AMERICAN COLLEGE OF
OCCUPATIONAL AND
ENVIRONMENTAL MEDICINE

January 13, 2025

Submitted via: regulations.gov

The Honorable Douglas L. Parker
Assistant Secretary of Labor for Occupational Safety and Health
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

RE: Comments on Docket No. OSHA–2021–0009; RIN: 1218-AD39; Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings

Dear Assistant Secretary Parker:

On behalf of the American College of Occupational and Environmental Medicine (ACOEM), I am writing to express support for the U.S. Department of Labor (DOL) Occupational Safety and Health Administration's (OSHA) Notice of proposed rulemaking "Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings" [Docket No. OSHA-2021-0009]. In January 2022 and again in September of 2023, ACOEM commented on OSHA's Advance Notice of Proposed Rulemaking (ANPRM) - Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings (copies attached). Knowing the serious health effects of heat exposure from our day-to-day care of workers, ACOEM continues to strongly support this proposed rule to protect workers exposed to heat and urges OSHA to act quickly to promulgate the proposed standard.

Founded in 1916, ACOEM is the nation's largest medical society dedicated to promoting worker health through preventive medicine, clinical care, research, and education. The College represents Occupational and Environmental Medicine (OEM) physicians and other healthcare professionals devoted to preventing and managing occupational and environmental injuries, illnesses and exposures.

OSHA has done a thorough review of the many adverse health effects of heat exposure. Heat affects just about every organ system in the body, causing acute and chronic illnesses, injuries, and death. Occupational exposure to heat continues to increase, affecting more and more workers, and placing additional strain on our healthcare system (Tustin et al., 2021; Bouchama et al. 2022; IPPC 2023). Hawkins and Ibrahim (2023) found that, for every 1.8°F (1°C) increase in temperature, occupational injury rates increased by almost 10%. Not only is heat stress a hazard for workers and the general population *now*, but epigenetic effects suggest that the effects of today's heat exposure may be evident in future generations (Cramer et al., 2022).

We support many of the provisions of the proposed standard but believe that several of the provisions need to be strengthened to better protect workers. **Lack of acclimatization to heat stress is the most important cause of heat-related illness (HRI) and death in occupational settings, and we feel that this should be the foremost concern addressed in the standard**. We also believe that the standard is missing key provisions that can mitigate heat hazards and prevent work-related heat-related illnesses, injuries, and deaths. The following are our recommendations to add and/or strengthen provisions in OSHA's heat standard. Below the bulleted lists are our reasons and references supporting our recommendations.

Initial Screening and Observation:

- *Require observation for signs and symptoms at the initial heat trigger.*
- *OSHA should add a provision for medical screening before workers begin working in hot environments, such as a Heat Stress Questionnaire*

Ongoing Evaluation:

- *OSHA should specify when a worker is offered further medical evaluation.*

Acclimatization Protocols:

- *For new and returning workers, an acclimatization protocol should include BOTH the requirements of paragraph f (high heat trigger requirements) AND a gradual acclimatization schedule.*
- *For new and returning workers, OSHA should require a buddy system during the acclimatization period. Further, a buddy system should be required for workers working in high heat, high workload environments. Supervisors should also monitor workers for heat stress symptoms*

Heat Measurement and Triggers:

- *Use Wet Bulb Globe Temperature (WBGT) rather than Heat Index for the initial and high heat triggers. In areas of higher humidity and heat, use heat load mitigation methods to allow for productive work to occur.*

Control Measures:

- At and above the high heat trigger, work-rest cycles should be based on both temperature and workload.
- *Use the NIOSH hierarchy of controls to guide control measures. Allow for heat load mitigation methods to enable productive work.*
- *Restrict indoor fan use to ambient temperatures < 95°F.*
- *Require all employers to have a written Heat Injury and Illness Prevention Plan (HIIPP).*

Scope:

- *Under "Scope," include all indoor workers and specifically emphasize coverage for temporary workers, both indoors and outdoors.*

Require observation for signs and symptoms at the initial heat trigger.

Response to OSHA questions regarding Requirements at or Above the High Heat Trigger-Observations for Signs and Symptoms:

ACOEM believes that the requirements to observe workers for signs and symptoms of heat-related illness should be required at the **initial** heat trigger level rather than the high heat trigger. Many heat-related illnesses and injuries (HRII) and deaths have been reported at heat index levels below 90°F (Hesketh et al., 2020; Maung and Tustin, 2020; Tustin, 2018). Further, studies show that work injuries increase in a dose-response relationship as ambient temperatures increase above 75-80°F (Spector et al., 2016; Spector et al., 2019; Evoy et al., 2022; Hawkins and Ibrahim, 2023).

However, it is worth noting that a single exposure limit or trigger does not take into account workload, acclimatization state, clothing, and other personal protective equipment (PPE), and personal comorbidities that can affect the severity of the heat stress hazard. If heat exposures rarely reach 80°F and do so only briefly during a work period, it is reasonable to believe that heat stress does not represent a significant hazard. A single exposure limit or trigger has principal utility in deciding if there should be a heat stress management program. Graded trigger points have the utility of phasing in workplace controls and interventions depending on the degree of heat stress. We appreciate that OSHA has considered this by establishing initial and

high trigger levels. Still, we would refer the agency to the framework for a simplified exposure assessment using Heat Index and reference to WBGT-based exposure assessment table provided by ACOEM in our ANPRM comments for an example of a more stratified approach.

Workers and supervisors will be trained on the signs and symptoms under the Training section of the standard. Confusion is likely to occur if a worker is suffering a HRI, but the worker's signs and symptoms are dismissed because the high heat trigger hasn't been reached. Further, it is likely that, on some days, the heat index will start at the 80° trigger and then cross to the 90° trigger. The more that workers and supervisors practice observing, the better they will become at identifying the signs and symptoms. Observation in the acclimatization period is a very important component of the heat stress program. Supervisors and workers will save lives by observing for signs and symptoms of HRI and providing appropriate responses to cool workers and obtain medical assistance as needed.

OSHA should add a provision for medical screening before workers begin working in hot environments

Response to OSHA questions regarding HIIPP:

As ACOEM stressed in its 2022 letter to OSHA supporting a heat standard, medical screening is a vital component of an effective HIIPP because it will identify workers at high risk for HRI and death. Both NIOSH and ACOEM recommend that employers include medical screening in their heat illness prevention program (Tustin, 2021; NIOSH 2016).

As OSHA recognized in its review of the health effects of heat exposure, certain medications and medical conditions can place individuals at increased risk for both HRII and exacerbation of underlying health conditions, including heart disease, diabetes, lung disease, and kidney disease. OSHA recognized in its review that all workers exposed to heat are at risk of kidney disease. Medical screening programs as a component of a HIIPP have not been extensively studied. However, one study of municipal employees working outdoors demonstrated that implementing a routine medical screening program combined with worker education and acclimatization protocols resulted in a substantial reduction in documented HRII in the population (McCarthy et al., 2019). When medical screening was dropped from that same HIIPP, heat-related illness rates increased (Perkison et al., 2024). Moreover, Sorensen showed that the rate of decline of renal function in sugarcane workers could be slowed when medical screening combined with reinforced education on heat stress prevention was put in place (Sorensen et al., 2020).

ACOEM's 2022 letter to OSHA detailed best practices for medical screening for workers exposed to hot environments. ACOEM acknowledges that employers are concerned about costs and workers are concerned about losing their jobs. A medical screening questionnaire, similar to OSHA's respiratory questionnaire required by the Respiratory Protection standard, would not be unduly burdensome to employers. Identifying and protecting workers at high risk will save medical and workers' compensation costs – and save lives.

To protect worker confidentiality and allow workers to both be informed about their own health risks and have control over their health information, ACOEM recommends that protections be added to the heat standard similar to those in the Silica and Beryllium standards in the following manner: The confidential medical screening questionnaire will be reviewed by a physician or

other licensed health care professional (PLHCP) with experience and training in heat-related illness. The PLHCP will determine if the worker is medically qualified to perform the job duties in hot environments. If the PLHCP believes that the worker needs further evaluation, the worker will be referred for a medical examination. The PLHCP will inform the worker of the medical findings and any recommendations regarding accommodation while working in hot environments. A written authorization signed by the worker will be required regarding what information is released to the employer. In addition, to further protect workers' jobs, a medical removal protection provision should be considered by OSHA. Critically, any questionnaire requirement should have rigorous and uniform review standards, as this requirement will have little real-world value if reviews are inconsistent. Also, we recommend that OSHA assess the current capacity of the PLHCP workforce with expertise in this field to determine if such a requirement is feasible and take any corrective actions needed to ensure an adequate supply of PLHCPs with relevant expertise available to employers.

OSHA should specify when a worker is offered further medical evaluation.

If a worker continues to have signs and symptoms of heat illness, the worker should be medically evaluated beyond first aid. Specifically, if a worker has symptoms of headaches, dizziness, nausea, fatigue, weakness, vomiting, and/or other symptoms that are not substantially improved after 15 minutes of rest, cooling, and hydration, then immediate medical attention should be sought and provided, sooner if symptoms worsen. Workers who have mental confusion or have had a syncopal episode (loss of consciousness) require immediate evaluation since these may indicate developing heat stroke or serious health conditions. In these cases, immediate transportation to a hospital emergency department in an air-conditioned vehicle is the appropriate intervention for those requiring medical attention. Heat stroke is a medical emergency requiring immediate treatment (Epstein and Yanovich, 2019; Bouchama, 2022). The licensed medical provider will determine the return to work status based on the severity of heat illness if present.

For new and returning workers, an acclimatization protocol should include BOTH the requirements of paragraph f (high heat trigger requirements) AND a gradual acclimatization schedule.

Response to OSHA questions regarding Requirements at or Above the Initial Heat Trigger-Acclimatization:

ACOEM believes that a gradual acclimatization schedule **must** be part of an acclimatization program for all new and returning workers. Unacclimatized workers are at the highest risk of HRII and deaths (Arbury et al., 2014; Calkins et al., 2019; NIOSH 2016; Spector et al., 2014; Spector et al., 2016; Spector et al., 2019; Tustin et al., 2018; Gun 2019; Tustin et al., 2021). As such, unacclimatized workers should be afforded the highest level of protection from heat stress. All of the controls under the high heat trigger are important, but leaving out a gradual acclimatization schedule directly impacts one of the most important risk factors for HRII – workload. Workload increases metabolic heat, which, added to the environmental heat exposure, increases the total heat stress to workers. Many new and returning workers may work harder than co-workers both because they are learning or re-learning a new job and because they do not want to lose their job. Working harder increases their workload. A gradual acclimatization schedule is the only way to control and safely increase workload (NIOSH, 2016).

The length of an acclimatization schedule is a matter of debate. Although a 5-day schedule is routinely recommended, longer acclimatization schedules of 7 to 14 days appear to confer more protection (Tyler et al., 2016; Dannen et al., 2018). Recently, Tyler and Notley (2024) reviewed the research on the time course of human adaptation to heat. They concluded that "heat acclimation … within a week is an oversimplification" and that "variables such as age, sex, ethnicity, body morphology, aerobic fitness, initial heat adaptation status, and previous acclimation or acclimatization history may influence the time course of adaption." Considering this, ACOEM recommends that OSHA require an acclimatization schedule that is at least 5 days for both new and returning workers but also allows for a longer acclimatization schedule, depending on workload, higher temperatures, and personal risk factors.

For new and returning workers, OSHA should require a buddy system during the acclimatization period. Further, a buddy system should be required for workers working in high heat, high workload environments. Supervisors should also monitor workers for heat stress symptoms

Response to OSHA questions regarding Effective Communication:

Workers working alone in hot environments do not have a coworker or supervisor at their side to observe for signs and symptoms of heat illness. Heat exhaustion can quickly escalate to heat stroke, and many people may not be aware of their symptoms or able to call for help because of the confusion and disorientation (Epstein and Yanovich, 2019; Bouchama et al., 2022). A supervisor remotely evaluating a lone worker will miss signs of heat exhaustion and heat stroke that can only be recognized face-to-face. When in-the-field, emergency management of heat stroke is required to save a life, a confused worker working alone will not be able to save themselves. OSHA is not protecting these workers under the proposed standard. A buddy system should be mandatory for both unacclimatized workers and workers working in high-heat, high-workload environments.

Use Wet Bulb Globe Temperature (WBGT) rather than Heat Index for the initial and high heat triggers.

Response to OSHA questions regarding Basis for Initial and High Heat Triggers:

ACOEM believes that OSHA should consider the following information and studies. WBGT has emerged as the gold standard for measuring heat stress in outdoor as well as indoor environments. This comprehensive metric incorporates multiple factors that contribute to heat stress, including ambient temperature, humidity, wind speed, solar radiation and cloud cover. Unlike simpler measures such as the heat index, WBGT provides a more accurate representation of how the human body experiences and responds to heat stress.

Recent research has further emphasized the importance of WBGT in assessing physiological heat strain. In a series of three companion papers, Ioannou and colleagues performed a systematic review to identify indicators of physiological heat strain, highlighting the significance of comprehensive metrics like WBGT (Ioannou et al. 2022, part 1); ran a Delphi exercise to understand what is important to consider when adopting an indicator to protect individuals who work in the heat (Ioannou et al. 2022, part 2); and conducted field experiments across nine countries to evaluate the efficacy of each indicator for quantifying the physiological strain experienced by individuals who work in the heat (Ioannou et al. 2022, part 3). Their comprehensive research on thermal stress indicators (TSIs) for occupational settings has identified WBGT as one of the most effective metrics for quantifying physiological heat strain

experienced by workers. This conclusion is based on a systematic review of 340 unique TSIs, a Delphi exercise to determine critical criteria for indicator selection, and extensive field studies across nine countries and multiple industries. The WBGT outperformed other indicators in reflecting workers' physiological responses to heat stress, correlating significantly with parameters such as skin temperature, body temperature and heart rate.

The findings from this series of three companion papers demonstrate that work-related applications and systems should employ the indoor and outdoor WBGT to inform management and make evidence-based decisions. This can lead to a rationalized organization of work and production as well as improved worker health and safety, where the real-time workers' data collected are used to provide automated feedback to workers on their health and positively influence their behaviors. For example, in construction and agriculture, automated scheduling software can use historical and real-time data on weather and seasonal patterns for scheduling tasks and employees based on the indoor and outdoor WBGT. This will allow employers to adjust schedules and to allocate shifts in response to the present and future conditions in the workplace. Also, analytics could identify associations between workplace practice and safety and health risk, reducing worker exposures to heat stress and producing individually tailored prevention or job resources to manage heat stress. Such practices can be effectively applied to traditional forms of work that require physical presence as well as to a dispersed workforce, such as teleworkers or moving workers including drivers and couriers.

Best practices for incorporating WBGT in the field involve developing comprehensive policies and procedures that outline specific thresholds and corresponding actions. Organizations should establish clear guidelines for work-rest cycles, hydration protocols and activity modifications based on WBGT readings.

The use of WBGT aligns with the growing recognition of the impacts of the environment on occupational health and safety. As extreme heat events become more frequent and intense, having a reliable and standardized method for assessing heat stress becomes increasingly critical. WBGT provides a robust tool for adapting workplace policies and practices to changing environmental conditions, ensuring worker safety in the face of rising temperatures.

At and above the high heat trigger, work-rest cycles should be based on both temperature and workload.

Response to OSHA questions regarding Rest Breaks (at both the Initial Heat Trigger and High Heat Trigger:

The current requirement of a rest break of 15 minutes every two hours is reasonable in many cases but may not be protective of workers doing moderate to heavy work in very hot conditions. We recommend that OSHA adopt the NIOSH recommendations in Table 6.2 (NIOSH, 2016) for work-rest cycles.

Use the NIOSH hierarchy of controls to guide control measures.

Response to OSHA questions regarding Requirements at or above both the Initial and High Heat Triggers:

Air conditioning is a feasible approach in many cases and results in elimination of a heat hazard. Air-conditioned vehicles should be required for vehicle operators, such as postal workers, truck drivers, bus drivers and others. Air conditioning and/or other approaches to

building cooling, such as reflective roofs, window shutters, night ventilation and green architecture, should be required when feasible (Kuczyński et al., 2021; Meade et al., 2024).

Further, in response to OSHA's question: "Whether there are control options OSHA should require for vehicles, either when used for work activities or when used as a break area," ACOEM recommends that air-conditioning be required in vehicles when workers must use a vehicle to do their job for all or a significant part of the day, such as for delivery workers, postal workers and cab drivers, among others.

Restrict indoor fan use to ambient temperatures < 95°F.

Response to OSHA questions regarding Evaluation of Fan Use:

OSHA's proposed standard, section (e)(6) requires employers to evaluate fan use at temperatures above 102°F. OSHA refers to a paper by Foster et al. (2022). However, this paper states "When air temperature is ≥ 35°C, fans are ineffective and potentially harmful…". In fact, studies indicate that fan use when ambient temperatures are above 35°C (95°F) results in heat gain, rather than heat loss, due to heat transfer (convection) from the hotter ambient temperature to the cooler body. Meade et al. (2024) critically reviewed the studies on fan use in hot environments and concluded that "although fan use improves sweat evaporation, these benefits are of insufficient magnitude to exert meaningful reductions in body core temperature in air temperatures exceeding 35°C." Further, Meade et al. cautioned that individual risk factors, including age, sex, ethnicity, underlying medical conditions, medications, physical fitness, lack of acclimatization and clothing, among others, are not adequately addressed in studies of fan use and can increase risk of heat-related illnesses and death. ACOEM recommends that OSHA restrict indoor fan use to temperatures below 95°F and require more effective workplace controls, such as air-conditioning.

Require all employers to have a written HIIPP.

Response to OSHA questions regarding Heat Injury and Illness Prevention Plan (HIIPP):

We urge OSHA to require a written HIIPP for all employers, rather than limiting the requirement to employers with greater than ten employees. A written plan helps to ensure that small employers seriously consider and develop an HIIPP. A written HIIPP would not be a significant burden on small employers, particularly if OSHA provides guidance and templates. OSHA should ensure that informational resources on occupational heat awareness and heat illness be provided and available to particularly small employers (<10 employees).

Under "Scope", include all indoor workers, and specifically emphasize coverage for temporary workers, both indoors and outdoors.

Response to OSHA questions regarding Scope and Application:

The exclusion from the standard of indoor workers doing "sedentary work" will put many workers at risk. Assessment of workload as sedentary is subjective and can be misconstrued by employers, workers and compliance officers. Hot indoor environments, particularly those with little ventilation and/or with local heat sources, can and do cause HRII and death (Arbury et al., 2014; Arbury et al. 2016; Tustin et al., 2018; Gun, 2019). Indoor workers with underlying personal risk factors are at increased risk. Temporary workers are also at increased risk of HRII and death because they are disproportionately in hazardous jobs, underserved populations and

less likely to be educated on heat exposure hazards by their employers (Coker et al., 2024). By specifically stating their inclusion in this standard, OSHA can highlight the requirement for employers to protect temporary workers.

Heat stress is increasingly causing many occupational injuries, illnesses, and deaths, but it is ***completely preventable***. ACOEM strongly supports OSHA's proposed heat standard and urges OSHA to act quickly to finalize this standard and save workers' lives and health. As always, ACOEM stands ready to assist OSHA in any way to achieve a Heat Standard to protect U.S. workers from heat stress.

We appreciate your consideration of these comments, and we look forward to collaborating with OSHA to carry out its mission of assuring safe and healthful working conditions for U.S. workers. If you have any questions or need additional information, please contact Dane Farrell (Dane@cascadeassociates.net), ACOEM's Government Affairs Representative.

Sincerely,

Tanisha Taylor, MD, MPH

Tanisha Taylor, MD, MPH, MBA, FACP, CIME, FACOEM
President
American College of Occupational and Environmental Medicine (ACOEM)

Attachments:

1. ACOEM's January 26, 2022, Comments on Heat Standard ANPRM
2. ACOEM's September 14, 2023, Letter on Heat Standard ANPRM and Interim Occupational Heat Standard Recommendations

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ATTACHMENT 1

AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

January 26, 2022

Assistant Secretary Douglas L. Parker
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

RE: Docket No. OSHA–2021–0009

Dear Assistant Secretary Parker:

Thank you for the opportunity to comment on the Occupational Safety and Health Administration (OSHA) Advanced notice of proposed rulemaking (ANPRM) – Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings. The American College of Occupational and Environmental Medicine (ACOEM) is a national medical society representing 4,000 occupational medicine physicians and other health care professionals devoted to promoting optimal health and safety of workers, workplaces, and environments. ACOEM is dedicated to improving the care and well-being of workers through science and the sharing of knowledge.

ACOEM strongly supports OSHA's initiation of rulemaking to protect workers from heat-related injuries and illnesses (HRI). The comments below focus on the following elements of a successful employer HRI prevention program: heat exposure limits that trigger workplace controls, acclimatization, and other workplace controls, first aid and emergency response, worker and supervisor training, medical monitoring/surveillance, and medical removal. In our experience, these elements, and most importantly management commitment and leadership, are key to effective HRI prevention.

Occupational Heat Exposure Limits

ACOEM recommends that OSHA determine heat stress exposure limits that will inform employers and employees of the severity of the heat hazard and trigger mandatory workplace controls. The goal of heat exposure limits and a heat stress rule is to reduce the incidence of HRI and deaths. However, few studies have analyzed heat exposure levels in relation to adverse heat exposure outcomes. An OSHA study (Tustin et. al., 2018a) examined outdoor heat inspections where illness or death occurred and found the median exposure measured by the heat index (HI) was 91°F with a range of 83°-110°F (ambient temperature). A study of Deepwater Horizon clean-up workers reported increasing rates of HRI and acute injuries with increasing heat exposures. The study also noted an interaction between heat exposure on the day of the incident with heat exposure the day before when the WBGT was 28°C (82.4°F) on

either the day of the incident or the day before (Garzon-Villalba et al., 2016). Although the Cal/OSHA heat standard set a simple trigger of 80°F, a baseline ambient temperature may not be appropriate for other areas of the country where humidity is a significant factor.

A single exposure limit or trigger does not take into account workload, acclimatization state, clothing, and other personal protective equipment (PPE), and personal comorbidities that can affect the severity of the heat stress hazard. If heat exposures rarely reach 80°F and do so only briefly during a work period, it is reasonable to believe that heat stress does not represent a significant hazard.

A single exposure limit or trigger has principal utility in deciding if there should be a heat stress management program. Graded trigger points have the utility of phasing in workplace controls and interventions depending on the degree of heat stress. To support the concept of graded triggers, the consensus document by Morrissey et al. (2021) on heat safety in the workplace found high-quality, peer-reviewed evidence for the following environmental heat monitoring recommendations:

- Environmental measurements should be taken on-site—as close to the individual work site as possible—to best represent environmental heat stress.
- Comprehensive heat stress assessment and associated interventions should include information on ambient environmental conditions, work demands, clothing, PPE, and worker acclimatization status.
- Environmental measurements for heat stress assessment should account for the influences of air temperature, humidity, wind speed, and radiant heat. Indices that incorporate or integrate the individual measurements can be used for heat stress assessment (e.g., wet bulb globe temperature).
- When using portable environmental sensors, employers should follow manufacturer specifications for set up, equilibration (i.e., allow time for the sensor to adjust to ambient conditions), and calibration.
- Employers should incorporate environment-based work modifications (e.g., change in number or duration of rest breaks) into workplace policies and procedures.

The wet bulb globe temperature (WBGT) index is the most widely recognized index of the environmental contributors and addresses the bulleted points from Morrissey et al. (2021). The National Institute for Occupational Safety and Health (NIOSH) 2016 criteria document proposes the Recommended Exposure Limit (REL) for acclimatized workers and the Recommended Alert Limit (RAL) for unacclimated workers. The thresholds are adjusted based on the metabolic rate. The American Conference of Governmental Industrial Hygienists (ACGIH) and International Standards Organization (ISO) also use the same limits based on WBGT and metabolic rate and provide adjustments for clothing. Any employer wishing to use WBGT-based exposure assessments based on the NIOSH, ACGIH and ISO criteria should be encouraged to do so. For

those employers without the resources to use and interpret WBGT-based methods, a simplified scheme based on Heat Index (HI) can be used. Simplification comes with a loss of accuracy and the triggers will have to account for that loss. There are times during which the HI, adjusted for sunlight, may underestimate the heat stress level due to local conditions such as heat from engines (riding lawn mowers) and radiant heat from concrete (construction sites, baseball stadiums), blacktop (highway construction, athletic field construction), or similar structures (aka heat islands).

The following is offered as a framework for a simplified exposure assessment using Heat Index and referenced to WBGT-based exposure assessment. The underlying assumptions are moderate work (300 W) in direct sunlight wearing woven work clothing. The probabilities are based on Garzón-Villalba et al. (2017) with a shift in the exposure-response curve to the left of 3 °C for unacclimated and a shift to the right of 3°C for rapid heat gain (>1°C/h of core temperature). The translation from WBGT to Heat Index is based on Bernard and Iheanacho (2015). (Note: The Heat Index categories are not based on the National Weather Service.)

Level	WBGT	Heat Index In Sun	Description
Acceptable	< 25 °C (RAL = 25 °C)	< 82 °F	Low probability (< 1%) of unsustainable heat stress for anyone
Caution	25 – 28 ° C (REL = 28 °C)	82 – 92 °F	Low probability (< 1%) of unsustainable heat stress for anyone who is acclimatized
Moderate	28 – 31 °C	92 – 106 °F	Low probability (< 1%) of rapid heat gain
High	31 – 34 °C	106 – 125 °F	Significant probability (up to10%) of rapid heat gain
Extremely High	> 34 °C	> 125 °F	Likelihood (> 10%) of rapid heat gain

The acceptable (green) zone does not require a heat stress management program. The caution (yellow) zone is the trigger point for a mandatory heat stress management program. Basic heat stress controls, such as provision of shade and water and hydration drinks, acclimatization protocols, and reminder training on HRI signs, first aid and emergency response, are put in place. The moderate, high, and extremely high zones represent times when increasing controls are required. For instance, additional controls, such as work-rest cycles, would be considered in the Moderate (Orange) zone. Suspending operations, providing personal cooling or other similar controls might be required in the Extremely High (Red) zone. As noted above, there may be times that the Heat Index trigger needs to be lower due to local heat conditions.

Acclimatization

Lack of acclimatization to heat stress is the most important cause of heat-related illness (HRI) and death in occupational settings (Arbury et al., 2014; NIOSH 2016; Tustin et al., 2018b; Gun 2019; ACOEM 2021). Retrospective studies by OSHA found that 70% of heat-related fatalities involved unacclimated workers with less than one week of job tenure. In addition to HRI, studies suggest an increased risk of work-related injuries due to inadequate acclimatization, among other factors (Spector et al., 2014; Spector et al., 2019). Acclimatization is a key component of an employer heat illness prevention program (Arbury et al., 2016).

Best practices for implementing acclimatization programs include correctly identifying workers at risk, creating an acclimatization protocol that gradually increases the duration of work in hot conditions, and closely monitoring workers as they acclimate. Unacclimated workers include new workers, workers returning to work after time off, and workers transferred to a high heat stress job from one that is not. In addition, temporary or multi-employer workers may not be acclimatized. Both the staffing agency and host employer have a responsibility to assess acclimatization status.

Acclimatization protocols may vary depending on the industry, the job, and the worker. The NIOSH/OSHA approach of increasing duration of work by 20% each day over a 5-day period may be adequate in many cases. However, Tyler et al. (2016) concluded from a meta-analysis of 96 studies on heat adaptation and physiologic response that, although short acclimatization periods (<7 days) provide some benefit, programs of 14 days or longer maximize physiologic acclimatization. Loss of heat adaptation (heat adaptation decay) occurs quickly (7-14 days) but extending acclimatization periods beyond seven days may confer longer-lasting heat adaptation (Dannen et al., 2018).

Monitoring of unacclimated workers, such as through a buddy system, during the acclimatization period is a critical component of the process. Unacclimated workers should never be left alone when working in a hot environment (ACOEM 2021). An acclimatization program must also include all components of an employer's overall heat illness prevention program, including provision of adequate fluid intake and rest breaks in the shade or other cooler locations. Finally, all workers and supervisors, particularly those monitoring workers in an acclimatization program, must have training on heat-related symptoms and emergency response measures (ACOEM 2021; Morrissey 2021).

Small employers with fewer employees and resources face challenges to successful implementation of acclimatization programs. These employers will need to consider a variety of approaches to decrease heat exposure. Approaches may include adjusting the time of day for the work to limit exposure during peak heat stress or adjusting work duties to decrease workload. For indoor environments, it is helpful to increase the distance from very hot sources

(e.g., industrial furnaces, molten materials, etc.) while addressing challenges of accomplishing the work from safe distances.

Engineering and Administrative Controls

Employers identify appropriate engineering and administrative controls through heat hazard assessments and use the hierarchy of controls to limit or, ideally, eliminate heat hazards. Many engineering controls exist for both indoor and outdoor heat hazards, including air-conditioning, ventilation, fans, misting devices, and shaded cooling centers. Mechanical and ergonomic methods to decrease workload, such as manual lifts, should be instituted where appropriate (ACOEM 2021; Morrissey 2021).

Administrative controls include hydration/fluid replacement, planning work during cooler parts of the shift, buddy systems, and work-rest cycles, among others. Abundant research substantiates the importance of adequate hydration (pre-shift, during shift, and post-shift) in preventing HRI. Workers must have ready access to water and electrolyte-containing liquids and to restrooms. Employers should educate workers and supervisors on signs and symptoms of hypohydration and dehydration and appropriate frequency and types of liquids to consume when working in hot environment. Employers can implement low-cost strategies to assess hydration status, such as urine color and body weight change (ACOEM 2021; Morrisey 2021; NIOSH 2016).

Morrissey et al. (2021) note that body-cooling strategies are effective but underutilized. Body-cooling strategies range from potentially expensive air-conditioning systems and cooling vests to very inexpensive, easy-to-institute methods, such as head and hand cooling, use of cold, wet towels and bandannas, water dousing and icy slush ingestion.

PPE is an important contributing cause of heat stress and may also be a control for heat stress. Heat hazard assessment should include the impact of PPE, and PPE should be selected with a view towards heat dissipation (thin, lightweight, loose, breathable, ventilated). Employers should provide a range of PPE sizes that fit most employees (Morrissey 2021). As a heat stress control in some jobs, PPE may be air-, water-, or ice-cooled (Tustin 2021; NIOSH 2016).

ACOEM strongly recommends that every workplace with potential heat stress hazards designate a competent person who is trained in heat stress causes and controls. The duties of a "heat stress competent person" would include management of the HRI prevention program, environmental heat exposure assessment, training of workers and supervisors, evaluation of HRI metrics, and continuous quality improvement of the HRI prevention program. During the Deepwater Horizon clean-up, two levels of heat stress management leadership were utilized. A heat stress manager (HSM) was responsible for the whole program, while a heat stress advisor (HSA) provided onsite supervision. An HSA was on-site at every discreet location and was

authorized to implement and oversee all aspects of the HRI prevention program. Those involved in the Deepwater Horizon health and safety program believe that the HSM/HSA component was a key factor in preventing HRIs.

First Aid and Emergency Response

A first aid and emergency response plan is critical to an employer's heat illness prevention program and will save lives. Heat exhaustion can quickly lead to heat stroke and death. All employees must be trained to recognize the signs and symptoms of HRI, respond quickly with first aid measures, and rapidly refer ill workers for medical evaluation and treatment (Tustin 2021). In heat-related emergencies, the response "in the first 5-10 minutes will likely dictate outcome" (Morrisey 2021).

Best practice components of a first aid and emergency response plan include:

- Site-specific coordination with local hospitals, emergency departments and emergency response services.
- Employees should be trained on how to activate emergency response and how to provide clear directions to the worksite.
- Employees should be trained on recognition and first aid treatment of HRI.
- A buddy system should be instituted so that coworkers can quickly assess for signs of HRI.
- As noted above, a competent person or heat stress advisor should be onsite and regularly assessing workers for HRI.
- First aid supplies and equipment should be easily accessible.
- First aid response includes immediate removal from heat exposure to a cool area (shade, fans, air-conditioning), assessment for medical referral, body cooling, provision of fluids (water, hydration drinks), and constant monitoring by an employee trained to recognize signs of heat exhaustion, dehydration and heat stroke and know when to call for emergency response services.
- Body cooling methods will depend on the worksite. Methods may include ice packs, cold water baths (i.e., using a garden hose), and fans.
- Workers who display mental status changes (confusion, lack of alertness, disorientation) may be suffering heat stroke. Heat stroke is a medical emergency, and 911 should be called immediately. These workers require immediate first aid, including aggressive body cooling. A responsible person should stay with the worker until help arrives.
- Workers who have symptoms of heat exhaustion and are not improving with onsite first aid treatment should be referred for medical evaluation.
- Training of all employees on first aid and emergency response procedures should occur for all new hires and at least annually. Periodic training should also occur when increases in heat exposure are anticipated.

- Training should also include heat emergency drills at least annually, and after-drill evaluations should be conducted. A Plan-Do-Study-Act (PDSA) approach will aid employers in improving their emergency response plan.

Worker and Supervisor Training

As OSHA has noted in the ANPRM and in several studies, worker training is frequently missing from heat illness prevention programs (Arbury et. al., 2016; Tustin et. al., 2018b). Heat illness prevention training for supervisors and employees will save lives, particularly in new, unacclimated workers, young workers, temp workers, and others. Few studies have evaluated the effectiveness of HRI training in worker populations. McCarthy et al. (2019) reported a decrease in HRI after instituting a heat stress training program, along with other workplace controls, for municipal workers. An intervention study of Egyptian construction workers reported an improvement in workers' understanding of HRI and behaviors, such as hydration and body cooling (El-Shafei et al., 2018). A consensus paper on heat safety in the workplace described the importance of worker education, particularly in successful acclimatization, hydration, body cooling, first aid and emergency response (Morrisey et al., 2021).

Best practices for worker and supervisor heat safety training encompasses the following (ACOEM 2021; Morrisey 2021):

- Initial comprehensive training for new and returning workers, including temporary workers and contractors, should include HRI signs and symptoms, prevention of HRI, and first aid and emergency response.
- Frequent periodic training, particularly when there is a new rise in ambient temperature.
- Training must be in a language and manner the individual understands.
- Hydration training should include symptoms of dehydration and underhydration, optimal hydration (need for both water and electrolytes), and importance of hydration before starting work. Hydration training should also consider individual and cultural factors, along with workplace settings. Ease of restroom access is an important consideration in ensuring that workers stay hydrated (Venugopal et al., 2016).
- Training on signs and symptoms of HRI is important not only so that workers can identify early HRI in themselves, but probably more importantly so that co-workers and supervisors can identify HRI in others and act quickly to provide first aid and emergency response.
- Training should emphasize the importance of identifying symptoms in all workers, but special attention should be paid to unacclimated workers.
- Training should emphasize early signs of heat stroke, such as confusion and slurred speech.
- Training should include personal risk factors for HRI, such as chronic diseases, drug use, obesity, and previous HRI.
- Training should include basic information on the role of metabolic heat in HRI.

- First aid and emergency response training should include rehearsals and be repeated frequently.

Appendix A includes several recommendations regarding heat stress awareness training of workers and supervisors.

Medical Monitoring/Surveillance

Both NIOSH and ACOEM recommend that employers include medical monitoring/surveillance in their heat illness prevention program (ACOEM 2021; NIOSH 2016). The primary purpose of medical surveillance is to identify workers at increased risk of HRI and for which work restriction may be considered. Medical surveillance programs not only protect workers vulnerable to heat stress but also protect other workers who may be at risk when a coworker is impaired. Physicians or other licensed health care providers (PLHCP) performing medical surveillance exams can also take the opportunity to educate workers about HRI risk factors, such as medical conditions and medication, and steps workers can take to protect themselves (McCarthy 2019; ACOEM 2021).

Over the last several decades, many studies have documented personal risk factors, such as cardiovascular disease, diabetes, previous HRI, skin disorders, and infections, among others, that increase the likelihood of HRIs, including studies from OSHA (Leon and Bouchama, 2015; Westaway et al., 2015; Tustin 2018b).

Best practices for medical monitoring / surveillance programs include the following (NIOSH 2016; McCarthy 2019; ACOEM 2021):

- Medical surveillance may be offered to workers prior to work in hot environments.
- A PLHCP knowledgeable about occupational HRI may provide guidance to employers developing HRI prevention programs, and specifically the medical surveillance program, and may oversee the medical surveillance program. This may include review of OSHA logs, medical records, and other data on HRIs.
- The employer should provide the PLHCP with a job description for workers in the medical surveillance program. The job description should include a description of physical demands, anticipated heat exposure levels, and required PPE.
- Frequency of medical surveillance – The medical surveillance program may include pre-placement, annual, and return-to-work medical evaluations to determine fitness to work in heat and hot environments.
- Screening questionnaires – Consider the use of screening questionnaires (similar to how the respiratory questionnaire is used in the Respiratory Protection Standard) to clear workers by the responsible PLHCP prior to working in a hot environment, periodically (i.e., annually), and upon return to work in a hot environment. The questionnaire includes questions on medical and occupational history, medications, and other personal risk factors.
- Vital signs (weight, blood pressure, pulse, and temperature) should be obtained when an examination is indicated.

- The PLHCP may decide that a physical exam or other tests are needed before a worker can be cleared. Physical examination components should emphasize the cardiac, respiratory, skin, endocrine, neurologic, and peripheral vascular systems.
- Risk stratified measurements of kidney function, such as serum creatinine and glomerular filtration rate (GFR), of heat-exposed workers may be helpful to identify early signs of kidney damage when intervention could prevent or reverse progression (Sorensen et al., 2020).
- The PLHCP should provide the employer with a written medical opinion noting any work limitations.
- The PLHCP should provide the employee with both a verbal and written medical report advising the worker of the PLHCP's recommendations and answering the worker's questions.

Approaches to medical surveillance may vary depending on work physical demands, required PPE use, the level and duration of heat exposure, and the resources available to the employer. Employers should consult occupational health professionals with knowledge of occupational HRI and prevention in developing the medical surveillance program and components.

See Appendices: Appendix B provides an example of a screening questionnaire;

Medical Removal

Clinicians consider many personal and workplace factors in assessing a worker's fitness to work in heat hazard conditions. Age, cardiovascular and respiratory diseases, diabetes, hypertension, chronic kidney disease (CKD), obesity, previous HRI, medications, and socioeconomic factors (lack of air conditioning or fans, transportation issues) are personal risk factors to be considered. Any one condition may not be enough to place restrictions, but the combination of multiple factors may place a worker at much greater risk of HRI.

CKD is one condition that, in and of itself, requires close scrutiny. CKD affects 8% to 16% of the population worldwide and is the 16th leading cause of years of life lost worldwide. Workers with early CKD who regularly work in hot environments are at risk of more rapid CKD progression due to repeated dehydration and acute kidney injury (AKI). Those with CKD need more time to acclimatize and need to be more closely monitored. Medical removal should be considered for workers with moderate to severe CKD as they are at increased risk for HRI and AKI (Chen et al., 2019). The PLHCP should inform the worker of these risks and consult with the worker's primary care physician or nephrologist. Additional confounding chronic conditions like diabetes and heart disease should make early removal a strong consideration.

In summary, many U.S. workers are at risk of HRI. An OSHA Heat Injury and Illness Prevention Standard is necessary to prevent occupational HRI and promote the well-being of U.S. workers. ACOEM stands ready to assist OSHA in achieving this goal.

Sincerely,

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ACOEM President

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APPENDICES

Appendix A – Heat stress awareness training "pearls"

- Begin heat stress awareness campaigns early in the project during the cooler weeks/months.
- Engage early adapters as heat stress champions to inspire and influence the late majority and laggards.
- Leverage experience and storytelling to drive heat awareness messages.
- Employ spaced or drip feed learning--toolbox talks are useful as a constant refresher and reminder to heat stress.
- Recognize, understand, and leverage differences in learning styles: visual, auditory, reading and writing, and kinesthetic.
- Workers and supervisors should be trained on how to activate emergency response (call 911 or appropriate on-site emergency response number).
- Speed of onsite response to HRI is crucial – both in activating emergency response and providing immediate onsite cooling.
- Utilize near misses, first aid case reporting, etc. as a learning opportunity to further drive heat awareness.
- Provide urine color charts and as lanyard accessories to assist in monitoring for signs and symptoms of dehydration.
- Ensure managers and supervisors have an understanding of work site blind/risk zones--less frequently visited areas on the work site or areas that are a long distance away from the nearest rest station/area.
- Rest stations should be placed close to the work area.
- Provide directional signage and posters to cool rest areas/stations.
- Strategically place rest areas around work sites and ensure they are easily accessible by foot and/or vehicle traffic.
- Employ frequent musters to account for all workers.
- Workers and supervisors should be trained on treatment of HRI including supplies and equipment requirement.
    - Encourage light weight, light-colored and loose-fitting clothing.
    - If employing cooling vests, be mindful that some may be heavy, bulky and limit ease of mobility.
    - Ensure adequate water availability (personal canteens, coolers, etc.) and encourage adequate water intake.
- Recognize and understand business expectations and constraints, such as ambitious schedules, budgets, and contractual agreements, may conflict with heat stress awareness and mitigation plans.

- Encourage audits and site walks by managers:
    - Helps to ensure visibility and heat awareness with emphases on shade, water, rest, emergency response, etc.
    - Helps to mitigate the risk of *ivory tower* and communication gaps between management and front-line workers.
- Meals:
    - Stress the importance of a healthy breakfast, particularly during fasting periods.
    - Encourage small meals as opposed to large food intake.
    - Recognize and understand increased risk of HRI during periods of fasting.
- Recognize common cognitive biases and their associated risk. Some examples:
    - Overconfidence bias: can be an issue if work force is driven to place themselves or others at risk.
    - Status quo basis: can be an issue during a lull.
    - Confirmation bias: can be an issue when evaluating an individual for heat stress (e.g., Given the individual is alert and oriented and only has no or few complaints, etc. then erroneously allowing this person to RTW.)

Appendix B – Examples of Screening Questionnaires

Heat Stress Questionnaire

Name: (first, last) _____Employer:_____ Job Title: _____

DOB: _____ Age: _____ Height: _____ Weight: _____ BMI: _____

Are you taking any of these medication or substances ? Some medications may increase or block sweating.

Heart Medications	Yes___ No___	Sleeping / Insomnia	Yes___ No___
Blood Pressure (diuretics)	Yes___ No___	Depression/Mood (lithium)	Yes___ No___
Asthma/COPD	Yes___ No___	Anticholinergic (bladder/dizziness)	Yes___ No___
Allergy (Benadryl)	Yes___ No___	Nicotine products	Yes___ No___
Alcohol	Yes___ No___	Cocaine, amphetamines	Yes___ No___

Please list medication names including over the counter medications or drug use.

_____

_____

Do you have any of these conditions that may increase risk of heat related illness?

Kidney disease	Yes___ No___	Previous Heat-related illness?	Yes___ No___
Heart disease	Yes___ No___	Are you trying to lose weight?	Yes___ No___
High blood pressure	Yes___ No___	Severe burns requiring hospitalization?	
Diabetes	Yes___ No___		Yes___ No___
Asthma/COPD	Yes___ No___	Are you pregnant/ planning a pregnancy (females) ?	
Neurologic disorder	Yes___ No___		Yes___ No___
Thyroid disorder	Yes___ No___	Are you exposed to physical / chemical hazards?	
Skin disease (extensive)	Yes___ No___		Yes___ No___
		Do you have a second job/occupation in a hot environment?	Yes___ No___

If "Yes" to any of the above, please describe:

_____

Employee signature: _____ Date: _____

Clinician name and signature: _____ Date: _____

Instruction to Clinicians: Employees with one or more risk factors -Discuss with employee why employee at increased risk for heat-related illness, importance of being aware of signs and symptoms of heat stress and when to seek medical attention.

Employee with uncontrolled health condition on exam or recent heat-related illness- restrict from work in hot environment until health condition stabilized. Recheck to confirm health condition stabilized before returning employee to work in a hot environment.

Sample Heat Stress Screening Questionnaire:

Employee Name: _____ Job Title: _____

Medical History:

Have you ever had or do you now have:	Yes	No
Rheumatic Fever	___	___
Chest pain or pressure	___	___
Heart trouble or heart attack	___	___
Heart Surgery	___	___
High blood pressure	___	___
Kidney trouble	___	___
History of heat intolerance, heat-related disease (including heat exhaustion or heat stroke)	___	___
Diabetes	___	___
Convulsions or epilepsy	___	___
Shortness of breath, asthma, emphysema, other lung problem	___	___
Currently pregnant	___	___
Present illness or injury	___	___

Explain “Yes” answers:

_____

_____

_____

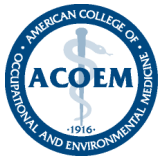
List any medications you are using, including over-the-counter medications:

_____

_____

Employee signature: _____ Date: _____

ATTACHMENT 2



AMERICAN COLLEGE OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

September 14, 2023

Assistant Secretary Douglas L. Parker
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, NW
Washington, DC 20210

RE: Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings Rulemaking

Dear Assistant Secretary Parker:

In January 2022, the American College of Occupational and Environmental Medicine (ACOEM) commented on OSHA's Advanced Notice of Proposed Rulemaking (ANPRM)-Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings. Knowing the serious health effects of heat exposure from our day-to-day care of workers, ACOEM strongly supported this advanced notice of proposed rulemaking to protect workers exposed to heat. It is over 1 ½ years since the ANPRM was published, and the threat to workers is even more grave. Heat stress is becoming an increasingly critical issue that demands immediate attention. As temperatures rise and extreme heat events become more frequent, the safety and well-being of workers are at risk. The urgency of this matter cannot be overstated. The severity of heatwaves is worsening. Workers across various industries face exposure to extreme heat without appropriate protection. The absence of a temporary heat standard leaves employees vulnerable to heat-related illnesses and injuries.

2023 will be the hottest year on record.[1] These heat trends are projected to continue for years to come without a reduction in carbon emissions and other steps to mitigate climate change. The impacts of extreme heat on American workers are striking, as recent reports and studies have highlighted. Since 2011, there have been 436 work-related deaths caused by environmental heat exposure.[2] Using BLS data, Hawkins et al. calculated over 31,000 occupational injuries and illnesses due to heat between 2011-2019.[3] Young workers, Black and Hispanic workers, and workers in the South were at highest risk. Industries with the highest rates were farming/fishing/forestry, construction, transportation, and installation/maintenance. Morrissey et al. reviewed data from OSHA's Severe Injury Reports from 2015-2022 and found that 91.9% of the exertional injuries were due to heat exposure.[4] The study also reviewed OSHA's fatality inspection database from 2017-2022 and found that 87.6% of exertion-related fatalities were due to heat exposure.

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[1] New Scientist, June 16, 2023, "Why 2023 is shaping up to be the hottest year on record". https://www.newscientist.com/article/2378692-why-2023-is-shaping-up-to-be-the-hottest-year-on-record/
New York Times, July 6, 2023, "Heat Records Are Broken Around the Globe as Earth Warms, Fast. https://www.nytimes.com/2023/07/06/climate/climate-change-record-heat.html
Washington Post, August 8, 2023. "2023 is on track to be the hottest year on record". https://www.washingtonpost.com/climate-environment/2023/08/08/2023-is-track-be-hottest-year-record/

[2] Bureau of Labor Statistics. TED: The Economics Daily. June 5, 2023. https://www.bls.gov/opub/ted/2023/36-work-related-deaths-due-to-environmental-heat-exposure-in-2021.htm

[3] Hawkins D, Ibrahim M. Characteristics of occupational environmental heat injuries/illnesses-Survey of occupational injuries and illnesses, 2011 to 2019. J Occup Environ Med, 2023; 65(5):401-406.

[4] Morrissey, M.C.; Kerr, Z.Y.; Brewer, G.J.; Tishukaj, F.; Casa, D.J.; Stearns, R.L. Analysis of Exertion-Related Injuries and Fatalities in Laborers in the United States. Int. J. Environ. Res. Public Health 2023, 20, 2683. https://doi.org/10.3390/ijerph20032683

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While existing data from sources like the BLS may provide some insight into the issue, it's crucial to recognize that the problem is far greater and more complex than what these figures suggest. By delving deeper into the realities of heat exposure's impact on workers' health, we can better understand the urgency and take measures to act. The reported cases of heat-related illnesses and injuries are severe underestimations of the true scale of the problem. Many cases go unreported or unrecognized, leading to a gross underrepresentation of the actual health risks faced by workers. This alarming gap in data highlights the need for immediate action. Moreover, the effects of heat exposure extend far beyond the immediate dangers of injury and heatstroke. Recent research, like the systematic review by Lee et al. sheds light on the extensive health implications linked to heat exposure. These include cardiovascular strain, kidney dysfunction, and cognitive impairment.[5]

The implications of heat on healthcare costs are not trivial. According to a recent report from the public policy research group Center for American Progress, extreme heat is estimated to create $1 billion in health care-related costs in the United States this summer of 2023 alone, including nearly 235,000 emergency department visits and more than 56,000 hospital admissions.[6]

Of note, we cannot forget how heat will affect the productivity of our workforce. Heat stress is projected to reduce total working hours worldwide. As highlighted in Romanello et al., global potential loss of income from a reduction in labor capacity due to extreme heat was $669 billion (U.S.) in 2021.[7] In the United States, more than 2.5 billion hours of labor in the agriculture, construction, manufacturing, and service sectors were lost to heat exposure.[8] According to the International Labor Organization, 2.2 percent of total working hours will be lost to high temperatures globally in 2030 - a productivity loss equivalent to 80 million full-time jobs.[9]

Cal-OSHA's established heat standard serves as a shining example of effective workplace safety regulation. Cal-OSHA's experience demonstrates that implementing a heat standard is not only feasible but also practical. Employers have successfully integrated these measures into their daily operations, showing that protecting workers from heat stress is an achievable goal. This standard has already proven its feasibility and, most importantly, its potential to save lives. It's imperative to highlight this success as we advocate for its expansion to cover all indoor and outdoor workplaces without limitations. We would also urge OSHA to consider examples of practical heat stress programs successfully implemented on the ground, such as the one used in the Deepwater Horizon response, which protected the 49,000 responders while allowing them to perform their tasks safely.

ACOEM's January 26, 2022, comments to the docket detail our recommendations for an occupational heat stress standard. We continue to make these recommendations but will not restate them exhaustively. However, we wish to stress that critical components of a heat standard should include acclimatization requirements, emergency response requirements,

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[5] Lee J, Lee YH, Choi WJ, Ham S, Kang SK, Yoon JH, Yoon MJ, Kang MY, Lee W. Heat exposure and workers' health: a systematic review. Rev Environ Health. 2021 Mar 22;37(1):45-59.
[6] Center for American Progress. The Health Care Costs of Extreme Heat. https://www.americanprogress.org/article/the-health-care-costs-of-extreme-heat/
[7] Romanello M, Di Napoli C, Drummond P et. al. The 2022 report of the *Lancet* countdown on health and climate change: health at the mercy of fossil fuels. Lancet, 2022; 400:1619-1654.
[8] The Lancet Countdown on Health and Climate Change data explorer. Change in Labour Capacity. https://www.lancetcountdown.org/data-platform/health-hazards-exposures-and-impacts/1-1-health-and-heat/1-1-4-change-in-labour-capacity
[9] Working on a warmer planet: The effect of heat stress on productivity and decent work. International Labor Organization, 2019. https://www.ilo.org/global/publications/books/WCMS_711919/lang--en/index.htm

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medical monitoring, medical removal protection, worker and supervisor training, free access to potable water and water breaks, and, of course, the full range of engineering and administrative controls.

We believe that OSHA should enact an Interim Standard for Occupational Heat Stress for both outdoor and indoor workers as OSHA continues to work on a permanent standard. Outdoor workers must include farmworkers, who are disproportionately affected by heat stress. As in the creation of any OSHA standard, input from unions, workers, employers, and other stakeholders will be instrumental in creating an effective standard. Both an interim and final standard will require rigorous enforcement.

Heat stress is a completely preventable occupational hazard causing many worker injuries, illnesses, and deaths. As always, ACOEM stands ready to assist OSHA in any way to achieve an Interim and Final Standard to protect U.S. workers from heat stress. Please do not hesitate to contact Dane Farrell (Dane@cascadeassociates.net), ACOEM's Government Affairs Representative, with any questions.

Sincerely,

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