Health and Safety Plan Template

This Health and Safety Plan template ensures that all appropriate considerations have been taken into account before your work on the competition site. It should be filled out, approved, updated, and posted on your site where it is accessible to all who are working there. Although not required, it would be a good practice to develop a similar document that addresses work activities at your local build site.

Cover Page

Health and Safety Plan

Solar Decathlon China 2017

(Team Name and School)

Team Health and Safety Officer (Name and Signature on final document)

Team Faculty Advisor (Name and Signature on final document)

Approval Date:
Revision number:

Header information

Health and Safety Plan
Team Name
Revision number:

The following topics should be included in your Health and Safety Plan.

Statement of Policy
State your team's policy regarding health and safety.

Assignment of Health and Safety Responsibilities
Information in this section should include, at a minimum, the following:

- *Name and title of the person responsible for all health and safety activities while working on the competition site*
- *Chain of command for health and safety matters*
- *Stop work authority*
- *Point of contact for health and safety information*
- *How health and safety concerns will be addressed.*

Emergency Procedures

Every Health and Safety Plan should include the following general information.

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

- 1) Secure the scene to prevent further injuries.
- 2) Call 120 or 999 (or equivalent) for an emergency response.
- 3) Provide first aid, if needed, and if trained.
- 4) Remain at the scene until a public safety officer takes charge.
- 5) Call or notify Solar Decathlon China 2017 headquarters, organizers, or event staff.

During the assembly and disassembly phases of the event, an ambulance will be on site 24 hours per day. During the public exhibit hours, an emergency medical technician (EMT) and an ambulance will also be on site.

Additional information to consider for inclusion:

- *More specific first aid and medical information*
- *Fire response actions*
- *Other types of emergencies, as appropriate*

Accidents and Incidents

Address what actions will be taken in case an accident or near miss occurs.

- *Identify who will be notified if an incident occurs, including the Solar Decathlon China 2017headquarters and event safety officer.*
- *Identify how these events will be investigated and documented. An Incident Report Form Solar Decathlon China 2017 will need to be completed. If your school requires additional documentation, identify that in this section.*
- *Identify how corrective actions will be identified and addressed to prevent reoccurrence.*

General Rules and Regulations

State your rules and regulations regarding safety on your site and what actions will be taken if there are deviations from those requirements.

State what your alcohol and drug policy is and how issues will be addressed if there are deviations from your policy.

Hazard Analysis

Discuss the process you will use to identify potential hazards and the controls you will implement to mitigate these hazards. The process you identify should meet the five core functions within the Integrated Safety Management System.

1. *Define the scope of work.*
2. *Analyze the hazards associated with that scope of work.*
3. *Develop controls to mitigate the hazards to an acceptable level of risk.*
4. *Perform work within the scope utilizing the controls.*

5. *Obtain feedback and identify areas for improvement.*

How do you determine if there is an acceptable level of risk? If the hazard with the use of controls ranks as low or routine using the following table, then that is an acceptable level of risk.

Probability

Consequences	Frequent A	Reasonably Probable B	Occasional C	Remote D	Extremely Remote E	Impossible F
Catastrophic I	High	High	High	Moderate	Low	Routine
Critical II	High	High	Moderate	Low	Low	Routine
Marginal III	Moderate	Moderate	Low	Low	Routine	Routine
Negligible IV	Routine	Routine	Routine	Routine	Routine	Routine

Risk

When defining probability and consequences, use the following criteria:

Event Probability Classification Table

Probability (that the potential consequence occurs)		
Level	**Annual Probability**	**Potential Consequences**
A	Frequent > 1.0	Likely to occur many times during the life

		cycle of the system (test/activity/operation)
B	Reasonably Probable 1.0 to 0.1	Likely to occur several times during the life cycle of the system
C	Occasional 0.01 to 0.1	Likely to occur sometime during the life cycle of the system
D	Remote 0.0004 to 0.01	Not likely to occur in the life cycle of the system, but possible
E	Extremely Remote 0.000001 to 0.0001	Probability of occurrence cannot be distinguished from zero
F	Impossible < 0.000001	Physically impossible to occur

Hazard Consequence Classification Table

Consequence		
Category	**Description (Est. $ Lost)**	**Potential Consequences**
I	Catastrophic (equipment loss > 1 million USD)	May cause death or system loss
II	Critical (100,000 USD to 1 million USD)	May cause severe injury or occupational illness, or minor system damage
III	Marginal (10,000 USD to 100,000 USD)	May cause minor injury or occupational illness, or minor system damage
IV	Negligible (<10,000 USD)	Will not result in injury, occupational illness, or system damage

Use the following guideline to effectively control risks:

Activity Hazard Analysis (AHA)

An AHA shall be completed for each major task associated with assembly and disassembly of your house on the competition site. An example of a completed AHA follows for your reference. There are slightly different formats being used in the industry. Find a format that works for you.

In this section, identify the format to be used and the requirements to complete your AHA. Your completed AHA should be placed in an appendix of the Health and Safety Plan for easy updating. For the Health and Safety Plan submittal requirement, complete an AHA for the identified tasks to date. Remember that as your process changes or new tasks are identified, the AHA needs to be updated or a new AHA generated.

Blue Line Building Services, Inc.
3801 East 40th Avenue
Denver, CO 80205

ACTIVITY HAZARD ANALYSIS STEEL ASSEMBLY	Date Submitted: 03/19/2010	Contract #: KAFH-8-77429-26	Job #:10-1226	New: X Revised:
Name of Project: Lab 131 Structural Floor Upgrade		Company / Organization: Blue Line Building Services		Location: FTLB
Supervisor: Sam Trujillo III	Submitted by: Joe Walz	Reviewed by: Ben Trujillo	Approved by:	

Required and/or recommended Personal Protective Equipment: Goggles/Safety Glasses, Ear Protection, Fire Resistant Gloves, Hardhat, Eye Safety Shield/Helmet with Filter Lens, Protective Clothing, Safety Boots, Disposable Respirator (optional).

General instructions:

1. Understand Steel and Shoring Shop Drawings, particularly the sequence of erection activates.
2. Understand the Shoring Sequence.
3. Understand Confined Space Entry Procedures
4. Operate equipment in strict accordance with Manufacturer's instructions. Owners manual for equipment shall be on site.
5. Report any observed defect or safety hazard to your supervisor immediately.
6. Prior to beginning work obtain Permitted Confined Space and Hot Work Permit from NREL.
7. Personal sampling pumps will be used during the first and second days of welding. Welders will be required to wear respirators with N-95 cartridges for the first four days of welding or until sampling results are received. The samples will be tested with an ICP analysis for total weight as it compares to the TLV of 5mg/m3 and individual metals TLV's. Assuming the results of the samples come back within acceptable limits the work will be allowed to progress without the use of respirators. If the personal samples come back not within acceptable limits further sampling will be performed. Until additional sampling shows acceptable levels and further evaluation is done, Welders will be required to wear respirators during all welding operations.
8. The ventilation system will be set up by the welding crew with the assistance of Blue Line's Superintendent and on-site CSP to insure that the maximum amount of welding fumes are being removed from the welding area. The CSP and Blue Line Superinterdent will ensure the ventilation system is being set up and used properly as work progresses in the space. The CSP will document set up of ventilation system 'on the Confined Space Permit.

ACTIVITY	POTENTIAL HAZARDS	PRECAUTIONARY ACTION & CONTROL TO BE TAKEN
1. General Use.	Inhalation	1a. Appropriate ventilation as required. Fan will be placed at ventilation core located north of new door penetration.
	Eye Injury	1b. Helmets, goggles, appropriate noncombustible or flame proof screens to prevent contact with projectiles, fumes, dusts and flashes.

	Burns	1c. Situational awareness, protective clothing, PPE
	Foot injury	1d. Wear safety shoes
	Fire	1e. Appropriate place fire extinguisher, remove all combustibles and fire hazards from welding area.
2. Steel Assembly	Routes	2a. Routes shall be pre-planned to ensure no worker is within path of steel. Material deliveries, staging, storage and procedures to move shall be coordinated with other trades and construction activities.
	Assembly stability	2b. Inspect ground conditions for proper support. Check supports/rigging for excess wear prior to use, remove any equipment considered a hazard. Ensure mounted/rigged correctly at connections.
	Overhead lifting	2c. Demonstrate proper lifting procedures. Avoid twisting body while lifting. Get assistance with all steel objects.
	Falling Objects	2d. Do not allow other construction processes within work area. Pre-plan escape allowing for prediction of direction of fall. Hard hats, safety shoes, safety glasses and all other appropriate PPE shall be worn.
3. Working in a confined space.	Working for long periods of time in cramped position can lead to backache or neck ache.	3a. Leave confined area frequently to stretch.
4. Footing, Work Surface / Area	Sprained ankles, falls, head injures	4a. Use extreme caution when moving within space over uneven surfaces and overhead obstructions. Wear safety boots with ankle support, as well as hard hat and eye protection at all times.
5. Using Hand Tools	Cuts, pinches, smashes, punctures.	5a. Keep tools in good condition. Inspect tools prior to use. Wear proper personnel protective equipment for tool. Follow manufacturer recommendations for tools.
6. Housekeeping		6a. Inspect area during shift any clear any debris. Dispose of all waste appropriately. NREL will provide separate container for disposal of acid waste piping. This piping shall be wrapped at openings prior to placing within container. Stage unused material in location not posing hazard to others working within space.

ACTIVITY HAZARD ANALYSIS WELDING	Date Submitted: 03/19/2010	Contract #: KAFH-8-77429-26	Job #:10-1226	New: Revised: X
Name of Project: Lab 131 Structural Floor Upgrade		Company / Organization: Blue Line Building Services		Location: FTLB
Supervisor: Sam Trujillo III	Submitted by: Joe Walz	Reviewed by: Ben Trujillo	Approved by:	

Required and/or recommended Personal Protective Equipment: Goggles/Safety Glasses, Ear Protection, Fire Resistant Gloves, Hardhat, Eye Safety Shield/Helmet with Filter Lens, Protective Clothing, Safety Boots, Disposable Respirator (optional).

General instructions:

1. Before cutting or welding is permitted the area shall be inspected by individual responsible for authorizing cutting and welding operations.

2. Operate equipment in strict accordance with Manufacturer's instructions. Owners manual for equipment shall be on site.

3. Employees assigned to operate equipment shall be familiar with the OSHA requirements outlined in 29 CFR 1926.351, 1910.252 and 1910.254 (Welding, Cutting, and Brazing).

4. Only authorized users may operate equipment.

5. Connections and machine grounding shall be checked daily.

6. Report any observed defect or safety hazard to your supervisor immediately.

7. Prior to beginning work obtain Permitted Confined Space and Hot Work Permit from NREL.

8. Two monitors will be in use during each work period. One positioned at work area of welders, the other with the Entry Attendant. The monitors will sampling for H2S, CO, O2 and combustibles. Monitor filters will be changed if it is dirty, discolored, or wet per Manufacture's instructions.

9. Two welders with helpers will be on site during all welding operations. Additionally, the Certified Safety Professional and Entry Attendant will monitor their activates as well.

10. Compressed gas will not be used as using stick welding methods. Compressor and generator will be staged on the outside of work space near ramp. Core drill penetration for welding leads will be made to eliminate trip hazards at entry.

11. Blue Line Superintendent will ensure all working within Permitted Confined Space have completed respirator training. New respirator with N-95 cartridge will be provided each day.

12. Personal sampling pumps will be used during the first and second days of welding. Welders will be required to wear respirators with N-95 cartridges for the first four days of welding or until sampling results are received. The samples will be tested with an ICP analysis for total weight as it compares to the TLV of 5mg/m3 and individual metals TLV's. Assuming the results of the samples come back within acceptable limits the work will be allowed to progress without the use of respirators. If the personal samples come back not within acceptable limits further sampling will be performed. Until additional sampling shows acceptable levels and further evaluation is done, Welders will be required to wear respirators during all welding operations.

13. The ventilation system will be set up by the welding crew with the assistance of Blue Line's Superintendent and on-site CSP to insure that the maximum amount of welding fumes are being removed from the welding area. The CSP and Blue Line Superintendent will ensure the ventilation system is being set up and used properly as work progresses in the space. The CSP will document set up of ventilation system `on the Confined Space Permit.

ACTIVITY	POTENTIAL HAZARDS	PRECAUTIONARY ACTION & CONTROL TO BE TAKEN
1. General Use.	Inhalation	1a. Appropriate ventilation as required. Fan will be placed at ventilation core located north of new door penetration.
	Eye Injury	1b. Helmets, goggles, appropriate noncombustible or flame proof screens to prevent contact with projectiles, fumes, dusts and flashes.
	Burns	1c. Situational awareness, protective clothing, PPE
	Foot injury	1d. Wear safety shoes
	Fire	1e. Appropriate place fire extinguisher, remove all combustibles and fire hazards from welding area.
2. Working in a confined space.	Working for long periods of time in cramped position can lead to backache or neck ache.	2a. Leave confined area frequently to stretch.
3. Footing, Work Surface / Area	Sprained ankles, falls, head injures	3a. Use extreme caution when moving within space over uneven surfaces and overhead obstructions. Wear safety boots with ankle support, as well as hard hat and eye protection at all times.
4. Using Hand Tools	Cuts, pinches, smashes, punctures.	4a. Keep tools in good condition. Inspect tools prior to use. Wear proper personnel protective equipment for tool. Follow manufacturer recommendations for tools.
5. Housekeeping		5a. Inspect area during shift any clear any debris. Dispose of all waste appropriately. NREL will provide separate container for disposal of acid waste piping. This piping shall be wrapped at openings prior to placing within container. Stage unused material in location not posing hazard to others working within space.

Appropriate Work Clothing and Personal Protective Equipment (PPE)
Identify the minimum level of PPE required for anyone accessing you site while construction activities are occurring (see rule 3-3). The minimum level is hard hat, safety glasses with side shields, safety boots with ankle protection, long pants, and shirt with sleeves (3 in. minimum).

Identify other PPE requirements based upon task activities and any special requirements that are associated with wearing that PPE.
Note: All team members and volunteers need to be briefed on the proper use, inspection, and limitations of that PPE.

Access Control
Be aware that the organizers will initially mark off the boundaries of your site with caution tape. If you continue to use the caution tape as your primary barricade, you will need to periodically inspect and assess the barricade to ensure its effectiveness.

Identify how you are going to prevent site entry by individuals who have not been briefed on the hazards and control on your site or who are not wearing the appropriate level of PPE.

Identify what your plan is if a media representative or VIP requests access your site during construction. The organizers consider the following three options acceptable in these cases:

- *Verify that the visitors are wearing the minimum level of PPE before briefing them on current activities.*
- *Stop work and secure hazards prior to allowing the visitors on site with or without the appropriate level of PPE.*
- *Do not allow access if they do not have the minimum level of PPE.*

Hoisting and Rigging
If a mobile crane will be used to place your house on the competition site, then the following information shall be included in the Health and Safety Plan.

- *A lift plan identifying the details of how your house/house components shall be picked up and placed, including:*
    - *Estimated weight of each component to be picked up*
    - *Pick points on each component*
    - *Rigging configuration (identify slings [capacity and angles], hardware, and special devices [such as spreader bars] that will be used)*
    - *Crane placement on gravel path, distance of delivery truck to boom, and distance of component placement to boom*
    - *Minimum crane capacity based upon weight of heaviest component, rigging, load radius, and boom angle/length: Work with a crane company to determine the minimum capacity*
    - *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. This needs to address pedestrians on the gravel path and team members on your site. Some form of positive barrier shall be used to control pedestrians from approaching the lift and shall only be in place when a lift is being performed. Identify and list that barrier in your plan.*

- *Identify who is going to do the rigging—you or the crane company. If team members are going to do the rigging, then these individuals have to be trained on proper rigging techniques.*
- *Identify topics to be covered in a pre-lift meeting coordinating all players involved, including crane operator, riggers, spotters, lift master, tag line operators, and anyone participating in site/pedestrian control.*
- *Identify how you are going to ensure the appropriateness of the rigging, such as capacity, damage, and that no counterfeit materials are used.*

If hoisting and rigging will be performed without a mobile crane, then indicate this in the Health and Safety Plan. Include the following information:

- *Equipment to be used in hoisting and rigging activities*
- *Qualifications of individuals involved*
- *Planning of all lifts (e.g., how you are going to ensure capacity, rigging of equipment)*
- *Site control details if any of these lifts are performed from the gravel path*
- *No rigging off of fork truck tines; rent the appropriate fork truck attachments for hoisting and rigging.*

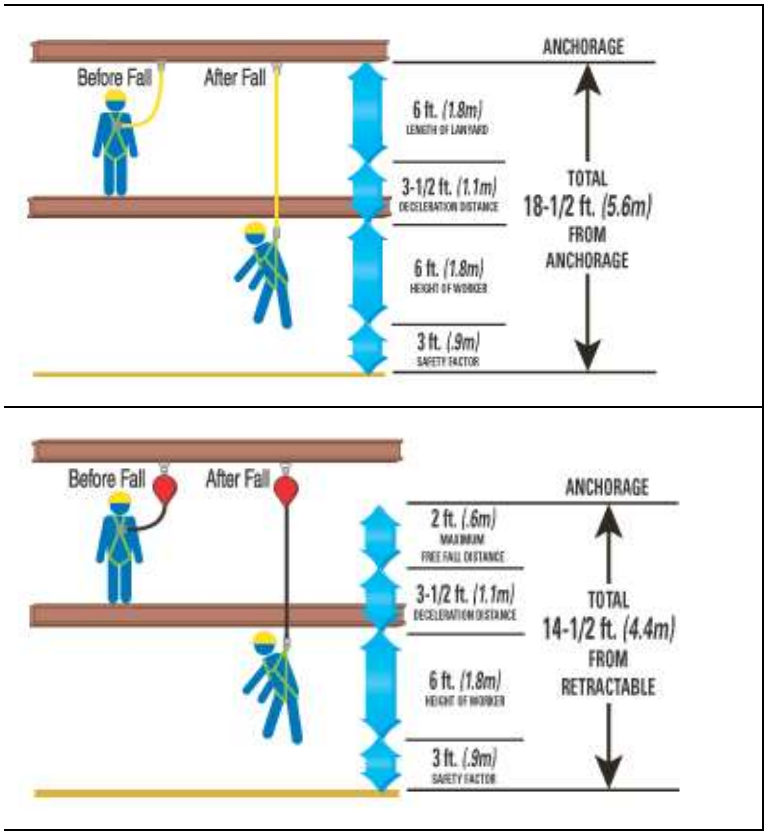
If your house is to be jacked or placed on temporary cribbing until the foundation is set, then identify controls to be used. For example, allow no one underneath the structure, use cribbing appropriate to the weight, and restrict activities around structure to minimize disturbance.

Fall Protection/Work from Elevated Heights

A Fall Protection Plan shall be included within this Health and Safety Plan for any work involving a personal fall arrest system (PFAS) or restraint system (RS). The Fall Protection Plan shall include:

- *Identification of the system to be used*
- *Identification of anchorage and anchor location*
- *Identification of system capacity being designed*
- *Identification of harnesses, lanyards, and connectors to be used*
- *If a PFAS is used, calculate 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, demonstrate that the system design does not allow anyone to reach a fall hazard*
- *Identification of the training requirements for individuals using this system*

Calculating Fall Clearance Distance



Monitoring systems are <u>not</u> allowed to be used to mitigate fall hazards from elevated heights.

- *Identify safety requirements for ladder usage.*
- *Identify safety requirements for scaffolding if it is to be used.*
- *Identify safety requirements for a scissor lift if it is to be used.*
- *Identify safety requirements for an aerial lift if it is to be used.*

Firefighting system

Teams can decide to adopt (1) or (2) according to the fire safety code (SDC Building Code, IRC), they follow

(1)Indoor fire extinguishers are required, and at least 2 fire extinguishers shall be arranged in one competing unit. A single fire extinguisher shall have the configured minimum extinguishing level of 2A and the maximum protected area of 75m^2/A for a unit extinguishing level.

(2)A fire sprinkler system is used as one of several measures to suppress fire even extinguish fire so that people and property can be protected. The whole system can be divided into two system, fire detection system and fire suppression system. Fire suppression system consists of a whole range of water supply system. When there is no danger, the wet system keeps an adequate pressure level. However, if an accident happens, the detection system sets off first. Smoke and heat detectors ring if temperature or smoke concentration within their area exceeds danger levels. The alarm will also ring to remind people to evacuate and call safety police. At the same time, sprinklers on piping system melt because of high temperature, water in the pipe begins to flow out, which causes a

decrease of pressure. Then pump sets off and imbibes water from tank, providing adequate pressure and flow rate to control fire before fire police come.

Electrical Safety, System, and Equipment

Within this section you need to identify how team members are going to be protected from the wide array of electrical hazards that may be presented during the event, from within the house to the tools you use during assembly and disassembly. Identify how you are going to comply with the general requirements included in SD China 2017 Building Codes.

Other requirements included but not limited to:

- *Use listed electrical components.*
- *No energized work is allowed on any electrical system other than to trouble shoot an issue.*
- *Electrical systems shall be locked out/tagged out (LOTO) prior to working on that system. Bring your locks, tags and any devices needed to LOTO your system/equipment!*
- *All individuals working under an LOTO shall have a personal lock on the system.*
- *Perform zero-energy verification before working on an electrical system after LOTO has been applied.*
- *Select the correct level of PPE (per tables or arc flash analysis) whenever there are exposed energized conductors, troubleshooting a system, or conducting zero-energy verification. Bring the identified PPE to the event!*
- *Identify your arc flash and limited approach boundaries and how you are going to control these boundaries.*
- *Power tools should be grounded or double insulated.*
- *Electrical appliances (cords, power strips, etc.) shall be heavy duty and rated for outdoor use.*
- *Identify inspection criteria for electrical tools and appliances.*

Hand and Power Tool Safety

Identify the necessary safety precautions, guarding, and training required for the type of hand and power tools that will be used at the event. For example, if you plan to use a chain saw on site, then you need to ensure the following:

- *Your operator has the knowledge and skills required to safely use a chain saw.*
- *The saw is equipped with safety features such as front and rear hand guards, chain break, and stop switch.*
- *PPE such as face shield, chaps, hearing protection, and leather gloves shall be worn in addition to the minimum level of PPE required for the site.*

Chemical Safety

Identify how you are going to address the following general requirements:

- *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 the generator shall be stored in compliant metal flammable cans with sealing spring-loaded lids. Fuels storage shall meet the storage requirements listed above. The generator shall be in secondary containment.*

- *Provide appropriate spill cleanup materials for hazardous materials you will have on site and ensure these materials are available. Notify the Solar Decathlon China organizers of any spills that occur on the competition site whether they are hazardous or not.*
- *If there is any potential of generating hazardous waste, then you need to identify how you are going to appropriately handle the waste. Consult with your school's environmental safety office.*

Hearing Conservation
Identify if any of your equipment or activities have the potential of generating noise levels of 85 dB or greater.

Hot Work Activities
If you will be performing any spark- or flame-producing activities such as grinding, soldering, or welding, then you will need to identify the fire protection measures you will be taking when performing this work.

Housekeeping
Identify how you are going to minimize trip hazards and keep your site clean.

Material Handling
Identify how you are going to minimize the potential for injuries during material handling activities. Identify measures to be taken if manual handling of items is required and identify if any mechanical assist measures that will be taken for material handling such as forklifts.

Motor Vehicle Operations
Identify how your team and your contractors will ensure safe motor vehicle operation on the competition site to promote pedestrian and operator safety.

Other Safety Considerations
Identify other safety considerations and associated controls that are necessary to ensure a safe work site and activities such as:
- *Providing adequate lighting to safely perform work at night*
- *Establishing work schedules/shifts to ensure workers have adequate rest to safely work on site*
- *Identifying other considerations pertinent to the work you will be performing.*

Training
Include the following information in this section:
- *30-hr construction safety training, or other nationally / recognizably authorized Occupational Safety and Health training (no less than 30 hours) is required for the project manager, construction manager, and safety officer. Include a copy of the training certificates for individuals holding those positions in one of the appendices.*
- *Identify all required training for the activities or controls identified in this Health and Safety Plan and how you are going to verify that these individuals have been trained prior to working on your site.*
- *Identify how you are going to train/brief all individuals who will be working on your site on this Health and Safety Plan.*

- *Identify how you are going to communicate any lessons learned regarding safety to team members.*
- *Identify any other health and safety training that you will be requiring for your team members.*

Inspections

Identify how you are going to periodically inspect your site for safety hazards and actions that will be taken if they are identified.