

Warm Weather Alert for All Members - Fighting Heat Stress

Heat stress is an increase in human body temperature and metabolism caused by physical exertion and/or a heated environment which can lead to exhaustion, mental confusion, disorientation, dehydration, loss of consciousness, heart attack, stroke and other fatal illnesses.

Heat stress results from internal, metabolic heat buildup (from working in bunker gear, for example) and external stress related to environmental factors, such as personal protective equipment. As the core temperature rises, so does the risk of heat stress. Performing strenuous tasks in the heated environment of a fire scene or in warm or humid weather can also increase the risks of heat stress.

Simple preventative measures can be taken to avoid heat injuries, including drinking fluids frequently throughout the day to stay well-hydrated and wearing a single layer of porous cotton under protective gear to keep the least amount of heat from becoming trapped near the body.

Becoming Acclimated

The rate at which people sweat is determined not only by genetics, but by hydration, state of acclimation and aerobic fitness. You can't sweat if your body doesn't have enough water. In order to maintain normal body function, fire fighters must replace fluid as soon as possible.

Acclimation is a physiological adaptation that the human body makes with repeated exposures to heat stress during exercise. It increases our rate of sweat production and shortens the time it takes for the sweating response to start and conserves sodium. Regular and sustained aerobic exercise can help with acclimation. Fire fighters who maintain an adequate level of fitness will have reduced cardiovascular strain and lower core temperature for the same level of heat stress. Fit fire fighters also tend to have reduced levels of body fat – and aren't carrying extra non-functional weight. Therefore, less energy is required by a fit person to do the same job as a less-fit person.

It is important for fire fighters to acclimate themselves to heat and know how to prepare for the summer weather. If sweat cannot evaporate, it doesn't matter how fit, how acclimated or how hydrated you are -- thermo-regulation will be compromised. In addition, it is essential that fire fighters are aware of the signs and symptoms of heat stress in order to detect it early and take the appropriate measures.

Heat Stress Symptoms

At first sign of symptoms, fire fighters should notify the officer in charge and immediately: institute work/rest cycles; keep cool and avoid radiant heat; drink small amounts of the appropriate fluids; avoid coffee, tea and alcoholic beverages; and use water spray bottles, fans and damp towels.

Some predisposing factors to heat stress include sustained exertion in the heat by unacclimatized workers; lack of physical fitness and/or obesity; recent alcohol intake; dehydration; individual susceptibility; chronic cardiovascular disease; and failure to replace water lost in sweat.

To prevent heat stress, follow these guidelines:

- Provide medical screening of fire fighters.
- Acclimatize for five to seven days by graded work and heat exposure, monitoring workers during sustained work in severe heat.
- Drinking ample water frequently throughout the work day.
- Ensure adequate salt intake with meals and supplement salt intake at meals for unacclimatized fire fighters.
- Provide cool sleeping quarters to allow skin to dry between heat exposures.

Fire fighters also need rehabilitation to ensure they can safely return to active duty following a work rotation. Measure the heart rate on each emergency responder (this can be measured by the worker himself) at the end of the work period. An effective rehabilitation program must include:

- Rest: a “time-out” to help fire fighters stabilize vital signs.
- Rehydration: replacing lost fluids/plasma volume.
- Restoration of core temperature through “active cooling” (warming).
- Medical monitoring and treatment.
- Relief from extreme climatic conditions (heat, cold, wind, rain).
- Refueling of calories and electrolytes.

Glossary of Terms

Heat Index

Heat Index combines air temperature and relative humidity to determine an apparent temperature – or how hot it actually feels. High heat-index days can be health and life threatening, even to the non-exerciser.

Humidity

Humidity is the amount of moisture in the air. Humidity is of particular concern to those whose primary cooling mechanism is perspiration evaporating. It's the evaporation of that perspiration that causes some cooling effect, not the process of perspiring itself. In other words, in water-vapor-saturated air (high humidity), there is no evaporation of perspiration, and therefore, our principle cooling mechanism is not functioning for us.

Dew point

Dew point is the temperature at which a vapor begins to condense. Dew points are sometimes reported or used rather than relative humidity. Beware of dew points above 70.

The table below can be used to estimate the heat index. The heat index is an accurate measure of how hot it really feels when the effects of humidity are added to high temperature. When the heat index is between 90° F and 104° F, sunstroke, heat cramps or heat exhaustion are possible with prolonged exposure and physical activity. When the index is between 105° F and 129° F, sunstroke, heat cramps or heat exhaustion are likely and heatstroke is possible. Heat indices of 130° or higher will result in heatstroke or sunstroke quickly.

Heat Index

The heat index (HI) is an accurate measure of how hot it really feels when the effects of humidity are added to high temperature.

The heat index is shown below in two tables. The first is a function of temperature/relative humidity (RH). The second is a function of temperature/dew point.

Heat Index Chart (Temperature & Dewpoint)

Dewpt (° F)	Temperature (° F)															
	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
65	94	95	96	97	98	100	101	102	103	104	106	107	108	109	110	112
66	94	95	97	98	99	100	101	103	104	105	108	108	109	110	111	112
67	95	96	97	98	100	101	102	103	105	106	107	108	110	111	112	113
68	95	97	98	99	100	102	103	104	105	107	108	109	110	112	113	114
69	96	97	99	100	101	103	104	105	106	108	109	110	111	113	114	115
70	97	98	99	101	102	103	105	106	107	109	110	111	112	114	115	116
71	98	99	100	102	103	104	106	107	108	109	111	112	113	115	116	117
72	98	100	101	103	104	105	107	108	109	111	112	113	114	116	117	118
73	99	101	102	103	105	106	108	109	110	112	113	114	116	117	118	119
74	100	102	103	104	106	107	109	110	111	113	114	115	117	118	119	121
75	101	103	104	106	107	108	110	111	113	114	115	117	118	119	121	122
76	102	104	105	107	108	110	111	112	114	115	117	118	119	121	122	123
77	103	105	106	108	109	111	112	114	115	117	118	119	121	122	124	125
78	105	106	108	109	111	112	114	115	117	118	119	121	122	124	125	126
79	106	107	109	111	112	114	115	117	118	120	121	122	124	125	127	128
80	107	109	110	112	114	115	117	118	120	121	123	124	126	127	128	130
81	109	110	112	114	115	117	118	120	121	123	124	126	127	129	130	132
82	110	112	114	115	117	118	120	122	123	125	126	128	129	131	132	133

Note: Exposure to full sunshine can increase HI values by up to 15° F

Heat Index Chart (Temperature & Relative Humidity)

RH (%)	Temperature (° F)															
	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
90	119	123	128	132	137	141	146	152	157	163	168	174	180	186	193	199
85	115	119	123	127	132	136	141	146	150	155	161	166	172	178	184	190
80	112	115	119	123	127	131	135	140	144	149	154	159	164	169	175	180
75	109	112	115	119	122	126	130	134	138	143	147	152	156	161	166	171
70	106	109	112	115	118	122	125	129	133	137	141	145	149	154	158	163
65	103	106	108	111	114	117	121	124	127	131	135	139	143	147	151	155
60	100	103	105	108	111	114	116	120	123	126	129	133	136	140	144	148
55	98	100	103	105	107	110	113	116	118	121	124	127	131	134	137	141
50	96	98	100	102	104	107	109	112	114	117	119	122	125	128	131	135
45	94	96	98	100	102	104	106	108	110	113	115	118	120	123	126	129
40	92	94	96	97	99	101	103	105	107	109	111	113	116	118	121	123
35	91	92	94	95	97	98	100	102	104	106	107	109	112	114	116	118
30	89	90	92	93	95	96	98	99	101	102	104	106	108	110	112	114

Note: Exposure to full sunshine can increase HI values by up to 15° F