to satisfy zero energy definitions according to ASHRAE Standard 228.
2. 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.
3. Demonstrate compliance with the Division definition. 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.

#### Net Zero Water design compliance

1. Baseline Estimates: Quantify current water consumption for all uses within the building.
2. Water Cycle Diagram: Create an initial diagram showing water sources, uses, and potential reuse paths.
3. Efficiency Design Strategies: Outline specific plans and systems to minimize water use and maximize reuse.

4. Water Management Plan: Detail a comprehensive strategy to manage water resources and achieve net-zero consumption.

## 5. Supplemental Documentation

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.

## 6. Video Pitch

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.

Jurors will review each team's Video Pitch 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.

## 7. Project Images

Each team must submit 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. Organizers use images to recognize individual team performance, to integrate into event materials, or for outreach, as appropriate.

### Format Requirements

- ✓ Ensure all images have a minimum resolution of 1920 x 1080 pixels.
- ✓ Ensure the images have an aspect ratio of 16:9.
- ✓ Submit the images as files such as .jpg, .tiff, or .png

## 8. Division Presentation Slides

Teams develop a 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.

### Format Requirements

- ✓ File type: PDF and/or PPTX (Slides aspect ratio of 16:9.)
- ✓ To ensure that all electronically submitted materials work with the organizers' presentation computers; teams should embed all videos in the team submission.

## 9. 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.

### Format Requirements

- ✓ File type: PDF and/or PPTX (Slides aspect ratio of 16:9.)
- ✓ To ensure that all electronically submitted materials work with the organizers' presentation computers; teams should embed all videos in the team submission.