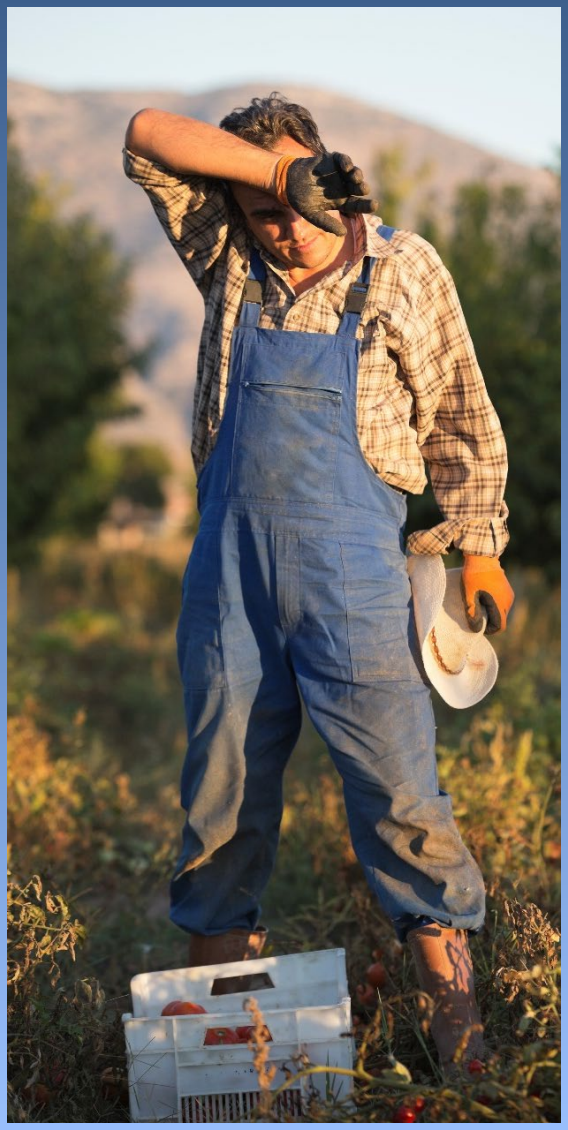
MASSACHUSETTS DEPARTMENT OF
LABOR STANDARDS

Heat Illness Prevention and Management for Outdoor Workers



Introduction

The Massachusetts Department of Labor Standards (DLS) recommends that employers of outdoor workers adopt a heat illness prevention program that includes:

- Specific measures required to reduce the risk of heat illness;
- training for workers and supervisors in the implementation of those measures;
- identification and management of heat illness including heat exhaustion and heat stroke.

Outdoor workers employed by local and state entities include landscape, construction, and maintenance workers, refuse collectors, police officers, parks and recreation employees and others.

This document provides recommendations for the elements to be included in a heat illness prevention and management program and background information and resources that may be helpful in understanding and implementing those elements. OSHA also offers a *Comprehensive Guide* for employers on developing a heat illness prevention program. The *Comprehensive Guide* can be found at (https://nrcawebstorage.blob.core.windows.net/files/filesnrca/pdf/Safety/Heat%20Illness/OSHA-protective-measures.pdf)

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Summary of Recommendations
Preventing Heat Illness

Recommendations for Water, Shade, Rest, and Acclimatization for Outdoor Workers	
Whenever the *heat index* is forecast to reach 80° F or above during the workday ● **Review the following measures and** ● **Implement those that are appropriate**	
Water	
1. Review the availability of water and shade for all workers and make plans to meet water needs if necessary.	● Workers should have easy access to enough water to be able to consume about one quart of water per hour. ● *Recommended water consumption* is based on heat risk level and work intensity.
Shade	
2. Workers should have access to shade for rest and meal breaks.	● Shade may be provided by trees or by man-made structures including shelters, buildings, or air-conditioned vehicles. ● Locate work tasks in shade when feasible.
Rest	
3. Use the *heat index* and *work intensity tables* to make decisions about: ● Modifying the Work Schedule ● Duration of Rest Periods	● When the *heat risk* is **extremely high**, all but emergency work should be rescheduled. ● When the heat risk is **high**, consider rescheduling moderate and heavy work to cooler times of the day or another day.
4. Get an estimate of the Heat Index for the expected hottest time during the workday. ● Add 15°F to the heat index for any workers who will be working mostly in the sun.	To estimate the maximum heat index for the workday: ● Check any online weather application to find the time highest temperature forecast during the workday. ● Using the heat index calculator in the *OSHA-NIOSH Heat Safety Tool* smartphone app, enter that temperature. ● The app provides the current humidity, which can also be entered into the calculator. ● The calcultaor provides an estimate of the maximum heat index for the day.
5. For each type of work to be done that day, estimate the work intensity.	● Work is classified as light, moderate, and heavy ● *Table 2* provides examples of the 3 types of work.
6. Decide on break times and durations to recommend to supervisors and workers. 7. Confirm that all workers are aware they should take a rest in the shade when they feel they need it and at least for as long as recommended for that day based on the heat index.	● Use *Table 3* to estimate the number of minutes of rest in the shade for each type of work and to identify work that may be too dangerous to perform that day. ● Consider adding extra time for workers wearing heavy protective clothing. ● Workers with personal risk factors for heat illness (e.g. obesity, heart disease, diabetes) may need additional rest.
Acclimatization	
8. Identify workers that have less time on the job and who may not be acclimatized to the heat and physical exertion. Adjust their schedules as needed	● New workers require acclimatization. Most deaths from heat illness occur among new workers who are not acclimatized to working in high heat. ● Current workers should be considered for acclimatization if they have not been consistently working in moderate or higher heat in the last two weeks. ● See specific guidance here on acclimatization.

Identifying and Managing Heat Illness

Heat Exhaustion

Signs and Symptoms of Heat Exhaustion

If a worker experiences any ONE of these:

- Weakness, severe fatigue
- Feeling lightheaded or dizzy
- Nausea and/or vomiting
- Fainting (with quick recovery)
- Unusually heavy sweating

Other possible symptoms:

- Thirst
- Muscle cramps,
- Headache,
- Cold/clammy skin,
- Elevated temperature

Managing Heat Exhaustion

Take these immediate actions:

1. Move the worker to a cool place As soon as possible
2. Remove unnecessary clothing
3. Cool off with wet towels, water mist, fan, or ice packs
4. Give water to drink
5. Elevate legs if they are feeling faint or have fainted
6. Monitor for symptoms of heat stroke

Other measures

- If resources for managing heat exhaustion are not available immediately on site, call 911.
- Get medical evaluation if not improved in 30 minutes
- Do not allow worker to return to work the same day

Some authorities recommend

- Calling 911 in all cases
- Requiring a medical evaluation even if recovery appears complete.

Heat Stroke

Signs and Symptoms

If a worker has any ONE of these signs:

- Loss of consciousness
- Disorientation
- Confusion/Not making sense
- Slurred or garbled speech
- Hallucinations
- Seizure

The worker may also have characteristics of heat exhaustion but with dry or red skin and will have an elevated temperature

Management

Take these immediate actions:

1. **CALL 911**
2. Move them to a cool place ASAP
3. Remove unnecessary clothing
4. Douse with cool water or hose down
5. Place in ice or cold water bath if possible
6. For seizure, turn worker on their side to avoid aspiration.

Definitions

Heat illness There are two common forms of severe heat illness that affect outdoor workers:

- **Heat stroke**: ***A medical emergency*** with a high risk of death that occurs when the body heat reaches levels high enough to affect the brain and cause confusion, garbled speech, loss of consciousness and other symptoms.
- **Heat Exhaustion**: A common reaction to heat stress that can range from mild to severe caused by the impact of heat and possibly dehydration on the cardiovascular and other body systems. Workers experience fatigue, weakness, dizziness, heavy sweating and other symptoms.
- **Other less common forms of heat illness** include heat syncope (passing out due to dehydration resulting in low blood pressure, but with quick recovery), heat muscle cramps, and heat rash. Uncommon but serious effects of heat stress include kidney failure and muscle breakdown (rhabdomyolysis). (More details at cdc.gov/niosh/topics/heatstress/heatrelillness.html.

Heat Index: The Heat Index is a measure of heat stress that combines the air temperature in the shade with the relative humidity. It estimates how the environment "feels" to the body when the effect of humidity is factored in. Humidity decreases the body's ability to cool because the rate of evaporation of sweat is reduced. When work is performed in full sunlight, add 15 degrees to the Heat Index.

The Heat Index can be determined for any location in real time by *The OSHA-NIOSH Heat Safety Tool* found at cdc.gov/niosh/topics/heatstress/heatapp.html. In estimating the Heat Index for a workday enter the highest temperature predicted for the workday and the current humidity.

Example: The Heat Index is 113° F when the air temperature is 90° F and the relative humidity is 80%. If in full sunlight the heat index would be 128° F.

Heat Risk is determined by the Heat Index adjusted for sun exposure and classified as low, moderate, high, or very high/extreme.

Work intensity can be classified as light, moderate, or heavy.

Heat Risk Levels: *Table 1* shows how heat risk levels relate to the heat index.

Table 1
Heat Risk Levels

Heat Index	Risk Level
Less than 91°F	Lower (Caution)
91°F to 103°F	Moderate
103°F to 115°F	High
Greater than 115°F	Very High to Extreme

From *OSHA employer guide* found at https://nrcawebstorage.blob.core.windows.net/files/filesnrca/pdf/Safety/Heat%20Illness/OSHA-protective-measures.pdf

Work Intensity: It is important to adjust rest time for work intensity**,** which is classified as light, moderate and heavy. *Table 2* shows examples of each level of work intensity

Table 2
Levels of Work Intensity

Light	Moderate	Heavy
• Operating equipment • Walking on flat ground • Using light hand tools • Traveling in vehicle	• Carrying equipment/supplies weighing 20-40 lbs. • Using heavy hand tools, such as shovels, for short periods	• Climbing • Carrying equipment/supplies weighing 40 lbs.or more • Using heavy hand tools, such as shovels.

Adapted from *NIOSH work/rest schedule* found at cdc.gov/niosh/mining/UserFiles/works/pdfs/2017-127.pdf found at

Basic Principles for Preventing Heat Illness

To prevent the most serious forms of occupational heat illness, workers exposed to high heat must keep the body's core temperature in a safe range through sweating, cooling, and requiring maintenance of adequate fluid intake.

These seven basic measures support the body's cooling process:

1. **Limiting the periods of exposure to high heat** by providing rest breaks at intervals corresponding to the level of heat risk, or rescheduling work for times of day or days when the air temperature is lower.
2. **Providing shade** or other means of cooling at frequent intervals.
3. **Ensuring that workers drink water** frequently to replace water loss from sweat. Consider drinks with electrolytes when workers conduct moderate to heavy work in high heat environments for two hours or more.
4. **Matching the intensity of physical exertion and the use of protective clothing to the amount of rest time per hour:**. Physical exertion produces internal body heat that is added to environmental heat. Heavy work requires more rest time per hour than light work. Use of heavy protective clothing requires more rest time as well.
5. **Ensuring that worker clothing promotes the evaporation of sweat and shields the head and body from the heat from sun:** Hat, light weight and light colored, loose clothing when possible.
6. **Acclimatizing by allowing workers to gradually get used to working in the heat** by starting with a short period and then slowly increasing the length of work periods. Acclimatization can reduce the risk of heat illness by improving workers' ability to expel heat. The highest risk for heat stroke is among newly hired workers who are suddenly exposed to high heat for a long duration.
7. **Informing workers** how age, health, weight, alcohol use and medications may affect their tolerance to heat.

These measures become increasingly important as the heat risk and the work intensity increase.

Six of these basic measures are implemented through four methods:

- **Water**
- **Rest/Avoidance**
- **Shade**
- **Acclimatization**

Heat Illness Prevention: Background and Supportive Information

Recommended Water Consumption

- Provide access to enough drinking water to allow workers to drink up to one quart per hour.
- Workers exposed to moderate or high heat should drink about ½-1 cup (8 oz.) of water about every 15 minutes, usually not more than 6 cups per hour. Workers performing moderate to heavy work in high heat for more than 2 hours should be advised to have snacks and meals containing salt.
- The amount of water should increase as the heat stress risk level increases
- When the heat risk is moderate or higher, workers performing moderate or heavy intensity work should be reminded to drink water every 15 minutes. Workers performing light work should receive the same remainder when the heat risk is high.
- Drinking smaller amounts of water frequently is more effective than drinking a large amount every hour. (More information is at cdc.gov/niosh/mining/UserFiles/works/pdfs/2017-126.pdf

Rest/Avoidance

Avoidance: When the heat stress level is high, consider rescheduling high-risk work (e.g., heavy work in the sun) to another day or to the coolest parts of the day.

Rest: Recommended rest time per hour in the shade is matched to the intensity of the work as shown in *Table 1*. For the lowest heat stress level only usual breaks need to be provided. As the heat stress level and the intensity of work increases, the amount of rest time per hour increases. For each level of work intensity, there is a heat index level above which workers should not work outdoors except for emergencies. The total rest time per hour may be divided into 2 or more breaks.

Table 3
Suggested Minutes of Rest per Hour of Work

Work Intensity	Heat Risk (Heat Index)			
	Low (<91)	Moderate (91-103)	High (103-115)	Very to Extremely High (>115)
Light	Usual	Usual	15 min.	20-45 min.* >122 - Caution**
Moderate	Usual	15-20 min.*	20-40 min.*	45 min. >116 - Caution**
Heavy	Usual	15-30 min.*	35-45 min.* >112 - Caution	Caution**

***Increase time with increasing heat index. See detailed *tables* for specific suggestions.**

** Caution: Avoid work if possible. Maximum work time 15 minutes per hour. Monitor workers closely. Adapted NIOSH Heat Stress Work/Rest Schedule

Shade

Shade can be under trees and other natural structures, or it can be provided by man-made structures such as outdoor shelters, cool spaces in buildings or inside an air-conditioned vehicle.

Acclimatization

Acclimatization should be considered for any worker, new or current, whose work is to involve exposure to a moderate or higher heat level for a significant period of the day. Current workers need time for acclimatization if they have not been consistently exposed to moderate or higher heat in the **last two weeks** due to absence or to being assigned work in a cooler environment.

In high heat settings, NIOSH recommends that new workers be assigned to 20% of the scheduled work duration on day 1 (e.g. 1.6 hours in an 8-hour day) and increase by an additional 20 percentage points daily until reaching 100% on day 5 (i.e., 20, 40,.60,80, 100%).

NIOSH states that all workers previously experienced with a job but absent from the job for 2 weeks or more can acclimatize more quickly in 4 days on this schedule: 50%, 69%, 80%, 100%.

When acclimatization according to the NIOSH schedule is not possible, effort should be made to require more frequent and longer rest periods than usually recommended and to monitor the worker for symptoms and signs of heat illness. (More information can be found at cdc.gov/niosh/mining/UserFiles/works/pdfs/2017-124.pdf)

Heat Illness: Background and Supportive Information

Heat stress may play a role in worker accidents and injuries due to its effect on concentration and other cognitive functions.

Heat exhaustion may occur during prolonged exposure to outdoor temperatures of 80 deg F or higher when the body cannot effectively maintain a normal internal temperature through sweating or other artificial means of cooling. High humidity increases the risk.

Superficial blood vessels dilate as the body attempts to release internal heat, making it difficult to maintain a normal blood pressure. Loss of fluid through sweating without adequate replacement can make it even harder to keep blood pressure up, possibly leading to fainting. If heat exhaustion is the cause of fainting, consciousness should return almost immediately after the worker lies flat.

The affected worker typically will report feeling weak, exhausted, and lightheaded and will be sweating heavily. **Without prompt management heat exhaustion may cause organ damage and/or progress to life-threatening heat stroke.** *Table 5* shows the symptoms and signs of heat exhaustion and how to manage it when it occurs.

Heat stroke occurs when control of internal body temperature is lost, and the temperature reaches a level that affects the brain and then keeps on climbing. **Confusion** is the main feature, and its occurrence should prompt immediate action including calling 911.

Heat stroke can be fatal, so every minute counts. Other symptoms commonly observed in heat stroke are shown in *Table 6* along with the required.

Training*

NIOSH recommends the following elements be included in a worker training program: found at cdc.gov/niosh/topics/heatstress/recommendations

"Train workers before hot outdoor work begins. Tailor the training to worksite conditions. Employers should provide a heat stress training program for all workers and supervisors about the following:

- Recognition of the signs and symptoms of heat-related illnesses and administration of first aid.
- The importance of drinking enough water and monitoring the color and amount of urine output.
- Proper care and use of heat-protective clothing and equipment and the added heat load caused by exertion, clothing, and personal protective equipment.
- Effects of personal factors (age, fitness, weight, medications, alcohol, etc.) on tolerance to occupational heat stress.
- The importance of acclimatization.
- The importance of immediately reporting any symptoms or signs of heat-related illness in themselves or in coworkers to the supervisor.
- Procedures for responding to symptoms of possible heat-related illness and for contacting emergency medical services.

Supervisors should also be trained on the following:

- Implementing acclimatization procedures so that new workers, and current workers who have not worked in high heat for the past two weeks, get adjusted to working in heat.
- Providing clean drinking water
- Providing rest schedules
- Providing shade for rest areas.
- What procedures to follow when a worker has symptoms of heat-related illness, including emergency response procedures.
- Monitoring weather reports.
- Responding to hot weather advisories.
- Monitoring and encouraging adequate fluid intake and rest breaks."

Appendix: Tables and Resources

Table A
Recommended Minutes of Rest per Hour According to Heat Index

Light Work							
Heat Index (^{oF})	88-112	113-114	115-116	116-118	119-120	121-122	>122
Rest Period Minutes/Hour	Usual	15	20	25	30	45	Caution

Moderate Work									
Heat Index (F^o)	88-101	102	103-104	105-106	107-110	111-112	113-114	115-116	>116
Rest Period Minutes/Hour	Usual	15	20	25	30	35	40	45	Caution

Heavy Work									
Heat Index (F^o)	88-93	94-96	97	98-99	100-102	103-106	107-110	111-112	>112
Rest Period Minutes/Hour	Usual	15	20	25	30	35	40	45	Caution

cdc.gov/niosh/topics/heatstress/heatapp.html

NIOSH guide nalc.org/workplace-issues/body/OSHA-Using-the-Heat-Index-A-Guide-for-Employers.pdf