BY ORDER OF THE COMMANDER
TINKER AIR FORCE BASE

TINKER AIR FORCE BASE INSTRUCTION
48-101

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Aerospace Medicine

PREVENTION OF HEAT STRESS DISORDERS

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFI 48-101, Aerospace Medicine Enterprise, AFPAM 48-151, *Thermal Injury*, and AFPAM 10-100, *Airman's Manual*. It establishes Tinker AFB responsibilities and procedures to prevent adverse effects of heat stress. This instruction prescribes policies and responsibilities for all military and civilian personnel who are assigned to Tinker AFB. It applies to Air Force Reserve and Air National Guard Units, except where noted otherwise. It does not apply to contractor personnel. It defines the Wet Bulb Globe Temperature (WBGT) Index, WBGT monitoring and reporting procedures, Heat Stress Index, Heat Stress posting, and unusual clothing stipulations. During mission essential, contingency or emergency operations, commanders may waive the provisions of this instruction; however, when commanders waive procedures they must ensure all supervisors exercise caution, make certain all subordinate personnel are aware of heat injury symptoms and take actions to protect the health of their personnel. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with AFMAN 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) located at **https://www.my.af.mil/afrims/afrims/afrims**. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through the appropriate chain of command. This TINKERAFBI may be supplemented at any level, but all supplements that directly implement this Instruction must be routed to the OPR or coordination prior to certification and approval.

NOTE: **This guidance is not a substitute for common sense and experience; the appearance of heat casualties is a sure sign that the safe limit of work time has been exceeded and/or water consumption is inadequate.**

1. Responsibilities:

1.1. Organizational Commanders:

1.1.1. Are responsible for disseminating the Heat Stress Advisory throughout their respective organization.

1.1.2. Enforce work-rest cycles and hydration requirements (see Attachment 2).

1.1.3. Ensure supervisors andworkers receive training annually concerning the early signs of heat stress and the methods to minimize associated effects, and techniques for prevention of heat related illness.

1.1.4. Ensure potable drinking water is available to meet the requirements of this instruction.

1.2. Supervisors:

1.2.1. Implement health and safety programs in their respective workplaces.

1.2.2. Provide annual training on the effects of heat stress and techniques for prevention of heat-related illness.

1.2.3. Take the necessary actions to preserve the health of their employees to the fullest extent possible.

1.3. Employees:

1.3.1. Follow commander and supervisor directives.

1.3.2. Report suspected heat stress disorders to their immediate supervisor and take protective measures to prevent adverse heat effects.

1.3.3. Watch for heat stress symptoms in their co-workers.

1.4. Bioenvironmental Engineering Flight (BEF) (72 AMDS/SGPB):

1.4.1. Manage the Heat Stress Program

1.4.2. Monitor the Wet Bulb Globe Temperature (WBGT) Index and determine the corresponding Heat Condition.

1.4.3. Provide WBGT Index notifications to Tinker Command Post, 76 AMXG Maintenance Operations Center (MOC), and 552 MOC.

1.4.4. Provide notification of the Heat Condition via the Tinker Homepage.

1.4.5. Monitor WBGT Index, upon request, during non-routine activities such as chemical warfare exercises.

1.5. Public Health Flight (72 AMDS/SGPM):

1.5.1. Assist supervisors in developing appropriate training materials for supervisors, workers, and trainees.

1.5.2. Analyze occupational illness data to determine adverse trends and report findings to Environmental, Safety and Occupational Health (ESOH) Council working group as needed.

1.6. Tinker Command Post (552 ACW/CP), once informed by BEF, will report Heat Condition to the following offices:

Table 1.1. List of Offices

72 ABW/CC	72 MSG/CC	552 OG/CC
72 ABW/CV	72 MDG/CC	552 ACG/CC
OC-ALC/CC	72 ABW/CE	552 OSS/SOF
552 ACW/CC	72 OSS/CC	
552 ACW/CV	72 BW/SC	

1.7. 76 AMXG MOC and 552 MOC, when notified by BEF, will broadcast via radio the Heat Condition.

2. Outdoor Guidelines:

2.1. Monitoring and Notification of Outdoor WBGT Index:

2.1.1. WBGT is monitored by BEF during the months of May through September. Extended monitoring will be based on seasonal variations.

2.1.2. On weekdays with a forecasted ambient temperature of 85°F or greater, BEF will monitor the WBGT Index and corresponding Heat Condition at least every two hours from 1000 to 1600.

2.1.3. When the WBGT Index reaches 85°F, the WBGT Index will be monitored at least hourly by BEF until the WBGT Index drops below 85°F or until 1600, M-F.

2.1.4. WBGT Index notification will be made every time the Heat Condition changes while above 85°F.

2.1.5. BEF will make WBGT Index notifications to Tinker Command Post, 76 AMXG MOC, and 552 MOC. Upon notification from BEF, 76 AMXG MOC and 552 MOC will disseminate Heat Condition information via radio broadcast.

2.1.6. Heat Conditions will be posted on the plasma screens located throughout the OC-ALC facilities.

2.1.7. The WBGT Index can be found at any time by going to the Tinker Homepage, **https://wwwmil.tinker.af.mil**, and clicking the "HEAT CONDITION" icon to see the WBGT Index and Heat Condition and associated work/rest cycles (see Attachment 3).

2.1.8. Contact BEF on-call personnel, through the Tinker Command Post, with any questions or concerns after 1600, M-F, and during weekends.

2.2. Supervisors or designated representative (i.e. Unit Safety Representative (USR), Voluntary Safety Representatives (VSR)) will:

2.2.1. When the forecasted temperature is greater than 85°F, brief affected employees on the Heat Condition notification procedures, techniques for prevention of heat-related illness, and reporting procedures for cases of suspected heat illness at the start of each shift. Training materials are available from Public Health.

2.2.2. Implement all Heat Condition Advisories as published by BEF to include work/rest cycles.

2.2.3. Ensure employees take breaks in a shaded or cooled area to the maximum extent possible.

2.2.4. Ensure potable water is available for employee consumption.

2.3. Wear of overly bulky and restrictive clothing (e.g., chemical warfare defense ground crew ensemble: CWDE) places an added heat stress burden on individuals. If personnel are wearing CWDE or other heavy, restrictive clothing (e.g., impermeable coveralls), a correction factor must be added to a reported WBGT Index to account for added physiological stress. See Attachment 2 for guidance.

3. Indoor Guidelines:

3.1. Supervisors with employees working in "High Risk" areas, with assistance from VSR (if applicable) will:

3.1.1. Identify "High Risk" areas. "High Risk" areas are unconditioned (non-air conditioned) areas in industrial areas. Buildings that contain areas that may be "High Risk" include, but are not limited to: 230, 240, 260, 2122, 2121, 2136, 2211, 3102, 3105, 3234, 3703, and 3705.

3.1.2. Brief affected personnel, when the forecasted temperature is greater than 85°F, on Heat Condition notification procedures, heat stress prevention techniques and reporting procedures for cases of suspected heat illness at the start of each shift.

3.1.3. Ensure potable water is readily available for employee consumption.

3.1.4. Perform wellness check of indoor employees every two hours when Heat Condition four (Red Flag) is reached outdoors to ensure personnel are given the opportunity to take a hydration/cooling break as needed.

3.1.5. Perform wellness checks of indoor employees every hour when Heat Condition five (Black Flag) is reached outdoors to ensure personnel are given the opportunity to take a hydration/cooling break as needed.

3.1.6. Implement outdoor procedures as described in paragraph 2.1 for interior facilities affected by direct solar load (e.g. western facing hangars with open hangar doors).

3.2. Non-Industrial Areas. Since administrative workers are considered unacclimated, special consideration should be given to those areas where administrative employees are exposed to high heat due to temporary HVAC limitations. In conjunction with Employee Relations, supervisors and commanders should determine if accommodations are necessary to ensure the safety and well-being of affected employees. If accommodations are necessary, supervisors will implement the "High Risk" guidelines as described in paragraph 3.1.

4. Guidelines for Occupational Heat Exposures:

4.1. Personnel who routinely perform their jobs while exposed to hot environments (such as aircraft maintenance, ground maintenance, and repair work in steam pits and tunnels) are occupationally exposed. Occupational exposures to thermal stress are evaluated during Occupational Environmental Health (OEH) surveillance (i.e., Industrial Hygiene Surveys) by BEF. BEF survey reports are posted in the work centers for 10 days and available to all workers.

4.2. Supervisors of occupationally exposed personnel should use Attachment 2 to plan work and rest cycles for individuals under their control per AFPAM 48-151, *Thermal Injury*. When the WBGT Index reaches the temperatures shown in the attachment for the category of workload, supervisors should initiate work/rest cycles. Work load descriptions are located in Attachment 1.

4.3. During normal duty hours, all related questions will be directed to BEF. After duty hours, inquiries will be directed to the BEF technician on-call via the Tinker Command Post.

4.4. In case of emergency, dial 911.

5. Supervisor/Individual Considerations. Ability to adjust and tolerate heat varies with the individual. Some of these factors are:

5.1. Acclimatization (body's ability to adjust to heat stress)

5.2. Duration of exposure

5.3. Amount of work to be performed

5.4. Air movement and humidity

5.5. Type of clothing worn

5.6. Physical fitness

6. Prevention of Heat Stress Illness or Injury:

6.1. Acclimatization. This is of the utmost importance for new arrivals from cooler climates. This process takes 10 to 14 days and is directly related to the heat stress imposed on the individual. A period of acclimatization is required for all personnel regardless of each individual's physical condition. An individual is considered acclimatized if he or she has undertaken regular exercise for longer than 10 days in the same environmental conditions as the proposed activity.

6.2. Encourage Water Intake. Commanders and supervisors are responsible for ensuring water is available. Do not use thirst as an index of how much to drink; drink more than you think you might need. Small amounts of water (one pint every hour) are encouraged during periods of moderate activity when exposed to hot temperatures. Milk and coffee do not make up for water loss. Carbonated beverages, while containing water, are not effective in keeping the body hydrated.

6.3. Obtain adequate rest before physical exertion.

6.4. Avoid strenuous exercise during hottest hours.

6.5. Wear loose clothing to permit the passage of air.

STEVEN J. BLEYMAIER, Colonel, USAF
Commander

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFI 48-101, *Aerospace Medicine Enterprise,* October 19, 2011

AFI 91-202, *The US Air Force Mishap Prevention Program,* August 5, 2011

AFPD 48-1, *Aerospace Medicine Enterprise,* August 23, 2011

AFPAM 48-151, *Thermal Injury,* November 18, 2002

AFPAM 10-100, *Airman's Manual,* March 1, 2009

AFMAN 10-2503, *Operations in a Chemical, Biological, Radiological, Nuclear, and High-Yield* Explosive *(CBRNE) Environment,* July 7, 2011

Adopted Form

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AFMAN—Air Force Manual

AFPAM—Air Force Pamphlet

BEF—Bioenvironmental Engineering Flight

CWDE—Chemical Warfare Defense Equipment

ESOH—Environmental, Safety and Occupational Health

HVAC—Heating, Ventilation, and Air Conditioning

MOC—Maintenance Operations Center

MOPP—Mission Oriented Protective Posture

NBC—Nuclear, Biological and Chemical

OEH—Occupational and Environmental Health

USR—Unit Safety Representative

VSR—Voluntary Safety Representative

WBGT—Wet Bulb Globe Temperature

Terms

Acclimatization—A period of adjustment an individual's body requires to become accustomed to working in hot environments. Full acclimatization occurs through progressive degrees of heat exposure and physical exertion. Personnel may need two weeks of increasing exposure to become substantially acclimated and may retain most of their adaptation for about one-week after leaving a hot climate. Workers in good physical condition acclimatize more quickly.

Heat Stress—Heat stress is the combination of environmental and physical work factors that constitute the total heat load imposed on the body. The environmental heat stress factors are air temperature, radiant heat exchange (example, sunlight), air movement, and relative humidity. Physical work contributes to total heat stress through the body's production of heat (metabolic heat) as it burns energy to sustain the work. This production of metabolic heat depends on the intensity of the physical effort, which is affected, in turn, by body size, muscular developments, physical fitness, and age.

Light (Easy) Work—Light work would correspond to sitting with moderate arm and leg movements, standing with light work at machine or bench, using a table saw, or standing with light or moderate work at machine or bench and some walking about. Military applications would include walking on hard surfaces at 2.5 mph with <30 lb load, weapons maintenance, manual of arms, tower operations, pilot ground activities, marksmanship training, and drill/ ceremony.

Moderate Work—Moderate work would correspond to scrubbing in a standing position, or walking about with moderate lifting and pushing. Military applications would include walking on hard surface at 3.5 mph with <40 lb load, walking on loose sand at 2.5 mph with no load, patrolling, refueling, low crawl, high crawl, defensive position construction, and field assaults.

Heavy (Hard) Work—Heavy work would correspond to carpenter sawing by hand, shoveling sand, heavy assembly work, or intermittent heavy lifting with pushing or pulling (pick and shovel work). Military applications would include walking on hard surface at 3.5 mph with >40 lb load, and walking on loose sand at 2.5 mph with load, armament crew, heavy aircraft repair, and Nuclear, Biological and Chemical (NBC) reconnaissance.

Wet Bulb Globe Temperature (WBGT) Index—The WBGT Index is a combination of temperature measurements which consider dry air temperature, relative humidity, and radiant heating. The equation for the WBGT Index uses dry bulb (DB) temperatures, natural wet bulb (NWB) temperatures, and globe (GT) temperatures.

Attachment 2

WORK-REST CYCLES AND HYDRATION REQUIREMENTS

Table A2.1. Work-Rest Cycle and Hydration Chart

WBGT Index[1] °F	Tinker Heat Condition	Easy Work			Moderate Work			Hard Work		
		Work Rest[2] Cycle (Acclimated)	Work Rest[2] Cycle (Unacclimated)	Water Intake Qt/hr[2]	Work Rest[2] Cycle (Acclimated)	Work Rest[2] Cycle (Unacclimated)	Water Intake Qt/hr[2]	Work Rest[2] Cycle (Acclimated)	Work Rest[2] Cycle (Unacclimated)	Water Intake Qt/hr[2]
≥77	0	60/0 Min		¼	60/0 Min		¼ - ½	60/0 Min		¼ - ½
8	1 (White Flag)	60/0 Min		½	60/0 Min	50/10 Min	¾	40/20 Min		¾
9		60/0 Min			60/0 Min	50/10 Min		40/20 Min	30/30 Min	
80		60/0 Min			60/0 Min	50/10 Min		35/25 Min	30/30 Min	
81		60/0 Min			50/10 Min			30/30 Min		
82	2 (Green Flag)	60/0 Min		½	45/15 Min	40/20 Min	¾	30/30 Min		1
83		60/0 Min			40/20 Min			25/35 Min		
84		60/0 Min			35/25 Min			20/40 Min		
85	3 (Yellow Flag)	60/0 Min		¾	30/30 Min		¾	15/45 Min		1
86		60/0 Min			25/35 Min			15/45 Min		
87		45/15 Min			20/40 Min			15/45 Min		
88	4 (Red Flag)	35/25 Min		¾	15/45 Min		¾	15/45 Min	10/50 Min	1
89		30/30 Min			15/45 Min			15/45 Min	10/50 Min	
90	5 (Black Flag)	15/45 Min		1	15/45 Min	10/50 Min	1	10/50 Min	0/60 Min	1
91		15/45 Min			15/45 Min	10/50 Min		10/50 Min	0/60 Min	
92		15/45 Min			15/45 Min	10/50 Min[4]		10/50 Min[4]	0/60 Min	
93		15/45 Min	15/45 Min[4]		15/45 Min[4]	10/50 Min[4,5]		10/50 Min[5]	0/60 Min	
94		15/45 Min[4]	15/45 Min[4,5]		15/45 Min[5]	10/50 Min[5]		10/50 Min[5]	0/60 Min	
≤95		15/45 Min[5]	15/45 Min[5]		15/45 Min[5]	10/50 Min[5]		10/50 Min[5]	0/60 Min	

Notes:

1. WBGT in degrees Fahrenheit. If workers wear more than hot weather clothing, the following guidelines apply: When performing work/exercise and wearing breathable coveralls or combat armor, add 5 degrees to the table above. Add 10 degrees when using restrictive or impermeable clothing, e.g. fire-fighting gear, TYVEK or MOPP gear. Add 15 degrees when using restrictive or impermeable clothing **AND** combat armor.

2. Rest means minimal physical activity, i.e. sitting or standing. Attempt to accomplish in shade if possible.

3. Individual water requirements may vary by +/- 0.25 Qt/hr.

4. Consider reducing work time to only 5-10 minutes per hour. For training, consider stopping activity until WBGT lowers.

5. MISSION CRITICAL WORK ONLY—Unit Commander will determine which tasks are mission critical. Full heat acclimation takes up to two weeks of continued physical activity under heat stress conditions similar to routine exposures.

***CAUTION*:** Daily fluid intake should **not** exceed 12 quarts. Hourly fluid intake should **not** exceed 1 quart. (1 Quart is equal to 1 canteen).

Attachment 3

TINKER HOMEPAGE AND "HEAT CONDITION" LOCATION

Figure A3.1. Tinker Homepage