Microclimate

Toolbox Talk

efnms
European Federation of National Maintenance Societies vzw

EHSEC

Microclimate

The atmosphere that surrounds us in our working area is called a thermal environment or microclimate.

Overheated working areas may cause heat stress that can:

- Cause damage to physical and mental health
- Cause fatigue or exhaustion at the body's thermoregulation system
- Limit the ability to react to external stimuli
- Be a parameter of increasing work-related accidents

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- Impact on health from heat stress
  - Problems such as cramps, electrolyte deficiency, dehydration, skin rashes, heat swelling, decreased capability for physical and mental work etc.
  - Serious diseases such as heat exhaustion, total body exhaustion that can cause serious injuries, heat stroke etc.
- Temperatures below 16°C may cause respiratory problems, increased pressure and fatigue of the cardiovascular system, etc.

Microclimate

- Excessive air velocity creates air streams that are defined as localized feelings of heat or cold in any area of the body and can cause irritation.

- On the other hand, excessively low air velocities, ranging from 0.08m/s and below, cause a feeling of stagnant air and a concentration of pollutants that are the same annoying and should therefore be avoided.

Microclimate

- Parameters for determination of the working thermal environment

Physical parameters	Other parameters
Air Temperature	Workload
Air Relevant Humidity	Clothing
Air velocity	Exposure duration
Thermal radiation	Health Condition

*Physical activity increases body temperature around 0,5oC for average work and above 4ºC for heavy work.

Legislation

Temperature-Relevant Humidity

The acceptable combinations of temperature and relative humidity, according to the standards of the ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) No 55-1992 and the International Organization for Standardization ISO 7730-1993, are:

20-23.5 ^{o}C for the winter
23-26 ^{o}C for the summer

With relevant humidity between **30 and 60%**

Thermal Comfort Index

For the thermal environment assessment, the ISO, standard 7243 has proposed the bioclimatic index **WBGT**- Liquid temperature index- (wet bulb globe temperature). That index is calculated through the following types:

- Internal spaces: WBGT=0.7tnwb+0.3tg
- External spaces: WBGT=0.7tnwb+0.2tg+0.1ta

where,

tnwb: the indication of the wet bulb thermometer

ta: the indication of the dry bulb thermometer

tg: the indication of the black globe thermometer

Measurement of harmful factors

- **Preliminary examination**
  - Collection of information (former measurements)
  - Indicative measurements
- **Measurements Strategy**
  - Choice of factors that will be measured
  - Finding appropriate methodology and measurement instruments
  - Conversation with the responsible persons for the accurate definition of the time and points of measurement
- **Conducting measurements by also recording the exact environmental conditions**
- **Results**
  - Recording and evaluating the results
  - Conclusions
- **Measurements Repetition**

Measurement of harmful factors

Results must be managed as follows:

- Recording the instrument output
- Evaluation
- Comparison of the results with the corresponding limit values
- Conclusions
- Proposals to reduce the exposure

Measurements repetition if necessary

Technical Documentation

- Choice of approved methods
- Instrument maintenance and calibration accompanied by the valid certificate
- Comparison of results with legal limits and recommendations based on other directives

Microclimate Measurements

Temperature and relevant humidity measurements

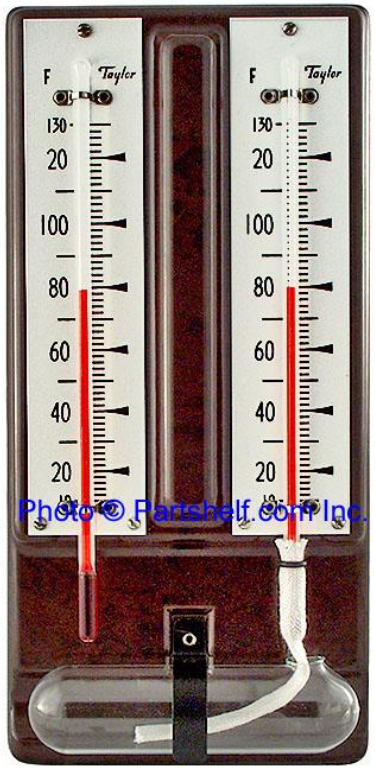
Digital thermometers

Microclimate measurements

Wet Bulb Thermometer⇨ WB

In this case the bulb is covered by the wick which has been dampened by distilled water.

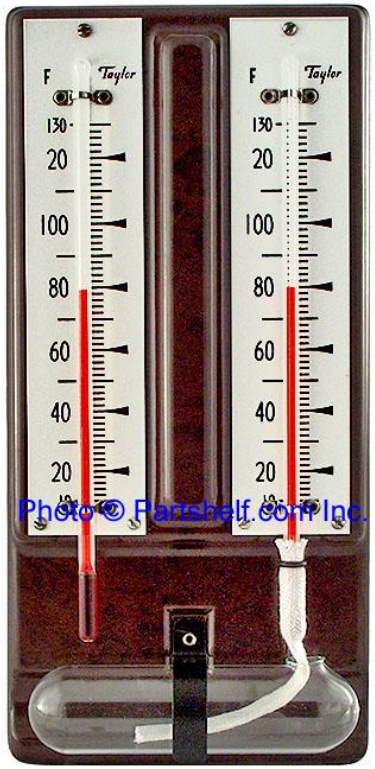
The water evaporation absorbs heat that yields the thermometer indication.



Microclimate measurements

Dry bulb thermometer⇨ DB

It is the highly widespread mercury thermometer used to measure the temperature of the air



Microclimate measurements

Black bulb thermometer⇨ GT

It consists of a copper ball painted on its outer side in black matte color and is used for measuring the thermal radiation

Microclimate measurements

Thermal comfort measurements

- Wet bulb thermometer⇨ WB
- Dry bulb thermometer⇨ DB
- Black bulb thermometer⇨ GT

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Thermal Comfort Index

WBGTinter.=0.7WB+0.3GT

WBGTexter.=0.7WB+0.2GT+0.1DB

Area Heat Stress Monitor

Microclimate measurements

Air Velocity measurements

When measuring, the white dot on the sensor must be opposite to the wind direction

Anemometer