



DEPARTMENT OF THE NAVY

CHIEF OF NAVAL EDUCATION AND TRAINING
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CNET INSTRUCTION 6260.1B

Subj: HEAT STRESS CONTROL FOR FIREFIGHTING TRAINING

Ref: (a) NEHC-TM92-6
(b) NAVMED P-5010-3
(c) American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices
(d) CNETINST 3541.1D

Encl: (1) Work Load Assessment
(2) Permissible Heat Exposure Threshold Limit Values
(3) Heat Stress Log and Data Sheet
(4) General Guidelines - Essential Information Regarding Prevention and First Aid of Heat Casualties

1. Purpose. To provide general information and guidance for the prevention of heat stress casualties when conducting firefighting training. Since this is a major revision, specific additions, deletions, and revisions have not been noted as such.

2. Cancellation. CNETINST 6260.1A

3. Discussion. Personnel engaged in firefighting training evolutions are more likely to experience heat stress than personnel involved in other training activities. This is due to the level of physical exertion required and the environment in which the training takes place. A comprehensive program of monitoring, training, and preventive measures is needed to reduce the probability of a heat stress casualty and ensure the safety of all personnel involved.

4. Applicability. This instruction is applicable to:

a. All training activities in the Naval Education and Training Command (NAVEDTRACOM) that conduct Navy firefighting training.

b. Fleet activities conducting live firefighting training utilizing Chief of Naval Education and Training (CNET) approved curriculum.

5. Definitions

a. Acclimatized. Gradual exposure to the weather conditions in the area for a period of 2 weeks or more.

b. Ambient Temperature. The temperature as indicated in a standard weather thermometer.

c. Cool Down Area. Any area protected from direct sunlight where air circulation is sufficient to allow the body to cool for the prescribed rest period. Staging areas may be used for cool-down periods as long as high volume portable fans are present and operational.

d. Immediate Proximity. A location close enough to the field area where firefighting training is conducted so that an emergency medical technician (EMT)/corpsman can observe the physical condition of students and instructors immediately before and after live fire evolutions. "Immediately before" includes the period during which personnel are donning OBAs/SCBAs and clothing necessary for the fire fighting evolution.

e. Heat Stress Monitor. The person responsible for evaluating heat stress conditions as identified in this instruction. A heat stress monitor must be trained in the specific issues and concerns of heat stress; maintenance, calibration and operation of necessary equipment; interpretation of instrument readings and heat stress tables; and the contents of this instruction.

f. Impermeable Clothing. Clothing which prohibits the passage of water (e.g., rain suits, aluminized proximity coats and trousers).

g. PHEL. Permissible heat exposure limit.

h. Permeable Clothing. Clothing which allows water to pass through (e.g., cotton khakis, NOMEX coveralls, flight deck jerseys, fire retardant khakis/dungarees).

i. Semi-permeable Clothing. Clothing which restricts the passage of water (e.g., turn-out pants and coat).

j. Staging Areas. Areas immediately adjacent to the firefighting evolution where students and staff receive instruction, don and doff clothing, or store clothing and equipment.

k. WBGT Index. Wet bulb globe thermometer reading. Calculated by use of special heat monitoring instruments.

l. Work/Rest Regimen. The percentage of time which personnel may be engaged in strenuous activity compared to the percentage of time that rest is required. Periods of inactivity between live fire evolutions may be classified as "rest time" as long as such activities are conducted in a cool-down area. During rest periods, personnel must be permitted to loosen damp clothing or change into dry clothing, drink plenty of fluids, and recuperate from the effects of the heat.

6. Action. Instructors and students who participate in firefighting training that involves exposure to high temperatures or high humidity shall receive appropriate training in heat stress control and prevention. This training shall include recognition of heat stress illness symptoms and emergency procedures to be followed in the event of a heat stress casualty. Any instructor or student who observes or experiences heat stress symptoms shall report these symptoms to the nearest instructor, EMT, or corpsman. Recommendations in references (a) through (c) and requirements established by this instruction shall be adhered to whenever dry bulb temperature readings indicate heat stress control action is required.

7. Responsibilities

a. Commanding Officers shall:

(1) Authorize or direct extensions of permissible heat exposure limits or reduction of rest times. Significant extensions or reductions should be granted only in the most unusual circumstances.

(2) Approve alternate permissible heat exposure limits used to determine maximum stay times.

(3) Consider discontinuing or modifying training whenever the Wet Bulb Globe Thermometer (WBGT) index exceeds 90 degrees Fahrenheit in the student and instructor staging areas. When notified that the WBGT index has reached 88 degrees Fahrenheit, advise the Fire School Director what actions are to be taken if the WBGT index reaches 90 degrees Fahrenheit in the staging areas.

b. Fire School Directors shall:

(1) Ensure a Heat Stress Monitor is present during all fire field training evolutions.

(2) Ensure compliance with the requirements of this instruction and any exceptions to permissible heat exposure limits authorized and directed by the commanding officer.

(3) Ensure all staff/instructors assigned to conduct firefighting training are provided training in heat stress control and prevention at least annually, prior to onset of hot weather.

(4) Consider modifying course hours of operation during the period 15 May through 15 October of each year to allow for minimum on-field time during periods of increased temperatures and to reduce the possibility of heat-related illnesses.

(5) Determine permissible heat exposure threshold limit values based on workload assessment guidance contained in enclosure (1).

(a) Ensure that all personnel exposed to high heat and humidity, having reached permissible heat exposure limits, are afforded prescribed rest time in accordance with enclosure (2).

(b) Staff personnel should be rotated from heat-intensive environments to cool areas. Students should normally receive break periods during training and should never be expected to conduct training during the entire allowable stay time without a break.

(c) Due to the unique features of some firefighting training devices and areas, Permissible Heat Exposure Limit (PHEL) values established in enclosure (2) may not be practical. Those activities which have training devices (i.e., 21C12 and 19F Series) and areas that cannot comply with the PHEL values listed in enclosure (2) shall request an industrial hygiene survey of peak heat stress periods to determine safe realistic PHEL values and stay times.

(6) Notify director of training and commanding officer when WBGT index reaches 88 degrees Fahrenheit in student and/or instructor staging areas.

(7) When advised by the commanding officer of actions to be taken in the event temperatures should reach 90 degrees Fahrenheit in the staging areas, immediately notify the Field Safety Chief of such actions.

(8) Establish an appropriate number of heat stress monitoring locations. **Note:** Areas of 19F and 21C12 series trainers monitored by computer do not need WBGT monitoring.

(9) Ensure each student receives heat stress training before beginning live firefighting training evolutions.

(10) Modify live firefighting evolutions as necessary to conduct the most strenuous portions of training during minimum heat stress periods.

(11) Ensure all instructors are familiar with pre-mishap plans in the event of an emergency.

c. Field Safety Chiefs (Structure Chiefs for Single Structure Facilities) shall:

(1) Ensure the Heat Stress Monitor observes dry bulb thermometers at each heat stress monitoring location. **Note:** Areas of 19F and 21C12 series trainers monitored by computer do not need WBGT monitoring.

(2) Ensure the Heat Stress Monitor conducts WBGT surveys for each fire field evolution and ensure survey results are recorded on enclosure (3) whenever dry bulb temperature reaches or exceeds 80 degrees Fahrenheit (70 degrees Fahrenheit when personnel are wearing semi-permeable or impermeable clothing) in the staging areas adjacent to the evolution.

(3) Notify the Senior Instructor and the Fire School Director when the WBGT index reaches 88 degrees Fahrenheit in the student and/or instructor staging areas adjacent to the evolution.

(4) Evaluate the results obtained from WBGT surveys and take actions recommended by references (a) and (b) and as follows:

(a) Ensure sufficient, cool drinking water is available.

(b) When appropriate, place students not actively involved in a fire field evolution out of direct sunlight.

(c) Rotate field instructors as necessary.

(d) Ensure all students are briefed before the live firefighting evolution begins about the signs and symptoms of heat stress. Enclosure (4) contains information regarding prevention and first aid for heat casualties.

(5) Activate the pre-mishap plan when heat stress symptoms are observed or whenever notified that heat stress symptoms have been detected by others.

(6) Take such action as directed by the Fire School Director should temperatures reach 90 degrees Fahrenheit in the staging areas.

d. Instructors shall:

(1) Familiarize themselves with the contents of this instruction.

(2) Closely observe students for signs of heat stress related symptoms. Notify the on-site EMT or corpsman and Field Safety Chief when heat stress symptoms are detected.

(3) Give students more frequent water breaks during periods of extreme high temperatures and humidity.

(4) Monitor personnel identified by enclosure (4) of reference (d) as at-risk for heat stress closely during the evolution for possible signs of heat illness. If conditions are extreme, they should not be allowed to participate.

Note: For personnel who have suffered a heat stress illness during training, comply with medical officer's recommendations.

e. Heat Stress Monitors shall:

(1) Familiarize themselves with the contents of this instruction.

(2) Conduct WBGT surveys in accordance with reference (b).

(3) Maintain custody and operate WBGT survey equipment.
Note: Some WBGT survey equipment may be built-in as part of the facility.

(4) Conduct WBGT surveys at each location. Log temperatures in the dry bulb temperature log with time of observation. Thermometers shall be monitored at least one half hour before the start of fire field training evolutions and at least every hour thereafter until field training evolutions are completed. WBGT surveys for each fire field evolution shall be conducted when dry bulb temperature in the staging areas reaches or exceeds 80 degrees Fahrenheit (70 degrees Fahrenheit whenever personnel are wearing semi-permeable or impermeable clothing).

(5) Calculate WBGT values in accordance with references (a) and (c) and record results on enclosure (3).

(6) If an industrial hygiene survey has been conducted and the survey establishes PHEL values different from those identified in enclosure (2), create charts similar to those in enclosure (2), with the assistance of an industrial hygienist, and ensure all instructors are familiar with the new PHEL values. Retain a copy of the industrial hygiene heat stress survey for validation.

(7) Notify the Field Safety Chief whenever heat stress conditions require a change to the scheduled evolutions, or when WBGT index reaches 88 degrees Fahrenheit in the staging areas adjacent to the evolution.

(8) Maintain Heat Stress Logs and Data Sheets for a period of 3 years beyond the year to which they apply.

f. On-Site EMT or Corpsman shall:

(1) Be proficient in emergency field treatment procedures and disposition of heat injured victims as recommended in reference (a).

(2) Be located in the immediate proximity of the fire-fighting evolution to closely monitor students and instructors for any signs of heat stress related symptoms.

(3) When any heat stress related symptoms are observed, begin immediate treatment of the affected individual. Notify the Field Safety Chief and Course Instructor as soon as possible without jeopardizing the individual being treated.

8. Limitations of Activity

a. References (a) through (c) may be used for heat stress management of students involved in firefighting training.

b. Enclosures (1) and (2) shall be used to determine work/rest regimens for students and instructors when engaged in firefighting training unless an Industrial Hygiene survey has been conducted and new work/rest regimens established in accordance with survey findings and approved by the commanding officer.

c. Threshold Limit Values (TLVs) in enclosure (2) are based on the assumption that nearly all acclimatized, fully-clothed personnel with adequate water and salt intake are able to function effectively under the given working conditions without exceeding a deep body temperature of 38 degrees centigrade.

d. Rest times are also based on the assumption that the WBGT value of the resting place is the same or very close to that of the workplace.

9. Form Availability. CNET 6260/2 (3-98) may be reproduced locally.

/S/R. M. SCOTT
Captain, U.S. Navy
Chief of Staff

Distribution (CNET 5218.2C):

Lists I (9, 16-18, 20-23, 27, 30, 34, 37, 40, 43, 44, 48)
SNDL 23C (COMNAVRESFOR), 24A1 (COMNAVAILANT), 24A2
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26J2 (AFLOATTRAGRUMIDPAC, AFLOATTRAGRUWESTPAC),
41B (COMSCLANT), FF5 (COMNAVSAFECEN), FKA1G
(COMNAVSEASYSOM (03G))

WORK LOAD ASSESSMENT
(for average size worker)¹

- | | | |
|----|---|---|
| 1. | <u>Body Position/Movement</u> | <u>Kcal/hr (avg)</u> |
| | a. Sitting | 78 |
| | b. Standing | 96 |
| | c. Walking | 180-240 |
| | d. Walking uphill | 180-240 plus 48 for every
one meter rise |
| 2. | <u>Type of Work</u> | <u>Kcal/hr (avg)</u> |
| | a. Hands | |
| | (1) Light | 84 |
| | (2) Heavy | 114 |
| | b. One Arm | |
| | (1) Light | 120 |
| | (2) Heavy | 168 |
| | c. Both Arms | |
| | (1) Light | 150 |
| | (2) Heavy | 210 |
| | d. Whole Body | |
| | (1) Light | 270 |
| | (2) Moderate | 360 |
| | (3) Heavy | 480 |
| | (4) Very Heavy | 600 |
| 3. | <u>Workload Category Definitions</u> | |
| | a. <u>Light Work</u> (up to 200 Kcal/hr): Classroom instruction and similar activities. | |
| | b. <u>Moderate Work</u> (200-350 Kcal/hr): Donning fire-fighter's ensemble, donning OBA/SCBA equipment, handling uncharged hoses. | |
| | c. <u>Heavy Work</u> (350-500 Kcal/hr): Handling charged hoses, firefighting, fire fighting salvage work. | |

¹ Figures include Basal Metabolism for average size worker.

**PERMISSIBLE
HEAT EXPOSURE THRESHOLD LIMIT VALUES
WHEN WEARING PERMEABLE CLOTHING**

WORK/REST REGIMEN	WORK LOAD		
	LIGHT	MODERATE	HEAVY
100% work/0% rest per hr	86.0	80.0	77.0
75% work/25% rest per hr	87.0	82.4	78.6
50% work/50% rest per hr	89.0	84.9	82.2
25% work/75% rest per hr	90.0	88.0	86.0

**PERMISSIBLE
HEAT EXPOSURE THRESHOLD LIMIT VALUES
WHEN WEARING SEMI-PERMEABLE OR IMPERMEABLE CLOTHING**

WORK/REST REGIMEN	WORK LOAD		
	LIGHT	MODERATE	HEAVY
100% work/0% rest per hr	76.0	70.0	67.0
75% work/25% rest per hr	77.0	72.4	68.6
50% work/50% rest per hr	79.0	74.9	72.2
25% work/75% rest per hr	80.0	78.0	76.0

Note: Table Values are in Fahrenheit, WBGT

HEAT STRESS LOG AND DATA SHEET

COURSE: _____ DATE: _____
START TIME: _____ STOP TIME: _____
SURVEY CONDUCTED BY: _____
COMMANDING OFFICER NOTIFIED:* TIME: _____ BY: _____
DIRECTOR, FIRE SCHOOL (Signature)** _____
FIELD SAFETY CHIEF (Signature)** _____

LOCATION	TIME	DB (°F)	WB (°F)	GT (°F)	WBGT (°F)	WORK LOAD	WORK/REST REGIMEN	INIT

* Must be completed following phone call or verbal notification when WBGT index reaches or exceeds 88°F
** Signature required within 24 hours following a phone call or verbal notification when WBGT index reaches or exceeds 88°F
Note: 21C12 and 19F Series Firefighting Trainers automatically monitor and record WBGT index data in some trainer areas; a copy (with signatures) may be used in lieu of the Heat Stress Log and Data Sheet providing that the same information is available.

GENERAL GUIDELINES

Essential Information Regarding Prevention and First Aid of Heat Casualties

1. Heat Stress Preventive Measures. The human body contains a great deal of water and considerable salt. Sweating causes the body to lose these items and they cannot be replaced. The body cannot be divorced from water or trained to do without salt. The following rules will aid in preventing heat casualties during hot weather:

a. Encourage students and staff to drink water frequently and to drink as much as they need. Infrequent large intakes may lead to stomach distention, vomiting, or cardiac problems. Needs may range from two quarts to three gallons a day but may increase to five gallons a day when performing heavy work in hot weather. In fact, the need for water may exceed the desire. Ideally, personnel should drink until their urine becomes clear or very pale yellow.

b. Stay away from "cold drinks" while still sweating. Avoid caffeine products.

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. Personnel should wear headgear in the sun and remember that light and loose clothing will deflect the sun's heat.

e. Personnel who get sick or dizzy in hot weather should rest. DON'T OVERDO IT!

f. If an individual stops sweating - GET PROMPT MEDICAL AID.

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

h. The hour immediately after the noon and evening meals should be devoted to relaxation or nonstrenuous training. Seven hours of sleep per 24 hours is the minimum required for general efficiency.

i. Susceptibility to heat injury is greatly increased by illness, infections, or any febrile condition including reactions to immunizations. A previous history of heat stroke, 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 a medical officer.

2. Body Heat and Environment

a. The human body uses energy in its vital process when doing work. This energy becomes heat which, at ordinary temperatures, is transferred 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 becomes higher than that of the skin, the process is reversed and the body begins to gain heat.

b. When the body cannot lose heat to the surrounding environment, it begins sweating. As sweat evaporates, transferring heat from the body to the surrounding air, the body is cooled and normal body temperature is maintained.

b. Sweating causes a loss of body water and salt. This loss upsets the heat regulating mechanisms of the body. The lack of proper heat regulation in the body may lead the individual to becoming a heat casualty.

3. Types and Causes of Heat Casualties

a. There are three basic types of heat casualties:

(1) Heat Cramps. May occur as an isolated condition with normal body temperature or along with heat exhaustion. Heat cramps may occur in a small area of the body or involve a large area when major muscle groups have been stressed. Most frequently involved are muscles of the arms, legs, or abdomen.

(2) Heat Exhaustion. Occurs as a result of exposure to high temperatures and humidity, including solar heat. Pro

longed work, recent arrival in hot climate, too much clothing, medications, being overweight, alcohol, or excessive caffeine consumption with the previous 18 hours are contributing factors.

(3) Heat Stroke. Occurs as a result of exposure to high temperatures and humidity, including solar heat, coupled with the body's inability to sweat. Prolonged work, recent arrival in a hot climate, and too much clothing are all contributing factors. When sweating stops, the temperature of the body rapidly builds up to dangerous levels.

b. In the past, a heat stroke victim was described as always having hot, dry skin as opposed to the moist, clammy skin of a heat exhaustion victim. It has been found that, although the skin may be hot and dry, just as often it may be moist from sweat. Therefore, upon initial evaluation, the skin cannot be the differentiating factor in deciding on the degree of the heat injury. Only rectal temperature can initially differentiate between heat stroke and heat exhaustion.

4. Symptoms and First Aid. Set forth below are the symptoms and first aid treatment of the two most serious types of heat casualties:

a. Heat Exhaustion

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

(2) First Aid:

(a) Call corpsman or EMT and ambulance.

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

(c) Lay casualty down with the head level with or lower than the feet.

(d) Loosen clothing and equipment.

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

b. Heat Stroke

(1) Symptoms: Weakness, headache, dizziness, loss of appetite, nausea, shortness of breath, faintness, or even collapse may occur. ONSET IS SUDDEN. DEATH/BRAIN DAMAGE MAY OCCUR IF BODY TEMPERATURE IS NOT LOWERED.

(2) First Aid

(a) Call corpsman or EMT and ambulance IMMEDIATELY.

(b) THE PRIMARY CONCERN IS TO LOWER BODY TEMPERATURE AS QUICKLY AS POSSIBLE.

(c) Move casualty to a cool, shady place with circulating air. DO NOT attempt to make the casualty drink.

(d) Loosen clothing and equipment.

(e) Apply cool water to the whole body with a sponge or cloth. Be careful to avoid obstructing the nose and mouth.

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