

Wet Bulb Globe Thermometers to Measure Heat Exposure for Construction



Why Using Wet Bulb Globe Thermometers to Measure Heat Exposure for Construction Employees is Recommended

Environmental heat is more than just temperature. Four factors contribute to heat stress in workers:

- Air temperature.
- Humidity. High relative humidity makes it difficult for the body to cool itself through sweating.
- Radiant heat from sunlight or artificial heat sources such as furnaces.
- Air movement. In most situations, wind helps workers cool off.

An environmental heat assessment should account for all of these factors. OSHA recommends the use of wet bulb globe temperature (WBGT) monitor to measure workplace environmental heat.

A WBGT has the following sensors –

- A dry bulb thermometer to measure the ambient air temperature.
- A natural wet bulb thermometer to measure the potential for evaporative cooling.
- A black globe thermometer to measure radiant heat.

The WBGT instrument should be placed close to the work location. For example, if the work is in direct sunlight, then the WBGT instrument should be in the sun. Employers should always follow the WBGT manufacturer's instructions about setup, calibration, and use.

WBGT has important advantages over other environmental heat measurements. One major advantage is that WBGT accounts for all four major environmental heat factors – temperature, humidity, radiant heat, and wind. In contrast, standard thermometers only assess one factor (air temperature). Heat Index is another common way to measure heat stress. It is measured in the shade and combines air temperature and relative humidity to represent how hot the conditions feel at rest. The heat index does not account for the effects of wind, sunlight, radiant heat sources, or workload – all of which influence exposure for roofers and solar installers. Air (dry bulb) temperature also ignore relative humidity. All these factors can influence the total heat stress experienced by workers.

Workplace environmental heat should be measured on-site using WBGT meters. Use of heat index is a less desirable substitute. While local weather reports based on

meteorological data from observation stations can be useful, the readings from these stations may not reflect the conditions at the specific worksite. Heat conditions at the worksite may be different for multiple reasons, from cloud cover and humidity to local heat sinks. The potential error increases with distance from the weather station.

In addition to possible distance-based errors, weather reports can be inaccurate if the worksite has features that affect heat conditions. These features include:

- Indoor work – A weather report cannot gauge conditions inside a building.
- Direct sunlight – Weather services measure temperature and Heat Index in the shade. Work in the sun may be considerably hotter. Direct sunlight can increase Heat Index by up to 13.5°F (7.5°C).
- Heat sources – Weather reports cannot account for the heat generated by fires, hot tar or other materials, or other hot equipment, or heat-absorbing surfaces such as roof surfaces.
- Wind blockage – Some worksites may be hotter than surrounding areas because of structures that block air movement. Examples include trenches and bowl-shaped roof parapet.
- Reflective material – Water, metal, or other materials can reflect sunlight onto workers.

At worksites with the above features, weather reports are unlikely to provide accurate estimates of environmental heat. Employers should use an on-site measurement such as WBGT.

NIOSH, ACGIH, the U.S. military, and many athletic organizations recommend WBGT for measurement of heat stress in workers and athletes.

Use of Heat Index for Screening

The Heat Index does not measure worksite heat as accurately as WBGT. Employers should not rely on Heat Index alone for the most accurate hazard assessment. Some employers may find the Heat Index helpful as part of more comprehensive workplace hazard assessment.

Outdoor workers have died of heat stroke when the day's maximum Heat Index was only 86°F. OSHA has found that less severe heat-related illnesses can happen at even lower Heat Index values. Employers who choose to monitor the Heat Index should be aware of the heat-related illness risk for workers below the national and local weather service heat advisory warnings for the public.