Department of the Army
Headquarters, United States Army
Training and Doctrine Command
Fort Eustis, Virginia 23604-5700

***TRADOC Regulation 350-29**

15 June 2023

Training

PREVENTION OF HEAT AND COLD CASUALTIES

FOR THE COMMANDER:

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History. This is a major revision to TRADOC Regulation 350-29. The portions affected by this revision are listed in the summary of changes.

Summary. This regulation prescribes policy and provides guidance to commanders in preventing environmental (heat or cold) casualties.

Applicability. This regulation applies to all Active Army and Reserve component training conducted at service schools, Army training centers, or other training activities under Headquarters, U.S. Army Training and Doctrine Command (TRADOC) control.

Proponent and exception authority. The proponent for this regulation is the Deputy Chief of Staff, TRADOC. The proponent has the authority to approve exceptions or waivers to this regulation that are consistent with controlling law and regulations.

Army management control process. This regulation does not contain management control provisions.

Supplementation. Supplementation of this regulation and establishment of command and local forms are prohibited without prior approval from the Command Surgeon's Office, TRADOC, ATTN: ATBO-M, 950 Jefferson Avenue, Fort Eustis, Virginia 23604-5750.

*This regulation supersedes TRADOC Regulation 350-29 dated 18 July 2016.

Suggested improvements. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) through channels to Command Surgeon's Office, TRADOC, ATTN: ATBO-M, 950 Jefferson Avenue, Fort Eustis, Virginia 23604-5750 or usarmy.jble.tradoc.mbx.hq-tradoc-g-1-4-surgeons@army.mil.

Distribution. This regulation is available in electronic media only at the U.S. Army Training and Doctrine Command Administrative Publications website, https://adminpubs.tradoc.army.mil.

Summary of Changes

TRADOC Regulation 350-29
Prevention of Heat and Cold Casualties

This revision, dated 15 June 2023 –

o Updates responsibilities (para 1-4).

o Updates guidance on acquisition of materiel (para 1-4f(2)).

o Updates guidance on identifying and marking at-risk Soldiers (para 1-4g(3)).

o Adds sickle cell trait as a risk factor, and exercise collapse associated with sickle cell trait (ECAST) (paras 2-1a(3)(b), B-2b, and G-2a(2)(g)).

o Adds figure "Spectrum of exertional heat illness with associated conditions" (figure 2-1).

o Validates the requirement to conduct heat illness and cold injury prevention and treatment refresher training to leaders annually (paras 2-2 and 3-2).

o Adds descriptions of, and symptoms and treatment for, sunburn, carbon monoxide poisoning, and snow blindness (paras 3-1a(2), B-2f, and C-2d).

o Revises heat illness risk management and casualty identification and treatment, based on updates to the basic reference (appendix B).

o Modifies recommendations for fluid replacement and work-rest and for continuous work duration and fluid replacement (tables B-1 and B-2).

o Updates examples for completing DD Form 2977 (Deliberate Risk Assessment Worksheet) (tables B-3 and C-4).

o Updates recommended carbohydrate and electrolyte content for sports drinks (table E-1).

o Updates guidance in use and instructions on sanitizing of arm immersion cooling systems (para E-3d).

o Makes administrative changes, and updates graphics, links and references throughout.

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Chapter 1
Introduction

1-1. Purpose
This regulation prescribes policy and provides guidance to commanders for preventing, managing, and reporting environmental (heat or cold) casualties. It serves as a digest of information from published Army references for use by commanders, staff, and instructors.

1-2. References
See appendix A.

1-3. Explanation of abbreviations and terms
See the glossary.

1-4. Responsibilities
Commanders and supervisors at all levels are responsible for protecting Soldiers and civilian personnel from the adverse effects of heat and cold, and for ensuring subordinate leaders are trained in recognition and treatment of heat illness and cold injury.

a. Deputy Chief of Staff, G-3/5/7. Publish tasking orders annually reinforcing the requirement to conduct heat illness and cold injury prevention and treatment refresher training for leaders (see paras 1-4b(2), 1-4d(7)(a), and 1-4e(2) and (3) below).

b. U.S. Army Training and Doctrine Command (TRADOC) Surgeon.

(1) Co-chair the Heat Illness Prevention Subcommittee (HIPS) meetings (formerly a subcommittee of the Executive Safety Council). See appendix A for link to the HIPS charter.

(2) Prepare and disseminate memorandums on behalf of the Deputy Chief of Staff, G-1/4, TRADOC, prompting compliance among TRADOC subordinate commands with heat illness and cold injury prevention training each year.

c. TRADOC Safety Director. Co-chair the HIPS meetings.

d. Commanders of core function leads and centers of excellence who oversee work and training in hot and cold weather environments.

(1) Ensure, through safety directors, that prevention of heat and cold casualties is addressed in command/center/school safety and occupational health manuals, standard operating procedure(s) (SOPs), policies, and guidelines (see TRADOC Regulation (TR) 385-2).

(2) Ensure appropriate hot weather and cold weather protective items (clothing, shelter) are available to Soldiers.

(3) Ensure potable (drinking) water, ice, and supplemental beverages are available to Soldiers. Plan for 3 gallons of water per day per Soldier for drinking. The use of carbohydrate-

electrolyte beverages (sports drinks) is recommended only in circumstances described in appendix E, para E-2.

Note. The maximum amount of water each Soldier should drink is three gallons (12 quarts) per day; see appendix B.

(4) Ensure medical support and evacuation plans for initial entry training centers are tested at least annually (see TR 350-6) and evaluate compliance with the emergency medical services (EMS) goal of injured personnel arriving at a medical treatment facility within 1 hour of any incident (see TR 350-6).

(5) Establish policy for hourly measurement of wet bulb globe temperature (WBGT) when ambient temperature is over 75 ºF.

(6) Establish guidance for adjustment of training schedules, locations, and intensity, based on the prior 2 days' physical activity and heat category.

(7) Establish coordination between the medical treatment facility and training organizations for assistance from preventive medicine service to:

(a) Present refresher training to leaders annually on heat illness prevention and treatment and cold injury prevention and treatment (see paras 2-2 and 3-2).

(b) Assist in development of local risk management worksheets (see appendixes B and C).

(c) Report heat illnesses and cold injuries in accordance with TR 1-8.

(8) Report compliance with heat illness prevention and treatment refresher training prior to 15 April each year, and cold injury prevention and treatment refresher training prior to 15 October each year, to the TRADOC Surgeon's Office as directed in annual tasking orders (TASKORD).

(9) Provide safety and medical professional representation to HIPS meetings.

(10) Ensure assigned safety and medical professionals are familiar with both safety and medical terminology and reporting requirements (see appendix G).

(11) Ensure that local policy guidance includes heat illness as a risk factor throughout the year. Although the definition of "heat season" as 1 May through 30 September each year is generally appropriate at most U.S. Army installations, exertional heat illnesses are a year-round problem, with varying severity depending on the installation (see appendix H).

e. Commanders of brigades and equivalent units.

(1) Establish SOPs to incorporate requirements/procedures contained in this regulation and establish techniques, protocols, and authorities for application of specific controls/mitigation measures such as those identified at appendixes E and F.

(2) Conduct heat illness prevention and treatment training for all subordinate leaders prior to 15 April each year.

(3) Conduct cold injury prevention and treatment refresher training for all subordinate leaders prior to 15 October each year.

(4) Based on guidance from higher headquarters (see para 1-4d above), establish guidance on adjustment of training schedules (for example, train during the cooler part of the day), locations (for example, indoors or in the shade), and modification of the uniform, as needed to protect Soldiers against extremes of heat and cold.

(5) Refer to TR 385-2, for guidance on risk management.

f. Commanders of battalions/squadrons and equivalent units.

(1) Establish SOPs to incorporate requirements/procedures contained in this regulation and establish techniques, protocols, and authorities for application of specific controls/mitigation measures and other preventive measures such as those identified at appendixes E and F.

(2) Plan in annual budget programs and request necessary funding for materiel needed for surveillance, prevention, and treatment.

(a) Requisition needed materiel from Army and Department of Defense supply catalogs.

(b) Options for procurement of ice (for arm immersion cooling systems and for iced sheets) include procurement by the unit of an industrial ice maker, or vendor supply contracts.

(c) See appendix E for guidance regarding procurement of beverages, and acquisition of arm immersion cooling systems and other cooling devices.

(d) See ATP 3-90.97 for guidance on procurement of Army compatible heaters and tents.

g. Commanders of companies/troops/batteries/detachments.

(1) Ensure Soldiers adhere to each of the elements of the “performance triad” (sleep, activity, and nutrition) to help defend against heat illnesses and cold injuries. See Army Regulation (AR) 40-5.

(a) Sleep is vital for health, performance, and wellbeing. Proper sleep hygiene practices (habits that promote optimal sleep duration and quality) are important for everyone. Soldiers need at least 7-8 hours of sleep every night. The better the sleep, the greater its benefits.

(b) Physical activity is essential to Soldiers’ performance, physical readiness, and health. This includes fitness level, exercise and workout plan, and movement throughout the day.

(c) Performance fueling requires nutrient-rich meals and builds on nutritional fitness. Nutrient-rich foods support muscle growth, recovery, tissue repair, and immune function, and will improve mental and physical performance.

(2) Ensure Soldiers' clothing and equipment is present and serviceable prior to the training day; modify uniform based on local conditions, in accordance with guidance from higher headquarters.

(3) Identify and mark Soldiers who are at risk for heat illness and cold injury. Options include:

(a) Square patch affixed to the upper left sleeve (red for heat injury risk and blue for cold injury risk); see figure 1-1.

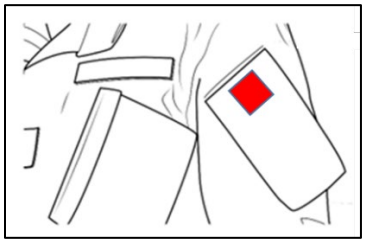

Figure 1-1. Patch on upper left sleeve

(b) Wristbands or armbands (red for heat and blue for cold).

(c) Colored beads on boot- and shoe laces (red for heat and blue for cold).

(4) Monitor conditions of heat and cold on the training site. Modify scheduling, location, and uniform in accordance with guidance from higher headquarters.

Note. The wear of face masks under elevated health protection condition (HPCON), such as during a pandemic, does not significantly increase risk of heat illness.

(5) Plan for alternate activities and locations for conditions of extreme heat and cold.

(6) Be prepared to apply iced sheets in case of suspected heat stroke. See appendix F for procedures on use of iced sheets.

(7) Ensure Soldiers drink sufficient amounts of fluids and consume all their meals. Encourage Soldiers to drink frequently in small amounts and observe their fluid intake.

Note. Proper fueling, and adequate consumption of water, provides Soldiers' requirements for sodium and other electrolytes. The electrolytes in food help retain water. Ensure Soldiers have adequate time (at least 10 minutes) to consume their meals. The use of carbohydrate-electrolyte beverages (sports drinks) is recommended only in circumstances described in para E-2 below.

(8) Ensure canteens/hydration systems are properly cleaned daily (see Training Circular 4-02.3). Hydration systems are to contain water only, and not other type drinks due to the risk of bacterial growth and contamination.

(9) Ensure Soldiers maintain their supply of sunscreen and lip balm, and apply it approximately 30 minutes before sun exposure and reapply at least every two hours throughout the day, in both heat and cold, to prevent injury from sun exposure.

- Sunscreen should have sun protection factor (SPF) of at least 30. Lip balm should contain SPF of at least 15.

- Apply sunscreen first, followed by insect repellent containing DEET. Apply sunscreen approximately 30 minutes prior to applying DEET repellent and reapply sunscreen more often throughout the day.

(10) Develop and enforce work/rest cycles, guard rotation, and sleep plans during extended training hours.

(11) Be prepared to treat and evacuate Soldiers who demonstrate signs of heat illness or cold injury.

(12) Remind Soldiers to observe their buddies for signs of heat illness or cold injury (see TR 350-6).

(13) Reevaluate the training mission if two or more heat illnesses or cold injuries occur at a given training site on the same day.

(14) Leaders at all levels are responsible for the care rendered by their subordinates to heat and cold casualties until fully recovered or transferred for definitive medical care.

1-5. Records management (recordkeeping) requirements
The records management requirement for all record numbers, associated forms, and reports required by this publication are addressed in the Records Retention Schedule–Army (RRS–A). Detailed information for all related record numbers, forms, and reports are located in the Army Records Information Management System (ARIMS)/RRS–A at https://www.arims.army.mil. If any record numbers, forms, and reports are not current, addressed, and/or published correctly in ARIMS/RRS–A, see DA Pamphlet 25–403 for guidance.

Chapter 2
Heat illness risk basics and training resources

2-1. Basics of heat illness risk

a. The hazard. Environmental conditions such as air temperature, mass of water vapor in the air (humidity), and air movement can significantly influence the body's capacity to dissipate heat. If

heat dissipation does not happen quickly enough and the internal body temperature continues to rise, the Soldier may experience symptoms of heat illness as described below (see para G-2a for more detailed descriptions).

(1) Minor heat-related illnesses and conditions include heat edema (minor swelling), miliaria rubra (heat rash or prickly heat), sunburn, heat or parade syncope (fainting or passing out), and exercise-associated muscle cramps (EAMCs; also known as heat cramps). These are not reportable medical events (reference AR 40-5).

Note. Sunburn can impair sweating and may increase the risk for exertional heat illness. Exposure to UV radiation from the sun (regardless of cloud cover or temperature) sets the conditions for skin cancer. Soldiers with fair skin that burns and freckles easily, light blue/green eyes, and either red or blond hair are at highest risk for developing melanoma; however, anyone can develop skin cancer.

(2) Exertional heat illness comprises heat exhaustion (HE), exertional heat injury (EHI), and exertional heat stroke (EHS). See figure 2-1, Spectrum of exertional heat illness with associated conditions considered below.

(a) Heat exhaustion is a moderate form of exertional heat illness, without significant organ injury; however it is a reportable medical event. Soldiers who experience three episodes of HE in less than 24 months require referrals to medical evaluation boards.

Note. The descriptor "exertional" differentiates the form of heat illness experienced by physically active persons who are producing substantial metabolic heat loads (common among military personnel and athletes) from the "classical" form that occurs in vulnerable populations passively exposed to heat (young children, elderly persons, those without drinking water, or those with impaired thermoregulation due to illness or medication.

(b) Exertional heat injury (EHI) is intermediate in severity between heat exhaustion and exertional heat stroke. Individuals with EHI will initially have clinical evidence of damage to a vital organ. The symptoms of EHI will improve slowly with cessation of exertion, and cooling measures. Soldiers diagnosed with EHI are placed on temporary profiles for a period of 1 week. Soldiers who experience three episodes of EHI in less than 24 months or a single episode with complications that meet the definition of a disqualifying medical condition require referrals to medical evaluation boards (see AR 40-501).

(c) Exertional heat stroke (EHS) is a serious, life-threatening condition characterized by profound central nervous system (CNS) dysfunction (for example, delirium, agitation, inappropriate aggressiveness, convulsions, or coma) in the presence of severe hyperthermia. EHS involves multi-organ (heart, stomach and bowel, liver, kidneys, and skeletal muscle) damage that manifests across a varied time course, depending on the magnitude and duration of elevated body core temperature (usually measured rectally) of greater than (>) 104 degrees Fahrenheit (°F), although the temperature does not necessarily correspond with the amount of damage, and EHS should not be excluded just because the temperature is not > 104 °F. The recovery period for an EHS casualty can vary greatly. An EHS casualty is placed on an initial profile for a minimum period of 2 weeks, and reevaluated weekly to determine need for further profiling, or referral to a medical evaluation board. See AR 40-501.

(3) Conditions associated with hot weather and exertion include exertional rhabdomyolysis, exercise collapse associated with sickle cell trait, and hyponatremia.

(a) Exertional rhabdomyolysis (ER) is a condition involving breakdown of skeletal muscle with release of muscle cell contents into the circulation, which most commonly arises from inadequate conditioning/aerobic fitness for the physical task, but is often associated with heat strain.

(b) Exercise collapse associated with sickle cell trait (ECAST) is a medical emergency characterized as a "conscious collapse" in which the casualty is initially conscious and coherent but experiencing significantly increasing pain and weakness in the working muscles, especially the legs, buttocks, and lower back, then collapse to the ground. It occurs in persons with sickle cell trait (SCT) and additional risk factors including excessive heat stress, poor hydration status, and lack of exercise acclimatization. It can progress to cardiorespiratory collapse and death if not treated.

(c) Hyponatremia (water intoxication) refers to low blood sodium. It is associated with prolonged (> 6 hours) physical work and arises primarily from fluid overload, under-replacement of sodium losses, or usually a combination of both. Hyponatremia and heat exhaustion share many symptoms. If a Soldier has been given oral fluids (maximum of 1½ quarts per hour) and does not improve quickly, he or she should receive further medical evaluation. Repeated vomiting is more often seen with hyponatremia.

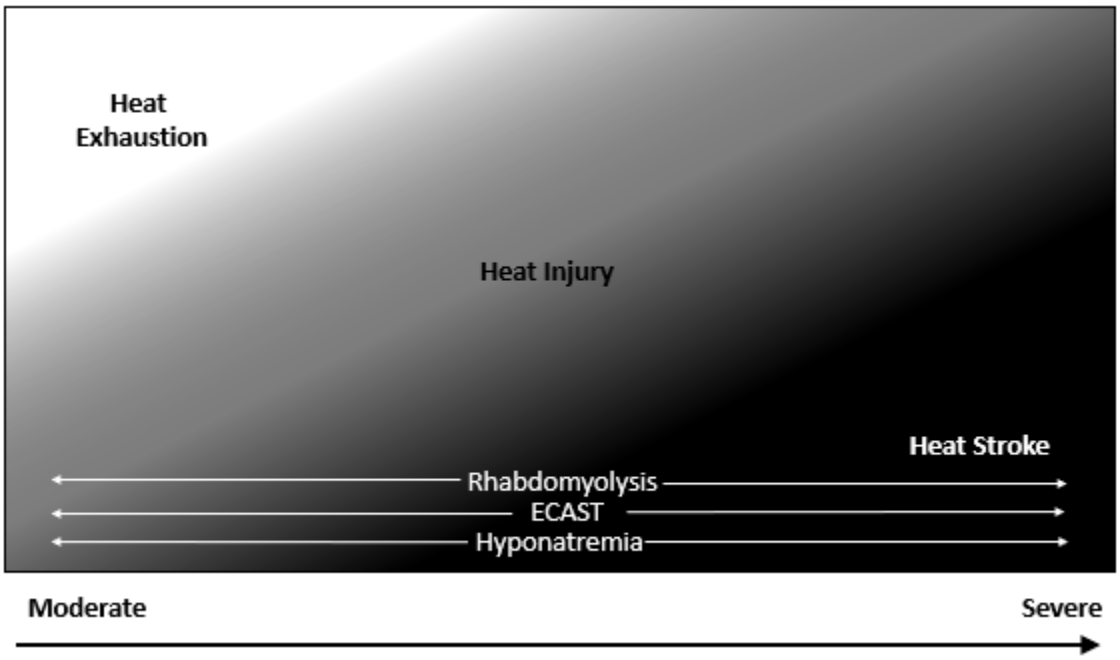

Figure 2-1. Spectrum of exertional heat illness with associated conditions

b. The defense. The body normally rids itself of heat through the skin, constituting heat relief. Some heat is lost by radiation and convection (movement of air) from the skin, but the body relies mostly on evaporation of sweat from the skin to cool itself. The adverse impact of high environmental temperature can be reduced by resting after exposure to heat (proper work/rest

ratios), becoming acclimatized to heat, drinking enough fluid, wearing clothing properly, maintaining a high level of fitness, and using proper pacing strategies during timed events. These measures contribute to the body's normal mechanisms for dissipating heat. Individuals can also dissipate heat by spending time in air-conditioned-space, showering in cool water, and immersing their arms in cold water.

c. Acclimatization. A Soldier can take up to 21 days to adapt to an increased heat and humidity environment, with regular exposure to heat and strenuous exercise. Factors to consider in acclimatizing Soldiers are the WBGT index (see appendix D); work rates and duration; uniform and equipment; and Soldiers' physical and mental conditions.

2-2. Heat illness prevention refresher training

a. Refresher training for leaders on heat illness prevention and treatment is required annually (see para 1-4 above).

Note. This training requirement is in fulfilment of commanders' responsibilities to support safety during Army operations, to reduce losses of manpower (see AR 385-10, chapter 10); and to minimize the total health threat and risk to personnel (see AR 350-1, table F-2 under "Risk management (RM)/ Environment Considerations" and guidance published annually by Headquarters Department of the Army). This requirement is not subject to Army Directive 2018-07 series that reduces or eliminates activities that do not build and sustain combat readiness.

b. The TRADOC Surgeon updates and publishes heat illness prevention and treatment refresher training products annually (see para 1-4 above).

c. Use task number 699-000-8015, Prevent Environmental Injuries, to record compliance in Digital Training Management System (DTMS).

d. The following resources are available:

(1) Defense Centers for Public Health – Aberdeen, Heat Illness Prevention & Sun Safety, 5 April 2023, available at https://phc.amedd.army.mil/topics/discond/hipss/Pages/default.aspx.

(2) Operational Environment Center Gaming and Visualizations (G&V) Training Video, Death of a Soldier: Heat Can Kill, 7 April 2023, https://www.youtube.com/watch?v=xTSdM2MM64k.

(3) Operational Environment Center Gaming and Visualizations (G&V) Training Video, Death of a Soldier: Heat Can Kill, 7 April 2023, http://www.youtube.com/watch?v=xOtcM2FlJdo.

(4) U.S. Army Combat Readiness/Safety Center, Seasonal Safety Campaigns website, 7 April 2023, https://safety.army.mil/MEDIA/.

(5) U.S. Army Center for Initial Military Training, Heat Injury Ice Sheets Video, 7 April 2023, youtube.com/watch?v=bfP_VbD18yM.

(6) U.S. Army Combat Readiness Center, Heat Illness Prevention, 7 April 2023, https://www.dvidshub.net/video/659310/heat-illness-prevention.

(7) Uniformed Services University Consortium for Health and Military Performance (CHAMP) Human Performance Resources by CHAMP (HPRC), A variety of resources on clinical care, educational tools, and research, 7 April 2023, https://www.hprc-online.org/resources-partners/whec.

e. milSuite, TRADOC Environmental Health Protection, heat illness prevention materials, 7 April, 2023, https://www.milsuite.mil/book/groups/tradoc-environmental-health-protection/content.

f. Risk management process. See appendix B.

Chapter 3
Cold injury risk basics and training resources

3-1. Basics of cold injury risk

a. The hazard. The body loses heat by radiation, convection, conduction, and evaporation. Radiation of heat occurs when surrounding objects have lower surface temperatures than the body and is independent of air/water motion. Convection of heat occurs by the movement of a gas/liquid over the body when air/water temperature is below body temperature, and can be induced by either body motion or natural movement of air (wind) or water. Conduction of heat occurs between two objects that are in direct contact and have different surface temperatures. Evaporative heat loss occurs when liquid turns to water vapor, with sweating and respiration. Evaporative cooling from sweating is useful in hot weather but problematic in cold weather, especially when sweat is trapped within clothing and diminishes the clothing's insulation. Cold weather-related injuries include the following (see para G-2b for fuller descriptions of cold weather-related injuries):

(1) Cold injuries are classified into three categories: hypothermia, freezing, and nonfreezing.

(a) Hypothermia is reduction of body core temperature to 95 °F or lower due to environmental cold exposure, diagnosed by measurement of temperature rectally with a low-reading thermometer.

(b) Frostbite occurs only with exposure to temperatures below freezing. It results from the freezing of tissue fluids in the skin and/or layers under the skin. It can be superficial (affecting the skin and not the underlying layers) or deep (resulting in loss of tissue).

(c) Nonfreezing injuries include trench foot and chilblain, usually affecting the foot or hand, due to prolonged blood vessel constriction. These can occur in temperatures as high as 60 °F with prolonged exposure. Trench foot can result in tissue injury and destruction.

(2) Other injuries related to cold weather include carbon monoxide poisoning, snow blindness, and sunburn.

(a) Carbon monoxide is a poisonous gas that cannot be seen or smelled. Carbon monoxide binds to red blood cells more readily than oxygen so less oxygen is available to vital organs and tissues. It is contained in the exhaust from stoves and vehicles. Carbon monoxide can build up in closed spaces that are poorly ventilated.

(b) Snow blindness results when solar radiation "sunburns" unprotected eyes. Eyes may feel painful, gritty, and there may be tearing, blurred vision, and headache.

(c) Sunburn to the skin increases heat loss during cold exposure, increasing susceptibility to hypothermia.

b. The defense. The body's normal response to the cold is to constrict the blood vessels in the skin and remote parts of the extremities, reducing heat loss and conserving warmed blood for the vital organs. The body may activate shivering to increase heat production when vasoconstriction (narrowing of blood vessels) is insufficient to maintain body temperature. Actions to aid the body's defenses against the cold include dressing properly for cold and cold/wet conditions, especially during low activity (such as lying on the ground); adding clothing in layers for cold and inactivity; removing layers for increased temperatures and activity in order to prevent sweating; staying well-nourished so the body has enough fuel; and drinking plenty of fluids, which is important in maintaining the circulation volume.

c. Acclimatization. Soldiers do not respond physiologically to cold exposure the same as to heat exposure. The adjustments to cold exposure are less pronounced, slower to develop, and less practical in terms of relieving strain. For this reason, it is more important for leaders to ensure Soldiers are properly clothed for cold and wet conditions, adjust the uniform requirements depending on activity, and provide for external warming measures (heated shelter).

3-2. Cold injury prevention refresher training

a. Refresher training for leaders on cold injury prevention and treatment is required annually (see para 1-4 above).

Note. This training requirement is in fulfilment of commanders' responsibilities to support safety during Army operations, to reduce losses of manpower (see AR 385-10, chapter 10); and to minimize the total health threat and risk to personnel (see AR 350-1, table F-2 under "Risk management (RM)/ Environment Considerations" and guidance published annually by Headquarters Department of the Army). This requirement is not subject to Army Directive 2018-07 series that reduces or eliminates activities that do not build and sustain combat readiness.

b. The TRADOC Surgeon updates and publishes cold injury prevention and treatment refresher training products annually (see para 1-4 above).

c. Use task number 699-000-8013, Prevent Cold Weather Injuries, to record compliance in DTMS.

d. The following resources are available:

(1) Defense Centers for Public Health – Aberdeen, Cold Injury Prevention, 7 April 2023, available at https://phc.amedd.army.mil/topics/discond/cip/Pages/default.aspx.

(2) U.S. Army Combat Readiness Center, Fall/Winter Safety Campaign, 7 April 2023, https://www.dvidshub.net/video/659310/heat-illness-prevention.

(3) milSuite, TRADOC Environmental Health Protection, Cold Weather Injury Prevention, 7 April, 2023, https://www.milsuite.mil/book/groups/tradoc-environmental-health-protection/content.

e. Risk management process. See appendix C.

Appendix A
References

Section I
Required Publications
Unless otherwise indicated, TRADOC publications and forms are available on the TRADOC Administrative Publications website at https://adminpubs.tradoc.army.mil/. DA publications and forms are available on the Army Publishing Directorate website at https://armypubs.army.mil/. DOD issuances and forms are available on the Executive Services Division website at https://www.esd.whs.mil/DD/.

AR 40-5
Army Public Health Program

TRADOC Circular 350-70-1
Medical Support to Training

TRADOC Regulation 1-8
U.S. Army Training and Doctrine Command Operations Reporting

TRADOC Regulation 350-6
Enlisted Initial Entry Training Policies and Administration

TRADOC Regulation 385-2
U.S. Army Training and Doctrine Command Safety Program

Section II
Related Publications

Armed Forces Reportable Medical Events Guidelines and Case Definitions, October 2022, Defense Health Agency
(Accessible at https://www.health.mil/Military-Health-Topics/Health-Readiness/AFHSD/Reports-and-Publications)

AD 2018-07
Prioritizing Efforts – Readiness and Lethality

AR 40-66
Medical Record Administration and Healthcare Documentation

AR 40-501
Standards of Medical Fitness

AR 350–1
Army Training and Leader Development

AR 385-10
The Army Safety Program

ATP 3-21.18
Foot Marches

ATP 4-25.12
Unit Field Sanitation Teams

ATP 3-90.97
Mountain Warfare and Cold Weather Operations

ATP 5-19
Risk Management

Cold Injury Prevention (Defense Centers for Public Health – Aberdeen)
https://phc.amedd.army.mil/topics/discond/cip/Pages/default.aspx

The following Training Aids are available at the Defense Centers for Public Health – Aberdeen, Health Information Products e-Catalog portal at https://ephc.amedd.army.mil/HIPECatalog/

- Heat Can Kill Sticker
- Heat Injury Controls Poster
- Exertional Heat Illness Prevention (EHIP) Guide
- Sun Card
- Sun Protection Poster
- Heat Can Kill (for Trainees) (poster)

FM 7-22
Holistic Health and Fitness

GTA 05-08-012
Individual Safety Card

Headquarters Department of the Army Executive Order 023-21
Implementation of Army Sickle Cell Trait (SCT) Screening of All Soldiers
(Available at https://g357.army.pentagon.mil/od/SitePages/EXORDS.aspx)

Heat Illness Prevention (Defense Centers for Public Health – Aberdeen)
(Available at https://phc.amedd.army.mil/topics/discond/hipss/Pages/default.aspx)

Heat Illness Prevention Subcommittee (HIPS) Charter, TRADOC Surgeon and Director TRADOC Safety and Occupational Health, 26 August 2021
(Accessible at http://www.milsuite.mil/book/groups/tradoc-environmental-health-protection/content)

Memorandum, TRADOC Surgeon, Use of Carbohydrate-Electrolyte Beverages (CEB) and Oral Rehydration Solutions (ORS), 8 Jun 21
(Accessible at https://www.milsuite.mil/book/docs/DOC-1031160)

TB MED 507
Heat Stress Control and Heat Casualty Management

TB MED 508
Prevention and Management of Cold-Weather Injuries

TB MED 531
Facility Sanitation Controls and Inspections

TM 10-8465-236-10
Operator's Manual for Modular Lightweight Load-Carrying Equipment (MOLLE) II

TRADOC Environmental Health Protection milSuite website
https://www.milsuite.mil/book/groups/tradoc-environmental-health-protection/content

TC 4-02.1
First Aid

TC 4-02.3
Field Hygiene and Sanitation

Section III
Prescribed Forms
This section contains no entries.

Section IV

Referenced Forms

DA Form 2028
Recommended Changes to Publications and Blank Forms

DD Form 2977
Deliberate Risk Assessment Worksheet

Appendix B
Heat illness risk management and casualty identification and treatment

B-1. Heat illness risk management

a. Identify the hazards**.** Hot weather presents a natural hazard that can be made dangerous by various risk factors. A summary of the major factors for consideration is provided below.

(1) Major functional risk factors.

(a) High-risk activities (very heavy exertion) such as a 5 mile run in < 40 minutes and 12-mile march with 55 pounds in < 180 minutes can present a risk for exertional heat illness even in low heat category conditions; sequential days of high-risk activities with little recovery also increases risk. Avoid back-to-back strenuous days, modify time of day for training, and modify uniforms.

Note. Foot marches, physical training runs, and land navigation events are most highly associated with heat injury.

(b) Lack of heat acclimatization (early heat season, unaccustomed to hot weather). Use the crawl-walk-run approach (see Field Manual 7-0) to allow Soldiers an opportunity to acclimatize to the environment.

(c) Low physical fitness (unable to score at least 60 points on the 2-mile run).

(d) Exceeds body composition standards.

(e) Has sickle cell trait (SCT).

(2) Major acquired risk factors.

(a) Prior heat illness.

(b) Recent illness, fever, or infection.

(c) Use of some medications (including antihistamines; decongestants; high blood pressure medications (for example, diuretics, beta blockers); or psychiatric drugs (for example, tricyclic antidepressants, antipsychotics).

(3) Major environmental risk factors.

(a) High WBGT heat category and sequential days of high heat category weather.

(b) Clothing and equipment that add thermal insulation and decrease potential heat loss/exchange.

(c) Lack of shelter or shade.

b. Assess the hazards. The potential for heat casualties can be assessed by—

(1) Using the WBGT to determine the heat category when ambient temperature is over 75 °F. The WBGT should be assessed at the training site throughout the training day; do not rely on the heat category determined elsewhere on the installation. See appendix D for detailed instructions on use of WBGT equipment, and tables B-1 and B-2 for temperature index.

(2) Knowing your Soldiers' individual risk factors. Early identification of who will be at increased risk (prior heat illness, concurrent illness, use of certain medications, etc.) will aid in the assessment of who may be at increased risk.

(3) Remind Soldiers to check their color of urine to assess hydration status at the start of each training day. The urine should be light colored. If hydration is inadequate, encourage extra fluid at night or in the morning.

(4) Track Soldiers' hydration status according to how many times a canteen or hydration system is refilled during the day. See para E-1.

c. Develop controls and make risk decisions. The risk of heat casualties can be mitigated through—

(1) Education, to include:

(a) Establishing SOPs.

(b) Posting heat casualty prevention information where it is easily accessible.

(c) Ensuring all Soldiers are trained in recognition and treatment of heat illnesses (see para 2-2 above).

(d) Employing pacing strategies (see FM 7-22 and ATP 3-21.18) to avoid over-exertion and risk of heat illness.

(2) Appropriate training event planning, to include:

(a) Minimizing consecutive days of heavy physical training when heat stressors exist.

(b) Reviewing work-rest cycles and establishing mandatory work-rest schedules (tables B-1 and B-2) when possible.

(c) Planning to perform heavy work (including physical training) in early morning or evening hours whenever possible. Avoid the heat of the day.

(d) Considering training alterations that improve heat loss (uniform) and/or reduce the training intensity (pace, load) if particularly high-risk activities must be performed.

(e) Providing shade to reduce solar load. When necessary, shelters to provide shade can be improvised with canvas, ponchos, or parachutes. Ensure that shaded areas have good air circulation.

(f) Providing for shaded, shallow trenches to rest in when possible. Resting on hot ground increases heat stress; the more body surface in contact with the hot ground, the greater the heat strain. The ground heated by the sun can be substantially hotter than the air. Cooler ground is just inches below the surface.

(g) Providing medical and evacuation support. See TRADOC Circular 350-70-1, Medical Support to Training for guidelines for the minimum medical support for high and low-risk training events.

(h) Planning for adequate hydration.

- Access to water resupply points every 3 hours; know when and where water resupply will be available..

- Carry as much water as possible when separated from approved sources of drinking water. Ensure that Soldiers always have at least 1 quart in reserve. Soldiers can live longer without food than without water.

(i) Providing means of cooling, such as the AICS and/or “cool zones” (or similar), to facilitate heat loss in hot weather (see paras E-3 and E-4 below).

(3) Identifying the following:

(a) Previous heat exhaustion, heat injury, or heat stroke among Soldiers.

(b) Overweight Soldiers and those who are unfit.

(c) Soldiers on medications that may increase risk of becoming a heat casualty (see para B-1a(2)(c) above).

(d) Soldiers who are ill. Consider having these Soldiers report to sick call.

Note. Mark Solders who are at risk as described in para 1-4g(3) above.

(e) Heat category hourly. The WBGT must be positioned at the training site.

(4) A hydration monitoring system such as parachute cord with beads or similar.

(5) Knowledge of standardized guidelines for warm weather training conditions such as the fluid replacement and work-rest guides.

(6) Ensuring water control points throughout designated training areas.

Table B-1. Fluid replacement and work-rest guidelines for training in warm and hot environments

		Easy Work		Moderate Work		Heavy Work		Very Heavy Work	
Heat Category	WBGT Index (°F)	Work-Rest	Water Intake (qt/hr)	Work-Rest	Water Intake (qt/hr)	Work-Rest	Water Intake (qt/hr)	Work-Rest	Water Intake (qt/hr)
1 (white)	78 - 81.9	NL	½	NL	¾	40/20	¾	20/40	1
2 (green)	82 - 84.9	NL	½	NL	¾	30/30	1	15/45	1
3 (yellow)	85 - 87.9	NL	¾	NL	¾	30/30	1	10/50	1
4 (red)	88 - 89.9	NL	¾	50/10	¾	20/40	1	10/50	1
5 (black)	> 90	NL	1	20/40	1	15/45	1	10/50	1

Easy Work	Moderate Work	Heavy Work	Very Heavy Work
• Weapon maintenance • Marksmanship training • Drill and ceremony	• Patrolling with 30-pound load • Low and high crawl • Dig defensive position	• Patrolling with 45-pound load • Four-person litter carry (180 pounds) • Dig defensive position	• Two-person litter carry (150 pounds) • Move under direct fire • Obstacle course

Legend:
hr = hour
qt = quart
NL = no limit to work per hour (up to 4 continuous hours).
Notes:
1. Applies for average-sized and heat-acclimatized Service member wearing the Operational Camouflage Pattern (OCP) uniform.
2. The work-rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hours of work in the specified heat category.
3. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).
4. Rest means minimal physical activity (sitting or standing) accomplished in shade if possible.
5. CAUTION: Hourly fluid intake should not exceed 1½ qt.
6. CAUTION: Daily fluid intake should not exceed 12 qt.
7. If wearing heavy protective clothing (mission-oriented protective posture (MOPP)), add 10 ºF to WBGT index for easy work and 20 ºF to WBGT index for moderate and heavy work.

Table B-2. Recommendations for continuous work duration and fluid replacement in warm and hot environments

		Easy Work		Moderate Work		Heavy Work		Very Heavy Work	
Heat Category	WBGT Index (°F)	Work (min)	Water Intake (qt/hr)	Work (min)	Water Intake (qt/hr)	Work (min)	Water Intake (qt/hr)	Work (min)	Water Intake (qt/hr)
1 (white)	78 - 81.9	No Limit (NL)	½	NL	¾	110	¾	45	¾
2 (green)	82 - 84.9	NL	½	NL	1	70	1	40	1
3 (yellow)	85 - 87.9	NL	¾	NL	1	60	1	25	1
4 (red)	88 - 89.9	NL	¾	180	1¼	50	1¼	20	1¼
5 (black)	> 90	NL	1	70	1½	45	1½	20	1½

Legend:
hr = hour
qt = quart
NL = no limit to work time per hour (up to 4 continuous hours).
Notes:
1. Applies for average-sized and heat-acclimatized Service member wearing the Operational Camouflage Pattern uniform.
2. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or shade (± ¼ qt/hr).
3. CAUTION: Hourly fluid intake should not exceed 1½ qt.
4. CAUTION: Daily fluid intake should not exceed 12 qt.

d. Implement controls. Heat casualty controls can be implemented through the following:

(1) Make risk decision at the appropriate command level based on local SOP.

(2) Plan the timing and frequency of training events in consideration of the heat stress.

(3) Implement work-rest and fluid replacement guidelines based on the heat category. During recovery periods, emphasize rest, shade, rehydration, and eating.

(4) Encourage appropriate fluid consumption. Forced hydration orders are discouraged and can be dangerous.

(5) Ensure adequate hydration of all Soldiers before any exercise or physical work.

(6) Provide sufficient time for complete consumption of meals. Complete consumption of rations including salt packets will provide an adequate salt intake and help prevent hyponatremia.

(7) Conduct random checks by unit leaders and buddy checks by fellow Soldiers to monitor hydration status and the overall well-being of Soldiers. Monitor hydration status by reminding Soldiers to check the color of their first morning urine. See para B-1b.

(8) Provide cool water and allow for enough time to drink and eat. Soldiers drink most of their water with meals; improving water availability increases food consumption. For use of carbohydrate-electrolyte beverages (CEB) (sports drinks) see para E-2 below.

(9) Modify the clothing worn and equipment carried as necessary to reduce heat strain.

(10) Establish drinking schedules by using Tables B-1 and B-2. Water required to replace sweating may exceed the body's ability to absorb fluid, which is about 1½ qt/hr. Soldiers should not be expected to drink more than this amount per hour; the remaining water must be consumed later.

(11) Wear appropriate uniforms to protect against sun, wind, and other hazards. This includes headgear and goggles. Apply sunscreen and lip balm regularly (see para 1-4f(11)).

(12) Wearing the operational camouflage pattern (OCP) uniform will reduce heat strain by protecting Soldiers from solar load. When not in direct sun (or brush), loosen and take off clothing to improve ventilation and evaporative cooling.

(13) Keep clothing clean, since clean clothes protect better and help prevent skin rashes. Whenever possible, wash clothing and air-dry or sun dry.

(14) Change socks at least twice a day. Prolonged wear of wet socks can lead to foot injury (for example, blisters) or foot fungus (athlete’s foot).

(15) Wearing only underwear under the Joint Service Lightweight Integrated Suit Technology (JSLIST) should be considered, depending on mission requirements and threat level.

e. Supervise and evaluate. The final step to the risk management process is the supervision and evaluation of the controls taken to prevent heat casualties. Examples are as follows:

(1) Enforce SOPs.

(2) Ensure subordinate leaders and Soldiers at all levels receive the deliberate and real-time risk assessment information and understand the required controls prior to delegating responsibilities to ensure control measures have been implemented.

(3) Monitor progress of implementation of control measures.

(4) Conduct spot checks regarding heat category, work-rest guidelines, fluid replacement, etc.

(5) Conduct spot checks of Soldiers by asking questions while observing their mental status and physical capabilities. Look for common signs and symptoms of both minor and major heat illnesses.

(6) Adjust work-rest schedules, work rates, and water consumption according to conditions.

(7) If and when the first heat illness occurs, halt training and reassess hazards and controls before resuming training.

(8) Table B-3 provides examples for completing items in DD Form 2977 (Deliberate Risk Assessment Worksheet) under "Hazard," "Control," and "How to Implement/Who will Implement" found in TB MED 507 and ATP 5-19. Each worksheet should be developed specifically for each training or work site.

Table B-3. Guide for completing portions of DD Form 2977 – Heat illness

HAZARD	INITIAL RISK LEVEL	CONTROL	HOW TO IMPLEMENT/ WHO WILL IMPLEMENT
High-risk activities Easy Moderate Hard Very hard	L M H EH	Plan the timing and frequency of training events in consideration of the heat stress	How: Range Control SOP Who: BN S-3 i/c/w Range Control
Sequential days of high-risk activities 0 days 1 day 2 days 3 days	L M H EH	Plan the timing and frequency of training events in consideration of the heat stress	How: Range Control SOP Who: BN S-3 i/c/w Range Control
Days of heat acclimatization > 13 7-13 3-6 < 3	L M H EH	Implement work-rest and fluid replacement guidelines based on the heat category. During recovery periods, emphasize rest, shade, rehydration, and eating	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Physical fitness Physically fit Moderately fit Minimally fit Not fit	L M H EH	Implement work-rest and fluid replacement guidelines based on the heat category. During recovery periods, emphasize rest, shade, rehydration, and eating	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Soldier risk factors (prior heat illness, current illness) Very few Few Several Many	L M H EH	Implement work-rest and fluid replacement guidelines based on the heat category. During recovery periods, emphasize rest, shade, rehydration, and eating	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
WBGT heat category < Cat 1 Cat 1 Cat 2-3 Cat 4-5	L M H EH	Plan the timing and frequency of training events in consideration of the heat stress	How: Range Control SOP Who: BN S-3 i/c/w Range Control
Prior days of high heat category 0 1 2-3 > 4	L M H EH	Plan the timing and frequency of training events in consideration of the heat stress	How: Range Control SOP Who: BN S-3 i/c/w Range Control
Shelter or shade Available Moderately available Minimally available Not available	L M H EH	Implement work-rest and fluid replacement guidelines based on the heat category. During recovery periods, emphasize rest, shade, rehydration, and eating	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
LEGEND: **EH -** Extremely High Risk **H -** High Risk **M -** Medium Risk **L -** Low Risk			

B-2. Heat illness casualty identification and treatment
Heat illnesses result from the combined effects of exertion, individual risk factors, and heat stress. Heat illnesses may be minor in terms of injury to the body (for example, heat exhaustion) but are still reportable, and can progress to more severe forms (for example, EHI and heat stroke) that can result in permanent injury or death. See TC 4-02.1 and TB MED 507.

a. Heat exhaustion. “Canaries in the coal mine” (early indications of potential hazards) – catch these before they get to a more extreme case of heat stroke – catch early as they need rest/water/evaluation and possible medical care.

(1) Symptoms.

(a) Dizziness.

(b) Headache.

(c) Loss of appetite.

(d) Nausea.

(e) Weakness.

(f) Clumsy/unsteady walk.

(g) Profuse sweating and pale (or gray), moist cool skin.

(h) Normal to slightly elevated body temperature.

(i) Muscle cramps (also known as heat cramps).

(2) Treatment.

(a) Rest Soldier in shade.

(b) Loosen uniform/remove headgear.

(c) Have Soldier drink 1 quart of water each 30 minutes.

(d) Seek medical aid.

(e) Evacuate if there is no improvement in 30 minutes, or if Soldier's condition worsens.

Note. Local policy may require transport of the suspected heat exhaustion casualty to the nearest medical treatment facility for evaluation.

b. Heat stroke. Medical emergency – these cases already have abnormal brain function and can be fatal – initiate rapid cooling and EVAC!

(1) Symptoms.

(a) Profound central nervous system dysfunction (loss of consciousness, seizure activity, combatative, and/or altered mental status).

(b) Body core temperature often, but not always, exceeds 104 °F. NOTE: do not delay cooling if body core temperature cannot be measured.

(c) Profuse sweating.

(d) Headache.

(e) Convulsions and chills.

(f) Dizziness.

(g) Nausea.

(h) Weakness.

(i) Pulse and respirations are weak and rapid.

(j) Vomiting.

(k) Confusion, mumbling (do mental check questions to see if brain is working correctly).

- What is your name?
- What month is it? What year is it?
- Where are you?
- What were you doing before you became ill?

(2) Treatment. COOL and CALL!! – the faster the body is cooled, the less damage to the brain and organs.

(a) Cool the casualty with any means available, even before removing clothes.

(b) Strip (if possible, ensure a same gender helper is present).

(c) Rapidly cool with iced sheets.

Note. See appendix F for further details on preparing and applying iced sheets.

(d) Place ice packs, if available, in groin, axillae (armpits) and around the neck.

(e) Fan the entire body.

(f) Continue cooling if casualty starts shivering, until temperature can be measured at below 102 ºF.

(g) Activate EMS or the emergency medical plan for the training area.

(h) Evacuate immediately, and continue cooling during transport.

(i) Give nothing by mouth.

Note. The same person should observe the Soldier during cooling and evacuation in order to spot symptom changes.

c. Exertional rhabdomyolysis.

(1) Symptoms.

(a) Severe or prolonged muscle pain during and after exertion.

(b) Muscle weakness, stiffness, or abnormal firmness.

(c) Abnormal urine color (red, dark brown, or tea-colored).

(2) Treatment.

(a) Have casualty rest and continue to drink water (no more than 1-1/2 quarts per hour).

(b) Seek medical attention.

d. Exercise collapse associated with sickle cell trait (ECAST). This is a medical emergency that can result in death if not properly identified and treated.

(1) Symptoms.

(a) "Conscious collapse," characterized by increasing pain and weakness in the working muscles, especially the legs, buttocks, and lower back.

(b) Wobbly and unstable legs.

(c) Collapse to the ground.

Note. ECAST is distinguished by "collapse" (unable to continue standing). Mental status is normal, and body temperature may not be elevated.

(2) Treatment.

(a) Stop the Soldier from participating in further activity.

(b) Activate the EMS.

(c) Cool the Soldier rapidly, if heat stroke is also suspected.

e. Hyponatremia ("water intoxication"). This is a medical emergency that can be mistaken for heat stroke, though treatment is very different.

(1) Signs and symptoms.

(a) Mental status changes.

(b) Vomiting.

(c) Excessive water consumption.

(d) Poor diet.

(e) Abdomen bloated.

(f) Large amounts of clear urine.

(2) Treatment.

(a) Do not give more water, or intravenous fluids.

(b) If awake, allow Soldier to consume salty foods or snacks.

(c) Seek medical aid.

(d) Evacuate immediately.

Note. If the distinction between exertional heat stroke and hyponatremia cannot be determined at point of injury, EHS should be presumed and cooling measures initiated.

f. Sunburn.

(1) Signs and symptoms.

(a) Chills, fever.

(b) Redness, slight swelling (1st degree).

(c) Pain and blistering (2nd degree).

(2) Treatment.

(a) Cool compresses or aloe-based gels.

(b) Seek medical attention (severe cases).

Appendix C
Cold injury risk management and casualty identification and treatment

C-1. Cold injury risk management

a. Identify the hazards. Cold weather may present a hazard if any one of the following is present:

(1) Cold (temperature 40 ºF and below).

(2) Wetness (rain, snow, ice, humidity); immersion; or wet clothes at temperatures below 60 °F.

(3) Wind (wind speed 5 miles per hour and higher).

(4) Lack of adequate shelter/clothing.

(5) Lack of provisions/water.

(6) Other risk factors, such as –

(a) Previous cold injuries or other significant injuries, or pre-existing medical conditions.

(b) Use of tobacco/nicotine, alcohol, or certain medications.

(c) Skipping meals/poor nutrition.

(d) Low activity.

(e) Fatigue/sleep deprivation.

(f) Little experience/training in cold weather operations.

(g) Cold casualties in the previous 2 to 3 days.

b. Assess the hazards. The potential for cold casualties can be assessed by determining –

(1) The magnitude of cold exposure (see table C-1). Reliable measurement equipment must be used to determine –

(a) Air temperature (thermometer).

(b) Wind speed (anemometer).

(c) Wetness.

(d) Weather forecast (local weather station or another source such as the worldwide web).

Table C-1. Wind chill temperature

Cooling power of wind expressed as an equivalent chill temperature (under calm conditions)

ESTIMATED WIND SPEED (IN MPH)	ACTUAL THERMOMETER READING (F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURES (F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-21	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Winds greater than 40 MPH have little additional effect.	LITTLE DANGER (for properly clothed person) Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh.			GREAT DANGER				
	Trench foot and immersion foot may occur at any point on this chart.											

(2) The readiness of Soldiers. Soldiers must have—

(a) Appropriate clothing in good condition (clean and without stains, holes or blemishes that could decrease the insulation).

(b) Adequate shelter.

(c) Proper fitness.

(d) Proper food and hydration.

(3) Mission-related concerns, to include—

(a) Degree of mobility, which impacts Soldier heat generation.

(b) Contact with ground or other surfaces that may increase conductive cooling.

(c) Exposure to wet conditions (for example, stream crossings).

c. Develop controls and make risk decisions. Cold casualties can be controlled through –

(1) Education.

(a) Soldier education, to include –

- Assessing cold stress.
- Recognizing and preventing cold injuries.
- Limiting the effects of cold through clothing, shelter, and nutrition.
- Learning how to work effectively in cold environments.

(b) Leadership education, to include –

- Supervising Soldiers who often have only a superficial understanding of cold.
- Evaluating the impact of cold on the mission (for example, everything takes longer; Soldiers will be more fatigued, more likely to make mistakes).

(c) Experiential learning, to include –

- Remembering that true effectiveness in cold environments only comes with experience.
- Practicing the clothing principles of layering and staying dry. These principles must be tailored to the individual, and must be practiced so that Soldiers will learn when to dress down (before sweating begins) and when to add layers (before shivering begins).

- Remember Remember the acronym COLD:

Keep it **C**lean
Avoid **O**verheating
Wear it **L**oose and in Layers
Keep it **D**ry

- Layers can be removed as ambient temperature or physical activity increases, which can reduce sweating and moisture build-up within clothing.

Note. See tables C-2 and C-3 for recommended cold weather uniform and equipment usage.

- Avoid cotton clothing, which holds perspiration in cold-weather environments.

- In extreme cold environments, do not remove clothing immediately after heavy exertion (for example, physical readiness training); wait until you are in a warmer location.

- Using equipment in the cold. Everything takes longer, so practice is needed. Soldiers also need to be able to identify where special tools or clothing (for example, contact gloves) may be necessary.

- Planning for longer missions (weather may change quickly and hinder operations, and troop fatigue impacts even routine operations).

(d) The posting of cold-casualty prevention information as an ongoing reminder.

(e) Establishing standard operating procedures (SOP) for most routines.

(2) Training.

(a) Clothes are to be appropriate and worn properly.

- Clothing must be kept dry; wet and damp clothes changed as soon as possible.

- Clothing is to be worn loose and in layers; hands, fingers, and the head are to be covered and protected.

- All clothing must be clean and in good repair (no broken zippers or holes).

- Proper boots must be worn, ones that are not too tight (even with heavy socks) and are dry.

- Socks must be clean and dry, an extra pair of socks must be carried, wet or damp socks must be changed as soon as possible, and foot powder must be used on feet and in boots.

o Wipe dry the inside of vapor barrier boots at least once per day, or more often as feet sweat.

o Dry leather boots by stuffing with paper towels.

- Feet are to be washed daily if possible.

- Gaiters are to be worn to keep boots dry when necessary.

- Gloves or mittens are to be worn.

- Hands must be warmed under clothes before hands become numb.

- Skin contact with snow, fuel, or bare metal is to be avoided, and proper gloves are to be worn when handling fuel or bare metal.

- Gloves are to be waterproofed by treating them with waterproofing compounds.

- A scarf, insulated cap with flaps, or a balaclava is made available to cover the face and ears.

- Face and ears are to be warmed by covering them with warm hands. The face and ears must not be rubbed.

- Face camouflage is not to be used when the air temperature is below 32 ºF.

- Sunscreen and lip balm are to be worn.

- Eyewear that protects against ultraviolet (UV) light (for example, goggles) is to be worn to prevent snow blindness.

Table C-2. Army cold weather uniform and equipment posture – 55 °F to 33 °F

Area of Consideration	***Special Requirements and Recommended Actions***	
	Clothing Layer:	ECWCS Generation III
Available Personal Clothing and Equipment	Base layer	• Lightweight cold weather undershirt and drawers and • Midweight cold weather shirt/drawers
	Insulating layer	• Green fleece jacket
	Outer shell	• Wind cold weather jacket (wind shirt) • Extreme cold/wet weather jacket (hard shell) • Extreme cold/wet weather trousers (hard shell)
	Other: • Issued gloves with liners • Issued wool socks with synthetic liner sock • Temperate boots; cold weather boots recommended (Belleville 795, Danner Ft. Lewis 400g Tan Military Boots)	• Balaclava and neck gaiter • Suspenders • Knife • Arctic necklace (lighter and lip balm worn around neck)
Training	• Knowledge of cold region environmental hazards • Knowledge of cold weather clothing capabilities and limitations • Skill to use cold weather clothing and equipment to provide protection from the elements • Skill to prevent, recognize, and treat cold injuries	
Food and Water	• Meals ready to eat • One hot meal daily as mission dictates • 3½–5 quarts of water per day	
Shelter and Heat	• Patrol bag • Bivouac cover • Sleeping mat • Poncho • Poncho liner (optional)	
Additional Control Measures	• Water re-supply plan • Sanitation plan	
Legend ECWCS - Extreme Cold Weather Clothing System		

Table C-3. Army cold weather uniform and equipment posture – 32 °F to 14 °F

<table>
<tr><th>Area of Consideration</th><th colspan="3">Special Requirements and Recommended Actions</th></tr>
<tr><td></td><td>Clothing Layer:</td><td colspan="2">ECWCS Generation III</td></tr>
<tr><td rowspan="4">Available Personal Clothing and Equipment</td><td>Base layer</td><td colspan="2">• Lightweight cold weather undershirt and drawers
• Midweight cold weather shirt/drawers</td></tr>
<tr><td>Insulating layer</td><td colspan="2">• Green fleece jacket</td></tr>
<tr><td>Outer shell</td><td colspan="2">• Wind cold weather jacket (wind shirt)
• Extreme cold/wet weather jacket (hard shell)
• Extreme cold/wet weather trousers (hard shell)
• Extreme cold weather parka (puffy Jacket)</td></tr>
<tr><td colspan="3">Other:
• Issued gloves with liners
• Issued wool socks with synthetic liner sock
• Cold weather boots (Belleville 795, Danner Ft. Lewis 400g Tan Military Boots)
• Arctic necklace (lighter and lip balm worn around neck)
• Trigger finger mittens with extra trigger finger liners
• Suspenders
• Contact gloves
• Knife
• Balaclava and neck gaiter
• Ski goggles</td></tr>
<tr><td>Training</td><td colspan="3">Additional training is available from Northern Warfare Training Center Arctic Light Individual Training Program or similar program</td></tr>
<tr><td>Food and Water</td><td colspan="3">• Meal, cold weather (MCW) 1 bag = 1 meal which provides about 1500 calories
• 34 ounces of heated water are required to hydrate one MCW
• Two hot meals per day as mission dictates
• 3½–5 quarts of water per day
• One stove per team to heat water for rations and melt snow for water</td></tr>
<tr><td>Shelter and Heat</td><td colspan="3">Individual:
• Medium Shelter System, all components
• Sleeping mat, poncho and poncho liner
Squad:
• Ahkio group complete
• Arctic 10-man tent
• Space heater arctic</td></tr>
<tr><td>Additional Control Measures</td><td colspan="3">• Begin leader/medic checks for cold injuries; 2-3 times daily at minimum
• Water re-supply and storage plan (to prevent water from freezing)
• Sanitation plan
• No skin camouflage below 32 °F (0 °C)
• Contact gloves must be worn when working outdoors
• POL gloves must be worn when working with fuel
• Consider four-season, 2-4 man shelters for personnel that work away from support base</td></tr>
<tr><td colspan="4">Legend
ECWCS – Extreme Cold Weather Clothing System
POL – petroleum, oil, and lubricants</td></tr>
</table>

Note. See ATP 3-90.97 for temperature zones below 14 °F.

(b) The body is to be kept warm.

- Soldiers are to keep moving.
- Large muscles (arms, shoulders, trunk, and legs) are to be exercised to keep warm.

(c) Health and nutrition must be sustained.

- Alcohol use is to be avoided (alcohol impairs the body's ability to shiver).

- Tobacco products are to be avoided (tobacco products decrease blood flow to the skin).

- All meals are to be eaten to maintain energy and proper electrolyte balance.

- Water or warm nonalcoholic fluids are to be consumed to prevent dehydration.

- Carbon monoxide poisoning must be prevented by using only Army-approved heaters in sleeping areas, by not sleeping near the exhaust of a vehicle while the vehicle is running, and by not sleeping in an enclosed area where an open fire is burning.

(d) Soldiers will protect each other.

Soldiers are to watch for signs of frostbite and other cold weather injuries in their buddies.

- Soldiers are to ask about and assist with rewarming of feet, hands, ears or the face.

(e) Leadership initiatives will be practiced.

- Activities or exercises will be limited, modified, or discontinued during very cold weather.

- Covered vehicles are to be used for troop transport.

- Warming tents are to be available in temperatures 32 °F and lower.

- One or two hot meals per day will be provided (see tables C-2 and C-3).

- All equipment is to be checked and working properly.

- Provide medical and evacuation support. See TRADOC Circular 350-70-1, Medical Support to Training for guidelines for the minimum medical support for high- and low-risk training events.

d. Implement controls. Cold casualty controls can be implemented through –

(1) Identified controls already in place (buddy checks, sock changes, available shelter, and warm meals).

(2) Controls that are integrated into standard operating procedures (SOPs).

(a) Soldiers (including newly arrived Soldiers) will be educated about hazards and controls.

(b) The buddy system will be implemented to check clothes and personal protection.

(c) Soldiers will be encouraged and allowed to speak up about any problem (self-checks).

(3) A decision to accept risk at the appropriate level.

e. Supervise and evaluate. The final step in the risk-management process is the supervision and evaluation of the controls taken to prevent cold casualties. Examples are—

(1) Ensuring all Soldiers and leaders are educated and experienced in the prevention, recognition, and treatment of cold-weather injuries, as well as effective measures for working in cold environments.

(2) Conducting inspections and reinforcing buddy checks to ensure control measures have been implemented.

(3) Monitoring the adequacy/progress of implementation of control measures.

(4) Performing spot checks of shelters, rewarming facilities, and food and drink supplies.

(5) Recording and monitoring indicators of increasing cold risks, such as—

(a) An increase in the number of cold-weather injuries.

(b) An increase in the number of complaints/comments about cold.

(c) Observations of shivering and signs of cold-weather injuries.

(6) Continuously evaluating current control measures and strategizing new or more efficient ways to keep warm and avoid cold injuries.

f. Table C-4 provides examples for completing items under "Hazard," "Control," and "How to Implement/Who will Implement" found in TB MED 508 and ATP 5-19. Each worksheet should be developed specifically for each training or work site.

Table C-4. Guide for completing portions of DD Form 2977 – Cold injury

HAZARD	INITIAL RISK LEVEL	CONTROL	HOW TO IMPLEMENT/ WHO WILL IMPLEMENT
Cold (temperature 40 ºF and below) Wind chill above 25 °F Wind chill 25 – -5 °F Wind chill -10 – -45 °F Wind chill below -45 °F	 L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Wetness (rain, snow, ice, humidity) or wet clothes at temperatures below 60 °F. Minimal wetness Moderate wetness Very wet Extremely wet	 L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Shelter/clothing Sufficient Somewhat sufficient Minimally sufficient Not sufficient	 L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant

Table C-4. Guide for completing portions of DD Form 2977 – Cold injury (cont.)

HAZARD	INITIAL RISK LEVEL	CONTROL	HOW TO IMPLEMENT/ WHO WILL IMPLEMENT
Activity level High activity Moderate activity Minimal activity Inactive	L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Fatigue/ sleep deprivation Rested Somewhat fatigued Moderately fatigued Very fatigued	L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
Experience/training in cold weather operations Very experienced Somewhat experienced Minimally experienced Not experienced	L M H EH	Buddy checks Sock changes Available shelter Warm beverages and meals Ensure heated spaces are well ventilated	How: TRADOC Regulation 350-29 Who: Platoon Sergeant
LEGEND: **EH -** Extremely High Risk **H -** High Risk **M -** Medium Risk **L -** Low Risk			

C-2. Cold weather casualty identification and treatment

Cold weather-related injuries include: injuries due to decreased temperature (hypothermia, frostbite, nonfreezing cold injury), injuries due to heaters, carbon monoxide poisoning, and accidents due to impaired physical and/or mental function resulting from cold stress. Cold weather injuries can also occur in warmer ambient temperatures when an individual is wet due to rain or water immersion. See TC 4-02.1 (First Aid).

a. Hypothermia. Hypothermia occurs when heat loss is greater than heat production. This can occur suddenly, such as during partial or total immersion in cold water, or over hours or days, such as during extended operations or survival situations. Hypothermia may occur at temperatures above freezing, especially when a person's skin or clothing is wet.

(1) Symptoms.

(a) Vigorous shivering is typically present, but may decrease or cease as body core temperature continues to fall.

(b) Conscious, but usually apathetic or lethargic. With severe hypothermia, the casualty may be unconscious or stuporous.

(c) Confusion.

(d) Sleepiness.

(e) Slurred speech.

(f) Shallow, slow breathing.

(g) Weak, slow pulse.

(h) Low or unattainable blood pressure.

(i) Change in behavior, poor control over body movements, or without slow reactions. Hypothermic patients may also display poor judgment and decision-making.

(j) With severe hypothermia, the casualty may be unconscious or stuporous.

(2) Treatment. The goals for field management of hypothermia are to rescue, examine, insulate, and rapidly transport. If untreated, hypothermia is a true medical emergency and requires evacuation. Rewarming techniques include:

(a) Remove the casualty from the cold environment.

(b) Replace wet clothing with dry clothing.

(c) Cover the casualty with insulating material or blanket. Provide insulation from the cold ground using material such as a sleeping mat, and protect insulating material from getting wet.

(d) Wrap the casualty from head to toe using a blanket, poncho, or survival blanket (from combat lifesaver aid bag).

(e) Avoid unnecessary movement from the casualty.

Note. Rewarming with exercise is done only if the casualty has no cardiac irregularities.

(f) If casualty is conscious, slowly give high caloric sweet, preferably warm, fluids.

(g) Seek medical aid.

(h) Evacuate as soon as possible with the casualty lying down.

b. Frostbite. Frostbite is freezing of skin, and is most prevalent in the fingers, toes, ears and face. It occurs with exposure to below-freezing temperatures (< 32 °F) and during direct contact with cold metal and super-cold petroleum (fuel), oil, and lubricants (POL). As the wind chill temperature goes below minus 15 °F, the risk of frostbite substantially increases. Both natural and man-made wind increase the risk of frostbite. Man-made wind includes riding in open vehicles, exposure to propeller/rotor-generated wind, running, and skiing. Altitude exposure increases risk of frostbite, as temperatures become lower at higher elevations and often there is little tree cover to protect against the wind. Tight clothing or equipment such as boots or backpack straps can also be conbtributing factors as they restrict blood flow.

(1) Symptoms.

(a) Numbness in affected area.

(b) Tingling, or tender areas.

(c) Pale, yellowish, waxy-looking skin (grayish in dark-skinned Soldiers).

(d) Frozen tissue that feels wooden to the touch.

(e) Significant pain after rewarming, which may be accompanied by blistering or swelling.

(2) Treatment.

CAUTION: Avoid thawing the affected area if it is possible that the injury may refreeze before reaching the medical treatment facility.

(a) Local rewarming at room temperature or using body heat.

(b) Loosen or remove constricting clothing and remove jewelry.

CAUTION: DO NOT massage the skin or rub anything on the frozen parts.

(c) Move the casualty to a sheltered area, if possible.

(d) Protect the affected area from further cold or trauma. Soldiers should not walk on frostbitten feet unless their survival depends on it.

(e) Once a tissue is thawed, it must not freeze again. If there is the possibility of tissue refreezing, it is better not to thaw it in order to avoid damaging tissue further.

(f) Avoid exposure to excessive heat (open flame, stove tops, steam, heat packs) or rubbing affected tissue. Tissue that is numb and/or damaged from frostbite is at risk for burns from uncontrolled heat sources.

(g) All Soldiers with a peripheral freezing injury must be suspected of being hypothermic and treated appropriately. During field management, it is more important to prevent hypothermia than to rewarm frostbite rapidly.

(h) Seek medical aid.

(i) Evacuate the casualty.

c. Non-freezing cold injury. The most common non-freezing cold injuries are chilblain and trench foot. Trench foot occurs when tissues are exposed to temperatures from 32-60 °F for prolonged periods of time (> 12 hours), whereas chilblain, which is a more superficial injury, can occur after just a few hours of exposure. A non-freezing cold injury is classified by the symptoms and stages of recovery.

(1) Chilblain. Chilblain is a non-freezing cold weather injury that can occur after 1-5 hours in cold-wet conditions when skin temperature is > 32 °F. The most commonly affected areas are the backs of the fingers, but the ears, face, and other exposed skin are also areas of occurrence. There are rarely lasting effects from chilblain.

(a) Symptoms.

- Chilblain lesions are swollen, tender, itchy, and painful.

- With re-warming, the skin becomes swollen, red (or darkening of the skin in dark-skinned Soldiers) and hot to the touch.

- An itching or burning sensation may continue for several hours after exposure.

Note. Early diagnosis of chilblain becomes evident when symptoms do not resolve with re-warming.

(b) Treatment. Re-warm affected area; keep warm and dry.

(2) Immersion foot (trench foot) is caused by prolonged (> 12 hours) exposure of tissue, especially the feet, to wet cold and conditions at 32 °F to 60 °F. Inactivity and damp socks and boots (or tightly laced boots that impair circulation) speed onset and severity.

(a) Symptoms.

- Cold, numb feet that may progress to hot with shooting pains

- Slight sensory change for 2 to 3 days

- Swelling, redness, and bleeding may become pale and blue

- Accompanied by aches, increased pain sensitivity, and infection

- Loss of sensation

- Severe edema (swelling) and gangrene (dead tissue)

- Loss of tissue

(b) Treatment.

- Remove wet or constrictive clothing; gently wash and dry affected extremities

- Elevate affected limbs and cover with layers of loose, warm, dry clothing

- Do not burst blisters, apply lotions or creams, massage, expose to extreme heat or permit Soldiers to walk, which can increase tissue damage and worsen the injury

- Seek medical attention
- Evacuate for medical treatment

d. Other injuries related to cold weather.

(1) Carbon monoxide poisoning.

(a) Symptoms.

- Drowsiness
- Headaches
- Ringing in ears
- Bright red lips/eyelids
- Nausea
- Unconsciousness

(b) Treatment.

- Move to fresh air immediately
- Seek medical aid promptly
- Provide mouth-to-mouth resuscitation if victim is not breathing

(2) Snow blindness.

(a) Symptoms.

- Gritty feeling in eyes
- Redness and tearing
- Pain during eye movement
- Headache

(b) Treatment.

- Remove from sunlight

- Blindfold eyes/cover with cool, wet bandages
- Seek medical attention

(3) Sunburn.

(a) Signs and symptoms.

- Chills, fever.
- Redness, slight swelling (1st degree).
- Pain and blistering (2nd degree).

(b) Treatment.

- Cool compresses or aloe-based gels.
- Seek medical attention (severe cases).

Appendix D
Instructions on use of the wet bulb globe temperature (WBGT)

D-1. Principle of the WBGT
Wet bulb globe temperature is a composite temperature used to estimate the effect of high air temperature, high humidity, thermal radiation (for example, sunlight), and low air movement on humans. The WBGT index was developed in 1956 by the United States Marine Corps at Parris Island to reduce heat stress injuries in recruits. It is determined with special equipment and calculated to reflect components of air, humidity and wind that affect "actual temperature" experienced by personnel: WBGT is derived from the formula: $0.7T_w + 0.2T_g + 0.1T_d$

T_w = Natural wet-bulb temperature (with dry-bulb temperature indicates humidity)

T_g = Globe thermometer temperature (also known as black globe thermometer)

T_d = Dry-bulb temperature (actual air temperature)

and yields a category or "flag" color; see table D-1.

Table D-1. WBGT categories

Heat Category or "Flag"	WBGT Index (°F)
1 (white)	78 - 81.9
2 (green)	82 - 84.9
3 (yellow)	85 - 87.9
4 (red)	88 - 89.9
5 (black)	> 90
Note: If wearing heavy protective clothing (mission-oriented protective posture (MOPP)), add 10 ºF to WBGT index for easy work and 20 ºF to WBGT index for moderate and heavy work.	

D-2. Equipment

a. The original WBGT kit is comprised of a wet bulb thermometer, a black globe thermometer, and a dry bulb thermometer in an aluminum case and mounted on a tripod when in use. This kit is the standard WBGT device in unit assemblages. Instructions on use of this kit are found inside the kit, and in ATP 4-25.12.

b. A number of automated devices, known as heat stress monitors, are acceptable alternatives. Consult with the installation Environmental Health Section for assistance in choosing a device.

D-3. Method for use of the WBGT

a. All readings for the WBGT index are taken at the location representative of the conditions to which Soldiers are exposed (see paras B-1b(1) and B-1c(3)). Whether the original WBGT kit or digital heat stress monitor is used, it is placed 4 feet above the ground for a period of 20 minutes before readings are taken.

b. Any WBGT device, whether mechanical or digital, should be calibrated by test, measurement and diagnostic equipment (TMDE) support personnel on a schedule in accordance with guidelines for that specific WBGT device.

Appendix E
Methods for controlling risk of heat illness

E-1. Monitoring hydration status

The currently-issued personal hydration system bladder holds 100 ounces of water (about 3 liters, or 3-1/8 quarts). Hydration status may be monitored by assuring full personal hydration systems at the start of the day, and spot checking water consumption by compressing the bag during/after events, or by counting number of bags consumed.

E-2. Carbohydrate-electrolyte beverages (CEB) (sports drinks) and oral rehydration solutions (ORS)

a. Carbohydrate-electrolyte beverages (CEB) (sports drinks) are an effective source for electrolyte replacement because they may enhance consumption due to their flavor an reduce risk of hyponatremia (water intoxication) due to the sodium content.

(1) Carbohydrate-electrolyte beverages should be used only under the following conditions:

(a) When Soldiers are not fully heat acclimatized; a process that can take up to 21 days (especially for trainees/Soldiers in initial military training (IMT)).

(b) When Soldiers who are unaccustomed to hydrating with water and may lack the discipline needed to drink enough water.

(c) When Soldiers maintain vigorous physical activity for more than 3 hours (for example, conducting road marches or obstacle courses).

(d) When Soldiers have poor nutritional intake or sustain an energy deficit of 1,000 calories or more per day (by not eating full meals, or skipping meals).

(e) When sweat loss is high and electrolytes are not adequately replaced through the diet (especially when food restriction is part of the training curriculum (for example, Ranger, Survival Evasion Resistance and Escape (SERE), Special Forces (SF)).

(f) When integrated with standard water consumption (before, during, and/or after activity).

Note. Local dining facilities provide cooling beverage support for field training, such as hand grenade ranges, obstacle courses, basic rifle marksmanship ranges, and field training exercises that occur in hot, arid climates. A cooling beverage is cool water, with or without a flavored beverage base, given to sustain adequate body hydration. Currently, CEB base powders are available for cooling beverage support of field training during the heat season (generally May through October).

(2) Sports drinks should contain electrolytes in the amounts shown in table E-1.

Table E-1. Carbohydrate and electrolyte content of carbohydrate-electrolyte beverages

	Per 8-oz. serving	Per quart
Sodium	82-163 mg	300-700 mg
Potassium	18-46 mg	70-180 mg
Carbohydrate	12-14 g	50-100 g

Note. CEBs containing greater than 163 milligrams of sodium per 8 ounce serving may become unpalatable and are not approved for routine use.

(3) Obtain CEBs in bulk (such as 2½- or 5-gallon beverage dispensers) versus individual serving units (such as individual bottles or powder packets) and serve in cups. Do not dispense CEBs in canteens or hydration systems, to avoid the growth of harmful bacteria.

b. Oral rehydration solutions. Oral rehydration solutions (ORS) are medical materiel (class VIII) and are classified as medical food by the U.S. Food and Drug Administration (FDA). These types of medical foods are used to treat and prevent dehydration, typically due to diarrhea. The ORS can contain three to five times the amount of sodium and potassium found in typical CEB.

(1) In units outside IMT, as part of a deliberate risk assessment, documented on a DD Form 2977, commanders may elect to use ORS prior to a training event in extreme conditions or within select settings, such as training that includes purposeful food restriction (for example, Ranger; Special Forces; Survival, Evasion, Resistance and Escape (SERE)). Unit surgeons can make the determination to supplement intake with class VIII ORS. Regular consumption of meals and proper drinking protocols adequately provide a trainee/Soldier with a good electrolyte balance for most physical training activities.

(2) For initial military training (IMT) trainees, the use of ORS is not approved for routine hydration maintenance or prevention of heat illness/injury; CEB should be used in this instance.

E-3. Arm immersion cooling system (AICS)

a. Principle. The AICS is a simple, efficient method for facilitating body (core and skin) temperature cooling, and reducing the risk of serious heat illness. The AICS takes advantage of the rapid rate of heat transfer from the skin directly into cool water (compared to transfer into evaporative sweat or air), and the large surface area-to-mass ratio of the forearms. Several studies have reported that hand and forearm immersion in cool (50-68 °F) water reduces body core and skin temperature faster than a non-cooling control, extends length of time for heat tolerance, and increases total work time.

b. Description and sources.

(1) An AICS can be any reservoir of cold water used to immerse the hands and forearms during rest periods and provides 40% of the body core temperature cooling rate achieved using ice water immersion to the neck. The AICS prototype units stand ~40 inches (in) tall and the trough is 60 in long x 24 in wide. Folded size is 62 in x 24 in x 4 in for ease of portability. Weight without water is ~55-60 pounds, making it fairly easy for 2 Soldiers to move and set up. The AICS

includes an integrated thermometer for monitoring water temperature, and assembly and use instructions stenciled on the fabric. See figure E-1.

Figure E-1. Prototype arm immersion cooling system units

(2) Commercially produced AICS units, similar to those shown in Figure E-1, are available.

(3) AICS units can be fabricated locally at a much lower cost for materials and labor than the AICS prototype units. The locally-fabricated AICS units can be constructed with 50-gallon plastic drums cut in half, and use fabricated metal hooks to hold the drum in place. See figure E-2.

Figure E-2. Locally-fabricated or improvised arm immersion cooling system

c. Use.

(1) AICS units must be set up prior to start of training for use during “Heavy Work” and “Very Heavy Work” events in heat categories 1 through 5 and during “Moderate Work” events in heat category 4 or 5 (see table B-1).

(2) Fill the AICS unit with ice, then add water and let stand for 3-5 minutes.

Note. If desired, a capful of bleach may be added to each trough of water to reassure Soldiers the water is clean; there is no proven risk from microorganism viability or transfer in water that is colder than 80 °F.

(3) To achieve approximately 1.5 °F body temperature reduction, submerge forearms and hands into chilled water for the indicated cooling time. The AICS is more effective when arms are immersed greater than 3 minutes to truly reduce the body core temperature as opposed to less than 3 minutes.

(a) Alternating users on each side will accommodate a maximum number of users.

(b) Ensure that Soldiers at highest risk for heat illness immerse for longer periods of time.

(c) Check water temperature hourly and replace water when its temperature reaches 80 °F (see table E-2).

Table E-2. Temperature of water and cooling time

Temperature (degrees)	Cooling time (minutes)
> 80 °F	Replace water
71-80 °F	12-15
55-70 °F	8-12
45-54 °F	5-8
35-44 °F	3-5

d. Under elevated health protection condition (HPCON) protocols for preventing the spread of illness (such as during a pandemic):

(1) Ensure all Soldiers remove uniform top before submerging forearms.

(2) Limit to 1 trainee/student per AICS and maintain social distancing (6 feet apart) while waiting to use the AICS.

(3) Add 1 capful of bleach to AICS refill every 3 hours during the training day.

(4) Sanitize the AICS units.

(a) Use a solution of bleach and water to disinfect the AICS at the end of each day of use.

Note. To make a 500 part per million solution, mix as follows:

Bleach strength	
5.25%	8.25%
¼ cup per 1 gallon water	1½ tablespoon per 1 gallon water

Source: TB MED 531, table B-1.

(b) Wet contact time required for disinfecting is 1 minute followed by a clear water rinse.

E-4. Reduce heat load

a. The practice of designating and equipping sites for deliberate cooling and rest ("cool zones") is recommended for reducing the heat effects on Soldiers in training. Cool zones provide a break area for those who are exposed to the debilitating effects of the heat during physical activity. These break areas are specially designed to provide shade from the sun and include devices or items to aid the body in dissipating heat. Such devices include camouflage cover or solar shades (see figure E-3), water trailers/tanks, coolers containing water, sports drinks (as authorized), power breezers/fans and misters (see figure E-4), and the AICS.

Figure E-3. Solar shade

Figure E-4. Cool zone with misting fan, water resupply, and arm immersion cooling system

b. Provide for Soldiers to spend time in air-conditioned-space or shower unclothed in cold water at the end of a day of moderate and heavy training in category 3 and above, in order to reduce heat load.

c. Cool zones along with misters and AICS units are most effective in controlling body temperature and reducing the cumulative effect of heat over multiple days.

Appendix F
Use of ice packs and iced sheets

F-1. Concept

a. The use of commercial ice packs and ice sheets for treatment of heat stroke in the field is recommended in TB MED 507. Ice packs and ice sheets may be procured, or iced sheets may be prepared with readily-available items.

Note. The term "ice sheet" refers to commercially-available products; the term "iced sheet" refers to the locally-produced item.

b. Units may elect to purchase ice packs and ice sheets. The advantages of these over locally-prepared iced sheets is that there is no need to launder linen, procure ice, or carry heavy containers of ice and water.

c. Units may elect to prepare iced sheets locally. The advantages of these over commercially-prepared ice packs and ice sheets is lower cost (including replacement of damaged or spoiled products), readily-available components, and no need to refrigerate or freeze the products. The use of bed sheets cooled with ice water has been proven to significantly improve the recovery and outcome of persons suffering from heat stroke. The recommended indications and procedures for use of iced sheets are as follows:

(1) Provide iced sheets in accordance with risk assessment and local guidance. For planning purposes, the recommended number of sheets is 4 per potential heat casualty, in insulated ice chests or coolers. Determine the means of procurement for the chests, sheets, and ice through organizational supply personnel.

(2) Prepare iced sheets by placing ordinary bed sheets in iced water.

(a) Keep iced water ready in insulated ice chests or coolers filled with 1/3 water and 2/3 ice.

(b) Have sheet readily available, either soaking in iced water or in resealable plastic bags.

(c) When needed, immerse sheet in iced water and ensure it is saturated; this can be done as Soldier's outer clothing is being removed.

(3) Depending on the risk, the ice chests can be maintained at training sites by drill sergeants; carried on ambulances or nonstandard evacuation vehicles; and maintained at troop medical clinics.

(4) Iced sheets should be applied anytime a Soldier has a change in their mental status and environmental heat exposure is the likely cause of this change (that is, either during environmental heat extremes or following days of exposure to environmental heat extremes). Mental status changes include confusion, inability to properly follow commands, and loss of consciousness. The mental status changes of heat illness are more important than the Soldier's temperature when deciding on the treatment of heat illnesses.

Note. A heat casualty's body core (rectal) temperature should be measured only by medical personnel.

Ask the following questions to assess mental status:

(a) What is your name?

(b) What month is it? What year is it?

(c) Where are you?

(d) What were you doing before you became ill?

(5) Iced sheets should always be applied as follows (see figure F-1):

(a) Lay the first sheet down on a litter or stretcher.

(b) Place the casualty on top of the first iced sheet.

(c) Place wadded or rolled iced sheets in the casualty's groin, armpits, and around the neck.

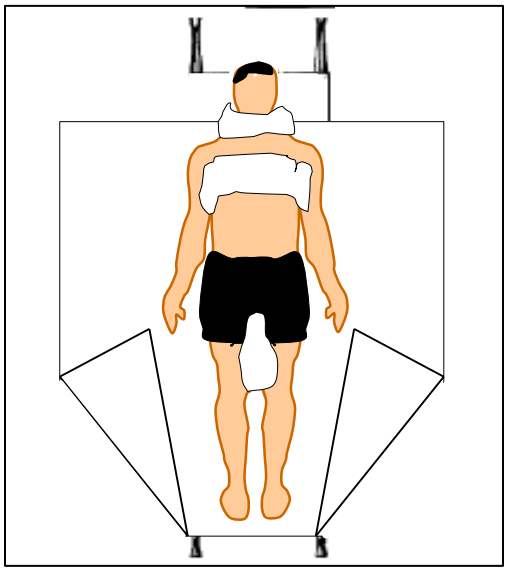

Figure F-1. Application of iced sheets

(d) Fan the entire body.

(e) Refresh sheets every 3 minutes (put them back into cooler and then reapply).

(f) Continue cooling if casualty starts shivering, until temperature can be measured at below 102 ºF.

(2) Seek medical aid.

(3) Give nothing by mouth.

(4) Iced sheets should be re-iced and re-applied (or completely replaced) every 3 minutes (because the sheets are no longer delivering cooling therapy). Cooling should be continued until EMS arrives. Do not disrupt cooling on the basis of a temperature measurement (for example, with ear or skin thermometer).

(5) Evacuate any Soldier who requires cooling with iced sheets to the nearest emergency room via EMS.

(6) Iced sheets should be laundered after use and before use on another casualty, except in emergency circumstances. Sheets should not be stored long term in water or in a damp condition, as this will lead to mold or mildew. Reusable commercial ice packs or ice sheets should be cleaned according to their instructions after use, and single-use products should be disposed of appropriately.

(7) See U.S. Army Center for Initial Military Training "Heat Injury Ice Sheets Video" at www.youtube.com/watch?v=bfP_VbD18yM.

Appendix G
Safety and medical terminology and reporting requirements

G-1. Safety terminology and reporting of heat illnesses and cold injuries

a. Heat illnesses and cold injuries are reported as Army accidents in accordance with AR 385-10 (The Army Safety Program), chapter 3; and TR 1-8 (U.S. Army Training and Doctrine Command Operations Reporting), as follows:

(1) Class A. An injury and/or occupational illness resulting in a fatality or permanent total disability.

(2) Class B.

(a) An injury and/or occupational illness resulting in permanent partial disability; or

(b) When three or more personnel are hospitalized as inpatients as the result of a single occurrence.

(3) Class C.

(a) A nonfatal injury or occupational illness that causes 1 or more days away from work or training beyond the day or shift on which it occurred; or

(b) Disability at any time (that does not meet the definition of Class A or Class B and is a day(s)-away-from-work case).

(4) Class D. A nonfatal injury or illness that results in restricted work; transfer to another job; medical treatment greater than first aid; needle stick injuries; cuts from sharps that are contaminated from another person's blood or other potentially infectious material; or medical removal under medical surveillance requirements of an OSHA standard.

b. Limited use safety accident investigation reports. These are DA accident investigation reports used solely for the prevention of subsequent DA accidents. Limited use accident reports include investigations of operations or exercises (see AR 385-10).

G-2. Medical terminology and reporting of heat illnesses and cold injuries

a. Heat illnesses and hot weather-related conditions.

(1) The following heat illnesses are reported as reportable medical events in accordance with AR 40-5 (Preventive Medicine); and TR 1-8, as follows:

(a) Heat exhaustion (HE) (International Classification of Diseases, 10th revision (ICD-10) code T67.5, if unspecified; or heat exhaustion, anhidrotic (T67.3), or heat exhaustion due to salt depletion T67.4). A syndrome of elevated body core temperature (though temperature may be in the normal range at presentation for care, especially if oral) with physical collapse or debilitation occurring during or immediately following exertion, with no more than minor central nervous system (CNS) symptoms (such as headache, dizziness). HE resolves rapidly with minimal cooling intervention.

(b) Exertional heat injury (EHI) (no separate ICD-10 code). Providers should code cases of EHI as heat exhaustion, unspecified (T67.5) as the primary diagnosis, with appropriate additional diagnostic codes based on the clinical presentation. Examples include but are not limited to acute kidney injury (nontraumatic) N17.9, acute and subacute hepatic failure without coma K72.00, or rhabdomyolysis M62.82.

(c) Exertional heat stroke (EHS) (ICD-10 code T67.02). A seriously elevated temperature (> 104 °F or 40 °C) that causes CNS injury. Clinically, EHS presents as hyperthermia, physical collapse or debilitation, and brain dysfunction as evidenced by delirium, stupor, or coma, occurring during or immediately following exertion or significant heat exposure. EHS may be complicated by organ and/or tissue damage, systemic inflammatory activation, and disseminated intravascular coagulation.

(2) The following heat illnesses are not reportable in accordance with AR 40-5, but are recorded in health records and may be reported for command interest; also, an accident/incident case that meets criteria as defined in para G-1a above must be reported through safety channels.

(a) Heat or parade syncope (fainting/passing out), (ICD-10 code T67.1). A temporary circulatory failure due to pooling of blood in the peripheral veins – especially those of the lower extremity – and a consequent decrease in diastolic filling of the heart. Symptoms range from

lightheadedness to loss of consciousness. Heat syncope often, but not always, occurs during prolonged standing and is often associated with hot weather environments.

(b) Heat edema (minor swelling) (ICD-10 code T67.7). Swelling and discomfort of the hands and or feet. Victims of heat edema may complain that their shoes feel tight or are ill fitting. The symptoms usually resolve within a few days, as the person becomes heat acclimatized. Treatment for this self-limiting condition is reassurance and leg elevation.

(c) Heat cramps (ICD-10 code T67.2). Brief, recurrent, and often are agonizing skeletal muscle cramps of the limbs and trunk. The cramp in an individual muscle is usually preceded by palpable or visible contractions and lasts 2 to 3 minutes. Cramps tend to be recurrent and may be precipitated by vigorous use of affected muscles. The cramp produces a hard lump in the muscle. Heat cramps often occur in salt-depleted persons during a period of recovery (up to many hours) after a period of intense work in the heat.

(d) Miliaria rubra (heat rash or prickly heat) (ICD-10 code L74.0). Impairment of sweating from blockage of sweat ducts. Rashes of 20 percent of body surface area will markedly elevate body core temperature and reduce physical work capabilities for up to 3 weeks after the rash has resolved. Therefore, skin hygiene is important during hot weather deployments. Mild sunburn impairs sweating so Soldiers should minimize skin exposure to ultraviolet radiation.

(e) Sunburn (ICD-10 code L55) impairs sweating over the affected skin and predisposes Soldiers to heat injury from systemic effects, including fever, that influence central thermoregulation.

(f) Exertional rhabdomyolysis (ICD-10 code M62.82). Exertional rhabdomyolysis may occur without elevations in body core temperature or brain dysfunction but frequently occurs as part of the clinical syndromes of severe heat illness. Exertional rhabdomyolysis is caused by skeletal muscle damage with release of cellular contents into the blood circulation, including myoglobin, potassium, phosphate, creatine kinase, and uric acid. Rhabdomyolysis is not always the result of heat strain, however if it accompanies a heat injury, it is incorporated in the diagnosis (see para G-2a(1)(b) above).

(g) Exercise collapse associated with sickle cell trait (ECAST). No ICD-10 code exists for ECAST. ICD-10 code D57.3 refers to sickle-cell trait (SCT). Additional codes for heat exhaustion, unspecified T67.5, or heat syncope T67.1 should be included as well. Symptoms include increasing pain and weakness in the working muscles, especially the legs, buttocks, and lower back, and collapse to the ground. It occurs in persons with SCT and additional risk factors including excessive heat stress, poor hydration status, and lack of exercise acclimatization. ECAST is distinguished from heat cramping and heat exhaustion by “collapse” (inability to continue standing); and distinguished from exertional heat stroke by normal mental status, and body temperature not elevated.

(h) Hyponatremia (water intoxication) (ICD-10 code E87.1) refers to low blood sodium (below 135 milliequivalents per liter (mEq/L); symptoms develop at 130 mEq/L). Hyponatremia is associated with prolonged (> 6 hours) physical work and arises primarily from fluid overload,

under-replacement of sodium losses, or usually a combination of both. Hyponatremia and heat exhaustion share many symptoms. If a Soldier has been given oral fluids (maximum of 1½ quarts per hour) and does not improve quickly, he or she should receive further medical evaluation. Repeated vomiting is more often seen with hyponatremia.

(i) Dehydration (ICD-10 code E86.0). Dehydration (> 2 percent body weight loss) increases the risk of heat illness, adversely affects physical work performance, and may also impair some mental functions.

b. Cold injuries.

(1) The following cold injuries are reported as reportable medical events in accordance with AR 40-5; and TR 1-8, as follows:

(a) Hypothermia (ICD-10 codes T69.8, T69.9). Reduction of body core temperature to 95 °F or lower due to environmental cold exposure, diagnosed by measurement of temperature rectally with a low-reading thermometer.

(b) Frostbite (ICD-10 codes T33.0, T33.52, T33.8, T33.9, T34). Frostbite occurs only with exposure to temperatures (including wind chill) below freezing or from contract with an object that is below freezing. It results from the freezing of tissue fluids in the skin and/or layers under the skin. It occurs relatively rapidly, however the extent of injury often takes weeks to determine. The different ICD-10 codes are specific to the anatomical injury site, such as toes, fingers or nose.

- Superficial: Partial or full thickness freezing of the skin without involvement of the underlying layers. Mobility is unaffected, and blistering may occur.

- Deep (producing loss, or necrosis (death of cell tissue): Full-thickness freezing of the skin (including underlying layers) and which may involve muscles, tendons, and bones as severity increases.

(c) Immersion foot (ICD-10 code T69.02). Non-freezing injuries, usually of extremities (foot or hand) due to prolonged blood vessel constriction in response to cold that leads to tissue injury and destruction. These injuries develop over a period of hours to days. They may occur at temperatures below or above freezing and can occur at temperatures as high as 60 °F with prolonged exposure. Injury is accelerated by exposure to damp conditions. (Note: The term “trench foot” is also sometimes used to describe a tropical foot injury or “jungle rot.”)

(2) The following cold injuries are not reportable in accordance with AR 40-5, but are recorded in health records and may be reported for command interest:

(a) Chilblain (ICD-10 code T69.1) is a superficial cold injury typically occurring after 1 to 5 hours in cold-wet conditions, at temperatures below 50 ºF. Small red bumps appear on the skin, most often on the back surface of the fingers, but the ears, face and exposed shins are also common areas for occurrence. The bumps are swollen, tender, itchy, and painful. Upon rewarming, the

skin becomes inflamed, red and hot to the touch, and swollen, with an itching or burning sensation that may continue for several hours after exposure. There are no lasting effects from chilblain.

(b) Carbon monoxide poisoning (ICD-10 code T58). Carbon monoxide is a poisonous gas that cannot be seen or smelled. Carbon monoxide binds to red blood cells more readily than oxygen so less oxygen is available to vital organs and tissues. It is contained in the exhaust from stoves and vehicles. Carbon monoxide can build up in closed spaces that are poorly ventilated. Early signs of carbon monoxide poisoning are headache, confusion, dizziness, and drowsiness. Persons found unconscious in a closed tent or vehicle may be victims of carbon monoxide poisoning, especially if the lips and skin are bright red.

(c) Snow blindness (ICD-10 code H16.13) and sunburn (ICD-10 code L55). Snow blindness and sunburn are caused by exposure of unprotected eyes and skin to ultraviolet (UV) radiation. The threat of snow blindness and sunburn depends on the intensity of sunlight, not the air temperature. Snow, ice, and lightly colored objects reflect the sun's rays, increasing the risk for injury.

- Snow blindness results when solar radiation "sunburns" unprotected eyes. Eyes may feel painful, gritty, and there may be tearing, blurred vision, and headache. The use of protective eyewear or goggles that block more than 90 percent of UV radiation will help to prevent snow blindness.

- Sunburn to the skin increases heat loss during cold exposure, increasing susceptibility to hypothermia. It also leads to uncomfortable/painful feelings that decrease Soldier performance. Exposure to UV radiation from the sun (regardless of cloud cover or temperature) sets the conditions for skin cancer. Soldiers with fair skin that burns and freckles easily, light blue/green eyes, and either red or blond hair are at highest risk for developing melanoma; however, anyone can develop skin cancer. Sunburn can be prevented by using a sunscreen with SPF of at least 30, and lip balm with SPF of at least 15. For cold weather, an alcohol-free sunscreen lotion will be used that blocks both ultraviolet A and ultraviolet B rays.

c. Reporting of cases that are evaluated, diagnosed, and treated in TRICARE network (off installation) civilian treatment facilities. The commander of the medical treatment facility is responsible for coordinating the retrieval of medical documentation resulting from visits to the TRICARE network, and establishing local operating policies for inclusion of all treatment documentation from visits to TRICARE providers; see AR 40-66.

Appendix H
Within-year exertional heat illness incidence
Although the definition of "heat season" as 1 May through 30 September each year is generally appropriate at most U.S. Army installations, exertional heat illnesses are a year-round problem, with varying severity depending on the installation. See figure H-1.

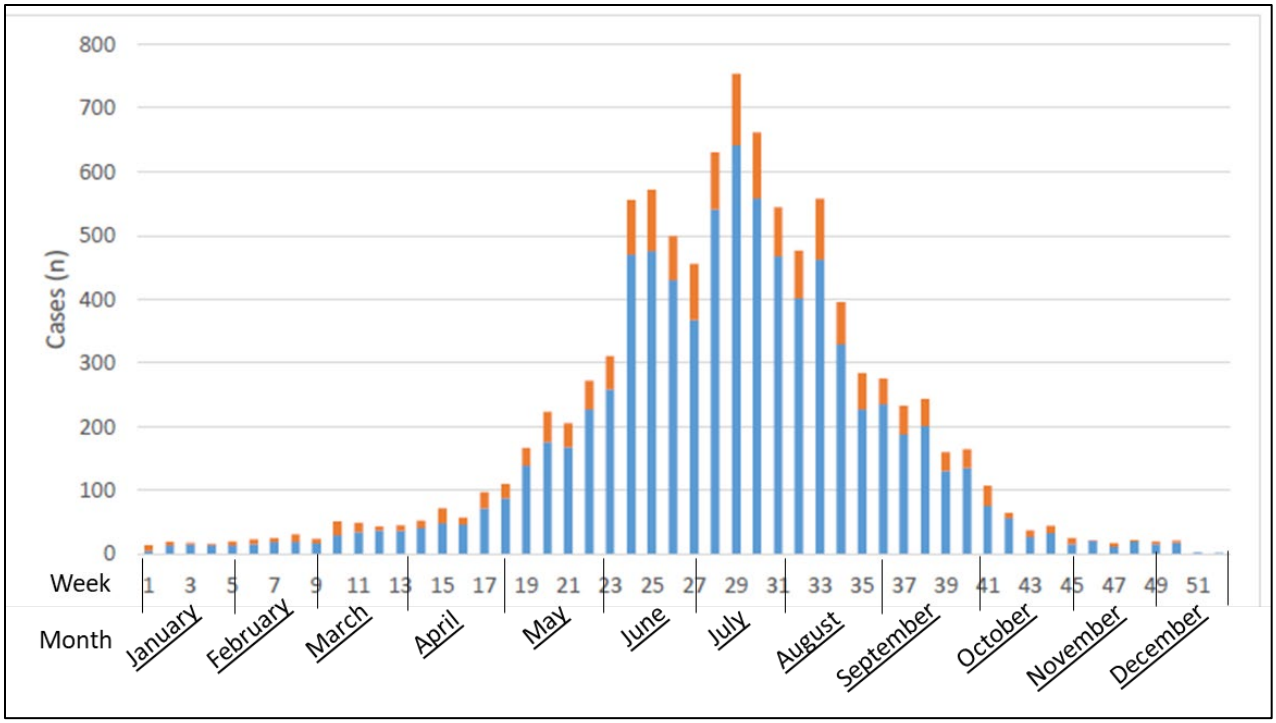

Figure H-1. Within-year exertional heat illness incidence

For number of days of heat risk per year for a specific location, see "Health of the Force" report at https://phc.amedd.army.mil/topics/campaigns/hof.

Glossary

Section I
Abbreviations

AD	Army directive
AR	Army regulation
ATP	Army techniques publication
AICS	arm immersion cooling system
CEB	carbohydrate-electrolyte beverages
CNS	central nervous system
DA	Department of the Army
DD	Department of Defense
DTMS	Digital Training Management System
ECAST	exercise collapse associated with sickle cell trait
EHI	exertional heat injury
EHS	exertional heat stroke
EMS	emergency medical service
ER	exertional rhabdomyolysis
FM	Field manual

GTA	graphic taining aid
HE	heat exhaustion
HIPS	Heat Illness Prevention Subcommittee
HPCON	health protection condition
ICD-10	International Classification of Diseases, 10th revision
IMT	initial military training
ORS	oral rehydration solution
SCT	sickle cell trait
SOP	standard operating procedures
TB MED	technical bulletin (medical)
TC	training circular
TMDE	test, measurement, and diagnostic equipment
TR	TRADOC Regulation
TRADOC	U.S. Army Training and Doctrine Command
UV	ultraviolet
WBGT	wet bulb globe temperature

Section II
Terms

Carbohydrate
A nutrient that is the most important source of energy for the body. The digestive system changes carbohydrates into glucose (blood sugar) for energy to fuel cells, tissues, and organs. Simple carbohydrates include sugars found naturally in foods such as fruits, vegetables, milk, and milk products, and sugars added during food processing and refining. Complex carbohydrates include whole grain breads and cereals, starchy vegetables, and legumes.

Electrolyte
Substance that contains electrically-charged particles, or ions, that affect fluid balance and blood pressure. The primary ions of electrolytes are sodium, potassium, calcium, magnesium, chloride, hydrogen phosphate, and hydrogen carbonate.

Exertional heat illness
Comprises heat exhaustion (HE), exertional heat injury (EHI), and exertional heat stroke (EHS).

Exertional heat injury
Intermediate in severity between heat exhaustion and exertional heat stroke.

Heat exhaustion
A moderate form of exertional heat illness, without significant organ injury; however it is a reportable medical event.

Sickle cell trait
A condition in which an individual carries a mutation on one of two genes that form red blood cells, with the other gene being normal. It is generally a benign carrier condition, and does not disqualify individuals for military service. In rare instances some individuals with SCT, when

subjected to the extremes of exertion, and the environmental challenges of altitude or heat, have increased relative risk for blood clots, and exertional rhabdomyolysis. For this reason, all Soldiers are screened for SCT and if positive, are considered to be at risk for exercise collapse, as described above, to ensure appropriate risk mitigation measures.