



WBGT Indoor Versus WBGT Outdoor

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Question: Which Index do I Use?

The WBGT Index was developed to model the stress imposed on humans by sultry environments. It was later found to over estimate the stress when used outdoors in situations where the largest source of radiant was the sun. The original index is called Indoor WBGT and is described as $0.7 \text{ WBN} + 0.3 \text{ Gv}$. The modification is called Outdoor WBGT (with solar load) and is described as $0.7 \text{ WBN} + 0.2 \text{ Gv} + 0.1 \text{ DB}$.

Where WBN = Naturally Ventilated Wet Bulb temperature

Gv = The temperature inside a "Vernon (6" black) Globe"

DB = The common Dry Bulb temperature (air temperature)

Answer

The NIOSH recommended use of these two equations states that the indoor index should be used in all cases except that of outdoor with solar load.

In general terms the solar load case is special because the sun has a minor effect on a worker (head and shoulders) than other heat sources. This outdoor index therefore provides a less conservative measure of heat stress.

But What About Old Data?

In cases where WBGT data have been inappropriately accumulated using the outdoor WBGT index; there are a few points to consider in determining the usefulness of this data. A mathematical, practical and economic discussion is required.

By analyzing the two equations it can be seen that if the radiant load is low such that the globe temperature approaches the dry bulb temperature the two indices become the same:

$$.7 \text{ WBN} + .2 \text{ Gv} + .1 \text{ DB} = .7 \text{ WBN} + .3 \text{ Gv: if Gv} = \text{DB}$$

This comparison can be expanded to a globe temperature 10° higher than DB. Then the outdoor index reads 1° lower (less conservative) than the indoor index.

WBGT Outdoor	WBGT Indoor
$.1 \text{ WBN} + .2 (\text{DB}+10) + .1 \text{ DB}$	$.7 \text{ WBN} + .3 (\text{DB}+10)$
$.7 \text{ WBN} + .3 \text{ DB} + 2$	$.7 \text{ WBN} + .3 \text{ DB} + 3$

Historical data is therefore still valuable if there is sound evidence that there was little or no radiant loading involved. In some cases this can be obtained subjectively from a trained individual (most

people can be trained to feel radiant load that will give a reading of GV 10° greater than DB on their faces or backs of their hands). This type of subjective opinion can not be allowed if the index is approaching a prescribed limit.

Some economic and/or confidence benefit may be realized by utilizing an inexpensive, simple to operate, meter to determine if a more detailed analyses is required.