SOLAR DECATHLON MIDDLE EAST
DUBAI, UAE - 2018

Rules and Building Code

Version 4.0

Last Update: September 12, 2018

Contents

INTRODUCTION

SOLAR DECATHLON

The Solar Decathlon is an international competition created by the U.S. Department of Energy in which universities from all over the world meet to design, build and operate sustainable and high energy efficiency grid-connected solar powered houses. During the final phase of the competition, participating teams assemble their houses in an expo area, open to the general public, while undergoing the ten contests of the competition, which is why this event is called a Decathlon.

SOLAR DECATHLON MIDDLE EAST

The Solar Decathlon Middle East (SDME) was created through an agreement signed between Dubai Electricity and Water Authority (DEWA) and the Department of Energy of the United States of America, in June 2015, in order to organize a sustainable solar house competition in Dubai, in 2018 and 2020.

The ten SDME contests will follow the lines of those in previous editions of the competition, with some customization to challenge the teams to adapt their designs to the heat, dust & high humidity experienced in the Middle East.

The goal of the SDME 2018 Organization is to contribute to the knowledge and dissemination of industrialized, solar and sustainable housing, and therefore has the following basic objectives:

- To raise awareness of the students participating in the competition, on the benefits and opportunities offered by the use of renewable energy technologies, energy management and sustainable construction, challenging them to think creatively and develop innovative solutions that contribute to energy savings.
- To encourage professionals from different industries to select materials and systems that reduce the environmental impact of their buildings, optimizing its economic viability and providing comfort and safety of occupants.
- To educate the general public about responsible energy use, renewable energy, energy efficiency, and the technologies available to help them to reduce/optimize their energy consumption.
- To encourage the use of solar technologies.
- To promote architecturally attractive solar system integration, working on using the solar technologies to replace conventional construction materials in the building envelope such as the roof, skylights or facades.
- To clearly demonstrate that high performance solar homes can be comfortable and attractive.
- To increase public awareness about energy for residential use. The competition demonstrates that a beautifully and well-designed house can generate enough electricity to meet the needs of a household.

The Solar Decathlon Middle East will raise the prestige and visibility of the selected participating universities as they are part of the small group of top institutions that will compete in the world's most important Solar House Event. One of the main characteristic elements of the Solar Decathlon Middle East competition is its emphasis on sustainability, innovation and research. The participant teams work not only to develop and build their houses, but also to enhance the systems' integration and generation of knowledge on sustainable construction.

Solar Decathlon Middle East offers students a unique opportunity for learning, taking theory and putting it into practice, and doing so through a case study. Students working on the project will be challenged to use their innovation capacity, and their ability to design and build an energetically self-sufficient solar house. The projects

are developed by multidisciplinary teams, giving the students the opportunity to learn not only about technical issues but also about teamwork, communication skills, a sustainable lifestyle and socio-economic issues in order to ensure the viability of their project.

These Rules have been developed and adapted from the U.S. Department of Energy Solar Decathlon Rules and the Solar Decathlon Europe Rules to meet the unique objectives and principles of the Solar Decathlon Middle East Organization. With this new edition to be held in 2018 in Dubai, these Rules have been developed to refine the requirements to be met by the competing projects. The Rules are intended to encourage competition prototype houses that meet a triple challenge: energy, environment, and society. Therefore, the evaluation of proposed projects, via the 10 contests of the Decathlon, are intended to address different issues related to houses of the future. The Solar Decathlon Middle East 2018 Rules will focus on encouraging designs that address the following four principles:

Middle East Climate – The SDME 2018 embraces the goal of developing and promoting ideas, capacities and technologies that can be implemented for the benefit of the inhabitants of the Middle East region. Each project must be a good response to our cultural, climatic and social contexts, as well as a high-performance prototype that should successfully perform during the period of time during which it compares with others. All proposals should be focused on solving the issues and needs for the sustainable living in this region, where high temperatures, high humidity and dust condition our daily lives during most of the year.

Innovation – For the Solar Decathlon, innovation must remain at the heart of the projects. It is embedded in all project areas such as architecture, construction, energy production, conditioning systems, furnishings, house appliances, management systems, etc. Innovative cultural relationship to research and development in the field of building industry: future urban designers, architects, engineers as well as social and financial managers are required to find the most adapted solutions for our specific context while sharing the most innovative ideas with colleagues from other countries.

Sobriety – While it is important for the designs to ensure the renewable energy supply, it is equally important to limit demand and thus energy consumption. SDME encourages the participating teams to produce very high efficiency houses and incentivizes them to “produce and consume wisely”.

Mobility – The question of energy coupling between positive-energy building and electrical transportation systems is to be addressed by the teams. SDME is not an international competition for electric vehicles but a testing ground for innovative solutions merging community design, housing and transportation systems in a holistic approach.

SDME 2018 RULES

The Solar Decathlon Middle East Rules are designed to meet the Organization objectives and to promote a fair and challenging competition among teams. The official language for the SDME 2018 Competition in Dubai is English. The SDME 2018 Rules document describes what each team needs to know as a competitor in the Solar Decathlon Middle East. It contains the following five sections:

1. Definitions
Includes important terms related to the SDME organization, the competing teams, and projects.

2. General Rules
Includes rules related with the general aspects of the competition, describing the organization, the participating teams, the site, the houses, the event final phase, deliverables and the general conditions.

3. Contests
In this section, the SDME 2018 contests and sub-contests are defined, including the scoring distribution, the contests evaluation criteria and the different procedures.

4. Building Code
This code primarily exists to protect the teams and ensure public health and safety. Compliance with the SDME Building Code is a prerequisite for participation in the competition.

5. Appendices
It contains complementary information, additional to the rules.

***Note that the information included in the present document may be updated**; details or complementary information may be added in the future. However, all the modifications will be clearly indicated in the new editions of the SDME Rules.*

DEFINITIONS

GENERAL DEFINITIONS

Assembly Period: The period in which the competing teams assemble their houses. For the exact dates please refer to the Competition Calendar.

Communication Materials: All printed or electronic publications designed to convey information to the public supporting the Competition goals.

Competition: All aspects of the Solar Decathlon Middle East 2018 in Dubai related to the 10 contests and the scoring of those contests, along with the project development of the competition houses.

Competition Calendar: The timetable establishing the dates of the final phase of the competition and the daily activities assigned.

Competition House: The complete assembly of physical components of the Team's house at the Solar Hai, in compliance with the SDME rules.

Contest: The Solar Decathlon Middle East competition consists of 10 separately scored contests, each of them may contain one or more sub-contests. See the section "Contests".

Contests Period: The period of days when some or all contests are active.

Decision: The Rules Officials' interpretation or clarification of a rule.

Deliverables: Documentation and other materials requested by the SDME 2018 Organization from the teams during the project's development, in order to verify compliance with the Competition Rules.

Demand response: All intentional modifications in the power consumption patterns of an electric utility customer to better match the demand for power with the supply.

Disassembly Period: The period in which the competing teams disassemble their houses, located between the conclusion of public tours and the completion of the Solar Hai cleanup.

Electric and Photovoltaic Chart – 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 and photovoltaic systems for interconnection to the village grid.

Event: All the activities that take place on the Solar Hai including, but are not limited to, registration, assembly, inspections, contests, special events, public exhibits, and disassembly.

Event Sponsor: An entity selected by the SDME 2018 Organization to support the project and help ensure its success.

Final phase of the SDME 2018 Competition: The phase including assembly, disassembly, exhibition and contests periods.

Grid-Tie Assembly: The period of time during assembly after the house has been connected to the village grid (interconnected)

Inspection: Each of the inspections conducted of all the Competition Houses in the Solar Hai for verifying compliance with the SDME Rules, accessibility and safety codes.

Inspections Card: Official card indicating the teams' inspections' status.

Jury: The group of individuals selected by the organizers to make evaluations on a specific aspect of each team's project.

Juried Contest/Sub-Contest: A contest/sub-contest based on Jurors assessment.

Measured Contest/Sub-Contest: A contest/sub-contest based on task completion or measured performance.

Protest Resolution Committee: The group of individuals selected by the Organizers to resolve team protests during the competition. The Protest Resolution Committee consists of people who are familiar with the project, but not part of the organization or the teams.

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.

Scored Period: Any period of time during which a particular measured contest is in progress.

Scoring Server: Digital application that collects data from the central data logger server, includes forms for manually entering jury and task-based sub contest results, and calculates composite scores.

SDME Teams Portal: Solar Decathlon Middle East portal for Teams is the official communication tool of the competition.

Building Code: A set of design and construction standards set forth and enforced by the Solar Decathlon Middle East Building Official for the protection of public health and safety during the event.

Solar Hai: Competition Site, where the teams' houses are assembled along with the common areas needed for the Competition development. Hai, حَي in Arabic, refers to a district or a community in a city. It represents the sense of community that this competition brings and encourages amongst all participants.

Stand-Alone Assembly: The period of time during assembly before the house has been interconnected to the village grid.

Sub-contest: An individually scored element within a contest.

Village Grid: Bi-directional, AC electrical network system installed on the competition site which will measure constantly and individually the contribution and consumption in electrical energy of each house.

SDME ORGANIZATION FUNCTIONS

Competition Manager: The organizer responsible for the management of the competition and responsible for mobilizing all the necessary resources for the achievement of the objectives, with the final decision-making authority in all the aspects related to the scope, planning, costs, quality, resources, communication, risks, sponsorship, and acquisitions of the competition.

Competition Management: Management of all the aspects related to the scope, planning, costs, quality, resources, communication, risks, sponsorship, and acquisitions of the competition.

Competition Team: The group of organizers responsible for supervision on all competition aspects with the focus on enforcing the Rules and stating its content, conducting a fair and compelling competition, assigning penalties and scorings.

Competition Strategies Management: Planning, coordinating and controlling all the activities related to the Competition.

Event Organization: The main organizer of SDME 2018 Competition in Dubai is the Dubai Water and Electricity Authority (DEWA).

HS Coordination: Evaluating the teams' Health and safety plans and consequently developing the Competition's Health & Safety Plan and supervising the houses' assembly and disassembly works at the Solar Hai.

Infrastructure Management: Planning, execution, development and control of all the activities related to the assembly, functioning and disassembly of the Solar Hai.

Inspection: Carrying-out the house's inspection and filling out the corresponding Inspection Card, according to the SDME Building Code.

Monitoring & Instrumentation Coordinator: The organizer responsible for the instrumentation system and the scoring server of the Competition.

Jury Coordinator: An organizer, liaison between the Solar Decathlon Middle East 2018 Organization in Dubai and the jury, responsible for accompanying the jury during the houses' visits, the deliberation process and the evaluation reporting.

Observer: An organizer assigned by the Competition Manager to observe team activities during contests period. 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 Middle East Rules.

Organizer: A Solar Decathlon Middle East employee, subcontractor, or observer working on the project.

Press & External Communications Coordinator: The organizer responsible for communication issues between the internal and external parties of the Solar Decathlon Middle East, acting as proxy between the participant Teams and the media.

Public Events Coordinator: The organizer responsible for planning, coordinating, executing and developing all the public activities and events related to the Competition and for the public outreach of the project. Communications Area.

Rules Official: An organizer authorized to interpret the rules. The Competition Manager is the lead Rules Official in the Competition Area.

Scorekeeper: The individual selected by the organizers to operate and maintain the scoring server during the competition. Competition Area.

Site Operations Coordinator: The organizer responsible for the evaluation of the teams' Site Operations plans, consequently developing the Competition site operation plan and the coordination and supervision of the houses' assembly and disassembly works at the Solar Hai. Infrastructures Area.

Social Media & Marketing Coordinator: The organizer responsible for managing the social media platforms and producing the official SDME multimedia files (videos, photos, presentations and etc.). Also responsible for administrating the SDME Website and working toward the identification of the brand SDME as a recognizable name and logo. Communications Area.

Sponsorships and Exterior Relations Coordinator: The organizer responsible for developing and implementing a long-range corporate giving strategy, to identify, cultivate, solicit and steward relationships with business supporters, fostering a strong worldwide awareness and support. Communications Area.

Staff: Individuals working for the Organizers on the project.

Universities Relations Coordinator: The organizer responsible for the communication with the participant teams, helping them come across the project development. Competition Area.

Zero Energy Building: very high energy performance building that produces enough renewable energy to covers the very low amount of energy that it requires, on an annual basis.

TEAM MEMBERS

Communications Coordinator: A team member responsible for the team's communications with the media and for developing all the communications materials. Works in conjunction with the SDME's Communication Organizers to coordinate the team's interactions with the media.

Construction Manager: A team member responsible for the planning and execution of the construction, transport, assembly, and disassembly of the house.

Contest Captain: A team member responsible for the team's primary strategies and coordination of Tasks Contests; is also responsible for demonstrating the compliance of appliances with the Rules.

Decathlete: A team member who is an enrolled student – undergraduate or post graduate studies, at a participating school or has graduated from a participating school within 18 months of the beginning of assembly.

Electrical Engineer: Professional electrical engineer or an electrical engineering professor responsible for reviewing, and certifying the electrical drawings, charts, and calculations, including the house's PV system. He can also be the same professional in charge of the execution of the electrical works of the project, and in conjunction with the SDME electrical engineer to interconnect the house to the Solar Hai grid.

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. Responsible for signing the official document certifying the compliance of the codes of the country of origin.

HS Team Coordinator: A team officer who is responsible for developing and enforcing the team's Health & Safety Plan during the competition phases, assembly and disassembly of the houses.

Instrumentation Contact: A team member collaborating with the Organizers' instrumentation team to develop a plan to accommodate the equipment used to measure the performance of the home during the competition.

Project Architect: A team member responsible for the architectural design efforts such as overseeing the architectural aspects of the development of the design, production of the construction documents, including drawings and specifications.

Project Engineer: A team member who designs and coordinates engineering aspects of a construction project.

Project Manager: A team member responsible for the planning, procurement, and execution of the project.

Safety Officer: A team member responsible for the safety measures observance during the event.

Site Operations Coordinator: A team member responsible for developing and enforcing the teams' Site Operations Plan during the competition phases, assembly and disassembly of the houses.

Student Team Leader: A student team member responsible for the coordination among the team. Ensures that official communication from the Organizers are routed to the appropriate team member(s).

Structural Engineer: A team member who analyze, design, plan, and research structural components and structural systems to achieve design goals and ensure the safety and comfort of users or occupants, his work takes account mainly of safety, technical, economic and environmental concerns.

Team Crew: A person who is integrally involved with a team's project, but is unaffiliated with the participating schools; contractors, volunteers, and sponsors are examples of team crew.

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.

GENERAL RULES

1. SDME ORGANIZATION

1-1 Organization Chart

For the SDME 2018, the following governance structure will be used for taking decisions:

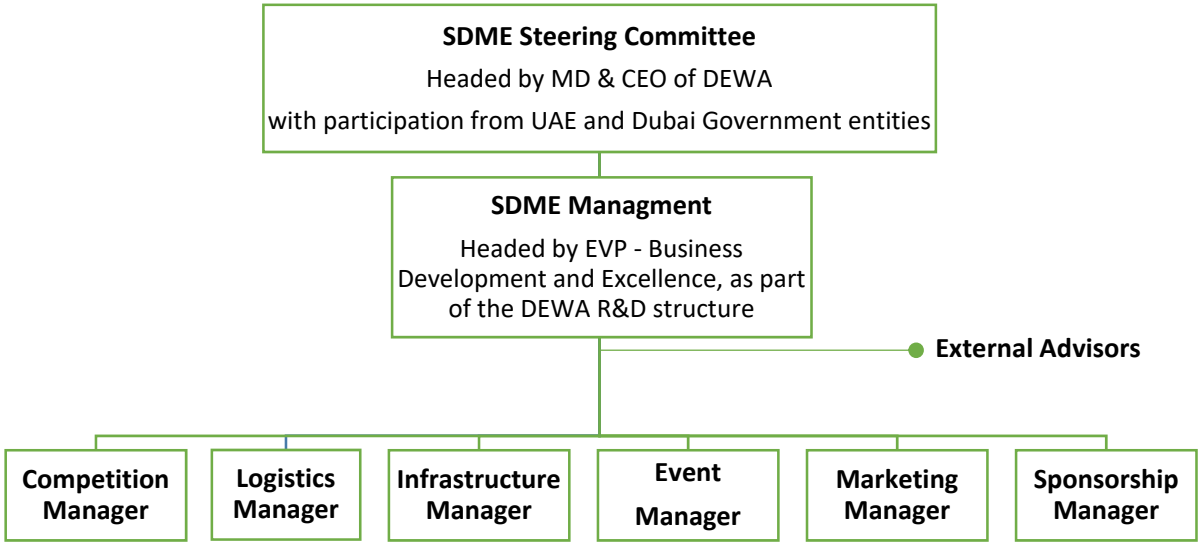


Figure 1. SDME Organization Chart

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 SDME Teams Portal/website for Teams and dated for the year of the event are the rules in effect.

2-4 Official Communication

It is the team's responsibility to stay continuously updated with all the official project communications. Official communication between the teams and the Organizers will occur preferably through one or more of the following:

a) SDME Teams Portal, as part of SDME website (www.solardecathlonme.com): is the main communication tool for the competition teams. The registered team members will be able to communicate effectively with the Organizers.
b) Email: For expediency and to protect confidentiality, the Organizers may choose to communicate with teams via team members' email addresses and the SDME Email (2018Solardecathlonme@dewa.gov.ae). The content of the communications sent to this email address will remain confidential, unless the team grants permission to the SDME 2018 Organization to divulge the content of these communications to the other teams. However, most official communication will occur via the SDME Teams Portal.
c) Webinars/workshops: SDME 2018 Organization may invite the Teams to participate in a webinars and workshops. Invitations and instructions for participation will be provided via the SDME Teams Portal and email.
d) Meetings: Before the event, the teams and organizers have an in-person meeting. Notification of the date and agenda of this meeting will be made via the SDME Teams Portal and email. During the event, a meeting will be held the day before assembly begins. Additionally, meetings will be held on a daily basis throughout the event.
e) Postings at headquarters: During the event, a bulletin board (or other venue for posting information) may be established at event headquarters. Teams will be notified via the SDME Teams Portal and email if such a venue is established and the purpose for which it has been established.

2-5 SDME Teams Portal

The SDME Teams Portal is accessed through the Solar Decathlon Middle East Website (www.solardecathlonme.com). The SDME Teams Portal will contain all the necessary information and tools for communication between the teams and the organization. The portal is accessible only for the participating teams. All the Team Members must be registered in this Portal. The primary usage of SDME Teams Portal will be:

- Receive all official communications
- Calendar updates
- Request and receive information or clarifications
- Submit questions
- Upload and download files

2-6 Decisions on the Rules

The decisions on the Solar Decathlon Middle East Rules are interpretations of the rules contained in this document. When the Rules Officials make a decision that may, in their opinion, directly or indirectly affect the strategies of all teams, the Rules Officials will add the decision to the Solar Decathlon Middle East Rules and notify the teams of the addition via the SDME Website.

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

2-7 Self-Reporting

Teams shall self-report definite or possible 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 a Rules Official 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 Competition Manager will act with discretion when determining the penalty for a rules infraction. Rules infractions observed by Rules Officials and organizers, i.e., not self-reported by the team, may be subject to more severe penalties than self-reported rules infractions.

2-8 Bonuses and Penalties

a) Bonuses:

- Teams might gain a bonus of up to 5 points according to their H&S plan and documents. For more details, refer to the Building Code section 11.1.3.
- Teams with the houses that pass all the inspections on time will receive a bonus of 10 points.

b) Penalties:

Teams committing rule infractions are subject to one or more of the following penalties, depending on the severity of the infraction:

- Point penalty applied to one or more contests;
- Disqualification from part of, or all of, one or more contests/sub-contests;
- Disqualification from the competition;
- Disqualification from the competition requires prior notice to the team and an opportunity for the team to make a written statement on its own behalf.

Penalties will also be applied to Teams not fulfilling with all the Deliverables' requirements:

- For late submission:
  - From 15 min till 48 minutes after the deadline - Up to 0.5 points
  - From 48 hours after the deadline till 1 week later - Up to 2.0 points
- For missing content: More than 5 % of the required content is missing - Up to 2.0 points

Note: In case any participant Team delivers more than 1 week after the deadline or/and with more than 25% of the content required missing, the SDME 2018 Organization reserves the right to decide and apply a larger penalty, considering the special conditions of each particular case.

During assembly period, penalties will be applied to Teams not respecting:

- Health & Safety measures (More details in the Building Code, section 11.1.4)
- Assembly and disassembly plan
- Construction site cleaning and waste management
- Stock and work area
- Deadline of the electrical connection to village grid
- Deadline of house delivery

The SDME H&S and Rules Officials shall determine the severity of rules infractions and classify them as minor or major and report them to the Competition Manager. The Competition Manager is solely authorized to apply point penalties or disqualify a team from the competition or from part of, or all of, one or more sub-contests for rules infractions. The Competition Manager shall notify all teams via the SDME official email address when a penalty has been assessed against any team. The notification shall include the identity of the team committing the infraction, a brief description of the infraction, including its severity, and the nature of the penalty, giving the teams the opportunity to protest.

Notes:

1. Teams will be assigned penalties for not realizing the daily tasks during the contests period, unless there is a clear explanation for not complying with this requirement.
2. Teams will be assigned penalties for not trying to maintain the interior comfort conditions during the contests period, unless there is a clear explanation for not complying with this requirement.

2-9 Protests

Official written protests may be filed by teams 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 to be frivolous, by the protest resolution committee.

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 filled only if the team and the Rules Officials are not able to resolve the dispute themselves; or if 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 must be submitted between 9 a.m. and 7 p.m., and within 24 hours of the action being protested. The final opportunity to file a protest is within 5 minutes following the conclusion of the final sub contest on the final day of contests period.

Exception: The results of one or more contests may be announced during the final awards ceremony. The results of contests 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 Faculty Advisor, the current date and time, an acknowledgement that a 10-point filing fee will be assessed, a clear description of the action being protested, and a succinct description of the protest.
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 Protest Resolution Committee. Unless the competition manager is called by the committee to testify, he/she is not permitted to read the protest until after the protest resolution committee has submitted its written decision.
    III. The Protest Resolution 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 Protest Resolution 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 Protest Resolution Committee notifies the Competition Manager of its decision, and indicates how many points shall be assessed as a filing fee. The decision of the Protest Resolution Committee is final, and no further appeals are allowed.

VII. If the decision involves changes to a team's score or a refund of some, or all, of the 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 SDME Teams Portal and/or email notification.

2-10 Prize Scheme

a) The monetary prizes will be awarded to all the university teams, selected by the SDME organization to take part in the SDME 2018 Competition, that fulfill the following requirements:
   1. Submit all the competition's deliverables
   2. Complete the assembly of their houses in the Dubai Solar Hai
   3. Pass the inspections and participate in the SDME contests

b) At the conclusion of the contests period, each participating team will be associated with a final score between 0 and 1,000 points, calculated according to the procedures outlined in these rules, based on actual team performance and its bonus and penalties, if any.

c) The teams will be ranked according to their net score and will earn prizes as follows:

Table 1: Team Ranks and Scores

Place	Award (AED)
1st	900,000
2nd	800,000
3rd	700,000
4th	550,000
5th	450,000
6th-22th	400,000

d) Creative Solutions Awards will be dedicated to innovative solutions, ideas and proposals from the participants that can be further developed into a business proposal. A total fund of AED 200,000 will be distributed among to the most innovative solutions, according to the assessment of the jury.

e) Prizes will be distributed by the organizers to a single entity and account, as directed by the team faculty advisor on official university letterhead with beneficiary details signed by university leadership. Multiple distributions will not be accommodated.

f) It is the sole responsibility of the team to determine any taxes or associated payments required as a result of this award.

g) Any distribution beyond the initial recipient is the sole responsibility of the teams.

h) Through participation in the competition, the team agrees to accept the ranking and scores determined by the organizers. The results of the contests are final. Teams may participate in the Protest process described in these Rules during the times indicated. No right to counsel is authorized.

i) The SDME organization might give additional non-monetary awards.

3. PARTICIPATION

3-1 Entry

The project is open to Colleges, Universities, and other post-secondary educational institutions. Only Institutions from countries that have commercial relationships with the UAE will be able to enter the competition or be part of the teams. Entry is determined through a proposal process. All proposals are reviewed, scored, and ranked. Based on the quantity and quality of proposals, a limited number of twenty teams will be selected for entry in competition.

Universities that have taken part in previous editions of the Solar Decathlon in United States, Europe, China or South America are welcome to submit their proposal to participate in the Solar Decathlon Middle East 2018. However, as houses and projects of the previous editions of the Solar Decathlon will not be able to participate, teams will have to submit a new design proposal.

3-2 Team Officers and Contact Information

Each team must provide contact information for the Team Officers listed in table 2 and must keep the contact information current through the duration of the project.

a) If a team's internal officer titles do not exactly match those listed in the table 1, each team shall still provide the contact information for the person fulfilling each of the areas of responsibility described (See Definitions – Team Members)
b) Teams must provide the contact information for one and only one person in each officer position; this individual is responsible for forwarding information to any "co-officers," as necessary.
c) An individual may have multiple officer titles.
d) The requested information must be included in the Press Release.

The Solar Decathlon Middle East 2018 in Dubai is intended to be a primarily student-run project. The only team officer who must be a faculty member is the Faculty Advisor. The structural and electrical engineers may be a post-graduate student, faculty member or working professional. It is highly recommended to fill all other team officer positions with students

Table 2: Team Officers and Contact

Team Officer Titles	Name	Contact
Faculty Advisor		
Project Manager		
Construction Manager		
Project Architect		
Project Engineer		
Structural Engineer		
Electrical Engineer		
Student Team Leader		

Health & Safety Team Coordinator		
Safety Officers		
Site Operations Coordinator		
Contest Captain		
Instrumentation contact		
Communications Coordinator		
Sponsorship Manager		

3-3 Safety

a) Each team member should have a medical insurance that is valid in the UAE. The information of the medical insurance must be included in the H&S Report as it is mentioned in Building Code 11.3.4.
b) Each team is responsible for the safety of its operations.
c) Each team member and team crew member shall work in a safe manner at all times during the project in accordance with the requirements identified in the rules and approved team Health and Safety Plan.
d) Each team shall supply all necessary personal protective equipment (PPE) and safety equipment for all the team's workers during the project.
e) 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.
f) Individuals under the age of 18 are not permitted to be on the competition site during assembly and disassembly.
g) Smoking is not permitted within the competition site at any time during assembly or disassembly.
h) Pets and other animals are not permitted on the competition site during assembly or disassembly except for registered service animals.
i) Organizers may issue a stop work order at any time during the project if a hazardous condition is identified.
j) Failure to follow the procedures and requirements outlined in each team's Health and Safety Plan is considered a rule violation subject to Rule 2-8, and violations are subject to penalty points.
k) All electrical work on the competition site shall meet electrical lockout/tagout requirements indicated in each team's approved Health and Safety Plan.

3-4 Conduct and Dress Code

a) Improper conduct, the use or influence of alcohol, and the use or influence of illegal substances are not permitted on the competition site. Improper conduct may include, but is not limited to, improper language, unsportsmanlike conduct, unsafe behavior, distribution of inappropriate media and cheating.
b) Teams should be aligned with the UAE Dress Code: to be aligned with the UAE culture. It is best to remain covered at least from shoulder to knees.
c) All videos, photos, documents and any other digital or printed material produced by the participating teams and related to the SDME project must respect the SDME conduct and dress code.

3-5 Use of Likeness, Content, and Images

Team members and team crew agree to the use of their names, likenesses, documents, audiovisuals and/ or graphics, in any communication materials issued by the SDME2018 organizers, partners, event supporting institutions and event sponsors.

a) For the Competition dissemination, SDME2018 Organizers, event supporting institutions and event sponsors, may use the teams' information (content and images).
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.

All materials provided by Teams to the SDME2018 Organization including, but not exclusively, the mandatory deliverables, must belong to the participant Teams, or the Team must have been authorized by owners of material subject to intellectual property regulations, such as background music or third party images. Therefore, the Teams must submit the SDME 2018 Dissemination Authorization conveniently signed by the Faculty Advisor, with each audiovisual file.

Exception: If a team submits content or images that it would like to be kept confidential, it should make that request, with an explanation, in writing to the recipient of the content or images. Every effort will be made to honor requests for confidentiality. All confidentiality requests expire at the date of the end of the SDME2018 competition.

3-6 Withdrawals

If a participant team, during the project development, ever thinks of withdrawing from the Competition due to any reason, they must communicate it to the SDME 2018 Organization before taking its final decision.

The SDME 2018 Organization will try to help the Team to resolve any problem. However, if the Team continues with the idea of withdrawing from the Competition, they must notify their decision to the SDME Project Manager with a letter signed by the Faculty Advisor. All written withdrawals complying with the previous items are final.

4. SOLAR HAI

4-1 Solar Hai Specifications

The Solar Hai, or competition site, is where the teams' houses are assembled. The Solar Hai specifications will be communicated through the SDME Teams Portal, including a detailed plan drawing indicating its limits, accesses, lots, and circulation areas.

The perimeter of the Solar Hai will be limited by setting out accesses, the allotted lots, established limits and internal paths. The SDME 2018 Organization will provide general lighting of the Solar Hai, as well as the supply of water, workspaces for each team with Wi-Fi connection, access to private cafeterias and public toilets.

4-2 Civil Liability

Each team is financially responsible for any damage it causes in and to the competition site. Therefore, teams must contract Compulsory Insurance for the Solar Hai.

4-3 Lot Conditions and Attribution

a) The lots' size is 20.0 m by 20.0 m. Only due to exceptional reasons, the lots size may vary.
b) During specific days of the assembly and the disassembly periods, teams will have at least one extra area named Operations Area, of 20.0 m by 5.0 m. The Operations area will bring extra space to place the cranes and help in the load/unload tasks. The Operation Area must be freed on the day indicated by the SDME organizers.

c) Once realized the SDME Lot attribution by drawing lots process, the SDME 2018 Organization will notify the teams the specific conditions for each lot. Teams must design and plan all their site operations accordingly.
d) In the Solar Hai, lots' perimeters and their Operations Area will be clearly defined and signposted. Teams may not go beyond these limits under any circumstances. All storage, loading/unloading, assembly and disassembly will take place inside the permitted area and during the established period.
e) The Organization will provide all teams with a secondary storage area for materials and equipment not in use during the exhibition period.
f) Teams are responsible for cleaning their lots and re-establishing them to their original conditions once the disassembly process is over.

4-4 Footings

a) Superficial, low-impact footings, shall be used to support all house and site components located on the competition site. As, across the lot, changes in the vertical elevation may exist, Teams must design and plan adjustable footings accordingly.
b) Footings shall be designed to comply with the soil bearing pressure criteria specified in the Solar Decathlon Middle East Building Code.
c) Once the foundation has been laid out during the assembly, teams shall notify it to the appropriate Inspector in order to verify compliance. The assembly may not continue until the footing inspection has been passed

4-5 Assembly period video recording

To ensure security, audiovisual-support and communication for the competition, cameras will be installed by the Organization in order to record entire assembly period.

Images remain property of the Organization who can use them to verify safety conditions and communication purpose.

4-6 Construction Equipment

a) **Safety** - Teams shall not permit the use of any equipment or tools on the competition site that are not safe and/or do not comply with the applicable safety certificates or standards.
b) **Cranes** - The SDME organization will share with the teams the contact information of one or more local crane companies that will offer special cranes rental conditions. The Teams can select one of these companies or any other of their choice. The Teams are responsible for the coordination of their works with the crane company. In any case, the Teams must notify SDME about the selected company.
c) **Other machinery and equipment** - The SDME Organization will share with the teams the contact information of one or more local companies that can provide auxiliary resources for the elevation and movement of the houses and their constitutive elements (forklift, cherry-picker, scaffolding, etc.). These companies will offer special rental conditions for equipment and materials available in their catalog. Teams can select one of the companies suggested by the SDME or any other. In any case, they must notify SDME about the selected company.
d) **Use of the cranes** - The usage of cranes or alternative means will be administered by assigned turns. The exclusive use of the crane may be possible in two specific cases: With the university's express request, under the Organization approval and for cranes' use incompatibility
e) **Efficient handling and storage** - To facilitate the loading and unloading, the elements of the house and the materials must be placed on pallets or skips, whenever possible.

4-7 Access and circulation of vehicles

a) **Site Operations Plan** - As part of this plan, the organization will designate a meeting point area for heavy vehicles and will determine the strict order of entry of these vehicles to the Solar Hai, to carry out the loading or unloading tasks. The order of entry will be done considering the location of the lots and Teams' Operations Plan.

b) **Truck/Heavy Vehicle Meeting Point** - It is a place near to the Solar Hai planned to park all heavy vehicles prior their entrance to the site. Heavy vehicles, as truck-mounted cranes, trailers, semi-trailer and trucks, when arrive must park in the Truck/heavy Vehicle Meeting Point. The Meeting Point is clarified in the village layout available in the SDME Teams Portal.

c) **Heavy vehicles order of entry** – To guarantee the orderly entry into the Solar Hai, vehicles parked in the Truck/Heavy Vehicle Meeting Point will be called in, one after the other. If a vehicle is not ready when it is called, its entry will be re-schedule to a moment that does not disturb the Site Operation Plan. No heavy vehicles are permitted in the Solar Hai out of the periods established in the Site Operation Plan or without authorization.

d) **Circulation of heavy vehicles** - These vehicles must circulate on the designated paths for them in the Site Operation Plan. Only in exceptional circumstances, and with the SDME Site Operations Coordinator´s authorization, trailers and semi-trailers may be driven out of the designated paths.

e) **Vehicles at Solar Hai** - Only one vehicle/transport per team will be permitted at a time in the Solar Hai. The rest of the vehicles/transports must wait for the previous one to leave the Solar Hai and get the authorization to enter. This process will be coordinated between the SDME Site Operations Coordinator and those in charge of each team.

f) **Light vehicles** - The access of light vehicles to the Solar Hai will be permitted only with SDME organizers' authorization and following their instructions.

4-8 Generators

a) Generators are not permitted to power auxiliary equipment and construction lights necessary during assembly and disassembly.

b) Electrical power will be available during the assembly and disassembly phases on each team's lot in a specific Construction Site Box.

4-9 Lighting at Competition Site

a) General lighting of the site will be provided by the Organization during the assembly, disassembly and electrical grid connected periods.

b) During assembly and disassembly periods, providing construction lighting devices is under the responsibility of each team. Teams are also responsible for maintaining adequate interior and exterior lighting levels during the working hours.

4-10 Cleanliness and Waste Management

a) Site cleaning - Teams are responsible for maintaining their lots, construction sites, and adjacent areas, clean. Teams must comply with all the SDME Organization indications about the site cleaning.

b) Stock areas and work areas - Teams must respect the stock and work areas. In cases of doubt, Team must consult the Site Operation Coordinator. The exit routes of the stock and work areas must always be clean and free of obstacles.

c) Waste Disposal - During assembly and disassembly, teams must take their waste products to the disposal areas available in the Solar Hai according to separated wastes collection rules.

d) Liquid Disposal - The release or disposal of liquids in the Solar Hai must be realized only with the SDME Organization authorization.

4-11 Working System

a) Assembly and disassembly phases will be clearly indicated in the Competition Calendar.
b) Each team must designate a Construction Manager responsible for coordinating all its team's site operations, as well as a Health & Safety Coordinator to verify that the workers are in conditions to perform their tasks (Rule 3.2).
c) During the assembly and disassembly periods, teams must comply with the UAE Labour Law, and follow the approved Health & Safety plan and the Health & Safety Coordinator instructions.
d) Teams must execute the assembly and disassembly tasks in two shifts per day. In the UAE Labor Law, the maximum number of ordinary working hours shall be eight hours per day. The daily working hours shall be regulated so that the worker does not work more than five consecutive hours without intervals for rest, meals and prayer, whose total period shall not be less than one hour. Such intervals shall not be included in the working hours.
e) During the assembly and disassembly periods, Teams are required to have a daily list of Team members for every shift, as well as the schedule for each one of them.

4-12 Transportation to site

a) Every team is responsible for the transportation of their houses to the Dubai Solar Hai.
b) Teams are encouraged to consider the dimensional aspects and to place their items on pallets or skids, whenever possible.
c) The SDME 2018 Organization suggests that participant teams contact transport companies during the development phase of their project to guarantee that the freight transport will comply with the UAE customs regulations.
d) For additional logistics information please refer to Rule 11.5.

4-13 Electric Vehicles

a) DEWA will provide the teams with electric vehicles. The vehicles must be park within their lots.
b) The movement of the electric vehicle inside and outside the Solar Hai is permitted only during the periods indicated in the Competition Calendar and following the SDME instructions.
c) The competition prototype house must include the infrastructure required to charge the vehicle.

5. THE SOLAR ENVELOPE

5-1 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 2. The solar envelope shape is a truncated pyramid whose base measures 20 m x 20 m and whose top plane is located at the height of 7 m and measures 10 m x 10 m.

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 5-1 if all of the following conditions are met:
   I. The team makes a request to the SDME 2018 Organization for an exemption.
   II. The team can prove to the SDME 2018 Organization's satisfaction that the component is not significantly restricting a neighbor's right to the sun.
   III. The SDME 2018 Organization determines that the component is sufficiently unique in function and small in size to warrant an exemption.
c) Moveable or convertible house or site components shall not extend beyond the solar envelope.
d) The Electric Vehicle should not necessarily be within the solar envelope. However, it should be located/parked within the house lot (20mx20m). Moreover, any related infrastructure (shading, carport, garage, walls, charging port, etc.) must be within the solar envelope.

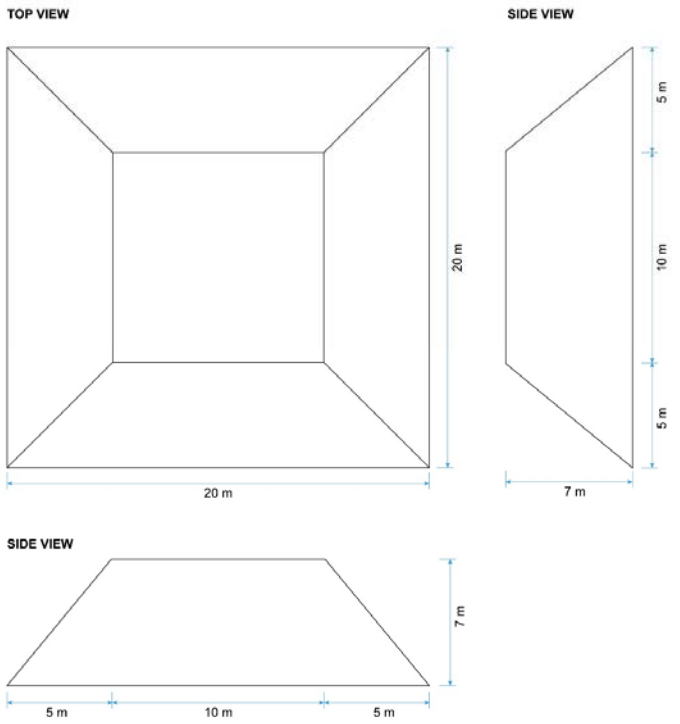


Figure 2. Solar Envelope

6. THE PROJECT

6-1 Documents needed to request approval for the design

a) **Structural Design**

I. The house's structural design need to be approved by SDME before the team arrival at the Solar Hai.

II. Each team needs to prepare full design calculation and drawings according to the codes specified in the Building Code depending on the structural materials used. For the structural calculation of other materials, teams must consult the SDME for code compliance requirements.

III. The structural drawings must be in CAD or Revit formats, and the calculation report based on computer simulations are favored.

IV. The faculty advisor and the professional responsible of the structural design must sign and stamp the structural drawings and calculations of the house, including railing and all site components that might pose a threat to public safety if they fail.

V. By signing and stamping the structural drawings and calculations, these professionals certify that the structural provisions of the requested codes and SDME Building Code have been met by the design and that the structure is safe to be used and visited by the general public.

b) **Electrical and Photovoltaic design**

I. The house's electrical and photovoltaic design need to be approved by SDME/DEWA before the team arrival at the Solar Hai. For grid connection requirements, please refer to Rule 7.5.

II. All the teams must submit drawings (CAD files) and calculations for both the house electrical system and its photovoltaic installation, complying with DEWA's Shams Dubai requirements as well as other DEWA standards and guidelines.

III. A professional electrical engineer or a professor of electrical engineering must sign and stamp the electrical drawings and calculations, including the house´s PV system.

IV. By signing and stamping the electrical drawings and calculations, the engineer or professor certifies that the submitted documents meet the requirements of both DEWA's Shams Dubai standards and guideline and the electrical sections of the SDME Building Code and that the electrical design is safe and does not pose any risks to occupants or visitors.

6-2 Architectural Footprint and Measurable Area

a) **Architectural Footprint**

I. The house's architectural footprint must not exceed 150 m^2.

II. In SDME, the Architectural Footprint refers to the area of the lot covered by the house and is defined as the projection of the perimeter of the roof on the ground.

III. The architectural footprint includes the roofed areas, overhangs, canopies, PV arrays, sun control and shading devices.

IV. Unroofed components like ramps, decks, porches, terraces, railings and parking space are not considered as part of the architectural footprint.

V. If the team plans to open/extend any movable or convertible elements in the house during the contests period, the additional utilized area should be included in the total architectural footprint.

VI. In the architectural footprint's drawing, the Teams must mark and shade the SDME Architectural Footprint over a Site Roof Plan and indicate its area in square meters.

b) **Minimum & Maximum Measurable Area**

I. The measurable area shall be at least 45.00 m^2 but shall not exceed 90 m^2 for single floor housing unit, and 110.00 m^2 for multi-story housing units.

II. The purpose of the identifying the Measurable Area is to determine the size of the net interior space that will be conditioned, measured as a floor area.

III. The walls, partitions, columns, shafts, floor to ceiling closets, technical rooms, etc. are not part of the measurable area.

IV. If the building has convertible or moveable components, the maximum and minimum measurable areas during live presentations or shown in printed media presented by the team during jury visits, public exhibition or contests counts towards the maximum and minimum measurable areas of record respectively.

c) **Multi-story housing units:**

I. The larger of the two floors shall not exceed 70.00m^2 of measurable area.

II. For Public Touring, at least the access and the route of the visitors on the ground floor must be accessible by the disabled, according the SDME Building Code and the UAE Building Regulations for the Disabled (http://www.moid.gov.ae/EPublications/The Building Regulation Facilities for the Disabled-en.pdf)

6-3 Entrance and Exit Routes

a) The main entrance may be placed on any side of the house. Houses in corner lots may have their entrance route coinciding with the intersection of two streets.

b) The house's exit route must be accessible to the public and lead from the main house exit to one of the publicly accessible streets of the Solar Hai adjacent to the solar envelope. Teams are responsible for providing an accessible route from the public streets or squares at the boarder of their lot to the ramps and steps of their houses.

c) Teams shall clearly mark in the project drawings the entrance and exit routes as well as the path between the house to the Solar Hai streets or squares.

6-4 Project's Minimum Requirements

Teams need to provide the following within their solar envelope to participate in all 10 contests of the competition:

a) Appliances – See Contest 6 for specific details

b) Workstation – desk, table or area for work or study at home with a computer

c) Public area for dinners – See Contest 6

d) Public areas of the house (at least living room and kitchen) must be open to public tours, and all areas of the house must be open for jury tours.

e) Bedroom or bedrooms.

f) Adequate interior and exterior lighting, during day and night. – See Rule 12.6

g) At least the house tour and the exit routes must comply with the SDME accessibility requirements.

6-5 Competition Prototype Alternates

a) Competitors are open to using any unusual or innovative building material/Building Systems that shows adaptation to the Middle East region weather conditions. Supporting documentation of such materials or building systems must be provided as part of the competition prototype.
b) As a separate documentation and clearly identified as Project`s alternates, teams may present project's alternates showing additional possibilities of their project. These alternates design may include other components or technologies, other density or changes to adapt the project to a different climate or socio-economic conditions.
c) The competition prototype house with its included components and functionality, as presented on the Solar Hai will be the one evaluated during the competition, in addition to the alternatives that are clearly associated with the presented prototype.
d) Alternatives that are not specifically related to the prototype presented in the Solar Hai, and can be applied to any other house will not be taken into account.
e) Alternatives whose application requires significant changes in the presented prototype will also not be taken into account.

7. ENERGY

7-1 Energy Sources

a) The only energy sources allowed for electricity in the SDME competition is the house PV system and the electricity grid. Other approaches/energy sources can only be showcased and must not be connected to the house system at the Solar Hai. The SDME Houses are high energy efficient solar homes designed to be connected to the electrical grid and to use solar radiation to produce an equal quantity of energy that they consume, on an annual basis.
b) Energy storage can be used, complying with the Rules 7-3, 7-4 and section 6.11 of the SDME Building Code. The use of small batteries is regulated by Rule 7-6.
c) Fireplaces, fire pits, candles, and other devices or appliances using non-solar fuels are not permitted in the designs.

7-2 Village Grid

In the Solar Hai the organizers shall install an electrical 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) The house should operate with AC service, 50 Hz, 230V Single Phase. If the team would like to use different specifications, the team should contact the organizers to request for an exception.
c) The Low Voltage grounding means system of the electricity distribution grid in the Solar Hai follows a TT configuration (Note: the LV grounding means system characterizes the grounding means mode of the secondary of the MV/LV transformer and the means of grounding means the installation frames). This aspect should be carefully taken into account when designing the grounding means of the house and photovoltaic system.
d) There will be a General Box in each of the lots with the necessary protections for the electrical connection to the General grid of the Solar Hai. Each team has the responsibility of connecting the General Box with

their own conduits. The connection will be made by an authorized technical expert of the Organization. The individual branch must have a section of 3x16 mm^2, insulation 0.6/1 kV and must be halogen-free.

e) The Organization will execute the grounding system of the Solar Hai. Each Lot will have one grounding connection point at the General Box, for both the house electrical system and PV system.

f) Teams shall provide and install an insulated grounding conductor suitable for their design from the house main distribution board (MDB) to the organizer utility panel (General Box). Please refer to Building Code section 6.9.

7-3 PV Equipment Eligibility

a) To facilitate the PV installation approval process, DEWA's Shams Dubai has created a non-exhaustive list of eligible equipment. The list includes PV modules, inverters and interface protection equipment.

b) All PV equipment used in the SDME houses must be from the DEWA's Shams Dubai list or must be approved by DEWA's Shams Dubai Team before the arrival of the team to the Solar Hai.

c) The teams are not required to follow the standard DEWA/Shams Dubai procedure to get a provisional approval for use non-listed equipment. For the evaluation of non-listed equipment they must submit the following:

   i. Reasons for selecting the non-listed equipment
   ii. The equipment data sheet (specifications and technical information)
   iii. Copy of the equipment certifications and standards compliance

d) If a PV modules, PV inverters, or Interface Protections manufacturer wishes to include its equipment in the Shams Dubai list, he must follow the instructions indicated in the following link: https://www.dewa.gov.ae/en/consultants-and-contractors/innovation/innovation-services/pv-equipment-eligibility

e) The energy storage system and related equipment must comply with the SDME Building Code 6.11

f) The energy storage system and equipment must comply with the SDME Building Code 6.11

g) To use any PV equipment that is not included in the Shams Dubai list, Teams need to get the approval from SDME/DEWA prior to the arrival of the team to the Solar Hai.

7-4 PV Technology

a) One of the basic objectives of the SDME included in RFP is "to promote architecturally attractive solar system integration, working on using the solar technologies to replace conventional construction materials in the building envelope such as the roof, skylights or facades." This objective has been also included in the introduction to the SDME Rules.

b) There is no limit for the PV power installed (kWp) for the house. This will increase the application of innovative PV technologies and BIPV solutions as it coincides with the SDME objectives.

c) Teams must justify the size of their PV arrays based on computer simulations, considering factors such as the efficiency of the used technologies, the PV's orientation and angle, the house's estimated annual competition energy consumption, their demand response strategy, the sobriety and the SDME limitations on the storage systems and the inverters.

d) For limitations of the storage systems and inverters, please refers to Rules 7-5 and 7-6.

e) Bare photovoltaic cells and encapsulated photovoltaic modules must be commercially available to all teams at the beginning of the event in the Solar Hai.

f) Non-commercial PV solutions or PV solutions with substantial modification of the crystal structure, junction, or metallization need to be approved by the organizers before arrival at the Solar Hai.

g) Custom-designed PV modules will be permitted, if the manufacturer demonstrates that the PV modules have been manufactured by the relevant standards applicable (e.g. IEC 61215 for Crystalline Silicon Terrestrial PV modules and IEC 61646 for thin-film terrestrial PV modules).

7-5 Inverters

a) Teams may use one or more inverters.

b) The AC side total maximum power level of the grid-tied solar power inverter(s) is 8 kW.

c) The inverters and their installation must comply with the requirements stated for grid interconnection of modules and interface protections as per DEWA's Shams Dubai Regulations.

d) Only the houses' batteries can be connected on the DC side of the solar power inverter(s), see rule 7-6 (h). All houses' loads and the electric vehicle's chargers must be connected on the AC side of the solar power inverter(s).

7-6 Batteries

a) The use of commercially available energy storage devices, such as electrochemical batteries and capacitors, as part of the competition house design, is permitted. The electrical storage systems requirements are:
   I. The batteries must be fully charged at the beginning and end of the contests period.
   II. The batteries, associated enclosure(s) and their installation, must be compliant with the SDME Building Code.
   III. Teams are encouraged to size their energy storage system based on computer simulations considering factors such as their estimated annual (and contests period) electrical production, annual (and contests period) consumption profiles, their demand response strategy, the sobriety and the SDME limitations on the inverters. However, in no case the energy storage capacity of the houses can be higher than 15 kWh, as per the manufacturer specifications.

b) The use of the factory-installed battery within the team's electric vehicle is permitted for the operation of the electric vehicle only. Vehicle-to-grid power flow is not permitted. The EV battery must be fully charged at the end of the contests period.

c) Failure to end the contests period with a fully charged storage system or EV battery will be considered a rules violation and be subject to penalty points, disqualification of related sub-contests and energy adjustments as deemed appropriate by the Competition Manager.

d) 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. These batteries do not need to end the contests period with a full charge.

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

f) "Plug-in" (non-hardwired) 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. Exception: If not used in the operation of the house at any time during contests period and are not part of the equipment evaluated in the contests, portable electronic devices, such as cell phones and tablets, are permitted within the solar envelope without having to be plugged into the house's electrical system.

g) The batteries can be connected in the AC or the DC side of the solar power inverter(s)

7-7 Connection of the houses to the Solar Hai grid

a) Teams must obtain the SDME/DEWA approval of their house´s electrical and PV design before their arrival at the Solar Hai.
b) Once the final electrical inspection (including photovoltaic systems) has been approved, the houses will be officially connected to the Solar Hai grid. The Electrical Energy Balance of the houses at the beginning of the contests period will be zero.

7-8 Thermal Energy Storage

Thermal energy storage devices located outside of the footprint shall be fully shaded from direct solar radiation.

7-9 Desiccant Systems

Teams must communicate to the SDME 2018 Organization if they are planning to incorporate a desiccant system. If a desiccant system is used, it must be regenerative.

a) To ensure that the desiccant has been fully regenerated by the conclusion of contests period, 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 contests period. In some cases, a measurement at the conclusion of the contests period will not be necessary.
c) At the conclusion of the contests period, the weight of the desiccant material or device shall be less than or equal to its initial weight. 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.

7-8 Humidification Systems

If a team is intending to use a humidification system, they must notify the Organization for approval of all the system's characteristics, and the corresponding certifications of their different components.

8. LIQUIDS

8-1 Containers and their location

a) Teams are responsible for specifying, sizing and installing all the liquid containers needed for their houses at the Solar Hai, including the containers for supply water, used water and any other kind of container for liquids. There will be no sewer system at the Solar Hai. All the water used in the houses must be stored until removal by the SDME organization at the end of the contests period.
b) Primary supply water and greywater containers shall be located outside of the house's measurable area.
c) Liquids for solar storage, hot water
d) , or other thermal storage containers may be located within the measurable area.
e) The primary supply water tank(s) or container(s) shall be fully shaded from direct solar radiation.

8-2 Water Delivery

The procedure and requirements for water delivery is as mentioned below:

a) SDME organization will supply non-potable water for the contests purposes, using water trucks.
b) The teams shall include a detailed water budget in the Project Manual. They shall estimate their water needs at the Solar Hai, taking into account the competition tasks and the water required for cleaning, irrigation, radiance systems, grey water systems, ect.
c) Teams are responsible for providing easy accessibility to the containers opening. The project drawings must clearly indicate the filling locations, the quantity of water requested at each filling location, dimensions of

the containers, the diameter of the containers openings (10 cm minimum) and should provide at least 30 cm clearance above the containers filling locations.

d) Teams shall provide a minimum of six people, on command, to help move the water hose to their house from the previously serviced house.
e) SDME organization will establish the water supply calendar before the contests period. The house supply water containers and any other necessary plumbing element must be ready to receive the water at the scheduled time(s).
f) Water supply out of the scheduled time(s) needs to be requested in advance and subjected to approval. Teams are responsible for contests tasks that they do not carry out if they run out of the water.
g) Teams are responsible for distributing water within their houses, including all necessary pumps, tanks, lines, valves, etc.

8-3 Water Removal

The procedure and requirements for water removal is as mentioned below:

a) On water removal day, SDME organization will use water trucks equipped with a pump.
b) Teams are responsible for providing easy accessibility to the containers opening. The project drawings must clearly indicate the water removal locations, the quantity of water to be removed from each removal location, dimensions of the containers, the diameter of the containers openings (10 cm minimum) and should provide at least 30 cm clearance above the containers water removal locations.
c) The houses must be ready for the water removal on the scheduled day, and the teams must not delay the removal process.
d) Teams shall supply a minimum of six people, on command, to help move the water hose to their house from the previously serviced house.

8-4 Team provided liquids

A competing team may provide its own liquids for the following purposes:

a) Personal hydration/consumption.
b) Food preparation.
c) Thermal mass.
d) Hydronic systems testing.
e) Small volumes of glycerol, deionized water or other working fluids for thermodynamic systems using working fluids other than non-potable water.
f) Assembly (e.g. hydraulic fluids), finishing (e.g. paint) and cleaning (e.g. mineral spirits).

8-5 Grey Water

a) It is allowed to use grey water in the heat recovery systems, see Rule 8-9.
b) Teams that would like to reuse greywater at the Solar Hai should ask for authorization from the SDME organization, after submitting the specifications of the proposed solution. SDME organization will decide, on a case by case basis. Water coming from approved solutions will be used only for the purposes specified by the SDME organization, in its approval letter.
c) Any greywater reuse must be approved by the SDME organization before the teams' arrival to the Solar Hai.

8-6 Rainwater Harvesting

A competing team may collect rainwater falling on its allotted site and use it for any of the following uses:

a) Irrigation
b) Water feature

c) Heat sink or heat source.
d) Other purposes as approved by the SDME organization on a case-by-case basis. Alternative uses must be approved by the SDME before the arrival of the Teams at the Solar Hai.

8-7 Evaporation

Water may be used for evaporation purposes.

8-8 Thermal Mass

a) Teams may use liquids as thermal mass.
b) The thermal storage containers shall be isolated, i.e., the contained liquid shall not circulate to other containers or systems.

8-9 Grey Water Heat Recovery

a) Heat may be recovered from grey water as it flows from the drain to the waste water tank.
b) "Batch-type" recovery is prohibited.

9. VEGETATION

9-1 Placement

Use of potted vegetation is permitted; pots may be moved around the site until the start of the contests period from which will remain stationary until the end of contests period.

9-2 Watering Restrictions

Grey water containing odor or speculated to contain organisms that may go septic shall not be used for vegetation watering.

10. MONITORING

A significant part of the scoring of the competition consists on the measurement of different items and on the correct performance of various tasks. The Monitoring system is responsible for controlling these measurements. All sensors, wiring, tripods and the rest of the material necessary for these tasks will be provided by the SDME Organization.

Monitoring is structured in two independent areas:

1. **Electrical:** Responsible for the monitoring of Contest 3: Energy Management, evaluating the houses' electrical energy self-sufficiency provided by solar active technology and their electricity use intensity.
2. **Instrumentation:** Responsible for the monitoring of Contest 5: Comfort Conditions and Contest 6: House Functioning, by locating sensors where appropriate.

There are two types of monitoring: Continuous Monitoring and Monitoring Tasks, depending on whether the measurements are continuous or punctual. The following table shows which measurements belong to each group.

Table 3: Monitoring Types

ID	Contest and sub-contests	Type of Instrumentation	Monitored	Task completion
3.	Energy Management			
	3.1 Load consumption per surface area.	meters	✔	
	3.2 Net electrical balance	meters	✔	
	3.3 Temporary generation- consumption profile patterns correlation.	meters	✔	
	3.4 Demand response	meters	✔	
5.	Comfort Conditions			
	5.1 Temperature	sensors	✔	
	5.2 Humidity	sensors	✔	
	5.3 Air quality – CO2	sensors	✔	
	5.4 Lighting	sensors	✔	
	5.5 Façade airborne sound insulation1	Sensors[1]	✔	
	5.6 HVAC systems noise1	Sensors[1]	✔	
6.	House Functioning			
	6.1 Refrigeration	sensors	✔	
	6.2 Freezing	sensors	✔	
	6.3 Water Balance	Observer[2]	✔	
	6.4 Clothes Washing	Sensors	✔	✔
	6.5 Clothes Drying	Observer[2]		✔
	6.6 Dishwashing	sensors	✔	✔
	6.7 Oven	sensors	✔	✔
	6.8 Hot Water Draws	Observer[2]		✔
	6.9 Cooking	Observer[2]		✔
	6.10 Home Electronics	Observer[2]		✔
	6.11 Dinner	Diners[3]		✔
7.	Sustainable Transportation3	Observer[2]		✔

Notes

1. There will be no continuous measurement of the houses acoustical performance (Sub-contests 5.5 and 5.6). An acoustic lab will carry out the required test.
2. The observers will monitor the water consumption, weight of the dried towels, the temperature of the water in hot water draws, weight the water in the cooking tasks, the times in which the home electronic devises are in use, and the completion of the EV tasks.
3. The diners will evaluate the dinner experience.

10-1 SDME Sensors' Location and Wire Routing

A summary of the sensor's location and wire routing is provided in this section. Extended information is included in the Technical Monitoring Procedures Document that will be available through the SDME Teams Portal.

a) Instrumentation - The Organization will supply a list of all the SDME instrumentation devices necessary for the Monitoring System of the houses.

b) Sensors Location - The location of sensors is determined by the Organization, based on the Projects Documents as part of the team's deliverables.
c) Wire Routing - As sensors will be wired, a route for running wires from each sensor location to the data logger must be provided. The Teams are responsible to provide a wire routing that permits a quick and easy installation and removal of the SDME Instrumentation wires. This route must be clearly detailed in Construction Documents as part of the team's deliverables. To provide an easy installation is mandatory to ensure the house to be monitored and can enter the Competition. These wires and sensors are installed temporarily for the contests period.
d) Feed-through - All devices used for the monitoring will be located indoors in a specific monitoring panel room. Houses must provide feed-through to pass the power and Ethernet wires from the exterior to the interior of that room.
e) Instrumentation Plan and Approval - Teams must submit instrumentation drawings showing the location of the SDME sensors, meters, and the wire routing. Teams must have the Instrumentation Plan approved by the SDME Organization to be able to participate in the contests period. The procedure is as follows:

Before the final phase of the Competition:

1. The Organization determines and indicates location of the sensors based on Project Documents included in the team's deliverables.
2. The Team integrates wire routing and Monitoring Panel in a Preliminary Monitoring Plan delivered to Organization, two weeks after sensors' location definition sent by the Organization.
3. The Organization examines this document and eventually asks for modifications before approval of the Final Monitoring Plan. The approved Final Monitoring Plan must be included in Construction Documents as part of the team's deliverables.
4. Final minor changes can be allowed by the Organization after submission of Updated Construction Documents as part of the team's deliverables.

On site, during the assembly period:

1. The SDME Organization will check the spaces provided for the wiring (channels, paths, holes, etc.).
2. The Team will make the adjustments necessary so that the instrumentation system can be safely and robustly installed by the SDME Organization.
3. The SDME Organization will mark the location of the sensors
4. The SDME Organization will install the monitoring panel, power it and check everything is correctly installed.
5. The SDME Organization will wire the sensors to the monitoring panel.
6. The SDME Organization will verify the operation of the sensors.
7. Teams are responsible for the monitoring system integrity.

Note: The scoring of the monitored sub-contests will be based only on the SDME sensors and meters. Teams may also install sensors as part of their houses' systems. The measurements of these sensors might differ from the measurements of SDME sensors due to several factors such as the sensors type, accuracy, calibration, location, etc.

10-2 Water Meters

a) Water meters will be installed by the SDME Organization between the water pump and the water distribution circuit of the house.
b) Water meters´ model, size and space requirements will be specified on the SDME Teams Portal.
c) Teams are responsible for providing adequate inlet and outlet connections for the water meter.

d) Teams must also provide two valves, upstream and downstream the meter, to stop the water flow if there are any problem with the meter.
e) The meter location must permit an easy reading of their measurements.
f) Teams must clearly show in the project drawings the meter location, the space to make the connections, the required valves, the pipes sizes and any other necessary fitting.
g) The final meters' location must be approved by the SDME Organization.
h) Maximum pressure at the meter inlet shall not exceed 2 bar, PRVs shall be installed, at least 1 m before the meter, to achieve the required pressure.

10-3. Monitoring Checklist

Instrumentation and monitoring rules compliance will be verified using the "Monitoring Checklist". This checklist must be filled by the Teams. Monitoring Checklist contains the following sections:

Table 4: Monitoring Checklist

Ref	Contest	Information	Where in the ID drawings have been included
M1	Contests 3	Electrical topology (Electrical/PV Single-line Diagram indication the proposed location for the SDME meters)	≪specify≫
M2	Contests 3	Terminal blocks: location, quantity, and distance to the MP	
M3	Contests 3	Electricity sub-metering: Conduits between the MP and the Electrical Panel, indicating their diameters or section.	
M4	Contests 3	Electricity sub-metering: space (and protection) in the Main Electrical Panel for the HVAC/Lighting meter	
M5	N/A	Electricity sub-metering: space (and protections) in the Main Electrical Panel for the EV meters	
M6	Contests 3	Monitoring Panel: connections to the Main Electrical Panel	
M7	Contests 3	Monitoring Panel: connections to the terminal blocks	
M8	Contests 3, 5 and 6	Monitoring Panel: location and space for its installation,	
M9	Contests 3, 5 and 6	Monitoring Panel: connections to the outdoor enclosure (power line and data grid)	
M10	Contests 5 and 6	Monitoring Panel: connections to the sensors	
M11	Contests 5 and 6	Conduits, channeling, junction boxes and Feed-throughs, including diameter (or section) and location. (floor plan and section, if needed)	
M12	Contests 5 and 6	Sensors and pedestals locations (permanent and during the public Tours)	
M13	Contests 5 and 6	Length of the wires between the sensors and the Monitoring Panel (floor plan)	
M14	Contest 6	Home appliances table: brand and model, capacity (interior volume), rules compliance	
M15	Contest 6	Water meter (WM): location, clearance, space, valves, and connectors	

11. THE EVENT

11-1 Registration

All Solar Decathlon Middle East participants, attending the Final Phase of the Competition, must register through the online registration site, which will be available closer to the event. Only for special cases, registration will be on-site in Dubai, UAE. Due to safety concerns, the different categories of participants will have different types of access (such as to restricted areas or during restricted times).

The following rules apply to registrants:

a) All registrants:
   I. Each event participant must register individually. Group registrations are not allowed.
   II. When registering, event participants must complete all required information and forms before access to the event is allowed.
b) Organizers, team members and jurors:
   I. Will be required to provide a photo that will be kept on file and used for security purposes.
   II. To avoid delays, the SDME 2018 Organization encourages using the online registration site and submitting the completed forms, information, and photos prior to the event.
   III. Once the SDME 2018 Organization receives all the information required, forms, and photos, an event security ID will be issued to all individuals which must be visible at all times.
c) Staff and team crew:
   I. Will be required to provide a photo that will be kept on file and used for security purposes.
d) Visiting media:
   I. Must check in at event headquarters.
   II. Will be required to provide a photo that will be kept on file and used for security purposes.

11-2 Use of the Solar Decathlon Middle East 2018 Logo

All communication materials produced by or in collaboration with the teams, before, during and after the competition, must refer prominently to the project as the Solar Decathlon Middle East 2018 in Dubai and shall credit the Solar Decathlon Middle East as indicated by the organizers. This includes all the materials and/or means in which companies and/or institutions refer to their collaboration with one or more teams by using their logo(s). The SDME Corporate Identity Manual includes specific instructions for this use.

The Solar Decathlon Middle East 2018 in Dubai shall be recognized wherever teams' logos are used. The possible combinations between SDME and teams' logos shall be described in the team's visual identity manual, and must comply with the SDME 2018's Corporate Identity Manual.

11-3 Teams' Sponsors and Supporting Institutions

Teams' Sponsors & Supporting Institutions are a very important aspect of the SDME 2018 Competition. For this purpose, each participant Team may select the companies and/or institutions that best serve the development of their purposes. However, both (the participant team, and the team's sponsors and supporting institutions) will have to comply with the SDME 2018 Rules.

The relationship between SDME 2018 and teams' sponsors will always be done through the team's sponsorship contact. SDME 2018 Organization will not have direct contact with the teams' sponsors.

Teams' sponsors and supporting institutions may be recognized with text, logos, or both, but the text and logos must appear in conjunction with the Solar Decathlon Middle East 2018 in Dubai logo and the Event Supporting Institutions and Main Event Sponsors. However, all these possible combinations must comply with the SDME 2018's Corporate Identity Manual.

Solar Decathlon Middle East 2018 logo is available through the SDME Teams Portal and can be requested via email.

Teams may include the logo of their teams' supporting institutions and sponsors in the following:

a) Before the competition: in any element, as long as you fulfill the SDME 2018 Rules requirements regarding use and size.
b) During the competition at the Solar Hai: Commercial or technical advertising in the house's interior is forbidden, except for the following cases:
    I. On the explanatory panels located inside the house lot (in the outdoor waiting areas). Logos must be included in a vertical or horizontal strip that should not cover more than 25% of the total panel surface.
    II. In the teams' website and/or other services for mobile devices that teams may provide, included in the Sponsorship's section. Additionally, it may be included inside a vertical or horizontal strip, with a maximum size of 10% of the screen's total surface.
    III. On the informational brochure, handout or any other object that may be given to the public-
    IV. On the back of the decathletes' uniforms.
    V. Off-the-shelf components that feature a built-in manufacturer's logo are acceptable and do not need to comply with the SDME and team's logo requirements.
    VI. In any vehicle and/or material, only during assembly and disassembly phases.
    VII. In the team's audiovisuals as part of their deliverables.
    VIII. Houses cannot be named after their sponsors, and houses' logos cannot directly refer to their sponsor's corporate identity ("Direct reference" is subject to the SDME 2018 Organizers' interpretation).
    IX. Communication 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.

11-4 Team Uniforms

a) During contests period, workshop 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) Uniforms will help to identify team's members quickly and easily, and will be composed of a series of wearable items.
c) On the front part of teams' uniforms (jacket, shirt, hat or other wearable item), only the team's logo and the SDME's logo should be visible
d) On the reverse of teams' uniforms (jacket, shirt, hat, or other wearable item), team sponsor logos may be visible only if complying with the logos rules requirements.
e) A built-in clothing manufacturer logo may be visible on the front or back of the team uniform.
f) Since the Solar Hai is a public space, Teams should maintain the dress code required for public areas.
g) Each team will determine its uniforms' color(s) as part of the team's deliverables. In case of too much similarity between two teams, the Organization will ask for a second choice. The objective is to avoid visual uniformity and facilitate SDME 2018 communication.
h) Uniforms design will be evaluated by the Communication jury.

11-5 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) for its members.
d) Each team is responsible for making its own reservations and arrangements and for covering all necessary costs.

11-6 Documents on-site and Inspections

a) **Documents on-site**

I. Teams must maintain the following documents at their lot, from the first day of the assembly until the end of the disassembly phase.
   - A hard copy of the approved construction documents: Construction Drawings and the Project Manual with the structural and electrical sections, signed and stamped.
   - A hard copy of the approved Health and Safety plan.

II. These documents must always be available for use by the Inspectors, members of official agencies and SDME organizer.

b) **Inspections**

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

I. 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.
II. Spot checks for compliance shall take place throughout the Final Phase of the SDME 2018 Competition.
III. 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 contest. All final inspections shall be passed by the end of the inspectors' workday for a team to be eligible to participate in the following day's contest. **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.
IV. Because open, partially functioning houses are preferable to closed, fully functioning houses, the organizers may direct the inspectors to require that an unsafe condition be corrected so public tours can occur - even if, as a consequence, the house is ineligible for participation in the contests.

12. CONTESTS PERIOD

12-1 House Occupancy

Under normal circumstances, when the occupancy rule is in effect, no more than six people, and no less than two people may be located in the house measurable area at any one time.

a) The house occupancy rule is automatically suspended whenever the Comfort Conditions contest measurements are suspended, e.g. during the public tours.
b) During Dinner Gathering, the house occupancy rule is automatically suspended.
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.

12-2 House Operators

Only Decathletes are permitted to operate the house and participate in the contest during contests period. All competition-related communications on the competition site shall be between the organizers and decathletes.

12-3 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 SDME Organization as soon as possible after the inconsistency is known. The SDME Organization will then submit this documentation or a summary of the documented inconsistencies to the respective juries and inspectors.
b) The Safety Officer should review the changes against the team's approved HS Plan to assess whether the changes warrant additional or different safety controls.
c) If undocumented inconsistencies are discovered during inspections, the SDME 2018 Organization will compile a summary of the inconsistencies and submit the summary to the respective juries.

12-4 Public Tour

a) During contests period, houses will be open to public tours during the times specified in the Competition Calendar.
b) Teams are required to provide an accessible route to all areas of the house and site that are available to the public during exhibition periods.
c) Teams are permitted to produce and distribute only one informational brochure or handout. Nevertheless, those might be different for each of the target groups. No other handouts are permitted to be distributed. The handout material and its properties, like its recyclability, content and creativity, will be positively evaluated.
d) Teams shall develop signage and information panels that complements public tours by informing visitors about the project and engaging visitors waiting in line.
e) Only organizers-approved vendors may provide food and beverage to the general public on the competition site.
f) Teams are responsible to provide adequate interior and exterior illumination levels in the route and areas available to the public during exhibition periods.

Additional requirements

Although teams must design only one route for all public, they may plan different explanations for each of the target groups: General public, professionals (architects, engineers, technicians and specialized press), youth, teenagers and children, as well as considering long and short tours, attending to the number of public waiting.

Teams must manage the waiting lines during public tours, and therefore design a specific area inside the lot for them to wait and include shade and any entertainment activity.

Public tours and explanations must consider people with disabilities. Therefore, teams must plan all the necessary actions or systems to let them follow the same visit as the rest of the public, without any information loss, neither being split up or given special attention. However, only once the public tour has finished, wheel chairs and strollers/push chairs (and people accompanying them) may have a different exit from the rest of the public.

During public tours, teams must provide access to the public areas of the house (at least living room and kitchen).

If the house has two different levels, and the planned public tours include visiting both levels, access must be granted for disabled people by means of mechanical elements (lifts), while following the UAE Building Regulations for the Disabled (http://www.moid.gov.ae/EPublications/The Building Regulation Facilities For the Disabled-en.pdf). Moreover, as it is mandatory to show the rest of the house, teams may make use of other means (such as models, videos, real time cameras, drawings, photos) for this end.

Augmented reality systems and/or any other electronic systems to enrich the public visit are permitted, beyond those provided for people with sensorial disabilities.

When planning their communication strategy during the Final Phase of the SDME 2018 Competition, teams must consider the following aspects:

- Most of the visitors coming to the Solar Hai will be English and Arabic speakers.
- Due to the climatic conditions in Dubai, teams are encouraged to plan shading areas, elements and/or devices inside their lot for the waiting public.

Auxiliary electric/electronic equipment used during public tours, such as TV, screens, beamers and music players must be powered by the house's energy. However, portable devices such as mobile phones and tablets used in the public tours not need to be charged in the houses if they meet all the requirement of the exception to the Rule 7-6-f.

12-5 Use of Houses During Event

Each house will be impounded under the direct supervision of the Organizers during a specific period of time. Team Members and Team Crew are not allowed to occupy, move, or conduct maintenance on any part of the house during the Impound. Please refer to the Competition Calendar.

12-6 Interior & Exterior Lighting

Each house will have to keep on the main lightings of all the indoor spaces and exterior lights during specified periods of time according to the Competition Calendar.

a) The dimmers of the required lighting fixtures must be adjusted to their highest positions and must be continuously on during the specified periods.

b) Task lighting, table lamps, range hood lighting, and lights located within residential appliances such as a refrigerator, clothes dryer, microwave, and oven that are intended to illuminate the interior of the appliance are not required to be on.
c) In case of technical problems, the team must notify the observer, to avoid point penalties.

12-7 Safety during the Event

Each Team is responsible for the safety of the general public into their house and on their lot.

12-8 House Configuration for Jury Tours

Teams shall show the juries, all possible configurations of the house during the jury tours.

a) House configurations that could affect the outcome of contests but were not seen by the jury during their tours, are prohibited during contests period. Some examples of reconfigurable features are the following:
    I. A significant movable component, such as a room, wall, or bed.
    II. Shading devices, such as retractable awnings or operable shutters.
    III. Reconfigurable cloth-drying area.
    IV. Window coverings that may obstruct views or reduce light levels.
b) If there is insufficient time to do a live reconfiguration during jury tours, teams may use some other method, such as photographs or video, to show all reconfigurable features in their various configurations. Reconfigurable features that will not actually be reconfigured at any time during contests period need not be reconfigured during jury tours.
c) All plug-in or portable appliances that may be used during contests period shall be in their fully deployed locations and configurations during jury tours. Also, be aware that juries may request that plug-in, portable, or hard-wired appliances be turned on so they can evaluate noise levels or other characteristics of the appliances that may not be evident when the appliance is off.

12-9 Teams Activities at the Solar Hai

a) Only SDME approved activities are permitted at the Solar Hai.
b) Teams wishing to hold any activity not specified in the Competition Calendar, in their homes, lot or any other area of the Solar Hai, must request authorization from the SDME Organization. These include any event co-organized by teams and governments/supporting institutions/sponsoring companies from official receptions to product presentations.
c) The Organization has the authority to reject or approve any request and may issue a conditional approval or suggest a change of date or time.

13. DELIVERABLES

a) The SDME 2018 Competition involves eight deliverables that should be submitted by the participating teams at different phases in the competition, as listed in the preliminary Deliverables Schedule (Table 5).
b) The primary purposes of the deliverables are to ensure the safety, verify SDME Rules and Building Code compliance, generate the construction documents, prepare the Teams for the competition, develop the communication strategies, produce dissemination material and making known the Teams and their projects.
c) The specific objectives of each deliverable, the deliverables submission instructions and the documents formatting requirements are all clarified in separate documents called “Content and Criteria”, available at the SDME Teams Portal.
d) General comments, guidelines, and information for the project drawings are available in Appendix 1.
e) The juries will review and evaluate the final version of the Teams' deliverables (First phase of the juries’ evaluation).
f) The SDME Organization is committed to assist the Teams in their preparation for the contests and help them to understand the rules. Therefore, after each deliverable, the Organization will send a "Deliverable Report" to each Team, with comments about the rules compliances and other suggestions.
g) The information and suggestions contained in "Deliverable Reports" are not intended to relieve the Teams of responsibility for complying with the SDME Rules and the required codes and standards.

Table 5: Deliverables Schedule

Deliverable No.	Phase	Due Date	Documentation Name	Abbreviations
Deliverable #1	Communication 1 (COM)	6-Dec-2016	Web page (Preliminary)	Web#1
			Audiovisual #1	AV#1
			Press Kit #1	PK#1
Deliverable #2	Schematic Design (SD)	8-Mar-2017	Project Drawings #1	PD#1
			Project Manual #1	PM#1
			Web page	Web#2
			Press Kit #2	PK#2
Deliverable #3	Communication 1 (COM)	19-Sep-2017	Audiovisual #2	AV#2
			Architectural Model	N/A
			Press Kit #3	PK#3
Deliverable #4	Design Development (DD)	29-Oct-2017	Project Drawings #2	PD#2
			Project Manual #2	PM#2
			Electric and PV Chart and Checklists	PV#1
Deliverable #5	Construction Documents (CD)	21-Feb-2018	Project Drawings #3	PD#3
			Project Manual #3	PM#3
			Design Approval Documents 1	DA#1
			Simulation Report #1	SIR#1
			Electric and PV Chart and Checklists	PV#2
			Press Kit #4	PK#4
Deliverable #6	Final Construction Documents (CD)	15-May-2018	Project Drawings #4	PD#4
			Project Manual #4	PM#4
			Design Approval Documents 2	DA#2
			Monitoring Checklist #1	MO#1
			Visitor's Guide information	INF
			Simulation Report #2	SIR#2
			Electric and PV Chart and Checklists	PV#3
Deliverable #7	Competition Documents (COMP)	4-Sep-2018	Project Drawings #5	PD#5
			Project Manual #5	PM#5
			Design Approval Documents #3	DA#3
			Contests Reports (See note #1)	
			Simulation Report #2	SIR#3
			Electric and PV Chart and Checklists	PV#4
			Monitoring Checklist #2	MO#2
			Audiovisual #3	AV#3
			Press Kit #5	PK#5
Deliverable #8	Final Report (FR)	19-Dec-2018	As-Built Drawings	PD#6
			As-Built Project Manual	PM#6
			Simulation Report #3	SIR#3
			Press Kit #6	PK#6
			Introduce Project info in the Web Database	

Notes:

1. The Contest Reports for Juries must be included in the Project Manual, section "Contests, and Special Awards Supportive Information." They also must be submitted as separate PDF files.
2. The abbreviations for the Contest Reports for Juries files are ARC (Architecture), ENG (Engineering and Construction), EE (Energy Efficiency), COM (Communication), SUS (Sustainability). Similarly, the abbreviations for the Special Awards reports are INN (Innovation), ID (Interior Design) and BIPV (Building Integrated Photovoltaics).

CONTESTS

The Solar Decathlon Middle East competition consists of ten separately scored contests. Some contests have various sub-contests. Each one of contests has its assessment criteria. The Organization will reward the winners in each of the contests in addition to the overall competition winners.

SDME 2018 Contests

1 Architecture
2 Engineering and Construction
3 Energy Management
4 Energy Efficiency
5 Comfort Conditions
6 House Functioning
7 Sustainable Transportation
8 Sustainability
9 Communication
10 Innovation

Competition Scoring

In the SDME Competition, there are three different ways to earn points: Jury evaluation, Task completion, and Monitored performance. Please refer to table 6 for contest structure and scoring system.

Jury Scoring

A multidisciplinary jury, composed of renowned experts, will use their knowledge and experience for the evaluation of the houses. The scorings will be carried out following the evaluation criteria and guidelines developed by the SDME Organization. The Jury assessment and scorings are final, and no appeals are allowed.

Monitored performance Scoring

During the contests period, the houses will be continuously monitored, and additionally, spot measurements will be done. The monitored performance scoring is based on the criteria indicated in the contest details. Points for measured performance are awarded performance requirements are met or partially met.

Task Completion Scoring

Teams will obtain points by successfully completing the requested tasks. Each task will be observed by an observer, who will be recording the results.

Table 6: Contest Structure and scoring system

ID	Contest and sub-contests	Type	Contest Points	Sub-Contest Points
1	Architecture	Juried	100	
2	Engineering and Construction	Juried	100	
3	Energy Management		140	
	3.1 Load consumption per surface area.	Monitored		60
	3.2 Net electrical balance	Monitored		45
	3.3 Temporary generation-consumption profile patterns correlation.	Monitored		15
	3.4 Demand response	Monitored		20
4	Energy Efficiency	Juried	80	
5	Comfort Conditions		120	
	5.1 Temperature	Monitored		70
	5.2 Humidity	Monitored		15
	5.3 Air quality – CO2	Monitored		5
	5.4 Lighting	Monitored		15
	5.5 Façade airborne sound insulation[1]	Monitored		10
	5.6 HVAC systems noise[1]	Monitored		5
6	House Functioning		120	
	6.1 Refrigeration	Monitored		5
	6.2 Freezing	Monitored		5
	6.3 Water Balance[2]	Monitored		30
	6.4 Clothes Washing	Monitored/ Task		10
	6.5 Clothes Drying	Task		10
	6.6 Dishwashing	Monitored/ Task		10
	6.7 Oven	Monitored/ Task		10
	6.8 Hot Water Draws	Task		15
	6.9 Cooking	Task		10
	6.10 Home Electronics	Task		5
	6.11 Dinner	Task		10
7	Sustainable Transportation	Task	80	
	7.1 Driving task completion			50
	7.2 Energy-efficient driving			30
8	Sustainability	Juried	100	
9	Communication	Juried	80	
10	Innovation	Juried	80	
	10.1 Architecture			15
	10.2 Engineering and Construction			20
	10.3 Energy Efficiency			20
	10.4 Communication			10
	10.5 Sustainability			15

CONTEST 1: ARCHITECTURE

Objective

To evaluate the coherence of the design, the flexibility of space, the innovation, the seamless integration of technologies in the house's architecture and how the house's design responds to the conditioning factors of the Middle East.

Evaluation

A multidisciplinary jury of renowned architects will evaluate the associated deliverables, in addition to on-site evaluation of the house.

Evaluation Concepts / Sub-contests

- Design coherence
- Formal expression
- Spatial quality and flexibility
- Innovative solutions
- Technologies' integration
- Response to the Middle East context

- **Design's coherence**: Clarity in the conception of the architectural idea and the house' spaces. Synthetic, essential, simple and radical proposals will be assessed positively. The coherence between the lot landscaping and the house design will also be evaluated.

- **Formal expression and technologies' integration**: Correct use of architectural values as composition, balance, scale and proportions.

- **Spatial quality and flexibility**: Produce high quality and flexible spaces, addressing solutions as expansion-transition areas, transformable or multi-use spaces, and an adequate indoor/outdoor relation. The daylighting and artificial light design will also be evaluated.

- **Innovative solutions**: The use of innovative designs, spaces and materials.

- **Technologies integration**: The seamless integration of the house technologies, including the solar systems, in the design concept and the formal expression of the project.

- **Response to Middle East context**: Selection of skins, shapes, materials, systems and strategies adequate to the local weather and how the project responds to the necessities, lifestyle, and aspirations of a specific sector of the Middle East population.

Scoring

A total of 100 points will be awarded by the corresponding jury for this contest.

CONTEST 2: ENGINEERING AND CONSTRUCTION

Objective

To evaluate the construction and engineering systems design merits, innovation, integration and implementation. Teams must demonstrate the higher level of functionality of the house structure, electricity, plumbing and solar systems design and construction.

Evaluation

A multidisciplinary jury of engineering specialists will evaluate the associated deliverables, in addition to on-site evaluation of the house. The application of research results and solutions developed by or with the students' collaboration will be evaluated positively.

Evaluation Concepts / Sub-contests

- Construction system and assembly of the house
- House Structure
- Plumbing System
- Electrical System
- Solar Systems
- Energy Strategy and Simulations

- **Construction system and assembly of the house**: evaluation of the selected construction system and the constructive solutions for the envelope, partitions, and finishes. The planning of the assembly of the house on the site will also be assessed.

- **House Structure**: The structural concept, typology, innovation, calculations and construction will be assessed.

- **Plumbing System**: The concept, dimensioning, innovation and installation of the plumbing systems as well as the equipment and fixtures selection will be assessed. Technical aspects of water saving solutions as greywater or water treatment will be also evaluated.

- **Electrical System:** The topology, dimensioning, innovation and installation of the electrical system.

- **Solar Systems:** The functionality, design, innovation and installations will be assessed in addition to the building integration of the PV and the solar thermal, if used. The use of solar thermal for purposes other than domestic hot water will be positively evaluated.

- **Energy Strategy and Simulations**: The annual, and contests period, electrical production simulations and analysis will be assessed in addition to the demand response strategy and the justification of the sizing of the PV array and the electrical energy storage system.

Scoring

A total of 100 points will be awarded by the corresponding jury for this contest.

CONTEST 3: ENERGY MANAGEMENT

Objective

To evaluate the house' electrical energy self-sufficiency, their energy consumption, and their electrical management system.

Evaluation

The evaluation is based on the collected data of the different electric energy flows by the organization's monitoring system during the contests period.

Evaluation Concepts / Sub-contests

3.1 Load consumption per surface area.
3.2 Net electrical balance
3.3 Temporary generation- consumption profile patterns correlation.
3.4 Demand response

Sub-contest 3.1: Load consumption per surface area

This contest aims to evaluate the electrical energy consumption of the houses fulfilling comfort conditions and functions. Some consumptions depend on the surface of the house as cooling and ventilation and others are fixed as the appliances. Therefore, in the competition, the load consumption of the houses is estimated using the following formula:

$$L = \frac{E_V}{A} + \frac{E_F}{C}$$

Where:
E_V = Consumption of systems related to the houses area: cooling, ventilation, and lighting.

E_F = Other consumptions including plug load, appliances, hot water, home automation systems, etc.

A = Measurable area of the house, as defined in Rule 6.3.

C = Average of the measurable area of all the projects

E_F value and the general consumption of the houses will be measured by the SDME monitoring system.

a) All available points will be earned by the house with the lowest energy consumption.
b) Reduced points are earned if the calculated house consumption is between the lowest consumption and 2.0 times the lowest consumption. Reduced point values are scaled linearly, as shown in Figure 3.
c) No points are earned if the calculated consumption is equal or higher than 2.0 times the lowest consumption.

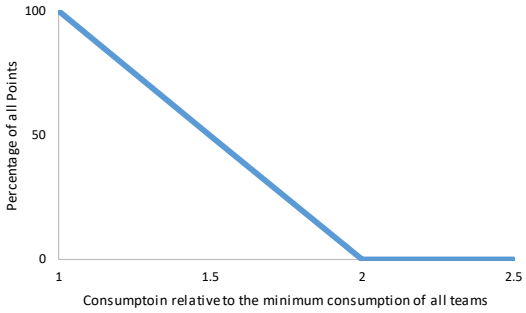


Figure 3. Load consumption per surface area sub-contest points' distribution

Notes:
1. E_v value will be determined using a specific electricity meter. This SDME meter will be located in the house electricity panel. Teams must leave a 95 mm free space in a DIN rail to place this meter. The space designed for this meter must be close to the independent breaker dedicate to merge the circuits related with the houses lighting and HVAC systems. See Technical Monitoring Procedures document available in the SDME Team Portal.
2. Teams who, in order to reduce energy consumption, intentionally do not maintain comfort conditions by disconnecting or not fully using active systems when they are required will be penalized.

Sub-contest 3.2: Net electrical balance

The score of the energy self-sufficiency of the houses will be determined at the conclusion of the contests period, based on the balance between the amount of electricity drawn from the grid and the amount of electricity sent to the grid.

a) All available points are earned for a net electrical energy balance of at least 0 kWh; that means that the amount of energy send to the grid is equal or higher than the energy drawn from the grid.
b) Reduced points are earned for a net electrical energy balance between -50 kWh and 0 kWh. Reduced points are scaled linearly, shown in Fig. 4.
c) No points are earned for a net electrical balance below -50 kWh.

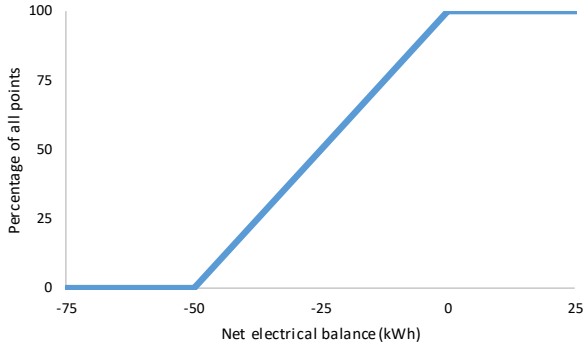


Figure 4. Net electrical balance sub-contest points' distribution

Note:
1: Teams who, in order to reduce energy consumption, intentionally do not try to maintain comfort conditions by disconnecting or not fully using active systems when they are required, could be disqualified in this sub-contest.

Sub Contest 3.3: Temporary Generation-Consumption Correlation

One of the main advantages of distributed solar generation is that electricity is consumed in the same place where it is generated. This reduces the need for transmission lines and minimizes the electricity transport losses. This effect is maximized if electricity is consumed at the same time as it is generated. This contest will evaluate the temporary correlation between electricity generated and simultaneously consumed and the total electricity consumed, during the monitored period. This correlation is the following:

$$\xi = \frac{E_{G\_L}}{E_L}$$

Where E_{G_L} is the electricity generated and simultaneously consumed by the loads, and E_L is the electricity consumed by the loads.

If batteries are included the following equation applies:

$$\xi = \frac{E_{G\_L} + E_{Bat\_L}}{E_L}$$

Where E_{Bat_L} is the electricity supplied by the batteries to the loads. Points will be awarded according to the following expression:

$$\text{Points obtained} = \text{Total possible points} \cdot \xi$$

Notes:

1: E_{G_L} will only be measured during the daily intervals in which the houses have the same solar access and E_L will be measured 24h/24.

2: Remember that the energy stored in the batteries can only be from the solar electrical source.

Sub Contest 3.4: Demand response

Demand response provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage during peak periods. In the competition, to engage the Teams to shift their electricity usage to Off-peak times, the electricity rates will be lower during the Off-peak and Shoulder periods and higher during the On-peak period. The Off-peak period is from 22:00 to 7:00, the Shoulder periods are from 7:00 to 12:00 and from 17:00 to 22:00, and the On-peak period is from 12:00 to 17:00. The electricity taken from the grid will be billed in Shams (SDME's currency) per kWh, as shown in Figure 5.

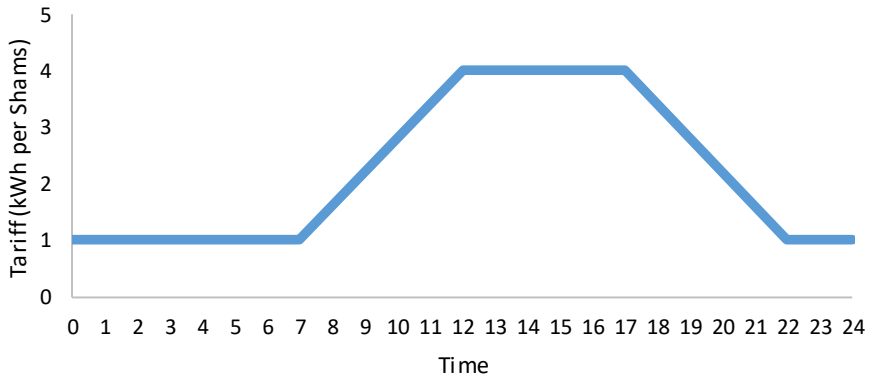


Figure 5: Electricity pricing structure (Shams per kWh)

a) All available points are earned at the conclusion of the contests period for the house with the lowest bill.
b) Reduced points are earned for the houses with bills between the lowest bill and twice the houses' average bill. Reduced point values are scaled linearly, as shown in Figure 6.
c) No points are earned for the houses with bills equal or higher than twice the houses' average bill.

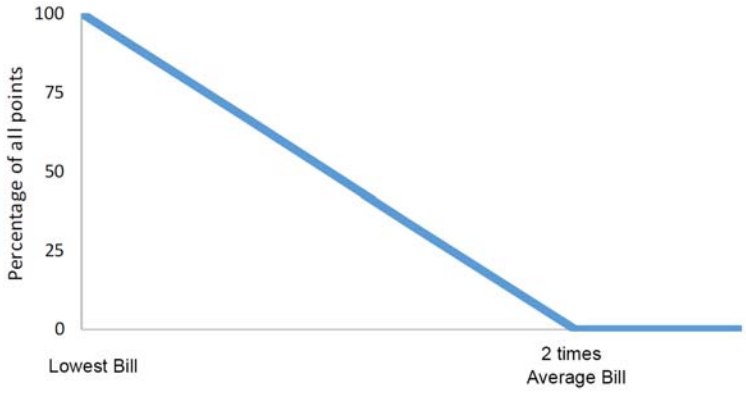


Figure 6: Demand response sub-contest points' distribution

Scoring

A total of 140 points will be awarded for this contest in the competition.

CONTEST 4: ENERGY EFFICIENCY

Objective

To evaluate the functionality and efficiency of the houses design, systems and components, in addition to their contribution in reducing energy consumption.

Evaluation

A multidisciplinary jury of building services specialists will evaluate the houses energy efficiency, based on the associated deliverables and the on-site verification. The application of research results and solutions developed by or with the students' collaboration will be evaluated positively.

Evaluation Concepts / Sub-contests

- Efficiency of the House Envelope
- Efficiency of passive and semi-passive solutions
- Efficiency of the active systems
- Efficiency of the appliances
- Efficiency increase due to the smart management
- Building performance simulations

• **Efficiency of the House Envelope**: Appropriate design, dimensioning and material selection of walls, roof, floors, and glazing to minimize the lighting and AC energy requirements.

• **Efficiency of passive or semi-passive strategies**: Effective use natural sources to respond to local climate, maximizing the occupants' thermal and lighting comfort while minimizing its energy consumption.

• **Efficiency of the active systems**: Type, dimensioning and management of the HVAC, lighting and hot water systems will be evaluated, considering their energy efficiency and their capacity to meet the occupant's needs.

• **Efficiency of the appliances**: Selection of high energy efficiency appliances with appropriate sizes to meet the occupants' requirements. Smart devices and their adequate interaction with the house energy management system will be evaluated positively.

• **Efficiency increase due to the smart management**: Innovate building controls, automation systems, internet of the things (IoT), and any smart management solutions that contribute to the increase the house comfort and its energy performance will be evaluated. The development of creative interfaces that help to improve the occupants' energy consumption behavior will be assessed positively.

• **Building performance simulations**: Thermal, lighting, and energy simulations, as well as the annual energy balance estimation of the houses will be assessed, considering the analysis process, and how the simulations have helped to develop a very high energy performance NZE project.

Scoring

A total of 80 points will be awarded for this contest in the competition.

CONTEST 5: COMFORT CONDITIONS

Objective

To evaluate the capacity for providing interior comfort through the control of temperature, humidity, daylighting, indoor air quality and acoustic performance.

Evaluation

The evaluation will be based on the collected data by the organization's monitoring and testing systems during the contests period.

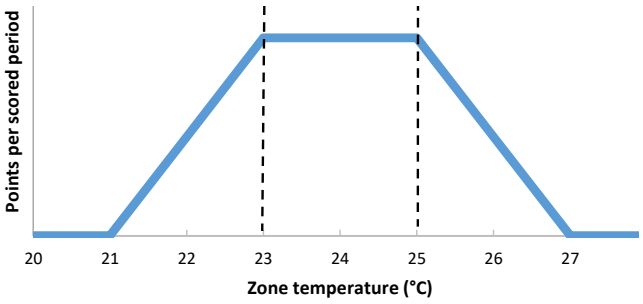
Evaluation Concepts / Sub-contests

5.1 Temperature	5.4 Lighting
5.2 Humidity	5.5 Façade airborne sound insulation
5.3 Air quality – CO2	5.6 HVAC systems noise

Sub-contest 5.1: Temperature

The interior temperature will be constantly measured in least two thermal zones of the house. The organizers will select these zones and will place a temperature sensor (globe thermometers according to CE 7726 standard) in each of them. In case it is necessary, a third temperature sensor will be installed.

a. Each sensor will be scored separately.
b. All available points are earned at the conclusion of each scored period by keeping the time-averaged interior temperature between 23 °C (73.4 °F) and 25°C (77.0 °F) during the scored period. See the Competition Calendar for the schedule of scored periods.
c. Reduced points are earned if the time-averaged interior temperature is between 21°C (69.8°F) and 23 °C (73.4 °F) or between 25°C (77 °F) and 27°C (80.6 °F). Reduced point values will be scaled linearly, as shown in Figure 7.



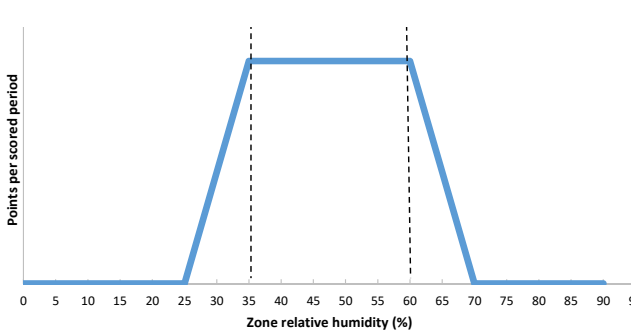
Full points:	23°C (73.4°F) ≤ Temperature ≤ 25°C (77 °F)
Reduced points:	21°C (69.8°F) < Temperature < 23°C (73.4°F)
or	25°C (77 °F) < Temperature < 27°C (80.6 °F)
No points:	Temperature ≤ 21°C (69.8°F)
	Temperature ≥ 27°C (80.6 °F)

Figure 7: Temperature sub contest point distribution

Sub-contest 5.2: Humidity

The relative humidity will be constantly measured. Two humidity sensors will be located next to the temperature sensors. Each sensor will be scored separately.

a. All available points are earned at the conclusion of each scored period by keeping the time-averaged interior relative humidity below 60.0% during the scored period. See the Competition Calendar for the schedule of scored periods.
b. Reduced points are earned if the time-averaged interior relative humidity keeps between 25% and 35% or between 60.0 % and 70.0 %. Reduced points values are scaled linearly, as shown in Figure 8.



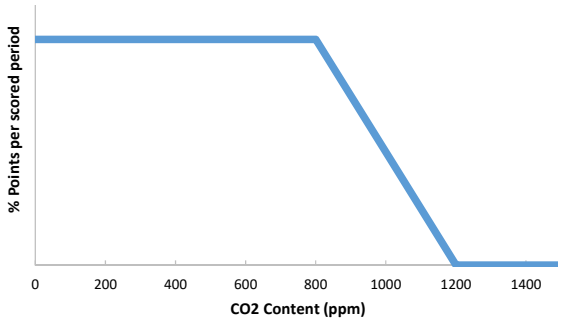
Full Points:	35% < Relative humidity < 60%
Reduced Points:	25% < Relative humidity < 35%
	60% < Relative humidity < 70%
No Points:	Relative humidity < 25%
No Points:	Relative humidity > 70%

Figure 8: Humidity sub contest point distribution

Sub-contest 5.3: Air quality – CO2

The content in CO2 in the air will be constantly measured. In most cases, CO2 sensors will be located next to temperature sensors.

a. All available points are earned at the conclusion of each scored period by keeping the content in CO2 below 800 ppm during the scored period. See the Competition Calendar for the schedule of scored periods.
b. Reduced points are earned if the content in CO2 is between 800 ppm and 1200 ppm. Reduced points values are scaled linearly, as shown in Figure 9.



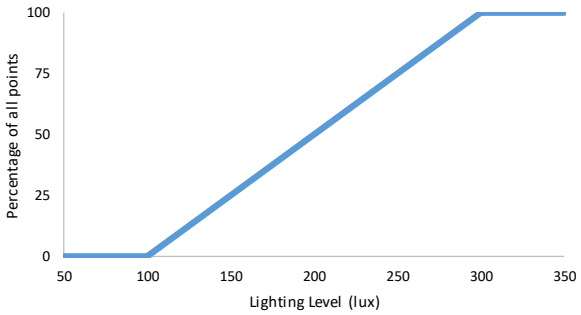
Full Points:			CO2 content	<	800 ppm
Reduced Points:	800 ppm	<	CO2 content	<	1200 ppm
No Points:			CO2 content	>	1200 ppm

Figure 9: Air quality (CO2) sub contest point distribution

Sub-contest 5.4: Lighting

The organizers will identify two zones in each house to measure the illumination level at the approximate center, or at the more used area, of each selected zone, at an approximate height of 0.90 m. Care will be taken to ensure that the measurement reflects the functional illumination of the room.

a) All available points are earned at the conclusion of each scored period by keeping the interior illumination levels at 300 lux or greater during the scored periods each day.
b) Reduced points are earned if the time-averaged interior illumination level is between 300 lux and 100 lux. Reduced point values are scaled linearly, as shown in Fig. 10.
a) No points are earned for interior illumination level below 100 lux.



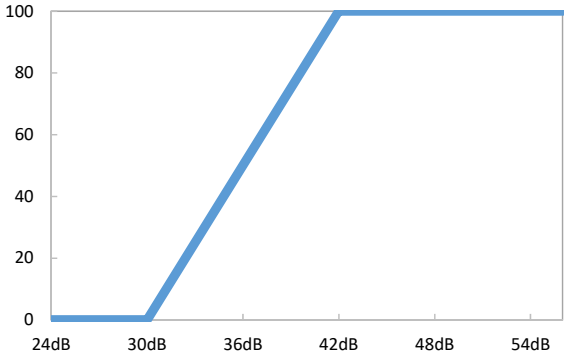
Full Points:			Lighting Level	>	300 lx
Reduced Points:	100 lx	<	Lighting Level	<	300 lx
No Points:			Lighting Level	<	100 lx

Figure 10: Natural light sub contest point distributing

Sub-contest 5.6: The façade airborne sound insulation

The measurement will be done according to the global method proposed in ISO 140-5:1998 standard. The sound insulation Dls,2m,nT (dB) values for each of the 1/3 octave bands will be calculated between 100Hz and 5 kHz. Dls,2m,nT,w (dB) calculated according to ISO 717-1:1996 will be used as assessment parameter.

a) All available points are earned at the conclusion of all the houses' sound measurements by having a sound insulation level equal to or above 42 dB.
b) Reduced points are earned if the sound insulation level is between 30 dB and 42 dB. Reduced points values are scaled linearly, as shown in Figure 11.



Full Points:			Sound Insulation	>	42 dB
Reduced Points:	30 dB	<	Sound Insulation	<	42 dB
No Points			Sound Insulation	<	30 dB

Figure 11: Internal acoustical performance points distribution

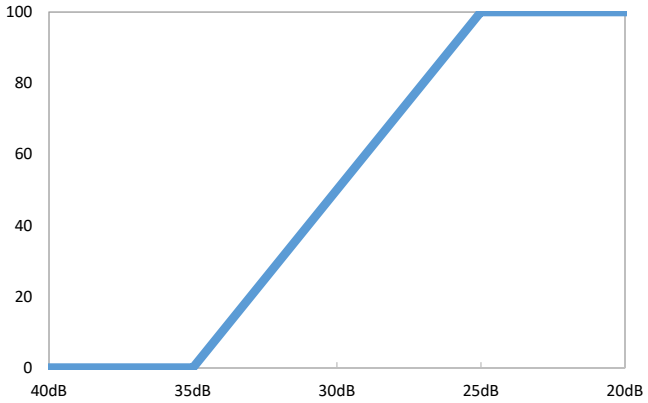
Sub-contest 5.6: HVAC systems noise

Sound level measurements for HVAC systems and any other active equipment will be measured in the living room. These acoustic measurements will be performed according to the ISO 10052: 2004 standard.

a) All available points are earned at the conclusion of the sound measurements sound level is equal or below 25 dB.

b) Reduced points will be earned if the sound level is between 25 dB and 35 dB. Reduced points values are scaled linearly, as shown in Figure 12.

c) No points will be earned if the sound level is equal or higher than 35 dB.



Full Points:			Acoustic values	<	25 dB
Reduced Points:	25 dB	<	Acoustic values	<	35 dB
No Points:			Acoustic values	>	35 dB

Figure 12. HVAC sound level inside housing unit point's distribution

---

Scoring

A total of 120 points will be awarded for this contest.

CONTEST 6: HOUSE FUNCTIONING

Objective

To evaluate the performance of the house and the efficiency of the selected appliances. The contest replicates normal activities and tasks of a contemporary home.

Evaluation

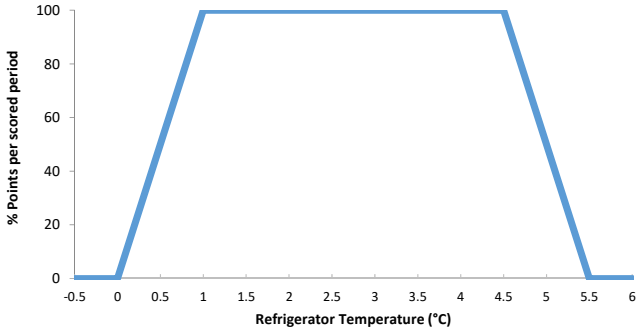
The evaluation will be based on the collected data by the organization's monitoring system during the contests period, in addition to the Team's degree of success in completing the required tasks.

Evaluation Concepts / Sub-contests

Monitored Performance Scoring:	6.7 Oven
6.1 Refrigeration	6.8 Hot Water Draws
6.2 Freezing	6.9 Cooking
6.3 Water Balance	6.10 Home Electronics
Tasks Completion Scoring:	Guests Scoring:
6.4 Clothes Washing	6.11 Dinner
6.5 Clothes Drying	
6.6 Dishwashing	

Sub-contest 6.1: Refrigeration

A sensor will be placed in the interior of the refrigerator to monitoring its internal temperature.
a). All available points are earned after each scored period by keeping the time-averaged Interior temperature of the refrigerator between 1.0°C and 4.5°C during the scored period.
b). Reduced points are earned if the time-averaged interior refrigerator temperature is between 0.0°C and 1.0°C or between 4.5°C and 5.5°C. Reduced point values will be scaled linearly, as shown in Figure 13.
C). No points are earned for a time-averaged interior refrigerator temperature below 0°C or above 5.5°C.



Full Points:	1.0O C	<	Temperature	<	4.5oC
Reduced Points:	0.0O C	<	Temperature	<	1.0oC
	4.5O C	<	Temperature	<	5.5oC
No Points:			Temperature	<	0.0oC
			Temperature	>	5.5oC

Figure 13: Refrigerator sub contest point's distribution

Notes:

1. Refrigerator volume shall be a minimum of 170 liters.
2. All food and beverages that will be used during the dinner contest and that need to be refrigerated must be stored in the home's refrigerator.
3. The refrigerator may only be used to store food and beverages
4. The refrigerator must be on during the whole contests period.

Sub-contest 6.2: Freezing

A sensor will be placed in the interior of the freezer its internal temperature.

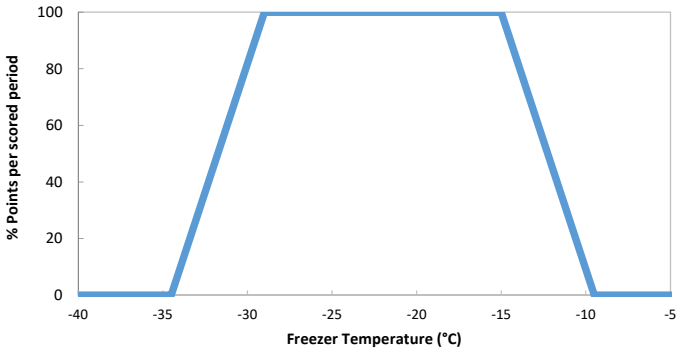
a) All available points are earned after each scored period by keeping the time-averaged interior temperature of the freezer between -29.0°C and -15.0°C during the contests' period.

b) Reduced points are earned if the time-averaged interior temperature is between -34.5ºC and -29.0°C or between -15.0°C and -9.50ºC. Reduced points will be scaled linearly, as shown in Figure 14.

c). No points are earned for a time-averaged internal freezer temperature below -29°C or above -9.5°C.

Notes:

1. The freezer volume shall be a minimum of 57 liters.
2. The freezer must on during the whole contests period.
1. The freezer may be used to store food and only enough ice to fill the freezer's ice bin (or equivalent).



Full Points:	-29O C	<	Temperature	<	-15oC
Reduced Points:	-34O C	<	Temperature	<	-29oC
	-15O C	<	Temperature	<	-9.5oC
No Points:			Temperature	<	-34.5oC
			Temperature	>	-9.5oC

Figure 14: Freezer sub contest point's distribution

Sub-contest 6.3: Water Balance

Water conservation is a relevant topic for the sustainable built environment. The water consumption of the participating houses will be measured during the contests' period. The houses water use will be calculated using the meters' initial value (beginning of the contests' period) and the end value (end of the contests' period). SDME Organization will perform a daily reading of the meters to verify the functioning of the measuring system.

a) The house with the lowest water consumption will achieve the maximum points available.
b) Reduced points are earned if the house's water consumption is between the lowest consumption and twice the houses' average consumption. Reduced point values will be scaled linearly, shown in Figure 15.
c) No points are earned if the house's water consumption is equal to or higher than twice the houses' average consumption.

Notes:

1. The hot water tank should be full at the beginning and at the end of the contests period.

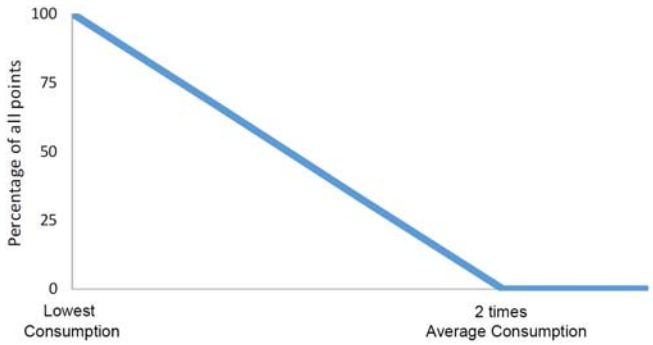


Figure 15: Water Balance sub contest point's distribution

Sub-contest 6.4: Clothes Washing

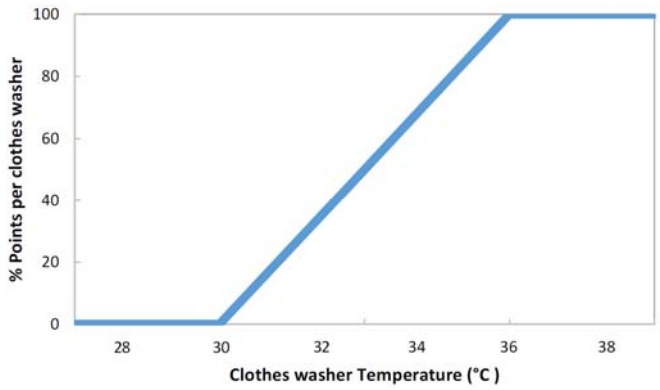
A sensor will be placed inside the clothes washer to monitor the temperature of the water. To be eligible for points, it is needed to run an automatic clothes washer containing a load of laundry through one, or more complete, uninterrupted, "normal/regular" (or equivalent) cycles.

a) All available points are earned if the temperature sensor reaches 36°C at some point in the cycle.
b) Reduced points are earned if the temperature sensor reaches a temperature higher than 30°C but does not reach 36°C. Reduced points will be scaled linearly, as shown in Fig. 16.
c) No points are earned if the temperature sensor does not reach a temperature higher than 30°C.

Notes:

1. A load of laundry is defined as six organizer-supplied big bath towels (approx. 2.5 kg).
2. The clothes washer shall operate automatically and have at least one wash and rinse cycle.
3. Cycle "interruption" includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual.
4. In a combination washer/dryer machines, the drying function shall be disabled until the completion of the wash cycle.

5. Cycle completion shall be confirmed by the observance of an audible or visible signal.
6. 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 chosen.



Full Points:	36° C	<	Temperature		
Reduced Points:	30° C	<	Temperature	<	36° C
No Points:			Temperature	<	30° C

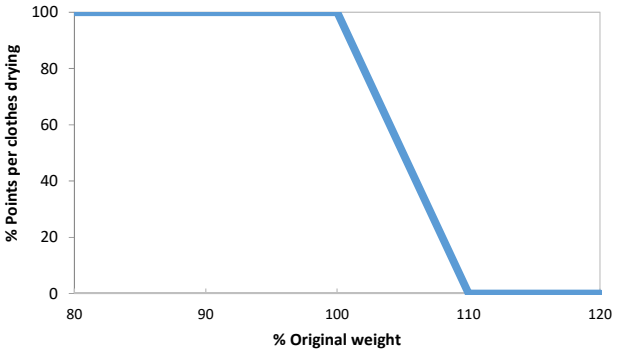
Figure 16. Clothes washer sub contest point's distribution

Sub-contest 6.5: Clothes drying

A load of washed laundry from the above task is eligible for clothes-drying points only if the load experienced a complete, uninterrupted cycle in an automatic clothes washer. The teams have a maximum of four hours to complete the washing and drying tasks.

a) All available points are earned by returning a load of laundry to a total weight less than or equal to the towels’ total weight before washing.
b) Reduced points are earned if the “dry” towels weight is between 100.0% and 110.0% of the original towels weight. Reduced point values are scaled linearly, as shown in Figure 17.
c) No points are earned for a measured weight above 110% of the original towels weight.

Notes:
1. Teams must specify in the project drawings the clothes drying method, or methods, that they plan to use during the competition. The drying method may include active drying (e.g., machine drying), passive drying, (e.g., on a clothesline), or any combination of active and passive drying.
2. The use of clothes dryer (or any other active dryer system) is not mandatory. Teams can decide to use only a natural dryer system.
3. Teams that plan to use drying machines, or other commercial clothes drying systems, must submit to the SDME Organization their technical information, in the Project Manual.
4. Teams that plan to use any custom made or non-commercial active or semi-passive drying system must submit drawings and explicative documentation and drawings of the proposed system. Additionally, an agency or external professional must certify that the proposed solution is safe and do not represent any risk for the users or the house visitors.
5. All drying methods that require the towels to be visible (such as on a clothesline) must be demonstrated to the Architecture juries as they visit the houses.



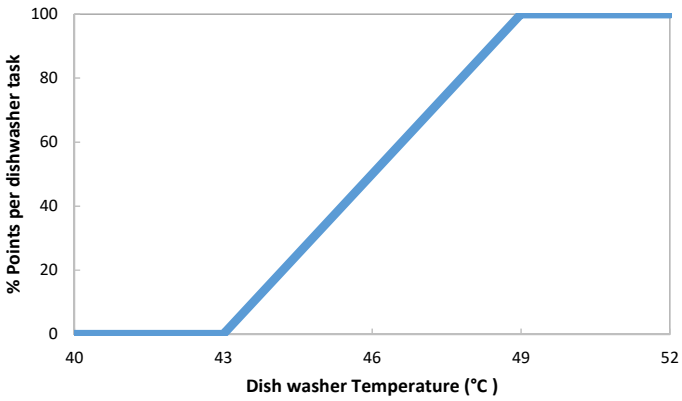
Full Points:			Weight	<	100%
Reduced Points:	100%	<	Weight	<	110%
No Points:			Weight	<	110%

Figure 17. Clothes dryer sub contest point's distribution

Sub-contest 6.6: Dishwashing

The dishwashing task requires to run a complete, uninterrupted, "Normal" (or equivalent) cycle within a specified period. A sensor, placed in the dishwasher, will be continuously measuring the temperature during the washer cycle.

a) All available points are earned if the water reaches a temperature equal or higher than 49.0 °C, at some point during the dishwashing cycle.
b) Reduced points are earned if the water reaches a temperature between 43.0 and 49.0 °C, at some point during the dishwashing cycle. Reduced point values will be scaled linearly, as shown in Figure 18.
c) No points are earned if the water does not reach a temperature over 43.0 °C.



Full Points:	490C	<	Temperature		
Reduced Points:	430C	<	Temperature	<	490C
No Points:			Temperature	<	430C

Figure 18: Dishwasher sub contest point's distribution

Notes:
1. The dishwasher must have a minimum capacity of six place settings per the manufacturer's specifications.
2. The dishwasher must operate automatically and have at least one wash and rinse cycle per task.
3. Cycle "interruption" includes the adjustment of supply temperature or flow in a manner not anticipated by the manufacturer or addressed in its operation manual.
4. Cycle completion shall be confirmed by the observance of an audible or visible signal.
5. Dishwasher may be run empty, partially loaded or fully loaded; the load may be soiled or clean.
6. 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.

Sub-contest 6.7: Oven

Oven task lasts 60 minutes, from its start to its stop. A sensor will be located inside the oven, to monitor the temperature during the entire oven task.

The temperature will be sampled every minute. The monitoring system will retain the value of the 45 highest measurements within the entire oven period (60 minutes) and take the lowest value among these 45 values as the oven temperature to be used for score calculation.

a) All available points are earned after each scored period if the oven temperature is above or equal to 220°C.
b) Reduced points are earned if the oven temperature is between 180°C and 220°C. Reduced points are scaled linearly, as shown in Figure 19.
c) No points are earned if the oven temperature is equal or lower than 180°C.

Note:
The oven volume published in the manufacturer's specifications shall be a minimum of 55 liters.

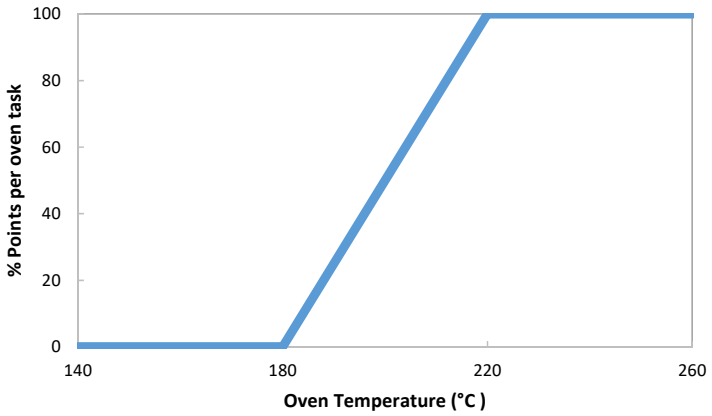


Figure 19: Oven sub contest point's distribution

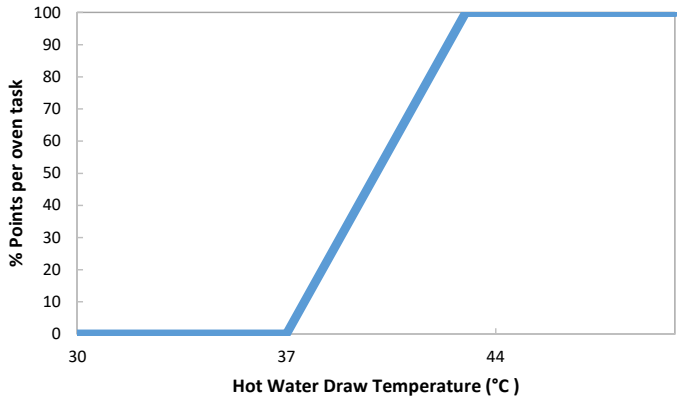
Sub-contest 6.8: Hot water draws

This sub-contest simulates most of the washing and bathing tasks. The hot water will be drawn from the shower and will occur during the times specified in the Competition Calendar. The maximum number of hot water draws for one day will not exceed three, but they may occur consecutively. For each task, only the houses that deliver at least 50 liters of hot water in 10 minutes or less will be eligible for points. The water will be collected in a container and its temperature will be measured by the organizers.

a) All available points are earned be delivering an average water temperature of at least 43°C.
b) Reduced points are earned for water temperatures between 37.0°C and 43.0°C. Reduced point values are scaled linearly as shown in Figure 20.
c) An average water temperature equal or below 37°C earns no points.

Notes:

1. Before carrying out this task, it is necessary to remove the shower head, to be able to connect a hose in the shower.
2. The Organizers will send to the Teams the information about the hose connection requirements.



Full Points:			Temperature	>	43oC
Reduced Points:	37O C	<	Temperature	<	43oC
No Points:			Temperature	<	37oC

Figure 20: Hot water draws sub contest points distribution

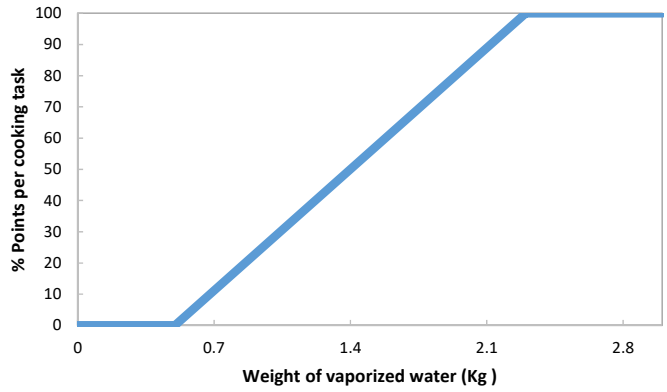
Sub-contest 6.9: Cooking

Teams must evaporate 2.3 kg of water by using a kitchen appliance. They have a maximum of two hours to perform the cooking task.

a) All available points are earned by evaporating the 2.3 kg of water within a specified period.
b) Reduced points are earned if between 0.5 kg and 2.3 kg of water are vaporized. Reduced point values are scaled linearly, as shown in Figure 21.
c) No points are earned if the evaporated water is equal or less to 0.5 kg.

Notes:

1. Any kitchen appliance may be used, but it must operate in its normal configuration as it is vaporizing the water.
2. The water shall be vaporized in a single container, and the starting water weight shall be at least 2.75 kg.



Full Points:			Weight	>	2,3kg
Reduced Points:	0,5kg	<	Weight	<	2,3kg
No Points:			Weight	<	0,5kg

Figure 21: Cooking sub contest point's distribution

Sub-contest 6.10: Home Electronics

All available points are earned for showing videos on the computer display, and on the TV during the specified periods of time. For the home electronics periods, refer to the Competition Calendar.

Notes:

1. The TV shall be a minimum of 32 in. (81.28 cm) per the manufacturer's stated display size.
2. The computer display shall be a minimum of 17 in. (43.2 cm) per the manufacturer's stated display size. The computer may be a notebook, laptop, or desktop computer.
3. The TV and computer screens shall be able to be operated simultaneously and controlled independently of each other. Each must remain in the house for the duration of contest week.
4. Functions of "Screensaver", "Stand by", or another mode that reduces the energy consumption of these devices must be disabled during this task period.
5. The brightness of TV and computer displays shall be set to at least 75% of maximum. Observers will conduct spot checks to verify that the brightness of the screen is at the required level.
6. All content show by the computer display and the TV must comply with the Rule 3.4 and need to be approved by the SDME organization.
7. The organizers may supply content to be displayed on the computer and TV.

Sub-contest 6.11: Dining

Each team shall host three dinner gatherings during the contests period. Dinner gatherings will feature a pair of guest decathletes from three neighboring houses. There will be a total of eight diners: two hosts, and six guests. The organizers can replace two guests from neighbor houses with two VIP guests.

The guests shall use the scoring chart that the observers give to them (one per guest team) when entering the house for the dinner gathering. The guests must provide the chart back to the observer, once filled out at the end of the dinner. Each guest team shall assign a score to the host team after each dinner gathering. The quality of the meal, atmosphere, and overall experience will be evaluated as excellent, very good or good.

a) Decathletes must prepare and cook all food and beverages in the house during the period indicated.
b) The host decathletes must serve a complete meal with an adequate amount of food for all diners (eight people) at appropriate serving temperatures and in a timely manner.
c) All meals must be made in the houses with fresh ingredients. Ordered "take-out" and pre-cooked "over-the-counter" food items are not permitted. The meals must contain at least one main hot dish.
d) The meal shall be served and eaten in the house measurable area.
f) If desired, considering the task's time, before the dinner portion of the gathering, the host team may share with the guests and offer them hors d'oeuvres and beverages, outside of the house's measurable area.
h)Teams hosting dinner parties shall comply with the following requirements:

i. The use of fire for cooking is prohibited. Do not use any flames, including candle flames.
ii. Do not serve or utilize any alcoholic beverages.
iii. Do not serve or utilize pork or any pork product.
iv. Use only drinking water purchased in sealed containers, for both cooking and drinking.
v. All dishes and cookware shall be washed with hot water and soap and rinsed prior to use.
vi. Store all food and beverages properly while on the competition site, e.g., beverages and foods marked "refrigerate after opening" must be refrigerated appropriately after opening.
vii. Do not use portable coolers (ice box) to store food, beverages, or ice on the competition site.
viii. Provide the list of ingredients for all items served at each dinner party, to help prevent allergic reactions among diners. Common food allergies include milk/dairy products, eggs, peanuts, tree nuts (walnuts, cashews, pecans, etc.), fish, shellfish, soy, and wheat.
ix. Outdoor cooking and grilling are prohibited for health and safety reasons. Teams can include outdoor cooking equipment in their houses but not use them in the Solar Hai.

Scoring

A total of 120 points will be awarded for this contest in the competition.

CONTEST 7: SUSTAINABLE TRANSPORTATION

Objective

To evaluate the simulation of a typical household driving patterns. In this contest, teams should drive an electric vehicle charged from the house's electric system several times during the competition.

Evaluation

The evaluation is based on the collected data from the team's electric vehicle odometer and its battery level during the contests period.

Evaluation Concepts / Sub-contests
7.1 Driving task completion
7.2 Energy-efficient driving

Sub-contest 7.1: Driving task completion

The organizers will provide the places that must be visited by the teams in their cars. All available points are earned visiting the specified places and returning to their houses within the time established by the organization. The driving distance per task will be different every day. The total driving distance during the contest period will be around 400 Kilometers (250 miles). Teams may choose when to begin each task and the order in which they will visit the places, but each task must begin and end within the times indicated in the competition calendar.

a) All available points are earned by completing the driving task, complying with all the requirements of this contest.
b) Reduced points are earned depending on the percentage of completion of the driving task.

Sub-contest 7.2: Energy-efficient driving

The driving distance and the energy consumption of each driving task will be measured, to evaluate the smart and energy-efficient driving behaviors of the participating teams. The driving efficiency will be expressed in kWh/100km.

a) All available points will be earned by the team with the highest energy efficiency (the lowest kWh/100km).
b) Reduced points are earned if the team driving efficiency is between the highest efficiency and 30% less of the highest efficiency. Reduced point values will be scaled linearly.
c) No points are earned for the team with the efficiency equal or lower than 30% of the highest efficiency.

Notes:

1. Teams are eligible for efficient-driving sub-contest points only if they previously have completed the driving task, as described in the Sub-contest 7.1
2. Teams must consider Rule 4-12 regarding the electric vehicle.
3. Any modification of the vehicles, or their parts, is prohibited.
4. The vehicle must be driven by a decathlete who is licensed with an international driving license to operate a motor vehicle and accompanied by at least one passenger.
5. Both the driver and the passenger must wear a seat belt.
6. Driver must comply with all the Dubai driving laws and respect the maximum and minimum speed limits. Teams are responsible for the payment of any traffic fines they might receive.
7. Driver shall notify the Organizer about any problem that prevents them from continuing the travel or maintaining the speed required on the road.

8. If a Team does not do, or complete, the driving task without any reasonable justification, they will be penalized, and additionally, the estimated consumption of the task will be added to the consumption of the Energy Management contest.
9. If a Team does not do, or complete, the driving task due to a reasonable reason will be not penalized. However, the estimated consumption of the task will be added to the consumption of the Energy Management contest.
10. The electric vehicle must only be charged from the house electrical system, and the vehicle batteries must be full at the completion of the contests period.
11. Teams that try to cheat or circumvent the system will lose all the points of this contest.

Scoring

A total of 80 points will be awarded for this contest in the competition: 50 points for driving task completion and 30 points for energy-efficient driving.

CONTEST 8: SUSTAINABILITY

Objective

To evaluate the sustainability of the house, including the reduction of its environmental impact during its whole life-cycle, through its design, systems, and components. The water conservation initiatives and the vegetation are part of this evaluation.

Evaluation

A jury of professionals specialized in the different areas of the contest will evaluate the associated deliverables, in addition to on-site assessment of the house.

Evaluation Concepts / Sub-contests

- Sustainability in the project
- Construction systems
- Materials
- Bioclimatic strategies
- Active systems and equipment
- Solar systems
- Water
- Vegetation
- Waste

• **Sustainability in the project:** Relation between the general concepts of the house and the sustainability will be evaluated, as well as the Team understanding of the Sustainable Built Environment and how this understanding is reflected in their project.

• **Construction system:** Contribution of the selected system to a more sustainable construction, considering aspects as water use, solid waste, time, recyclability, and health & safety.

• **Materials:** Selection of the materials will be evaluated taking account their sourcing and environmental impact, considering their possibilities to be reused or recycled, their incorporated energy and CO_2, as well as their durability and maintenance requirement.

• **Bioclimatic Strategies:** Application of the passive design strategies to maintain a healthy and comfortable indoor environment and minimizing the energy requirements.

• **Active systems and equipment:** The contribution of the selected HVAC and artificial lighting systems to maintain a healthy and comfortable indoor environment as well as the environmental impact of these systems.

• **Solar Systems:** Evaluation of the thermal solar, PV and energy storage systems will include their environmental benefits and impacts as well as their energy recovery time, CO_2 emissions and durability.

• **Water:** Evaluation of the house and landscaping water conservation strategies, as low-flow/water-saving fixtures, high efficiency irrigation solutions, greywater system, water treatment and water reuse.

• **Vegetation:** Aspects that will be positively evaluated: use of native and low-water-use locally-adapted plants (See Appendix 4), implementation of low-maintenance solutions, biodiversity, and the use of plants, including green walls or roofs, to reduce the house energy consumption and the surrounding heat.

• **Waste**: The waste reduction, collection, and management as well as its reuse/recycle possibilities will be evaluated in the three phases of the project: construction, use, and end-of-life.

Scoring

A total of 100 points will be awarded by the corresponding jury for this contest

CONTEST 9: COMMUNICATION

Objective

To evaluate the teams' communication and social awareness capacity, considering their creativity, effectiveness, and efficiency of sharing the SDME relevant topics (sustainability, energy efficiency and the use of renewables), as well as the team's goals and objectives.

Evaluation

A jury of communication professionals will evaluate the associated deliverables and the dissemination and social awareness actions, from the start of the competition until the event in Dubai.

Evaluation Concepts / Sub-contests

- Communication strategy
- Communication throughout the project duration
- Education and social awareness
- Communication at the Solar Hai
- Creativity
- Effectiveness
- Efficiency

Communication strategy: Development of a comprehensive, consistent, and integrated communications plan based on a clear definition of the team's messages, communications goals, and target audiences. The Team's visual identity, uniform, and motto as well the project name must be aligned with its communication strategy.

Communication throughout the project duration: Web and social media content and impact, audiovisuals, architectural models, apps, activities, seminars, conferences, interviews, appearances on radio, TV, press and magazines.

Education and social awareness: Design and execution of educative actions, contents, and materials for raising social awareness about environmental issues, responsible consumption (water. energy, etc.), use of renewables and the need to adopt more sustainable lifestyles.

Communication at the Solar Hai: Develop an informative, entertaining, engaging, and audience-appropriate house tour, and the efficient use of on-site features, displays, informative panels, models, virtual reality, apps, and any other way to engage, educate and raise awareness of visitors.

Evaluation criteria

Creativity: Innovative and original ways to reach the public and to transmit the Team's messages. The success of the team to incorporate digital communications strategies will be positively assessed.

Effectiveness: Clarity of the messages chosen, right communication actions and the adequacy of the solutions to each target group. Media appearances and successful engagement of online audiences will also be positively evaluated.

Efficiency: Comparison between the audience reached, and the resources invested, considering the effort needed to engage with various segments of the public.

Scoring

A total of 80 points will be awarded for this contest in the competition.

CONTEST 10: INNOVATION

Objective

To evaluate the innovation of the house, its systems and components, focusing on emergent, radical and revolutionary changes, in addition to contribution of the innovation to improving the comfort, performance, level of sustainability or energy efficiency of the house.

Evaluation

Each of the five competition Juries will evaluate the innovation in their field, based on the associated deliverables, in addition to on-site evaluation of the house. The application of research results and solutions developed by or with the students' collaboration will be evaluated positively. The final scoring of the innovation contest will be the sum of the Juries individual assessments.

Evaluation Concepts / Sub-contests

- Innovation in Architecture
- Innovation in Engineering & Construction
- Innovation in Energy Efficiency
- Innovation in Communication & Social Awareness
- Innovation in Sustainability

Innovation in Architecture: Evaluating to what degree, the house architecture, provide new spatial and functional concepts that enhance the house´s livability, use of innovative materials, creative ways to integrate the solar systems as well as novel well-conceived lighting solutions.

Innovation in Engineering and Construction: Evaluating the innovative construction systems, structures, services (plumbing, electrical, photovoltaic, etc.) and materials.

Innovation in Energy Efficiency: Evaluating innovative active and passive solutions to provide the functional, healthy and comfortable spaces with a minimum of energy consumption. The appropriate use of new smart controls, artificial intelligence based energy management, Internet of Things (IoT) and any other emergent technology will be positively assessed.

Innovation in Communication and Social Awareness: Assessing all novel initiatives to increase the effectiveness of communication, attract public attention, and disseminate clear messages regarding the need for responsible use of energy, sustainable construction and the use of renewables.

Innovation in Sustainability: Evaluating the implementation of new ways to increase the level of the sustainability in the Built Environment. Innovative systems, solutions, and materials that contribute to reducing the environmental impact of the project will be assessed positively.

Scoring

A total of 80 points will be awarded by the corresponding juries for this contest.

BUILDING CODE

1. INTRODUCTION

Although there is some degree of overlap between the SDME Rules and its Building Code, it is important to note that there are important distinctions as well. The Rules primarily exist to promote a fair and interesting competition. The Building Code primarily exists to protect the public health and ensure safety. Failure to comply with the Rules may result in official warnings, point penalties, or disqualification from the competition. Failure to comply with the Building Code may prohibit the participation of the house in any aspect of the overall competition. Compliance with the Building Code is a prerequisite for participation in the competition.

2. ADOPTED CODES

The 2012 International Residential Code (IRC) of the International Code Council with amendments and the 2014 National Electric Code (NEC) of the National Fire Protection Agency (NFPA) have been adopted by reference as the Solar Decathlon Building Code and have the same force and effect as though fully set forth in the Solar Decathlon Rules, except as specifically amended by provisions that follow.

Since the houses will be assembled in Dubai, they need to comply with the SDME Building Code, in addition to:

a) "UAE Fire and Life Safety Code of Practice" and its annexures "A.1.21. Rev 2 Fire Stopping Exterior Wall Cladding/Curtainwall and roofing system", "A.2. Emergency Action Plans" and "B.1. Balcony Terrace and Windows".
b) "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code, for the accessible routes of the houses' tours and the means of egress.
c) Green Building Regulations and Specifications in the Emirate of Dubai.
d) DEWA and DEWA's Shams Dubai regulations, for electrical and PV systems.
e) American Concrete Institute (ACI) for concrete structures calculations.
f) AISC 360 - Load and Resistance Factor Design (LRFD) method for steel structures calculation.
g) ASCE 7 "Minimum design loads for buildings and other structures" for design loads.
h) UBC 1997, Volume 2 for Seismic loads.
i) BS 5950 for structural use of steelwork.

3. BUILDING PLANNING AND CONSTRUCTION

The building is intended to be representative of a single-family dwelling constructed in accordance with the provisions contained in the IRC. Because portions of the building will be open to viewing by the general public, the IRC is amended with specific provisions of the "International Building Code" (IBC), "UAE Fire and Life Safety Code of Practice" and "The Building Regulations & Facilities for the Disabled United Arab Emirates Code" as appropriate. The following provisions are amended and emphasized as they constitute the highest degree of risk to the building occupants during public exhibition. Compliance with the letter of intent of the referenced codes is mandatory in addition to the items discussed in the paragraphs below.

3.1. Fire Protection and Prevention

a. Fire Protection Plan

Each team shall provide a fire protection plan. This plan should indicate the location of fire extinguishers, how egress will be made from the unit, and who will be responsible (i.e., the team's health and safety officer) for public tour life safety during the event. Include a written operations plan for team-facilitated orderly and quick evacuation and fire mitigation. Successful demonstration of the

plan will be required before any public tour of the building will be permitted. Refer to the "UAE Fire and Life Safety Code of Practice".

b. Each house will be required to have smoke alarms as per “UAE Fire and Life Safety Code of Practice” requirements, with at least one fire extinguisher at each level of the house with a minimum Underwriters Laboratory (UL) rating of 2A-10BC, in addition to one C02 fire extinguisher next to the electrical board. Smoke alarms shall be connected to the AC voltage side of the inverter and provided with independent, e.g., integral with the alarm, battery backup. All alarms shall be interconnected and all shall sound when one is activated.
c. Any building system component must have a minimum of 1 hour fire rated and must strictly comply with “UAE Fire and Life Safety Code of Practice".
d. Technical Room must be separated from the house interior by 2-hours fire rated walls and 1.5-hour fire rated door.

3.2. Means of Egress

The following means of egress components accessible to the public shall comply with "UAE Fire and Life Safety Code of Practice".

a. Stairs

Stairs are prohibited as part of the houses tours, unless a lift or other mechanical system be provided. All changes in elevation used as part of the public tour, accessible route, or means of egress shall be provided with sloped walking surfaces or ramps. Demonstration or mechanical equipment access stairs located within the interior of the dwelling and excluded from use by the public or any other individual during the public tours may be provided in accordance with IRC Section 311.4. Ladders or stairs that are not IRC compliant may be provided as “demonstrators”. Stairs to habitable spaces excluded from use by the public or any other individual during public tours may be provided following specific approval by the Building Official.

b. Handrails

Handrails shall be provided on both sides of ramps (sloped walking surfaces in excess of 5% in the direction of travel) used by the public during the display. All handrails shall be designed in accordance with "The Building Regulations & Facilities for the Disabled - United Arab Emirates Code”.

3.3. Interior Finishes

Interior finishes must comply with IRC Section R302.9 and "UAE Fire and Life Safety Code of Practice". Synthesized building materials, such as those using plastics, must be provided with the manufacturer’s test documentation indicating compliance with ASTME-84 or UL 723 demonstrating a minimum Class C. Exceptions:

a. Materials tested to EN 13501 with a minimum Euro-Class C
b. Materials tested to DIN 4102 with a minimum B1 classification
c. Other testing methods subject to approval by the Solar Decathlon Building Official

3.4. Glazing

The following hazardous locations are subject to human impact and require safety glazing. See IRC Section 308 for specific details and exceptions.

a. Photovoltaic modules containing glazing materials and placed within any of the locations listed in Items b through g below. For Photovoltaic modules containing glazing materials please refer to Shams Dubai requirements.
b. Glazing in doors
c. Glazing in doors, surrounds, and walls enclosing or facing bathtubs or showers where not located more than 152 cm (60 in.) above the finished floor
d. Glazing located within a 61.0 cm (24 in.) arc of either vertical edge of a door and less than 152.4 cm (60 in.)

above the floor

e. Glazing within 36 in. (91.4 cm) of stairways and/or within 60 in. (152.4 cm) of the bottom edge of stair treads when the bottom edge of the glazing is less than 60 in. (152.4 cm) above a walking surface
f. Glazing in overhead panels (including skylights and glazed solar panels) placed where glazing is not separated from the occupants by a solid surface such as a roof
g. Glazing in panels located with all the following conditions present:
   i. Pane of glazing is greater than 0.836 m^2 (9 ft^2)
   ii. Bottom edge of glazing is less than 45.7 cm (18 in.) above the floor
   iii. Top edge of glazing is greater than 91.4 cm (36 in.) above the floor
   iv. Walking surface is located within 91.4 cm (36 in.) of the glazing

3.5. Roofing

All roofing materials shall comply with IRC Chapter 9 and "UAE Fire and Life Safety Code of Practice". Photovoltaic, shingle modules and structure must be evaluated in accordance with Shams Dubai Requirement. All modules and their installation must be designed for design wind loads, and comply with the Safety of environment: recommendation for DEEG Solar PV systems. (https://www.dewa.gov.ae/en/consultants-and-contractors/innovation/innovation-services/publications)

3.6. Foam Plastic Insulation

Foam plastics used for building construction shall only be permitted if the foam plastic is isolated from the interior of the building with gypsum board 0.5 in. (1.3 cm) thick. This applies to foams typically used in structural insulated panel wall, floor, and roof systems. Provide documentation to demonstrate compliance (IRC, Sec. R316).

a. Gypsum board containing phase-change materials and other flammable performance enhancements may not qualify as the required thermal barrier unless specifically approved.
b. The thermal barrier specified in Section R316.4 is not required to be installed on the walking surface of a structural floor system that contains foam plastic insulation where the foam plastic is covered by a minimum nominal 0.5 inch (1.3 cm) thick wood structural panel or equivalent.
c. Exposed foam plastic located in attics or crawlspaces (interstitial space between the floor assembly and the competition site surface) shall be covered with an ignition barrier consisting of 1.5 in. (3.81 cm) thick mineral fiber insulation, 0.25 in. (0.64 cm) thick wood structural panels, 0.375 in. (0.95 cm) thick particleboard, 0.25 in. (0.64 cm) hardboard, 0.375 in. (0.95 cm) gypsum board, or corrosion-resistant steel having a base metal thickness of 0.016 inch (0.41 mm).
d. All insulation materials must be in accordance with UAE Fire Code.

3.7. Exterior Envelope

Drawings submitted for review shall contain section details of proposed wall assembly showing framing, sheathing, water-resistive barrier, flashing, and exterior cladding as applicable (IRC, Sec. R703).

3.8. Ceiling Height

Ceiling height shall provide a minimum of 213.4 cm (7 ft) of headroom in habitable locations and as otherwise specified in IRC, Sec. R305.

3.9. Skylights

IRC Section R308.6 regulates skylight glazing. Glazing is limited to certain types, and screening under the glazing may be required. Indicate which glazing products are to be used and provide sufficient details in the submitted plans to ensure compliance (IRC, Sec. 308.6). Glass PV or hydronic solar collectors used overhead without a solid

surface underneath (such as a roof) will be regulated as skylights and must comply with Shams Dubai requirements.

3.10. Green Building Regulations

The SDME houses must comply the "Green Building Regulations and Specifications in the Emirate of Dubai" (https://www.dm.gov.ae/wps/wcm/connect/662c2fc7-03b4-41a5-aad0-c9d1959773a3/Green+Building+Regulations+and+Speci.pdf?MOD=AJPERES)
And their construction documents should be of sufficient clarity to indicate the location, nature, and scope of the proposed Green Building features and show that it will conform to the provisions of these regulations. They also must include the "Green Building Declaration", a compliance checklist designed to assist the building professionals in ensuring the project's full compliance with the Green Building Regulations.

3.11. Fire Sprinkler System

All houses shall be provided with Fire Sprinkler System designed in accordance with design requirements of "UAE Fire and Life Safety Code of Practice". For the water discharge duration, the team may follow the NFPA 13 standard. Such systems shall be fully operational during the public exhibit and competition. Each dwelling will be individually required to provide site-stored fire water for sprinkler operations based on the sprinkler system design demand. Each dwelling's sprinkler will be required to be provided with a pump capable of the pressure and volume required for the fire sprinkler design. The pump shall be mounted on a portable skid and shall be pretested and demonstrated to be functional at the minimum required fire sprinkler design pressure prior to arriving at the event site. Pumps used for fire sprinklers may be dedicated to the fire sprinkler system or may be used for both domestic and fire system purposes. All valves provided between the fire water supply source and each individual fire sprinkler shall be of a type that can be locked in the open (on) position. Teams shall provide the means to ensure that the valves are locked open during the duration of the public exhibit. A test and drain valve shall be placed in an accessible location at the most remote point of the sprinkler system. This valve will be used to assist in charging the system with water and will be operated by the team during the inspection period to demonstrate that the sprinkler system is charged and that the pump used for sprinkler pressurization is operating correctly.

4. ACCESSIBILITY

4.1. Accessible Route – Interior

An accessible route shall be provided within the unit to all spaces accessible to the public as part of the tour. Components of the accessible route used by the touring public must comply "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code.
(http://www.moid.gov.ae/EPublications/The%20Building%20Regulation%20Facilities%20For%20the%20Disabled-en.pdf)
Other accessible features may be included in rooms such as kitchens and bathrooms at the discretion of the designers. If any of the features are available and intended for use by the public, they shall be accessible in accordance with the "The Building Regulations & Facilities for the Disabled - United Arab Emirates Code". Similarly, voluntary accessibility provided outside of areas accessible to the touring public should comply with "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code for the level of accessibility desired.

4.2. Accessibility – Habitable Roof Deck and Interior Second Floor/Loft Levels

Solar Decathlon competition houses are intended to demonstrate single-family dwellings that would not normally be regulated by local accessibility standards. However, these buildings are open to the public for educational

purposes and must be accessible in all primary function areas. Therefore, any portion of the building where the public is permitted must provide an accessible route that follows the "The Building Regulations & Facilities for the Disabled - United Arab Emirates Code".

a. Buildings regulations for the Disabled requires that an elevator to be installed in buildings where an accessible route is required to stories above the first floor (such as the roof deck, second floor, mezzanine or loft)

b. Houses with a second floor, mezzanine, loft or habitable roof deck are acceptable without elevators, if no member of the public, organizers, or competing teams are allowed to access the space during public exhibit periods. Any provided means of access to stories above the first floor shall be "cordoned off" to inhibit entry, during the public exhibit periods.

4.3. Accessibility – Ramps

The following are the most important regulations and specific Solar Decathlon criteria regarding ramps:

a. A “ramp” is any sloping surface used as part of the circulation path that has a slope in excess of 1:20. Sloping surfaces less than 1:20 shall comply "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code.
b. The slope of a ramp cannot exceed 1:12.
c. At the top and bottom of any ramp, a landing 150 cm (60 in.) long is required.
d. A 150 cm x 150 cm (60 in. by 60 in.) landing is required at any point where a ramp changes direction.
e. Handrails are required if the ramp’s rise exceeds 15 cm. (6 in). Handrails shall be continuous and be provided with 30 cm (12-in.) extensions beyond the top and bottom of the ramp’s sloping surface. Handrails with a circular cross section shall have an outside diameter of at least 30 mm (1.25 in.) and not greater than 50 mm (2 in.). If the handrail is not circular, it shall have a perimeter dimension of at least 100 mm (4 in.) and not greater than 160 mm (6.25 in.) with a maximum cross-section dimension of 57 mm (2.25 in.). Handrails shall be uniform in height, not less than 85 mm (34 in.) and not more than 95 cm (38 in.) above the walking surface of the ramp.
f. Teams must design and provide a metal plate transition component between the access ramp and the walking surface of the competition site. Such plate shall be no greater than 13 mm (1/2 inch) thick at the edge contacting the walking surface of the competition site. If the edge exceeds 6.4 mm (1/4 inch) thickness, it shall be provided with a 1:2 bevel. If the connected ramp exceeds 5% slope, the transition plate and the ramp must be provided with handrails and edge protection. Both shall extend onto the transition plate with the handrails extending 30 cm (12 in.) beyond the termination of the transition plate. The design of the transition plate shall accommodate the lateral loads placed on the handrails and extensions without relying on ground embedment for support.

4.4. Changes in Elevation

All changes in elevation (including even minor changes in areas such as door thresholds) must be considered along an accessible route. Changes not exceeding 0.64 cm. (0.25 in) are acceptable.

a. Changes in level between 0.64 cm and 1.3 cm (0.25 in. and 0.5 in.) shall be beveled with a slope not steeper than 1:2.
b. A change in level of 1.3 cm (0.5 in.) is permitted to be 0.64 cm. (0.25 in) vertical plus 0.64 cm (0.25 in.) beveled. However, in no case may the combined change in level exceed (1.3 cm (0.5 in.). See Figure 22.
c. Changes in elevation exceeding 1.3 cm. (0.5 in) must comply with ramps requirements of the "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code
d. Sloped walking surfaces must comply with "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code shall be permitted.

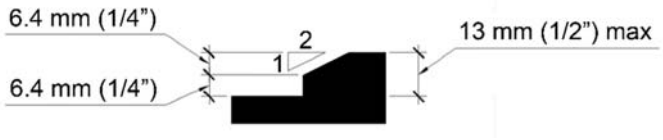


Figure 22: Changes in elevation of 13 mm

4.5. Doors and Door Approaches

All doors shall comply with "The Building Regulations & Facilities for the Disabled" United Arab Emirates Code

a. For exterior doors, the minimum opening is 90cm (35.5 in.) when the door is open.
b. Doors that can be fixed in an open position may be accepted as part of the accessible route if 80 cm (32 in). Minimum clearance is provided through the door opening with the door secured in the fully open position.
c. Doors without required maneuvering clearances that are intended to remain open during the public tour must be clearly identified on the plans and approved by the SDME Official.

5. STRUCTURAL

The structural drawings and calculations shall be stamped by a qualified faculty and submitted for approval. It is strongly recommended that teams involve a qualified, licensed professional throughout the design process because he or she could require structural design changes that could affect other aspects of the house.

In addition to meeting applicable IRC, ACI, LRFD, BS, and local requirements, special attention must be given to the structural design challenges unique to the temporary exhibit. These challenges include, but are not limited to, the following:

a. Increased live loads because of public access to houses.
b. Necessity for non-earth-embedded foundations employing steel stake anchor embedment tie-down because of the lack of a permanent foundation and unique wind-loading conditions because of roof-mounted solar systems.
c. Increased dead loads because of unusual or concentrated mechanical and electrical equipment.

5.1. Prescriptive Requirements

a. Structural systems shall be designed in accordance with the appropriate prescriptive provisions of the IRC where practical. Engineered design may be employed using accepted engineering practice in accordance with the International Building Code, ACI, LRFD and BS. Alternate materials and methods shall comply with IRC Section 104.11 and Sec. CC2.6.
b. Structural framing: A detailed structural plan view drawing is required at a minimum. Successive plan sheets shall be provided and shall include foundation footings, anchorage details, floor framing, wall locations, and roof framing. All structural components shall be listed including sizes, species and grade, orientation of the structural components, and repetitive spacing (on-center distances). Include details on connections between joists and beams, floor systems and foundations, walls and floors, rafters and beams, etc. Specify proprietary hangers or other mechanical connections (IRC, Sec. R301.1).
c. All units shall be in metric system.

5.2. Design Loads

For Live and Dead loads, the code to be considered is ASCE 7 (Chapter 2, 3 and 4), for the Wind load, the code to be considered is ASCE 7 (Chapter 6), and for the Seismic loads, the code to be considered is UBC 1997, Volume 2 (Chapter 16). The following minimum loads must be used in the structural design:

a. Live loads:
   - Floor live loads (Public gathering/accessible area): 5.0Kn/m^2
   - Floor live loads (Area Not accessible to the public): 2.0Kn/m^2
   - Decks and ramps: 5.0Kn/m^2
   - Roof live load (Non-accessible): 1.0Kn/ m^2
   - Balconies load (Area not exceeding 9.3m2): 2.87Kn/ m^2
   - Balconies load (Area exceeding 9.3 m^2): 4.79Kn/m^2

b. Dead loads: Superimposed dead load to be calculated based on partition wall density.

Wind loads: Design shall be based on basic wind velocity of 45m/s at 10m above ground level in exposure category C (Lateral stability check to ensure structure stability against overturning, sliding and uplifting with a factor of safety of 2.0 to be performed and submitted). For all structures where wind loads are applied as per codes, other directions than the two orthogonal ones to be investigated for ultimate and serviceability limit states.

c. Seismic: UBC, Zone 2A (Soil profile type: Sc)
d. Railings: 200 lb (890 N) concentrated load applied in any direction at any point at the top of the rail.
e. Temporary Surface: 60 kN/m2 (2,088 psf) maximum load-bearing pressure. Additional structural design requirements at the post-event house location (to be determined by the licensed professional of record).

Structural plans shall indicate the design live loads (example: 5 kN/m^2 floors, 5 kN/m^2 means of egress components (ramps), 1 kN/m^2 roof live load), in addition to the location, size, and weight of special loads such as liquid storage tanks and mass or trombe walls. These loads are considered minimums for the temporary event competition. Higher design loads may be mandated by the local authority having jurisdiction in the location where the house will be permanently sited. The design should accommodate the higher of the design values required by the Solar Decathlon Building Code or Dubai Municipality.

5.3. Exterior Construction

Structural plans shall include design details for any exterior appurtenances such as decks, stairs, ramps, awnings, canopies, and roof projections (IRC, Sec. R301.1). Deck structural framing shall include full details for house ledger connections, joist-to-beam connections, and beam-to-column/footing connections. Special design attention shall be paid to load path for deck foundation systems for concealed footing systems.

5.4. Specific Point Loads

Provide wind-analysis calculations for point-load connections demonstrating the components' abilities to withstand 100 mph (45.0 m/s) (3 second gust), exposure category C wind conditions. Provide point-load connection details for all solar panel connections to demonstrate that the connections will resist uplift (IRC, Sec. R301.1,R905.16 and BS).

5.5. Foundation

Provide a foundation plan for temporary setup on the competition site. The design must accommodate all design loads, including gravity and lateral derived from wind and seismic. Plans shall include location and size of all

temporary footings and required tie-down anchors (e.g., type, number, and installation configuration) to prevent wind uplift or overturning (IRC, Sec. R401.1 and R401.2) and to provide adequate lateral load transference for UBC, Zone 2A. Please provide consideration for sloping or variable site conditions.

General Requirements:

a. All houses, decks, and other structures shall be provided with foundations sufficient to safely transmit gravity, lateral, and uplift loads. For purposes of design, the presumptive surface bearing capacity shall be 100 kN/m^2 (2,088 psf).
b. Design wind speed shall be 100 mph (45.0 m/s) (3-second gust) with a C exposure.
c. Uplift design may employ uplift anchorage, dead-load analysis, or a combination of both. Anchorage embedment into the temporary site will be limited to the method and design values indicated in Section 5.5(c). Teams are encouraged to configure their structures to take advantage of dead loads to resist wind uplift, and seismic- and wind-generated overturning and sliding. All designs shall be supported by calculations demonstrating the efficacy of the designed system. Foundation designs and calculations shall be approved prior to placement of the structure on the competition site.

d. Ground anchors shall be designed considering Silty Sand layer up to 1 m below ground level.
   - Teams will be responsible for the design and structural qualification for the load transference mechanism between the stake and the building structure being anchored. Threaded rods may be used. Driven rods used in multiples must be spaced a minimum of 24 in. on center.
   - Teams are responsible for removal of the stakes at the conclusion of the event.
   - Alternative ground anchorage methods may be permitted upon approval of the Solar Decathlon Building Official.

5.6. Alternate Materials

Alternate materials are permitted as follows:

a. Engineered lumber (e.g., TJIs, LPIs, and BCIs) pursuant to specific manufacturer's design data: The product selected must carry a current ICC Evaluation Services report. See http://www.icc-es.org/.
b. Structurally insulated panel systems pursuant to specific manufacturer's design data: The product selected must carry a current ICC Evaluation Services report. Also be advised that foam plastics must be thermally isolated from the interior of the dwelling (see Section 3-6 for more details).
c. Engineered trusses (floor or roof) must be designed in accordance with IRC Sections R502.11 or R802.10 as appropriate: Individual truss reports shall be provided for review and shall bear the seal of a registered design professional.
d. Alternate materials may be permitted if approved pursuant to approval by written request under IRC Section 104.11: It is the responsibility of the applicant to provide adequate proof to document the alternate as meeting the intent of the prescriptive code requirements. The organizers reserve the right to deny any alternate for failure to clearly demonstrate code equivalence.
e. Phase-change materials included within building components must be identified on the plans. Specifications for the material composition must be provided with fire-performance testing data. Be advised that phase-change embedment in gypsum board or interior wall or ceiling finishes may affect the ability of these materials to pass IRC required fire tests.
f. Unlisted electrical components intended to be used must be fully disclosed no later than 12 months prior to the start of the competition. Such unlisted components will be limited to 60 volts. Such components shall be fully described in a written proposal format with competent technical substantiation provided. The proposal is subject to approval by the event organizers subject to stipulated minimum testing to ensure safe operation during the public event.

5.7. Structural Steel

Provide structural details for load-carrying structural steel assemblies. Include welded or bolted connections within the assembly and where attached to other structures (IRC, Sec. R301.1.3,AISC 360, and BS 5950).

6. ELECTRICAL

6.1. Governing Code

The house electrical system and its components mush comply with DEWA regulations. The provisions of the currently active DEWA regulations are available on (https://www.dewa.gov.ae/en/consultants-and-contractors/innovation/innovation-services/publications)

Exception: Electrical system design methods required by non-Dubai entrants for compliance in the jurisdiction of final placement may be permitted following review and approval by the Solar Decathlon Building Code Official. Such approval will require compliance with an approved national or international electrical code or standard. Teams seeking approval must submit two copies of the referenced code for evaluation prior to approval. If approved, such teams will be required to provide special inspection of the electrical system prior to placement of the structure in Dubai. Solar Decathlon temporary site final inspections of the visible electrical system will be performed by Solar Decathlon electrical inspectors using team supplied electrical test equipment suitable for the approved DEWA regulation-alternate electrical system.

6.2. Drawing Requirements

a. Electrical plan(s) must include layouts of proposed receptacles, switches, light fixtures, smoke alarms, ceiling fans, etc.

b. Provide details on the proposed PV system along with a key for symbols used in the drawings. Such details shall include information on the photovoltaic panels, distribution (e.g., wiring, inverters, switch gear, and over-current protection).

c. Provide a key for electrical symbols used in the electrical plans.

d. Detailed load schedule needs to be provided for the total load consumption of the building with proper breaker size, cable size, and earth leakage protection, etc. (Indicate the MCB capacity, total connected load, and total demand load). Refer to DEWA load distribution schedule available on SDME Teams Portal.

e. Indicate the incoming breaker size of the distribution board, the total connected load of the house and the total demand load of the house.

f. Indicate the dimensions of the electrical components in the drawings.

6.3. Tamper-Resistant Receptacles

406.11 Tamper-Resistant Receptacles in Dwelling Units

In all areas specified in DEWA regulations, all 230-volt receptacles shall be listed as tamper-resistant receptacles.

6.4. Outdoor Accessories

a. All accessories that are going to be installed outside the building must be weatherproof.

b. Provide a 30mA earth leakage protection to the sockets installing outside the house.

c. Any receptacles used on the exterior of the building must be protected with ground fault circuit interrupters (GFCI). Enclosures provided must be suitable for damp locations.

406.8 Receptacles in Damp or Wet Locations

(A) Damp Locations. A receptacle installed outdoors in a location protected from the weather or in other damp locations shall have an enclosure for the receptacle that is fire when the receptacle is covered (attachment plug cap not inserted and receptacle covers closed).

An installation suitable for wet locations shall also be considered suitable for damp locations.

A receptacle shall be considered to be in a location protected from the weather where located under roofed open porches, canopies, marquees, and the like, and will not be subjected to a beating rain or water runoff. All 250-volt non-locking receptacles shall be weather-resistant type.

(B) Wet Locations.

(1) Receptacles in a Wet Location: 250-volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted. All 250-volt non-locking receptacles shall be weather-resistant type.

Exception: 250-volt receptacles installed in a wet location and subject to routine high-pressure spray washing shall be permitted to have an enclosure that is weatherproof when the attachment plug is removed.

6.5. Arc-Fault Circuit Protection

210.12 Arc-Fault Circuit-Interrupter Protection

(A) Definition: Arc-Fault Circuit Interrupter (AFCI). A device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

(B) Dwelling Units: All 230-volt, single phase, branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by a listed arc-fault circuit interrupter, combination-type, installed to provide protection of the branch circuit.

Exception No. 1: Where RMC, IMC, EMT or steel armored cable, Type AC, using metal outlet and junction boxes is installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install a combination AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception No. 2: Where a branch circuit to a fire alarm system installed in RMC, IMC, EMT, or steel armored cable, Type AC, with metal outlet and junction boxes, AFCI protection shall be permitted to be omitted.

6.6. Ground-Fault Circuit Protection

Any AC receptacles located in kitchens or bathrooms shall be GFCI protected.

210.8 Ground-Fault Circuit-Interrupter Protection for Personnel

(A) Dwelling Units. All 230-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified in (1) through (8) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms
(2) Garages, and also accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use
(3) Outdoors
(4) Crawl spaces — at or below grade level
(5) Unfinished basements — for purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and the like
Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.
(6) Kitchens — where the receptacles are installed to serve the countertop surfaces
(7) Laundry, utility, and wet bar sinks — where the receptacles are installed within 1.8 m (6 ft) of the outside edge of the sink.

6.7. Equipment Listings

All electrical equipment shall carry an approved testing agency's listing or shall have been approved by the Solar Decathlon Building Official and Solar Decathlon electrical inspectors for temporary use during the event.

a. Unlisted PV modules may be used in a system with a DC bus voltage of no greater than 60 volts (open-circuit) at 32°F (0°C) if, and only if, such equipment has been evaluated and approved by the Solar Decathlon Building Official and Solar Decathlon electrical inspectors. PV cell and module mounting means are subject to increased scrutiny in custom, unlisted, building-integrated PV applications.
b. The use of unlisted PV modules and the installation of listed PV modules in an unapproved manner in a system with a DC bus voltage of greater than 60 volts (open-circuit) at 32°F (0°C) are prohibited. Listings shall be to IEC Standards specified under Shams Dubai standard and shall be approved by an international accredited testing laboratory.
c. The attachment of PV modules to any building material where the PV module is not listed for such an application is prohibited, regardless of the bus voltage.
d. All DC to AC utility-interactive inverters must be in the Shams Dubai eligible equipment list or comply with its eligibility process. Please refer to Rules 7-3 and 7-5.

6.8. Photovoltaics

All electrical connections, drawings, and calculations for conventional and photovoltaic installations shall be submitted in CAD and PDF formats, according to DEWA's Shams Dubai standards.

6.9. Grounding

Each team shall provide and install an insulated grounding conductor suitable for their design from their main distribution board (MDB) to the organizer utility panel (Meter cabinet).
The organizers will bond the grounding conductor to the Solar Hai grounding network. Each team should not have/install a grounding electrode (commonly referred to as a ground rod).

6.10. Inverter Disconnect

Each team shall provide a disconnecting means located between the inverter and the solar array where panel-integrated micro-inverters are not employed. The disconnecting means should be capable of ready lockout/tag-out to facilitate safe service of the inverter(s).

6.11. Batteries

a) Lead-acid, NiCd or NiMH batteries and its installation must comply with the IEC 62485-2 “Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries”. This Norm replaces the EN 50272-2.
b) Lithium batteries and its installation must comply with the IEC 63056 ED1 “Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems. This standard is under development. If it is not available for the Construction Documents phase, the SDME Organization will evaluate the Teams' electrical storage systems based on the documentation provided in their deliverables for approval.
c) To use any other kind of electrical storage technology or for use non-commercial solutions, the Team must get the written approval from the SDME prior the assembly period.
d) The Teams must include the technical and safety information of the batteries and any other electrical storage system in the “Electrical Storage System Checklist,” section 3 of the document "Electrical PV Charts and Checklists" available in the SDME Portal.

7. MECHANICAL

7.1. Drawing Requirements

a. Provide a key for symbols used in the drawings (IRC, Sec. R106.1.1).
b. For all HVAC equipment, show unit dimensions, weight loading required clearances, electrical characteristics and connection requirements, and provide multiple sections to indicate elevations and spatial requirements.
c. Show and identify the kitchen extract and toilet extract in the drawings and include the ventilation information and details.
d. Indicate the FFL and SSL in the drawings to use them as the reference for piping and ducts levels, for better coordination

7.2. Return Air

Return air shall not be taken from a bathroom, kitchen, or mechanical. (IRC, Sec. M1602.2). A separate isolated return shall be provided for the above.

7.3. Outside and Exhaust Air

e. Outside Air

Outside air shall not be taken closer than 10 ft (304.8 cm) from an appliance or plumbing vent, or discharge outlet of an exhaust fan [unless the intake is located at least 3 ft (91.4 cm) below the vent or fan discharge] (IRC, Sec. M1602.2, Item 1).

f. Screens

Outside air inlets shall be equipped with a screen with openings 0.25 in. to 0.5 in. (0.64 cm to 1.3 cm) (IRC, Sec. M1602.3).

c. Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19 m^3/s) shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system. (IRC Sec. M1503.4)

7.4. Bathroom Ventilation

Bathrooms shall be provided with mechanical ventilation systems capable of providing 50 cfm (23.6 L/s) for intermittent ventilation or 20 cfm (9.4 L/s) for continuous ventilation, or with windows allowing a 1.5 ft^2 (0.14 m^2) opening for natural ventilation (IRC, Sec. R303.3).

7.5. Ducting

g. The houses with HVAC system using ducting shall consider the fire compartmentation the fire rating of the wall between rooms.
h. The houses with HVAC system using ducting shall provide the BOD (bottom of duct elevation) from the reference level.
i. The flexible ducts shall be limited to 1.5 m maximum length and provided by SMACNA.

8. SOLAR MECHANICAL

8.1. Drawing Requirements

Provide plan details for any proposed solar mechanical systems. Provide details on collectors, fluid distribution, heat exchangers, etc., along with a key for symbols used in the drawings (IRC, Sec. 106.1.1). Plans should emphasize compliance with IRC M2301. Calculations at arriving area for heating is required.

8.2. Cross Connection

Provide details for the solar hot-water system. Provide details indicating if potable water or other heat transfer liquids will be employed. If other than potable water is used, an approved heat exchanger shall be employed to isolate potable water from transfer fluids (IRC Section R106.1.1). Provide calculation for storage capacity of hot water to be provided and to ensure all loads during night are included in calculating capacity.

8.3. Access

Solar and MEP equipment such as controls, dampers, fans, and pumps shall be accessible for inspection, maintenance, repair, and replacement (IRC, Sec. M2301.2.1).

8.4. Roof-Mounted Collectors

The roof shall be constructed to support all loads imposed by the collectors. If collectors are intended to serve as the roof covering, documentation shall be provided to determine compliance with the roofing provisions in IRC, Chapter 9. If the collectors will be placed over the roof covering, the collectors and supporting structure shall be constructed of noncombustible material or fire-retardant-treated wood equivalent to that required for the roof covering (IRC, Sec. M2301.2.2, ACI, LRFD, and UAE Fire and Life Safety Code of Practice).

8.5. Pressure and Temperature Relief

Pressure- and temperature-relief valves shall be provided for components under pressure. Relief devices shall be installed in sections of the system so that a section cannot be valved off or isolated from a relief device (IRC, Sec. M2301.2.3). Pressure and temperature relief devices shall have the capacity to be removed and capped prior to inspection to accommodate the required 100 psi (690 kPa) system pressure test required by Section 8-13.

8.6. Vacuum Relief

A vacuum relief valve shall protect system components that might be subjected to pressure drops below atmospheric pressure during operation or shutdown. Plans shall indicate if this system is subject to vacuum conditions (IRC, Sec. M2301.2.4).

8.7. Expansion Tanks

Expansion tanks in solar systems shall be installed in accordance with IRC, Section M2301 in closed-fluid loops that contain heat-transfer fluid (IRC, Sec. M2301.2.6).

8.8. Solar Loop Isolation

Valves shall be installed to allow isolation of the solar collectors from the remainder of the system (IRC, Sec. M2301.2.8).

8.9. Maximum Temperature Limitation

Systems shall be equipped with means to limit the maximum water temperature of the system fluid entering or exchanging heat with any pressurized vessel inside the dwelling to 180°F (82°C). This protection is required in addition to required temperature and pressure relief valves stated in IRC, Section M2301.2.3 (IRC, Sec. M2301.2.9).

8.10. Collector and Thermal Storage Unit Labeling

a. Collectors and storage units shall be listed and labeled to show the manufacturer's name, model number, serial number, collector weight, collector maximum allowable temperatures and pressures, and the type of heat transfer fluids that are compatible with the collector and storage units (IRC, Sec. 2301.3).
b. Identification of system components. All components of the solar hydronic system shall be identified with permanent identification labels. Such labels shall indicate the function of the component (i.e. panel loop supply or return, heat exchanger, domestic loop, etc.) and flow direction.

Exception: Domestic plumbing fixture supply and in-floor radiant heat loops.

8.11. Prohibited Heat-Transfer Media

Flammable gasses and liquids shall not be used as heat-transfer fluids (IRC, Sec. M2301.4).

8.12. Backflow Prevention

All connections from the potable water supply to solar systems shall comply with IRC, Section P2902.4.5 (IRC, Sec.M2301.5).

8.13. Pressure Test

All solar hydronic piping shall be tested hydrostatically at a pressure of not less than 100 psi (690 kPa) for no fewer than 15 minutes. Temperature and pressure relief devices that operate at or less than 100 psi (690 kPa) shall be isolated during the test by removal and capping.

Exception: Systems designed for pressures under 100psi (690kPa) may be tested at lower pressures when approved by the Solar Decathlon Building Official. Such testing must be approved prior to transportation of the structure to the competition site.

9. PLUMBING

9.1. Drawing Requirements

a. Provide a labeled isometric diagram of the proposed plumbing system for review. Clearly indicate waste lines, vent lines, potable water supply, heat exchange equipment, access panels, and the type of any heat transferring fluid used other than potable water.
b. Provide a legend for symbols used in the drawings (IRC, Sec. 106.1.1).
c. Include the slope (%) and the flow direction of all drainage pipes.

Identify the plumbing fixture unit.

9.2. Water Closet Demonstration

Water closets are installed for demonstration only and shall not be connected to any portion of the sewage disposal system. The water closet may be attached to a PVC or ABS 10.2 cm to 7.7 cm (4 in. to 3 in.) water-closet flange provided with a capped end or with the test plug knock-out in place. No structural member shall be cut or otherwise damaged to accommodate the water-closet flange assembly. No water supply shall be extended to the water closet unless otherwise approved by the Solar Decathlon Building Official. Bowl openings should be provided with a concealed opaque cover to discourage use of the toilet during the temporary exhibit.

9.3. Plumbing Wall – Structural

Recommendation: Create a dedicated plumbing wall with thickness sufficient to allow pipe penetrations within the studs not exceeding 60% of the stud width in nonbearing walls (IRC, Sec. 602.6).

9.4. Shower Mixing Valves

Shower mixing valves shall be pressure balanced, thermostatic mixing, or a combination of the two, with the high limit set at 120°F (48.9°C) to prevent scalding (IRC, Sec. P2708.3).

9.5. Backflow Prevention

Backflow prevention is required to isolate the potable water supply from the solar systems. See IRC Section P2902.2 for permissible devices. Because this project uses supply tanks for potable water, the use of a separate and isolated fill system for the solar component may be deemed acceptable backflow prevention (IRC, Sec. P2902.2).

9.6. Water Heater and Heated Storage Vessel Seismic Support

Water heaters and other heated fluid storage vessels shall be anchored or strapped in the upper one-third and in the lower one-third of the appliance to resist a horizontal force equal to one-third of the operating weight of the water heater, acting in any horizontal direction, or in accordance with the appliance manufacturer's recommendations.

9.7. Supply

No additives of any kind may be added to the water in the team's supply tank. This water is not for consumption at any time. Teams will be required to provide the tank and support it so that it does not damage the site.

9.8. Waste

All substances used in combination with water to clean the house, dishes, utensils, etc., must be nontoxic and preferably biodegradable. Teams may incur a point penalty for any toxic substances that are found in the wastewater tank.

9.9. Water Feature Safety

a. Water features shall not exceed a depth of 2 ft (61 cm).
b. For water features >1 ft but <2 ft (>30.5 cm but <61 cm), there shall be a representative from the team positioned at the water feature when open to the public to monitor the area and act as a lifeguard if necessary. During times when the area is not open to the public, the water feature shall be covered or guarded in a manner to prevent access.
c. To ensure safe access, a 44 in. (111.8 cm) accessible surface shall be maintained all around the water feature.
d. Visitor flow patterns shall be considered in the placement of the water feature.
e. The water feature should have sufficient circulation/treatment/measures taken to ensure the water does not become stagnant and a nuisance hazard.

9.10. Rainwater Harvesting

Teams may demonstrate or actively engage in harvesting and utilizing captured rainwater provided that the rainwater harvesting system meets the Dubai Municipality Green Buildings Regulations. Harvested Rainwater shall only be used for irrigation purposes.

9.11. Accessibility

All pipes, valves, cleanouts, particularly waste piping must be accessible for maintenance. Where recessed in wall cavities provide removable access panels or other approved methods for access.

9.12 Isolation Valves

Provide isolation valves to stop the flow at different sections of the system without affecting the entire system. All branches shall be provided with isolation valves.

9.13 Sizing

Main header and main piping distribution system should be sized with 10% to 15% extra capacity. Maximum water velocity = 1.5 m/s during peak demand conditions.

9.14 Vents

All the vent coil drainage located on the roof shall be coordinated with the air intake.

10. MATERIAL SAFETY

10.1. Thermal Storage

All thermal storage devices (“mass”) must be made of stable, nontoxic materials. For all heat-transfer fluids, Material Safety Data Sheets (MSDS) must be submitted for approval. All liquid-based thermal storage systems must be marked with the NFPA’s hazard warning diamond appropriate to the technology.

10.2. Paint and hazardous waste

Teams are not permitted to dispose of paint, solvent, grease or any hazardous waste on the competition site. Disposal of these kind of waste shall follow Dubai Municipality solid waste regulations.

10.3. Material Safety Data Sheets (MSDS)

MSDS are required for all potentially hazardous materials to be used at the event, such as cleaning solvents, glycol, rubber cement, rubbing alcohol, etc.

11. HEALTH AND SAFETY

11.1 Health and Safety General Rules & Guidelines

The main objective of health and safety on any site is to prevent the occurrence of ill-health, injury, or accident. This includes ensuring the health and safety of all participating team members as well as any representatives or visitors present on site during each phase of the competition.

Health and safety is an area of major importance for the organizers of the Solar Decathlon competition. Therefore, great emphasis is going to be made to confirm that the teams are complying with:

- **Planning and executing a safe process of production** whereby competing teams must plan and develop every single phase of the competition considering health and safety requirements.
- The DEWA IMS Policy Statement
- DEWA's Safety Signs Booklet (Available on SDME Teams Portal)
- The Dubai Municipality (DM) Code of Construction Safety Practice, DM Technical Guidelines, and DEWA Safety Procedures that outline mandatory health and safety requirements:
- DM Technical Guidelines of interest include the following:
    - Head protection – DM-PH&SD-P4-TG08
    - Eye and face protection – DM-PH&SD-P4-TG09
    - Hearing protection – DM-PH&SD-P4-TG10
    - Hand protection – DM-PH&SD-P4-TG12
    - Foot protection – DM-PH&SD-P4-TG13
    - Fall protection – DM-PH&SD-P4-TG14
    - Respiratory protection – DM-PH&SD-P4-TG15
    - Heat stress at work – DM-PH&SD-P4-TG03
    - Electrical safety – DM-PH&SD-P4-TG05
    - Guarding of dangerous machinery – DM-PH&SD-P4-TG06
    - First aid requirements – DM-PH&SD-P4-TG17
- DEWA Safety Procedures of interest including: SP02, SP03, SP06, SP09, and SP16. In addition to IMSP04 for Identification of Legal & Other Requirements (Available on SDME Teams Portal).

- Each team is responsible for the safety of its operations from project start to finish, including the safety of individual team members and the safety of any visitors on site.
- Each team member and team crew member shall work in a safe manner at all times during the project in accordance with the requirements identified in the rules and team Health and Safety Plan.
- Each team shall supply all necessary personal protective equipment (PPE) and safety equipment for all of the team's workers and visitors during the project.
- During assembly and disassembly, a minimum level of PPE including 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 inches (7.6 cm) long, long pants (the bottoms of the pant legs shall, at a minimum, touch the top of the boots when standing), a Class 2 high visibility reflective vest, shirt or jacket, and safety boots (meeting Class 75 impact/crushing standards of ASTM F2413 or equivalent) with ankle support, shall be worn by each team member and team crew member.
- Additional PPE or safety equipment shall be used if required for the task being performed (e.g. shock/arc protection, hearing protection, face shields, dust mask, etc.).

- Team members shall meet the requirements outlined in OSHA 29 CFR Part 1910, Subpart S, as well as those outlined in Chapter 16 of the Dubai Code of Construction Safety Practice in order to be considered a qualified electrical worker and permitted to work on teams' electrical systems on the competition site.
- Individuals under the age of 18 are not permitted to be on the competition site during assembly and disassembly.
- Smoking is not permitted within the competition site at any time during assembly or disassembly.
- Pets and other animals are not permitted on the competition site during assembly or disassembly with the exception of registered service animals.
- The operation of Unmanned Aircraft Systems (drones) within the site is prohibited at all times.
- Organizers may issue a stop work order at any time during the project if a hazardous condition is identified. The duration of the stop work order is at the discretion of the organizers and additional construction time will not be provided.
- All electrical work on the competition site shall meet electrical lock-out/tag-out requirements indicated in each team's approved Health and Safety Plan. Fall protection systems shall be used in a manner to provide protection against fall exposures 100% of the time.
- Failure to follow the procedures and requirements outlined in each team's Health and Safety Plan is considered a rule violation, and violations are subject to penalty points (see SECTION 1.4).

111.1.1 – Work Phases

In order to comply with the four mentioned points (safe process of production and compliance with local regulations), teams should take the following steps:

1. Conduct process safety analysis
2. Develop a Health and Safety Plan
3. Prepare for construction works
4. Construction Works

Throughout this project, the following general prevention principles should be considered:

- Avoid risks
- Evaluate unavoidable risks
- Combat risks at the source
- Adapt work to manpower
- Take into account technical evolution
- Replace dangerous items with safer or less dangerous ones
- Plan safety measures before the work begins
- Use collective protection[1] prior to individual ones
- Provide appropriate instructions to workers
- Maintain communication with team members, volunteers, and subcontractors about health and safety related issues and keep them informed about any changes

[1] Collective protection is a safety technique whose goal is to simultaneously protect several workers exposed to a certain risk. For example: To protect multiple workers from the risk of falling from heights, the following collective protection measures could be used - railings, footbridges, safety nets, scaffoldings, etc.

Conduct process safety analysis

A thorough analysis of the steps involved in the assembly, maintenance, and disassembly of the house must be conducted in order to identify all hazards that have the potential to cause injury or ill-health to an individual. The best way to do this is as follows:

1. **Breakdown the project** into work-units or activities.
   For example: foundation execution, façade assembly, installation of PV panels, etc.

2. **Identify the tasks** to be done in each work-unit or activity.
   For example: the structural tasks for a modular house will consist of:

   a) *Transporting the module*
   b) *Unloading the module*
   c) *Stocking the module*
   d) *Making the on-site layout*
   e) *Laying the module on site*
   f) *Assembling the module with the rest of the structure*

3. **Identify the agents** (e.g. human resources, machinery, materials, etc.) that are involved in each task. Following the previous example:

   a) *The truck*
   b) *The load*
   c) *The Health and Safety Operations' Coordinator responsible for managing the work*
   d) *The workers*
   e) *Etc.*

4. **Identify the risks** associated with each task, and the **associated control measure(s)** that should be in place to minimize the risk. Following the previous example:

   a) TASK 1: Unloading module

Risk 1(a): *Getting knocked down by the transport truck in the working area.*
Control Measure 1(a): *Ensure that the truck driver is certified, mark the driveway / path for the truck, and ensure it is separated from the workers path.*

Risk 1(b): …
Control Measure 1(b): …

   b) ***TASK 2: Laying the module on site***

Risk 2(a): *Getting knocked down by the load.*
Control Measure 2(a): *Control the load with ropes from at least four opposite points, keep workers far away from the module, and ensure the crane user is certified and licensed to operate a crane.*

Risk 2(b): …
Control Measure 2(b): …

The following is a list of possible risks that may be identified. These can be used as examples:

Fall of persons from different heights	Trapped by turned over machines, tractors, or vehicles
Fall of persons from same height	Overexertion
Fall of objects because of collapse	Exposure to extreme environmental temperatures
Fall of objects because they came loose	Thermal contact
Fall of objects because of manipulation	Exposure to electrical connections
Stepping on objects	Exposure to radiation
Colliding with still objects	Exposure to harmful substances
Colliding with objects in motion	Contact with caustic or corrosive substances
Knocked by objects or tools	Explosion
Flying fragments or particles	Fire
Accidents caused by living beings	Run over or hit by vehicles
Trapped by or between objects	Non-traumatic pathologies

The aim of conducting a process safety analysis is to answer the following questions:

- Which agents are involved in each task?
- What potential hazards can be identified, and what are the associated risks?
- Who may be harmed and how? E.g. Solar Decathlon team members, workers, visitors, etc.
- How can each identified risk be controlled or prevented?
- Describe the safety measures to be adopted to prevent or minimize the risk

It is important to remember that the process safety analysis must cover not only the construction process, but all the activities of the Solar Decathlon competition including: project development, previous works at university, team members' training, transport, assembly, maintenance works during the competition, disassembly, etc.

Develop a Health and Safety Plan

The **Health and Safety Plan** is explained in more detail in SECTION 2.

Prepare for construction works

This phase consists of developing all the previous measures planned to prevent risks. As described in the Health and Safety Report (see SECTION 2.2), in order to prevent risks, individuals shall:

- Receive the appropriate training for the tasks that will be carried out e.g. using machinery, use of power tools, etc.
- Obtain driving licenses and necessary certificates (or licenses) for trucks, motorized platforms, and all other necessary auxiliary measures.
- Attend necessary first aid courses.
- Undergo medical examinations.

All completed course certificates and documents derived from these activities shall be included in the **Health and Safety Report**, and in the **Health and Safety Specific Terms and Conditions Document** (see SECTION 2.2).

Construction works

During the final phase of the competition, all teams shall always keep in mind the measures described in the Health and Safety Plan.

The teams shall analyse and assess all the safety control measures before commencing with the work in order to avoid unexpected risks. Accordingly, teams may modify the actions described in the Health and Safety Plan. Following these changes, teams must inform the Solar Decathlon on-site office and organizers immediately and wait for their approval, as any change shall at least ensure the same level of safety.

During the assembly, maintenance, and disassembly stages, the team must identify all the safety control measures that are necessary to ensure a safe work site. For example:

- Provision of adequate lighting to safely perform work.
- Establishing work schedules and/or shifts to ensure team members have suitable time to rest and to work safely on site.

Also, during these stages, it is **mandatory** to obey the orders and instructions provided by the Solar Decathlon on-site office.

The following figure shows the conditions and stages for site access and working authorization.

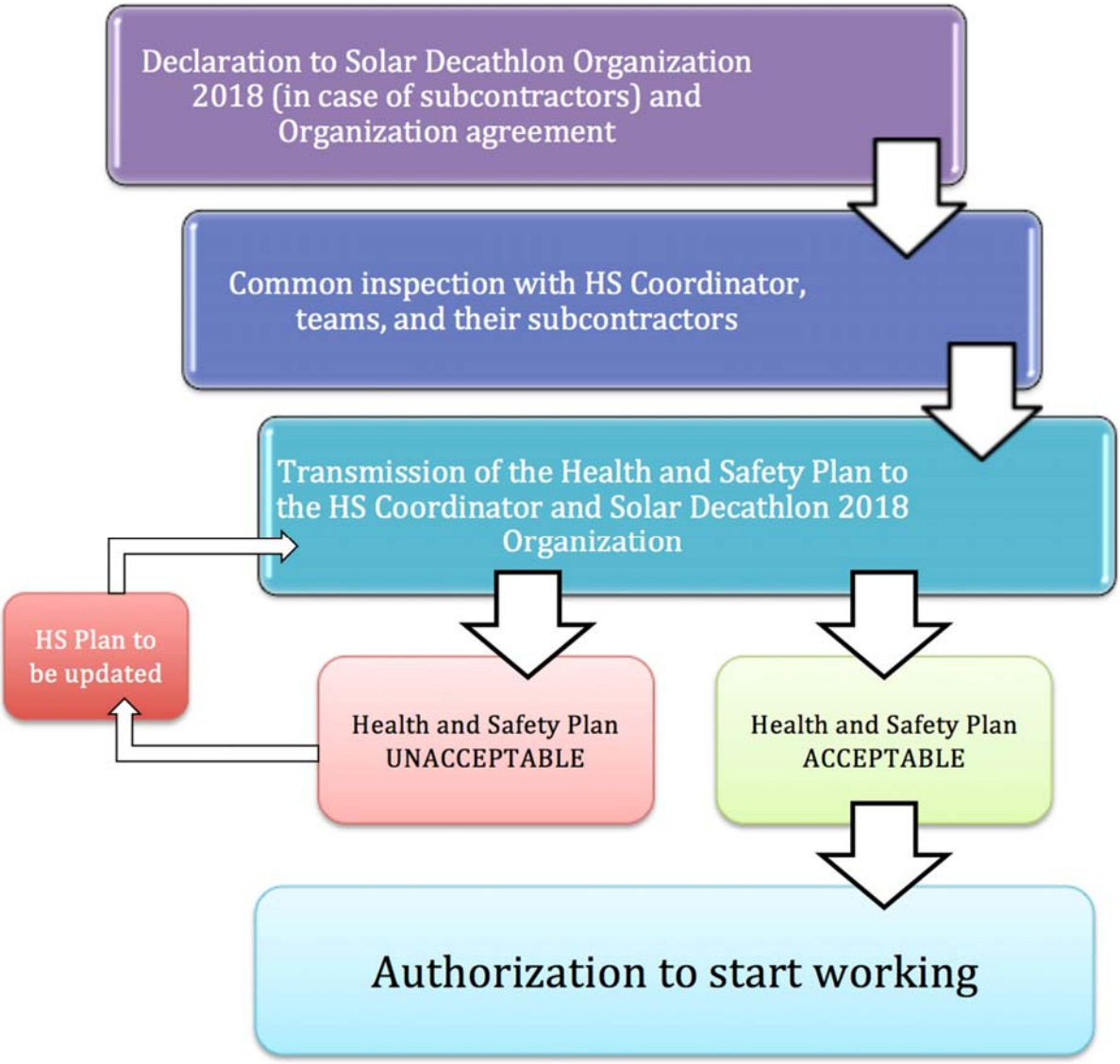


Figure 23: conditions and stages for site access and working authorization

11.1.2 Solar Decathlon on Site Office

The Solar Decathlon on-site office consists of:

- **Health and Safety (HS) Coordinator:** The HS Coordinator will be responsible for coordinating and overseeing all health and safety related aspects during the construction, in compliance with local regulations and DEWA safety procedures.

- **Health and Safety (HS) Inspectors:** The HS Inspectors are appointed by the HS Coordinator (as and where needed) to assist with health and safety activities. This includes checking on deliverables, inspecting team construction sites, informing the HS Coordinator of any incidents, etc. During the HS Coordinator's absence, the HS Inspectors may act as the HS Coordinator.

In case the works involve serious and/or imminent risk to injury and/or ill-health to any individual on site, the HS Coordinators or HS Inspectors have the authority to stop any work until the risk is cleared.

Construction Works Control

During the competition, the Solar Decathlon on-site office will participate in daily meetings with all teams. They will give specific instructions to teams based on the activities they perform throughout the day. According to the experience during the previous days, the actions to be repeated or avoided will be indicated.

Throughout the competition, the HS Coordinator and HS Inspectors will inspect the lots of all teams. The objectives of these inspections will be to:

- Work with teams to help them solve any problem(s) or to answer any queries
- Verify compliance with health and safety measures
- Decide if **bonus** and/or **penalties** are to be applied
- Stop any work immediately (if necessary)

11.1.3 Bonuses

Teams complying with the 3 following items will obtain up to **5 points** of bonus for the total score of the competition:

- All the documents required for health and safety are received on time
- No explanations or additional documents are needed to complete the health and safety deliverable
- The health and safety documentation submitted by the team is complete enough to receive the certificate of approval to work

11.1.4 – Penalties

Teams will not receive a penalty if they are working in a safe manner and are following their Health and Safety Plan accordingly.

No penalties will be applied to trivial situations that are immediately corrected. However, penalties may be applied in the case of repetitive trivial situations.

To avoid risks and possible penalties, it is recommended for teams to consult the HS Coordinator and/or HS Inspectors if they have any doubts concerning any health and safety measures to be adopted for a specific task. The HS Coordinators / HS Inspectors can provide guidance and a potential penalty could, therefore, be avoided.

If there is any detection of a non-trivial (i.e. serious) health and safety related fault, the procedure will consist of the following:

1. The team will be ordered to stop work immediately.

    a. The HS Coordinator / HS Inspector shall decide on the number of team members to stop working (the whole team or only those involved in the fault).
    b. The HS Coordinator / HS Inspector shall decide if it is necessary to solve the fault before stopping. In this case, only the minimum number of team members necessary will resolve the fault and will leave the lot once they have finished.
    c. The HS Coordinator / HS Inspector shall decide for how long the work is to be stopped.
    d. If the HS Coordinator / HS Inspector stop all the works, it is absolutely **mandatory** to keep out of the lot for the time established. This time counting will start immediately after the last team member called to stop is out of the lot. The team shall await further instructions from the HS Coordinator / HS Inspector to resume the works again.

2. In order to prevent recurrence, the HS Coordinator / HS Inspector will meet with the team to analyse the fault and indicate the measures to be taken to resolve this type of risk.

3. The HS Coordinator / HS Inspector will order the team members involved in the task to immediately solve the problem.

4. Depending on the degree of the fault (see SECTION 1.4.1), the HS Coordinator / HS Inspector may apply **point** or **time penalties** (stopping the works), or both. Moreover, in the case of a serious fault, the HS Coordinator / HS Inspector may recommend to adopt another kind of action.

5. In case of an intolerable fault, the HS Coordinator / HS Inspector will meet amongst themselves (and any other representatives of the organization) to discuss the possible disqualification of the team from the competition

The HS Coordinator / HS Inspector will fill in a report signed by the team's appointed Safety Officer including the degree of the fault, the details of the incident, and the measures taken.

Grade	Fault Type	Points penalty (up to)[2]	Time stoppage (up to; minutes)
1	Trivial	1	0
2	Tolerable	2	30
3	Moderate	5	50
4	Important	10	100
5	Intolerable[3]	20	240

[2] Point penalties will be applied only during assembly and maintenance phases.
[3] In case of an intolerable fault, or reiterative faults that compromises the health and safety of students, the HS Coordinator / HS Inspector will meet with representatives of the organizers to evaluate the need to stop the works of the team and immediate expulsion from the competition.

The Solar Decathlon 2018 Organizers, through the HS Coordinator / HS Inspector, have the authority to determine the grade of every fault, and the penalty to apply (type and quantity).

Degree of faults (explained)

Grade 1 – Trivial Fault (with serious and imminent unexpected risks):

- Temporary lack of individual protections or incorrect use of them
- Temporary incorrect work procedure
- Temporary lack of necessary signage

Examples:

- Not wearing a hard hat
- Carrying excessive loads
- General signs in the entry of the lot removed and not replaced

Grade 2 – Tolerable Fault (with serious and imminent unexpected risks):

- Lack of collective protections, or ineffective protections, with tolerable risks as a consequence
- Repetitive degree fault 1

Grade 3 – Moderate Fault:

- Lack of collective protections, or ineffective protections, with moderate risks as a consequence
- Systematic degree fault 1, or repetitive with moderate risks as a consequence
- Not following the site's instructions, with moderate risks as a consequence

Grade 4 – Important Fault:

- Lack of collective protections, or ineffective protections, with important risks as a consequence
- Systematic degree fault 1, or repetitive with important risks as a consequence
- Not following the site's instructions, with important risks as a consequence

Grade 5 – Intolerable Fault:

- Negligent attitudes
- Deliberate actions that cause or may cause important risks for the team members or any other person
- Not following the site's instructions to resolve an expected serious and imminent risk

11.2 Health and Safety Plan Requirements

The overall success of the Solar Decathlon competition is dependent on the health and safety of all team and crew members, volunteers, subcontractors, organizers, and the public. To achieve this objective, each team is required to submit a Health and Safety Plan that identifies the following elements:

- How the team will be minimizing risk
- How the team will address major hazards that may be encountered during assembly and disassembly activities on the competition site
- How the team will control these hazards to prevent injury to the team and crew members, volunteers, subcontractors, organizers, and the public
- Areas of high risk such as electrical safety, working at elevated heights / fall protection, hoisting and rigging activities, and safe equipment operations shall include the necessary level of detail to ensure the health and safety of all site personnel
- How the team will ensure that they are in compliance with applicable regulations
- The roles and responsibilities of the team's core supervisory personnel (Project Manager, Construction Manager, and Health and Safety Officer(s)) throughout the event

The main objective of the Health and Safety Plan is to prevent and/or resolve any incident that may arise during the course of this competition. This includes construction works, assembly, and disassembly, maintenance during contest weeks, and entry and exits of vehicles to and from the site.

Each team is required to write and submit a Health and Safety Plan specific to its project and workplace requirements and be in charge of its practical application on site.

The plan will be analysed and reviewed by the Health and Safety Team Coordinator prior to submission to the organizers who will ultimately accept and approve it.

11.2.1 – Plan Development

A Health and Safety Plan template will be provided to each project group. The template will identify the main topics to be addressed, the level of detail required, performance expectations, and selected requirements such as minimum level of training needed for various team positions. The format of each team's submitted plan can deviate slightly from the recommended template as long as the information and level of detail are clear, and the Decathlon-specific requirements are met. Each plan shall be developed in consideration of the unique needs and requirements of each team's competition prototype and construction methodologies on the competition site. Teams are to work or consult with their school's health, safety, and environment department during the development process. They can be an excellent resource when developing the Health and Safety Plan, while also ensuring that school-specific requirements are addressed.

11.2.2 – Content Requirements

The Health and Safety Plan document shall be developed in response to an in-depth risk analysis of all situations related to the project including:

- Performance of tasks
- Joint or successive activities
- Environment and surroundings of the workstations and jobsite
- Direct or indirect risks for persons, property, and the environment in which the operation is performed

Each team must update its Health and Safety Plan according to all observations made during the process safety analysis (see SECTION 1.1.1).

The Health and Safety Plan must include the following:

- Name and address of the Solar Decathlon 2018, Health and Safety Coordinator, prevention authorities, and team members (from the participant's side)[4]
- Number of workers involved
- Contact information of the site operation coordinator
- Description of works
- First aid procedure
- Name and number of first aid certified worker(s) / team members
- Description of the team's first aid kit
- Description of welfare, well-being, and hygiene conditions (e.g. toilet facilities, changing facilities, pantries, rest areas, eating facilities, etc.)[5]
- Detailed description of operations
- Procedures to adapt collective protection
- Emergency preparedness procedure
- Incident Investigation
- Risk assessment:
  - Risks generated by other, risks generated by the environment, risks generated on other, and self-generated risks should all be considered
  - There are **5 steps** in carrying out a risk assessment:
    1. **Identify the hazards**
    2. **Decide who might be harmed and how**
       a. Consider who may be at increased risk of harm
       b. Consider frequency / duration of task
       c. Consider nature of work
    3. **Evaluate the risks and decide on control measures**
       a. What is the likelihood and severity of the harm should it occur?
       b. What monitoring strategies or techniques should be in place?
       c. Are there any known exposure limits?
       d. Consider the hierarchy of control[6]

[4] In case of any incident or accident that may occur, an investigation into the root cause should be conducted and recommendations / resolutions should be implemented accordingly.
[5] DEWA SP16 Welfare, Well-being, and Hygiene Procedure to be used as a frame of reference.
[6] Risks should be reduced as low as reasonably practicable by taking preventative measures in order of priority. See ANNEXURE I for a table following the hierarchy of control.

4. **Record findings and implement them**
    a. Note that it is important to review the findings when changes are made, and that they should be communicated accordingly. It is also important to prioritise hazards / risks.
5. **Review the assessment and update if necessary**
    a. Are there any improvements that need to be made?
    b. Have any new problems been identified?

In addition to the aforementioned points, the Health and Safety Plan must also consist of the following:

- **Health and Safety Drawings** that are to be included in the corresponding section of the project drawings. They must clearly define the safety measures to adopt in every work phase[7]. As a minimum, they must include:
    - Identification of work phases: determining the activities to be developed in each phase, the risks associated, and the safety / control measures that will be in place
    - Number of team members and their corresponding tasks
    - Collective protection to be used (position in each phase, details of installation, etc.)
    - Location of first aid kit(s) / box(es) / area
    - Delimit (i.e. indication of boundaries) the different areas inside the lot
    - Determine locations of important elements for each work phase. For example:
        - Movement of trucks
        - Movement of modules (any heavy load movement)
        - Position of crane
        - Position of scaffolding
        - Etc.
    - Individual protection to be used (i.e. Personal Protective Equipment (PPE))
    - Signposting
    - Emergency evacuation plan (during assembly and disassembly periods). The evacuation plan must be kept visible inside the lot (preferably using a waterproof mobile signpost) during the final phase of the competition. Moreover, each team member must have a copy of it and keep it with them during their working periods. The emergency evacuation plan must indicate the procedure in case of an emergency or accident and must include at least:
        - Directional arrows indicating evacuation path
        - Route to closest health centre / first aid area
        - Procedure to follow in case of injury and/or accident
        - Emergency contact numbers (i.e. police, fire, ambulance, first aiders, etc.)

- **Health and Safety Report** that is to be included in the Project Manual, in the Health and Safety Plan Section. Appropriate reference to drawings location should be made as and where needed. The report should include the following sections:
    - Health and Safety Checklist (the following is an example – more points may be included as needed):

CONTENTS	LOCATION IN THE REPORT / DRAWINGS
Name and address of Solar Decathlon 2018, HS Coordinator, Prevention Authorities, Team	
Number of workers	

[7] It is recommended that teams develop the Health and Safety Drawings as assembly sketches of each activity, step-by-step, for a better understanding of the adopted measures and their effectiveness.

Contact information of the Site Operations Coordinator

Description of works

First aid procedure

Name and number of first aid certified worker(s)

Description of the team's first aid kit / box

Description of welfare, well-being, and hygiene conditions

Detailed description of operations

Risk assessment – risks generated by other

Risk assessment – risks generated by environment

Risk assessment – risks generated on other

Risk assessment – self-generated risks

Procedures to adapt collective protection

- o General health and safety related data of the project
- o Health and Safety Plan objectives
- o Conditions of the site where construction will take place, and interesting data related to the prevention of risks during the construction process. These include:
  - Construction process
  - Type and characteristics of the materials and elements that will be used
  - Site description
  - Climate description
  - Accessibility and paths for vehicles
  - Determining factors for the house placing
  - Overlaps with the affected services and other circumstances or activities of the environment that may cause risks during the construction
  - Planned activities
  - Trades whose intervention is affected by risk prevention
  - Auxiliary resources planned for the construction
  - Machinery that will be used for the construction
  - Construction site installations
  - Characteristics table for the stocks
  - Activities for risk prevention
  - Construction plan – determination of effective work timing
  - Overlaps and incompatibilities in the construction (i.e. limitations)
  - Number of team members taking part in the construction
  - Contracting planned
- o Critical work phases for risk prevention
- o Identification of risks and effectiveness evaluation of adopted safety / control measures
- o Location and identification of the areas where the work involves special risks (i.e. high risk areas of work)
- o Collective protection that will be used
- o Individual protection that will be used:
  - Signposting of risks
- o Safe working procedures of every team member

- Machinery and auxiliary resources
- Planned measures in case of accident:
  - First aiders
  - First aid kit / box
  - Preventive medicine
  - Planned evacuation procedure
- Identification of risks for possible later works
- Useful plans and information for possible later works
- Adopted system for the level of health and safety control during work
- Information about health and safety
- Emergency evacuation plan during the assembly and disassembly periods

- **Health and Safety Specific Terms and Conditions Document** is to be included in the Project Manual, in the Health and Safety Plan Section. This is the document that satisfies that all team members are complying with local regulations and DEWA safety procedures and requirements. For the Solar Decathlon competition, the following documents will be required:
  - A statement in which the team commits itself to avoid or minimise the risks derived from the work process
  - A statement in which the team commits itself to envisage the health and safety demands and/or needs from all the people taking part in the project (decathletes, subcontractors, etc.), and in which the team declares to have considered those demands and/or needs in the Health and Safety Plan.
  - Complete technical specifications of the collective protections that shall be used.
  - Complete technical specifications of the individual protections that shall be used.
  - A description of the terms and conditions of the Safety Plans that each team member has to comply with.
  - A statement in which all team members have passed specific medical examinations for the works that they will be carrying out and have the necessary qualifications. All team members shall be properly identified in this statement, and it shall clearly specify that all are of legal age.
  - A statement that the team has received the necessary training to assemble and disassemble the house that will be exhibited, preventing unexpected risks. All team members shall be properly identified in this statement.
  - For contracted staff:
    - Medical examinations of the workers
    - Specific training
    - A statement of compliance with the Health and Safety Plan
    - If necessary, a clear and specific description of their own procedures to the Health and Safety Plan

11.2.3 – Required Training

To ensure a minimum knowledge base regarding health and safety issues during construction activities, the team's HS Safety Coordinator and HS Safety Officers are required to complete the OSHA 30-hour Construction Safety Training course. Team members that will be involved in any construction activity is required to complete the minimum OSHA 10-hour Construction Safety Training Course. If OSHA Construction Safety Training courses are not available in the team's region, the team should look for an equivalent training and obtain the SDME Organization approval on the alternative training course.

Additionally, at least two team members on the construction site must be available who are certified First Aiders (i.e. completed First Aid Training), and at least two team members on the construction site must be available who are certified Fire Wardens (i.e. completed Fire Fighting training). This is required for each competing team. However, it is recommended that all team members complete the First Aid training course as well as Fire Fighting course. Proof of completion of all required courses shall be included within the Health and Safety Plan.

11.2.4 – Submission and Approval

Teams are required to submit their Health and Safety Plan to the organizers (HS Coordinator) for acceptance. Teams are responsible for updating the Health and Safety Plan, both before and after acceptance, to reflect changes in construction parameters as and where needed.

During the event, a current copy of each team's Health and Safety Plan shall always be made available on their site in a prominent location. Individuals working on each team's site shall be briefed on the final, approved plan and should know the expectations regarding safety, hazards, and controls.

The final Health and Safety Plan will be considered acceptable only when the HS Coordinator certifies that all items are properly developed. Once teams have an acceptable Health and Safety Plan, the HS Coordinator will issue them a **certificate of approval** accordingly.

Without the certificate of approval, the team will NOT be authorized to assemble the house in the corresponding site of the Solar Decathlon 2018.

The teams are allowed to make changes to their Health and Safety Plans after acceptance and receipt of the certificate of approval. However, the newly amended Health and Safety Plan must be sent back to the HS Coordinator and a **NEW** certificate of approval must be issued.

For example: If Team A did not plan to use a crane to place their house when the plan was submitted, but later decide that a crane will be necessary; then they must update their plan accordingly. Team A will then send this updated plan to the HS Coordinator for approval. The HS Coordinator will then issue a new certificate of approval.

11.2.5 – Final Construction and Documentation Submission

Format requirements:

- General format of Health and Safety Plan template to be met
- Packaged into a single, bookmarked PDF document

Content requirements:

- Health and Safety Plan meeting the requirements outlined in SECTION 2
- Proof of completion of all required courses as outlined in SECTION 2.3

11.3 Team General Requirements

This section explains the roles and responsibilities of the team members.

11.3.1 – Health and Safety (HS) Team Coordinator and Safety Officers

The **HS Team Coordinator** is the team member in charge of health and safety throughout the solar decathlon competition, and has the ultimate responsibility for the development and enforcement of the team's Health and Safety Plan. They are responsible for the health and safety of the all team members including students, faculty members, contracted staff, etc.

During the design process, the HS Team Coordinator is the one who signs the Health and Safety Plan, certifying that all the information provided therein is true and complete. They are also responsible for every decision established in the Health and Safety Plan. It is recommended that the HS Team Coordinator be a qualified engineer or architect.

The HS Team Coordinator must always be on the lot (on site) when work is being carried out. It is also **mandatory** for them to have a distinctive sign or nametag that can be easily identified by other members of the team as well as the organizers.

It is **mandatory** to clearly identify the HS Team Coordinator in the Health and Safety Plan.

Note: It is recommended that a faculty or other person with authority in the team assumes the role of HS Team Coordinator during the design and construction phases.

The **Safety Officers** are those selected team members who are in charge of observing safety measures. It is also **mandatory** to clearly identify the Safety Officers in the Health and Safety Plan.

The Safety Officers need to:

- Possess sufficient knowledge of the assembly and disassembly processes
- Possess sufficient experience in order to identify risks and suitable control measures to minimize or prevent them
- Possess enough authority inside the team to lead the remaining team members
- Be able to identify when any activity needs to be stopped during assembly or disassembly if necessary

11.3.2 – Relationship with Solar Decathlon On-Site Office

The HS Coordinator / HS Inspectors will only give orders or instructions to the HS Team Coordinator or Safety Officers who will in turn inform the rest of their team. The HS Coordinator / HS Inspectors will only communicate with the rest of the team in the case of an imminent or important risks.

The HS Team Coordinator and/or Safety Officers will participate in the daily briefings on site. Moreover, they are encouraged to hold similar daily briefings with their team members to them inform them of the instructions provided by the organizers.

11.3.2 – Contracted Staff

Any contracted staff shall be considered as another team member. It is **mandatory** for all contracted staff (including truck drivers, crane controllers, etc.) to comply with the Solar Decathlon 2018 Rules and Regulations.

It is important that any agreement or contract with contracted staff include adherence to both local regulations and those specified in the Solar Decathlon 2018 Rules and Regulations.

Note: The Solar Decathlon 2018 organizers may apply penalties to team members as a result of the actions of their contracted staff.

The Health and Safety Plan must include the activities to be developed by the contracted workers.

The contracted company or workers shall accept to comply with the Health and Safety Plan of the team in all aspects of their work, and must declare to meet the requirements of the whole document. Therefore, the plan must include a statement signed by the contracted workers and their acceptance. A detailed Health and Safety Plan must include a complete description of all the works to be done. Teams must work together with the contracted staff in developing the sections of the Health and Safety Plan that include the tasks in which the contracted staff are needed.

11.3.3 – Working Shifts and Resting

A basic measure to reduce risks is to guarantee that all team members are well rested. Accidents are more likely to occur as a result of lack of concentration / focus due to tiredness. A strict planning of activities and shifts among the team members is needed. It is recommended that each team member not exceed 8 working hours per day. Teams are also recommended to organize three working shifts of 8 hours, including 1 hour for lunch, and a 15-minute break for each shift.

Teams are also encouraged to have a specific area for having lunch or resting. However, it is preferable for team members leave the lot during this time to minimise risk of injury or accident occurrence.

As stated in SECTION 3.1, the HS Team Coordinator must be on the lot while any activity is being carried out inside. When the HS Team Coordinator is taking a break for lunch or to rest, the team's Safety Officer may take his/her place accordingly.

During the construction works, the Solar Decathlon on-site office may require to see a daily list of team members for every shift, as well as the schedule for each one.

11.3.4 – Emergency and Accident Procedures

The Health and Safety Plan of each team shall include all of the information concerning this subject.

The **Health and Safety Drawings** must include: location of first aid box(es), route to nearest health centre or first aid room, planned signposting, etc.

The **Health and Safety Report** should include any information pertaining to each team member's insurance that will cover his/her stay in the UAE.

The **Health and Safety Specific Terms and Conditions Document** must include information about accident procedures, first aid, etc. where appropriate.

Before starting work, teams are encouraged to complete an emergency training course prior to the final phase of the competition. They are also encouraged to visit the nearest health centre or first aid room to familiarize team members with the fastest route to get there.

During the construction works, the evacuation plan must be kept visible inside the lot (see SECTION 2.2) during the final phase of the competition. Moreover, each team member must have a copy of it and keep it with him/her during their working periods. Regardless of the health and safety measures of the Solar Decathlon 2018 organization, every team shall have a first-aid box inside their lot. In addition, there must be a team member responsible for first aid (i.e. certified and qualified) during each shift.

In **case of an accident**:

- The team must respond as described in the Health and Safety Plan (evaluation, first aide, etc.).
- The team must evaluate the emergency.
- Call or notify the Solar Decathlon on-site office and organization
- If necessary, ask the Solar Decathlon on-site office and organization for any additional help

11.3.5 – Collective Protections

All teams shall provide every work unit with collective protection during the assembly, maintenance, and disassembly phases of the house. All team members, crew, and volunteers that will use the collective protections **need to be trained** on their **proper use**, **inspection**, and **limitations**.

All of the protection equipment, auxiliary resources, machinery, etc. shall have the **CE branding** – this includes both collective and individual protection equipment used.

11.3.6 – Individual Protection

Each team has to provide their staff (i.e. team members and crew) with personal protective equipment (PPE), during the assembly and disassembly phases of the house. This equipment should also be available whenever considered necessary e.g. during maintenance operations.

All team members, crew, and volunteers need to be briefed on their proper use, inspection, and limitations.

Note: PPE is considered a last resort in terms of safety control measures.

During the assembly, maintenance, and disassembly phases, a minimum level of PPE is **mandatory** and required at all times:

- Hard hat (white or yellow colour)
- Safety glasses
- A shirt with sleeves and long trousers
- Safety boots with ankle support
- Reflective jacket or vest (yellow colour)
- Additional PPE or safety equipment as and where needed depending on task being performed

The Solar Decathlon organization will provide specific hard hats for the following team members in order to easily identify them on site:

- The Site Operations Coordinators
- The HS Team Coordinator
- The Safety Officers

Teams will have to clearly identify the crane signal person (i.e. the person who directs the operation of a crane) by writing the term "BANKSMAN" in black-colored capital letters on the back of his/her reflective jacket.

Important Note: For the Safety Helmets, the team members should provide and use White Helmets only. However, SDME will provide each team with four helmets for the following members: Site Operation Coordinator (Orange), H&S Coordinator (Red), Main Safety Officer (Red), and the Banksman (Yellow). For the Safety Vests, you are allowed to use any color expect for Green. Only SDME organizers will be wearing green helmets and vests.

11.3.7 – Vehicles on Site

When trucks or any other vehicle is moving within the site, the following rules must be followed:

- The speed of the trucks will adapt to the step of a man
- One person must walk in front of the truck
- Another person must walk behind the truck

These two people will have to:

- Establish the maximum speed of the vehicles
- Direct the movements of the truck
- Avoid any accidents with people with the rest of the vehicles and/or with different elements of the site

11.3.8 – Load Operation

In order to minimize the risk of any musculoskeletal disorders from occurring, the maximum load to be carried out by one single person is should be in accordance to Figure 1:

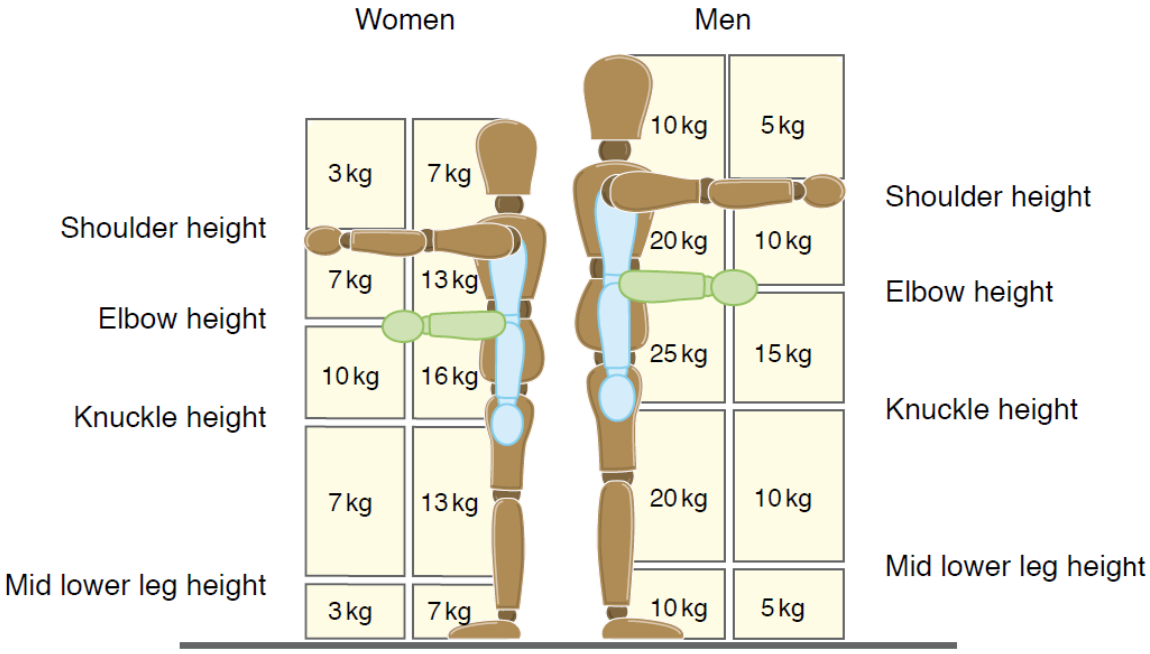


Figure 24: HSE UK guideline weights and heights for lifting and lowering[8]

[8] It is recommended to read the full guide of Manual Handling at Work.

APPENDICES

APPENDIX 1 COMMENTS, GUIDELINES & INFORMATION FOR THE CONSTRUCTION DRAWINGS

✓	ID	Architecture and Interior Design
	1	**Materials**
	1.1	Indicate the materials and specifications
	1.2	Building walls, doors and windows to be at least one-hour fire rated.
	1.3	Ensure that finishing materials are complying with SDME rule and UAE FLS code. Materials shall comply with the requirements of the code, attested by test certificates.
	1.4	Team must avoid condensation on the external walls. Provide a vapor barrier in the external walls and the roof if needed.
	1.5	Exposed gaps/joints between different components to be filled with a certified weatherproof & fireproof sealant.
	2	**Floor Plans**
	2.1	Provide detailed dimensions for rooms, doors and windows, ramps (width, length, and slope), wall thicknesses, etc.
	2.2	Show and annotate all the building components.
	3	**Elevations and sections**
	3.1	Ensure that sections & elevations are referred in the plans or provide a key plan showing the location of each one
	3.2	Indicate all heights and levels for all building parts
	3.3	In the sections, show the ceiling if any and indicate the rooms internal height.
	3.4	Provide the details callouts
	5	**Roof plans**
	5.1	Identify all component and equipment installed on the roofs.
	5.2	Indicate the drainage strategy: evacuation points, slopes, etc.
	5.3	Provide protections (guardrail, balustrade, ...etc.) for accessible Roof or roof terraces.
	5.4	If solar or MEP equipment is installed on the roof, provide the strategy to access them for maintenance and cleaning works.
	6	**Reflected ceiling plan**
	6.1	Please show all MEP equipment: lights, smoke detectors, sprinklers, etc.

	7	**Accessibility and Safety**
	7.1	The ramps shall be 5% slope; higher percentages are allowed depending on the length covered. Refer to “The building Regulation & Facilities for the Disabled.”
	7.2	Provide handrails on both sides of the ramps. Balustrade/handrail shall be 900-1200mm high. A lower handrail to be provided at 70-75 mm height with regards to the wheelchairs users.
	7.3	Above 3m width of the ramp, an intermediate handrail shall be provided. Refer to §3/6 of The Building Regulation & Facilities for the Disabled.
	7.4	Ramps landings to be 1500 mm long as minimum
	7.5	Doors clear width is measured, in open position, from the internal face of the leaf to the internal face of the frame. Ensure 90 cm clear width minimum, for external doors; and 80 cm clear width minimum, for internal doors.
	7.6	Guards are required for any space, walking or standing surface above 760mm from F.F.L (UAE FLS code §2.17.2.1) that includes terraces, balconies, and decks.
	7.7	Guardrails height must comply with UAE fire and life safety code of practice: minimum height =1100 mm with maximum clearance among the vertical rods of the railing 100 mm.
	7.8	The height of the window sill shall be non-less than 900 mm except in case of the existence of balconies or terraces outside such windows, in which safety protection (balustrade) of minimum height 1.1m shall be provided.
	7.9	For the stairs, please follow below these regulations: Maximum risers/ steps per flight = 14 Minimum headroom = 8 ft Minimum stairs width = 3.5 ft Maximum riser height= 7 in Minimum tread depth= 11 in The steps dimensions follow the rule: [(riser height H x 2) + tread depth = 60 to 65 cm] Handrail to be provided at both sides of the stair at 965-1065 height. Provide a clearance of not less than 57 mm between the wall and the handrail and ensure that the gripping surface is of a circular section 32-51 mm diameter.
	7.10	Ensure a distance between 90 cm and 140 cm between the two handrail grips.
	8	**Public Tour**
	8.1	Ensure an accessible and clear tour path for disabled persons.
	8.2	Avoid narrow areas and if the visitors will need to make a turn, ensure that there is enough space for maneuver a wheelchair.

✓	ID	Structure
	1	**Required on structural drawings**
	1.1	General notes
	1.2	Loading area diagram for ground, first and roof level (Roof level load diagram to include point/area load for solar panel)
	1.3	Service Reactions (Forces/moments) on supporting columns/walls at foundation level
	1.4	Base plate layout with anchor bolt detail
	1.5	Footing layout with typical footing sectional detail and Allowable soil bearing capacity.
	1.6	All floor framing layout with the necessary information table.
	1.7	Steel section and connection details with ultimate design (forces/moments) in tabulated format to be shown on drawing.
	1.8	The faculty advisor and the professional in charge of the structural design must sign and stamp the structural drawings and calculations of the house, including railing and all site components that might pose a threat to public safety if they fail. (Rule 6.1)
	2	**Required information on General notes drawing**
	2.1	Design criteria.
	2.2	Design codes
	2.3	Design loads (Gravity, wind and seismic)
	2.4	Basic Load combinations for ultimate and service design.
	2.5	Proposed design materials properties and specifications (Concrete, Reinforcement, steel work, precast, wood, masonry block, etc.)
	2.6	Fire resistance requirements; Fire rating for proposed construction materials.
	3	**Codes to be considered** (In addition to the ones included in the Rules)
	3.1	Design Codes ACI 318: "Building Code Requirements for Structural Concrete." AISC 360: "Specification for Structural steel buildings (LRFD)" BS 5950: "Structural Use of Steelwork in Buildings"
	3.2	Dead & Live loads ASCE 7 "-Minimum design loads for buildings and other structure." Chapter 2 - Combinations of loads Chapter 3- Dead Loads Chapter 4- Live Loads

	3.3	Seismic Loads UBC 1997, Volume 2,"Structural Engineering Design Provisions," Chapter 16 Seismic zone factor - 2A Soil profile Type - Sc
	3.4	Wind Loads ASCE 7 "-Minimum design loads for buildings and other structure"- Chapter 6. Design shall be based on basic wind velocity of 45m/s at 10m above ground level in exposure category C. For all structures where wind loads are applied as per codes, other directions than the two orthogonal ones to be investigated for ultimate and serviceability limit states.
	4	**Required documents and Structure Design Detailed calculations complying with the codes**
	4.1	Design of footing under gravity and lateral loads (serviceability and ultimate).
	4.2	Design of base plate, anchors and bolts connections under gravity and uplift load
	4.3	3D analysis of structure under gravity and lateral loads, the design of structural framing element (serviceability and ultimate) for the forces generated under applied loads as per mentioned design codes.
	4.4	Detailed connection design calculations under applied loads.
	4.5	For alternate materials, manufacture's design data calculations sheets for proposed design of the structure.
	4.6	Manufacture's specifications for material composition with fire performance testing data and ICC Evaluation services report (Refer to Section-17 -IBC)
	5	**Design Gravity Loading**
	5.1	Floor live loads - 5.0Kn/m^2 (Public gathering / accessible area)
	5.2	Floor live loads - 2.0Kn/m^2 - Area Not accessible to the public (Residential area only).
	5.3	Roof live load - 1.0Kn/m^2 (Non-accessible)
	5.4	Balconies load - 2.87Kn/m^2 (Balcony area not exceeding 9.3m^2 4.79Kn/m^2 (exceeding 9.3m^2)
	5.5	Superimposed dead load to be calculated based on partition wall density.

✓	ID	Plumbing and Mechanical
	1	**Plumbing**
	1.1	All pipes, valves, cleanouts, particularly waste piping must be accessible for maintenance. Where recessed in wall cavities provide removable access panels or other approved methods for access. The access panels must be indicated in the drawings.
	1.2	Include the slope (%) and the flow direction of all drainage pipes
	1.3	Include and identify in the drawings the vent pipes with a positive slope.
	1.4	Provide isolation valves to stop the flow at different sections of the system without affecting the entire system. All branches shall be provided with isolation valves.
	1.5	Main header and main piping distribution system should be sized with 10% to 15% extra capacity. Maximum water velocity = 1.5 m/s during peak demand conditions.
	1.6	Provide the potable water demand and the water heater capacity calculation
	1.7	Identify the plumbing fixture unit
	1.8	Include the calculation of the rainwater downpipes. Indicate their location on the drawings
	1.9	All the vent coil drainage located on the roof shall be coordinated with the air intake.
	2	**Fire Sprinkler System**
	2.1	Include in the drawings the fire sprinkler system and its details
	3	**HVAC**
	3.1	For all HVAC equipment, show unit dimensions, weight loading required clearances, electrical characteristics and connection requirements, and provide multiple sections to indicate elevations and spatial requirements.
	3.2	Cooling load densities shall be calculated taking into account the occupancy and U values.
	3.3	HVAC systems must be capable of providing an indoor temperature range between DB 22.5 ˚C RH 30% (min) and DB 25.5 ˚C RH 60% (max). Refer to the “Dubai Green Building Regulations and specifications guide” section 402.1 Thermal Comfort
	3.4	The houses with HVAC system using ducting shall consider the fire compartmentation the fire rating of the wall between rooms.

	3.5	The houses with HVAC system using ducting shall provide the BOD (bottom of duct elevation) from the reference level
	3.6	Show and identify the kitchen extract and toilet extract in the drawings and include the ventilation information and details.
	3.7	The flexible ducts shall be limited to 1.5 m maximum length and provided by SMACNA.
	3.8	Indicate the FFL and SSL in the drawings to use them as the reference for piping and ducts levels, for better coordination

.

✓	ID	Electrical and PV
	1	**Electrical General**
	1.1	Detailed load schedule needs to be provided for the total load consumption of the building with proper breaker size, cable size, and earth leakage protection, etc. (Indicate the MCB capacity, total connected load, and total demand load). Refer to DEWA load distribution schedule available on SDME Teams Portal.
	1.2	Teams need to leave some free space in the DIN rail of the houses electrical panels for the SDME meters. Refer to sub-contests 3.1: “Leave a 95 mm free space in a DIN rail to place the SMDE meter for the HACV and lighting consumption”.
	1.3	Wiring accessories (switches, sockets, isolator, spur outlets, cooker control units, etc.) need to be provided according to the DEWA regulation.
	1.4	All accessories that are going to be installed outside the building must be weatherproof.
	1.5	Provide a 30mA earth leakage protection to the sockets installing outside the house.
	1.6	Indicate the dimensions of the electrical components in the drawings.
	1.7	Only the houses’ batteries can be connected to the DC side of the solar power inverter(s).
	1.8	All houses’ loads and the electric vehicle's chargers must be connected to the AC side of the solar power inverter(s) per SDME Rules.
	1.9	Earthing arrangements need to be shown in the drawings. Earthing test points need to be indicated in the drawings for testing purpose. Refer to SDME Rule 7-2 (e): To provide the earthing system of the houses, the Teams shall submit the calculation and value of their projects' Earth continuity conductor Resistance, taking into account their electrical design and the wires sizes up to buried plates.
	1.10	Information in the electrical PV chart & checklist should be updated according to the SDME Rules and Building Code
	1.11	A professional electrical engineer or a professor of electrical engineering must sign and stamp the electrical drawings and calculations, including the house´s system according to Rule 6.1.
	1.12	Indicate the incoming breaker size of the distribution board, the total connected load of the house and the total demand load of the house.
	2	**DEWA regulation** (Section 10 Distributed Renewable Resource Generation DRRG) Shams Dubai
	2.1	Provide the wiring diagrams and data sheets/specifications for the solar system.

	2.2	Array – general specification a) Module type (s) b) Total number of modules c) Number of strings d) Modules per string
	2.3	string information a) String cable specifications - size and type b) String fuse specifications (where fitted) – type and voltage/current rating
	2.4	Array electrical details a) Array main cable specifications – size and type b) Array junction box locations (where applicable) c) D.C isolator type, location and rating (voltage/current)
	2.5	Earthing & over voltage protection a) Details of all earth/bonding conductors - size and connection points. To include details of array frame equipotential bonding cable where fitted. b) Design verification and details of any connections to an existing lightning protection system (LPS) or additionally provided LPS. c) Details of any surge protection device installed (both on AC and DC lines) to include location, type, and rating.
	2.6	AC electrical details, inbuilt and external protections a) A.C isolator location, type & rating b) A.C overcurrent protective device location, type & rating
	2.7	Residual current device location, type & rating
	2.8	Provide the sizing calculations for the system component, including PV panels, inverters, batteries (if applicable), solar charge controllers (if applicable), etc.
	2.9	Include the technical specifications for the system components, according to the SDME Rules and DEWA standards and requirements.
	2.10	The AC side total maximum power level of the grid-tied solar power inverter(s) is 8 kW according to SDME Rules.
	2.11	The inverter(s) and their installation must comply with the requirements of DEWA's Shams Dubai Regulations for grid interconnection of modules, and interface protections.
	2.12	To obtain approval on the use of PV panels, inverters and interface protection equipment that are not listed on Shams Dubai eligible equipment for the competition, the team must submit, to the SDME Organization, the following: 1. The equipment data sheet (specifications and technical information), 2. Copy of the certification and standard compliance, 3. Reason of selecting the non-listed equipment.

✓	ID	Fire Prevention and Protection
	1	**Fire resistant**
	1.1	Include plan(s) and sections, indicating the finishing material fire class (fire rating) and the fire resistance of walls, partitions, doors, and windows.
	1.2	Technical Room must be separated from the house interior by 2-hours fire rated walls and 1.5-hour fire rated door.
	2	**Fire protection (in addition to the fire sprinkler system)**
	2.1	Include the fire protection plans and details, showing the fire detection system, extinguishers location, travel distances, exit location, exit signs, egress path and any other component or system that help in case of fire. Refer to the SDME building code (3.1 Fire Protection & Prevention) and the UAE Fire & Life Safety Code of Practice.

APPENDIX 2 TECHNICAL MONITORING PROCEDURES V1

1. INTRODUCTION

A significant part of the competition measurements consists of scoring the houses' energy behavior, the interior comfort conditions and the functioning of the house. The SDME instrumentation and monitoring system is the way to evaluate the following contests:

Contest 3 - Energy Management

Contest 5 - Comfort Conditions

Contest 6 - House Functioning

Contest 7 - Sustainable Transportation

Given the importance of the houses monitorization, the teams need to have a clear idea about their houses instrumentation to provide all the required to be able to ensure a straightforward and fast set up of the SDME system. The purpose of this appendix is to complement Rule 10, providing additional information about the SDME 2018 monitoring procedures and the houses instrumentation.

2. INSTRUMENTATION AND DATA COLLECTION

In the SDME Competition, Teams earn points through the jury evaluation, tasks completion and the monitored performance, as shown in Table 1. Only the monitored sub-contests are directly connected with the SDME monitoring system.

Table 2 gives more details on the monitored and task-completion sub-contests, indicating the measurement locations, the variables to be monitored, the data acquisition time and scored period of each of the sub-contests. As shown in this table, the acquisition time of the data for the monitored sub-contest with continued measurements is one minute, and their score is also every minute.

3. MONITORING PANELS

The Monitoring Panels are wall mounted enclosures that contain data loggers, data acquisition modules, electrical meters and other components of the SDME monitoring system (Fig. 1). These enclosures will be provided and installed by the SDME, during the assembly period.

Teams must provide a free space in a wall for the installation of the Monitoring Panel. The enclosure dimensions are 700 mm (height) x 500 mm (long) x 150 mm (depth). The Monitoring Panel must be near to the inverters and the house Main Electrical Panel (i.e., electrical room). The proposed location of the Monitoring Panel needs to be validated by the SDME.

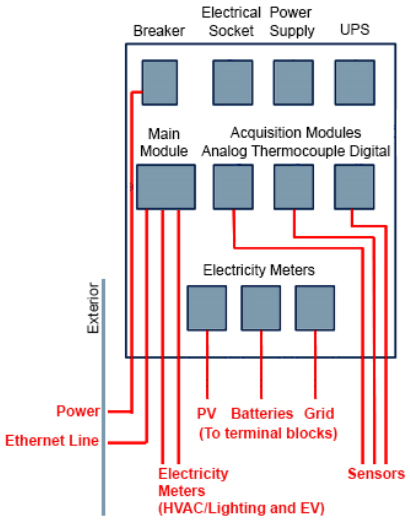


Figure 1. Typical SD Monitoring Panel

Table 6: Contest Structure and scoring system

ID	Contest and sub-contests	Juried	Monitored	Task completion
1.	Architecture	✓		
2.	Engineering and Construction	✓		
3.	Energy Management			
	3.1 Load consumption per surface area.		✓	
	3.2 Net electrical balance		✓	
	3.3 Temporary generation- consumption profile patterns correlation.		✓	
	3.4 Demand response		✓	
4.	Energy Efficiency	✓		
5.	Comfort Conditions			
	5.1 Temperature		✓	
	5.2 Humidity		✓	
	5.3 Air quality – CO2		✓	
	5.4 Lighting		✓	
	5.5 Façade airborne sound insulation1		✓	
	5.6 HVAC systems noise1		✓	
6.	House Functioning			
	6.1 Refrigeration		✓	

	6.2 Freezing		✓	
	6.3 Water Balance2		✓	
	6.4 Clothes Washing		✓	✓
	6.5 Clothes Drying			✓
	6.6 Dishwashing		✓	✓
	6.7 Oven		✓	✓
	6.8 Hot Water Draws			✓
	6.9 Cooking			✓
	6.10 Home Electronics			✓
	6.11 Dinner			✓
7.	Sustainable Transportation3		✓	✓
8.	Sustainability	✓		
9.	Communication	✓		
10.	Innovation	✓		

Notes

1. An acoustical performance of the house will be done only once. An acoustic lab will carry out the required test and submit the result to the SDME.

2. The observers will monitor the water consumption.

3. The data collected by the SDME EV meter does not affect the scoring of the teams; the Contest 7 evaluation is not related to this data. SDME will install this meter to determine the consumption of the houses and the EV charging consumption separately, for after competition studies.

Table 7: Monitoring summary (monitoring and task-completion sub-contest)

Sub-contest	Measurement location	Acquisition time	Scoring time	Variables
3.1 Load consumption per surface area	Monitoring Panel + Electrical board of the house	Every minute	Every minute	E_L=electricity consumed by the loads E_V = electricity consumed for heating, cooling, ventilation, and Lighting systems E_F = electricity consumed the house loads not included in the E_V.
3.2 Net electrical balance	Monitoring Panel	Every minute	Every minute	E_s=house's electrical energy sent to the grid throughout the contests period E_d=house's electrical energy drawn from the grid throughout the contests period
3.3 Temporary generation-consumption correlation	Monitoring Panel	Every minute	Every minute	E_{G_L}=electricity generated and simultaneously consumed by the loads E_{Bat_L}=electricity supplied by the batteries to the loads (if apply) E_L=electricity consumed by the loads
3.4 Demand response	Monitoring Panel	Every minute	Every minute	$E_d(t)$= drawn from the grid at time t $P_E(t)$= price of the power at time t
5.1 Temperature	Pedestal at the Living room	Every minute	Every minute	$T_{iLivingRoom}$=temperature in the living-room
	Pedestal at the Bedroom	Every minute	Every minute	$T_{iBedroom}$=temperature in the bedroom
5.2 Humidity	Living-room (next to the temperature sensor)	Every minute	Every minute	$H_{iLivingRoom}$=relative humidity
	Bedroom (next to the temperature sensor)	Every minute	Every minute	$H_{iBedroom}$=relative humidity
5.3 Air quality CO_2	Living-room (next to the temperature sensor)	Every minute	Every minute	$Q_{iLivingRoom}$=CO_2 concentration
5.4 Lighting	Living-room (pedestal)	Every minute	Every minute	$L_{LivingRoom}$=living room lighting level
	Kitchen (countertop)	Every minute	Every minute	$L_{Kitchen}$=kitchen lighting level
6.1 Refrigeration	Refrigerator	Every minute	Every minute	T_{fridge}=temperature in the fridge
6.2 Freezing	Freezer	Every minute	Every minute	$T_{freezer}$=temperature in the freezer
6.3 Water balance	Water meter	Twice a day	Every day	V_{CW}=cold water volume consumed
6.4 Clothes washing	Washing machine	Every minute	Every task	T_{WM}=temperature in the washing machine
6.5 Clothes drying	Scale in the kitchen countertop	One time	Every task	ΔW_{dryer}=Wi-Wo=(towels' total weight before washing) – (towels' total weight after drying)
6.6 Dishwashing	Dishwasher	Every minute	Every task	T_{DW}=temperature in the dishwasher
6.7 Oven	Oven	Every minute	Every task	T_{oven}=temperature in the oven
6.8 Hot water draws	In the bathroom or the kitchen	One time	Every task	T_{HW}=temperature of the hot water
6.9 Cooking	Scale in the kitchen countertop	One time	Every task	ΔW_{cook} = Wi-Wo = (pot weight before starting the task) – (pot weight once the task is considered completed)
7.1 Driving task completion	EV dashboard	One time	Every task	EV_T = percent of the task that has been completed
7.2 Energy-efficient driving	EV dashboard	One time	Every task	EV_D = driven distance EV_E = energy consumed

4. MONITORING PANELS CONNECTIONS

The monitoring panel will have multiple connections, as shown in Fig. 1. Table 3 includes the typical connections of the monitoring panel and the requirements of these connections.

Table 8: Monitoring panel Connections

	Location	Connection	Details
1	In the electrical room	Monitoring Panel - HVAC/Lighting and EV meters Two dedicate meters, one for HVAC/Lighting loads and another for the EV loads, will be installed by the SDME during the assembly period, in the house Main Electrical Panel. These meters will be connected to the Monitoring Panel by the SDME.	Teams must supply dedicated protection merging the HVAC and lighting loads and separate protection for the EV. Next (or close) to each one these protections, the teams must provide a free space (95 mm minimum) in the DIN rail, for the installation of the SDME dedicated meters.
2	In the electrical room	Monitoring Panel - PV, Grid, and Batteries The Monitoring Panel meters will collect information from the PV, the grid and the batteries. These connections will be made by the SDME, using terminal blocks provided by the teams. Teams must install protections on each of the lines so that the SDME Monitoring Team can install the meters and make the connections safely.	The Teams must provide twelve terminal blocks, four for the PV, four for the Grid (export & import) and four for the Batteries if installed. The terminal blocks shall be installed within a distance no larger than 500mm from the bottom of the Monitoring Panel. These terminal blocks should allow connecting wires from 6mm² to 16mm² sections and must be labeled.
3	Between the electrical room and the interior of the house	Monitoring Panel - the sensors Teams must provide conduit/channeling to enable the connection between the Monitoring Panel and the sensors, located at the interior of the house.	The sensors are in the kitchen/laundry appliances, over the kitchen counter, and mounted in pedestals (living and bedroom).
4	Between the electrical room and exterior of the house	Monitoring Panel – power line. Teams must provide the conduits to enable the connection between the Monitoring Panel and an exterior enclosure installed by the SDME at the back corner of the lot.	The monitoring system will have its independent power line. The connection point of this line is in an exterior enclosure, installed by the SDME. The connection will be made using a 3x6mm^2 section cable, entering to the bottom of the Monitoring Panel
5	Between the electrical room and exterior of the house	Monitoring Panel – ethernet data grid. Teams must provide the conduits to enable the connection between the Monitoring and the exterior enclosure installed by the SDME at the back corner of the lot.	One Ethernet line will be wired, by the SDME, from the bottom of the Monitoring Panel to the fiber optic connection point (data grid), located in the lot' exterior enclosure.

5. ROUTING, CONDUITS AND CHANNELING

As specified in Rule 10-1, the SDME sensors will be wired. All the SDME sensors and meters need to relate to the Monitoring Panel. The Teams are responsible for providing a wire routing (conduits, channeling, junction boxes, etc.) that permits quick and easy installation and removal of the SDME Instrumentation wires. This route must be indicated in the houses Construction Documents.

For the Sub-contest 3.1 - Load consumption per surface area, the teams need to provide the routing between the SDME meter for HVAC/Lighting (located in the house Electrical Panel) and the Monitoring panel. The conduit for this connection shall have at least 20mm diameter. Similarly, the teams must provide a conduit (20mm minimum diameter) for the connection between the SDME EV meter and the Monitoring Panel. For the connections between the Monitoring Panel and the exterior enclosures, the teams must provide the conduits, as indicated in Table 3, points 4 and 5.

For the minimum diameter of the Conduits/Channeling for the sensors in the appliances and equipment, please refer to Table 4.

Table 9: Conduits/Channeling to the House Appliances and Equipment

Sub-contest	Sensor type	Diameter of conduit (min)
5.1	Temperature	25mm
5.2	Humidity	25mm
5.3	Air quality CO2	25mm
5.4	Lighting	25mm
6.1	Refrigeration	20mm
6.2	Freezing	20mm
6.4	Clothes washing	20mm
6.6	Dishwashing	20mm
6.7	Oven	20mm

6. SENDORS MOUNTED ON PEDESTALS

Each house will have at least two pedestals with sensors, one close to the center of the living area and one close to the center of the bedroom area. An additional pedestal will be used if the organization believes that the house's spatial distribution needs more sensors.

The pedestal in the living room will have the following sensors: temperature, humidity, air quality (CO2) and lighting. The pedestal in the bedroom will have temperature and humidity sensors.

In the solar Hai, the SDME Monitoring Team will mark on the floor the location of the pedestals. Teams are responsible for keeping the sensors in the established location, during the scoring periods, as indicated in the Daily Competition Schedule.

To avoid accidents and minimize the chance that the visitors damage the sensors, the SDME ask the teams to relocate the pedestal to a closet, corner or next to a wall, during the Public Tours. During these periods, the data from these sensors are not part of the scoring process. Teams must return the pedestals to the indicated location at least 10 minutes before the beginning of the scoring period. If a pedestal is not in the correct location during the scoring period, the observer will note the time in which the pedestal was out of its location and the team will receive no points on the related sub-contests, during this time.

7. INSTRUMENTATION DRAWINGS

The minimum requirements for the instrumentation drawings are presented in Table 4.

Table 10: Monitoring Drawings

Ref	Drawing	Description
ID-001	General Monitoring Plan	Floor plan shown all the appliances and equipment required in the Contests 6 – House Functioning, the Main Electrical Panel, Monitoring Panel (MP), the sensors, and the pedestals (permanent location and temporary location during the Public Tours). Indicate the wiring routing, conduits/channeling between the MP and the sensors, MP and the Main Electrical Panel and MP and the exterior. Include Table 5, with the length of the wires from the Monitoring Panel to the sensors, and the conduits/channeling diameter or section. Include details and information about the conduits/Channeling Indicate the location of the water meter
ID-002	Monitoring Panel room	The purpose of this drawing is to demonstrate that the project has the necessary space and include all the requirements to install the Monitoring Panel (MP) and make all the connections. Use the electrical room large-scale interior elevation(s) to showing the location of the Main Electrical Panel, the MP, the electrical terminal blocks, the electrical protection and any other equipment installed in this wall or walls. Indicate the dimensions of the MP and the distances between the MP and the Main Electrical Panel and the distance between the MP and the electrical terminal blocks.
ID-003	Electricity meters' topology	Include a single-line diagram (Electrical/PV/Batteries) highlighting the monitored lines, indicating the proposed location of the SDME meters (HVAC/Lighting, EV, PV, Grid (export & import) and batteries, if applicable).
ID-004	Electricity meters connection	Include blow-up elevations of the Main Electrical Panel, the Monitoring Panel, and the terminal blocks. Indicate the location of the HVAC/Lighting and EV meters (available space in the Electrical Panel) Show the connections between the MP and the Electrical Panel, and between the MP and the terminal blocks.
ID-005	House appliances table	Include Table 2 House Appliances and Equipment

8. TABLES TO BE INCLUDED IN THE INSTRUMENTATION DRAWINGS

The teams are responsible for defining the route for wiring the SDME sensors and providing the necessary conduits/channeling to connect the sensors with the Monitoring Panel (MP). In the drawing ID-001, the teams must include Table 5 that includes the sensors ID and the length of the wires from the sensor to the MP. The team shall use the sensors' ID to indicate their location in the drawing. The IDs P1 and P2 are for the pedestals. Various sensors will be installed in each of these sensors, as shown in Table 5. The pedestal P1 will be located near to the center of the living area and the P2 near to the center of the bedroom area.

Table 11: House Appliances and Equipment

Sensor ID (sub-contest)	Sensor	Conduit/Channeling (Section or diameter)	Length of the wires
5.1L	Temperature (Living pedestal)	*«specify»*	*«specify»*
5.2L	Humidity (Living pedestal)		
5.3L	Air quality CO2 (Living pedestal)		
5.4L	Lighting (Living pedestal)		
5.1B	Temperature (Bedroom pedestal)		
5.2B	Humidity (Bedroom pedestal)		
5.4K	Lighting (Kitchen countertop)		
6.1	Refrigeration		
6.2	Freezing		
6.4	Clothes washing		
6.6	Dishwashing		
6.7	Oven		

Similarly, to show the compliance of the appliances and equipment required for the competition, teams must include the Table 3 in the Instrumentation drawings. In this table, the teams shall present the information like the brand, model, capacity (interior volume) and dimensions required in for Contest 4 – House Functioning. The use

of clothes dryer is not mandatory, therefore is not included in the table. (Please, remember to include the specifications of the appliances in the Project Manual)

Table 12: House Appliances and Equipment

	Appliance/Equipment	Required Capacity/Dimensions	Brand	Model	Capacity/Dimensions
1	Refrigerator	170 liters	*«specify»*	*«specify»*	*«specify»*
2	Freezer	57 liters			
3	Oven	55 liters			
4	Clothes washer	Six big bath towels			
5	Dishwasher	Six place settings (min)			
6	TV	32 in (81.28 cm)			
7	Video viewing solution	No requirements			No requirements
8	Computer Screen	17 in (43.2 cm)			
9	Cooktop or stove	No requirements			No requirements

9. MONITORING CHECKLIST

Table 13: Monitoring Checklist

Ref	Contest	Information	Where have been included
M1	Contests 3	Electrical topology (Electrical/PV Single-line Diagram indication the proposed location for the SDME meters)	*«specify»*
M2	Contests 3	Terminal blocks: location, quantity, and distance to the MP	
M3	Contests 3	Electricity sub-metering: Conduits between the MP and the Electrical Panel, indicating their diameters or section.	
M4	Contests 3	Electricity sub-metering: space (and protection) in the Main Electrical Panel for the HVAC/Lighting meter	
M5	N/A	Electricity sub-metering: space (and protections) in the Main Electrical Panel for the EV meters	
M6	Contests 3	Monitoring Panel: connections to the Main Electrical Panel	
M7	Contests 3	Monitoring Panel: connections to the terminal blocks	
M8	Contests 3, 5 and 6	Monitoring Panel: location and space for its installation,	
M9	Contests 3, 5 and 6	Monitoring Panel: connections to the outdoor enclosure (power line and data grid)	
M10	Contests 5 and 6	Monitoring Panel: connections to the sensors	

M11	Contests 5 and 6	Conduits, channeling, junction boxes and Feed-throughs, including diameter (or section) and location. (floor plan and section, if needed)
M12	Contests 5 and 6	Sensors and pedestals locations (permanent and during the public Tours)
M13	Contests 5 and 6	Length of the wires between the sensors and the Monitoring Panel (floor plan)
M14	Contest 6	Home appliances table: brand and model, capacity (interior volume), rules compliance

APPENDIX 3 HEALTH & SAFETY: HIERARCHY OF CONTROL

Table 14 – Ref. Leadership and worker involvement toolkit; Health and Safety Executive (HSE) UK

1. Elimination	Redesign the job or substitute a substance so that the hazard is removed or eliminated. For example: workers must avoid working at height where they can.
2. Substitution	Replace the material or process with a less hazardous one. For example: use a small MEWP to access work at height instead of stepladders. Care should be taken to ensure the alternative is safer than the original.
3. Engineering Controls	Use work equipment or other measures to prevent falls where you cannot avoid working at height. Install or use additional machinery such as local exhaust ventilation to control risks from dust or fume. Separate the hazard from operators by methods such as enclosing or guarding dangerous items of machinery/equipment. Give priority to measures that protect collectively over individual measures.
4. Administrative Controls	These are all about identifying and implementing the procedures you need to work safely. For example: reducing the time workers are exposed to hazards (e.g. by job rotation); prohibiting use of mobile phones in hazardous areas; increasing safety signage, and performing risk assessments.
5. Personal Protective Equipment (PPE)	Only after all the previous measures have been tried and found ineffective in controlling risks to a reasonably practicable level, must personal protective equipment (PPE) be used. For example: where you cannot eliminate the risk of a fall, use work equipment or other measures to minimise the distance and consequences of a fall (should one occur). If chosen, PPE should be selected and fitted by the person who uses it. Workers must be trained in the function and limitation of each item of PPE.

APPENDIX 4 DAPTIVE AND NATIVE PLANTS SPECIES

1. Local Environmental Species Used “Cosmetic” Agriculture

Item	Scientific Name	Common Name	Family Name
1	Acacia arabica	Arabian Gum	Leguminosae
2	Acacia ehrenbergiana	Salam	Leguminosae
3	Acacia farnesiana	Sweet Acacia	Leguminosae
4	Acacia tortilis	Ambrella Thorn	Leguminosae
5	Aerva javanica	Snow Bush / Kapok Bush	Amaranthaceae
6	Atriplex sp.	Salin Bush	Chenopodiaceae
7	Avicennia marina	Mangrove	Avicenniaceae
8	Boerhavia elegans choisy	Showerka	Nyctaginaceae
9	Colligonum comosum	Arta	Polygonaceae
10	Casuarina equisetifolia	She Oak	casuarinaceae
11	Cometes surattensis	Dhaffa	Caryophyllaceae
12	Convolvulucs virgortus	Faghi	Convolvuloceae
13	Dodonaea viscosa	Purple Hop-Bush	Sapindaceae
14	Hamada elegans	Ramth	Chenopodiaceae
15	Leptadenia pyrotechnica	Markh / Broom Bush	Asclepiaceae
16	Leucaena leucocephala	Lead Tree	Leguminosae
17	Lycium shawii	Christmas Berry	Solanaceae
18	Moringa oleifera	Horse Radish Tree	Uoringaceae

2. Palm Trees

Item	Scientific Name	Common Name	Family Name
1	Areca catechu; L	Betal Nut Palm	Palmae
2	Arecastrum romanzafiannum	Queen Palm	Palmae
3	Bismarckia nobilis	Bismarck palm	Palmae
4	Butia capitata	Wine Palm	Palmae
5	Caryota mitis	Fish Tail Palm	Palmae
6	Caryota urens	Stinging	Palmae
7	Chamaedorea elegans	Parlour Palm	Palmae
8	Chamaerops humilis	European Fan Palm	Palmae
9	Chrysalidocarpus lutescens	Golden Can Palm	Palmae
10	Cocos nucifera	Coconut Palm	Palmae
11	Cyrtostachys renda	Sealing Wax Palm	Palmae
12	Elaeis guineensis	African Oil Palm	Palmae
13	Howea forsteriana	Kentia Palm	Palmae
14	Hyophorbe lagenicaulis	Bottle Palm	Palmae
15	Hyphoene thepiaca	African Doum Palm	Palmae
16	Livistonia chinensis	Chinese Fan Palm	Palmae
17	Livistonia dicipien	Cabbage Palm	Palmae
18	Lodoicea maldivica	Coco-de-mer	Palmae
19	Neodypsis decaryi	Triangle Palm	Palmae
20	Phoenix reclinata	Senegal Date Palm	Palmae
21	Phoenix roebelenii	Dwarf Palm	Palmae
22	Phoenix canariensis	Canary Island Date	Palmae
23	Phoenix dactylifera	Date Palm	Palmae
24	Phoenix sylvestris	Silver Date Palm	Palmae
25	Pritchardia pacifica	Fiji Fan Palm	Palmae
26	Ptychosperma macarthurii	Hurricane Palm	Palmae
27	Rhapis flablliformis	Lady Palm	Palmae
28	Roystonea elata	Florida Royal Palm	Palmae

29	Roystonea regia	Cuban Royal Palm	Palmae
30	Sabal palmetto	Palmetto Palm	Palmae
31	Trithrinax paviflora	Thatch Pole	Palmae
32	Veitchia merrilli	Manila Palm	Palmae
33	Washingtonia filifera	California Palm	Palmae
34	Washingtonia robusta	Washington Palm	Palmae
35	Wodyetia bifurcata	Foxtail Palm	Palmae

3. Semi-Palm Trees

Item	Scientific Name	Common Name	Family Name
1	Beacarnea recurvata	Pony Tail	Liliaceae
2	Cycas media	Australian Nut Palm	Cycadaceae
3	Cycas revoluta	Sago palm	Cycadaceae
4	Encephalartos ferox	Zululand cycad	Zamiaceae
5	Horridus Encephalartos	Ferocius blue cycad	Zamiaceae
6	Pachypodium lamerei	Madagascar palm	Apocynaceae
7	Pandamus utilis	Screw pine	Pandaceae
8	Pandanus veitchii	Variegated screw pine	Pandaceae
9	Ravenala madagscariensis	Travelers tree	Musaceae
10	Strelitzia Nicolai	Bird-of-paradise tree	Musaceae
11	Strelitzia reginae	Bird-of-paradise	Musaceae
12	Yucca aloifolia	Spanish bayonet	Agavaceae
13	Yucca filamentosa	Adams needle	Agavaceae
14	Yucca elephantips	Giant yucca	Agavaceae
15	Yucca brevifolia	Joshua tree	Agavaceae
16	Zamia Pumila	Jamaica sago	Zamiaceae

4. Trees and Bushes

Item	Scientific Name	Common Name	Family Name
1	Acacia arabica	Arabian gum	Leguminosae
2	Acacia farnes iana	Sweet acacia	Leguminosae
3	Acacia mangium	Black wattle	Leguminosae
4	Acacia saligna	Golden wreath	Leguminosae
5	Adansonia digitata	Boabab	Bombacaceae
6	Albizi lebbech	Womans tongue tree	Leguminosae
7	Araucaria excelsa	Norfolk island pine	Araucaiaceae
8	Azadirachta indica	Neem tree	Meliaceae
9	Balanates aegyptiaca	Jericho balsam	Zygophyllaceae
10	Beaucarnea recurvata	Pony tail	Liliaceae
11	Bauhinia varigata	Purple orchid tree	Leguminosae
12	Bombax ceiba	Red kapok tree	Bombacaceae
13	Callistemon viminalis	Bottle brush tree	Myrtaceae
14	Cassia fistula	Golden shower	Leguminosae
15	Cassia nodosa (javanica)	Pink & white shower tree	Leguminosae
16	Cassia roxburghii marginata	Red cassia	Leguminosae
17	Casuarina equisetifelia	She oak	Casuarinaceae
18	Ceratonia siligua	Kharoob	Leguminosae
19	Chiranthodendron pentadactylon	Monkey hand tree	Sterculiaceae
20	Chorisia Speciosa	Pink floss silk tree	Bombacaceae
21	Conocarpus erectus	Button mangrove tree	Combretaceae
22	Conocarpus erectus sericeus	Silver tree	Combretaceae
23	Conocarpus lancifolius	Land mangrove	Combretaceae
24	Cordia sebestena	Geiger tree	Boraginaceae
25	Dalbergia sissoo	Sissoo tree	Leguminosae
26	Delonix regia	Flam of the desert	Leguminosae

27	Enterolobium cyclocarpum	Ear tree	Leguminosae
28	Eucalyptus citriodora	Lemon gum	Myrtaceae
29	Eucalyptus camaldulensis	Red gum	Myrtaceae
30	Ficus bengalensis	Banyan tree	Moraceae
31	Ficus benjamina	Weeping fig	Moraceae
32	Ficus elastica	Indian rubber plant	Moraceae
33	Ficus infectoria	Spotted tree	Moraceae
34	Ficus religosa	Bo-tree	Moraceae
35	Ficus retusa	Indian laurel	Moraceae
36	Ficus rubiginosa	Rusty fig	Moraceae
37	Gliricidia sebium	Madre de cacao	Leguminosae
38	Jacaranda mimosifolia	Mimosa-leaved ebony	Bignoniaceae
39	Kigelia pinnata	Susage tree	Bignoniaceae
40	Lagerstroemia indica	Crape myrtle	Lytheraceae
41	Leucaena leucocephala	Lead tree	Leguminosae
42	Melaleuca genistifolia	Fleece tree	Myrtaceae
43	Melaluca guinguenervia	Cajeput tree	Myrtaceae
44	Melaluca leucadendron	Papper bark tree	Myrtaceae
45	Melia azedarach	Pride of India	Meliaceae
46	Millingtonia hortensis	Indian cork tree	Bignoniaceae
47	Moring oleifera	Horse radish tree	Moringaceae
48	Peltophorum inerme	Yellow flame tree	Leguminosae
49	Pithcellobium dulce	Cats-claw	Leguminosae
50	Paulownia tomentosa	Empress tree	Scrophulariaceae
51	Plumeria spp	Frangipani	Apocynaceae
52	Pongmia Glabra	Pongam	Leguminosae
53	Samanea saman	Rian tree	Leguminosae
54	Schinus molle	California pepper tree	Anacardiaceae
55	Spathodia campanulata	African tulip tree	Bignoniaceae
56	Schinus terebinthifolius	Pepper tree	Anacardiaceae
57	Tabebuia argetea	Silver trumpet tree	Bignoniaceae
58	Tebebuia pallida	Cuban pink trumpertree	Bignoniaceae

59	Tamarix aphylla	Athel tamarisk	Tamaricaceae
60	Tamarindas indica	Tamarind tree	Leguminosae
61	Tecoma stans	Yellow bells	Bignoniaceae
62	Terminalia cattapa	Tropical almond	Combretaceae
63	Thespesia populnea	Portia tree	Malvaceae
64	Tipuana tipu	Rosewood	Leguminosae
65	Vitex agnus castus	Chaste tree	Verbinaceae
66	Ziziphus spina	Christi thorn	Rhamnaceae
67	Petrea volubilis	Queens wreath	Verbenaceae
68	Tecoma stans	Yellow bells	Bignoniaceae
69	Lawsonia inerme	Henna	Lytheraceae
70	Nerium oleander	Oleander	Apocynaceae
71	Simmondsia chinensis	Jojoba	Buxaceae
72	Scaevola sericea	Beach Naupake	Goodeniaceae
73	Hibiscus rosa-sinensis	Chinese hibiscus	Malvaceae
74	Hibiscus sabdariffa	Karkade	Malvaceae
75	Thevetia peruviana	Yellow oleander	Apocynaceae
76	Duranta rapens	Sky flower	Verbenaceae
77	Acacia coriacea	Wire wood	Leguminosae
78	Acacia pendula	Weeping myala	Leguminosae

5. Soil Covers

Item	Scientific Name	Common Name	Family Name
1	Rhoeo discolor	Moses-in-the Cradle	Commelinaceae
2	Ruellia scumosa	Ruellia	Acanthaceae
3	Ruellia tuberose	Ruelia	Acanthaceae
4	Alternanthera versicolor	Joyweed	Amaranthaceae
5	Agapanthus africanus	African Lily	Liliaceae
6	Atriplex sp.	Salt bush	Chenopodiaceae
7	Scaevola aemula	Fairy fanflower	Goodeniaceae
8	Myoporum parvifolium	Creeping boobialla	Myporaceae
9	Sesevium portulacastrum	Sea pursalin	Aizoaceae
10	Angelonia gardneri	Blue wings	Scrophulariaceae
11	Adenium obesium	Flower of the desert	Apocynaceae
12	Centratherum muticum	Brazil button flower	Compositae
13	Aptenia cordifolia	Baby sun rose	Aizoaceae
14	Asparagus densiflorus	Asparagus	Liliaceae
15	Carissa grandiflora	Natal plum	Apocynaceae
16	Crinum asiaticum	Poison bulb	Amarylidaceae
17	Hymenocallis narcissiflora	Peruvian Daffodil	Amarylidaceae
18	Gazania rigens	Treasure flower	Compositae
19	Lippia nodiflora	Lippia	Verbenaceae
20	Osteospermum fruticosum	Trailing Arrican daisy	Compositae
21	Pennisetum setaceum	Fountain grass	Gramineae
22	Setcreasea purpurea	Purple heart	Commelinaceae
23	Verbena peruviana	Verbena	Verbenaceae
24	Wedelia trilobata	Wedelia	Compositae

25	Sesevium	Sea Pursaline	Aizoaceae
26	Portulacaria afra	Elephant food	Portulacaceae
27	Pentas lanceolata	Egyptian Star Cluster	Rubiaceae
28	Turnera unifoloa	Brooklyn Bot	Turneraceae
29	Leucophyllum frutescens	Texas Ranger	Scrophulariaceae
30	Iresine herbstii	Beefsteak Plant	Amaranthaceae
31	Iresine lindenii	Blood leaf	Amaranthaceae
32	Carpobrotus edulis	Hottentot Fig	Aizoaceae
33	Lampranthus roseus	Ice plant	Aizoaceae
34	Asystasia gangetca	Coromandel	Acanthaceae
35	Rosmarinus officinalis	Rosemary	Lbiatae

6. Climbers

Item	Scientific Name	Common Name	Family Name
1	Allamanda cathartica	Golden Trumpet	Apocynaceae
2	Antigonon leptopus	Coral vine	Polygonaceae
3	Clerodendrum splendens	Glorybower	Verbenaceae
4	Doxantha unguis cati	Cats claw	Bignoniaceae
5	Senecio confusus	Mexican flame vine	Compositae
6	Clitorea ternatea	Butterfly Pea	Leguminosae
7	Cryptostegia grandiflora	Indian Rubber Vine	Asclepiodaceae
8	Quisqualis indica	Rangoon creeper	Combretaceae
9	Ficus pomila	Creeping Fig	Moraceae
10	Ipomoea patatas	Sweet potato	Convolvulaceae
11	Ipomoena palmata		Convolvulaceae
12	Ipomoea pes-capree	Beach morning glory	Convolvulaceae
13	Jacquemontia pentantha	Jacquemontia	Convolvulaceae
14	Jasminum grandiflorum	Jasmine	Oleaceae
15	Tecomaria capensis	Cape honeysuckle	Bignoniaceae
16	Tristellateia austtralasiae	Galphimia vine	Malpighiaceae

7. Green Landscapes

Item	Scientific Name	Common Name	Family Name
1	Paspalum Vaginatum	Paspalum	Gramineae
2	Cynodon dactylon L	Bermuda grass	Gramineae
3	Tifway grass	Bermuda hybrid	Gramineae
4	TifGreen Grass	Bermuda Hybrid	Gramineae
5	Zoysia Japonica	Zoysia Grass	Gramineae
6	Stenotaphrum	Buffalo Grass	Gramineae
7	Lolium parenne	Ryegrass	Gramineae

8. Flowers

Item	**Scientific Name**	**Common Name**	**Family Name**
1	Dianthus caryophullus	Carnation	Caryophyllaceae
2	Dianthus chinensis hybrid	Rainbow pink	Caryophyllaceae
3	Dianthus barbatus	Sweet william	Caryophyllaceae
4	Impatiens wallriana	Sultana	Palsaminaceae
5	Ipatiens balsamina	Rose balsam	Palsaminaceae
6	Nicotiana alata	Jasmine tobacco	Solanaceae
7	Salvia splendens	Scarlet sage	Lobiate
8	Antirrhinum Hybrid Tall	Floral snapdragon	Scrophulariaceae
9	Antirrhinum Hybrid Dwarf	Floral snapdragon	Scrophulariaceae
10	Celosia cristata	Cockscomb	Amaranthaceae
11	Celosia plumosa	Feather celosia	Amaranthaceae
12	Dahlia variabilis	Dahlia	Compositae
13	Delphinium ajacis	Rocket larksuper	Ranunculaceae
14	Gaillardia pulchella	Blanket flower	Compositae
15	Heliotropium peruvianum	Heliotrope	Boraginaceae
16	Limonium sinuatum	Statice	Plumbaginaceae
17	Ageratum SP	Floss-flower	Compositae
18	Viola tricolor	Pansy	Violaceae

19	Petunia gandiflora	Petunia	Solanaceae
20	Petunia milliflora	Petunia	Solanaceae
21	Zinnia hybrid	Youth and old age	Compositae
22	Lobelia erinus	Lobelia	Lobeliaceae
23	Phlox drummondii	Dwarf annual phlox	Polemoriaceae
24	Verbena hybrida	Verbena	Verbenaceae
25	Callistephus chinensis	China aster	Compositae
26	Centaurea cryans	Cornflower	Compositae
27	Coreopsis Sp.	Lance tickseed	Compositae
28	Cosmos bipinnatus	Garden cosmos	Compositae
29	Fuchsia hybrida	Fushia	Onagraceae
30	Gazania splendens	Treasure flower	Compositae
31	Helianthus annuns	Sunflower	Compositae
32	Matthiola incana	Stocks	Curiferae
33	Nemesia strumosa	Cape jewels	Scrophulariaceae
34	Lathyrus odoratus	Sweet pea	Leguminosae
35	Alyssum maritime	Ice plant	Curiferae
36	Catharanthus rosea	Madagascar periwinkle	Apocynaceae
37	Portulaca grandiflora	Rose moss	Portulacaceae
38	Dimorphotheca aurntiaca	Rain cape marigold	Compositae
39	Amaranthus tricolor	Josephs coat	Amaranthaceae
40	Gypsophila elegans	Annual baby’s breath	Caryophyllaceae
41	Iberis coronaria	Rocket candytuft	Curiferae
42	Clarkia elegans	Orchid godetia	Oenotheraceae
43	Calendula officinalis	Pot marigold	Compositae
44	Gompharena globosa	Globe amaranth	Amaranthaceae
45	Tagetes ericta	Marigold	Compositae
46	Brassica oleracea	Flowering kale	Curiferae

9. Fruit-bearing Trees

Item	Scientific Name	Common Name	Family Name
1	Citrus aurantifolia	Lime	Rutaceae
2	Citrus sinensis	Sweet orange	Rutaceae
3	Citrus reticulta	Mandarin orange	Rutaceae
4	Ficus carica	Fig tree	Moraceae
5	Carica papaya	Papaya	Cariaceae
6	Mangifera indica	Mango tree	Anacardiaceae
7	Psidium guaiva	Apple gwaiva	Myrtaceae
8	Ficus sycomorus	Sycamore fig ficus	Moraceae
9	Olea europea	Olive tree	Oleaceae
10	Punica granatum	Pome granate	Punicaceae
11	Ceratonia siliqua	Carob	Leguminosae
12	Tamarindus indica	Tamarind tree	Leguminosae
13	Annona squamosa	Sugar apple	Annonaceae
14	Manikara zapota	Chikoo	Sapotaceae
15	Terminalia catappa	Tropical almond	Combretaceae
16	Citrus aurantium	Bitter orange	Rubceae
17	Morus spp.	Mulberry	Moraceae
18	Musa spp.	Banana	Musaceae
19	Ziziphus spina credi	Christi thorn	Rhamnaceae
20	Pithcellobium dulce	Cats-claw	Leguminosae
21	Grewia asiati	Phalsa	Tilliaceae

For Arabic Names, please contact us on 2018solardecathlonme@dewa.gov.ae

Reference: Public Parks & Horticulture Department – Dubai Municipality 2010

APPENDIX 5 COMPETITION CALENDAR

SOLAR DECATHLON MIDDLE EAST 2018 COMPETITION CALENDAR V1 — OCTOBER - NOVEMBER 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
28-Oct-18	29-Oct-18	30-Oct-18	31-Oct-18	01-Nov-18	02-Nov-18	03-Nov-18
DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6
On Site Registration WELCOME CEREMONY HEALTH & SAFETY TRAINING	START ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation
04-Nov-18	05-Nov-18	06-Nov-18	07-Nov-18	08-Nov-18	09-Nov-18	10-Nov-18
DAY 7	DAY 8	DAY 9	DAY 10	DAY 11	DAY 12	DAY 13
ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Water Delivery Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	ASSEMBLY PERIOD On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation
11-Nov-18	12-Nov-18	13-Nov-18	14-Nov-18	15-Nov-18	16-Nov-18	17-Nov-18
DAY 14	DAY 15	DAY 16	DAY 17	DAY 18	DAY 19	DAY 20
ASSEMBLY PERIOD Water Delivery On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	END OF THE ASSEMBLY PERIOD (No work to take place while teams wait for final inspections) On Site Registration Health & Safety Supervisions, Site Operations and Building Inspections Instrumentation Installation	MINOR FINAL ARRANGEMENTS & FINAL SET UP TEAM'S OPEN HOUSE Opening Rehearsal	BEGINNING OF THE EXHIBITION OPENING CEREMONY VIP / MEDIA / INSTITUTIONAL VISITS	PUBLIC VISITS 9:00 - 18:00 Instrumentation Testing	PUBLIC VISITS 9:00 - 18:00 Instrumentation Testing	PUBLIC VISITS 9:00 - 18:00 Instrumentation Testing

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
18-Nov-18	19-Nov-18	20-Nov-18	21-Nov-18	22-Nov-18	23-Nov-18	24-Nov-18
DAY 21	DAY 22	DAY 23	DAY 24	DAY 25	DAY 26	DAY 27
COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES
PUBLIC VISITS COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS Contest Award Ceremony COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS Contest Award Ceremony COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS 9:00 - 18:00 Contest Award Ceremony COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS 9:00 - 18:00 Contest Award Ceremony COMPETITION ACTIVITIES	PUBLIC VISITS 9:00 - 18:00 COMPETITION ACTIVITIES
25-Nov-18	26-Nov-18	27-Nov-18	28-Nov-18	29-Nov-18	30-Nov-18	01-Dec-18
DAY 28	DAY 29	DAY 30	DAY 31	DAY 32	DAY 33	DAY 34
COMPETITION ACTIVITIES	COMPETITION ACTIVITIES	COMPETITION ACTIVITIES				
PUBLIC VISITS COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS COMPETITION ACTIVITIES Jury Visits*	PUBLIC VISITS Contest Award Ceremony COMPETITION ACTIVITIES	PUBLIC VISITS 09:00 - 16:00 SDME AWARDS CEREMONY	VICTORY BREAKFAST PUBLIC VISITS 9:00 - 18:00	HOLIDAY	
02-Dec-18	03-Dec-18	04-Dec-18	05-Dec-18	06-Dec-18	07-Dec-18	08-Dec-18
DAY 35	DAY 36	DAY 37	DAY 38	DAY 39	DAY 40	DAY 41
HOLIDAY	DISASSEMBLY PERIOD On Site Registration, Instrumentation Removal, Health & Safety Supervisions and Site Operations	DISASSEMBLY PERIOD On Site Registration, Instrumentation Removal, Health & Safety Supervisions and Site Operations	DISASSEMBLY PERIOD On Site Registration, Instrumentation Removal, Health & Safety Supervisions and Site Operations	DISASSEMBLY PERIOD On Site Registration, Instrumentation Removal, Health & Safety Supervisions and Site Operations	END OF THE DISASSEMBLY PERIOD On Site Registration, Instrumentation Removal, Health & Safety Supervisions and Site Operations	TEAMS CHECK OUT : Final Site Inspection

APPENDIX 6 DETAILED COMPETITION SCHEDULE

SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

Sunday 28th October	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Welcome ceremony	Competition			SDME				
Health & Safety Training	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				

Monday 29th October	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

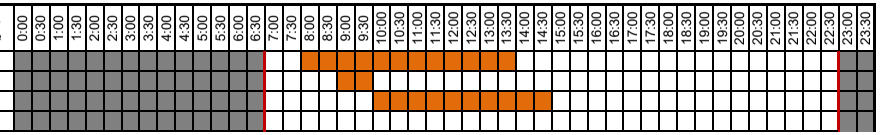
Tuesday 30th October	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Wednesday 31st October	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Thursday 1st November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Friday 2nd November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Saturday 3rd November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				



SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

Sunday 4th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Monday 5th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Water Delivery	Competition	Rule 8,2		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

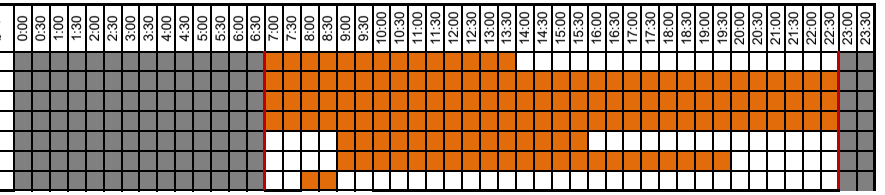
Tuesday 6th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Wednesday 7th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Thursday 8th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Friday 9th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Saturday 10th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				



SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

Sunday 11th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Water Delivery	Competition	Rule 8,2		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Monday 12th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house assembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Final Inspections	Competition	Rule 11.6		SDME				
Instrumentation Installation	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Tuesday 13th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Minor final arrangements within the house	Infrastructures			SDME				
Opening Ceremony rehearsal	Communication							
Teams Private Visits	Communication			ACT				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Wednesday 14th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Official Opening Ceremony	Communication			ACT				
VIP / Media / Institutional Visits	Communication	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Monitoring tests - Systems' functioning	Competition	Rule 10		SDME				

Thursday 15th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Façade airborne sound insulation	Competition		5.5	TASK	10	1*	1*	
HVAC systems noise	Competition		5.6	TASK	5	1*	1*	
Monitoring tests - Systems' functioning	Competition	Rule 10		SDME				

Friday 16th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Façade airborne sound insulation	Competition		5.5	TASK	10	1*	1*	
HVAC systems noise	Competition		5.6	TASK	5	1*	1*	
Monitoring tests - Systems' functioning	Competition	Rule 10		SDME				

Saturday17th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Façade airborne sound insulation	Competition		5.5	TASK	10	1*	1*	
HVAC systems noise	Competition		5.6	TASK	5	1*	1*	
Monitoring tests - Systems' functioning	Competition	Rule 10		SDME				

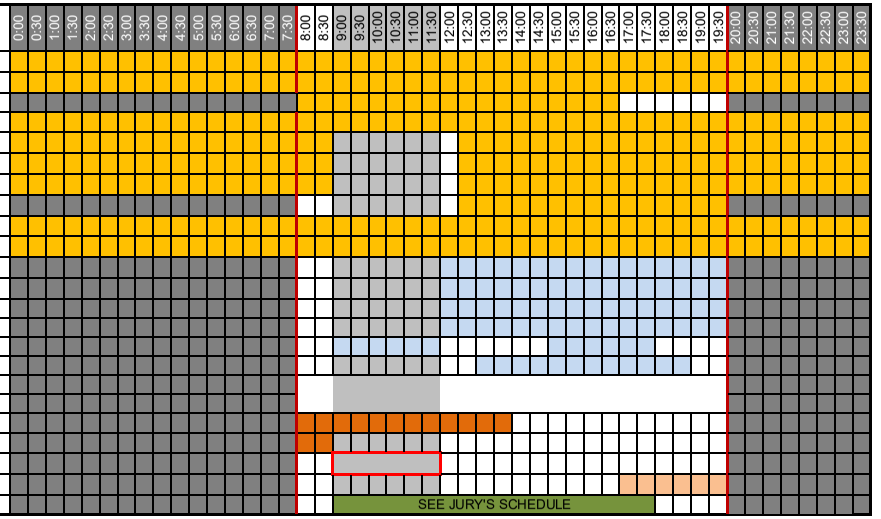
SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

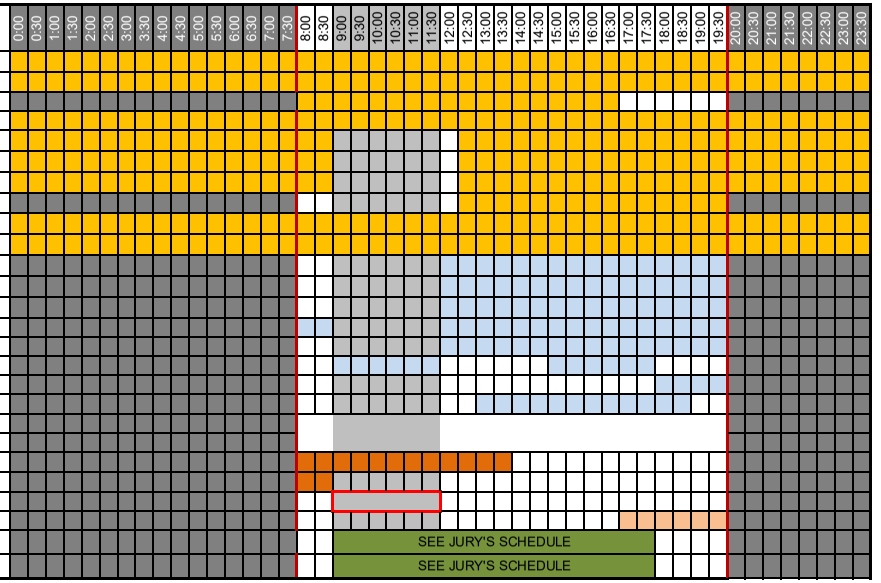
COMPETITION DAY 1

Sunday 18th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Oven	Competition		6.7	TASK	10	6	1	1.667
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								47.373
ACCUMULATED AVAILABLE POINTS								47.373
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Jury 1 Visits	Competition			JURY				



COMPETITION DAY 2

Monday 19th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	2	2.143
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Dinner Party*	Competition		6.11	TASK	10	3	1	3.333
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								52.849
ACCUMULATED AVAILABLE POINTS								100.222
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Jury 1 Visits	Competition			JURY				
Jury 2 Visits	Competition			JURY				



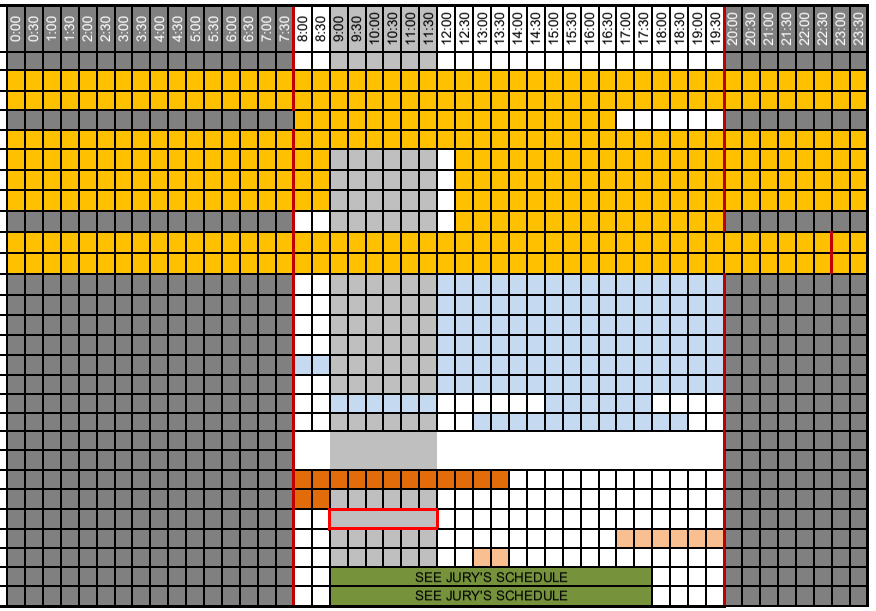
SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

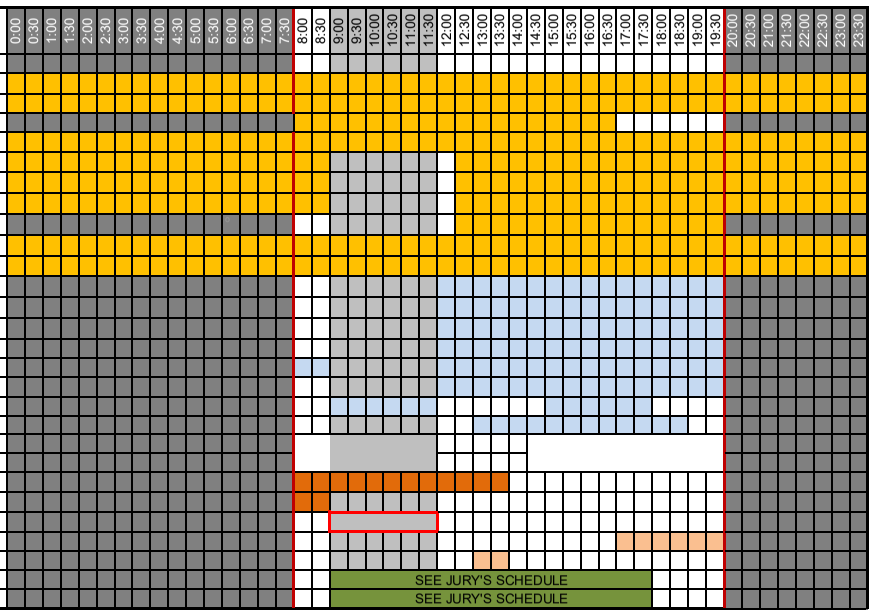
COMPETITION DAY 3

Tuesday 20th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Architecture Contest	Competition		1	JURY	100	1	1	100.000
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Oven	Competition		6.7	TASK	10	6	1	1.667
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	1	1.071
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								150.111
ACCUMULATED AVAILABLE POINTS								250.332
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Contest Award Ceremony 1	Communication			ACT				
Jury 2 Visits	Competition			JURY				
Jury 3 Visits	Competition			JURY				



COMPETITION DAY 4

Wednesday 21st November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Sustainability Contest	Competition		2	JURY	100	1	1	100.000
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Oven	Competition		6.7	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	2	2.143
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								151.182
ACCUMULATED AVAILABLE POINTS								401.514
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Contest Award Ceremony 2	Communication			ACT				
Jury 3 Visits	Competition			JURY				
Jury 4 Visits	Competition			JURY				



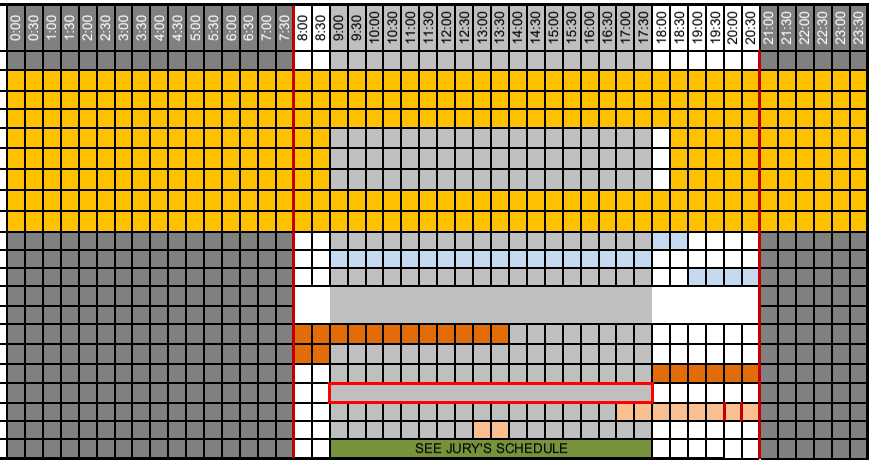
SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

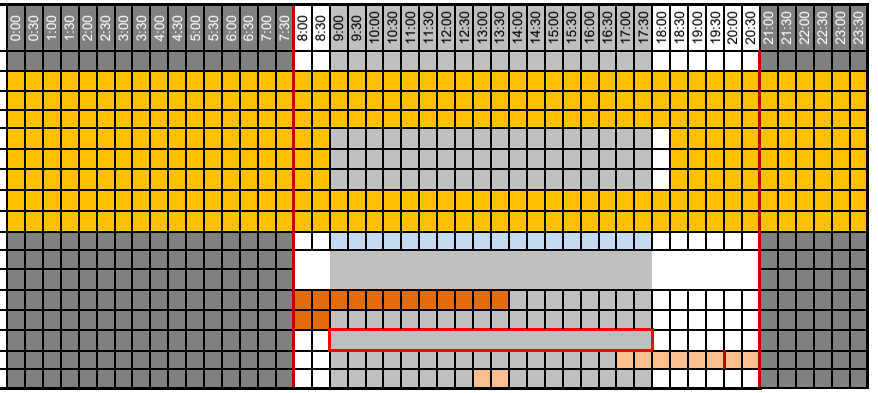
COMPETITION DAY 5

Thursday 22nd November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Energy Efficiency Contest	Communication		4	JURY	80	1	1	80.000
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	58	5.428
Humidity	Competition		5.2	MEAS	15	748	58	1.163
Air Quality - CO2	Competition		5.3	MEAS	5	748	58	0.388
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Hot Water Draws	Competition		6.8	TASK	15	14	1	1.071
Home Electronics	Competition		6.10	TASK	5	276	36	0.652
Dinner Party*	Competition		6.11	TASK	10	3	1	3.333
DAYLY AVAILABLE POINTS								105.536
ACCUMULATED AVAILABLE POINTS								507.050
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Water Delivery	Competition	Rule 8.2		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition			ACT				
Contest Award Ceremony 3	Communication			ACT				
Jury 4 Visits	Competition			JURY				



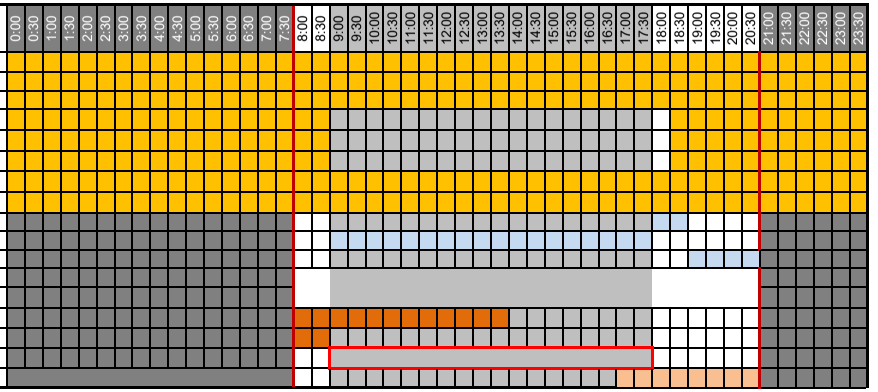
COMPETITION DAY 6

Friday 23rd November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Communication Contest	Competition		9	JURY	80	1	1	80.000
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	58	5.428
Humidity	Competition		5.2	MEAS	15	748	58	1.163
Air Quality - CO2	Competition		5.3	MEAS	5	748	58	0.388
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Home Electronics	Competition		6.10	TASK	5	276	36	0.652
DAYLY AVAILABLE POINTS								101.131
ACCUMULATED AVAILABLE POINTS								608.181
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Contest Award Ceremony 4	Communication			ACT				



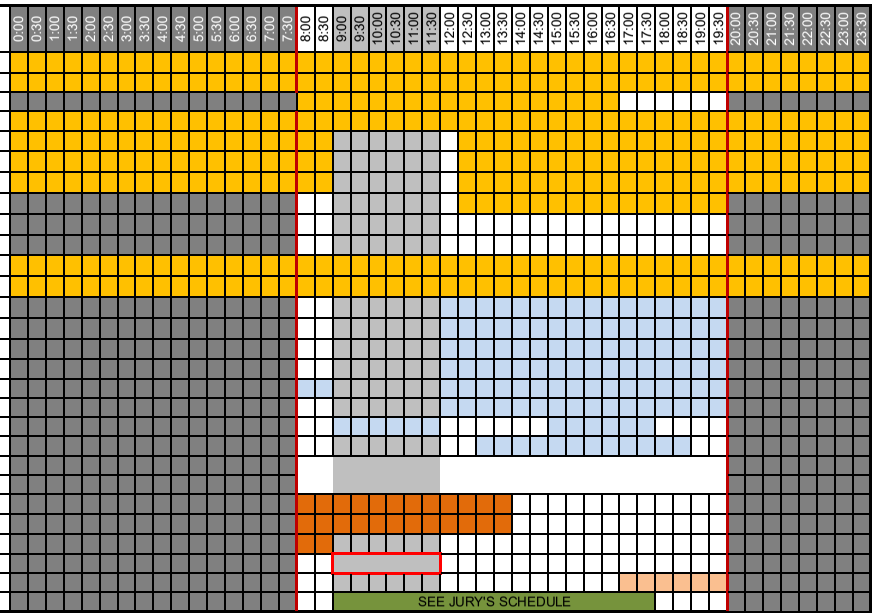
COMPETITION DAY 7

Saturday 24th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	58	5.428
Humidity	Competition		5.2	MEAS	15	748	58	1.163
Air Quality - CO2	Competition		5.3	MEAS	5	748	58	0.388
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Hot Water Draws	Competition		6.8	TASK	15	14	1	1.071
Home Electronics	Competition		6.10	TASK	5	276	36	0.652
Dinner Party*	Competition		6.11	TASK	10	3	1	3.333
DAYLY AVAILABLE POINTS								25.536
ACCUMULATED AVAILABLE POINTS								633.716
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		TASK				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				



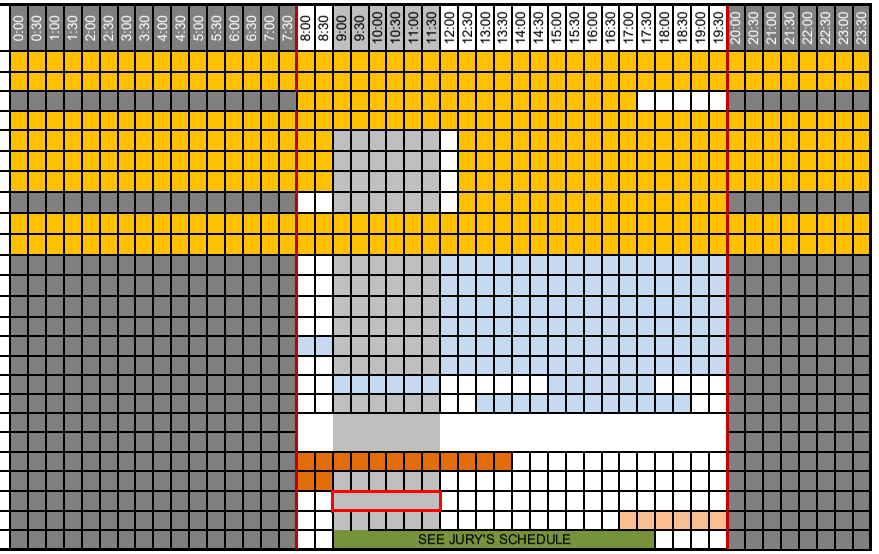
COMPETITION DAY 8

Sunday 25th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Façade airborne sound insulation	Competition		5.5	TASK	10	1*	1*	0.000
HVAC systems noise	Competition		5.6	TASK	5	1*	1*	0.000
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Oven	Competition		6.7	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	2	2.143
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								51.182
ACCUMULATED AVAILABLE POINTS								684.899
On site - Registration	Competition	Rule 11.1		SDME				
Water Delivery	Competition	Rule 8.2		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Jury 5 Visits	Competition			JURY				



COMPETITION DAY 9

Monday 26th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.6	TASK	10	7	1	1.429
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Oven	Competition		6.7	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	2	2.143
Cooking	Competition		6.9	TASK	10	7	2	2.857
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
Sustainable Transportation	Competition		7	TASK	80	6	1	13.333
DAYLY AVAILABLE POINTS								52.611
ACCUMULATED AVAILABLE POINTS								737.509
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Jury 5 Visits	Competition			JURY				



SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

COMPETITION DAY 10

Tuesday 27th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Engineering and Construction Contest	Competition		8	JURY	100	1	1	100.000
Load consumption per surface area	Competition		3.1	MEAS	60	960	96	6.000
Net electrical balance	Competition		3.2	MEAS	45	960	96	4.500
Temporary generation-consumption correlation	Competition		3.3	MEAS	15	252	36	2.143
Demand response	Competition		3.4	MEAS	20	960	96	2.000
Temperature	Competition		5.1	MEAS	70	748	82	7.674
Humidity	Competition		5.2	MEAS	15	748	82	1.644
Air Quality - CO2	Competition		5.3	MEAS	5	748	82	0.548
Lighting	Competition		5.4	MEAS	15	210	30	2.143
Refrigerator	Competition		6.1	MEAS	5	960	96	0.500
Freezer	Competition		6.2	MEAS	5	960	96	0.500
Clothes Washing	Competition		6.4	TASK	10	7	1	1.429
Clothes Drying	Competition		6.5	TASK	10	7	1	1.429
Dishwashing	Competition		6.6	TASK	10	6	1	1.667
Oven	Competition		6.7	TASK	10	6	1	1.667
Hot Water Draws	Competition		6.8	TASK	15	14	2	2.143
Cooking	Competition		6.9	TASK	10	7	1	1.429
Home Electronics	Competition		6.10	TASK	5	276	24	0.435
DAYLY AVAILABLE POINTS								137.849
ACCUMULATED AVAILABLE POINTS								875.358
PASSIVE EVALUATION PERIOD								
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Contest Award Ceremony 5	Communication			ACT				

Wednesday 28th November	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Façade airborne sound insulation - Results	Competition		5.5	TASK	10	1*	1*	10.000
HVAC systems noise - Results	Competition		5.6	TASK	5	1*	1*	5.000
Water Balance	Competition		6.3	MEAS	30	1	1	30.000
Innovation Contest	Competition		10	JURY	80	1	1	80.000
DAYLY AVAILABLE POINTS								125.000
ACCUMULATED AVAILABLE POINTS								1000.000
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				
Public's Favorite Award	Communication			ACT				
Energy Management, Comfort Conditions, House Functioning and Sustainable Transportation Contests Awards	Communication		3, 5, 6, 7	ACT				
Innovation Contest Award	Communication		10	ACT				
Final Competition Awards	Communication			ACT				
Closing Ceremony	Communication			ACT				

Thursday 29th November	Type of activity	Section in R&R	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				
Public Visits (General Public)	Competition	Rule 12.4		ACT				
Interior & Exterior Lighting	Competition	Rule 12.6		ACT				

Friday 30th November	Type of activity	Section in R&R	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available

HOLIDAY

SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

SDME 2018 DETAILED COMPETITION SCHEDULE V.01

OCTOBER / NOVEMBER 2018

Saturday 1st December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available

Sunday 2nd December	Type of activity	Section in R&R	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available

HOLIDAY

Monday 3rd December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house disassembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Water removal	Competition	Rule 8.3		SDME				
Instrumentation removal	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Tuesday 4th December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house disassembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Instrumentation removal	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Wednesday 5th December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house disassembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Instrumentation removal	Competition	Rule 10		SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Thursday 6 th December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house disassembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDE				
Health & Safety Supervisions	Infrastructures			SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Friday 7 th December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
On site - Registration	Competition	Rule 11.1		SDME				
Stand-alone house disassembly	Infrastructures			SDME				
Site Operations	Infrastructures			SDME				
Health & Safety Supervisions	Infrastructures			SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

Saturday 8th December	Type of activity	Section in Rules	Contest Nº	Contest type	Total Pts Available	Total Periods or tasks	Daily Periods or tasks	Daily Pts Available
Decathletes check out	Infrastructures			SDME				
Team / organizer meeting	Competition	Rule 2.4		SDME				

* During the Dinner Party the teams have to maintain all the outdoor lights on. However, they are free to illuminate the indoor spaces in the way that they consider better to create an enjoyable ambient for their guests.
** The acoustic measurements will be carried out only one time on each house. The teams will be informed on which day the measurements of their house will be done.

SDME ORGANIZATION ACTIVITIES
IMPOUND HOURS
TASKS REQUIRING OBSERVEF
COMMUNICATION ACTIVITIES
PUBLIC VISITS
MEASUREMENT
JURY

APPENDIX 7 TASKS CALENDAR

SOLAR DECATHLON MIDDLE EAST DUBAI, UAE - 2018

Solar Decathlon Middle East 2018 - Tasks Calendar (V.3)

TASK	TOTAL	DAY 1 SUNDAY 18th Nov	DAY 2 MONDAY 19th Nov	DAY 3 TUESDAY 20th Nov	DAY 4 WEDNESDAY 21th Nov	DAY 5 THURSDAY 22th Nov	DAY 6 FRIDAY 23th Nov	DAY 7 SATURDAY 24th Nov	DAY 8 SUNDAY 25th Nov	DAY 9 MONDAY 26th Nov	DAY 10 TUESDAY 27th Nov
Clothes Washer	7										
Clothes Dryer	7										
Dishwashing	6										
Oven	6										
Hot Water Draws	14		2	2	2	1		1	2	2	2
Cooking	7										
Home Electronics	10										
Dinner Party	3										
Electrical Vehicle	6										

September 11, 2018

APPENDIX 8 SUMMARY OF CHANGES

#	Rule and Change	Page
1	**Introduction:** • The affordability feature of the houses is removed from the competition objectives.	4
2	**Definitions:** • The Electrical Engineer definition in the Team Members section is updated.	10
3	**Rule 2. Administration:** • Rule 2-8 Penalties: The title is change to Bonuses and Penalties, Point (a) is added, and the Penalty Referee is substituted by the SDME H&S and Rules Officials. • Rule 2-10 Prize Scheme: In Point (d), Special Innovation Awards is renamed to Creative Solutions Awards	14
4	**Rule 3. Participation:** • Rule 3-3 Safety: Point (a) is added.	18
5	**Rule 4. Solar Hai:** • Rule 4-6 Construction Equipment: Point (b) and (c) are updated. • Rule 4-8 Generators: Point (b) is updated. • Rule 4-11 Working System is updated. • Rule 4-13 Electric Vehicles: Point (a) and (b) are updated.	20
6	**Rule 5. The Solar Envelope:** • Rule 5-1 Solar Envelope Dimensions: Point (d) is updated.	22
7	**Rule 6. The Project:** • Rule 6-1 Documents needed to request approval for the design: Point (a) II is updated. • Rule 6-2 Architectural Footprint and Measurable Area: Point (a) and (b) are updated. • Rule 6-5 Competition Prototype Alternates: Point (c) is updated, and Points (d) and (e) are added.	23
8	**Rule 7. Energy:** • Rule 7-1 Energy Sources: Point (a) is updated. • Rule 7-2 Village Grid: Point (b), (d) and (e) are updated, and Point (f) is added. • Rule 7-3 PV Equipment Eligibility: Point (b) is updated. • Rule 7-4 PV Technology: Point (b) is updated, and Point (h) is deleted. • Rule 7-5 Inverters: Points (b) and (d) are updated. • Rule 7-6 Batteries: Point (h) is added. • Rule 7-7 Connection of the houses to the Solar Hai grid: Point (b) is updated.	25
9	**Rule 8. Liquids:** • Rule 8-2 Water Delivery: Point (b) and (c) are updated. • Rule 8-3 Water Removal: Point (b) is updated.	29
10	**Rule 10. Monitoring:** • Table 3: Monitoring Types is updated. • Rule 10-1 SDME Sensors' Location and Wire Routing: Note is added. • Rule 10-2 Water Meters: Point (h) is added. • Rule 10-3 Monitoring Checklist: List is replaced with Table 4.	31
11	**Rule 11. The Event:** • Rule 11-3: Teams' Sponsors and Supporting Institutions: Point (b) I is updated.	
12	**Rule 12. Contests Period:** • Rule 12-1 House Occupancy is updated. • Rule 12-6 Interior & Exterior Lighting is updated.	35
13	**Rule 13. Deliverables:** • Table 4: Deliverables Schedule: Changed to Table 5, and content is updated. • Point (d) is added.	38
14	**Contests:** • Jury Scoring: Jury assessment and scoring are final. • Table 6: Contest Structure and scoring system is added.	40
15	**Contest 3: Energy Management:** • Sub Contest 3.1: Load consumption per surface area: Notes are updated. • Sub Contest 3.2: Net electrical balance: Notes are updated. • Sub Contest 3.4: Demand response: Points (b) and (c) are updated. • Figure 6: Demand response sub-contest points' distribution is updated.	43
16	**Contest 5: Comfort Conditions:** • Sub-contest 5.4: Lighting: Two zones instead of three will be identified to measure the illumination level. • Sub-contest 5.6: The façade airborne sound insulation: Points (a) and (b) are updated.	49
17	**Contest 6: House Functioning:**	53

	• Sub-contest 6.1: Refrigeration: Note #5 is deleted. • Sub-contest 6.3: Water Balance: Points (b) and (c) are updated and Note #1 is added. • Figure 15: Water Balance sub-contest points' distribution is updated. • Sub-contest 6.4: Clothes Washing: Points (a), (b) and (c) are updated. • Sub-contest 6.5: Clothes drying: Instead of three hours, the teams have a maximum of four hours to complete the washing and drying tasks, and "Scoring points in the Clothes Washer sub-contest is not a prerequisite for scoring points in the Clothes Dryer sub-contest" is deleted. • Figure 16: Clothes washer sub-contest points distribution is updated. • Sub-contest 6.6: Dishwashing: Points (b) and (c) are updated and Note #3 is deleted.	
18	**Contest 7: Sustainable Transportation:** • Sub-contest 7.1: Driving task completion: The driving task will be done in six days instead of ten, each day with different driving distance, totalling approximately 400 km. • Sub-contest 7.2: Energy-efficient driving: Note #6 is updated	61
19	**Building Code 2: Adopted Codes:** • Point (f) is updated and Points (g), (h) and (i) are added.	66
20	**Building Code 3: Building Planning and Construction:** • 3.1 Fire Protection and Prevention: Point (c) is updated and Point (d) is added. • 3.11 Fire Sprinkler System is updated.	67
21	**Building Code 5: Structural:** • 5.1 Prescriptive Requirements: Point (a) is updated, and Point (c) is added. • 5.2 Design Loads: Entire Section is updated. • 5.5 Foundation: Entire Section is updated. • 5.7 Structural Steel: associated codes are updated.	72
22	**Building Code 6: Electrical:** • 6.2 Drawing Requirements: Points (d), (e) and (f) are added. • 6.4 Outdoor Receptacles: Section title is changes, and Points (a) and (b) are added. • 6.9 Grounding is updated. • 6.11 Batteries: Points (b) and (d) are updated.	75
23	**Building Code 7: Mechanical:** • 7.1 Drawing Requirements: Points (b), (c) and (d) are added. • Section 7.5 Ducting is added.	77
24	**Building Code 8: Solar Mechanical:** • 8.3 Access is updated.	78
25	**Building Code 9: Plumbing:** • 9.1 Drawing Requirements: Points (c) and (d) added. • Sections 9.11 Accessibility, 9.12 Isolation Valves, 9.13 Sizing, and 9.14 Vents are added.	80
26	**Building Code 11: Health & Safety:** • 11.1 H&S General Rules & Guidelines: DEWA's Safety Signs Booklet is added. • 11.3.6 Individual Protection: Note #2 is updated.	82