



**GUIDELINE  
FOUNDATION**

# Principles of Good Practice

## Section 6: Heat Stress

For the Industrial Hygienist/Occupational Hygienist (IH/OH)

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## Principles of Good Practice Documents

The PGP are organized by OEHS areas of practice in a concise, easy-to-use table format. They are published as they are developed for each area of practice and are designed to be kept “evergreen” via regular updates. Refer to Section 1 for PGP use and limitations.

Currently, PGP have been documented for the following areas of practice:

OEHS Area of Practice/ PGP Authors and Contributors	Date	
	Initial Publication	Most Recent Update
<b>AIHA Thermal Stress Working Group</b> <b>Heat Stress PGP Version 1</b> <b>PGP AG Members:</b> John Mulhausen, Alan Leibowitz, Joe Damiano, Michele Twilley  <b>Heat Stress PGP Subteam:</b> Edward Primeau, Don Elswick, Maggie Morrissey, Celia Kaufman, Rotem Koler, Gabrielle Brewer, Denis Logie, Kyle Lowman, Kristin Yeoman	12/17/2025	12/17/2025

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## AIHA PRINCIPLES OF GOOD PRACTICE for HEAT STRESS

v1.0 - 12/17/2025

PGP Elements	Risk-Critical Practices	Good Practice	Enhanced Practice	References
<b>Scope and Objectives)</b>	<p>The AIHA Principles of Good Practice for Heat Stress Management is directed at preventing work-related illness and injury from exposure to excessive heat in occupational environments. This is achieved through comprehensively assessing and managing workers exposures to environments with high temperature extremes.</p> <p>The PGP illustrates professional practices in heat stress program management that have been determined to reliably and effectively protect workers from unacceptable risks of heat related illness and injury resulting from exposure to hot environments. The PGP establishes program and performance targets that can be used in continuous improvement activities by IH/OH practitioners and the profession as a whole.</p>			

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PGP Elements	Risk-Critical Practices	Good Practice	Enhanced Practice	References
Occupational Exposure Limit (OEL)	<p>Practitioners should be aware of new and modified laws and regulations associated with Heat Stress Management. Practitioners should understand the use and limitations of heat stress laws and regulations for the jurisdiction where work is taking place.</p> <p>States with existing heat stress standards are based on either the temperature or heat index: <b>California</b> uses a temperature of 80°F for outdoor work (95°F as high heat) and 82°F for indoor work (87°F requires engineering controls). <b>Colorado</b> uses 80°F for agricultural sector with 95°F as high heat increased risk condition. <b>Minnesota</b> uses an indoor temperature tied to work intensity ( 86°F - light work, 80°F - moderate, 77°F - heavy). <b>Washington</b> uses a trigger of 80°F for outdoor work and additional controls at 90° and 100°F. <b>Maryland</b> and <b>Oregon</b> uses a heat index of 80°F for basic protection, indoors and outdoors.</p>	X		<p>What Works Institute. 2025. Summary of Occupational Heat Stress Standards in U.S.</p>
	<p>Use the following criteria for establishing action levels and exposure limits:</p> <p>Heat index of 80°F or a wet bulb globe temperature equal to the NIOSH Recommended Action Limit.</p> <p>Heat index of 90°F or a wet bulb globe temperature equal to the NIOSH Recommended Exposure Limit</p>	X		<p>NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106.</p>
	<p>Adjust action levels and exposure limits in accordance with ACGIH Table 3. Screening Criteria using WBGTeff for Acclimatized and Unacclimatized Workers</p>		X	<p>American Conference of Governmental Industrial Hygienist. "TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," 2024</p>

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Exposure Assessment	<b>Qualitative Assessment</b>			
	Establish and follow procedures to conduct routine qualitative exposure assessment for thermal stress management using the ambient temperature and heat index.	X		Proposed Standard, 29 Code of Federal Regulations 1910.148: "Heat Injury and Illness Prevention."
	<b>Quantitative Assessment</b>			
	Utilize the AIHA Heat Stress App to calculate current and forecasted WBGT index (and heat index) and Heat Stress Risk Level. User inputs include but are not limited to: location (may add multiple locations); workload intensity; clothing; cloud cover.	X		<a href="https://www.aiha.org/public-resources/healthierworkplaces/healthier-community-resources/thermal-heat-stress-resources-oehs-professionals">https://www.aiha.org/public-resources/healthierworkplaces/healthier-community-resources/thermal-heat-stress-resources-oehs-professionals</a>
	Perform quantitative assessment against the OEL based on temperature and metabolic rates for workers in a SEG. (The discussion of OELs is in the previous section)		X	(1) American Conference of Governmental Industrial Hygienist. "TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," 2024. (2) NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106. (3) What Works Institute. 2025. Summary of Occupational Heat Stress Standards in U.S.
Utilize the wet bulb globe temperature (WBGT) meter, which measures the dry-bulb, wet-bulb, globe temperatures, relative humidity and integrates these values into the WBGT Index and compare results to the selected OEL.			X	(1) American Conference of Governmental Industrial Hygienist. "TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," 2024. 2) ACGIH. 2025. A Guide for the Control of Heat Stress and Strain. (3) OSHA Technical manual, Section III, Chapter IV, Heat Hazard Assessment.

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Medical Surveillance	<p>Post-incident Investigation: Medical assessment conducted as part of post-incident investigations of occupational heat-related illnesses should include an evaluation of personal risk factors to inform decisions about return-to-work for affected workers and to advise employers about mitigation strategies. Clinicians should ensure that workers are asymptomatic and have normal biomarker (e.g. blood tests for kidney and liver function) before authorizing an affected employee's return to work. Serum biomarkers such as creatinine, BUN, CK, aspartate aminotransferase, alanine aminotransferase, and lactate dehydrogenase may be elevated acutely in episodes of heat stroke.</p>	X		<p><a href="#">Tustin A, Sayeed Y, Berenji M, Fagan K, McCarthy RB, Green-McKenzie J, McNicholas J, Onigbogi CB, Perkison WB, Butler JW; ACOEM Work Group on Occupational Heat-Related Illness. Prevention of Occupational Heat-Related Illnesses. J Occup Environ Med. 2021 Oct 1;63(10):e737-e744. doi: 10.1097/JOM.0000000000002351. PMID: 34597285.</a></p>
	<p>Preplacement and Periodic Medical Examination: Workers who will be exposed to heat stress should receive pre-placement and periodic medical examinations. These examinations should include past medical history and occupational history, assessment of personal risk factors, physical examinations, and measurement of serum creatinine and glomerular filtration rate. Clinicians should recommend temporary or permanent work restrictions when indicated. Personal risk factors include: acute infection or illness such as Hypertension, Obesity, Respiratory Disease, Hyperthyroidism, Skin Disease, Kidney Disease, Diabetes mellitus, Neurological disease, Hypohydrosis, Parkinson disease. The following medications may increase risk of heat-related illnesses: Amphetamines, ACE inhibitors ARB, Anticholinergics, Anticonvulsants, Antihistamines, Antipsychotics, Benzodiazepines, Beta-blockers, Diuretics, and Tricyclic antidepressants.</p>		X	
	<p>Medical surveillance should consider genetic factors to consider worker susceptibility to thermal stress (impaired heat tolerance and susceptibility to heat illness): 51 nonpolymorphic, potentially pathogenic variants in 20 genes, including RYR1, CACNA1S, CACNA2D1, and PYGM.</p>		X	<p>AIHA. (2023). Technical Framework: Susceptible Worker Protection.</p>

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Education/ Training	Training shall include information about acclimatizing, proper hydrating/fluid intake, recognizing and reporting heat-related illness symptoms, giving appropriate first aid, proper care and use of heat-protective clothing, added heat load caused by exertion/clothing/personal protective equipment, other factors that affect heat tolerance (e.g., medications, alcohol, obesity, relevant health conditions such as sickle cell trait status, etc.), and how to ensure weather data (i.e., WBGT) is part of the process for making work/rest cycle decisions.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	Supervisor training shall include how to recognize heat-related illness signs and symptoms. Implementing appropriate acclimatization. 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.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	Employee Training shall include how to recognize the signs and symptoms of heat-related illnesses and administration of first aid. Causes of heat-related illnesses and steps to reduce the risk. These include 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 other factors (drugs, alcohol, obesity, 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.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	Conduct refresher training at least annually.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.

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Education/ Training	Conduct supplemental training whenever a workplace heat-involved OSHA recordable incident occurs (Lesson-to-be-learned), when there are program changes that need to be addressed, and when other heat related issues, topics, and specialized equipment need to be communicated to employees.		X	<a href="https://www.safetytalkideas.com/safetytalks/learning-from-past-incidents/">https://www.safetytalkideas.com/safetytalks/learning-from-past-incidents/</a>
	Emergency Response Team training shall include instruction on how to prevent heat-related illnesses, recognize symptoms, and respond to emergencies in hot environments. Key components include understanding factors like humidity, workload, and PPE, implementing self-monitoring and hydration, acclimating to heat gradually, and knowing first-aid measures and when to contact emergency services. Training is crucial for safety in hazardous waste, emergency response, and firefighting operations.		X	<a href="https://www.fws.gov/carp/training/category/safety-and-emergency-response">https://www.fws.gov/carp/training/category/safety-and-emergency-response</a>
Physiological Monitoring	Physiological monitoring for evaluating heat strain experienced by individual workers can provide timely, continuous data to inform health and safety decisions based upon workers' physiological responses. This information is used by employees, or others monitoring the work, to enable them to rapidly make necessary adjustments to the heat stress conditions, thereby reducing the level of heat strain. The user has the ability to review and respond to their own data and can serve as an educational tool and facilitate behavioral changes such as a reduction in work exertion, increased consumption of fluids, increased rest, and/or adjustment of clothing.		X	(1) AIHA. 2024. White Paper: Wearable Physiological Monitoring to Assess Heat Strain in Response to Heat Exposure. (2) Sean R. Notley, Robert D. Meade, David P. Looney, Christopher L. Chapman, Adam W. Potter, Alison Fogarty, Tabassum Howlader, Luana C. Main, Karl E. Friedl, and Glen P. Kenny. 2025. Physiological monitoring for occupational heat stress management: recent advancements and remaining challenges. <i>Applied Physiology, Nutrition, and Metabolism</i> . 50: 1-14. <a href="https://doi.org/10.1139/apnm-2024-0395">https://doi.org/10.1139/apnm-2024-0395</a>
	Employers should not rely on wearables that monitor the body's biological response (e.g., body temperature, heart rate, etc.) to heat related stressors. Wearables have several limitations that may underestimate heat stress hazards. The current wearables available on the market are regarded as physiological monitoring devices which do not have the reliability and accuracy of medical monitoring devices. Furthermore, the Food and Drug Administration (FDA) has chosen not to regulate wearables used by individuals for fitness or general wellness purposes.		X	(1) FDA's General Wellness: Policy for Low Risk Devices Guidance for Industry and Food and Drug Administration Staff, Document issued on September 27, 2019. Doc. Link: <a href="https://www.fda.gov/media/90652/download">https://www.fda.gov/media/90652/download</a> (2) Morrissey, M. C., Casa, D. J., Brewer, G. J., Adams, W. M., Hosokawa, Y., Benjamin, C. L., et al. (2021). Heat safety in the workplace: Modified Delphi consensus to establish strategies and resources to protect the US workers. <i>GeoHealth</i> , 5, e2021GH000443.

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Controls	<b>Engineering Controls</b>			
	<b>Portable shades and Reflective shields.</b> At places where the work is performed under the sun with no shade availability, it is recommended to install temporary portable shading solutions. One indicator that blockage is sufficient is when objects do not cast a shadow in the area of blocked sunlight. The shade should be provided, at, or as close to the work area. Adequate shade should also be available at the resting area.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	<b>Irradiant Heat blocking barriers.</b> Can be implemented where an irradiant-heat generating device is located near the work area.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	<b>Misting machines.</b> Can be implemented in low relative humidity (RH) environments to cool-down the work area or the resting area.	X		<a href="https://www.osha.gov/heat-exposure/controls">https://www.osha.gov/heat-exposure/controls</a>
	<b>Cooling fans or portable air-conditioning units.</b> The use of a cooling fan or portable air-conditioning unit might significantly reduce the Heat Load that the worker experiences. Caution: while utilizing fans is a simpler solution, under some weather conditions especially when the ambient air is very hot (above 39°C (102°F)) and dry, increased air velocity on the worker might cause dehydration and increased Heat Load that jeopardizes the body ability to cool itself down.	X		<a href="https://www.osha.gov/heat-exposure/controls">https://www.osha.gov/heat-exposure/controls</a>
	<b>Administrative Controls</b>			
	<b>Heat Injury and Illness Prevention Program/Plan.</b> Employers shall draft a written heat stress management program. The program includes a comprehensive list of the types of work activities covered; all policies and procedures related to heat stress; an identification of the occupational exposure limit and assessment method (i.e., heat index or wet bulb globe temperature). The plan establishes management direction as policy to implement the program, milestones to demonstrate initial launch and continuing success in implementation, and evaluation of the metrics on some frequency.	X		<a href="https://www.osha.gov/heat-exposure/planning">https://www.osha.gov/heat-exposure/planning</a>

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Controls	<b>Ensure that workers maintain constant communication and work in the buddy system.</b> Trained employees shall work in such a way that communication is continual and emergency response procedures are initiated in the event that a worker shows early symptoms of heat stress.	X		<a href="https://www.cdc.gov/disasters/extremeheat/pdf/Heat_Related_Illness.pdf">https://www.cdc.gov/disasters/extremeheat/pdf/Heat_Related_Illness.pdf</a>
	<b>Daily Heat Readiness Checklist.</b> Employers should complete a Daily Heat Readiness Checklist that will enable work supervisors to perform a quick check of the workforce heat stress preparedness prior starting the work (toolbox or otherwise). The checklist could be integrated into a Pre-Task Planning or Risk Assessment being used at the site.	X		OSHA Safe and Sound - heat Illness Prevention <a href="https://www.osha.gov/sites/default/files/Activity_FF_EmployerHeatChecklist.pdf">https://www.osha.gov/sites/default/files/Activity_FF_EmployerHeatChecklist.pdf</a>
	<b>Warning signage.</b> Employers should post signs in Excessively High Heat Areas for indoor areas of above 49°C (120°F).		X	NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	<b>Worker hydration.</b> Employers should ensure worker's receive adequate hydration. When the air humidity is high the sweat evaporation rate declines. Working with certain PPE items reduces even further the sweat ability to evaporate which jeopardize the sweat cooling effect while the body continues to lose precious quantities of water. Therefore, it is imperative to constantly consume large water quantities throughout the working day (8 ounces (230 ml) 3-4 times per hour – i.e. a cup of cool water every 15-20 minutes) and avoid alcoholic/caffeinated/sugary drinks. Usually, regular tap water and the typical food diet will have sufficient minerals to support the normal function of the body. In cases of prolonged work (above two hours) of heavy physical exertion in hot and/or humid conditions, it is recommended to add supplemental minerals to the water consumption regime (i.e. electrolytes drinks). Substantial loss of electrolytes can cause muscle cramps and additional dangerous health effects.	X		(1) Keeping Workers Well-Hydrated. <a href="https://www.osha.gov/sites/default/files/publications/OSHA4372.pdf">https://www.osha.gov/sites/default/files/publications/OSHA4372.pdf</a> (2) Morrissey, M. C., Casa, D. J., Brewer, G. J., Adams, W. M., Hosokawa, Y., Benjamin, C. L., et al. (2021). Heat safety in the workplace: Modified Delphi consensus to establish strategies and resources to protect the US workers. <i>GeoHealth</i> , 5, e2021GH000443.

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Controls	<b>Work hour considerations.</b> Scheduling the work to cooler times during the day (early mornings or late afternoons) can eliminate the Heat Stress conditions and the need for implementing engineering controls to reduce the air temperature and Relative Humidity.	X		NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
	<b>Acclimatization.</b> The employer shall establish an acclimatization schedule based on a progressively longer and/or higher heat conditions so employees may gain heat tolerance. An effective acclimatization program will reduce the impact heat stress will have on the core body temperature of the worker. NIOSH recommends gradually acclimating the worker to his or her new environment by increasing the time of exposure each day over a 7 to 14 day period. The time to acclimatize varies by worker based on individual risk factors.	X		(1) NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106. (2) Morrissey, M. C., Casa, D. J., Brewer, G. J., Adams, W. M., Hosokawa, Y., Benjamin, C. L., et al. (2021). Heat safety in the workplace: Modified Delphi consensus to establish strategies and resources to protect the US workers. <i>GeoHealth</i> , 5, e2021GH000443.
	<b>Personal Protective Equipment (PPE)</b>			
	<b>Cooling vests.</b> In cases where implementation of Engineering and Administrative controls does not reduce the Heat Stress significantly enough, or when heat retaining personal protective equipment (PPE) cannot be removed, an implementation of Cooling PPE might be needed. This includes cooling vests of different kinds. Some have ice blocks pockets, some have built-in fans, others have cool water circling system, etc. Such devices should be thoroughly vetted in application with the wearers to confirm alternate hazards are not introduced (weight for ergo risk, water in electrical conditions risk, etc.).	X		(1) NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106. (2) Morrissey, M. C., Casa, D. J., Brewer, G. J., Adams, W. M., Hosokawa, Y., Benjamin, C. L., et al. (2021). Heat safety in the workplace: Modified Delphi consensus to establish strategies and resources to protect the US workers. <i>GeoHealth</i> , 5, e2021GH000443.

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Controls	<b>Respiratory Protection Loose-fitting Hoods PAPR (Powered air-purifying respirator).</b> In cases where Respiratory Protection Equipment (RPE) is required while working under excessive heat, it is advisable to implement a positive air system Respiratory Protection Loose-fitting Hoods PAPR to reduce the heat load that the worker will experience. It provides a constant air supply to the worker's face which allows improved evaporation of sweat and therefore reduces the body's heat. The system can be used with Breathing Air (BA) supply, or as Air Purifying Respiratory (APR) with filtering cartridges.	X		NIOSH Science Blog: Heat Stress Imposed by PPE Worn in Hot and Humid Environments. Posted on 6 August 6, 2020 by W. Jon Williams, PhD and Jaclyn Krahn Cichowicz, MA.
	<b>Additional safeguards.</b> In cases where head protection PPE is not needed, a sun hat should be used to block solar radiation. Additionally wearing long sleeved cloths aiming for maximum skin coverage and using sunscreen for exposed skin area will protect the skin from irradiant heat and cancer risk due to the sun's Ultra-Violet (UV) radiation exposure.	X		NIOSH Fast Facts: Protecting Yourself from Sun Exposure, DHHS (NIOSH) Publication Number 2010-116.
Performance Measures/Evaluation	Employers should track health and safety outcomes including heat related illness, first aid cases and near-misses to ensure program effectiveness.  <b>Number of heat-related incidents:</b> Track the number of heatstroke, heat exhaustion, and other related illnesses. A reduction over time indicates program effectiveness.  <b>First-aid cases:</b> Monitor the number of employees needing first aid for heat-related symptoms like dizziness or cramps. Absenteeism: Track work absences due to heat-related illness. A high rate suggests a need for program adjustments.  <b>Near-misses:</b> Record and investigate situations that could have resulted in a heat-related incident. Addressing these can prevent future occurrences.	X		(1) Recommended Practices for Safety and Health Programs, OSHA 3885 October 2016. (2) NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.

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Performance Measures/Evaluation	<p>Employers should track physiological monitoring data in real time and intervene as needed to protect worker health.</p> <p><b>Wearable technology:</b> Devices like heart rate and core body temperature monitors can provide real-time data on a worker's strain in hot conditions. This allows for early intervention.</p> <p><b>Heart rate recovery:</b> Use standardized tests, such as monitoring pulse rates before and after rest breaks, to assess a worker's physiological response to heat. Unfavorable recovery patterns indicate excessive stress.</p> <p><b>Hydration status:</b> Measure hydration levels through techniques like pre- and post-shift body weight checks or urine color analysis.</p>		X	<p>(1) Physiological Monitoring as a Determinant of Heat Stress, Physiologic monitoring can help protect all workers from heat-related illness. By Bernard Fontaine, Sep 01, 2022, Occupational Health &amp; Safety. <a href="https://ohsonline.com/articles/2022/09/01/physiological-monitoring.aspx">https://ohsonline.com/articles/2022/09/01/physiological-monitoring.aspx</a></p> <p>(2) American Conference of Governmental Industrial Hygienist. "TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," 2024.</p>
	<p>Employers should conduct environmental monitoring in real time as needed to protect worker health.</p> <p><b>Wet Bulb Globe Temperature (WBGT):</b> Considered the gold standard for assessing heat stress risk, WBGT meters measure air temperature, humidity, air movement, and radiant heat. The data shall be evaluated to determine safe work/rest cycles and inform risk assessments.</p> <p><b>Heat index:</b> Use a heat index calculation (temperature and humidity) as a screening tool to identify general risk levels. Note that this measure does not account for radiant heat or wind, so it is less precise for professional applications than WBGT.</p> <p><b>Stationary sensors:</b> Use fixed sensors in large industrial settings to provide continuous environmental data for multiple work zones.</p>	X		<p>NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.</p>

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Performance Measures/ Evaluation	<p>Track Implementation metrics to ensure program effectiveness.</p> <p><b>Training completion rates:</b> Track the percentage of employees and supervisors who complete heat stress training. High rates indicate a successful training component.</p> <p><b>Control measure implementation:</b> Track the timely implementation of controls, such as providing cool-down areas, scheduling rest breaks, and adjusting work schedules. Policy compliance: Conduct regular audits to ensure workers and supervisors are following the established heat stress prevention policies.</p>	X		<p><a href="https://www.osha.gov/safety-management/program-evaluation">https://www.osha.gov/safety-management/program-evaluation</a></p>
	<p>Collect employee feedback to ensure program effectiveness.</p> <p><b>Surveys and interviews:</b> Use employee feedback to gauge satisfaction with prevention measures and identify areas for improvement. This can highlight issues that might be missed by objective data alone.</p> <p><b>Suggestion boxes:</b> Provide a channel for employees to anonymously offer ideas or report concerns related to heat stress.</p> <p><b>Lessons learned:</b> After a heat season or incident, conduct reviews with employees to gather insights on what worked well and what did not. This helps refine the program for the future.</p>		X	<p><a href="https://www.osha.gov/safeandsound">https://www.osha.gov/safeandsound</a></p>

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Recordkeeping	If the employer conducts on-site measurements at indoor work areas, they must have written or electronic records of those indoor work area measurements and retain those records for 6 months.		X	NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106.
	The recordkeeping regulation requires employers to record certain work-related injuries and illnesses.	X		29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses.

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## Glossary

**Acclimatization** means the body's adaptation to work in the heat as a person is exposed to heat gradually over time, which reduces the strain caused by heat stress and enables a person to work with less chance of heat illness or injury.

**Administrative Controls** mean the strategies or procedures that minimize the risk of heat exposure to workers. This type of control focuses on altering or managing tasks through a modification of employee work practices rather than changing environmental conditions to reduce heat or relying on personal protective equipment for cooling.

**Ambient temperature** means the temperature of the air surrounding a body. It is also called "air temperature" or "dry bulb temperature."

**Clothing Ensemble** means the garments being worn by a worker as part of their job. Variations of clothing ensembles such as the worker wearing breathable fabrics versus vapor impermeable fabrics can have a significant impact on the level of heat strain imposed on the worker.

**Cooling personal protective equipment (PPE)** means equipment worn to protect the user against heat injury or illness.

**Engineering Controls** mean the modifications or interventions in the work environment designed to reduce or eliminate workers' exposure to heat stress at the heat source. These controls would include work environment/equipment modification to reduce employee heat exposure rather than relying on workers to reduce their exposure through modified work practices.

**General Heat Stress Controls** mean controls which are implemented when the Recommended Action Level (RAL) is exceeded. Examples would include employee heat stress training, acclimatization, medical screening, hydration, and heat stress monitoring.

**Heat Cramps** mean a heat-related illness characterized by spastic contractions of the voluntary muscles (mainly arms, hands, legs, and feet), usually associated with restricted salt intake and profuse sweating without significant body dehydration.

**Heat Exhaustion** means a heat-related illness characterized by elevation of core body temperature above 38°C (100.4°F) and abnormal performance of one or more organ systems, without injury to the central nervous system. Heat exhaustion may signal impending heat stroke.

**Heat index** means the National Weather Service heat index, which combines ambient temperature and humidity. High heat trigger means a heat index of 90°F or a wet bulb globe temperature equal to the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit.

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**Heat Rash** means the development of red papules (bumps) which form due to skin being persistently moist from unevaporated sweat underneath restrictive clothing. As sweating increases, these papules give rise to a prickling sensation. Heat rash papules may become infected if they are not treated.

**Heat Strain** means the physiological response to the heat load (external or internal) experienced by a person, in which the body attempts to increase heat loss to the environment in order to maintain a stable body temperature.

**Heat Stress** means the net heat load to which a worker is exposed from the combined contributions of metabolic heat, environmental factors, and clothing worn which results in an increase in heat storage in the body.

**Heat Stroke** means an acute medical emergency caused by exposure to heat from an excessive rise in body temperature [above 41.1°C (106°F)] and failure of the temperature-regulating mechanism. Injury occurs to the central nervous system characterized by a sudden and sustained loss of consciousness preceded by vertigo, nausea, headache, cerebral dysfunction, bizarre behavior, and excessive body temperature.

**Heat Syncope** means the collapse and/or loss of consciousness during heat exposure without an increase in body temperature or cessation of sweating, similar to vasovagal fainting except that it is heat induced.

**Heat Tolerance** means the physiological ability to endure heat and regulate body temperature at an average or better rate than others, often affected by the individual's level of acclimatization and physical conditioning.

**Hydration** means the replenishment of fluids in the body. Proper hydration and replenishment of electrolytes are important for workers who may have experienced loss of both due to sweating while working in a hot environment.

**Hyperthermia** means a condition where the core temperature of an individual is higher than 37.2°C (99°F). Hyperthermia can be classified as mild (37.2–38.5°C; 99–101.3°F), moderate (i.e., heat exhaustion [38.5–39.5°C; 101.3–103.1°F]), profound (>39.5°C; 103.1°F), or profound clinical hyperthermia (i.e., heat stroke [>40.5°C; 104.9°F]), and death can occur without treatment (>45°C; 113°F).

**Indoor/indoors** means an area under a ceiling or overhead covering that restricts airflow and has along its entire perimeter walls, doors, windows, dividers, or other physical barriers that restrict airflow, whether open or closed.

**Initial heat trigger** means a heat index of 80°F or a wet bulb globe temperature equal to the NIOSH Recommended Alert Limit.

**Job-Specific Heat Stress Controls** mean controls which are implemented when the Recommended Exposure Limit (REL) is exceeded. This type of control can be a combination of engineering, administrative, and engineering controls. Examples could include adjustments to the clothing ensemble to better facilitate

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evaporative cooling, increasing the percentage of rest/cooling breaks per hour, adjusting the level of task physical exertion by process automation, rotating workers to reduce heat exposure time in hot environments, dehumidification of the work area, introducing spot cooling or increased air flow to the work area, installing heat shielding to reflect/block radiant heat, and reducing the area air temperature.

**Metabolic Heat** refers to the heat generated in the body due to energy expenditure associated with work activities. This internal heat must be dissipated by the body to maintain a stable core body temperature.

**Outdoor/outdoors** means an area that is not indoors.

**Physiological Monitoring** refers to a measurement of a vital sign in a worker (such as heart rate or core body temperature) as a surrogate to assess the level of heat strain being experienced by a worker under heat stress conditions.

**Radiant heat** means heat transferred by electromagnetic waves between surfaces. Sources of radiant heat include the sun, hot objects, hot liquids, hot surfaces, and fire.

**Recommended Alert Limit (RAL)** means the NIOSH-recommended heat stress alert limits for unacclimatized workers.

**Recommended Exposure Limit (REL)** means the NIOSH-recommended heat stress exposure limits for acclimatized workers.

**Relative Humidity (RH)** means the ratio of the water vapor present in the ambient air to the water vapor present in saturated air at the same temperature and pressure.

**Rhabdomyolysis** means a medical condition associated with heat stress and prolonged physical exertion, resulting in the rapid breakdown of muscle and the rupture and necrosis of the affected muscles.

**Shade** means the blockage of direct sunlight, such that objects do not cast a shadow in the area of blocked sunlight.

**Signs and symptoms of a heat emergency** means the physiological manifestations of a heat-related illness that requires emergency response and includes loss of consciousness (i.e., fainting, collapse) with excessive body temperature, which may or may not be accompanied by vertigo, nausea, headache, cerebral dysfunction, or bizarre behavior. This could also include staggering, vomiting, acting irrationally or disoriented, having convulsions, and (even after resting) having an elevated heart rate.

**Signs and symptoms of heat-related illness** means the physiological manifestations of a heat-related illness and includes headache, nausea, weakness, dizziness, elevated body temperature, muscle cramps, and muscle pain or spasms.

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**Temperature, Adjusted Dry Bulb ( $t_{adb}$ )** means the dry bulb temperature is the temperature of the air measured by a thermometer that is shielded from direct radiation and convection.

**Temperature, Ambient ( $t_a$ )** means the temperature of the air surrounding a body. Also called air temperature or dry bulb temperature.

**Temperature, Core Body ( $t_{cr}$ )** means temperature of the tissues and organs of the body. Also called Core Temperature.

**Temperature, Globe ( $t_g$ )** means the temperature inside a blackened, hollow, thin copper globe measured by a thermometer whose sensing element is in the center of the sphere.

**Temperature, Natural Wet Bulb ( $t_{nwb}$ )** means the wet bulb temperature under conditions of the prevailing air movement.

**Vapor-impermeable clothing** means full-body clothing that significantly inhibits or completely prevents sweat produced by the body from evaporating into the outside air. Examples include encapsulating suits, various forms of chemical resistant suits, and other forms of nonbreathable PPE.

**Vehicle** means a car, truck, van, or other motorized means of transporting people or goods.

**Wet bulb globe temperature (WBGT)** means a heat metric that takes into account ambient temperature, humidity, radiant heat from sunlight or artificial heat sources, and air movement.

**Wet bulb globe temperature – Effective ( $WBGT_{eff}$ )** means an adjustment of the calculated WBGT value with the WBGT - Effective also considering the impact of the clothing ensemble, in addition to environmental factors, being worn by the worker while performing a task.

**Work** means the physical efforts performed using energy from the metabolic rate of the body.

**Work area** means an area where one or more employees are working within a work site.

**Work/Rest Cycle** refers to the calculated duration of work which can be performed over a given time period (such as each hour) coupled with the duration of a cooling period that also occurs within that same time period based both on the WBGT and the metabolic rate associated with the environmental conditions and physical demands of the task being evaluated.

**Work site** means a physical location (e.g., fixed, mobile) where the employer's work or operations are performed.

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### Acronyms

C - Celsius

F - Fahrenheit

HI - Heat Index

NIOSH - National Institute for Occupational Safety and Health

OSHA - Occupational Safety and Health Administration

PPE - Personal Protective Equipment

RAL - Recommended Alert Limit

REL - Recommended Exposure Limit

RH - Relative Humidity

$t_a$  - Temperature, Ambient

$t_{adb}$  - Temperature, Adjusted Dry Bulb

$t_{cr}$  - Temperature, Core Body

$t_g$  - Temperature, Globe

$t_{nwb}$  - Temperature, Natural Wet Bulb

WBGT - Wet Bulb Globe Temperature

$WBGT_{Eff}$  - Wet Bulb Globe Temperature (Effective)

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