



UNITED STATES MARINE CORPS  
MARINE CORPS BASE HAWAII  
BOX 63002 KANEHOE BAY HAWAII 96863

IN REPLY REFER TO:  
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BASE ORDER 6200.3

From: Commanding Officer, Marine Corps Base Hawaii  
To: Distribution List

Subj: MARINE CORPS BASE HAWAII HEAT INJURY PREVENTION PROGRAM

Ref: (a) BUMEDINST 6220.12C, Medical Surveillance and Notifiable Event Reporting  
(b) NAVMED P-5010-3 (Rev.2-2009), Manual of Naval Preventive Medicine, Chapter 3 Ventilation and Thermal Stress Ashore and Afloat  
(c) NEHC-TM-OEM 6260.6A, Navy Environmental Health Center Technical Manual, Prevention and Treatment of Heat and Cold Stress Injuries

Encl: (1) Prevention and First Aid for Heat Stress Injuries  
(2) Heat Condition and Flag Warning System  
(3) Work/Rest and Water Consumption Table

1. Situation. Marine Corps Base (MCB) Hawaii is located in an area of high temperatures and humidity. Because of high humidity, the cooling process of evaporation is hampered and can produce a dangerous health hazard possibly resulting in a heat casualty. Per the references, enclosures (1) through (3) contain information on prevention and first aid, the installation Flag Warning System, the Wet Bulb Globe Thermometer (WBGT) Index System, and a water usage guide that shall be used as required.

2. Mission. Establish requirements for preventing heat injuries aboard MCB Hawaii.

4. Execution

a. Commander's Intent and Concept of Operations

(1) Commander's Intent. Preserve the health and safety of the workforce during heat stress conditions. Utilizing Job Hazard Analysis (JHA) and Risk Management processes, along with information contained in the references, will reduce or eliminate mishaps associated with heat stress.

(2) Concept of Operations. Leaders at all levels are responsible for implementing the requirements and procedures within this Order to prevent injuries during heat stress conditions. Heat injury prevention shall be incorporated into all JHA and risk management worksheets developed for training, operational, and recreational events. Controls and countermeasures to prevent heat injuries will be included in safety briefings, operational orders, and letters of instruction pertaining to such events.

b. Tasks

(1) Director, Base Safety Directorate. Administer this Order and ensure it remains current and accurate.

(2) Commanding Officer, Marine Corps Air Station (MCAS), Kaneohe Bay

(a) Establish and maintain, through the Meteorological and Oceanographic (METOC) Center, WBGT Program, ensuring the WBGT Index is computed year-round, on a daily basis between 0700-1700 when the ambient air temperature exceeds 85°F.

(b) Heat Stress Logs shall be inspected regularly with site visits, command inspections, and higher headquarters inspections being scheduled periodically to ensure compliance with this Order.

(c) MCAS is responsible for ensuring proper dissemination of the WBGT Index (WBGTI) whenever its value exceeds 85°F (yellow flag conditions). Any change in the WBGTI shall be reported by MCAS METOC.

(3) MCB Hawaii, Command Duty Officer

(a) Upon notification of a change in the WBGTI by MCAS, the Command Duty Officer will post the appropriate flag designator to the flagpole located on the edge of Dewey Square.

(b) Disseminate information contained in the enclosures to the Duty Officers of all units or departments engaged in training.

(c) Notify MCB Hawaii Emergency Manager of change in the WBGTI.

(4) MCB Hawaii Emergency Management. Upon notification of a change in the WBGTI by MCB Hawaii Command Duty Officer, the Emergency Manager will disseminate information to the MCB Hawaii community by using mass email technology, computer pop-ups, cellular voice, and text messages.

(5) Combat Logistics Battalion 3, Command Duty Officer. Upon notification of a change in the WBGTI, the Command Duty Officer will post appropriate flag designator to the flagpole located in front of building 1086.

(6) Marine Aircraft Group 24, Command Duty Officer. Upon notification of a change in the WBGTI, the Command Duty Officer will post appropriate flag designator to the flagpole located behind building 301.

c. Coordinating Instructions

(1) Commanders, Commanding Officers, Officers in Charge, Directors and Managers, and Senior Enlisted shall ensure heat injury prevention programs reflect command presence and leadership initiatives.

(2) Tenant Commanders may implement policies that meet or exceed the requirements of this Order. Policies shall address the requirements outlined in the enclosures as applicable.

(3) Tenant Commanders shall use the standard WBGTI and Heat Condition and Flag Warning System, as outlined in enclosure (2). Flags shall be posted at designated locations described in this Order.

(4) Commanders and Commanding Officers shall ensure annual heat injury awareness training and education is obtained from appropriate

qualified medical personnel. Report all heat related injuries and illnesses in accordance with reference (a).

5. Command and Signal

a. Command. This Order is applicable to MCB Hawaii staff and tenant command, all organizations and activities aboard MCB Hawaii.

b. Signal. This Order is effective on the date signed.



ERIC W. SCHAEFER

PREVENTION AND FIRST AID FOR HEAT STRESS INJURIES

1. General

a. The human body uses energy as a vital process. Energy produced becomes heat, which at ordinary temperatures is radiated from the body to the environment. When the temperature of the environment equals that of a person's skin, this is no longer possible.

b. When heat in the environment is higher than that of a person's skin, the process is reversed and the body gains heat.

c. When the body cannot lose heat to the surrounding environment, sweating occurs. When sweat evaporates, it transfers heat from the body to the surrounding air. This process cools the body, enabling it to maintain normal temperature. Sweating also causes loss of bodily fluids and minerals, including sodium (salt). The loss of salt in the body upsets heat regulating mechanisms of the body, which may result in a heat casualty.

2. Types, Causes, Symptoms, and First Aid

a. There are three basic types of heat stress injuries: heat exhaustion, heatstroke, and heat cramps. Heat exhaustion may progress into heatstroke, which is the most serious of the conditions. Unless promptly treated, heatstroke may result in death or permanent brain injury. Heatstroke is a medical emergency that must be treated immediately.

b. With heat exhaustion, the skin is sweaty, cool, and pale, whereas heatstroke presents on the skin as dry, hot, and flushed. Types, causes, symptoms, and first aid treatment for the most serious types of heat stress injuries are as follows:

c. Heat Exhaustion

(1) Causes. Excessive salt and water loss, exposure to high temperatures, humidity, or solar heat may be contributing factors, as well as arrival in a hot climate, and too much clothing.

(2) Symptoms. Skin is cool and moist; pulse is rapid and blood pressure may be low. Other symptoms are profuse sweating, headaches, tingling in hands and feet, paleness, difficulty breathing, irregular heartbeat, loss of appetite, nausea, and vomiting.

(3) First Aid

(a) Send for medical aid.

(b) Place victim in a cool, shady place with circulating air.

(c) Lay victim down with head level, or lower the victim's feet.

(d) Loosen clothing and remove equipment.

(e) If victim is conscious, give liberal quantities of water in small sips.

d. Heatstroke

(1) Causes. Heatstroke is the most serious of heat stress exposure related injury. Heatstroke results when the body's core temperature gets too high and the body is no longer able to cool itself.

(2) Symptoms. Early signs are headache, dizziness, delirium, weakness, nausea, vomiting, and excessive warmth. Skin is usually hot, red and dry, body temperature may be as high as 106. May go through heat cramps or heat exhaustion; a sudden collapse and loss of consciousness followed by coma and convulsions may occur. Sweating may or may not be present. Death and/or brain damage may occur if body temperature is not lowered.

(3) First Aid

(a) Immediately seek medical attention.

(b) The primary concern is to lower the body temperature as soon as possible. Immediately cool victim's body with water or wrap them in cool wet material.

(c) Move casualty to a cool, shady place with circulating air. Do not attempt to make them drink.

(d) Loosen clothing and equipment.

(e) Apply cool water or ice to the entire body and be careful to avoid nose or mouth.

(f) Fan patient constantly to promote cooling of body by evaporation of applied water.

e. Heat Cramps

(1) Causes. Heat cramps are painful muscle spasms that result from the loss of salt and electrolytes due to excessive sweating.

(2) Symptoms. Muscle cramps of the arms, legs, and/or stomach and excessive sweating.

(3) First Aid

(a) Move individual to a cool, shady area or improvise shade; loosen clothing.

(b) Monitor the individual and give water as tolerated. The patient should slowly drink at least one full canteen or quart equivalent.

(c) Treat by drinking fluids containing electrolytes such as calcium, sodium, and potassium.

3. Avoidance

a. The human body contains a great deal of water and a considerable amount of salt. Sweating causes the body to lose these items and they must be replenished.

b. Food, to the body, is like fuel to a fire. Consequently, there is less need for food in hot weather than in cooler times.

4. Prevention. The following are a few simple rules to avoid heat exhaustion and heatstroke during hot weather:

a. You are encouraged to drink water frequently and to drink as much as you need. Infrequent large intakes may lead to stomach distention, vomiting, and/or cardiac problems. When working on your own, drink water when you want it and drink all you want. You may need from two quarts to three gallons a day when consuming field rations and performing heavy work in hot weather. In fact, the need for water may exceed the desire.

b. Stay away from "cold drinks" while still sweating.

c. The average diet provides the necessary daily salt requirements. Salt tablets should be avoided, unless prescribed and under the supervision of a medical representative.

d. Keep your headgear on in the sun and remember light and loose clothing will actually reflect the sun's heat.

e. If you feel sick or dizzy when heated, take it easy for a while. Do not over exert yourself.

f. If you stop sweating, get medical aid immediately.

g. Eat lightly in hot weather and avoid sweets.

h. Poor physical condition, lack of muscle tone, obesity, alcohol, and lack of sleep increase susceptibility to heat illnesses.

5. Acclimatization

a. Personnel who are not accustomed to physical activity under conditions of high temperature are particularly susceptible to heat injury. This is especially true of individuals who are ten pounds or more overweight, or in whom a circulatory or sweating deficiency is noted. Conditions of high humidity and solar heat increase the possibility of heat injury.

b. Training programs for personnel who are climatically and/or physically deficient should be limited in intensity and time. A break-in period of two to three weeks with progressive degrees of physical exertion and heat exposure will usually suffice for achieving acclimatization. During the period, the workload should be increased gradually but not to the point of exhaustion or where personnel will be unduly fatigued the following day. Until acclimatized, personnel will lose greater than normal quantities of water and salt. These losses must be replenished.

c. While acclimatization increases tolerance for heat, it does not make an individual immune to becoming a heat casualty. Overexertion can lead to heat illness even in mild weather.

6. Water Intake. Water intake must be sufficient to replace what is lost through sweating. During field exercises in hot weather, this will require an allowance of up to one pint of water per individual per hour if heat exhaustion is to be avoided. Personnel should be encouraged to drink water

in small, frequent amounts. See enclosure (3) for water requirements for activity level versus mean temperature.

7. Rest, Sleep, and Recreation During Acclimatization Periods. Sleeping, messing, and recreation quarters should be screened and well ventilated by either natural or mechanical means. A Wet-Bulb Globe Temperature Index of more than 80°F during the day calls for artificial cooling if possible.

8. Aid Stations. Field Aid Stations should be prepared to treat cases of heat injuries. Artificial cooling devices should be employed at the aid stations and in ambulances whenever possible.

9. Previous and Inter-current Illness. Susceptibility to heat injury is greatly enhanced by illness, infections, or any febrile condition including reaction to immunization. A previous history of heatstroke, vascular disease, or skin trauma such as heat rash, acute sunburn, or any condition affecting sweat secretion or evaporation, increases the risk of heat injury. These cases call for special consideration by medical personnel.

10. Clothing

a. Clothing and equipment should be worn in such a way as to provide maximum skin ventilation without unnecessary exposure to bright sunlight.

b. In adjusting clothing and equipment, care should be taken to avoid restricting the flow of blood.

c. Personnel wearing protective gear, such as Kevlar or bullet proof vests should ensure they maintain adequate hydration.

11. Instruction. All Marines should receive periodic instructions from the Medical Department concerning the prevention, recognition, and emergency treatment of heat related injuries.

HEAT CONDITION AND FLAG WARNING SYSTEM

1. Control of Physical Activity

a. Wet-Bulb Globe Temperature Index (WBGTI). This index combines shade, air temperature, radiation, humidity, and wind into a single value to be used as a guide for controlling training. It is obtained by reading three simple instruments and multiplying each reading by a known factor. The results are then totaled and added to create the index. Training programs in warm weather should be planned provisionally on the basis of the WBGTI.

b. Instruction

(1) Shade Dry Bulb (DB) Thermometer. This is an ordinary thermometer which measures air temperature.

(2) Wet Bulb (WB) Thermometer. This is an ordinary thermometer with a moist wick surrounding the bulb. The WB reading will be the same as the corresponding DB only when the relative humidity is 100 percent. The WB thermometer will read less than the DB thermometer because of evaporative cooling of the bulb by the surrounding wick. The difference between the readings of the two thermometers becomes greater as humidity becomes less.

(3) Globe Thermometer (GT). This is an ordinary thermometer inserted through an airtight stopper into a hollow copper ball six inches in diameter. The ball is painted matte black on the outside. The stem of the thermometer is exposed for the reading. The black surface of the ball absorbs heat from the sun and other surfaces that may exceed the globe in temperature. The ball loses temperature to the cooler air by convection and to cooler surfaces by radiation. In an unshaded outdoor position, the GT reading is normally above the DB thermometer reading. Daytime readings of 20°F or more above the air temperature are observed under calm, sunny conditions. Either a decrease in radiant heat or an increase in wind velocity, or both, will lower the globe reading. Therefore, the GT reading is a balance between heat gained by radiation and heat lost by convection. The reading can be said to include air temperature, air movement, and radiation.

(4) Results. It can readily be seen the three instruments described above take into account all four variables of the thermal environment: temperature, humidity, radiation, and air circulation.

c. WBGT Formula. The WBGT is calculated as follows:

$$\text{WBGT} = \text{WB} \times 0.7) + (\text{Globe temperature} \times 0.2) + (\text{Dry Bulb} \times 0.1)$$

The formula applies to environments that are warm enough to cause sweating and to the type of hot weather clothing now worn by Marines and Sailors.

d. WBGTI

(1) When the WBGTI exceeds 80°F, heavy exercise for unacclimatized personnel should be conducted with caution and under constant supervision.

(2) When the WBGTI exceeds 85°F, strenuous exercise, such as marching at standard cadence, should be suspended for unacclimatized Marines and Sailors in their first two or three weeks. Outdoor courses of instruction in the sun are to be avoided.



(3) When the WBGTI exceeds 88°F, all physical training (PT) should be halted for those Marines and Sailors who have not become thoroughly acclimatized by at least 12 weeks of living and working in the same area. Those Marines and Sailors who are thoroughly acclimatized may carry on limited activity not to exceed six hours per day.

(4) When the WBGTI exceeds 90°F, all strenuous activity should be halted for all Marines and Sailors.

## 2. Flag System

<b>Green</b>	<b>80-84.9</b>
<b>Yellow</b>	<b>85-87.9</b>
<b>Red</b>	<b>88-89.9</b>
<b>Black</b>	<b>&gt;90</b>

<b>WBGT Index</b>	<b>Activity Level Hazards and Limitations</b>	<b>Flag</b>
80-84.9	Discretion is required in planning heavy exercise for unacclimatized personnel.	Green
85-87.9	Curtail strenuous exercise and activity for unacclimatized personnel during the first 3 weeks of heat exposure. Avoid classes in the sun.	Yellow
88-89.9	Strenuous exercise must be curtailed for all personnel with less than 12 weeks training in hot weather.	Red
90 or above	PT and strenuous exercise must be suspended for all personnel (excludes operational commitment not for training purposes).	Black

a. When a **green flag** is displayed, the individuals in charge of unit PT or work details should monitor the WBGTI hourly, as changes are likely.

b. When a **yellow flag** is displayed, in order to participate in PT or strenuous activity, personnel must have been in the immediate geographic area for greater than four weeks.

c. When a **red flag** is displayed, personnel must have been in the immediate geographic area for greater than 12 weeks before they may participate in PT or strenuous exercise.

d. **When a black flag is displayed, no PT is to be conducted.** Marines/Sailors work details should proceed with extreme caution.

WORK/REST AND WATER CONSUMPTION TABLE

1. The following table provides water consumption intake requirements based on the amount of work being performed and the amount of rest during a one hour period.

Easy Work/Moderate Work/Strenuous work

Flag Condition	WBGTI (F)	Easy Work		Moderate Work		Strenuous Work	
		Work/Rest	Water Per Hr.	Work/Rest	Water Per Hr.	Work/Rest	Water Per Hr.
Green	80-84.9	No Limit	.5 Qt.	50/10	.75 Qt.	40/20	1 Qt.
Yellow	85-87.9	No Limit	.75 Qt.	40/20	.75 Qt.	30/30	1 Qt.
Red	88-89.9	No Limit	.75 Qt.	30/30	.75 Qt.	20/40	1 Qt.
Black	>90	50/10	1 Qt.	20/40	1 Qt.	10/50	1 Qt.

**Notes:**

- Rest means minimal physical activity (sitting or standing) and should be accomplished in the shade if possible.

- For Mission Oriented Protective Posture gear, personal protective equipment, or body armor add 10°F to the Wet-Bulb Globe Temperature Index.

- Work/rest times and fluid replacement volumes will sustain performance and hydration for at least four hours of work in the specified heat category. Individual water needs will vary ± .25 quarts per hour.

2. Examples of work**Easy Work**

- Weapon maintenance.
- Walking hard surface at 2.5 mph with <30 lbs. load.
- Manual of Arms.
- Marksmanship training.
- Drill and Ceremony.

**Moderate Work**

- Walking loose sand at 2.5 mph with <40 lbs. load.
- Calisthenics.
- Patrolling.
- Individual movement technique (e.g.i low crawl, high crawl).
- Defensive position construction.
- Field assaults.

**Strenuous Work**

- Walking hard surface at 3.5 mph with >40 lbs. load.
- Walking loose sand at 2.5 mph with a load.
- Running and participating in physical conditioning training.