

Understanding Heat Transfer



Modes of Heat Transfer

Heat always moves from a warmer source to cooler recipient

- **Convection** – transfer due to movement as in circulating air or fluid
- **Radiation** – transfer through emanating wavelengths like the sun, an oven or hot coals.
- **Conduction** – transfer through direct contact
- **Metabolic** – generation of heat through body functions and movements.

Modes of Heat Protection

Certain barriers or manipulations can protect against heat

- **Evaporation** – function of the body where sweat dissipates, releases trapped heat from the body, and causes a cooling reaction. In HIGH HUMIDITY this function is impaired.
- **Shade** – natural or constructed obstructions against sunlight UV radiation. This method reduces or blocks solar radiation, limiting heat transfer through the skin.
- **Convection** – if the temperature of your body or skin are higher than the air or fluid moving around you, then wind, fan, or running water can pull heat away.
- **Conduction** – use of a cooled object or substance to reduce body temperature. This works by cooling the skin and blood as it circulates through the cooled body part. Examples are cold packs, cold water tubs, cold vests, cool neck wraps, etc.
- **Sun Protection Factor (SPF)** – indicates level of protection multiplied by indicated time. The higher the numbers, the greater protection. However, no SPF is completely effective.
 - UV Protection from SPF 15 = 93%, while SPF 50 = 98%
- **Umbrellas, Sunglasses, Hats, and Clothing** – look for items that indicate UV protections to prevent skin from being burned or prematurely aged.

Temperatures of >90 F and/or Humidity >70% the body's cooling system are ineffective

Wet Bulb Globe Index

Ratio	Workload WBGT		
	L	M	H
Work : Rest			
Continuous	86	80	77
3 : 1	87	82	78
1 : 1	89	85	82
1 : 3	90	88	86

Discontinue or **closely monitor** all workload activity with frequent rest @ **WBGT > 90**

L = Light Workload
M = Moderate Workload
H = Heavy Workload

Relative Humidity (%)	NWS Heat Index															
	Temperature (°F)															
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

 Caution
 Extreme Caution
 Danger
 Extreme Danger

