

HEAT STRESS – Technical Q & A's

The weather appears to be warming up and soon in the valley areas, the heat will be upon us. I suspect Cal OSHA will be out in force this year keeping a close eye on employers who have employees working outdoors. Last year, Cal OSHA issued numerous citations and even closed down worksites where there were Heat Stress violations. There still seems to be some confusion as to what constitutes "Heat Stress" and when it is applicable. In most cases, all employers at one time or another will have employees who work outdoors including driving to and from work-related locations.

Here are some Q&A's that may help.

1. Where and when does this standard apply?

This standard applies in all outdoor places of employment. The standard contains no specific limitations as to when it applies, and DOSH interprets the standard's provisions to apply at all times when employees are at work outdoors.

2. What is meant by outdoor places of employment?

An outdoor place of employment is best thought of as one that is *not* an indoor workplace. A workplace with a roof and enclosed sides is generally considered an indoor workplace.

On the other hand, open areas like agricultural fields, forests, parks, equipment and storage yards, outdoor utility installations, tarmacs, and roads, are obvious examples of outdoor workplaces. Outdoor workplaces also include construction sites in which no building shell has been completed and areas of construction sites that are outside of any building shells that may be present. Outdoor areas adjacent to buildings, e.g., loading docks, are also considered outdoor places of employment if an employee spends a significant amount of time working in them.

Sheds, packing sheds, and partial or temporary structures such as tents, lean-tos, and structures with one or more open sides can be either indoor or outdoor workplaces depending on the circumstances. In many cases these structures may actually be hotter than the environment outside of them because of heating by the sun and conditions inside like limited air circulation or lack of insulation. DOSH considers a structure in this category to be an outdoor workplace if it does not significantly reduce the net effect of the environmental risk factors that exist immediately outside of the structure.

3. Are there other regulations that apply to the risk of heat illness?

Yes. They include requirements for employers to have an effective Injury and Illness Prevention Program and to provide for drinking water, first aid and emergency response. There are also requirements tailored to specific industrial operations.

Title 8 CCR 3203 requires an employer to establish, implement, and maintain an effective Injury and Illness Prevention Program. All IIPPs must include effective procedures for hazard identification, evaluation and control, hazard correction, investigation of employee injuries and illnesses, and communication with employees about health and safety matters.

The requirement for effective communication is particularly relevant to heat-illness prevention. In evaluating compliance with this requirement, DOSH determines what the employer does to account for the whereabouts of all employees at appropriate intervals during the work shift and at the end of the shift. This is a critical procedure to follow when the outdoor work environment creates a heat hazard that could result in the collapse of an employee due to heat illness. Indoor heat can be a known hazard in the workplace, and under the obligation of the IIPP, employers are required to inform their employees about the hazard and outline the steps taken to mitigate it.

4. What are the environmental risk factors for heat illness?

Section 3395 defines environmental risk factors as including "air temperature, relative humidity, radiant heat from the sun and other sources, conductive heat sources such as the ground, air movement, workload severity and duration, protective clothing and personal protective equipment worn by employees."

Some of these factors, such as air temperature, radiant heat, air movement and conductive heat sources determine how much an employee's body is heated from external sources. Relative humidity, air movement, protective clothing, and some personal protective equipment affect an employee's ability to cool through the evaporation of sweat and contact with cooler air. Workload intensity and duration, which can be increased by use of personal protective equipment, add to the employee's heat burden by producing metabolic heat.

5. How can you evaluate the severity of environmental risk factors for heat illness?

It is critical that employers track the weather and routinely check for approaching heat waves. Heat waves are the primary cause of heat-related illnesses and fatalities in the state. For example, according to a study by Cal/OSHA, 84% of the heat illnesses in 2006 occurred during the July heat wave.

The National Weather Service forecasts the temperature in various locations in California. Weather forecasts and information are broadcast on NOAA Weather radio and can be accessed at: <http://www.weather.gov/view/states.php?state=ca&map=on>

Employees who use chemical protective clothing such as hazmat suits designed to be impervious to chemical liquids and vapors, or other clothing or body coverings that significantly interfere with the body's ability to dissipate heat compared with normal clothing, can be at risk of heat illness even when temperatures are considered mild. These employees should be included in a heat-stress program.

6. What is considered sufficient access to drinking water?

Water Quality and Amount: Potable drinking water must always be placed in locations readily accessible to all employees. The water provided must be fresh and pure, suitably cool, and in sufficient amounts, taking into account the air temperature, humidity, and the nature of the work performed, to meet the needs of all employees.

Where unlimited drinking water is not immediately available from a plumbed system, the employer must provide enough water for every employee to be able to drink one quart of water, or four 8-ounce cups, per hour. The water must always be cool, and in very hot weather it is recommended that employers have ice on hand to keep the water cool.

I If an employer chooses not to provide the full-shift quantity of drinking water at the start of a work shift (e.g., 2 gallons per employee for an 8-hour shift), the standard requires effective procedures

for drinking-water replenishment to allow each employee to drink one quart per hour. This means a sufficient quantity of water must always be present and readily accessible to allow every employee to consume at least one quart of water per hour until such time that the water supply has been replenished.

A water-supply procedure that depends on replenishment during the work shift is out of compliance if it is not reliable. An employer is also out of compliance if at any time drinking water is not available to employees, or if the practice is to wait until the water vessel is empty to replenish it. It is similarly impermissible for an employer to replenish the drinking-water supply only when requested by employees.

Distance: Water must always be readily accessible. DOSH interprets this phrase to mean that the water should be as close to the employee as is practicable, given the working conditions and layout of the worksite. On inspection, if a DOSH inspector questions whether the water supply is close enough to the employees, he or she will ask the supervisor present to explain the factors taken into consideration by the employer in determining the placement of water. DOSH must by law accept placement of the water at a distance that is reasonable under the circumstances.

Employers should build their water placement strategies around a sound understanding of the fact that the more an employee has to interrupt work in order to drink, the greater will be the likelihood that the employee will not be drinking as much water as is necessary to protect fully against heat illness. An employer may choose to augment maintaining a compliant readily accessible water supply by also providing a beverage container (preferably insulated) to be carried and used by the employee while working. The employee must be encouraged to refill the container from the employer's drinking-water supply and clean and maintain it as needed.

Why water is so important: Water provides the body's single best defense against heat other than removing heat exposure itself. In conditions of high heat and strenuous work, the human body can lose over a quart of fluid per hour just by sweating. Continuous replacement of this lost fluid is critical to allowing the body to maintain the life-preserving cooling benefits of perspiration. This means assuring the presence of, ready access to, and consumption of pure, fresh, and cool drinking water.

Encouragement to drink water: The standard requires not only that water be provided, but that employers encourage employees to drink it frequently. The importance of this cannot be overstated. Employees are there to work, and many of them may not feel how urgently their bodies need water. This is an unfortunate but preventable cause of heat illness.

Employers must emphasize this in their training sessions and stress the importance of frequent drinking of water throughout the day, especially in high heat. This can be significantly facilitated by steps such as removing any barriers that may exist to access, making the access distance as short as reasonable, and making the water station inviting by using ice and shade.

The 2006 Cal/OSHA Heat Illness Case Study showed that although 90% of the worksites had drinking water at the site, 96% of the employees suffering from heat illnesses were dehydrated.

Water temperature and use of ice: When temperatures exceed 90 degrees F, having ice on hand to cool the water is recommended. Cool water adds the extra benefit of providing direct cooling to the body immediately upon consumption, independent of perspiration.

7. What is considered sufficient access to shade?

When the actual presence of shade is required.: The heat illness prevention standard requires employers to provide employees access to an area with shade when they believe they need a

preventative recovery period or when they are actually suffering from heat illness. Employers must always have the capability to provide shade promptly if it is requested by an employee. However, DOSH believes adequate access to shade includes having shade *actually present* when the presence of shade is necessary to protect employees from heat illness. DOSH believes that the requirement to have shade actually present depends on the degree of risk presented by the outdoor environment. Accordingly, for employees who are not wearing specialized clothing,¹ having shade actually present will be considered a requirement of the standard where the outdoor dry-bulb temperature high for the area closest to the location at which employees are to work is forecast, as of 5 p.m. the previous day, to be over 85 degrees F, according to the National Weather Service. If the prediction on the previous day is for the temperature high for the area to exceed 85 degrees F, shade must be up as of the beginning of the shift and present throughout.

Note: A temperature listed as "degrees F" in any report by the National Weather Service is considered the dry-bulb temperature unless otherwise specified in the report.

Employers may choose, as an alternative to monitoring predicted temperature highs, to measure the temperature hourly during the work shift to determine whether the dry bulb temperature exceeds 85 degrees F at the worksite. This can be done by using any thermometer that reasonably appears to display the proper temperature. One way to make this determination is to check the reading against other thermometers to determine whether the temperature it shows is approximately the same, i.e., within approximately 1 degree F. If this method is chosen, the employer must promptly provide actual shade for the remainder of the shift once a temperature reading exceeds 85 degrees.

Regardless of what the predicted high has been the previous day, employers are expected to know if the actual temperature is exceeding 90 degrees F at their worksite. If the temperature enters this range, shade must actually be present regardless of the previous day's predicted temperature high.

Quality: Shade is blockage of direct sunlight. Blockage is always sufficient when objects do not cast a shadow in the shaded area. An enclosed area used to provide shade must allow cooling at least comparable to the cooling that would be provided in a shaded unenclosed area in the same location.

Sources: Shade can be provided by buildings, canopies, lean-tos, or other partial or temporary structures that are either ventilated or open to air movement. Trees and dense vines can provide shade that is superior to artificially provided shade and are accepted as compliant sources of shade if the canopy of the trees or vines is sufficiently dense to provide substantially complete blockage of direct sunlight. Flecks of sunlight are acceptable as long as, overall, the shade provides substantially complete blockage of sunlight. Where trees or other vegetation are used to provide shade, the thickness and shape of the canopy must, given the changing angles of the sun, result in a sufficient shadow being cast to protect employees from the sun during the entire shift.

The interior of a vehicle may not be used to provide shade unless the vehicle is air-conditioned and the air conditioner is operating. Similarly, metal storage sheds and other out-buildings do not provide protection from sunlight that meets the definition of shade unless they provide a cooling environment comparable to shade in open air (i.e., they must be mechanically ventilated or open to air movement).

Conditions of Access: The shaded area must let employees assume a comfortable posture and must not cause exposure to another hazard. Therefore, the shade requirement cannot be met by using areas underneath mobile equipment, like a tractor.

Areas shaded by artificial or mechanical (as opposed to natural) means, such as by a pop-up canopy as opposed to a tree, must allow for employees to avoid contact with bare soil. This can be done by providing chairs, benches, sheets, towels, or any other items that let employees sit and rest without contacting dirt. Where the shaded area is a lawn, no such item need be provided, regardless of the means by which the area is shaded.

How much shade must be available? During the shift, there must always be enough shade to accommodate those employees who seek it to cool off as required by the standard. Employers should anticipate that the hotter the weather gets, the more employees are likely to seek shade at the same time. This does not mean there must be enough shade to accommodate all employees on the shift at the same time, however. Rather, an employer may comply by adopting a procedure to ensure that employees who desire access to shade will not be deprived of it due to lack of space. One such procedure would be for the rotation of employees in and out of shaded areas to ensure all have sufficient access for the five-minute interval specified in the standard. Another would be to set up additional shade structures as needed. DOSH accepts as compliant any reasonable strategy that assures employees are not deprived of shade when they believe a preventative recovery period is needed. Any such procedure must be clearly and accurately described employer's written heat illness prevention procedures.

As a general rule, and subject to the considerations described above, DOSH considers the amount of shade to be sufficient if there is enough to accommodate, at the same time, 25 percent of the employees on a shift, so that employees can sit comfortably in the shade without touching each other.

How close must a shaded area be to employees?

The nearest shaded area must be as close as practicable. Usually this will mean that shade must be reachable within a 2 ½ minute walk, but DOSH recognizes that, just as in some cases it is practicable to place shade closer than that, the same considerations of practicality will necessitate shade being placed farther away than that in other cases. DOSH believes that in no case is it permissible for shade to be located more than ¼ mile or a five minute walk away, whichever is shorter. This is the same maximum allowable distance as for toilet and hand washing facilities in agricultural operations under the field-sanitation standard.

Note: The time it realistically takes to get to the shaded area is always the critical consideration, and this will be taken into consideration if the means of access is by vehicle instead of walking.

8. When may employers use cooling measures other than shade?

Non-agricultural employers may provide cooling measures other than shade during the preventative recovery period, if they can demonstrate that the alternative is at least as effective as shade.

Such cooling measures include other options or technologies such as fans and misting devices where the employer can demonstrate that they are at least as effective as shade at allowing the body to cool.

9. What are the requirements for preventive recovery periods?

The purpose of the recovery period is prevention of heat illness. The employer is required to provide access to shade for those employees who believe they need a preventative recovery period from the effects of the heat and for any who exhibit indications of heat illness.

Access to shade must be allowed at all times, and the employee must be allowed to remain in the shade for at least five minutes. The importance of prevention cannot be overstated. By waiting until symptoms appear before seeking shade and recovery, employees are at significant risk of developing serious heat illness, and the preventative purpose of the standard is defeated. When employees opt to access shade, employers should use this as an opportunity to encourage them to drink as much water as they comfortably can.

The purpose of the preventive recovery period is to reduce heat stress on the employee. Since people produce more metabolic heat while working, resting reduces this source of heat, and it also reduces the heart rate. Cool, potable water should be available in the recovery area to prevent further dehydration and enhance recovery.

The preventive recovery period is not a substitute for medical treatment. If an employee has any symptoms of heat illness, first-aid procedures should be initiated without delay. Common early signs and symptoms of heat illness include headache, muscle cramps, and unusual fatigue. However, progression to more serious illness can be rapid, and can include loss of consciousness, seizures, mental confusion, unusual behavior, nausea or vomiting, hot dry skin, or unusually profuse sweating.

Any of these symptoms requires immediate attention. Even the initial symptoms may indicate serious heat exposure. If medical personnel are not immediately available onsite and serious heat illness is suspected, emergency medical personnel should be immediately contacted and on-site first aid undertaken. No employee with symptoms of possible serious heat illness should be left unattended or sent home without medical assessment and authorization.

10. What written procedures should an employer develop to comply with the requirements of this standard?

It is up to the employer to develop, put in writing, and implement effective procedures for water replenishment during the shift as needed, employee access to shade at all times for preventative recovery periods, employee and supervisor training, and responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary, how emergency medical services providers will be contacted, how employees will be transported to a point where they can be reached by an emergency medical service provider if necessary, and how, in the event of an emergency, clear and precise directions to the worksite will be provided as needed to the emergency responder. Employees and supervisors must be trained on these procedures so that they understand and implement the employer's basic approach. The most successful employers make this training a matter of teamwork and profit from a team approach to making the system work.

These procedures must be in writing and made available to employees and to representatives of DOSH upon request. The employer may choose to integrate the procedures into the employer's IIPP.

11. What is acclimatization, and how should employers address it under the heat-illness prevention standard?

What is acclimatization: Acclimatization is the temporary and gradual physiological change in the body that occurs when the environmentally induced heat load to which the body is accustomed is significantly and suddenly exceeded by sudden environmental changes. In more common terms, the body needs time to adapt when temperatures rise suddenly, and an employee risks heat illness by not taking it easy when a heat wave strikes or when starting a new job that exposes the employee to heat to which the employee's body hasn't yet adjusted.

Why employers and employees need to understand acclimatization and act appropriately when acclimatization is needed: It is important for employers and employees to understand that inadequate acclimatization can imperil anyone exposed to conditions of heat and physical stress significantly more intense than what they are used to. Employers must understand that they are responsible for the working conditions of their employees, and they must act effectively when conditions result in sudden exposure to heat their employees are not used to.

Acclimatization is an immediate consideration that should result in direct action by the employer if, due to a sudden heat wave, employees are working at temperatures to which they haven't been exposed for several weeks or longer. New employees are among those most at risk of suffering the consequences of inadequate acclimatization, heat wave or not. An employer with new employees should be extra-vigilant, try to find ways to lessen the intensity of the employees' work during a two-week break-in period, and recognize immediately symptoms of possible heat illness.

Training for employees and supervisors must include the importance of acclimatization, how it is developed, and how the employer's procedures address it. As is true with all training, employers must ensure that their work procedures are consistent with the information provided in training.

12. How is training evaluated for compliance with the standard?

The basic test of training is its effectiveness. The standard lists several items of training information content, and DOSH evaluates compliance with the training requirements by looking at the content as well as the manner in which it has been presented.

An employer should tailor training material obtained from a reputable source so that it applies to the employer's particular work situation and employees. An employer using a "one-size-fits-all" product needs to understand the information provided and to add and subtract whatever is necessary to make it relevant to the employer's individual work situation.

Cal/OSHA has often heard from employers that training must be frequently reinforced to be effective. Some employers use a daily "tailgate meeting" approach, where a brief safety reminder about issues considered particularly relevant to the work to be performed that day is given every day before starting work. In addition, to be effective, employee training must be in a language employees can understand. The Injury and Illness Prevention Program standard requires that an employer have a system for communicating with employees in a form they can readily understand on matters of occupational safety and health, including provisions designed to encourage employees to inform the employer of hazards at the worksite without fear of reprisal.

As part of their evaluation of compliance, Cal/OSHA personnel ask a representative number of supervisory and non-supervisory employees questions about required training elements. They are asked questions to determine whether they received training and whether they can exhibit sufficient understanding of the training content to indicate that the information was conveyed using training methods generally recognized as effective.

The intent of such questions is not to test for answers that are always correct; rather, it is to look for the indicators of effective training that come with a good-faith and sincere effort to get across essential and complete information. In summary, the test of compliance with the training requirements of this standard is whether the training has occurred, whether the required content has been provided, and whether the training has been effective overall in communicating the essentials to employees.

The importance of supervisory training cannot be overstated. **The 2006 Cal/OSHA Heat Illness Case Study showed that 63% of the supervisors of employees who died from heat stroke**

had not been trained in the prevention of heat illnesses, the opposite from the training-rate statistic for non-fatal illnesses.

13. What procedures must an employer have for responding to symptoms of possible heat illness, including how emergency medical services will be provided should they become necessary?

In developing procedures for responding to symptoms of possible heat illness, the employer must first take into account whether a qualified, appropriately trained and equipped person is available to render first aid. If there is no such person, the employer should consider designating an employee to be a first-aid provider and have that employee receive first-aid training and any necessary equipment.

An appropriately trained and equipped first-aid provider who is available at the site can determine the appropriate response when an employee is experiencing possible symptoms of heat illness. This response may range from drinking water and resting in the shade to summoning emergency medical attention.

If no first-aid trained person is available, any situation in which an employee is showing symptoms of possible heat illness should result in calling for emergency medical services. The employer's procedures should also include the taking of immediate steps to keep a stricken employee cool and comfortable once emergency service responders have been called. The goal is to reduce the progression to more serious illness (which can be rapid and include symptoms such as loss of consciousness, seizures and mental confusion).

All employees and supervisors must be trained on every detail of the employer's emergency response procedures.

14. What procedures should an employer have for contacting emergency medical services, and if necessary, for transporting employees to the point where they can be reached by an emergency medical services provider?

The importance of rapidly and effectively obtaining emergency medical services in the event of a serious injury or illness cannot be overstated. Particularly at non-fixed worksites or where there is difficult access, the employer, having evaluated whether the worksite is served by the 911 system, needs to be ready to contact and communicate with emergency responders.

Training must include the information necessary for effective emergency preparedness. This includes the procedures to be used in responding to an employee showing indications of heat illness, contacting emergency medical services, and providing directions to the worksite. Where the employees themselves are not capable of communicating directly with emergency services and giving directions to their location, the employer must ensure that a designated person who can communicate is identified to employees and is immediately available to contact emergency services.

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