UNIVERSITY OF MARYLAND

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2017

Solar Decathlon 2017
Environment, Health & Safety Plan (EHSP)

re*ACT*

Primary Student Contact
Sophie Habib
School of Architecture, Planning and Preservation
University of Maryland
College Park, MD 20742
shabib@terpmail.umd.edu

U.S. DEPARTMENT OF ENERGY SOLAR DECATHLON 2017
HEALTH AND SAFETY PLAN
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SECTION 1 – KEY TEAM PERSONNEL IDENTIFICATION

KEY TEAM PERSONNEL			
Role	**Name**	**Phone**	**E-mailContact Information**
Health and Safety Officer	Student: Sophie Habib	443-848-8550	shabib@terpmail.umd.edu
	Faculty: Mike Binder	202-253-8291	mbinder@umd.edu
Project Manager	Student: Sandra Oh Boun	301-641-6841	2andra.oboun@gmail.com
	Faculty: Mike Binder	202-253-8291	mbinder@umd.edu
Construction Manager	Student: Alla Elmahadi	240-441-3952	aelmahadi5@gmail.com
	Faculty: Garth Rockcastle	202-445-4446	gcr@umd.edu
University Health & Safety Representative	Glynnis Bowman		gbowman@umd.edu

SECTION 2 – STATEMENT OF POLICY

The University of Maryland 2017 Solar Decathlon project will comply with all applicable Federal, State and Local Environment, Health and Safety regulations.

The University of Maryland 2017 Solar Decathlon project will comply with all Solar Decathlon Rules and Regulations related to Environment, Health and Safety.

This ESHP applies to all Team Members, Subcontractors and Volunteers involved with the University of Maryland 2017 Solar Decathlon Project.

SECTION 3 – EMERGENCY PROCEDURES

In the event of an emergency, Team Members shall follow the following procedures:

First, evaluate the emergency. Take in the whole picture. Then:

1) Secure the scene to prevent further injuries.

2) Call 911 (or equivalent) for an emergency response. (NOTE: the Denver competition site is located at 61st and Salida Street, near RTD's Peña Street Station)

3) Provide first aid, if needed, and if trained.

4) Call or notify Solar Decathlon headquarters, organizers, or event staff.

5) Remain at the scene until a public safety officer takes charge.

First Aid Response Actions

In addition to the general procedures cited above, when the current emergency requires first aid to be administered, Team Members will :

- Provide crowd control to ensure a clear area around the injured person(s).
- Provide crowd control to secure a clear path for emergency medical personnel to the reach the injured person(s). One Team Member will be stationed at the public way to guide emergency medical personnel to the injured person(s).
- Provide access to on-site first aid supplies appropriate to the injury. A fully stocked first aid kit will be available on-site at all times.
- Only personnel with first aid training will provide direct assistance to injured person(s) and only to the extend required to prevent further harm before emergency medical personnel arrive.

Fire Response Actions

In addition to the general procedures cited above, when the current emergency requires first aid to be administered, Team Members will :

- Use fire extinguishers to clear a path for visitors and personnel to the exits. All Team Members will be trained in the proper use of fire-extinguishers, and all fire extinguishers will be of the ABC type. Only in the event of a very small isolated fire will Team Members attempt to extinguish fires that are not preventing the evacuation of visitors and other personnel from the house.
- Evacuate all visitors and personnel from the house to the public way. All Team Members will be familiar with the Evacuation Routes from the house, and will have predesignated assigned stations to ensure orderly progression of visitors from the house.
- Team members will verify that all visitors have been evacuated and will then proceed along the evacuation route(s), collecting Team Members as they go.
- The Responsible Person* shall verify that all Team Members are accounted for.
- Team Members will be stationed around the site perimeter to maintain a safe exclusion zone.
- Team Members will provide crowd control to ensure a clear path for emergency responders to the site.
- One Team Member will be designated to wait for emergency responders at the public way and provide information regarding the location and circumstances of the fire emergency.

High Wind Emergency Response Actions

In the event of high winds which threaten the safety of visitors and personnel, Team Members will provide the following response in addition to the general procedures cited above.

- Evacuate all visitors and personnel from the house to the public way. All Team Members will be familiar with the Evacuation Routes from the house, and will have predesignated assigned stations to ensure orderly progression of visitors from the house.
- Team members will verify that all visitors have been evacuated and will then proceed along the evacuation route(s), collecting Team Members as they go.
- The Responsible Person (see Section 4 below) shall verify that all Team Members are accounted for.
- Team Members will be stationed around the site perimeter to maintain a safe exclusion zone.

SECTION 4 – GENERAL RULES AND REGULATIONS

Chain of Command

Key Team Personnel as identified in Section 1 will be trained in EHS procedures, including OSHA Regulations and First Aid. At any time when visitors or personnel are on-site, at least one of these Key Personnel will be on-site as well.

At any given time, one and only one of the Key Personnel will be designated as the Responsible Person. This Responsible Person will perform the following functions:

- Conduct a thorough inspection of the site to identify potential hazards at the beginning of their work shift.
- Conduct an inspection of all equipment including tools and Personal Protective Equipment (PPE) at the beginning of their work shift.
- Direct Team Members to rectify hazardous situations.
- Direct Team Members to remove from service any tools and PPE that presents a hazard.
- Monitor the activities of visitors and personnel on-site during their shift, identifying and rectifying any observed hazardous conditions or behaviors.
- At the conclusion of their shift, the Responsible Person shall remain on-site to monitor on-going operations until the next shift's Responsible Person has arrived and completed their start-of-shift inspections as described above.

Deviations from Safety Regulations

- All Team Members and personnel shall be trained in proper health and safety regulations including responsible work habits, proper use of tools, appropriate work clothing and use of PPE. No personnel shall be allowed to perform work on-site unless they have demonstrated familiarity with these practices, rules and regulations.
- All deviations from safe conditions shall be corrected immediately.
- Any personnel or visitors violating health and safety regulations shall be warned verbally and a report of their infraction shall be noted in an EHSP log.
- Team Members, personnel and visitors who commit repeated infractions of health and safety regulations will be barred from the site. Team Members barred from the site will be sent home.

Rules and Regulations Regarding Alcohol and Drug Use

- Alcohol shall not be permitted on the work site.
- Possession and/or use of illicit drugs on or off the work site is strictly prohibited for all Team Members and personnel.
- Team Members and visitors violating these regulations shall be immediately dismissed and barred from the site. Team Members shall be sent home after the first infraction.
- Team Members who report for their shift under the influence of alcohol shall be dismissed from the site. Team Members shall be sent home (permanently dismissed) after the second such infraction.
- Team Members who report for work under the influence of illicit drugs shall be permanently dismissed from the project after the first such infraction.

SECTION 5 – HOUSEKEEPING

- All tools shall be kept in good condition
- All tools shall be stored properly and safely. Workers are responsible for maintaining safe control of their tools at all times.
- All materials shall be stored so as not to create potential tripping and slipping hazards
- No materials shall be stored on ladders or scaffolds.
- Materials shall not be stored on elevated surfaces so as to pose a hazard to personnel below (falling object hazard).

- All materials and tools shall be stored as described in relevant sections of the OSHA 1926 and 1910 Standards.
- Electrical cords which pose a temporary tripping hazard shall be properly covered to prevent tripping and marked to ensure high visibility. See OSHA 1926 and 1910 for specific recommendations.
- All elevated platforms including scaffolds shall be equipped with toe boards to reduce the threat of falling objects.
- All personnel and visitors shall wear the ***Minimum PPE*** recommended by the DOE for the Solar Village whenever work is taking place on-site. ***The Minimum level of PPE when entering the Solar Village during the construction and disassembly periods is hard hat; safety glasses with side shields; safety boots with ankle protection; Class 2 Hi-visibility vest, shirt or jacket; long pants and shirt with sleeves (3 in. minimum) unless otherwise approved by Solar Decathlon EHS Staff.***
- All personnel shall wear appropriate fall protection when working more than 6' off the ground, or as indicated by OSHA 1926 or Local regulations.
- A Responsible Person (see Section 4) shall be on-site whenever work is being performed in order to observe and correct hazardous conditions.
- The Responsible Person designated for a given work shift shall inspect the site, tools and PPE at the beginning of their shift.
- The work site shall be kept free of loose trash at all times. Trash will be deposited in designated containers on site. These containers will be emptied regularly in order to prevent unsafe or unhealthy conditions from occurring.

SECTION 6 – ACCESS CONTROL

- All Team Members and personnel are personally responsible for maintaining a safe work site. All personnel should therefore be aware of those, including visitors that are NOT WEARING THE MINIMUM LEVEL OF PPE as prescribed in Section 5 above whenever work is taking place on-site.
- Team Members are responsible for preventing the entry of visitors not wearing the Minimum Level of PPE.
- If visitors insist on entering the site despite warnings from a Team Member, it is the Team Member's responsibility to call for an immediate cessation of work until the situation is corrected. Team Members should alert the on-site Responsible Person to the presence of personnel and visitors not wearing the Minimum Level of PPE.

- Appropriate quantities of the correct PPE for visitors shall be kept on-site at all times in order to minimize interruptions in work and safety risks.

SECTION 7 – ACCIDENTS AND INCIDENTS

- For the purpose of this EHSP, an *Accident* is defined as any situation in which a person (worker, visitor, etc.) is injured. An *Incident* is defined as any observed situation in which a person was in imminent danger of being injured.

- All Accidents will be reported to the Team Construction Manager, the Team Health and Safety Officer, and to the University Health and Safety Officer, as well as to the Solar Decathlon headquarters and event safety officer.

- Any Accident that prevents the injured person from working a future shift shall also be reported to OSHA and to the Local or State occupational health authority.

- A written report will be filed for all Accidents detailing the circumstances leading to the event, including photographic evidence and eyewitness testimony. All work on-site may be ordered to cease in order to facilitate this documentation activity.

- Each Accident will be thoroughly investigated to reveal the contributing causes of the event, and a written recommendation for corrective action will be submitted to the Team Construction Manager and the Team Health and Safety Officer for implementation.

- Pending the issuance of the comprehensive report and recommendations for corrective action, the Team Construction Manager and Team Health and Safety Officer shall implement interim corrective measures to eliminate the hazards leading to the Accident. The work site may be shut down until such interim measures can be implemented.

- All Incidents shall be reported promptly, both verbally and in writing to the Team Construction Manager and the Team Health and Safety Officer. Serious hazards shall be reported to the University Health and Safety Officer and to the Solar Decathlon event safety officer as well.

- All Incidents will be investigated promptly and the hazardous conditions leading to the Incident will be implemented. Changes to operating procedures and training may be required to prevent the hazards from reoccurring.

SECTION 8 – HEARING CONSERVATION

No equipment is currently considered a threat to hearing (exceeding 85 dB).

At least two sets of hearing protection which comply with 29 CFR 1910.95 Occupational Noise Exposure will be kept available on-site for any circumstances which may exceed 85dB. If such conditions arise, and if continued exposure is anticipated, additional hearing protection will be acquired.

SECTION 9 – CHEMICAL AND ENVIRONMENTAL SAFETY

Specific chemical and environmental hazards have not been identified at this time. When these hazards ARE identified, the following measures will be taken:

• All chemicals stored on site shall be in secondary containment located out of direct sunlight where they will not be damaged during general construction activities. All fuels for generators shall be stored in NFPA-compliant metal flammable cans with sealing spring-loaded lids. Fuels storage shall meet OSHA storage requirements. All generators shall be in secondary containment, or have catch pans suitably sized to catch any/all leaks and spills.

• Appropriate spill cleanup materials for hazardous materials will be identified and maintained y on site and where these materials will be located. Solar Decathlon organizers will be notified of any spills that occur on the Event site whether they are hazardous or not.

• Appropriate methods of handling the generation of hazardous waste will be identified and implemented.

• Copies of Safety Data Sheets (SDS's) shall be provided for each chemical brought on site, and will be added to an identified appendix of this EHSP.

SECTION 10 – FIRE PROTECTION & HOT WORK ACTIVITIES

The current construction plan does not include any hot work occurring on-site.

SECTION 11 – HAND AND POWER TOOL SAFETY

A comprehensive list of tools to be used on-site does not currently exist for the project. As each tool is identified, it will be added to the list, along with the following :

- Training requirements appropriate to the tool in question. No worker will be allowed to use a tool until they have been properly trained.
- A list of required safety guards that must be included on the tool. No tools shall be used unless they are equipped with the proper safety features.
- A list of recommended PPE for the tool in question. PPE will be procured before the tool is put in service and workers will be required to implement these PPEs at all times while using the tool.
- All tools shall be inspected daily and/or before each use for defective equipment/cords. All defective tools shall be tagged out of service.

SECTION 12 – ELECTRICAL SAFETY

Electrical Safety measures will be implemented at all times, including:

- Requiring that that all home design electrical systems meet the requirements of NFPA 70 National Electrical Code.
- Identifying electrical safety requirements when working with photovoltaic systems.
- Identifying electrical safety requirements when working with the battery storage system(s) of your house.

The University of Maryland 2017 Solar Decathlon Team will comply with NFPA 70E/OSHA Electrical Safety, including the use of Qualified Electrical Workers:

- Only team members identified as qualified electrical workers (QEW's) are permitted to work on electrical circuits and systems. Team members identified as "qualified" must receive the necessary training in order to be "qualified".
- The names of the team members "qualified" for electrical work will be provided, along with documentation of the training received as part of this plan
- Electrical systems > 50 v. AC, or >100 v. DC shall be locked out/tagged out (LOTO) prior to working on that system, or working in proximity to exposed conductors.
- All individuals working under an LOTO shall have a personal lock on the system.
- A zero-energy verification (ZEV) will be performed before working on an electrical system after LOTO has been applied. This test will be performed by a "qualified person with the appropriate test equipment".
- Energized Work (other than ZEV) will not be performed on any electrical system other than to trouble shoot an issue.
- An appropriate level of PPE (per tables or arc flash analysis, NFPA 70E) shall be used whenever there are exposed energized conductors, while troubleshooting a system, or conducting zero-energy verification.
- Arc flash and limited approach boundaries shall be specified, and a method of controlling these boundaries will be devised.
- All cord and plug tools used during assembly and disassembly shall be GFCI protected, including those connected to portable generators.
- Power tools shall be grounded or double insulated.

- All flexible cords (extension cords), power strips, and GFCI's shall be heavy duty and rated for outdoor use.
- Inspection criteria for electrical tools and appliances shall be identified.

SECTION 13 – MATERIAL HANDLING SAFETY

Forklifts shall be used only with the following safety measures:

- Forklifts shall be equipped with audible back up warning devices.
- A worker shall be assigned to monitor the area where each forklift is being used. The monitor will be responsible to keeping others at a safe distance from the forklift and its swing radius where applicable.
- When manual handling of materials in cooperation with a forklift, any potential hazards for being caught in-between will be identified and corrected.
- Forklifts will not be operated within 10 feet of energized electrical equipment including power lines and solar panels.
- ALL team members who are going to operate forklifts shall be trained in accordance with CFR 1910.178 Power Industrial Trucks. The names of the team members that are qualified to operate the forklift shall be provided, including the type of forklift(s) and the training received.
- Forklift operators shall have their operator's card on their person whenever operating a forklift at the Event Site

SECTION 14 – HOISTING & RIGGING

A lift plan is currently being formulated for inclusion in this EHSP. The lift plan will include:

- Estimated weight of each component to be picked up
- Pick points on each component.
- Tag line use
- Site control measures to be taken ensuring no one is placed in harm's way during the lift, and no one at any time is underneath a suspended load.

The crane company shall provide illustrations for:

- Crane Capacity & percent capacity of the lift based on heaviest load
- Radius
- Boom length & angle

- Rigging configuration (identify slings [capacity and angles], hardware, and special devices [such as spreader bars] that will be used)
- Crane pad area, distance of delivery truck to boom, and distance of component placement to boom

Rigging shall be done by the crane company.

A pre-lift meeting shall be conducted to orchestrate all players involved, including crane operator, riggers, spotters, lift master, tag line operators, and anyone participating in site/pedestrian control.

SECTION 15 – FALL PROTECTION

A comprehensive Fall Protection Plan is still being formulated for the construction sequence. When completed, the plan will include:

- Identification of the Fall Protection System to be used for each area of a concern. (i.e., Guardrail System, Personal Fall Arrest System (PFAS), Restraint System(RS) or other means and methods.)
- Fall protection system design certification by a PE (structural engineer.
- Identification of harnesses, lanyards, and connectors to be use. Include product specifications for all equipment.
- Identification of the training requirements for individuals using this system. Team members identified as "qualified" to utilize the selected fall protection system must receive the necessary hands-on training in order to be "qualified". Provide the names of the team members "qualified" to use the fall protection system including aerial lifts or scissor lifts and the training received. Include this information in the Training Section.
- Assurance that system design and equipment selected meet the requirements established within ANSI 359.1-2007 and 359.3-2007, and 29 CFR 1926 Subpart M Fall Protection

A schematic design top & side view that illustrates:

- Guardrail design & locations (as applicable)
- Anchorage type and anchor location and/or identification of other methods that will be employed in the areas. (as applicable)
- Associated heights from the anchor points to the surface below

If a PFAS is used, the plan will include calculations of the fall clearance distance to ensure the system design does not allow anyone to reach the ground or other lower surface before the fall is arrested.

If an RS is used, the plan will demonstrate that the system design does not allow anyone to reach a fall hazard

SECTION 16 – OTHER SAFETY CONSIDERATIONS

Temporary site lighting will be used to provide adequate work lighting at night. These lights will be powered by connections to the grid or by a portable generator where required.

A work schedule is still being developed, but when complete, it will ensure that workers receive adequate rest.

Drinking water will be provided at all times in order to avoid heat stress. Workers will be trained in the importance of remaining hydrated and identifying the signs of heat stress (both in themselves and in others).

Work will be suspended during periods of high winds during the hoisting and rigging phase of construction. Interior work will be performed only when conditions are deemed safe to continue.

SECTION 17 – TRAINING & DOCUMENTATION

The following persons listed as Key Personnel have completed the 30 hour OSHA Training Course offered at the University of Maryland:

Mike Binder – Faculty Project Manager and Faculty Health and Safety Officer

Alla Elmahadi – Student Construction Manager

Sophie Habib – Student Health and Safety Officer

The 30-hour OSHA Training was completed on February 22nd, 2017. Certificates of completion are pending and will be submitted to the Solar Decathlon competition organizers once received.

In addition to the Key Personnel identified above, the follow Team Members have completed the 30-hour OSHA Training:

Anil Moore – Student

Bo Green – Mentor

Phillip Carls – Mentor

These persons will serve as Responsible Persons when the Key Personnel cannot be on-site.

Garth Rockcastle, the Faculty Construction Manager will complete the 30-Hour Training On-line Course prior to commencement of construction activities.

All Team Members planning to participate in construction and assembly activities will be required to complete the 10-Hour OSHA Training.

All Team Members planning to participate in construction and assembly activities will be required to read this EHSP and pass a written test on its contents.

No Special Emphasis Training requirements for Team Members are currently anticipated, but will be identified as the construction plan takes shape.

Regular pre-shift meetings will be used as a tool to inform Team Members of Accidents, Incidents and corrective actions required.

SECTION 18 – HAZARD ANALYSIS

A comprehensive Hazard Analysis is still being formulated around a detailed construction plan as it takes shape. The results of this analysis will be documented in the prescribed format and included in this EHSP.

SECTION 19 – SIGNATURES

The required signatures will be attached once the remaining documentation is completed.