



UNITED STATES MARINE CORPS
MARINE CORPS AIR STATION
BOX 99100
YUMA, ARIZONA 85369-9100

StaO 6200.2F
3DF6
09 SEP 1997

STATION ORDER 6200.2F

From: Commanding Officer
To: Distribution List

Subj: HEAT CASUALTIES AND PREVENTION

Ref: (a) MCO 6200.1D

Encl: (1) Prevention and First Aid for Heat Casualties
(2) Heat Condition and Flag Warning System
(3) Wet Bulb Global Temperature (WBGT) Call Sheet
(4) Daily Water Requirements for Three Levels of Activity
Versus Daily Mean Air Temperature, °F

1. Purpose. To provide information on the types, causes, recognition, and treatment of heat casualties as directed by the reference. Further, to provide commanding officers, officers-in-charge of tenant units and station department heads with information necessary to regulate training so as to lower the incidence of heat casualties.

2. Cancellation. StaO 6200.2E.

3. Information. Marine Corps Air Station, Yuma lies in an area of extreme summer heat and low humidity. Because of that, loss of body water and salt may go unnoticed and produce a dangerous health hazard that may result in a heat casualty.

4. Action. The instructions in enclosure (1) contain information on the prevention and first aid for heat casualties and will be used as a guide in planning work and training during periods of hot weather. Enclosures (2) and (3) establish heat conditions and a warning system to be used during hot weather. Enclosure (3) establishes the concept of water usage per individual for planning purposes.

a. The Weather Service Officer will establish and maintain the Wet Bulb Global Temperature (WBGT) equipment and log in accordance with the reference. In addition, he/she will ensure proper dissemination of the WBGT Index whenever its value exceeds, or if at or above, decreases to less than 80, 85, 88, or 90.

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b. The Provost Marshal, Athletic Director, and Station Weapons Officer will ensure the appropriate flag designators are displayed at the locations listed below when notified by the weather service of the setting or canceling of a heat condition:

- (1) Main Gate.
- (2) Station Gym.
- (3) Station Weapons.
- (4) P-111 Guard House.

<u>WBGT Index</u>	<u>Flag Designators</u>
80.0	Green
85.0	Yellow
88.0	Red
90.0	Black

5. Summary of Revision. This revision contains a substantial number of changes and should be reviewed in its entirety.


C. J. TURNER

DISTRIBUTION: B

PREVENTION AND FIRST AID FOR HEAT CASUALTIES

1. General

a. The human body uses energy in its vital processes and in doing work. This energy becomes heat which, at ordinary temperatures, is radiated from the body to the environment. When the environment becomes as warm as the skin, this is no longer possible. When the temperature of the environment is higher than that of the skin, then the process is reversed and the body gains heat.

b. When the body cannot lose heat to the surrounding environment, it begins sweating. The sweat evaporates, transferring heat from the body to the surrounding air. This process cools the body and maintains the normal temperature.

c. Sweating causes loss of body water and salt. This upsets the heat regulating mechanisms of the body. Lack of proper heat regulation in the body may cause it to become a heat casualty.

2. Types, Causes, Symptoms, and First Aid

a. There are three basic types of heat casualties: Heat cramps, heat exhaustion, and heatstroke. Heat exhaustion may progress into heatstroke. Heatstroke is the most serious of the heat conditions and unless promptly treated, will result in death or permanent brain damage. Heatstroke is a true medical emergency.

b. The symptoms of the two most serious conditions, heat exhaustion and heatstroke are different and are easy to recognize. The major differences are in the condition of the skin. In heat exhaustion the skin is sweaty, cool, and pale. In heatstroke the skin is dry, hot, and flushed.

c. Set forth below are the types, causes, symptoms, and first aid treatment for the most serious types of heat casualties:

(1) Heat Exhaustion

(a) Causes. Exposure to high temperatures and humidity. Solar heat is also an important contributing factor. Prolonged work, recent arrival in a hot climate, and too much clothing.

(b) Symptoms. Shortness of breath, feeling of illness, headache, weakness, dizziness, blurred vision, nausea, and muscle cramps may occur. After onset, the casualty will have pale, cool, wet skin.

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(c) First Aid

1 Send for medical aid.

2 Place casualty in a cool, shady place with circulating air.

3 Lay casualty down with head level or lower the feet.

4 Loosen clothing and equipment.

5 If casualty is conscious, give liberal quantities of water in small sips.

(2) Heatstroke

(a) Causes. Exposure to high temperatures and humidity coupled with the body's inability to sweat, prolonged work, recent arrival in hot climate and too much clothing. Solar heat is also an important contributing factor. When sweating stops, the temperature of the body rapidly and increasingly builds up to dangerous levels.

(b) Symptoms. Lack of sweating, headache, dizziness, loss of appetite, nausea, shortness of breath, faintness, or even collapse may occur before onset. ONSET IS SUDDEN, and will be recognized by convulsions, delirium, or loss of consciousness. The skin will be flushed, hot, and dry. DEATH/BRAIN DAMAGE MAY OCCUR IF BODY TEMPERATURE IS NOT LOWERED.

(c) First Aid

1 Send for medical aid.

2 The primary concern is to lower the body temperature as soon as possible.

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

4 Loosen clothing and equipment.

5 Apply cool water or ice water to the entire body. Be careful to avoid the nose and mouth.

6 Fan patient constantly to promote cooling of body by evaporation of applied water.

ENCLOSURE (1)

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 replaced. The body cannot be "weaned" away from water or trained to do without salt.

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. Here 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, 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 the Medical Department.

d. Keep your headgear on in the sun and remember that light, 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 OVERDO YOURSELF.

f. If you stop sweating - GET PROMPT MEDICAL AID.

g. Eat lightly in hot weather and especially eat fewer 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

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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 breaking-in period of from two to three weeks with progressive degrees of physical exertion and heat exposure will usually suffice for achieving acclimatization. During this period, the work load should be increased gradually but not to the point of exhaustion or to the point 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 replaced.

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 and Salt Intake

a. Water intake must be sufficient to replace that lost by 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.

b. Salt replacement for acclimatized troops is normally adequate through their regular meals unless eating is curtailed. Supplementary salt intake for unacclimatized troops, or for seasoned troops doing heavy work in the heat, must be carefully supervised by the Medical Department. Extreme caution must be taken not to exceed two grams (roughly equivalent to three salt tablets) of supplement salt per day. No supplementary salt is required for military personnel who eat field rations.

c. If water is not available, salt in any form should not be taken alone. Salt in concentrated form is not absorbed into the system readily and may cause gastric irritation and nausea.

7. Rest, Sleep, and Recreation During Acclimatization Periods

a. Schedules should call for a ten-minute break every hour. The hour immediately after the noon and evening meals should be devoted to relaxation or non-strenuous training. Seven hours of sleep per twenty-four hour period is maximum required for general deficiency.

ENCLOSURE (1)

b. Sleeping, messing, and recreation quarters should be screened and well ventilated by either natural or mechanical means. A WBGT Index of more than 80 during the day calls for artificial cooling if possible.

8. Treatment Stations. Field dispensaries should be especially prepared to treat cases of heat illness. Artificial cooling devices should be employed at treatment stations and in ambulance whenever possible.

9. Previous and Intercurrent 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 of 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 a Medical Officer.

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 restriction of blood circulation.

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

ENCLOSURE (1)

HEAT CONDITION AND FLAG WARNING SYSTEM

1. Control of Physical Activity

a. The Wet Bulb Globe Temperature (WBGT) Index. 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 to added the index. Training programs in warm weather should be planned provisionally on the basis of the WBGT Index.

b. Instruction

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

(2) The Wet Bulb Thermometer. This is an ordinary thermometer with a moist wick surrounding the bulb. The wet bulb reading will be the same as the corresponding dry bulb only when the relative humidity is 100 percent. At any relative humidity less than 100 percent, the wet bulb thermometer will read less than the dry bulb 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) The Globe Thermometer. This is an ordinary thermometer inserted through an air tight stopper into a hollow copper ball six inches in diameter. The ball is painted matt 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 from other surfaces that may exceed the globe in temperature. The ball loses heat to the cooler air by convection and to cooler surfaces by radiation. In an unshaded outdoor position, the globe thermometer reading is normally above the dry bulb thermometer reading. Daytime readings of 20° or more above 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 globe thermometer 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 that the three instruments described above take into account all four variables of the thermal environment: temperature, humidity, radiation, and air circulation.

ENCLOSURE (2)

c. Formula. The WBGT is calculated as follows:

$$\begin{array}{r} \text{Dry Bulb Temperature} \times 0.1 \\ \text{Wet Bulb Temperature} \times 0.7 \\ \underline{\text{Black Globe Temperature} \times 0.2} \\ \text{TOTAL WBGT INDEX} \end{array}$$

The formula applies to environments that are warm enough to cause sweating and to the type of hot weather clothing now worn by Marines. The factors in the formula should be measured at the actual locale of training.

d. Use of the Index

(1) When the WBGT Index exceeds 80, heavy exercises for unacclimatized personnel should be conducted with caution and under constant supervision.

(2) When the WBGT Index exceeds 85, strenuous exercises, such as marching at standard cadence, should be suspended for unacclimatized troops in their first two or three weeks. Outdoor classes in the sun are to be avoided.

(3) When the WBGT Index exceeds 88, all physical training should be halted for those troops who have not become thoroughly acclimatized by at least 12 weeks of living and working in the same area. Those troops who are thoroughly acclimatized may carry on limited activity no to exceed six hours per day. When the WBGT Index exceeds 90, all strenuous activity should be halted for all troops.

(a) When a green flag is displayed, the individuals in charge of unit physical training or work details should monitor the WBGT Index hourly, as changes are likely.

(b) When a yellow flag is displayed, in order to participate in physical training or strenuous exercise, 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 geographic area for greater than twelve weeks before they may participate in physical training or strenuous exercise.

(d) When a black flag is displayed, NO PHYSICAL TRAINING is to be conducted. Troop work details should proceed with extreme caution.

ENCLOSURE (2)

WBGT CALL OUT SHEET

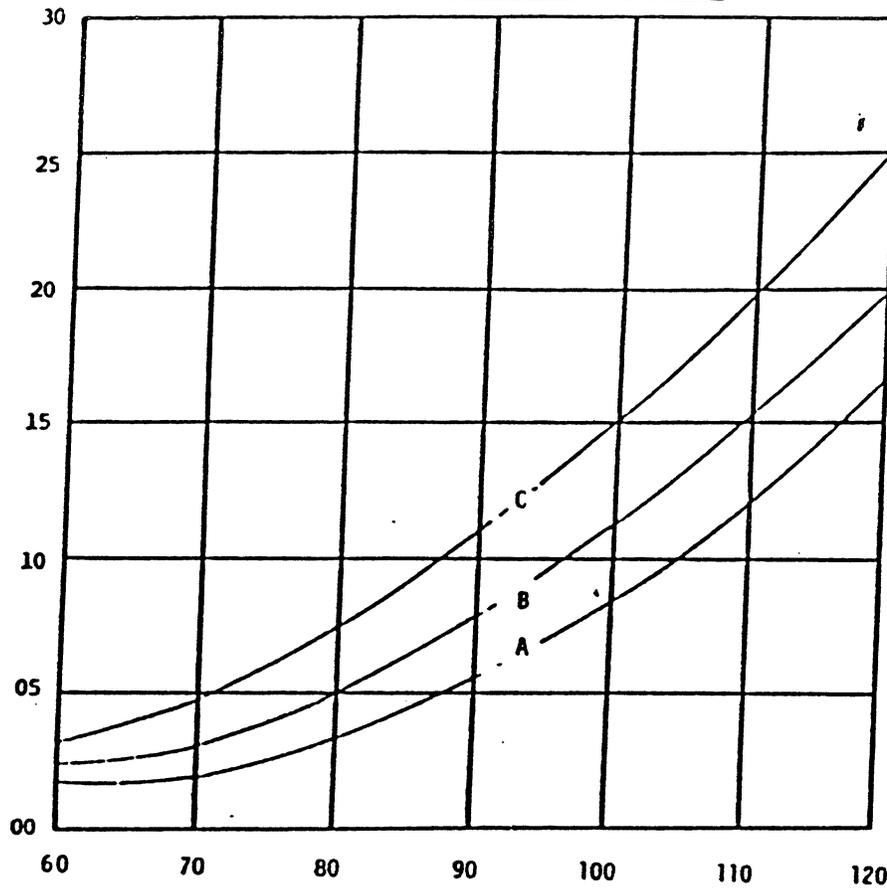
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MWSS 371 2509/2506									
P-111 3836									
DAYCARE 2350									
OBSVR INITIALS									
TIME CALLS COMPLETED									

MARINE CORPS ORDER 6200.1D AND STATION ORDER 6200.2F ARE THE REFERENCES FOR THE WBGT INDEX, PROCEDURES AND DEFINITIONS.

MCASY 3140/2 (REV 8-97)

DAILY WATER REQUIREMENTS FOR THREE LEVELS OF ACTIVITY
VERSUS DAILY MEAN AIR TEMPERATURE, °F



This graph shows water needs, in quarts per day, for men at three activity levels in relation to the daily mean air temperature.

Level A. Rest in shade

Level B. Moderate work in sun: cleaning weapons and equipment

Level C. Hard work in sun: creeping and crawling with equipment on

For example, if one is doing 8 hours of hard work in the sun, curve c, when the average temperature for the day is 100°F, his water requirements for the day will be approximately 15 quarts. (511)