



U.S. DEPARTMENT OF ENERGY

SOLAR DECATHLON

RULES

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SECTION I: DEFINITIONS

Assembly

The period of time between the arrival of trucks and the beginning of the [contests](#) on the [competition](#) site

Communications materials

All printed or electronic publications designed to convey information to the public

Competition

All aspects of the Solar Decathlon related to the [contests](#) and the scoring of those [contests](#)

Competition Manager

The [organizer](#) responsible for writing and enforcing the [rules](#) and conducting a fair and compelling [competition](#)

Competition prototype

The competition prototype is the complete assembly of physical components installed on the competition site.

Contest

The Solar Decathlon [competition](#) consists of 10 separately scored contests, each containing one or more [subcontests](#)

Contest Official

An individual selected by the [Competition Manager](#) to officiate one or more of the [contests](#); a Contest Official is only authorized to interpret the [rules](#) of the [contest\(s\)](#) to which he or she is assigned

Contest week

The nine day period on the [competition](#) site when some or all [contests](#) are in progress

Decathlete

A [team member](#) who is an enrolled student at a participating school or has graduated from a participating school within 12 months of the beginning of [assembly](#)

Decision

The [Rules Officials](#)' interpretation or clarification of a [rule](#)

Decisions on the Solar Decathlon Rules

The compilation of all [decisions](#) made by the [Rules Officials](#) during the [project](#)

Director

The [organizer](#) with final decision-making authority regarding all aspects of the [project](#)

Disassembly

The period of time between the closing of the public exhibit and the completion of [competition](#) site cleanup; Rule 8-2 does not apply during disassembly

Event

The activities that take place on the [competition](#) site including, but not limited to, registration, [assembly](#), inspections, [contests](#), special events, public exhibits, and [disassembly](#)

Event Production Manager

The [organizer](#) responsible for the [project's](#) public outreach, communications, special events, and volunteer activities

Event Sponsor

An entity selected by the [Director](#) to support the Solar Decathlon—a project of the U.S. Department of Energy (DOE), which partners with other institutions, such as its National Renewable Energy Laboratory (NREL), to help ensure the success of the [project](#)

Faculty Advisor

A [team member](#) who is the lead faculty member and primary representative of a participating school in the [project](#); also provides guidance to the team on an as-needed basis throughout the [project](#)

Grid-Tie Assembly

The period of time during [assembly](#) after the house has been connected to the village grid (interconnected); Rule 8-2 applies during grid-tie assembly

Interconnection Application

A form submitted by the team's [electrical engineer](#) to the [Site Operations Manager](#), which provides the technical details needed to determine the suitability of the team's electrical system for interconnection to the [village grid](#)

Juror

An individual selected by the [organizers](#) to make subjective evaluations of the [projects](#)

Jury

A group of [jurors](#) evaluating a specific aspect of each team's [project](#)

Objective Subcontest

A [subcontest](#) based on task completion or measured performance

Observer

Assigned by the [Competition Manager](#) to observe team activities during [contest week](#), an [observer](#) reports observed [rules](#) infractions to the [Rules Officials](#) and records the results of specific [contest](#) tasks, but does not provide interpretations of the Solar Decathlon Rules

Organizer

A DOE or NREL employee, subcontractor, or [observer](#) working on the [project](#) and having the authority described in Rule 1-4

Project

All activities related to the Solar Decathlon—from the initial meetings through the conclusion of the [event](#)

Protest Resolution Committee

A group of individuals selected by the [organizers](#) to resolve team protests during the [competition](#)

Public exhibit

Areas of the competition site open to the public during designated hours

Rule

A principle or regulation governing conduct, action, procedure, arrangement, etc., for the duration of the [project](#)

Rules Official

An [organizer](#) authorized to interpret the [rules](#); the [Competition Manager](#) is the lead Rules Official

Safety Officer

An [organizer](#) whose primary responsibilities are to review the teams' Construction Documents and evaluate the teams' competition site activities for compliance with Rule 3-3

Scored period

Any 15-minute period beginning at 0, 15, 30, or 45 minutes after the hour, during which a particular measured [contest](#) is in progress

Scorekeeper

The individual selected by the [organizers](#) to operate the [scoring server](#) during the [competition](#)

Scoring server

A server that collects data from the central datalogger server, includes forms for manually entering subjective and task-based objective [contest](#) results, and calculates composite scores

Site Operations Manager

The [organizer](#) responsible for all [event](#) site operations, except those listed as responsibilities of the [Competition Manager](#) and [Event Production Manager](#)

Solar Decathlon Building Code

A set of design and construction standards set forth and enforced by the [Solar Decathlon Building Official](#) for the protection of public health and safety during the [event](#)

Solar Decathlon Building Official

The [Rules Official](#) responsible for enforcement and interpretation of the [Solar Decathlon Building Code](#)

Stand-Alone Assembly

The period of time during [assembly](#) before the house has been interconnected to the village grid; Rule 8-2 does not apply during stand-alone assembly

Staff

Individuals working for the [organizers](#) on the [project](#)

Subcontest

An individually scored element within a [contest](#)

Subjective Subcontest

A [subcontest](#) based on a [jury](#) evaluation

Team Crew

A person who is integrally involved with a team's [project](#), but is unaffiliated with a participating school; contractors, volunteers, and sponsors represent team crew examples

Team Member

An enrolled student, recent graduate, faculty member, or other person who is affiliated with one of the participating schools and is integrally involved with a team's [project](#) activities; [Decathletes](#), [Faculty Advisors](#), and involved staff from a participating school are all considered team members

Village Grid

The bi-directional, AC electrical network on the [competition](#) site to which each house has an individually metered connection

Yahoo Group

A community Web site that includes official communications suitable for viewing by all teams

SECTION II: GENERAL RULES

Rule 1. Authority

1-1. Director

The Director represents the U.S. Department of Energy and has the final decision-making authority in all aspects of the project.

1-2. Competition Manager

The Competition Manager is the only Rules Official authorized to write and modify the rules.

1-3. Rules Officials

The Rules Officials are the only organizers authorized to interpret the rules.

- a. If there is any doubt or ambiguity as to the wording or intent of these rules, the decision of the Rules Officials shall prevail.
- b. Printed and electronic communications from the Rules Officials shall be considered part of, and shall have the same validity as, these rules.

1-4. Organizers

Occasionally, a Rules Official may not be immediately available to make an extremely time-sensitive decision. In these rare cases, organizers are authorized to revise the project schedule, change a team's score, or enforce the rules in any manner that is, in their sole judgment, required for the fair and efficient operation or safety of the competition.

1-5. Staff and Volunteers

Solar Decathlon staff and volunteers are not authorized to revise the project schedule, change a team's score, or enforce the rules under any circumstances.

Rule 2. Administration

2-1. Precedence

If there is a conflict between two or more rules, the rule having the later date takes precedence.

2-2. Violations of Intent

A violation of the intent of a rule is considered a violation of the rule itself.

2-3. Effective Date

The latest version of the rules posted on the Yahoo Group and dated for the year of the event represents the rules in effect.

- a. Members of the public without access to the Yahoo Group who are interested in receiving an electronic copy of the latest version of the rules may e-mail a request to the Competition Manager at sdrules@nrel.gov.

2-4. Official Communications

It is the team's responsibility to stay current with official project communications. Official communications between the teams and the organizers occur through, but are not limited to, one or more of the following:

- a. **Yahoo Group** (<http://groups.yahoo.com/group/SD2009/>): Official communications suitable for viewing by all teams are posted on the Yahoo Group message board. The Yahoo Group includes a section for posting files. If files are too large for the Yahoo Group, they are posted on the FTP Site or in the dropbox, and the

teams are notified of the exact location of file(s) via the Yahoo Group. Other Yahoo Group features are used for various purposes. Instructions for joining the Yahoo Group are provided to each team immediately following the selection of teams.

- b. **Competition Manager's e-mail** (sdrules@nrel.gov): For confidential communications or the transfer of small, confidential files, teams may e-mail the Competition Manager. The content of communications sent to this e-mail address remains confidential, unless the team grants permission to the Competition Manager to divulge the content of these communications to the other teams. See the exception in Rule 2-5 for more information about confidentiality.
- c. **Dropbox** (<http://dropbox.yousendit.com/SolarDecathlon>): The dropbox is used by the organizers and teams to transfer large or confidential files. Notification of or requests for file transfers are made via the Yahoo Group or e-mail.
- d. **FTP Site** (ftp://ftp2.nrel.gov/pub/solar_decathlon/): The FTP site is used by the organizers to make large files available to the teams.
- e. **Conference calls**: Teams are strongly encouraged to participate in regularly scheduled conference calls with the organizers. Invitations and instructions for participation in conference calls are provided via the Yahoo Group.
- f. **Meetings**: Before the event, the teams and organizers have an in-person meeting. Notification of the date and agenda for this meeting is made via the Yahoo Group. During the event, a meeting is held the day before assembly begins. Meetings are also held on a daily basis throughout the event.
- g. **Postings at headquarters**: During the event, a bulletin board (or similar venue for posting information) may be established at event headquarters. Teams will be notified via the Yahoo Group if such a venue is established and the purpose for which it has been established.
- h. **E-mail**: For expediency and to protect confidentiality, the organizers may choose to communicate with teams via team members' e-mail addresses listed in the Yahoo Group database. However, most official communication occurs via the Yahoo Group message board.

2-5. Decisions on the Rules

The Decisions on the Solar Decathlon Rules offers interpretations of the rules contained in this document, the Solar Decathlon Rules.

After the Rules Officials make a decision that may, in their opinion, directly or indirectly affect the strategies of all teams, the Rules Officials add the decision to the Decisions on the Solar Decathlon Rules and notify the teams of the addition via the Yahoo Group.

Exception: If such a notification would unfairly reveal the strategies of one or more individual teams, the organizers may, depending on the circumstances, refrain from notifying all teams of the decision.

2-6. Self-Reporting

Teams shall self-report obvious or suspected rules infractions that have occurred or may occur.

- a. The rules do not address every possible scenario that may arise during the competition. Therefore, a team considering an action that is not explicitly permitted by the rules should ask the Rules Officials for an official decision before proceeding with the action. If the team does not ask for an official decision, it puts itself at risk of incurring a penalty.
- b. The Rules Officials and Director exercise discretion when determining the penalty for a rules infraction. Rules infractions observed by Rules Officials, organizers, or other teams, i.e., not self-reported by the team committing the infraction, may be subject to more severe penalties than self-reported rules infractions.

2-7. Penalties

Teams committing rules infractions are subject to one or more of the following penalties, depending on the severity of the infraction: 1) point penalty applied to one or more contests; 2) disqualification from part of, or all of, one or more subcontests; or 3) disqualification from the competition.

- a. The Rules Officials shall determine the severity of rules infractions and classify them as **minor** or **major**.

- b. The Rules Officials are authorized to apply point penalties and disqualify a team from part, or all, of one or more subcontests as a consequence of **minor** rules infractions.
- c. The Rules Officials shall report to the Director all **major** rules infractions. The Director is solely authorized to apply point penalties or disqualify a team from the competition or from part, or all, of one or more subcontests for **major** rules infractions.
- d. Disqualification from the competition requires prior notice to the team and an opportunity for the team to make an oral or written statement on its own behalf.
- e. The Competition Manager shall notify all teams via the Yahoo Group when a penalty has been assessed against any team. The notification shall include the identity of the team receiving the penalty; a brief description of the infraction, including its severity, i.e., minor or major; and a brief description of the penalty.

2-8. Protests

Official written protests may be filed by a team for any reason. A filing fee of up to 10 points may be assessed to the team filing the protest if the protest is deemed by the Protest Resolution Committee to be frivolous.

- a. Teams are encouraged to communicate with the Rules Officials in an attempt to resolve issues and complaints before resorting to the protest process. Protests should be filed only if a) the team and the Rules Officials are unable to resolve the dispute themselves; or b) the team or the Rules Officials are too busy to engage in discussions that may result in resolution of the dispute without a protest.
- b. Protests shall be submitted between 8 a.m. and 6 p.m., and within 24 hours of the action being protested. The final opportunity to file a protest is 5 minutes following the conclusion of the final subcontest on the final day of contest week.

Exception: The results of one or more subcontests may be announced during the final awards ceremony. The results of subcontests announced during the final awards ceremony may not be protested.

- c. The protest shall be submitted to the Competition Manager in a sealed envelope. It shall include the name and signature of a Decathlete, the date of the protest submission, an acknowledgement that a 10-point filing fee may be assessed, and a clear description of the action being protested.
- d. The protest resolution procedure follows:
 - (i). The Competition Manager convenes the Protest Resolution Committee.
 - (ii). The Competition Manager submits the sealed envelope containing the team's written protest to the Committee. Unless the Competition Manager is called by the Committee to testify, he is not permitted to read the protest until after the protest resolution committee has submitted its written decision.
 - (iii). The Committee opens the envelope and reads the protest in private. No appearance by organizers or team members is authorized during the Committee's private deliberations. No right to counsel by organizers or team members is authorized.
 - (iv). The Committee notifies the Competition Manager if it would like to call any individuals for testimony. The Competition Manager notifies individuals called for testimony. The Committee may call the Competition Manager for testimony.
 - (v). Testimony is provided by individuals called by the Committee.
 - (vi). The Committee notifies the Competition Manager of its decision in writing and indicates how many points shall be assessed as a filing fee. The decision of the Committee is final, and no further appeals are allowed.
 - (vii). If the decision involves changes to a team's score or the assessment of a filing fee, the Competition Manager notifies the Scorekeeper of the changes, and the Scorekeeper applies the changes to the scoring server.
 - (viii). The Competition Manager posts a copy of the written protest and decision on the Yahoo Group.

Rule 3. Participation

3-1. Entry

The project is open to colleges, universities, and other post-secondary educational institutions. Entry is determined through a proposal process. All proposals are reviewed, scored, and ranked. Subject to the quantity and quality of proposals, a limited number of teams will be selected for entry.

3-2. Contact Information

Each team shall provide contact information for the team officers listed in Table 1 and shall keep the contact information current for the duration of the project.

- a. If a team's internal officer titles do not exactly match those listed in Table 1, each team shall still provide the contact information for the person fulfilling each of the areas of responsibility described in the second column.
- b. Teams shall provide the contact information for one and only one person in each officer position; these individuals are responsible for forwarding information to any "co-officers," as necessary.
- c. An individual may have multiple officer titles.
- d. Teams shall enter the required contact information into the Yahoo Group database designed specifically for this purpose.

Table 1: Team officers

Title	Responsibilities
Faculty Advisor	Serves as the lead faculty member and primary representative of a participating school in the project; also provides guidance to the team throughout the project
Project Manager	Responsible for planning and executing the project
Construction Manager	Responsible for planning and executing the construction, transport, assembly, and disassembly of the house
Project Architect	Responsible for the architectural design effort; license not required
Project Engineer	Responsible for the engineering design effort; license not required
Structural Engineer	Approves the house's structural systems; license required
Primary Student Contact	Ensures that official communications from the organizers are routed to the appropriate team member(s)
Health & Safety Officer	Responsible for developing and enforcing the team's Health & Safety Plan
Fire Watch Captain	Responsible for the team's life safety during the event
Public Relations Contact	Works in conjunction with DOE's Public Affairs office to coordinate the team's interactions with the media
Instrumentation Contact	Collaborates with the organizers' instrumentation team and the team's Construction Manager to develop a plan to accommodate the equipment used to measure the performance of certain aspects of the home during the competition
Electrical Engineer	Completes the Interconnection Application and works in conjunction with the Site Operations Manager to interconnect the house to the micro-grid on the competition site; license not required
Objective Contest Captain	Serves as the primary strategist and coordinator of tasks in Contests 6 through 10; is responsible for demonstrating the compliance of appliances with the SD2009 Rules
Cost Estimator	Responsible for the team's cost estimating database (see Appendix H-4)

3-3. Safety

Each team is responsible for the safety of its operations.

- a. Each team member and team crew member shall work in a safe manner at all times during the project.
- b. Each team shall supply all necessary personal protective equipment (PPE) and safety equipment for all of the team's workers during the project.
- c. During assembly and disassembly, a minimum level of PPE—hard hat (ANSI Z89.1 or equivalent, Type I, Class G or better), safety glasses with side shields (ANSI Z87.1 or equivalent), shirt with sleeves at least 3 in. (7.6 cm) long, long pants (the bottoms of the pant legs shall, at a minimum, touch the top of the boots when standing), and safety boots (ANSI Z41 PT99 or equivalent) with ankle support—shall be used by each team member and team crew member. Additional PPE or safety equipment shall be used if required for the task being performed.
- d. Children under the age of 13 are not permitted to be on the teams' sites during assembly and disassembly.
- e. Organizers may issue a stop work order at any time during the project if a hazardous condition is identified.

3-4. Conduct

Improper conduct or the use of alcohol or illegal substances will not be tolerated. Improper conduct may include, but is not limited to, improper language, unsportsmanlike conduct, unsafe behavior, distribution of inappropriate media, or cheating.

3-5. Use of Likeness, Content, and Images

Team members and team crew agree to the use of their names, likenesses, content, graphics, and photos in any communications materials issued by the organizers and event sponsors.

- a. Content and images (graphics and photos), and any publications in which the content and images appear, may be viewable and made available to the general public via DOE's, NREL's, and the event sponsors' Web sites with unrestricted use.
- b. The organizers and event sponsors will make all reasonable efforts to credit the sources of content and images, although they may be published without credit. To ensure proper usage of and credit for images, teams should submit photos and graphics by following the instructions for submitting images located in Appendix G.

Exception: If a team submits content or images that it would like to be kept confidential, the team should make that request, with an explanation, in writing to the requestor of the content or images. Every effort will be made to honor requests for confidentiality. All confidentiality requests expire on a date specified in the Yahoo Group calendar.

3-6. Withdrawals

Any team wishing to withdraw from the project must notify the Competition Manager in writing. All written withdrawals signed by a Faculty Advisor are final.

Rule 4. Site Operations

4-1. Damage Liability

Each team is financially responsible for any damage it causes to the competition site.

4-2. Construction Equipment

- a. Forklifts or other small vehicles used during assembly and disassembly may be driven on the grass portion of the competition site only if these vehicles are driven on a required product provided by the organizers that is designed to protect the grass.

- b. Truck-mounted cranes, trailers, semi-trailer trucks, etc., are generally limited to the gravel paths. However, under special circumstances approved by the Site Operations Manager, trailers and semi-trailers may be driven on the grass portion of the competition site on the required product designed to protect the grass.
- c. Track-mounted equipment, such as vehicles, cranes, and forklifts, are prohibited at all times.

4-3. Ground Penetration

Ground penetration is permitted only for the installation of tie-downs needed to meet wind loading requirements and for the installation of grounding means for the house's electrical system. Tie-downs are limited to an 18 in. (45.7 cm) vertical depth.

- a. At certain times during assembly, a qualified utilities locator will be on site to identify an acceptable location near each house for the installation of grounding means. Grounding means shall be installed at a 45-degree angle.

4-4. Impact on the Turf

Low-impact footings shall be used to support all house and site components located on the grass portion of the competition site.

- a. Properly designed footings comply with the soil bearing pressure criteria specified in the Solar Decathlon Building Code, but do not have an excessive safety factor that results in the load being distributed over an unnecessarily large area.

4-5. Generators

Generators are permitted to power tools and construction lights during stand-alone assembly and stand-alone disassembly.

- a. Engine generators shall meet the National Park Service (NPS) noise regulation stated in [36CFR2.12](#). This regulation allows a maximum 60 dB (A) at 50 ft (15 m) under full load. Note that a given dB level at one distance can be converted to an equivalent dB at a different distance.
- b. Operation and refueling of generators is limited to times approved by the organizers.

4-6. Spill Containment

- a. Generators must be equipped with secondary containment systems that can accommodate all of the oil, fuel, and coolant that the generator contains at maximum capacities.
- b. The release of water or other liquids onto the competition site or into nearby storm drains is prohibited.

4-7. Lot Conditions

Up to 18 in. (45.7 cm) of vertical elevation change may exist across a lot. Design and plan accordingly.

Rule 5. The Solar Envelope

5-1. Lot Size

Lots are 82 ft (25.0 m) east to west by 67 ft (20.4 m) north to south.

5-2. Solar Envelope Dimensions

To protect a neighbor's right to the sun, the house and all site components on a team's lot must stay within the solar envelope shown in Figure 1 and Figure 2.

- a. The official height of a site component or set of contiguous site components is the vertical distance from the point of highest grade along the outside perimeter of the site component(s) to the highest point of the site component(s).
- b. Small weather stations, antennas, air vents, and other similar components may be specifically exempted from Rule 5-2 if all of the following conditions are met:

- (i). The team makes a request to the Competition Manager for an exemption.
 - (ii). The team can prove to the Competition Manager's satisfaction that the component is not significantly restricting a neighbor's right to the sun.
 - (iii). The Competition Manager determines that the component is sufficiently unique in function and small in size to warrant an exemption.
- c. The restrictions in Rule 6-2b also apply to the solar envelope.

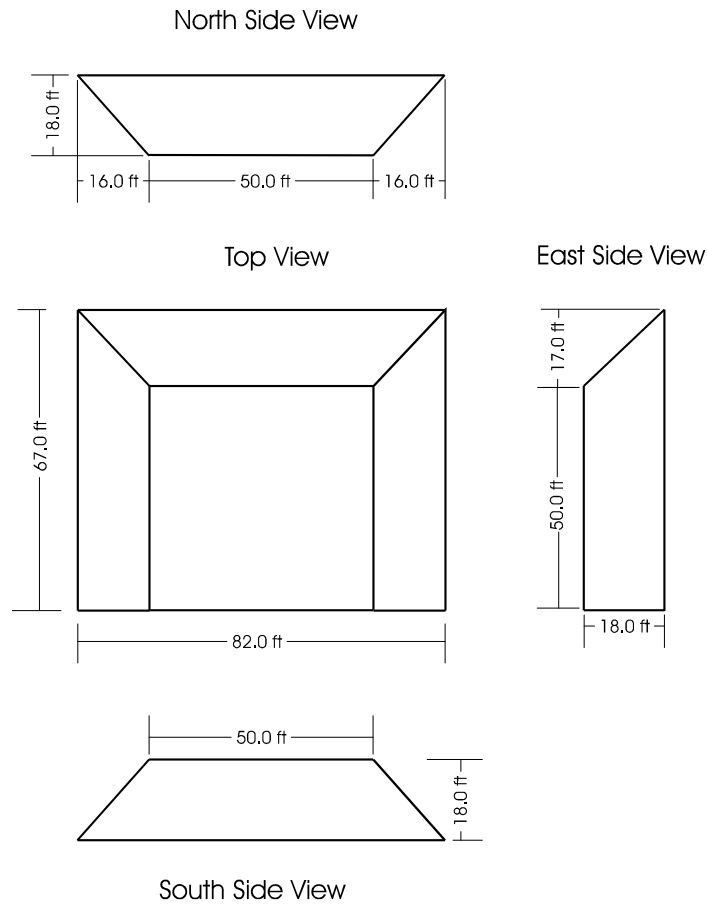


Figure 1: Solar envelope dimensions

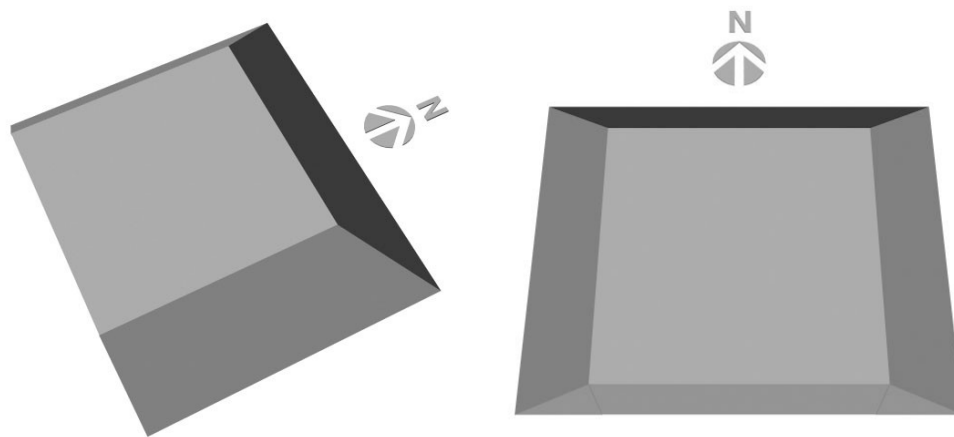


Figure 2: 3-D views of solar envelope

Rule 6. The House

6-1. Structural Design Approval

Each team shall submit structural drawings and calculations that have been stamped by a qualified, licensed design professional.

- a. By stamping the structural drawings and calculations, the licensed professional certifies that the structural provisions of the Solar Decathlon Building Code have been met by the design, and that the structure is safe for the public to enter if it has been built as designed.
- b. The licensed professional shall stamp the structural drawings and calculations of the house and all site components that might pose a threat to public safety if they fail.

6-2. Maximum Architectural Footprint

The architectural footprint, as defined below, shall not exceed 800 ft² (74.3 m²).

- a. Both the building and the components involved in the building's conversion of and shading from solar energy are included in the footprint.
- b. The maximum footprint of each component observed during live demonstrations or shown in printed or electronic media presented by the team during jury visits, public exhibit hours, or the contests counts toward the architectural footprint of record. For example, if a team deploys a motorized awning during public hours to demonstrate its operability, then the additional footprint attributable to the deployed awning counts toward the architectural footprint of record.

Exception: Hypothetical competition prototype alternates proposed in printed or electronic media and explicitly permitted by Rule 6-5 shall be considered for exemption from Rule 6-2 on a case-by-case basis.

- c. The footprint includes the **entire** area within the defined footprint perimeter. There are no exceptions for "openings" or "holes" located within the footprint.
- d. The Rules Officials shall apply the following guiding principles to determine whether a particular component is located within the footprint perimeter:
 - (i). Building integration of active solar (e.g., PV and solar thermal) and passive solar (e.g., shading) devices reduce construction costs of residential buildings, operational costs of residential buildings, or both. Therefore, the footprint rules shall incentivize building integration of solar devices and penalize the use of solar devices that are not well integrated into the building.
 - (ii). Roof overhangs should be designed primarily to enhance the thermal performance of the house. Therefore, the footprint rules shall discourage the design of roof overhangs that do not enhance the thermal performance of the house.
 - (iii). Because of the Rules Officials' time and resource constraints, measurements and calculations required to determine the footprint area should be as simple as possible. Therefore, complex measurement and calculation methods shall not be adopted, even if the use of simpler methods may slightly compromise the accuracy of the architectural footprint measurements and calculations.
- e. The following components are exempt from Rule 6-2:
 - (i). Vegetation and small pots
 - (ii). Handrails with open baluster/newel systems
 - (iii). Typical windows and doors
 - (iv). Site components that do not cast a shadow on the building above its finished floor height between 9 a.m. and 5 p.m. EDT or between 8 a.m. and 4 p.m. solar time on October 1. Note: If a team believes that only part of a site component is responsible for casting a shadow, the team may include a shading analysis in its Construction Documents and propose a partial area of the site component that should be excluded from the footprint measurement. Depending on the quality of the team's shading analysis, the Competition Manager may exclude part of the site component from the footprint measurement.
 - (v). PV walkway lights.

- f. Figure 3 may be used to determine if a particular component is included in the footprint.
- g. See Rules 8-3 and 8-9 for thermal storage and heat sink rules, respectively.

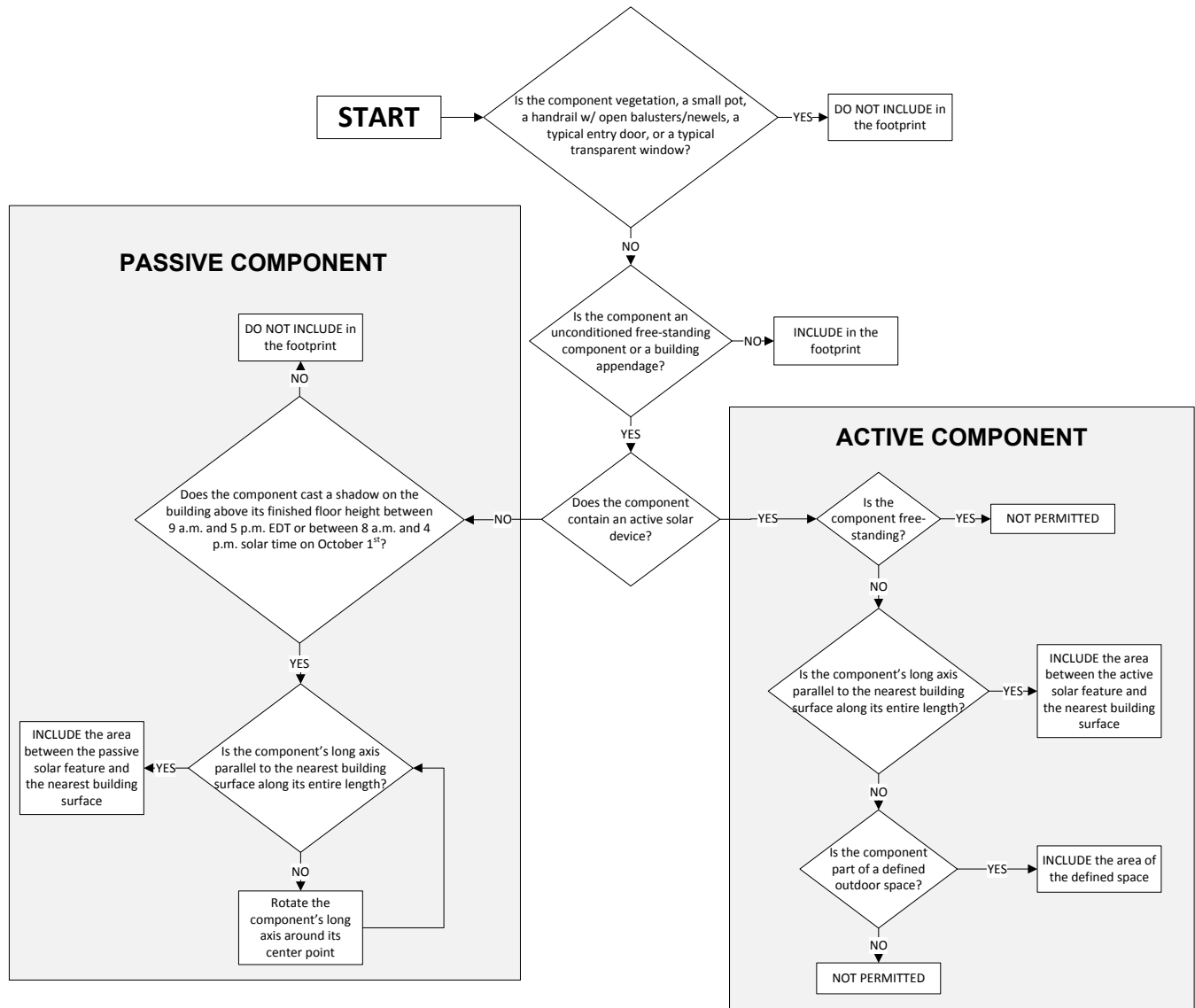


Figure 3: Architectural footprint analysis flow chart

6-3. Minimum Conditioned Space

The combined area of the building's fully conditioned spaces shall exceed 450 ft² (41.8 m²).

- a. All primary living areas shall be located within the conditioned space.
- b. The interior surfaces of walls defining the building's thermal envelope form the conditioned space perimeter.
- c. In multi-story houses, the conditioned area of the story with the smaller conditioned volume does not count as additional conditioned space.

6-4. Entrance and Exit Routes

- a. The main house entrance may be placed on any side of the house. However, an accessible route leading from the main street of the solar village to the main house entrance shall be provided.
- b. The house exit route shall lead from the main house exit to either the main street of the solar village (preferred) or to the gravel path behind the house.

Possible Exception: Pending the approval of the Site Operations Manager, teams on "corner lots" may modify the exit route so that it empties onto a "cross street." Teams requesting this option shall provide an

alternate site plan in the Construction Documents that shows an exit to the cross street. The alternate site plan will be considered if the team ends up on a corner lot. However, the location of corner lots will not be known with certainty until the beginning of assembly.

- c. Teams shall clearly illustrate and label the entrance and exit routes between solar envelope “property lines” and house entrance/exit in the construction drawings. The Site Operations Manager will use these drawings to calculate the quantity of walkway material required by each team.

6-5. Competition Prototype Alternates

In its various deliverables and printed/electronic media, a team is permitted to propose one or more of the following modifications to the competition prototype that may be implemented on a permanent site:

- a. An alternate foundation type may be proposed, but the alternate foundation type shall not increase the volume of usable living, equipment, or storage space.
- b. Removal of communications materials intended exclusively for use on the National Mall; however, communications materials also intended for use by the homeowner shall not be removed.
- c. Removal of instrumentation intended exclusively for research or competition purposes; however, instrumentation also intended for use in a control system or informational display shall not be removed.
- d. Replacement of the organizer-provided walkway material with an alternate walkway material.
- e. Replacement of a water-based heat sink/source with an earth-based heat sink/source in ground-source heat pump systems.
- f. Removal of supply water tank(s), wastewater tank(s), and water pressure pump(s) and tank(s) if water and sewer utilities are available on the permanent site.
- g. Changes required for compliance with local building codes that exceed the requirements of the SD2009 Building Code.

6-6. Conceptual Studies

In its various deliverables and printed/electronic media, a team is permitted to present the results of one or more of the following conceptual studies conducted on the competition prototype:

- a. Modular expansion of the competition prototype for clients interested in a larger home.
- b. Community-scale developments consisting of multiple competition prototypes.

Rule 7. Vegetation

The use of potted vegetation is permitted. All potted vegetation shall comply with Rules 4-4 and 4-6.

7-1. Placement

Vegetation may be moved around the lot until the beginning of contest week, after which it shall remain stationary until the conclusion of contest week unless the Construction Documents clearly show how some or all vegetation is designed to be moved as part of an integrated system.

7-2. Watering Restrictions

Greywater that may possibly contain organisms that could go septic shall not be used to water vegetation.

Rule 8. Energy

8-1. PV Technology Limitations

- a. Bare photovoltaic cells must be commercially available to all teams by the beginning of the event at a price not exceeding 5 U.S. dollars (USD) per peak watt at Standard Test Conditions (STC). Teams may pay extra for cutting, tabbing, or laminating the cells.

- b. Encapsulated photovoltaic modules must be commercially available to all teams by the beginning of the event at a price not exceeding 10 USD per peak watt at STC.
- c. Substantial modification of the crystal structure, junction, or metallization constitutes manufacture of a new cell and is not allowed.

8-2. Energy Sources

After the conclusion of stand-alone assembly (see Rule 8-6c for details) and until the conclusion of the Net Metering contest (see Appendix A for the detailed event schedule), global solar radiation incident upon the lot and the energy in small primary batteries (see Rule 8-4 for limitations) are the only sources of energy that may be consumed in the operation of the house without the requirement of subsequent energy offsets.

- a. All other energy sources, such as AC grid energy, consumed in the operation of the house must be offset by an equal or greater amount of energy produced, or “regenerated,” by the house.

8-3. Thermal Energy Storage

Thermal energy storage devices located outside of the architectural footprint perimeter shall be fully shaded from direct solar radiation between 9 a.m. and 5 p.m. EDT or between 8 a.m. and 4 p.m. solar time on October 1.

8-4. Batteries

Hard-wired battery banks and large plug-in uninterruptible power supplies (UPS) are not permitted.

- a. The use of primary (non-rechargeable) batteries (no larger than “9V” size) is limited to smoke detectors, remote controls, thermostats, alarm clock backups, and other small devices that typically use small primary batteries.
- b. “Plug-in” (non-hard-wired) devices with small secondary (rechargeable) batteries that are designed to be recharged by the house’s electrical system (e.g., a laptop computer), shall be connected, or “plugged into,” the house’s electrical system whenever the devices are located in the house or on the house site.

Exception #1: If not used in the operation of the house at any time during contest week, portable electronic devices used for mobile communications, such as cell phones and PDAs, are permitted on site without having to be plugged into the house’s electrical system.

Exception #2: See Contest 9-4.b for specific rules regarding the use of small mobile devices in the public exhibit.

- c. Stand-alone, PV-powered devices with small secondary batteries are permitted, but the aggregate battery capacity of these devices may not exceed 100 Wh.

8-5. Desiccant Systems

If a desiccant system is used, it must be regenerative.

- a. To ensure that the desiccant has been fully regenerated by the conclusion of the Net Metering contest, the desiccant material or device must be easily measurable.
- b. In most cases, the material or device will be measured prior to and at the conclusion of the Net Metering contest. In some cases, a measurement at the conclusion of the Net Metering contest may not be necessary.
- c. At the conclusion of the Net Metering contest, the weight of the desiccant material or device shall be less than or equal to its initial weight.
- d. Some desiccant systems with very low moisture storage capacities may be exempt from this requirement. Exemptions will be granted on a case-by-case basis.

8-6. Village Grid

The organizers shall provide the village with an electric power grid that provides AC power to and accepts AC power from the houses.

- a. The organizers shall provide the necessary service conductors and connect the conductors at the utility intertie point.

- b. A team shall notify the organizers if its house operates with an AC service other than 60 Hz, 120/240V split-phase with neutral.
- c. At a date and time specified in Appendix A, teams have the option to switch from stand-alone assembly to grid-tie assembly if all relevant inspections have been passed and the village grid is available. Teams shall not switch back to stand-alone assembly after switching to grid-tie assembly. At a later date and time specified in Appendix A, all teams shall have switched to grid-tie assembly.

8-7. Net Metering Rules

- a. When a team switches from stand-alone assembly to grid-tie assembly, its bidirectional meter resets to zero.
- b. If the meter reading is positive (net energy production) at the start of the Net Metering contest, the meter is reset to zero. If the meter reading is negative (net energy consumption) at the start of the Net Metering contest, the meter is not reset and the team begins the Net Metering contest with an energy deficit.

8-8. UNUSED

UNUSED

8-9. Heat Sinks

Dedicated heat sinks are not subject to the requirements of Rules 6-2 or 8-3.

- a. A component that may, at different times, perform as either a heat sink or a heat source shall comply with Rule 8-3. If such a component does not comply with Rule 8-3, it shall comply with Rule 6-2.

Rule 9. Water

9-1. Tank Locations

- a. Supply and waste tanks shall be located outside of the conditioned zone(s).
- b. Solar storage, hot water, or other thermal storage tanks may be located within the conditioned zone(s).
- c. Supply tanks shall be fully shaded from direct solar radiation between 9 a.m. and 5 p.m. EDT or between 8 a.m. and 4 p.m. solar time on October 1.

9-2. Team-Provided Water

A team may provide its own water for the following purposes:

- a. Personal hydration
- b. Irrigation
- c. Food preparation.

9-3. Greywater Reuse

A team may reuse greywater for irrigation only.

- a. Greywater reuse systems shall comply with Rule 7-2.

9-4. Rainwater Collection

A team may collect rainwater that falls on its site and use it in or as any of the following:

- a. Irrigation source
- b. Water feature
- c. Heat sink
- d. Heat source (only if it is fully shaded or located within the architectural footprint, or both).

9-5. Evaporation

Water may be used for evaporation purposes.

9-6. Thermal Mass

Teams may use water as thermal mass to substitute for materials more commonly used as thermal mass.

- a. Water used for this purpose shall not be mixed with any other substance.
- b. Water used for this purpose shall be contained in a stand-alone system, which will be sealed off after the initial filling.

9-7. Greywater Heat Recovery

Heat may be recovered from greywater as it flows from the drain to the waste tank.

- a. “Batch”-type greywater heat recovery is prohibited.

9-8. Water Delivery

The procedure and associated requirements for water delivery follow.

- a. On water delivery day, two water trucks begin at the southeast and northwest corners of the competition site in the morning and proceed clockwise to service each house. Each truck will be equipped with a pump to aid in water supply.
- b. Teams shall provide six people, on command, to help move the water hose to their house from the previously serviced house.
- c. After the two trucks have serviced all houses once, they will circle the village again to service any house needing a tank “topped off”
- d. Teams that delay the water supply process or request additional water after the trucks have completed their second circle around the village are subject to a penalty and a delay in receiving their water. Instead of or in addition to a penalty, these teams may be required to pay for their own water. Teams required to pay for their own water supply shall use a company approved by the organizers.
- e. Construction Documents shall clearly indicate the fill location(s), quantity of water requested at each fill location, tank dimensions, diameter of the opening(s) (minimum 4 in., or 10 cm), and clearance above the tank(s) (minimum 12 in., or 30.48 cm). All openings shall be easily accessible.
- f. Teams are responsible for distributing water within their houses. This includes all necessary pumps, tanks, lines, valves, etc. All pumping power to distribute water must be delivered by an AC circuit.

9-9. Water Removal

The procedure and associated requirements for water removal follow.

- a. On water removal day, two water trucks begin at the southwest and northeast corners of the competition site in the morning and proceed counterclockwise to service each house. Each truck will be equipped with a pump to aid in water removal.
- b. Teams shall supply six people, on command, to help move the water hose to their house from the previously serviced house.
- c. After the two trucks have serviced all houses once, they will circle the village again to service any house needing remaining water removed.
- d. Teams that delay the water removal process may be required to pay for their own water removal. Teams required to pay for their own water removal shall use a company approved by the organizers.
- e. Construction Documents shall clearly indicate the removal location(s), quantity of water to be removed from each removal location, tank dimensions, diameter of the opening(s) (minimum 4 in., or 10 cm), and clearance above the tank(s) (minimum 12 in., or 30.48 cm). All openings shall be easily accessible.
- f. Teams are responsible for either removing remaining water from the site or moving remaining water to the designated removal locations.

Rule 10. The Event

10-1. Registration

All Solar Decathlon event participants must register either through the online registration site, which will be available closer to the event, or on-site in Washington, D.C.

- a. The following rules apply to **all registrants**:
 - (i). Each event participant must register individually. Group registrations are not allowed.
 - (ii). Online registration is encouraged for organizers, team members and jurors, because on-site registration could cause delays in gaining event access.
 - (iii). When registering, event participants must complete all required information and forms before access to the event is allowed.
- b. **Organizers, team members and jurors:** You will be required to provide a photo that will be kept on file and used for security purposes. We encourage you to avoid delays by using the online registration site and submitting your completed forms, information, and photos prior to the event. Once we receive all of your information, forms, and photos, you will be issued an event security ID that must be presented upon request or visible at all times. Different categories of participants require different types of access (such as to restricted areas or during restricted times).
- c. **Staff and team crew:** You are not required to submit a photo. Due to safety concerns, site access for team crew may be restricted.
- d. **Visiting media:** You will not be required to submit forms or photos, but you must check in at event headquarters. Due to safety concerns, site access for visiting media may be restricted.

10-2. Event Sponsor Recognition

All communications materials produced by the teams concerning or referring to the project shall refer prominently to the project as the “U.S. Department of Energy Solar Decathlon” and shall credit DOE, NREL, and additional event sponsors as indicated by the organizers.

- a. Information regarding current event sponsors, artwork for the Solar Decathlon, and event sponsor logos are available on the Yahoo Group.

10-3. Team Sponsor Recognition

Team sponsors may be recognized with text, logos, or both, but the text and logos must appear in conjunction with the Solar Decathlon text and logo and may not be larger than one-third the size of the Solar Decathlon text and logo.

- a. Team Web sites shall comply with Rules 10-2 and 10-3, with the exception of the one-third size rule for team sponsor text and logos.
- b. Rule 10-3 applies but is not limited to all communications materials that will be on display or distributed on the competition site.
- c. Communications materials or other products that exist largely for the recognition of sponsors are prohibited. “Other products” include but are not limited to signs, exhibits, posters, plaques, photos, wall art, and furnishings.
- d. No more than 20% of the total time, 1 minute, or whichever is less, of a multimedia or audio presentation may be dedicated to recognition of team sponsors.
- e. Off-the-shelf components that feature a built-in manufacturer’s logo are acceptable and need not be accompanied by the Solar Decathlon text and logo.

10-4. Logistics

- a. Each team is responsible for the transport of its house, the house’s contents, and all necessary tools and equipment, and shall be responsible for any damage to or loss of such items.
- b. Each team is responsible for procuring all necessary equipment, tools, and supplies.

- c. Each team is responsible for transportation, accommodations, lodging, food, and beverages (including drinking water).
- d. Each team is responsible for making its own reservations and arrangements and for covering all necessary costs.

10-5. Inspections

Each project shall be inspected for compliance with these rules and the Solar Decathlon Building Code.

- a. A team shall notify the appropriate inspector when it is ready for an inspection. When two or more teams request an inspection simultaneously, the order of inspections shall be determined in a drawing.
- b. Spot checks for compliance shall take place throughout contest week.
- c. The Competition Manager shall check each team's inspection status, as indicated on the team's official inspection card, to determine which houses are eligible to participate in the contests. All final inspections shall be passed by the end of the inspectors' work day for a team to be eligible to participate in the following day's contests, which officially start at midnight.

Exception: Jury visits will proceed as scheduled regardless of a team's inspection status. However, jurors may be aware of the team's inspection status and may consider it in their evaluations.

- d. Because open, partially functioning houses are preferable to closed, fully functioning houses, the organizers will direct the inspectors to require that an unsafe condition be corrected so public visits can occur—even if, as a consequence, the house is ineligible for participation in the contests.

10-6. Communications Materials

All communications materials shall support the goal of Contest 5: Communications, which is to educate consumers about the project and topics relevant to the project.

Rule 11. Contest Week

11-1. House Occupancy

Under normal circumstances, no more than six people may be located in the house at any one time.

- a. Toward the end of each day of contest week, the Competition Manager shall post a message on the Yahoo Group message board indicating the hours during which Rule 11-1 is in effect the following day.
- b. Rule 11-1 is automatically suspended whenever the Comfort Zone contest measurements are suspended. See Appendix A-3 for the Comfort Zone contest schedule.

Exception: Rule 11-1 is always in effect for a team when a jury is on the team's site.

- c. Jurors, observers, official competition photographers and writers, and others with authority to enter a house as an organizer are not counted toward the number of house occupants.

11-2. House Operators

Only Decathletes are permitted to operate the house and participate in the contests during contest week.

11-3. Late Design Changes

The final project assembled on the competition site shall be consistent with the design and specifications presented in the Construction Documents.

- a. If there are known inconsistencies between the final project and the Construction Documents, the team is strongly encouraged to document these inconsistencies and submit the documentation to the Competition Manager as soon as possible after the inconsistency is known. The Competition Manager will then submit this documentation or a summary of the documented inconsistencies to the respective juries and inspectors at the appropriate time.
- b. If undocumented inconsistencies are discovered during inspections, the Competition Manager will compile a summary of the inconsistencies and submit the summary to the respective juries at the appropriate time.

11-4. Public Exhibit

- a. Teams are required to provide an accessible route to all areas of the house and site that are available to the public during exhibit hours.
- b. Teams are permitted to give one and only one informational brochure/handout to each member of the general public. No other handouts are permitted.
- c. Teams are prohibited from selling items to the general public on the competition site.
- d. Only organizer-approved vendors may provide food and beverage to the general public on the competition site.

11-5. Team Uniforms

- a. During contest week and special events specified by the organizers, all team members present on the competition site or the site of a special event shall wear uniforms representing their team.
- b. Team uniforms are exempt from Rules 10-2 and 10-3.
- c. Team sponsor logos are approved to be visible ONLY on the back of the team uniform (jacket, shirt, hat, or other wearable item).
- d. The only information or graphics that are approved to be visible from the front of the team uniform (jacket, shirt, hat, or other wearable item) shall be the institution and its logo, the team name and logo, the Solar Decathlon logo, and Event Sponsor logos.
- e. A built-in clothing manufacturer logo may be visible on the front or back of the team uniform, or both.

11-6. Impound

Each house shall be impounded on specified nights under the direct supervision of the organizers or staff. Team members and team crew shall not occupy the site during impound hours.

- a. There is a 10-minute impound grace period on nights during which Subcontest 9-2b is active.

SECTION III: CONTEST CRITERIA

The Solar Decathlon competition consists of 10 separately scored contests. Each contest contains one or more subcontests. For example, Contest 6: Comfort Zone consists of two separately scored subcontests: Temperature and Humidity. The team with the highest total points at the end of the competition wins. Table 2 shows the competition structure.

Table 2: Competition structure

Contest Number	Subcontest Number	Contest Name	Available Points	Subcontest Name	Available Points	Subcontest Type	Brief Descriptions of Subjective Evaluations and Objective Tasks
1	n/a	Architecture	100	n/a	n/a	Subjective	Architecture Jury evaluates Construction Documents and final constructed project
2	n/a	Market Viability	100	n/a	n/a	Subjective	Market Viability Jury evaluates Construction Documents, Cost Estimate, and final constructed project
3	n/a	Engineering	100	n/a	n/a	Subjective	Engineering Jury evaluates Construction Documents and final constructed project
4	n/a	Lighting Design	75	n/a	n/a	Subjective	Lighting Design Jury evaluates Construction Documents and final constructed project
5	n/a	Communications	75	n/a	n/a	Subjective	Communications Jury evaluates Construction Documents, Final Communications Plan, Web site, and final constructed project
6	6-1	Comfort Zone	100	Temperature	50	Objective Measured	Keep zone temperature in 72°F – 76°F (22°C – 24°C) range
	6-2			Humidity	50	Objective Measured	Keep zone relative humidity in 40% – 55% range
7	n/a	Hot Water	100	n/a	n/a	Objective Task	Deliver 15 gallons of water at average 110°F (43°C) temperature within 10 minutes; 20 water draws during contest week
8	8-1	Appliances	100	Refrigerator	10	Objective Measured	Keep refrigerator temperature in 34°F – 40°F (1°C - 4°C) range
	8-2			Freezer	10	Objective Measured	Keep freezer temperature in -20°F – 5°F (-29°C to -15°C) range
	8-3			Clothes Washer	20	Objective Task	Successfully wash 10 loads of laundry (one load = six bath towels) during contest week
	8-4			Clothes Dryer	40	Objective Task	Return 10 loads of laundry to their original weight (one load = six bath towels) during contest week
	8-5			Dishwasher	20	Objective Task	Successfully wash five loads of dishes (one load = six place settings) during contest week
9	9-1	Home Entertainment	100	Cooking	20	Objective Task	Successfully perform four cooking tasks (one task = vaporize 5 lb of water in less than 2 hours) during contest week
	9-2			Lighting	30	Objective Measured/Task	C9-2a: Keep work surface @ 50 foot-candles minimum (5 pts), C9-2b: All interior and exterior lights on at full levels at night (25 pts)
	9-3			Dining	10	Subjective	Host two dinner parties for eight people; teams score each other
	9-4			Public Exhibit	35	Objective Task	Operate TV, computer, and other exhibit devices
	9-5			Home Theater	5	Subjective	Invite neighbors to watch a movie on the home theater system; teams score each other
10	10-1	Net Metering	150	Energy Balance	100	Objective Measured	Achieve zero net AC energy during contest week
	10-2			Energy Surplus	50	Objective Measured	Produce surplus net AC energy during contest week; 50 pts for team with max kWh surplus, other teams with surplus get x% of 50 pts, where x is % of max team's kWh
TOTALS			1,000			465 subj. pts 535 obj. pts	Total of five on-site juries

There are three ways to earn points:

- Task completion
- Measured performance
- Jury evaluation.

Subcontests based on task completion or measured performance are called objective subcontests; subcontests based on a jury evaluation are called subjective subcontests.

Points for task completion are awarded as a function of “closeness to completion.” Points for measured performance are either awarded at the end of each scored period throughout contest week, at the end of each day, or at the conclusion of contest week when performance requirements are met or partially met.

The scoring of the subjective subcontests is more flexible than the scoring of the objective subcontests described above. However, for the sake of fairness, consistency is important. To increase the consistency of the scoring in subjective subcontests, the jurors shall use the evaluation method described in Appendix B.

Contest 1. Architecture

A jury of architects shall assign an overall score for the design’s architectural merit and implementation by evaluating the team’s Construction Documents (see Appendix D) and by performing an on-site evaluation of the competition prototype (see Appendix B).

The jury shall consider the following specific criteria in its evaluation:

Design and Implementation

- Was the team effective in its use of architectural elements including, but not limited to: scale and proportion of room and façade features, indoor/outdoor connections, composition, and linking of various home elements?
- Did the team create a holistic design that will be comfortable for occupants and compatible with the surrounding environment?
- Will the design offer a sense of inspiration and delight to Solar Decathlon visitors?

Documentation

- Did the Construction Documents enable the jury to conduct a preliminary evaluation of the design prior to its arrival at the competition site?
- Did the Construction Documents accurately reflect the constructed project as assembled on the competition site?

Contest 2. Market Viability

A jury of professionals from the homebuilding industry shall assign an overall score for the house’s market viability by evaluating the team’s Construction Documents (see Appendix D) and competition prototype cost estimate (see Appendix H), and by performing an on-site evaluation of the competition prototype (see Appendix B).

The jury shall consider the following specific criteria in its evaluation of the responsiveness of the design to the needs and desires of a team-defined target market (see Table 3 for examples of target market descriptions):

Livability

- Does the design offer the occupant(s) a safe, functional, convenient, comfortable, and enjoyable place to live (see Table 4 for examples of livability considerations)?
- Are the unique needs and desires of the target market met by the design?

Buildability

- Are the Construction Documents of sufficient quality and detail to enable a contractor to generate an accurate, detailed construction cost estimate?

- Are the Construction Documents of sufficient quality and detail to enable a contractor to construct the building as the design team intended it to be built?

Marketability

- Does the house demonstrate curb appeal, interior appeal, and quality craftsmanship?
- Do the house’s sustainability features and strategies make a positive contribution to its marketability?
- Does the house offer potential homebuyers within the target market a good value?

Cost Estimate

Is the construction cost estimate for the competition prototype sufficiently detailed and accurate?

Table 3: Examples of target market descriptions

Market I.D. Parameter	Example #1	Example #2	Example #3
Location of permanent site	New Orleans, LA	Folsom, CA	Boston, MA
Housing type	Emergency relief	Single family	Investment property in an urban college setting
# of occupants	2	3	1
Occupant demographic	Middle-aged married couple	Mid-30s married couple with infant	Graduate student
Homeowner annual income	\$35,000	\$100,000	\$75,000
# of bedrooms	1	2	1

Notes:

1. These examples show the *minimum* required level of detail for the target market description.
2. The target market description shall be included in a prominent location in the Construction Drawings and in the Market Viability Justification, which shall be located in the Project Manual (see Appendix D).
3. Other examples of housing types include, but are not limited to, the following: retirement cottage, vacation retreat, university housing, home office/studio, studio apartment, mobile home, barracks, penthouse, and loft.

Table 4: Examples of livability considerations (NOTE: This list is not exhaustive, and all considerations do not apply to all projects.)

Aesthetics	How well does the design respond to aesthetic tastes of the entire range of people within the target market? How are the views to the outside?
Maintenance	Will snow block the PV or solar collectors? If so, how will the homeowner remove the snow? How do the exterior surfaces hold up to environmental conditions? How frequent and convenient is required maintenance? How will water and dirt affect the floors and countertops? Are they easy to clean with standard household cleaning products? Are there interior surfaces, corners, or crevices that are difficult to keep free of dirt or dust? How is the oven cleaned? How is the freezer defrosted? How frequently must vegetation be watered? Is watering convenient? Is the car protected in inclement weather? Can appliances and furniture be easily moved for cleaning or maintenance? Is mold or rust likely to form anywhere in or on the house? When a house component or finish breaks or is damaged, is it easy to find a replacement?
Comfort	Is the tub or shower floor comfortable on a cold winter morning? Is it easy to sleep or listen to quiet music when there is heavy precipitation, high winds, lots of street noise, or a party next door? Are there any uncomfortable drafts? Is there a uniform temperature distribution throughout the house? Is the house comfortable for a tall person? A short person? A person with allergies, respiratory, or other physical problems? Do any of the house systems or appliances generate annoying or unpleasant sounds or smells? Is the furniture comfortable? Is the workstation comfortable during a long work day?
Privacy	Do the bathroom and bedroom offer visual and auditory privacy from other rooms and outside? To travel from the bathroom to the closet to change clothing, is it necessary to travel through public areas? Can all the windows in the house be covered so the occupants can achieve total privacy if they want it? Do the outdoor living spaces offer sufficient privacy?
Convenience	Are the appliances appropriately sized? Is the toilet paper dispenser easy to operate and conveniently located? In inclement weather, it is necessary to put on shoes and a coat to retrieve the mail, put out the trash, or walk from the house to the car? How many remote controls are needed to operate the home theater system and control systems? Are they intuitive? Are electric, network, phone, and other outlets conveniently located? Are wastebaskets and recycling bins conveniently located?
Functionality	Is the bathroom mirror foggy after a shower? Where does one air-dry a towel in the bathroom or bedroom? Is there an effective means for people to clean and dry their shoes when entering the house in inclement weather? Do the windows block UV rays that could damage interior finishes or furnishings? Does the smoke alarm sound when stir-frying is happening in the kitchen? How is moisture managed in the bathroom and kitchen? Do the high-tech or ultra-efficient devices perform as well as advertised? Is there sufficient storage space for clothes, food, cookware, linens, toiletries, books, CDs, tools, etc? How fast and consistently do the various water fixtures respond to different temperature settings? Does the workstation contain equipment and features sufficient for a home office? Do low-flow showerheads, sink faucets, and toilets perform their respective functions satisfactorily?
Special Features	If people with disabilities are included in the target market, is the house fully accessible? If young couples are included in the target market, could the house accommodate a baby? If the design is targeted toward a niche market, how well are those unique requirements met?
Flexibility	If the house is sold to new owners with different tastes or needs, how difficult would it be to redecorate or rearrange the interior or exterior? If the target market includes people with varying incomes, would less-expensive appliances or furnishings detract significantly from the house's appeal? Is the house wired to accommodate future breakthroughs in consumer electronics and/or home controls?
Safety	Is it difficult for a potential thief to break in? Do daily or seasonal maintenance tasks present any hazards? Do appliances pose any hazard to children? Is the workstation ergonomically comfortable? Does the workstation offer a convenient opportunity to relax one's eyes after staring at the monitor for a while?

Contest 3. Engineering

A jury of engineers shall assign an overall score for the design's engineering merit and implementation by evaluating the team's Construction Documents (see Appendix D), and by performing an on-site evaluation of the competition prototype (see Appendix B).

The jury shall consider the following specific criteria in its evaluation:

Functionality

Will the systems function as intended?

Efficiency

Relative to conventional systems, how much energy will the systems save over the course of an entire year?

Innovation

- Were any unique approaches used to solve design challenges?
- Do the proposed innovations have true market potential?

Reliability

- How long are the systems expected to operate at a high level of performance?
- How much maintenance is required to keep them operating at a high level?

Documentation

- Did the Construction Documents enable the jury to conduct a preliminary evaluation of the design prior to its arrival at the competition site?
- Did the Construction Documents accurately reflect the constructed project as assembled on the competition site?

Contest 4. Lighting Design

A jury of lighting designers and industry experts shall assign an overall score for the lighting design's merit and implementation by evaluating the team's Construction Documents (see Appendix D) and by performing on-site daytime and nighttime evaluations of the competition prototype (see Appendix B).

The jury shall consider the following criteria in its evaluation:

Electric Lighting Quality

- Are the lighted spaces rich and varied? Do they have adequate light for tasks? Do they have good color rendition?
- Are the luminaires attractive? Do they properly distribute light?

Daylighting Quality

- Have human factors, such as physiology, perception, preferences, and behavior, been addressed?
- What are the effects of daylight on all materials, including furniture, artwork, and plants?
- Is the admission of direct and diffuse sunlight effectively controlled?

Ease of Operation

Is the operation of the manual and automatic lighting controls intuitive?

Flexibility

Can the lighting system accommodate all activities and aesthetic requirements in all seasons?

Energy Efficiency

Do the lighting controls facilitate a reduction in lighting energy consumption throughout the year?

Note: Only the energy efficiency attributable to lighting controls shall be assessed in this contest. The energy efficiency of the lamps is evaluated in several of the objective contests.

Building Integration

Have the luminaires, fenestration, interior geometry and finishes, and manual and automatic lighting controls been effectively integrated into the building?

Documentation

- Did the Construction Documents enable the jury to conduct a preliminary evaluation of the design prior to its arrival at the competition site?
- Did the Construction Documents accurately reflect the constructed project as assembled on the competition site?

Contest 5. Communications

The goal of Contest 5: Communications is to ensure that all communications materials shall educate consumers about the project and topics relevant to the project.

A jury of communications professionals shall assign an overall score to the team's communications plan and implementation by evaluating the team's Construction Documents (see Appendix D), Final Communications Plan (see Appendix E), and Web site (see Appendix E), and by performing an on-site evaluation of the implemented communications plan (see Appendix B).

The jury shall consider the following specific criteria in its evaluation:

Compliance

- Were the communications deliverables submitted by the deadline?
- Does the Web site meet minimum coding requirements?
- Do the on-site communications materials fully comply with Rules 10-2 and 10-3?
- Did the house pass all inspections on site such that it could be opened to the public during required public hours?

Planning and Audience Analysis

- Has the team submitted comprehensible and plausible communications plans?
- Has the team conducted reasonable audience analyses, and does the plan reflect these analyses?
- Does the team communicate its message(s) appropriately to its target audience(s)?

Content

Has the team adhered to professional best practices?

- Audience-appropriate language and tone
- Correct spelling and grammar
- Originality or proper citation of unoriginal content.

Presentation

Has the team adhered to professional best practices?

- Design: graphics, photos, colors, and typography
- Web site information architecture: easy to use, consistent, comprehensible, and presents a logical hierarchy of information
- Web site graphical elements: easy to use, consistent, and well integrated with content and design.

Is the on-site presentation for the public pleasant? Logical? Can appropriate information be located easily? Are plans flexible enough to accommodate large crowds and long lines? Does the presentation engage waiting visitors?

Branding

Did the communications materials help make the project identifiable or memorable in any way?

Functionality

- Are the Web site and on-site presentation usable by people of all abilities?
- Are the communications materials appropriate to target audiences and to the setting of the Solar Decathlon solar village on the competition site?
- Do communications materials deliver the team's messages and function as intended?

Innovation

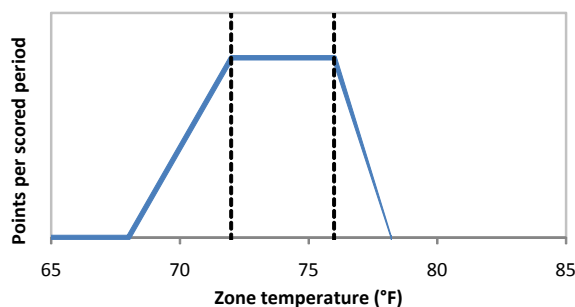
- What original and creative methods are used to control lines and wait times, and to engage visitors waiting in line during public hours? Are these methods effective?
- What creative effort is being made to communicate with visitors to the solar village outside of public hours (after the houses are closed)? Is this communication effective?
- What creative effort is being made to engage the public off site (e.g., around the United States and the world) in the team's participation in the event?
- What original and creative methods are employed to capture users' interests on the Web site?

Contest 6. Comfort Zone

6-1. Temperature

All available points are earned at the conclusion of each scored period by keeping the time-averaged interior dry-bulb temperature between 72.0°F (22.2°C) and 76.0°F (24.4°C) during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- Reduced points are earned if the time-averaged interior dry-bulb temperature is between 68.0°F (20.0°C) and 72.0°F (22.2°C) or between 76.0°F (24.4°C) and 80.0°F (26.7°C). Reduced point values are scaled linearly, as shown in Figure 4.
- The zone temperature deviating farthest from the target temperature range is the zone temperature of record. The organizers will identify at least two thermal zones in each house and measure the temperature of each zone.



Full Points:	$72\text{ °F (22 °C)} \leq \text{Temperature} \leq 76\text{ °F (24 °C)}$
Reduced Points:	$68\text{ °F (20 °C)} < \text{Temperature} < 72\text{ °F (22 °C)}$
	or $76\text{ °F (24 °C)} < \text{Temperature} < 80\text{ °F (27 °C)}$
No Points:	$\text{Temperature} \leq 68\text{ °F (20 °C)}$
	or $\text{Temperature} \geq 80\text{ °F (27 °C)}$

Figure 4: Scoring function for the Temperature subcontest

6-2. Humidity

All available points are earned at the conclusion of each scored period by keeping the time-averaged interior relative humidity between 40.0% and 55.0% during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- Reduced points are earned if the time-averaged interior relative humidity is between 25.0% and 40.0% or between 55.0% and 60.0%. Reduced point values are scaled linearly, as shown in Figure 5.

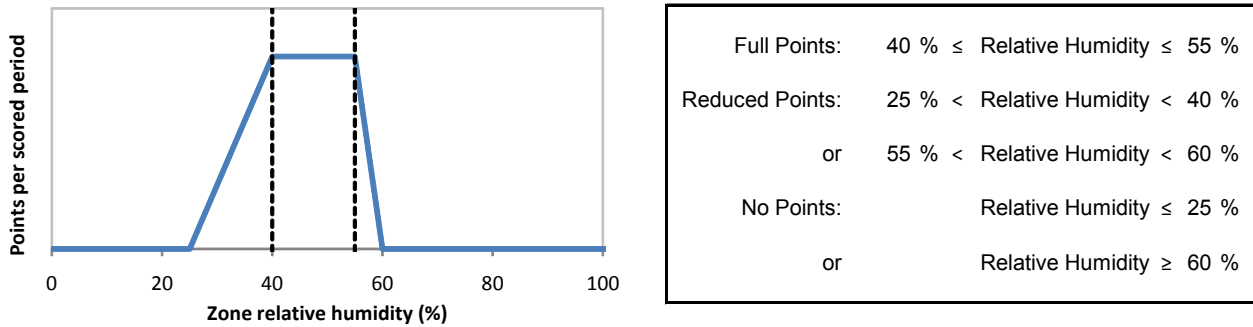


Figure 5: Scoring function for the Humidity subcontest

Contest 7. Hot Water

Hot water draws will occur at the approximate times specified in Appendix A. For each draw, at least 15 gal (56.8 L) of hot water shall be delivered in no more than 10 minutes to qualify for points. All available points are earned by delivering an average temperature of at least 110°F (43.3°C). An average temperature below 100°F (37.8°C) earns no points. For temperatures between 100°F (37.8°C) and 110°F (43.3°C), points are scaled linearly, as shown in Figure 6.

- These hot water draws are designed to simulate most of the washing and bathing tasks that would take place in a typical day. *Note: Dishwashing and clothes washing tasks are not simulated by these hot water draws because they belong to a different contest.*
- The schedule for hot water draws will most likely vary from one day to the next, just as it does in a typical home.
- The maximum number of hot water draws for one day will not exceed three, but they may occur consecutively.
- For fairness, all teams will be drawing hot water on nearly identical schedules.

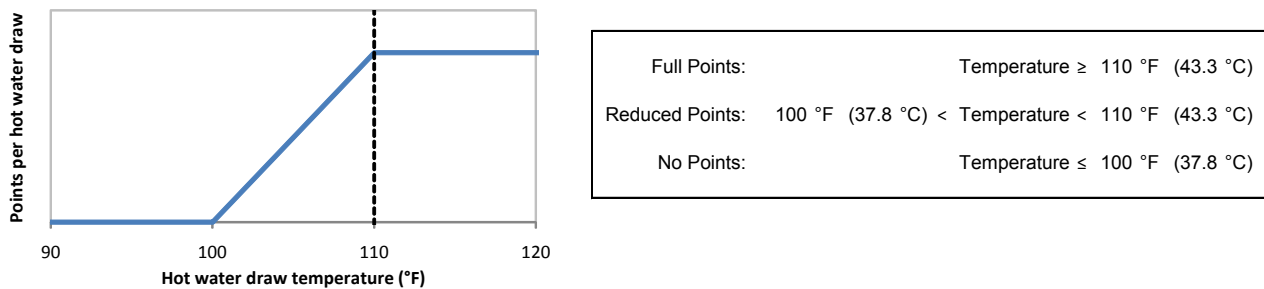


Figure 6: Scoring function for the Hot Water subcontest

Contest 8. Appliances

8-1. Refrigerator

All available points are earned at the conclusion of each scored period by keeping the time-averaged interior temperature of a refrigerator between 34.0°F (1.11°C) and 40.0°F (4.44°C) during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- Reduced points are earned if the time-averaged interior refrigerator temperature is between 32.0°F (0.00°C) and 34.0°F (1.11°C) or between 40.0°F (4.44°C) and 42.0°F (5.56°C). Reduced point values are scaled linearly, as shown in Figure 7.
- The refrigerator volume published in the manufacturer's specifications shall be a minimum of 6.0 ft³ (170 L).

- c. The refrigerator may be used to store food and beverages.

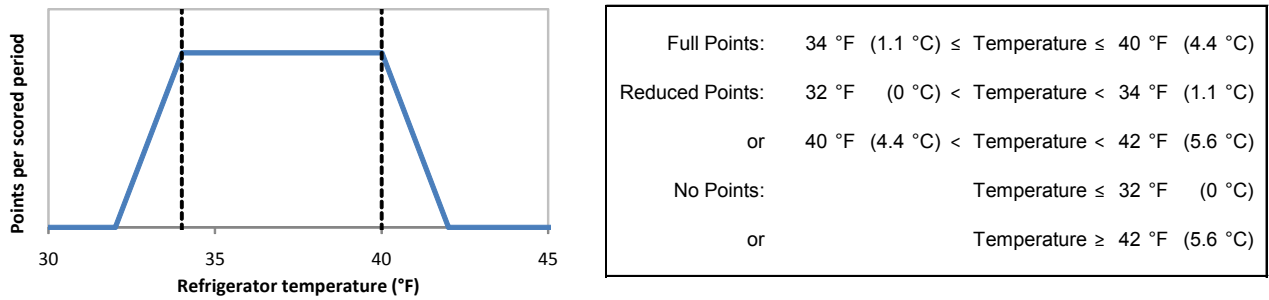


Figure 7: Scoring function for the Refrigerator subcontest

8-2. Freezer

All available points are earned at the conclusion of each scored period by keeping the time-averaged interior temperature of a freezer between $-20.0\text{°F } (-28.9\text{°C})$ and $5.0\text{°F } (-15.0\text{°C})$ during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- Reduced points are earned if the time-averaged interior freezer temperature is between $-30.0\text{°F } (-34.4\text{°C})$ and $-20.0\text{°F } (-28.9\text{°C})$ or between $5.0\text{°F } (-15.0\text{°C})$ and $15.0\text{°F } (-9.44\text{°C})$. Reduced points are scaled linearly, as shown in Figure 8.
- The freezer volume published in the manufacturer’s specifications shall be a minimum of 2.0 ft^3 (57 L).
- The automatic defrost function may be disabled.
- The freezer may be used to store food and only enough ice to fill the freezer’s ice bin.

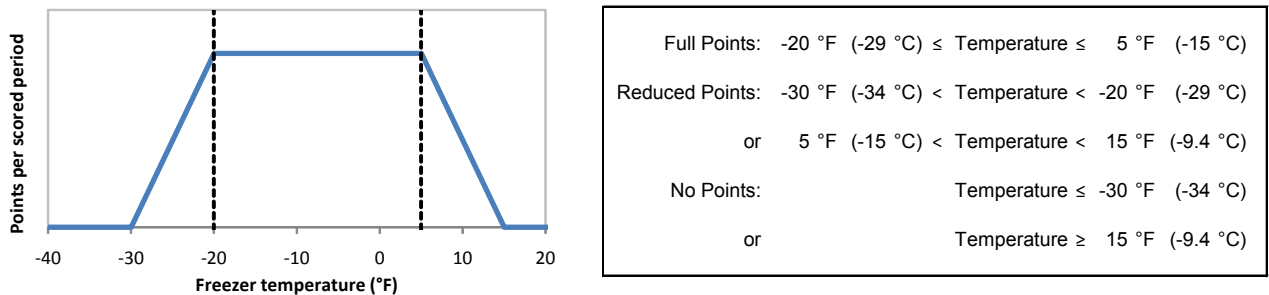


Figure 8: Scoring function for the Freezer subcontest

8-3. Clothes Washer

All available points are earned for washing laundry by running a clothes washer through one or more complete, uninterrupted, “normal” (or equivalent) cycle(s) within a specified period of time, during which a temperature sensor placed in the clothes washer must reach $110\text{°F } (43.3\text{°C})$ at some point during the cycle. See Appendix A for specific details regarding the number of points per clothes-washing task and the time periods designated for clothes-washing tasks.

- Half of the available points are earned if the temperature sensor reaches $105\text{°F } (40.6\text{°C})$, but does not reach $110\text{°F } (43.3\text{°C})$.
- A load of laundry is defined as six organizer-supplied bath towels.
- The clothes washer shall operate automatically and have at least one wash and rinse cycle.
- One or more complete, uninterrupted, “normal” (or equivalent) cycle(s) in an automatic clothes washer shall be used to wash the laundry.
- On several days during contest week, two loads of laundry are required to be washed. Teams have the option to combine double loads and wash them in one clothes-washer cycle.

- f. For redundancy, two temperature sensors shall be placed in the clothes washer for each test. The higher of the two readings is the temperature of record, unless it is determined that the sensor with the higher reading is defective, in which case the lower of the two readings is the temperature of record.
- g. The drying function in a combination washer/dryer shall be disabled until the completion of the wash cycle and removal of the temperature sensors.
- h. Cycle “interruption” includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual.
- i. Cycle completion shall be confirmed by the observance of an audible or visible signal.
- j. The organizers will consult the operation manual to identify appropriate cycle settings. “Normal” or “regular” settings shall be selected, if available. Otherwise, settings most closely resembling typical “normal” or “regular” settings shall be selected.

8-4. Clothes Dryer

All available points are earned by returning a load of laundry (defined as six organizer-supplied bath towels) to a total weight less than or equal to the towels’ total weight before washing. Clothes drying shall be completed within a specified period of time. See Appendix A for specific details regarding the number of points per clothes drying task and the time periods designated for laundry tasks.

- a. Reduced points are earned if the “dry” towel weight is between 100.0% and 110.0% of the original towel weight. Reduced point values are scaled linearly, as shown in Figure 9.
- b. A load of laundry is eligible for clothes-drying points only if the load experienced a complete, uninterrupted cycle (see Contest 8-3j for required cycle settings) in an automatic clothes washer. However, scoring points in the Clothes Washer subcontest is not a prerequisite for scoring points in the Clothes Dryer subcontest.
- c. The drying method may include active drying (e.g., machine drying), passive drying, (e.g., on a clothes line), or any combination of active and passive drying. All drying methods that require the towels to be visible (such as on a clothes line) must be demonstrated to the Architecture and Market Viability juries as they visit the houses.
- d. On several days during contest week, two loads of laundry are required to be dried. Teams have the option to combine double loads and dry them in one clothes-drying cycle, but each load will be scored separately.

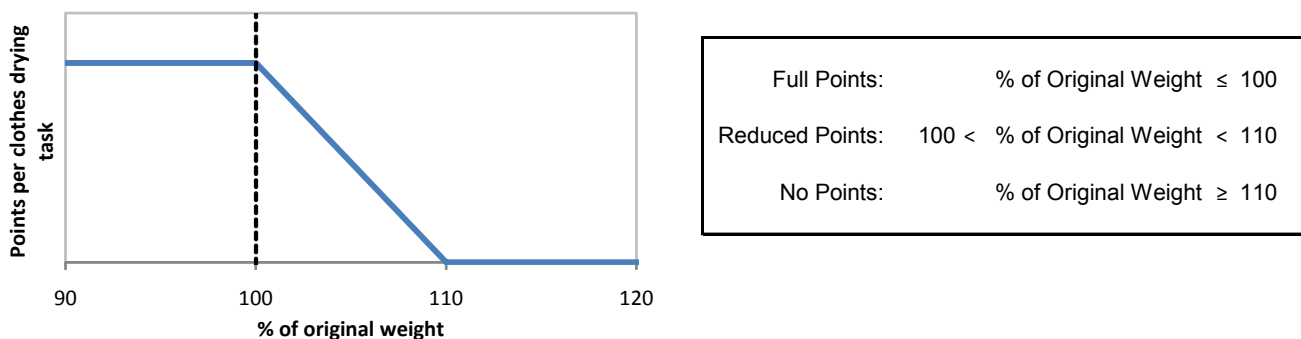


Figure 9: Scoring function for the Clothes Dryer subcontest

8-5. Dishwasher

All available points are earned by running a dishwasher through a complete, uninterrupted, “normal” (or equivalent) cycle within a specified period of time, during which a temperature sensor placed in the dishwasher must reach 120°F (48.9°C) at some point during the cycle. See Appendix A for specific details regarding the number of points per dishwashing task and the time periods designated for dishwashing tasks.

- a. Half of the available points are earned if the temperature sensor reaches 115°F (46.1°C), but does not reach 120°F (48.9°C).

- b. For redundancy, two temperature sensors shall be placed in the dishwasher for each test. The higher of the two readings is the temperature of record, unless it is determined that the sensor with the higher reading is defective, in which case the lower of the two readings is the temperature of record.
- c. The dishwasher shall operate automatically, have at least one wash and rinse cycle, and have a minimum capacity of six place settings according to the manufacturer's specifications.
- d. If the dishwasher has a heated drying option, this option shall be disabled.
- e. Cycle "interruption" includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual.
- f. Cycle completion shall be confirmed by the observance of an audible or visible signal.
- g. The organizers will consult the operation manual to identify appropriate cycle settings. "Normal" or "regular" settings shall be selected, if available. Otherwise, settings most closely resembling typical "normal" or "regular" settings shall be selected.
- h. The dishwasher may be run empty, partially loaded, or fully loaded; the load may be soiled or clean.

Contest 9. Home Entertainment

9-1. Cooking

All available points are earned by using a kitchen appliance to vaporize 5.000 lb (80.00 oz or 2.268 kg) of water within a specified period of time. See Appendix A for specific details regarding the number of points per cooking task and the time periods designated for cooking tasks.

- a. Reduced points are earned if between 1.000 lb (16.00 oz or 0.454 kg) and 5.000 lb (80.00 oz or 2.268 kg) are vaporized. Reduced point values are scaled linearly, as shown in Figure 10.
- b. Any kitchen appliance may be used, but it must operate in its normal configuration as it is vaporizing the water.
- c. The water shall be vaporized in a single pot and the starting water weight shall be at least 96.00 oz (2.721 kg).

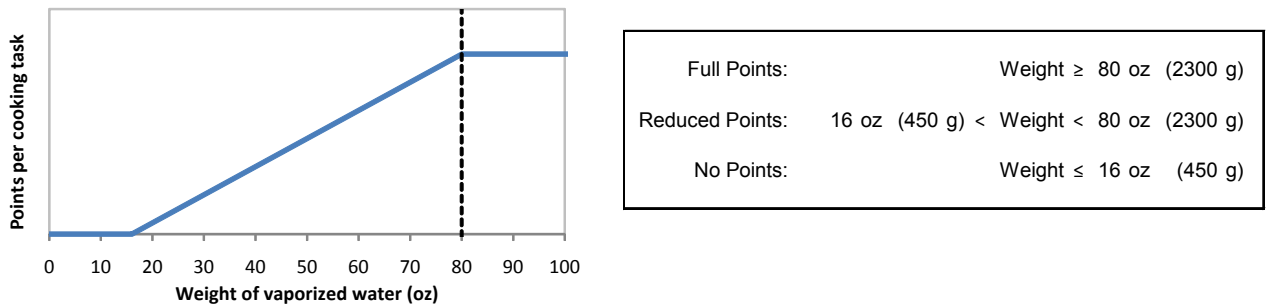


Figure 10: Scoring function for the Cooking subcontest

9-2. Lighting

a. Workstation Lighting

All available points are earned at the conclusion of each scored period by keeping the time-averaged workstation desk surface light level above 50 foot-candles (538 lux) during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- (i). Reduced points are earned if the time-averaged work surface light level is between 25.0 foot-candles (269 lux) and 50.0 foot-candles (538 lux). Reduced points are scaled linearly, as shown in Figure 11.
- (ii). Light-emitting devices within 18 in. (45.7 cm) of the sensors are not permitted.

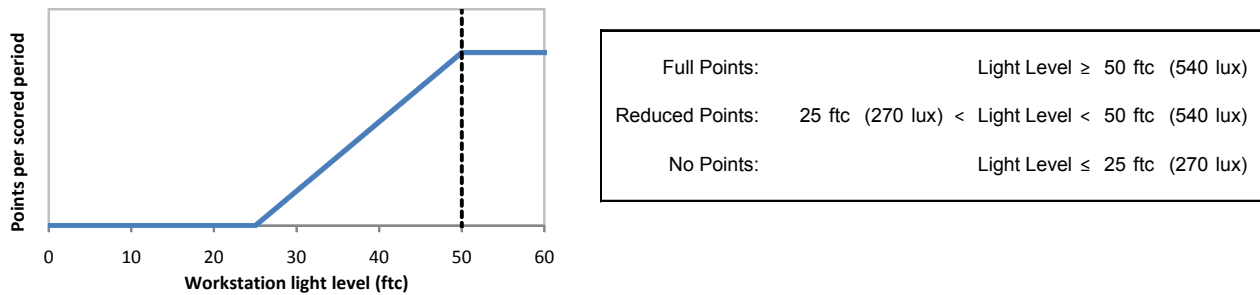


Figure 11: Scoring function for the Workstation Lighting subcontest

b. House Lighting

All available points are earned for keeping all interior and exterior house lights on during specified periods of time. See Appendix A for specific details regarding the number of points per House Lighting task and the time periods designated for House Lighting tasks.

- (i). All dimmers shall be adjusted to their highest positions and all other lighting control equipment shall be disabled or overridden so that the controlled lamps are fully and continuously on during the specified periods.
- (ii). Partial credit will be awarded for partial compliance. However, a team is only eligible for partial credit if it notifies its observer before turning selected lamps on or off.

9-3. Dining

Each team shall host two dinner parties for its neighbors during contest week. See Appendix A for the dinner party schedule and the number of available points per dinner party. Dinner parties will feature a pair of guests from each of three neighboring houses, and each guest team shall assign a score to the host team after each dinner party. The quality of the meal, ambiance, and overall experience shall be considered in the evaluation.

- a. To maintain consistency among the subjective contests and subcontests, guest teams shall use the scoring methodology described in the “Phase 3: Deliberation” section of Appendix B. Each of the three guest teams shall submit three percentage integer scores, i.e., one score for quality of the meal, one score for ambiance, and one score for overall experience, to the Contest Officials by 10 p.m. These nine scores will be averaged and multiplied by the maximum available points in the scoring server to generate a final score for each dinner party. Percentage integer scores may range from 0% (lowest possible score) to 100% (highest possible score).
- b. The village will be organized into five small “neighborhoods.” Each neighborhood consists of four neighboring houses. The guest list for the dinner party shall be limited to two people from each of the three neighboring houses. Each host team shall prepare dinner for at least eight people—six guests and two team members.
- c. Whereas take-out and prepared over-the-counter food items are permitted, dinner party guests are encouraged to assign higher scores to teams that use fresh ingredients to prepare the meal and those that prepare and cook the meal entirely in the house.
- d. The meal shall be served and eaten in the conditioned space at the eating area designated in the Construction Documents.
- e. Before and after the dinner portion of the party, the host team is permitted, but not required, to serve hors d’oeuvres and/or beverages, which may be served outside.
- f. Teams are required to submit detailed dinner party menus to the organizers. The organizers will review each menu for compliance. If corrective actions are required to meet all safety requirements, a team must submit an updated version of the menu.
- g. Teams hosting dinner parties shall comply with the following safety requirements:
 - (i). The use of flames, including candle flames, is prohibited during contest week.

- (ii). No alcoholic beverages may be stored in the house, used in meal preparation, served, or part of a meal in any way.
- (iii). All water used for cooking and drinking shall be drinking water purchased in sealed containers.
- (iv). All dishes and cookware shall be washed with hot water and soap and rinsed prior to use.
- (v). Normal domestic wastewater may go into the wastewater tank.
- (vi). All beverages and food must be stored properly and according to the instructions on the packaging, e.g., beverages and foods marked “refrigerate after opening” must be refrigerated appropriately after opening.
- (vii). To help prevent allergic reactions among dinner party guests, teams shall create a list of ingredients for each of the items being served at each meal. Common food allergies include milk/dairy products, eggs, peanuts, tree nuts (walnuts, cashews, pecans), fish, shellfish, soy, and wheat.

9-4. Public Exhibit

Before the beginning of contest week, the maximum power draw of a video display, computer, computer display and other devices used during the jury visit and public exhibit over a 5-minute period will be measured to establish the baseline power draw of the dedicated exhibit power strip. All available points are earned by operating these devices during specified scored periods and drawing at least 90% of the baseline power during the scored period. See Appendix A for the schedule of scored periods and for the number of available points per scored period.

- a. The video display shall be a minimum of 19 in. (48.3 cm) according to the manufacturer’s stated display size. The computer display shall be a minimum of 17 in. (43.2 cm) according to the manufacturer’s stated display size. The computer may be a notebook, laptop, or desktop computer. The computer and video displays shall be able to be operated simultaneously and controlled independently of each other.
- b. Small mobile devices containing rechargeable batteries shall not be recharged on the dedicated exhibit power strip. Whenever the batteries are not being used to power the devices, the batteries shall be continuously recharging within the solar envelope. The quantity of operating devices available at all times during public exhibit hours shall be declared to the Communications Jury. This same quantity shall be operating, i.e., not recharging, at all times during public exhibit hours. The organizers and observers will conduct spot checks to verify that these requirements are being met.
- c. The public exhibit loads shall operate in their baseline configurations and will be measured for the duration of the 30-minute Communications Jury visit. If some or all of a team’s Communications Jury visit occurs outside of a scored public exhibit period, the required duration of that team’s scored public exhibit period on the day of the visit will be reduced accordingly. This schedule adjustment compensates the team for having to operate the loads during the 30-minute Jury visit.
- d. Teams shall notify the organizers prior to the event of any exhibit devices that, under normal operation, are likely to fluctuate outside of $\pm 10\%$ of the baseline maximum power draw.
- e. Teams with continuous audio loops may request special permission to reduce the volume of the audio during the Architecture, Market Viability, Lighting Design, and Engineering Jury visits. If the organizers determine that the volume reduction is solely responsible for reducing the exhibit power draw below the 90% threshold, points will be restored for the affected scored periods.

9-5. Home Theater

Each team shall host a movie night for its three neighbors during contest week. See Appendix A for the movie night schedule and the number of available points for movie night. Each guest team shall assign a score to each host team after the movie. The quality and design of the home theater system, ambiance, and overall experience shall be considered in the evaluation.

- a. To maintain consistency among the subjective contests and subcontests, guest teams shall use the scoring methodology described in the “Phase 3: Deliberation” section of Appendix B. Each of the three guest teams shall submit three percentage integer scores, i.e., one score for the quality and design of the home theater system, one score for ambiance, and one score for overall experience, to the Contest Officials by 10 p.m. These nine scores will be averaged and multiplied by the maximum available points in the scoring server to

generate a final score for movie night. Percentage integer scores may range from 0% (lowest possible score) to 100% (highest possible score).

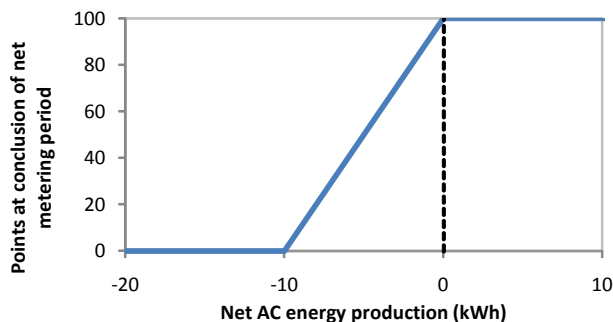
- b. The village will be organized into five small “neighborhoods.” Each neighborhood consists of four neighboring houses. One or more Decathletes from each neighboring house shall spend at least 15 minutes during the movie in each of their neighbors’ houses.
- c. The Temperature and Humidity subcontests are suspended during movie night. Therefore, the occupancy rule, Rule 11-1, is not in effect on movie night.
- d. Any food or beverages served on movie night shall be prepared in the house.
- e. Prior to the event, team members signed up for the Yahoo Group will have the option to vote for one of three movies selected by the organizers. The movie receiving the most votes shall be provided by the organizers on the day of movie night and shall be the movie shown in all houses on movie night. The selected movie shall be available in several of the most popular video formats, so that each team may request the format most suitable for its home theater system.

Contest 10. Net Metering

10-1. Energy Balance

All available points are earned at the conclusion of the specified net metering period (see Appendix A for the net metering schedule) for producing a net amount of AC electrical energy of 0.0 kWh or more.

- a. Reduced points are earned if the net AC energy is between -10.0 kWh and 0.0 kWh. Reduced points are scaled linearly, as shown in Figure 12.



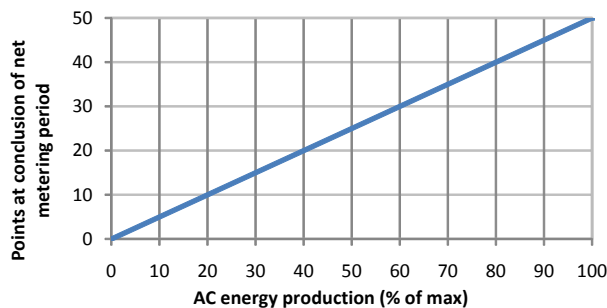
Full Points:	Net AC Energy \geq 0 kWh
Reduced Points:	-10 kWh < Net AC Energy < 0 kWh
No Points:	Net AC Energy \leq -10 kWh

Figure 12: Scoring function for the Energy Balance subcontest

10-2. Energy Surplus

All available points are earned at the conclusion of the specified net metering period (see Appendix A for the net metering schedule) by the team that produced the greatest surplus of net AC electrical energy.

- a. Reduced points are earned if the net AC energy is between 0.0 kWh and the net AC energy of the team with the greatest surplus. Reduced points are scaled linearly, as shown in Figure 13.



Full Points:	% of Max Net AC Energy \geq 100 %
Reduced Points:	0 % < % of Max Net AC Energy < 100 %
No Points:	% of Max Net AC Energy \leq 0 %

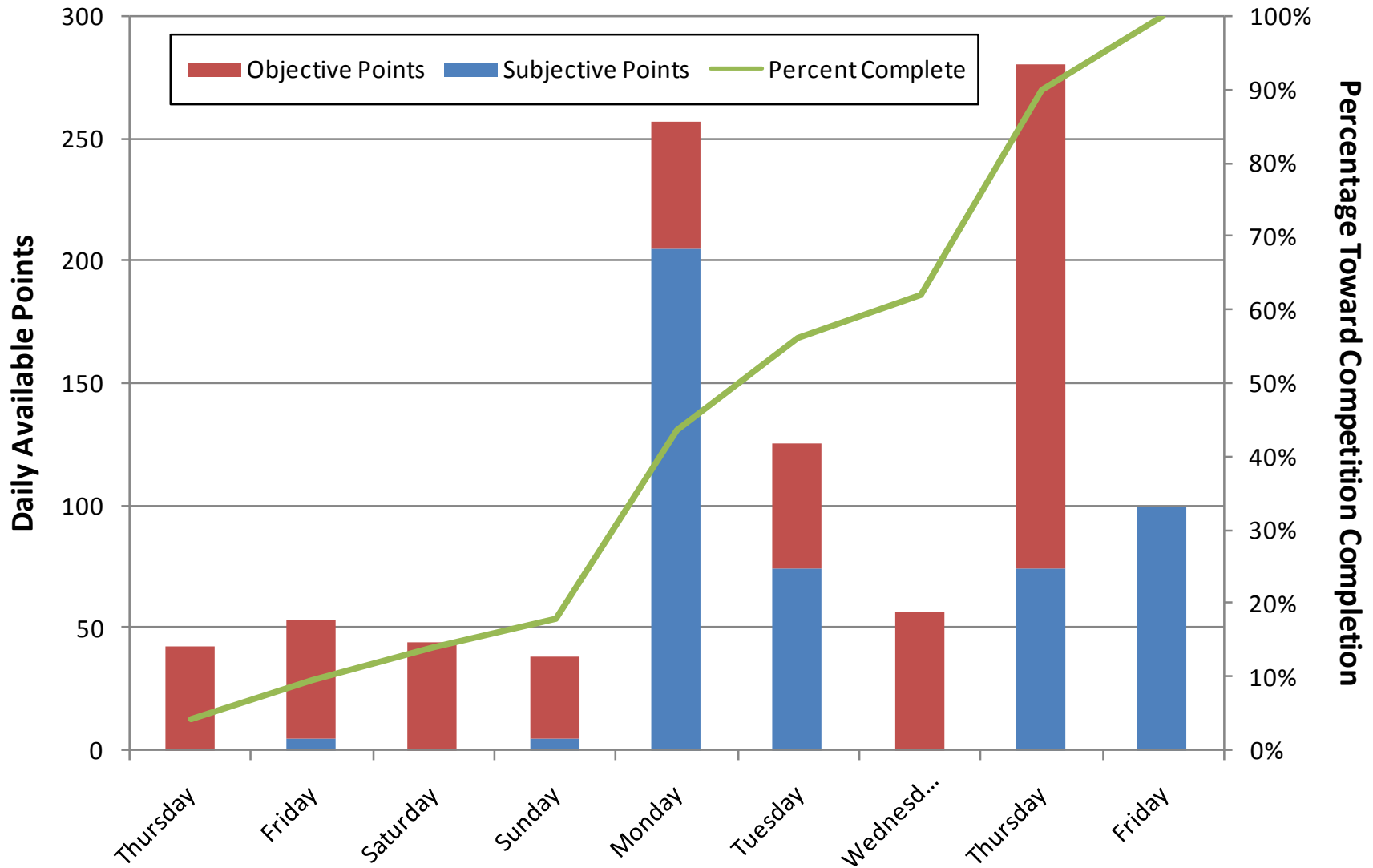
Figure 13: Scoring function for the Energy Surplus subcontest

Appendix A Event Schedules

A-1. Overview Event Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<p>This calendar gives an overview of daily activities. Please refer to the Detailed Event Schedule (Appendix A-3 in the Solar Decathlon Rules) for a complete list of daily activities.</p> <p style="color: red; text-align: center;">Last Updated on September 2, 2009</p>			<p>Day 0 REGISTRATION (Starts @ 3 p.m.) ALL-TEAM MEETING (5 p.m. – 7:30 p.m.)</p>	<p>Day 1 STAND-ALONE ASSEMBLY (24 hours; starts at 11 p.m. on Day 0)</p>	<p>Day 2 STAND-ALONE ASSEMBLY (24 hours)</p>	<p>Day 3 STAND-ALONE ASSEMBLY (24 hours)</p>
<p>Day 4 STAND-ALONE ASSEMBLY (24 hours)</p>	<p>Day 5 STAND-ALONE ASSEMBLY (Midnight – 8 a.m.) STAND-ALONE or GRID-TIE ASSEMBLY (8 a.m. - Midnight) WATER DELIVERY (8 a.m. – 6 p.m.)</p>	<p>Day 6 STAND-ALONE or GRID-TIE ASSEMBLY (24 hours)</p>	<p>Day 7 STAND-ALONE or GRID-TIE ASSEMBLY (Midnight - Noon) GRID-TIE ASSEMBLY and CLEANUP (Noon – 8 p.m.) OPENING RECEPTIONS (6:30 p.m. – 9 p.m.)</p>	<p>Day 8 CONTESTS (7 a.m. – Midnight) OPENING CEREMONY (1 p.m. – 2 p.m.) VIP TOURS (2 p.m. – 6:30 p.m.)</p>	<p>Day 9 CONTESTS (24 hours) PUBLIC EXHIBIT (11 a.m. – 3 p.m.) DINNER PARTY #1 (7 p.m. – 9 p.m.)</p>	<p>Day 10 CONTESTS (24 hours) PUBLIC EXHIBIT (10 a.m. – 5 p.m.) STUDENT RECEPTION (6:30 p.m. – 9 p.m.)</p>
<p>Day 11 CONTESTS (24 hours) PUBLIC EXHIBIT (10 a.m. – 5 p.m.) MOVIE NIGHT (7 p.m. – 9 p.m.)</p>	<p>Day 12 CONTESTS (24 hours) ARCHITECTURE and MARKET VIABILITY RESULTS (10 a.m. – 10:30 a.m.) PUBLIC EXHIBIT (11 a.m. – 3 p.m.) DINNER PARTY #2 (5 p.m. – 7 p.m.)</p>	<p>Day 13 CONTESTS (24 hours) COMMUNICATIONS RESULTS (10 a.m. – 10:30 a.m.) PUBLIC EXHIBIT (11 a.m. – 3 p.m.)</p>	<p>Day 14 CONTESTS (24 hours) TEAM-ONLY OPEN HOUSE (5 p.m. – 10 p.m.)</p>	<p>Day 15 CONTESTS (Midnight – 10 p.m.) LIGHTING DESIGN RESULTS (10 a.m. – 10:30 a.m.) PUBLIC EXHIBIT (11 a.m. – 3 p.m.)</p>	<p>Day 16 ENGINEERING RESULTS and AWARDS CEREMONY (8 a.m. – 9 a.m.) PUBLIC EXHIBIT (11 a.m. – 3 p.m.)</p>	<p>Day 17 PUBLIC EXHIBIT (10 a.m. – 5 p.m.) VICTORY RECEPTION (5:30 p.m. – 7:30 p.m.) TEAM/VIP OPEN HOUSE (7:30 p.m. – 10 p.m.)</p>
<p>Day 18 PUBLIC EXHIBIT (10 a.m. – 5 p.m.) DISASSEMBLY (5 p.m. – Midnight)</p>	<p>Day 19 DISASSEMBLY (24 hours)</p>	<p>Day 20 DISASSEMBLY (24 hours)</p>	<p>Day 21 DISASSEMBLY (24 hours)</p>	<p>JURY TOURS Architecture Fri, Day 9 0800-1710 Market Viability Fri, Day 9 0800-1710 Communications Fri, Day 9 0800-1710 Lighting Design Mon, Day 12 0900-2155 Engineering Mon, Day 12 0900-1650</p>	<p>DAY #1 Fri, Day 9 0800-1710 Fri, Day 9 0800-1710 Fri, Day 9 0800-1710 Mon, Day 12 0900-2155 Mon, Day 12 0900-1650</p>	<p>DAY #2 Sat, Day 10 0800-1450 Sat, Day 10 0800-1450 Sat, Day 10 0800-1450 Tue, Day 13 0900-2155 Tue, Day 13 0900-1650</p>
				<p style="color: red;">Impound Hours: 10 p.m. – 7 a.m. Duration: Day 7/8 through Day 17/18</p>		

A-2. Scoring Chronology



Sunday (Day 18)

	12:00 AM	12:30 AM	1:00 AM	1:30 AM	2:00 AM	2:30 AM	3:00 AM	3:30 AM	4:00 AM	4:30 AM	5:00 AM	5:30 AM	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM	10:30 AM	11:00 AM	11:30 AM	12:00 PM	12:30 PM	1:00 PM	1:30 PM	2:00 PM	2:30 PM	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM	7:30 PM	8:00 PM	8:30 PM	9:00 PM	9:30 PM	10:00 PM	10:30 PM	11:00 PM	11:30 PM								
Contest instrumentation removal																																																								
Team/Organizer meeting																																																								
Consumer Workshops																																																								
Stand-alone house disassembly																																																								

Public exhibit hours Impound hours

Mon (Day 19) - Weds (Day 21)

	12:00 AM	12:30 AM	1:00 AM	1:30 AM	2:00 AM	2:30 AM	3:00 AM	3:30 AM	4:00 AM	4:30 AM	5:00 AM	5:30 AM	6:00 AM	6:30 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM	10:30 AM	11:00 AM	11:30 AM	12:00 PM	12:30 PM	1:00 PM	1:30 PM	2:00 PM	2:30 PM	3:00 PM	3:30 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM	7:30 PM	8:00 PM	8:30 PM	9:00 PM	9:30 PM	10:00 PM	10:30 PM	11:00 PM	11:30 PM								
Stand-alone house disassembly																																																								
Village infrastructure disassembly																																																								
Team/Organizer meeting																																																								

Appendix B Subjective Subcontest Guidelines

B-1. Juror Guidelines

A jury's evaluation of each team's project consists of the following three phases:

1. Deliverables review
2. Scheduled on-site visit
3. Deliberation

Table 5 indicates the time commitments jurors are expected to make per team for each of the first two phases of the evaluation. Teams should consider these time commitments when determining how much information to present to the juries in the narrative portions of their Project Manuals and during the scheduled jury visits.

Table 5: Juror time commitments for deliverables review and scheduled jury visits

Jury	Time Commitment for Deliverables Review (per team)	Relevant Deliverables (see Appendix D for Construction Documents requirements)	Time Commitment for Scheduled Jury Visit (per team)
Architecture	10 to 20 minutes	<ol style="list-style-type: none"> 1. Construction drawings 2. Project Manual <ul style="list-style-type: none"> • Construction specifications • Architecture design narrative 	30 minutes
Market Viability	1 to 2 hours	<ol style="list-style-type: none"> 1. Construction drawings 2. Cost Estimate (see Appendix H for cost estimate requirements) 3. Project Manual <ul style="list-style-type: none"> • Construction specifications • Market viability justification 	30 minutes
Engineering	1 to 2 hours	<ol style="list-style-type: none"> 1. Construction drawings 2. Project Manual <ul style="list-style-type: none"> • Construction specifications • Energy analysis and discussion • Engineering design narrative 	30 minutes
Lighting Design	1 to 2 hours	<ol style="list-style-type: none"> 1. Construction drawings 2. Project Manual <ul style="list-style-type: none"> • Construction specifications • Lighting design narrative 	30 minutes (day) 10 minutes (night)
Communications	1 to 2 hours	<ol style="list-style-type: none"> 1. Web site 2. Final Communications Plan 3. Construction drawings (see Appendix E for Communications deliverable requirements) 	30 minutes

Phase 1: Deliverables Review

The deliverables review offers each juror an opportunity to explore the relevant details of each team's project via the deliverables outlined in Table 5. If questions arise during the deliverables review phase, jurors may address those questions to the appropriate Contest Official before or during the event.

Phase 2: Scheduled Jury Visits

The scheduled jury visits take place on the competition site and offer the jurors an opportunity to make visual verifications of information presented in the deliverables and to ask the Decathletes for clarification of questions

that may have arisen during the deliverables review. The logistical details of the scheduled jury visits will be provided to each juror by the Contest Official prior to the juror's arrival on the competition site.

Phase 3: Deliberation

STEP #1

During the deliberation phase, which takes place after the completion of scheduled jury visits, the jury is encouraged to place each team into one of four classes based on each team's performance relative to the contest criteria. The four classes are:

Class #1: ECLIPSES contest criteria 91% – 100% of available points

Class #2: EXCEEDS contest criteria 81% – 90% of available points

Class #3: EQUALS contest criteria 61% – 80% of available points

Class #4: APPROACHES contest criteria 0% – 60% of available points

Juries are not required to place a uniform number of teams in all classes or to place at least one team in every class. For example, if a jury determines that no teams are worthy of Class #1, there would be no teams with scores greater than 90%. Note that placing teams into classes (as a first step toward assigning an eventual percentage integer) is encouraged to ease the process of evaluating so many teams at one time.

If it is possible to further separate teams within a particular class, assigning different percentage integers within the allowed range of the particular class is encouraged. The assigned percentage integer may fall anywhere within the range associated with the class. If it is not possible to further separate teams within a particular class, it may be appropriate to assign each team in a particular class the same percentage integer.

STEP #2

After assigning each team a percentage integer from 0% to 100%, the jury shall submit its percentage integers to the Contest Official. The Contest Official will then submit the percentages to the Competition Manager, who will convert them into a score based on the total number of available points for the contest being judged. The Competition Manager will round off any noninteger percentage scores to the nearest integer. Prior to posting scores in the scoring server, the Scorekeeper will apply any applicable penalties that may have been incurred.

STEP #3

The three highest-scoring teams (plus ties) will be given awards during a regularly scheduled media announcement during contest week (see Appendix A for announcement schedule). Pending the jurors' availability, the organizers will invite the jurors to make the announcement. The scores for all of the teams will be posted immediately following the announcement.

STEP #4

The jury shall submit a brief summary of scoring justifications for each team to the Contest Official. A summary of the jury's justifications will be provided as feedback to each team so it might better understand why the jury evaluated the team as it did.

B-2. Team Guidelines

- a. It is ultimately the team's responsibility to clear the house of visitors and be otherwise ready for the arrival of juries at the times indicated in the Jury Schedule, which is available on the Yahoo Group. A Solar Decathlon organizer or staff person called a "runner" will deliver a warning 30 to 60 minutes prior to the arrival of the jury and will help the team clear the house of visitors and manage the line of people waiting to visit the house. A team shall not start clearing its house prior to the runner's warning in anticipation of the arrival of a jury, because public exhibit times must also be maximized.
- b. Teams shall show all possible configurations of the house during the visits of the Architecture and Market Viability juries and, if appropriate, the Engineering, Lighting Design, and Communications juries. House configurations that could affect the outcome of contests and that were not seen by a jury during its visit are prohibited during contest week. Some examples of reconfigurable features include:
 - A significant moveable component, such as a room, wall, or bed (safety plan must also be in place)

- Significant shading devices, such as retractable awnings or operable shutters
- Towel-drying locations
- Window coverings that may obstruct views or reduce light levels.

If a team does not have time to do a live reconfiguration during the jury visits, the team must use some other method, such as photographs or video, to show all reconfigurable features in their various configurations. If a team is not planning to actually reconfigure qualifying features at any time during contest week and has not shown or described the reconfiguration in the Construction Documents, that team does not have to show the reconfiguration to the juries.

All plug-in or portable appliances that may be used during contest week must be in their fully deployed locations and configurations during all jury visits. Also be aware that juries may request plug-in, portable, or hard-wired appliances to be turned on so they can evaluate noise levels or other characteristics of the appliances that may not be apparent when the appliances are off.

- Rule 11-1, “House Occupancy,” applies during jury visits. Team Crew may not communicate with the jurors during jury visits. A faculty member may be a silent observer during the visits.
- The jury visits will be held to a very strict schedule for each of the houses. The importance of following this schedule is twofold: 1) To ensure each team receives equal visitation time by the juries to maintain a sense of fairness among all the teams; and 2) Any deviation from the schedule will have an immediate effect on other events planned during the days the juries will be evaluating houses. A small deviation in the defined schedule for the juries could result in a very difficult situation to resolve in another component of the competition. If a team is not ready for a jury to begin its evaluation at the scheduled time, then the total time the jury spends in that team’s house will be reduced. With the exception of hot water draws, note that regularly scheduled contest activities will not be suspended or rescheduled to accommodate jury visits. When there is a scheduling conflict, a hot water draw may be rescheduled to an available 15-minute time period before or after the arrival or departure of the jury.
- During daytime jury visits, the jury will have 30 minutes to visit each house, followed by a 10-minute period to travel to the next house. During the 30-minute visit, 20 minutes will be allocated for the team to lead the jury through the house and answer any questions the jury may have. After 20 minutes, the team shall leave the house so that the jury can hold a private, 10-minute discussion about the house it has just visited.
- The Lighting Design jury will visit each house a second time at night. During the nighttime visit, the Lighting Design jury will have 10 minutes to visit each house followed by a 5-minute period to travel to the next house. During the 10-minute visit, 5 minutes will be allocated for the team to answer any questions the jury may have. After 5 minutes, the team shall leave the house so that the jury can hold a private, 5-minute discussion about the house it has just visited.
- A Solar Decathlon organizer will record juror comments made during jury visits. Some of this information will be provided as feedback to each team so it might better understand why the jury evaluated the team as it did.
- Presentation boards or other visual media summarizing information in the “Relevant Deliverables” (see the third column in Table 5) are permitted to be on display during jury visits. The public exhibit handout may be distributed only to the Communications Jury.
- One or more of the eligible house occupants (see Rule 11-1) may audiotape or videotape the jury visit as it is happening, but taping of the private jury discussion period is prohibited.
- Areas of the house excluded from the accessible exhibit route may be accessed by the juries and considered in their evaluations.
- The organizers shall provide all juries with summaries of important rule and code violations for each team so that juries are aware of violations before giving credit for aspects of the project that are not in compliance.
- The organizers may provide juries with contents of the organizers’ reviews of relevant deliverables.

Appendix C Objective Subcontest Guidelines

C-1. Measured Performance Subcontests

Table 6 lists sensors used in the “measured performance” subcontests, for which points are automatically awarded based on measurements made by each home’s datalogger. Purchasing information is provided for teams intending to practice the contests before the competition using the same equipment that will be used by the organizers.

Table 6: Sensors used in “measured performance” subcontests

Subcontest(s)	Sensor Type	Vendor	Model Number	Approx. Price
6-1. Temperature 6-2. Humidity	1) Temperature/humidity probe 2) Thermocouple	Campbell Scientific (probe) Omega (thermocouple)	HMP50-L probe TT-T-24S-TWSH-SLE thermocouple	\$425 \$75
8-1. Refrigerator	Thermocouple inserted in rubber “Super Ball” for mass	Omega	TT-T-24S-TWSH-SLE thermocouple	\$75
8-2. Freezer	Thermocouple inserted in rubber “Super Ball” for mass	Omega	TT-T-24S-TWSH-SLE thermocouple	\$75
9-2a. Workstation Lighting	Photometer mounted on base	LI-COR	<i>Sensor:</i> LI-210SA pyranometer <i>Base:</i> 2003S leveling base (click “Ordering”)	\$450
10-1. Energy Balance 10-2. Energy Surplus	Utility revenue-grade meter	GE	kV2c Encompass electronic meter family	\$150

Table 7 lists the central datalogger and associated accessories that collect sensor readings and transmit the data to the scoring server. Please refer to the “Grid Interconnection Process for Teams” and “Instrumentation Instructions” documents on the Yahoo Group for detailed policies and procedures for accommodating competition instruments. Members of the public without access to the Yahoo Group who are interested in receiving these documents may e-mail a request to the Competition Manager at sdrules@nrel.gov.

Table 7: Central datalogging equipment

Equipment Description	Vendor	Model Number	Approx. Price
Datalogger enclosure	Campbell Scientific	ENC14/16-DC-NM	\$275
Datalogger	Campbell Scientific	CR1000-ST-SW-NC (discontinued CR10X is still used in Solar Decathlon)	\$1,400
Power supply	Campbell Scientific	PS100-SW	\$225
Transformer	Campbell Scientific	9591	\$50
Solid-state multiplexer	Campbell Scientific	AM25T-ST-SW	\$950
RF radio and antenna	Campbell Scientific	<i>Radio:</i> RF401-ST (discontinued RF400 is still used in SD) <i>Antenna:</i> 14204	\$475
Sensor wire and miscellaneous parts	Various	Various	\$125

C-2. Task Completion Subcontests

The “task completion” subcontests listed in Table 8 are classified as such because teams earn points by successfully completing a task that is observed by, and the results of which are recorded by, an observer in the “observer logs”:

Table 8: Instruments and sensors used in “task completion” subcontests

Subcontest(s)	Instrument or Sensor Type	Vendor	Model Number	Approx. Price
Contest 7. Hot Water	1. Flowmeter	Omega	FTB-4105A	\$105
	2. Dual-input thermometer	Fluke	52 II (Fluke Model #)	\$250
8-3. Clothes Washer	Nonreversible temperature label	Omega	TL-5-105-10	\$10 (pkg of 10)
8-4. Clothes Dryer	Scale	Acculab	SVI-50C	\$350
8-5. Dishwasher	Nonreversible temperature label	Omega	TL-5-105-10	\$10 (pkg of 10)
9-1. Cooking	Kitchen scale	Salton	1008	\$50
9-2b. House Lighting	Visual inspection	n/a	n/a	n/a
9-4. Public Exhibit	Watt-hr energy meter	P3 International	P4460 Kill A Watt EZ	\$50

Please refer to the “Objective Contest Procedures” slideshow on the FTP site for detailed task completion subcontest policies and procedures, as well as examples of observer logs. Members of the public without access to the FTP site who are interested in receiving this slideshow may e-mail a request to the Competition Manager at sdrules@nrel.gov.

Appendix D Construction Documents

The Construction Documents consist of the drawings and project manual and serve the following important functions:

- The Construction Documents shall demonstrate compliance with the Solar Decathlon Building Code and the Solar Decathlon Rules so that the inspectors will be able to grant final on-site approval by simply verifying that the constructed project on the competition site was accurately represented by the Construction Documents.
- The Construction Documents shall clearly describe a team’s proposed assembly and disassembly procedures. The Site Operations Manager will review the teams’ procedures to identify and address potential conflicts among the teams. Each team is encouraged to consult with the Site Operations Manager as the relevant sections of the Construction Documents are being developed.
- The Construction Documents shall provide a residential contractor with all the information needed to generate an accurate, detailed cost estimate and to efficiently construct the building as the design team intended it to be built. The Construction Documents must be comprehensive because the design team shall assume that the contractor has had no prior communication with the design team, has no prior knowledge of the design, and has little or no experience building high-performance residences.
- Because the juries have a very limited opportunity to evaluate the constructed projects on the competition site, the Construction Documents provide the only means for a team to provide a detailed presentation of its project to the juries. In the weeks leading up to contest week, each juror shall evaluate sections of the teams’ Construction Documents relevant to the juror’s respective area of expertise. The primary purpose of the juries’ visits to the competition site is twofold: 1) to verify that the project, as assembled on the competition site, was accurately represented in the Construction Documents; and 2) to ask the Decathletes any clarifying questions that arose during the evaluation of the design via the Construction Documents.

D-1. Formatting Requirements

Drawings

- ANSI “B” (11 in. X 17 in.), ANSI “D” (22 in. X 34 in.), ISO “A3” (297 mm X 420 mm), or ISO “A1” (594 mm X 841 mm) sheet size
- Graphic scales included to allow users to reduce or enlarge printed sheets
- Compliant with [United States National CAD Standard® – Version 4.0](#)
- Packaged into a single PDF file (see Appendix G for PDF formatting and file-naming requirements)
- Consistent with the Construction Drawings formatting template and guidelines posted on the Yahoo Group¹

Project Manual

- ANSI “A” (8.5 in. X 11 in.) or ISO “A4” (210 mm X 297 mm) page size
- Organization and formatting of construction specifications in compliance with the Construction Specifications Institute’s [MasterFormat 2004 Edition](#), [SectionFormat](#), and [PageFormat](#) standards
- Packaged into a single PDF file (see Appendix G for PDF formatting and file-naming requirements)
- Consistent with the Project Manual formatting template and guidelines posted on the Yahoo Group

D-2. Project Manual Content

- Summary of changes since last Construction Documents submission
- Rules compliance checklist
- Code compliance checklist (optional)
- Complete set of construction specifications (including links to manufacturers’ data sheets)

¹ Members of the public without access to the Yahoo Group who are interested in receiving this document may e-mail a request to the Competition Manager at sdrules@nrel.gov.

- Structural calculations
- Detailed water budget
- Summary of unlisted electrical components
- Retail PV price quote
- Summary of reconfigurable features (see Appendix B-2b)
- Interconnection Application form
- Energy analysis results and discussion
- Architecture design narrative
- Market Viability justification
- Engineering design narrative
- Lighting Design design narrative

D-3. Content Requirements for Solar Decathlon Rules Compliance Check

Rule #	Rule Description	Content Requirement(s)
<input type="checkbox"/> 4-2	Construction Equipment	Drawing(s) showing the assembly and disassembly sequences and the movement of heavy machinery on the competition site
<input type="checkbox"/> 4-2	Construction Equipment	Specs for heavy machinery
<input type="checkbox"/> 4-3	Ground Penetration	Drawing(s) showing the locations and depths of all ground penetrations on the competition site
<input type="checkbox"/> 4-4	Impact on the Turf	Drawing(s) showing the location, contact area, and soil-bearing pressure of every component resting directly on the turf
<input type="checkbox"/> 4-5	Generators	Specifications for generators
<input type="checkbox"/> 4-6	Spill Containment	Drawing(s) showing the locations of all equipment, tanks, and pipes that will contain fluids at any point during the event
<input type="checkbox"/> 4-6	Spill Containment	Specifications for all equipment, tanks, and pipes that will contain fluids at any point during the event
<input type="checkbox"/> 4-7	Lot Conditions	Calculations showing that structural design remains compliant even if 18 in. (45.7 cm) of vertical elevation change exists
<input type="checkbox"/> 4-7	Lot Conditions	Drawing(s) showing shimming methods and materials to be used if 18 in. (45.7 cm) of vertical elevation change exists on the lot
<input type="checkbox"/> 5-2	Solar Envelope Dimensions	Drawing(s) showing the location of all house and site components relative to the solar envelope
<input type="checkbox"/> 5-2	Solar Envelope Dimensions	List of solar envelope exemption requests accompanied by justifications and drawing references
<input type="checkbox"/> 6-1	Structural Design Approval	List of, or marking on, all sheets in the complete electronic Construction Documents that have been or will be stamped by the structural engineer in the hard-copy, stamped structural submission; the stamped submission shall consist entirely of sheets or pages that also appear in the complete electronic construction document set
<input type="checkbox"/> 6-2	Maximum Architectural Footprint	Drawing(s) showing all information needed by the Rules Officials to measure the architectural footprint electronically
<input type="checkbox"/> 6-2	Maximum Architectural Footprint	Drawing(s) showing all movable components that may increase the footprint if operated during contest week
<input type="checkbox"/> 6-2	Maximum Architectural Footprint	Shading calculations and/or diagrams for components that DO NOT shade the building above its finished floor height between 9 a.m. and 5 p.m. EDT on October 1 (shading calculations and/or diagrams are not necessary for components that are either shorter than finished floor height or obviously do not shade the building)
<input type="checkbox"/> 6-3	Minimum Conditioned Space	Drawing(s) showing space conditioning means in primary living spaces

Rule #	Rule Description	Content Requirement(s)
<input type="checkbox"/> 6-4	Entrance and Exit Routes	Drawing(s) showing the accessible public tour route and the ground surface area that will be covered by organizer-provided walkway material
<input type="checkbox"/> 7-1	Placement	Drawing(s) showing the location of all vegetation and, if applicable, the movement of vegetation designed as part of an integrated mobile system
<input type="checkbox"/> 7-2	Watering Restrictions	Drawings showing the layout and operation of greywater irrigation systems
<input type="checkbox"/> 8-1	PV Technology Limitations	Specifications for photovoltaic components
<input type="checkbox"/> 8-1	PV Technology Limitations	Contractor price quote for photovoltaic components
<input type="checkbox"/> 8-3	Thermal Energy Storage	Drawing(s) showing the location of thermal energy storage components
<input type="checkbox"/> 8-3	Thermal Energy Storage	Specifications for thermal energy storage components
<input type="checkbox"/> 8-3	Thermal Energy Storage	Shading calculations and/or diagrams for thermal energy storage components (if necessary)
<input type="checkbox"/> 8-4	Batteries	Drawing(s) showing the location(s) and quantity of stand-alone, PV-powered devices
<input type="checkbox"/> 8-4	Batteries	Specifications for all stand-alone, PV-powered devices
<input type="checkbox"/> 8-5	Desiccant Systems	Drawing(s) describing the operation of the desiccant system
<input type="checkbox"/> 8-5	Desiccant Systems	Specifications for desiccant system components
<input type="checkbox"/> 8-6	Village Grid	Completed Interconnection Application form.
<input type="checkbox"/> 8-6	Village Grid	Drawing(s) showing the locations of the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means
<input type="checkbox"/> 8-6	Village Grid	Specifications for the photovoltaics, inverter(s), terminal box, meter housing, service equipment, and grounding means
<input type="checkbox"/> 8-6	Village Grid	One-line electrical diagram
<input type="checkbox"/> 8-6	Village Grid	Calculation of service/feeder net computed load per NEC 220
<input type="checkbox"/> 8-6	Village Grid	Site plan showing the house, decks, ramps, tour paths, and terminal box
<input type="checkbox"/> 8-6	Village Grid	Elevation(s) showing the terminal box, meter housing, main utility disconnect, and other service equipment
<input type="checkbox"/> 9-4	Rainwater Collection	Drawing(s) showing the layout and operation of rainwater collection systems
<input type="checkbox"/> 9-6	Thermal Mass	Drawing(s) showing the locations of water-based thermal mass systems
<input type="checkbox"/> 9-6	Thermal Mass	Specifications for components of water-based thermal mass systems
<input type="checkbox"/> 10-2	Event Sponsor Recognition	Drawing(s) showing the dimensions, materials, artwork, and content of all communications materials, including signage
<input type="checkbox"/> 10-3	Team Sponsor Recognition	Drawing(s) showing the dimensions, materials, artwork, and content of all communications materials, including signage
<input type="checkbox"/> 11-4	Public Exhibit	Interior and exterior plans showing entire accessible tour route
<input type="checkbox"/> 11-4	Public Exhibit	Drawing(s) showing the dimensions, materials, artwork, and content of the handout
<input type="checkbox"/> 11-4	Public Exhibit	Drawing(s) showing the artwork and content of the team uniform

Appendix E Communications Deliverables

E-1. Preliminary Communications Plan and Web Site

The Preliminary Communications Plan shall reflect the planning process for the team’s fundraising, media-outreach, and all other communications activities, including those required to participate in the Communications contest. The contents of the plan shall consist of no more than 20 pages.

A URL to a preliminary Web site consisting of at least three pages shall be submitted with the Preliminary Communications Plan. The preliminary Web site shall be evaluated by communications professionals at the National Renewable Energy Laboratory (NREL) to ensure compliance with the Minimum Web Site Coding and Accessibility Standards provided in this appendix. Each team shall be notified by 5 p.m., mountain time, on June 18, 2008, regarding changes they are required to make to the site for compliance. This begins a “conversation” between NREL and each team, resulting in the team’s Web site being fully compliant. As teams’ Web sites meet compliance, NREL links to the sites from the Solar Decathlon Web site. By 5 p.m. mountain time on August 19, 2008, all teams’ Web sites must be in compliance with standards and linked to the main Solar Decathlon Web site. Any Web site not linked to by this deadline shall not be evaluated by the Communications jury. As significant changes (e.g., new features or a complete redesign) are made to the teams’ Web sites between August 19, 2008, and the competition in 2009, NREL is available to conduct additional compliance reviews upon request.

The Planning Process

A plan is the result of a process. No two fundraising, media-outreach, and communications planning processes are the same.

Each team is highly encouraged during the planning process to engage the following resources that may be available within their school and community.

- Communications and marketing schools, consultants, and firms
- School development office—may be for the school overall or within a school at a university
- School public relations/public affairs/media relations office—may be for the school overall or within a school at a university
- Graphic design and Web site design students, faculty, consultants, and firms.

By seeking the advice of representatives of these resources, teams can formulate a communications plan that’s unique to them.

Some basic activities to undertake during the planning phase would be to:

- Discuss and describe the team’s “personality.” What do you believe in, want to accomplish, and care about? This will help you develop a brand and articulate your project to a variety of audiences.
- Discuss, describe, and quantify specific goals:
 - Fundraising: What is your current budget and funding? What types and quantities of funding do you need (cash vs. in-kind donations)? What are the fundraising milestones?
 - Media Outreach: Describe the media coverage you want to receive and by when.
 - Communications: What do you want to have happen as a result of your communications efforts? How will you achieve that result and by when?
- Identify the baseline—what are you doing now, who’s doing it, what’s going well, and what needs to change and by when?
- Conduct audience analyses—all communications efforts are driven by the needs and requirements of the audience:
 - Fundraising: Identify key donors (cash and in-kind)—who are they, what do they care about, and what motivates them?
 - Media Outreach: Identify media outlets to contact and determine how you can shape your messages to interest their readers, users, and viewers.
 - Communications: Who are the users of your Web site? What do they expect to find on your site? Who are the “off-site” spectators, and what do they want to know about your team? Who are the visitors to the solar village on the National Mall, and how can you best communicate with them?

- Draft key messages—what is the best way to say what you want to say to specific audiences, based on what you know about those audiences?
 - Determine messages that will be delivered through design and graphics, as well as the written word.
 - Establish a means and schedule for evaluating the effectiveness of your messages and changing them as needed.
- Identify and describe tactics—the ways, tools, and specific products by which you will reach target audiences:
 - Fundraising: What is the best way to reach donors—Web site, mailing, phone calls, special events?
 - Media Outreach: What is the best way to reach media outlets—personal contacts, news releases, special media events?
 - Communications: How will you use communications tools for effective management of your project? What is the best way to reach audiences both on and off the National Mall? How will you engage and educate visitors to the solar village—both during and outside of public hours? How will you incorporate your communications efforts with the overall design and presentation of your house?
- Identify, describe, and schedule ways to measure the effectiveness of your tactics. Test these measurement strategies on user or focus groups before full production. Gather data on tactics preceding the competition and apply what you have learned to your efforts at the competition. Collect both quantitative and qualitative data about your efforts and be prepared to report that data.
- Develop a fundraising/media outreach/communications team within your overall Solar Decathlon team; define roles and responsibilities; develop a team contract; determine how team members will work together and communicate to accomplish the plan.
- Implement the plan:
 - Identify the underlying foundation activities required to support efforts—what has to be developed or completed before you can really get started?
 - Break work into chunks, and assign these to individuals based on their ability, willingness, and availability.
 - Identify an overall budget and a budget for each chunk of work.
 - Develop an overall schedule, as well as a schedule for each chunk of work.
- Perform the work on schedule and budget (renegotiating as necessary).









Plan Contents

Communications plans are living documents that will change over time. Each team shall submit a Preliminary Communications Plan, a Final Communications Plan, and a Communications Report. A plan reports what you intend to do at a given time, and a report describes what you did and the results of your actions. Plans and reports generally consist of the following:


- Executive summary that provides a synopsis of the whole plan: 1 – 2 pages.
- Background: Information needed to understand and contextualize the plan (and may include references and links to more information elsewhere), including your team’s vision, mission, and overall goals and objectives for the project (not just the fundraising, media-outreach, and communications efforts).
- Scope: Describe the limits of your fundraising, media-outreach, and communications efforts—roughly, what these efforts will and will not consider, accomplish, or include.
- Budget: Present the overall budget for everything featured in the plan and then break this out into separate budgets for fundraising, media outreach, and communications. Finally, provide budgets for chunks of work and/or individual projects.
- Target audiences: Describe the key fundraising, media-outreach and communications audiences you intend to reach with your efforts.
- Key messages: Develop and present messaging tailored for each target audience.

- Team brand: Describe the look, feel, and key messages that together will make up the overall impression you want to have on audiences. You might include style guides for graphics and content.
- Project clients, contributors, and stakeholders: Describe the people whom you have to answer to (or make happy). What are their needs? Whose contribution is important or essential to meeting these needs? Who else can be affected by your efforts that you must consider? Who are the reviewers for your efforts? Communications activities directed toward these audiences should be included in your plan.
- Project objectives:
 - Fundraising: How much money do you need to raise and by when?
 - Media outreach: How many impressions and stories do you want to get? If you have project milestones that present natural opportunities for media coverage, what types of stories do you want to get and when?
 - Communications: How many Web users and/or event visitors do you want to reach? What impacts do you want to have?
- Roles and responsibilities: Describe who's going to do which specific projects or chunks of work and identify (as much as possible) who else needs to be involved. It's a good idea to also list the budgets for the chunks of work and individual projects in this section.
- Fundraising, media outreach, and communications tactics: Describe these tactics. Understand that it is especially important to include a robust description of the Web site and your plans for on-site exhibition, as these will be two key tactics evaluated by the Communications jury.

Minimum Web Site Coding and Accessibility Standards

- All team Web sites shall comply with Rule 10-2: Event Sponsor Recognition.
- The minimum coding standards were selected from standards that apply to all Web sites developed for the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE), as well as from Section 508 of the Americans with Disabilities Act (ADA). Where applicable, links to relevant sections of the EERE Communications Standards Web site are provided as an explanation of the requirements and indicated with the icon . Where applicable, those standards that are part of Section 508 have also been noted with the symbol . For more information about Section 508, visit: <http://www.section508.gov/>.
- Common elements:
 - A text or graphical link to the Solar Decathlon home page is provided on the home page in either the header or the footer.
 - At a minimum, an e-mail contact to the Webmaster is provided as a graphical or text link on the home page of the site.
 - Left or top navigation (or both), if used, link correctly; on and off states work correctly and can be skipped by screen readers.  
 - Each page has a meaningful and unique <title> tag and uses EERE style. 
- Page layout:
 - Pages must display correctly (e.g., no horizontal scrolling is necessary to view the full width of the page) in 1024 x 768 resolution (800 x 600 resolution is also acceptable).
 - Page information conveyed with color is also available without color, and foreground and background colors provide sufficient contrast.  
 - Headers and footers are consistent throughout the site.
- Directories and files:
 - File names do not contain uppercase letters, spaces, or special characters (e.g., & or \$).
- HTML syntax:
 - HTML syntax follows HTML 4.01 transitional standards or higher and has been validated by the [W3C Validator](#). 

- Row and column headings have been provided for all data tables. 508 i
- Links:
 - All links work throughout the site.
 - Links are coded relatively on static pages within the site.
 - Hypertext links used in content throughout the site are underlined to indicate they are links. 508
- Scripts/applets/dynamic pages (CGI, JavaScript, Java, etc.):
 - Every script works correctly in the standard browser set. i i
 - Content produced by scripting languages is accessible or has an accessible alternative. 508 i
 - Pages requiring applets or plug-ins must provide a link to an accessible page where they can be downloaded. 508 i
 - If a timed response is required, the user can request more time to complete an operation. 508 i
 - Back button functionality is not impaired.
- Forms:
 - Forms include text labels that correspond with form controls and markup to associate the two. 508 i
- Graphics:
 - All images are stored in a separate subdirectory.
 - Graphics have meaningful “alt” tags. (Use empty alt tags for spacer gifs and other unimportant graphics.) 508 i
 - Alt descriptions are used with all client-side image maps. 508 i
- Multimedia:
 - All
 - All multimedia files are stored in a separate subdirectory.
 - Equivalent alternatives are provided for all multimedia. 508 i
 - Pages requiring an applet or plug-in must provide a link to a page where the applet or plug-in can be downloaded. 508 i
 - QuickTime VR
 - All QuickTime VRs scroll correctly.
 - All QuickTime hotspots link correctly.
 - Flash
 - Animation has been tested on a browser without a plug-in downloaded. (Ensure the download process flows smoothly and that the animation works when loaded.)
 - Check all links within Flash animation. If the user exits Flash animation early, ensure that she will go to an appropriate page.
 - Sound works correctly.
 - If Flash is used as an introductory “splash” screen, there is an option provided to skip it.
 - Provide an accessible equivalent to the Flash animation. 508 i
- Documents for downloading and printing:
 - PDFs
 - All PDFs are stored in a subdirectory labeled “pdfs.”
 - References to PDFs within the HTML document use a consistent format and link scheme throughout the site (e.g., [PDF 54 KB](#)). i
 - Every page with a PDF link also includes a link to download Adobe Reader (<http://www.adobe.com/products/acrobat/readstep2.html>) with the text “[Download Adobe Reader](#).” 508 i

- Native file formats
 - Native file format documents are placed in a separate subdirectory, such as a “docs” subdirectory.
 - References to native files within the HTML document will use the following format and link scheme throughout the site: Title of Document ([Software 54 KB](#)). Examples:
 - The Value of Renewables ([MS Word 54 KB](#))
 - The Value of Renewables ([Excel 54 KB](#))
 - The Value of Renewables ([PowerPoint 54 KB](#))
- Testing:
 - For quality-control testing, test the site in the standard browser set: 
 - PC
 - Internet Explorer 6.0 and 7.0
 - Firefox 2.0
 - Mac
 - Safari 2.0

E-2. Final Communications Plan and Web Site

The Final Communications Plan shall be submitted by 5 p.m. mountain time on June 2, 2009, and shall reflect changes and progress in the team’s fundraising, media-outreach, and communications efforts since the Preliminary Communications Plan was submitted. The final plan shall not exceed 20 pages (excluding proofs listed below) and shall include, but is not limited to:

- Progress of fundraising activities—what is the current quantity of contributions (cash and in-kind)? What is the current project budget and accounting? What final fundraising activities are planned?
- Progress on media-outreach activities—include metrics.
- Lessons learned to date—what was planned? What has or hasn’t worked? What is actually going to be implemented? Include qualitative and quantitative data.
- Final plans for on-site exhibition activities, including proofs of any signs, posters, cards, the team brochure, media kit, and any electronic communications not accessible via the team Web site.
- The final URL for the team Web site.

The Final Communications Plan and Web site URL shall be evaluated by the Communications jury.

The final Web site shall consist of considerably greater content than the Web site submitted with the Preliminary Communications Plan. The Communications jury shall begin evaluations of teams’ Web sites at the same time that assembly begins on the National Mall.

E-3. Communications Report

The Communications Report shall be submitted by 5 p.m. mountain time Dec. 8, 2009, and shall reflect the results of the team’s fundraising, media-outreach, and communications efforts. The report shall not exceed 20 pages (excluding artwork) and shall include, but is not limited to:

- Results of fundraising activities—final quantity of contributions (cash and in-kind); final project budget and accounting; lessons learned—what went well, what didn’t, and what you would do differently.
- Results of media-outreach activities—include metrics.
- Results of on-site exhibition activities—estimates of the number of visitors to the house (justify estimates); assessment of the visitors’ experiences (include qualitative data); lessons learned—what went well, what didn’t, and what you would do differently.
- Evaluation of the team’s Web site—number of hits, unique visits, and any other user statistics; lessons learned—what went well, what didn’t, and what you would do differently.

- Team perspective on the effectiveness of the organizers' on-site communications efforts—team members have more experience with individual visitors than anyone on site, and the organizers appreciate learning from that experience.

Appendix F Health and Safety Plan

The following is a generic outline for a construction Health and Safety Plan. This is the minimum content you should include in your plan. The Health and Safety Plan should have a cover sheet as follows:

<p style="text-align: center;">HEALTH AND SAFETY PLAN</p> <p style="text-align: center;">(Team Name and School)</p> <p style="text-align: center;">(Team Health and Safety Officer) (Team Faculty Advisor)</p> <p style="text-align: center;">(Health and Safety Plan's Date)</p>

The following topics are suggested for inclusion in a construction subcontractor health and safety plan. Some topics may not be appropriate for inclusion depending on the scope of the individual construction project. Topics that NREL requires for all construction projects are marked with an asterisk (*). The safety plan may be presented in any written format.

1. HEADING INFORMATION (*)

- Name of subcontractor/company
- Effective date of plan
- Revision date of plan, if any
- Name and title of person(s) approving “the plan”, approval signatures required.

2. STATEMENT OF POLICY (*)

Subcontractor’s policy on occupational safety and health (OSH)

- Specific statement of intent to comply with the Code of Federal Regulations, Title 29, Part 1910, *General Industry Safety and Health Standards* and Part 1926, *Safety and Health Standards for the Construction Industry*, 10 CFR 851, Worker Safety and Health and other applicable codes and standards
- Statement that all requirements of the health and safety plan apply to lower-tier subcontractors, if any
- Statement of employee’s rights and responsibilities regarding a safe and healthful work environment in accordance with the work site OSH poster (i.e. AOSHA Poster or equivalent).

3. ASSIGNMENT OF OSH RESPONSIBILITY (*)

- Name and title of person responsible for all OSH activities at the work site, generally the project superintendent
- Corporate chain of command for OSH matters
- Issuance of stop-work authority
- Point of contact for OSH information.

4. EMERGENCY PROCEDURES (*)

- Emergency notification procedures, including phone numbers
- First aid and medical information
- Fire and rescue
- Other type of emergencies, as appropriate
- Special arrangements for or with emergency response agencies.

5. ACCIDENTS (*)

- Reporting requirements
- Investigation
- Corrective actions.

6. HAZARD ANALYSIS

Process used to identify construction hazards and implement controls. Note: This process should be structured based on the risk assessment for the project (small or routine projects). For larger projects having distinct construction phases with unique hazards, a hazard analysis process must be used to ensure that adequate controls are provided for each phase.

7. OSH REQUIREMENTS AND PROCEDURES (*) (Including but not limited to the following, as appropriate for the specific construction project)

- Access Control
- Accident Reporting
- Alcohol and drugs
- Appropriate work clothing
- Biological Safety
- Compressed air equipment
- Compressed gas cylinders
- Confined space entry (NREL Confined Space Program)
- Construction Safety (activities not covered in other sections)
- Cranes and rigging
- Electrical systems and equipment
- Emergency response, first aid, and medical services
- Fall protection (NREL Fall Protection Program)
- Fire prevention and response
- General rules and regulations
- Hand and power tools
- Hazard communication
- Hazardous waste
- Hazardous work permits (welding, confined space entry, etc)
- Hearing conservation
- Heavy equipment operations, including certifications for operators
- Housekeeping, including lay down areas, as required
- Industrial hygiene
- Ladders and scaffolds, includes aerial lifts
- Lifting
- Lockout/Tagout (NREL LO/TO Program)
- Material handling
- Occupational Health / Medical Monitoring
- Motor vehicle operations, including posting of site speed limits
- Nanotechnology
- Personal protective equipment, includes minimum and special based on specific activities
- Phase safety plans
- Powder actuated devices

- Pressure Safety
- Radiation protection
- Signs and barricades, indoors and outdoors, based on project
- Trenching and excavating, includes discussion of penetration procedures – walls, floors, ceilings, etc, for indoor activities
- Welding and cutting (NREL Hot Work Permit)
- Work site postings
- Workplace Violence Prevention

8. TRAINING

- Preproject requirements (i.e., OSHA 40-Hour, operator’s certifications, etc.)
- Jobsite safety orientation (*) (Required for NREL construction projects. May be amended to the existing contractor health and safety plan with NREL construction contractor safety orientation form).
- Periodic (e.g., weekly “tool box” sessions).
- Training records (Note: training may not be recognized if not properly documented.). Includes lower-tier subcontractors.

9. WORK SITE INSPECTIONS (*)

- Frequency (daily recommended)
- Reporting and correction of identified deficiencies
- Imminent danger / “stop work”
- Inspection records.

10. REFERENCES

11. ATTACHMENTS

Appendix G Deliverable Submission Instructions

Deliverables are considered to be on time if they are received by the Competition Manager by 5 p.m. mountain time on the respective due date. Refer to the “Deliverables Status Sheet” on the Yahoo Group for deliverable due dates and required file formats for each of the respective deliverables. Members of the public without access to the Yahoo Group who are interested in receiving this information may e-mail a request to the Competition Manager at sdrules@nrel.gov.

G-1. Hard Copies

The structural drawings and calculations are the only required hard-copy submissions. Please mail these deliverables to the Competition Manager at the following address:

Mike Wassmer
National Renewable Energy Lab
1617 Cole Blvd.
Golden, CO 80401

Please do not submit hard copies of any other deliverables.

G-2. Web Site URL

Web site URLs shall be e-mailed to the Competition Manager at sdrules@nrel.gov.

G-3. Computer-Generated File Requirements

- a. Any and all electronic files generated from a computer (drawings, project manuals, renderings, etc.) shall be submitted as a PDF meeting the following criteria:
 - (i). Embed all fonts.
 - (ii). Maintain a minimum resolution of 300 dpi.
- b. Whenever possible, utilize the “Save As” or “Export” to PDF functions within a CAD, 3-D rendering, or illustration application to produce a PDF.
 - (i). Utilizing the native application’s PDF functions usually produces a smaller, cleaner PDF with fonts defined and illustrations and drawings retained as vector objects.
 - (ii). Available options for PDF creation vary between applications—be sure to always select the option to embed all fonts and keep image compression at a minimum of 300 dpi.
 - (iii). If there are color options, choose no conversion if available. If not, select RGB conversion as that will typically yield a smaller file than CMYK.
- c. If an application does not support a direct-to-PDF function, create a postscript file by printing to a postscript printer with the “print to file” option selected. Use this postscript (.ps or .prn) file to create a PDF using Acrobat Distiller’s high-resolution job settings.
 - (i). Creating a PDF from scans, or by outputting the drawings into a raster image format (.jpg, .tiff, .png, .gif, etc.) and then creating a PDF from the images, is NOT ACCEPTABLE.
 - (ii). All-raster PDFs are large files at 300dpi, are of unacceptable quality at lower resolutions, and are not scalable without degradation.
- d. For logos, submit the PDF file AND a text file containing the following additional information:
 - (i). Name, phone number, and e-mail of person submitting the logo PDF.
 - (ii). A list of all PMS or CMYK numbers used in the logo PDF.

G-4. Photograph File Requirements

- a. Photographs shall be submitted in the native format of the camera, such as JPEG or RAW, if available.
- b. Every file conversion or image resampling from the original results in image degradation, so keep conversions to a minimum.

- c. Color photos must be in RGB, 8-bit color.
- d. For a photograph to be properly credited, the following information shall be included in each file's metadata or in a text file accompanying the photograph files:
 - (i). Name, phone number, and e-mail of person submitting the photograph
 - (ii). Photograph date and location
 - (iii). Photographer's name and affiliation.

G-5. Electronic File-Naming Instructions

The required file-naming convention for all electronic files follows:

[TEAM ABBREVIATION]_[DELIVERABLE ABBREVIATION]_[SUBMISSION DATE (YYYY-MM-DD)].[EXTENSION]

See Table 9 for a list of team name and deliverable abbreviations.

Example #1: A set of updated Construction Drawings submitted by Arizona to the organizers for follow-up review on April 5, 2009, would have the following file name:

UAZ_CD_2009-04-05.pdf

Example #2: A set of three computer-generated graphics files submitted by Minnesota to the organizers on June 3, 2008, would have the following file names:

UMN_GRAPHIC_1_2008-06-03.pdf

UMN_GRAPHIC_2_2008-06-03.pdf

UMN_GRAPHIC_3_2008-06-03.pdf

Table 9: Team and deliverable abbreviations

Team Name	TEAM ABBREVIATION	Deliverable Name	DELIVERABLE ABBREVIATION
Arizona	UAZ	Preliminary Communications Plan	PRELIMCOMMPLAN
Cornell	CORNELL	Design Development Drawings	DD
Team Germany	TUD	Construction Drawings	CD
Illinois	UIUC	Project Manual	MANUAL
Iowa State	ISU	Health and Safety Plan	SAFETY
Kentucky	UKY	Final Communications Plan	FINALCOMMPLAN
Univ. of Louisiana	LAF	Dinner Party Menu	MENU
Team Spain	UPM	Communications Report	COMMREPORT
Minnesota	UMN	Graphics files	GRAPHIC_[FILE #]
Team Missouri	MST	Photograph files	PHOTO_[FILE #]
Ohio State	OSU	Workshop preparation	WORKSHOP
Penn State	PSU		
Puerto Rico	UPR		
Rice	RICE		
Team California	SCU		
Team Alberta	ALB		
Team Boston	BOS		
Team Ontario/BC	ONTBC		
Virginia Tech	VT		
WI-Milwaukee	UWM		

G-6. Electronic File Submission Options

Electronic files smaller than 5 MB may be e-mailed to the Competition Manager at sdrules@nrel.gov or uploaded to the Solar Decathlon dropbox at <http://dropbox.yousendit.com/SolarDecathlon>. Electronic files larger than 5 MB shall be uploaded to the dropbox. Teams wishing to reduce file upload times may archive electronic files in ZIP files. Please verify that files in ZIP archives can be extracted using [WinZip](#).

Appendix H Construction Cost Estimate

H-1. Introduction

Each team is required to generate a detailed construction cost estimate of its competition prototype. The raw data constituting the estimate will be evaluated by the Market Viability Jury (see Contest 2). The raw data may also be used in organizer-developed summary information that may be provided to all juries and the public via communications materials published on the competition site, on the Solar Decathlon Web site, or both. See Appendix H-5 for details regarding the organizers' possible use of teams' raw data.

Teams lacking cost-estimating expertise or experience are strongly encouraged to consult the following references:

- a. Cost-estimating techniques
 - (i). DelPico, Wayne J. *Estimating Building Costs: For the Residential & Light Commercial Contractor*. Kingston, MA: Reed Construction Data, Inc., 2004.
 - (ii). Chiang, John and Waier, Phillip R. *Unit Price Estimating Methods*, updated 4th ed. Kingston, MA: Reed Construction Data, Inc., 2007.
- b. Contractor's pricing guide
 - (i). *Means Contractor's Pricing Guide: Residential Detailed Costs*, 15th Edition (2009 Version). Kingston, MA: Reed Construction Data, Inc.

H-2. Assumptions

- a. The cost estimate is being generated for a homebuilder bidding on a *single unit*, i.e., not a development, for an owner within the defined target market.
- b. The homebuilder is the installing contractor for all aspects of the project and will not, therefore, hire any subcontractors.
- c. The estimate is for the actual competition prototype, i.e., all house and site components on the competition site. Proposed alternates (see Rule 6-5 for limitations) shall be included in the estimate as such.
- d. Prices and costs shall be for the owner's site location.

H-3. General Requirements

- a. Specify the location of the hypothetical or actual owner's site in the Market Viability Justification and in the Construction Drawings.
- b. Enter all material, labor, and equipment costs in the database described in Appendix H-4.
- c. Use bare, i.e., "unburdened," 2009 unit prices only.
- d. Base the estimate on a quantity takeoff from the final set of Construction Documents submitted to the organizers.
- e. Whenever possible, use contractor prices for materials. Retail prices are acceptable only if an actual contractor price quote cannot be obtained from the material supplier and if a contractor price is not published in the contractor pricing guide used by the team. The price paid by the team shall not be used unless it matches either the contractor price or the retail price.
- f. Omit indirect costs (e.g., taxes, operating/office overhead, profit, and contingencies) and project overhead costs.
- g. Use a contractor pricing guide as the source of or basis for all labor and equipment prices. Adjustments to similar labor and equipment prices are permitted when the exact work result is not published in the guide. Adjustments shall be based on a team's experience on the construction site. For example, if the team or the team's subcontractor finds that the selected exterior siding material is much more time consuming to install than typical residential siding, the labor and equipment estimates shall be increased accordingly.
- h. Custom assemblies or systems that are not available from a supplier shall be handled in one of two ways:
 - (i). Include each constituent part in the primary cost estimate table.

OR

- (ii). Create a separate, secondary cost estimate table for each custom assembly or system. In the secondary table, include all the custom assembly or system's constituent parts and use the same specifications as the primary table. In the primary table, include one line item for each custom assembly or system. The line item in the primary table shall be equal to the sum of all line items in the secondary table.
- i. Cost adjustments based on assumed economies of scale for multi-unit developments or mass production of custom assemblies or systems are prohibited.

H-4. Database Specifications

Go to <http://solardecathlon.dabledb.com/> to access the online database.

H-5. Cost Estimate Modifications by Organizers

The organizers may publish cost estimate summary data in communications materials intended for the general public and the juries. Some juries may choose to consider this summary data in their evaluations, but only the Market Viability jury will have full access to the teams' raw data for its evaluation.

To enhance the quality of summary information supplied to the public and the juries, the organizers may modify teams' raw data as necessary. Teams will have an opportunity to review and appeal the organizers' modifications prior to the release of the information to the public and the juries.

Possible modifications to the teams' raw data include, but are not limited to, the following:

- a. After reviewing a team's estimate, the organizers may make appropriate modifications to correct for errors, inaccuracies, or other deficiencies in the estimate.
- b. If a team has used retail prices in some database records, the organizers may apply adjustment factors to these records so that contractor prices are reflected more accurately.
- c. Typical indirect and project overhead costs may be applied by the organizers to complete each team's estimate.
- d. The organizers may use published location and currency exchange factors to adjust costs for Washington, D.C., or other locations.
- e. The modified estimate submitted by the organizers to the Market Viability Jury may be accompanied by a summary of the organizers' review of a team's database. The Jury may be instructed to consider these comments as it evaluates a team's cost estimate.