

# *TerranearPMC Safety Share*

## **Week of July 18, 2011 – Heat Stress**

In the late 1950's, at the U.S. Marine Corps Recruit Depot on Parris Island, South Carolina (made famous by the Stanley Kubrick movie, *Full Metal Jacket*), there was particularly high humidity. Marines were required to perform high intensity exercises while in full uniform which resulted in a significant number of casualties due to heat stroke. This prompted the Department of the Navy to commission a number of studies relating hot weather conditions with exercise performance. These studies gathered information and developed the heat stress index, which today is known as the wet bulb-globe temperature (WBGT) – often pronounced as web-get.

WBGT measurements are designed to take into account not just the actual temperature, but humidity and radiant effects as well. By combining all three factors, an assessment can be made as to how the specific weather conditions may affect human health. While we all understand that temperature is the measurement of molecular movement, the level of humidity can really make a difference in the comfort level which one might experience. Anyone who has experienced 95°F heat in Florida and 95°F in Las Vegas, can attest that it would be far more pleasant to be in Vegas (ah, but it's a dry heat!). That's because the high humidity in Florida (maybe I should include Houston as well?) reduces the ability for our sweat to evaporate – a major natural cooling mechanism. The reason for this is that as the humidity increases, the air becomes saturated with moisture and therefore, has a reduced ability to allow more moisture – in this case human sweat- from entering the atmosphere. Thus, when we sweat in humid locations, our sweat just accumulates on our skin (and clothes), while in desert locations, the air is dry and has the driving force to allow moisture into the air (the only people who show visible signs of sweat in Vegas are those sitting at the poker tables).

In addition to high humid conditions and its ability to inhibit our natural cooling process, radiant affects can greatly influence our body's heat stress burden. Picture a black 55-gallon drum that is left outside in the sun when the temperature is 95° F. By the afternoon the surface of the drum will be so hot (much hotter than 95°F) that one could, in all likelihood, burn their fingers if touched without gloves. The reason for this extreme temperature is due to the sun's radiant effects from visible and ultraviolet wavelengths contacting the drum and causing a transfer of energy in the form of heat. This is the reason why it is so important to wear light-colored clothing during high heat stress conditions as darker colored garments will absorb more visible and UV wavelengths and thereby increase our heat stress burden.

Yes, working in high heat stress conditions must be taken seriously. Over the past few years there have been many tragic incidents involving high school, college and even professional football players that have succumbed to the conditions of heat stress. These events happen during the summer months when athletes are in training-mode and are fully outfitted and not yet acclimatized to their heat stress surroundings. Too often their conditions turn serious before someone notices, resulting in a trip to the

hospital and even death. Such tragedies occurred, not when the victims were alone and in a remote location, but in the middle of the football field with other players and even with coaches and medical staff present. Such was the case of Minnesota Viking Pro-bowl offensive lineman Korey Stringer in 2001 and a 15-year old high school student from Kentucky in 2009. In this last case, criminal charges of reckless homicide were brought up against the football coach.

Upon examining such tragic events, such misfortunes become even more astounding as we realize that in each case, these events were 100% preventable.

Using the traditional WBGT instrument is a great indicator to let us know if we are working in a potential heat stress environment. These instruments contain a standard dry bulb thermometer (to determine traditional atmospheric temperature), wet bulb thermometer (a dry bulb thermometer with a wetted wick that measures temperature as it is affected per evaporation) and a globe thermometer (a standard thermometer inside a black ball that will measure the radiation effects). However, while the WBGT provides us with an indication of heat stress conditions, it does not give definite information as to whether an individual is being burdened to the point of succumbing to heat stress conditions. This is because as humans we all have our unique susceptibilities and as such, how one person handles their environment may be completely different from another. Some of the influencing factors that can affect us in potential heat stress situations are:

- Rigor of work (heavy, medium, light)
- Clothing (non-breathable fabrics)
- Age (defense mechanisms may not operate to peak capacity)
- Predisposing health conditions (poor circulation, physical ability, agility, etc)
- Acclimatized to the specific environment

While OSHA does not have a published standard or regulation for working in heat stress conditions, the American Conference of Governmental Industrial Hygienists (ACGIH) does have a work/rest regimen that considers work rigor and type of clothing. In addition, ACGIH has published guidelines regarding internal core temperature measurements (100.4°F) and monitoring heart rates – both of which provide a direct indication of whether an individual needs to stop work and rest and hydrate. The rule of thumb is when one's heart rate exceeds 180 minus their age, they are taxing their body beyond the normal limits and therefore, should leave the work area and rest (shaded area and **water consumption!**).

Having a company policy or procedure that specifies the appropriate steps to take while working in a heat stress environment is an important document which everyone working in the field should read and be familiar.

Making the proper determination of the burden from heat stress conditions requires a number of assessment steps and therefore should include the involvement of your Safety and Health professional. Heat stress is dangerous and should always be taken seriously – your life depends on it!

**Judge each day not by the harvest you reap but by the seeds you plant.**

Robert Louis Stevenson