www.HEAT-SHIELD.eu

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A HEAT-DEFENSE PLAN FOR KEEPING WORKERS SAFE AND PRODUCTIVE IN THE HEAT

A guide for employers and enterprises

Have a plan

Don't be caught off guard! Have a plan in place for what you need to do during periods of high heat stress ***before*** hot weather occurs. This heat defence plan can serve as the back-bone of your plan, but make sure that you have everything you need to enact your heat defence plan when you need it. This can be in terms of materials, such as having coolers or water containers ready which can be filled to provide workers with elevated hydration demands or having ice on site to provide additional cooling for your workers. You also need to make sure your employees are familiar with the heat defence plan and know what they should do to take care of themselves and their colleagues during periods of hot weather.

Pay attention to the weather and the local climate

Again, don't be caught off guard! Sign up to a weather notification service that will alert you to an approaching period of hot weather, which could affect your workers' health and productivity. We recommend using our very own Heat-Shield weather notification system, which can be found at https://heatshield.zonalab.it/. Not only will you get weather notifications, but you will also receive recommendations on heat defence actions you should take depending on the weather, the type of work your enterprise needs and the clothing ensemble your workers wear to work.

The hazards of excessive heat in workplaces are not only associated with heat waves. In large parts of the world the typical seasonal variations in climate create heat conditions that threaten the health and productivity of working people. You can get user-friendly information about the climate in your location in the Heatshield supported website www.ClimatecHIP.org.

The website pops up if you put the word "climatechip" into Google. Then go to "Your Area" and the ongoing maximum daily temperature trend in the location of the computer pops up. A different location can be found by putting in the name in the "search" box. A variety of monthly presentations of different heat variables can be shown, including the occupational heat stress index, WBGT (estimates for working in the shade). Future increasing trends of heat based on different climate change models can also be seen.

Assess the risk

It is important to note that ***everyone*** is susceptible to heat stress and the related health risks. Older people are at particular risk during heat waves, however, studies have shown that young healthy men in physically intense jobs actually make up most of heat related health problems. With that said, you should take the time to make a list of people who might be at extra risk for heat related injuries. This list should include: older workers, workers who have particularly physically demanding jobs, workers who operate in particularly hot areas (e.g. exposed to the sun, works close to hot machinery), new workers who have not experienced occupational heat stress before and workers who have had issues with the heat in previous summers. When hot weather hits, you may consider giving these workers lighter tasks, giving them extra break time, or checking with them every now and then to make sure they are feeling alright. It is also a good idea to invoke a “buddy system” where workers have a pre-determined “buddy” that they check with every half hour to make sure they are feeling alright.

Give extra breaks

Working in excessive heat slows many types of work activities down and reduces hourly productivity. It may seem counterintuitive, but giving your workers extra breaks throughout the day may reduce the heat related impact on net productivity. This is because when the weather heats up, workers will naturally

start to take more unplanned breaks and slowing down their work efforts. By giving pre-planned breaks, we recommend 2-5 minutes every 30 minutes, you can reduce the number of unplanned breaks workers take and use this time to actively cool them using fans, cool water, or other methods (see below).

Reorganize the work day

An easy, low cost and effective way to maintain your workers' health and performance in the heat is to reschedule the workday. This can be done by one of two ways (or both): 1) Start the work day 1 to 2 hours earlier. This allows for your employees to be active during overall cooler hours of the day. 2) Schedule the days so the most physically demanding tasks (when workers will be producing the most amount of heat internally) to the coolest hours of the day and save the easiest tasks for the hottest hours of the day. The same approach can be used for indoor and outdoor tasks, where the outdoor tasks should be performed during the coolest parts of the day.

STAY HYDRATED!

This is probably the most important point of the entire plan. All of the negative effects that heat can have on the body are made worse by dehydration. This especially true for decreasing your workers cognitive performance, which can lead to mistakes, accidents and injuries. Furthermore, being chronically dehydrated will increase your workers' likelihood of developing kidney disorders after long-term heat exposure and dehydration. What is particularly worrisome is that many of workers come to the job in a dehydrated state (potentially up to ***~70%* of workers** depending on the industry). Then, in particularly hot and sweaty conditions, a worker may sweat as much as 10 liters per work shift.

Encourage workers to drink regularly. This can be helped by putting up posters in common areas like break rooms that help to remind workers to drink. Water stations should be set up in multiple locations at job sites. For outdoor work, workers can be encouraged to carry hydration backpacks or belts with water bottles on them, in order to have consistent access to water. Alternatively, "water caches" such as coolers containing water or large water jugs hidden in the shade of a tree can be set up in the field at the start of the work day in areas where workers will pass by.

Additionally, for those who are “heavy sweaters”, simply drinking water may not be sufficient to remain hydrated and these individuals should add extra salt to their diet. Of note, this may be inappropriate advice for people with heart and blood pressure issues. If a worker has one of these issues, they should check with their doctor before adding extra salt to their diet.

Create “cooling oases”

As stated above, taking pre-planned breaks is essential for maintaining worker productivity, and this can be optimized by taking these breaks in “cooling oases” where workers can benefit from extra cooling. For example, indoors, small dedicated rooms with air conditioning and cool water can be set up. If no rooms are available, areas away from hot machinery, equipped with electric fans and (cool) fresh water could be helpful. Outdoors, selecting an area with plenty of natural air flow that is in the shade is ideal. If no natural shading is present, portable sun canopies can be purchased and set up along with the water supplies for the “water caches” discussed above.

Cooling options during breaks

For extra cooling during breaks, several options exist:

Ice slurry ingestion: this can be done by adding shaved ice to ingested fluids, purchasing an ice slushy/slurry/Slurpee machine for a company break room. Just cooling the water, if the addition of ice is not possible, is another solution (although for the greatest cooling effect, ice is desirable).

Arm immersion: this can be achieved by purchasing a large tub, filling it with water and ice and having your workers submerge their arms as deep as possible into the water for 5 minutes. This has been shown to be a very effective way to deliver effective cool a person quickly and in a not-too-complicated fashion.

Cooling vests: Typically, these are better worn over prolonged periods. Cooling vests come in two forms: phase change materials and evaporative cooling. Phase change vests contain ice or a cooled gel that gradually cool the person wearing the vest as they work. These vests are highly effective. However, once all the cooling substance has melted, the cooling effectiveness will cease. Therefore, the vests need to be changed once they have lost their cooling effect. This requires a

cooling source such as a freezer to be relatively close to the work site which may cause logistical issues. Evaporative cooling vests just need to be wet and as the water evaporates gradually, the vests provide cooling. These vests are typically not as effective as the phase change vests and are not effective in very humid environments, but are less of a logistical challenge to operate. Additionally, new types of clothing that have personal fanning units incorporated into the clothing have recently come on the market and can provide an added cooling benefit for the worker.

Ice towels: This method is a cheaper alternative to cooling vests and can be a good solution during short periods with very high heat stress (and can be used for cooling during breaks) or in emergency situations with acute need to lower skin temperature (and if used over prolonged periods lower deep core temperature as well). This method essentially consists of wetting towels with water and then filling the towels with ice.

Stationary Ventilation: As mentioned above, by improving air flow across the skin, the body's natural heat loss processes are enhanced. This is especially true if the skin is wetted with a spray, cloth, or sponge. This way, extra evaporative cooling happens in addition to the normal evaporative cooling the workers would get from sweating.

Optimize clothing

A very simple and effective way to improve worker comfort, health and performance in the heat is to simply ensure they are wearing appropriate clothing for the conditions. Clothing that should be worn in hot conditions should be light, loose, made of breathable fibres, and have large knitting patterns, which again, allow for the clothes to "breath", that is for more air to pass across the skin surface. If the employee is working outdoors, it is advisable that they wear long pants and long-sleeved shirts as well as a hat to protect their skin against solar radiation. Also, lighter colour clothing may be advisable outdoors, as this too will help reflect solar radiation. Indoors, workers are advised to again wear light, loose clothing, however they should try and expose as much skin as possible to facilitate heat loss. For those working in industries where thicker, protective clothing is required, buying versions of these items of clothing that have mesh patches

incorporated into more protected areas such as the armpits, groin, elbows and behind the knees are advisable.

Signs and symptoms of heat illness

It is important for all supervisors and workers to be aware of the signs and symptoms of heat illness. These include:

Early, slight symptoms

- Tiredness
- Weakness
- Dizziness
- Headache
- Muscle Cramps

Later, more severe symptoms

- Cessation of sweating
- Breathing: fast and shallow
- Confusion
- Nausea or vomiting
- Fainting
- Skin: may be cool and moist
- Paleness
- Pulse rate: fast and weak

Treating heat illness

In the event of a worker experiencing the symptoms of heat illness, you should:

1. Move him/her to a cool area and out of the sun
2. Get her/him to sit down, loosen the clothing and take a rest
3. Make him/her drink plenty of cool water
4. Apply cool water on the workers' skin

If the worker loses consciousness, emergency medical services should be called immediately. In the interim, whatever cooling is available should be applied until emergency personnel arrive. These cooling interventions can be as simple as wetting the skin, applying ice to the body, particularly around the head and neck, and immersing the person in a tub of cool water if one is available.

Climate change consequences

An important current concern is the ongoing climate change and the consequences it will have for heat conditions in different kind of workplaces in the future. The environmental heat levels will certainly increase and the likely developments are shown in the Figure below. WBGT (Wet Bulb Globe Temperature) is a commonly used occupational heat stress index. When the hourly levels exceed 26°C physically intense work, such as in construction and agriculture, is affected by health and productivity threats.

Actions to reduce climate change and the threats to enterprises and their staff shown in the maps (and on the website ClimateCHIP.org) include:

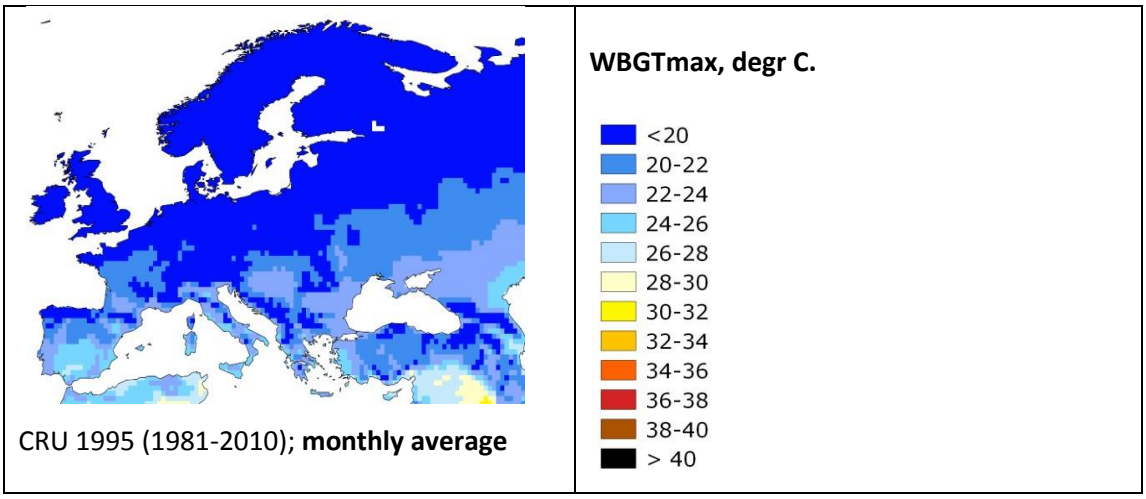
- producing and using electricity from renewable sources

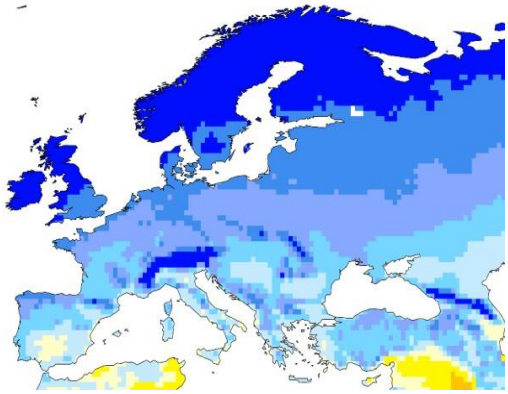
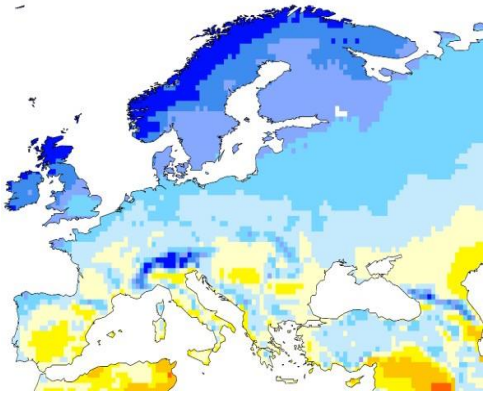
- reducing energy waste inside the production process and in heating or cooling enterprise buildings

- limiting travel needs for staff and using public transport or active transport (bicycling or walking) for unavoidable work travel or commuting

- exploring and implementing other greenhouse gas reducing changes in the operations

Figure. Regional distribution of afternoon heat levels (hourly) in Europe during the hottest month; recent years and end of century values; WBGT heat index levels in the shade (from Kjellstrom et al., 2018. Int. J Biometeorology).



	
HadGem - GFDL mid-point, RCP6.0, 2085 (2071- 2099); **monthly average**	HadGem and GFDL mid-point, RCP6.0, 2085 (2071- 2099); **hottest 3 days**

Further questions or concerns?

For more information on these and other ways to heat-proof your workplace, visit www.heat-shield.eu or contact consult@heat-shield.eu for free guidance and consultancy on heat-health actions for your company.