

CHAPTER 16. THERMAL STRESS PREVENTION PROGRAM

1600. GENERAL. The Thermal Stress Prevention Program protects Federal Aviation Administration (FAA) employees from injury caused by exposure to extremely hot or cold environments in the course of their work duties.

Although there are no Federal regulations specifically for the protection of workers from thermal stress, there are domestic and international standards for the limits of safe exposure to both heat and cold. This chapter presents the key program elements and references to exposure criteria to be used for safeguarding employees. It does not apply to issues of thermal comfort, which are addressed in Chapter 18, Building Air Quality Programs.

1601. BACKGROUND. FAA employees work under a variety of thermal conditions, both indoors and outdoors. Some of those working conditions have the potential of creating thermal stress. Outdoor examples include accident investigation conducted at the scene in hot weather, repair and painting of radar antennas in southern locations in the summer, and winter inspection of remote facilities in Alaska. Indoor examples include routine maintenance procedures, such as those performed on air handling units, often in a hot attic, by a technician wearing personal protective equipment (PPE) for protection from asbestos fibers, and non-routine procedures, such as the removal of bird nest and debris from the rafters of old, unventilated warehouses, also while wearing PPE. The Thermal Stress Prevention Program will ensure awareness of potential problems by employees who might encounter thermal stress in the performance of their work duties, and their supervisors, and will provide guidelines for handling those problems.

1602. STANDARDS.

a. In Section 2 of the OSH Act of 1970, Congress declared the Act's purpose and policy "to assure so far as possible for every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." However, the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) has published no regulations specifically for the protection of workers from heat stress or cold stress. The U.S. Department of Health and Human Services, National Institute of Occupational Safety and Health (NIOSH) and OSHA have issued advisory documents on heat stress, and the American Conference of Governmental Industrial Hygienists (ACGIH) has published an advisory document on cold stress. These advisory documents are consistent with standards on the subject published by the International Standards Organization (ISO). The ISO documents are widely referenced and used; they are legally binding on the FAA only if they are included in state or local laws, labor contracts, or other agreements.

b. The most recent detailed OSHA document is Section II, Chapter 4, Heat Stress, in Technical Manual Directive TED 1.15A (1/20/99). OSHA has also published fact sheets on both heat stress (95-16, Protecting Workers in Hot Environments - 1/1/95) and cold stress (98-55, Protecting Workers in Cold Environments - 12/22/98). The most recent NIOSH document on heat stress is Criteria for a Recommended Standard - Occupational Exposure to Hot Environments, Revised Criteria 1986, Publication No. 86-113, 1986. The ACGIH document on cold stress is Cold Weather Workers Safety Guide, Publication 9758 (1995). Their recommended exposure guidelines appear in TLVs[®] and BEIs[®]: Threshold Limit Values for Chemical Substances and Physical Agents; Biological Exposure Indices, published annually by the ACGIH in Cincinnati, OH.

c. The pertinent ISO standards (published in Geneva, Switzerland) are:

(1) Ergonomics of the thermal environment -- Estimation of the thermal insulation and evaporative resistance of a clothing ensemble, ISO 9920 (1995).

(2) Ergonomics of the thermal environment -- Principles and application of relevant International Standards, ISO 11399 (1995).

(3) Ergonomics of the thermal environment -- Medical supervision of individuals exposed to extreme hot or cold environments, ISO/DIS 12894 (1993).

(4) Hot environments -- Analytical determination and interpretation of thermal stress using calculation of required sweat rate, ISO 7933 (1989).

(5) Hot environments -- Examination of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature), ISO 7243 (1989).

(6) Thermal environments -- Instruments and methods for measuring physical quantities, ISO 7726 (1985).

1603. DEFINITIONS.

a. Acclimatization. The physiologic changes which occur in response to a succession of days of exposure to environmental heat stress that reduce the strain caused by the heat stress of the environment.

b. Chilblain. A nonfreezing, painful cold injury which causes little or no permanent impairment. It appears as red, swollen skin which is tender, hot to the touch, and may itch. It can develop in only a few hours of exposure to moist cold.

c. Cold stress. The loss of body of heat in cold weather conditions, when the deep body temperature falls below 36°C (96.8°F). For the purposes of this document, cold stress conditions can be assumed to exist whenever the weather parameters dictate that the regular break schedule be modified, as indicated by the ACGIH guidelines.

d. Deep body temperature. The internal temperature of the human body. For normal functioning of organs, the body must regulate this temperature between 36°C (96.8°F) and 38°C (100.4°F).

e. Frostbite. A condition that involves local tissue destruction resulting from freezing. The skin becomes numb and turns to a gray or waxy-white color. The area will be cold to the touch and may feel stiff or wooden. Ice crystal formation and lack of blood flow to the frozen area damage the tissues.

f. Frostnip. A condition that involves freezing of water on the surface of the skin. The skin becomes reddened and swollen. Usually there is no further damage after re-warming.

g. Heat cramp. A heat-related illness characterized by spastic contractions of the voluntary muscles (mainly arms, hands, legs, and feet), usually associated with a restricted salt intake and profuse sweating without dehydration.

h. Heat exhaustion. A heat-related illness characterized by muscular weakness, distress, nausea, vomiting, dizziness, pale clammy skin, and fainting; usually associated with lack of heat acclimatization and physical fitness, low health status, and an inadequate water intake.

i. Heat rash. A condition, also known as prickly heat, which occurs when sweat glands are plugged and inflamed from exposure to heat, humidity, and sweat. Tiny blister-like red spots appear on the skin.

j. Heat stress. The buildup in the body of heat generated by the muscles performing work combined with the heat coming from hot environments, when the deep body temperature rises above 38°C (100.4°F). Mental performance can be affected with an increase of 2° F above normal (98.6°F), and death can result if the body temperature rises as much as 5° F. For the purposes of this chapter, heat stress conditions can be assumed to exist whenever the weather parameters dictate that the regular work regimen be modified, as indicated by the ACGIH guidelines.

k. Heat stroke. An acute medical emergency arising during exposure to heat from an excessive rise in body temperature and failure of the temperature regulating mechanism. It is characterized by a sudden and sustained loss of consciousness preceded by vertigo, nausea, headache, cerebral dysfunction, bizarre behavior, and body temperatures usually in excess of 41°C (105.8°F). Normally, there is a lack of sweating, and the skin feels hot and dry.

l. Heat syncope or heat collapse. The collapse and/or loss of consciousness during heat exposure without an increase in body temperature or cessation of sweating, similar to vasovagal fainting except heat induced.

m. Hypothermia. A life-threatening condition in which the body cannot generate heat as fast as it is being lost and the deep body temperature falls below 95° F. Symptoms of possible hypothermia include confusion, slurred speech, uncoordinated movements, altered vision, and withdrawn or bizarre behavior.

n. Metabolic heat. The heat generated within a person's body due to normal body functions as well as muscle contractions from increased activity or exercise.

o. Qualified person. A person capable by education and/or specialized training of anticipating, recognizing, and evaluating employee exposure to temperature extremes. This person will be capable of specifying the necessary controls and personal protective equipment to ensure worker safety.

p. Thermal stress. Heat stress or cold stress.

q. Trenchfoot. A very serious nonfreezing cold injury which develops when skin of the feet is exposed to moisture and cold for periods of 12 hours or more. The combination of moisture and cold softens skin, causing tissue loss and, often, infection. Untreated, trenchfoot may eventually require amputation. Often the first sign of trenchfoot is itching, numbness, or tingling pain. Also known as "immersion foot."

r. Wet Bulb Globe Temperature (WBGT) Index. A temperature measurement that combines the effects of radiant heat, humidity, air movement, and dry bulb temperature. It is an indicator of deep body temperature and can be measured using a commercially available WBGT instrument.

1604. KEY PROGRAM ELEMENTS.

a. Plan. A regional or center Thermal Stress Prevention (TSP) Plan shall be developed, implemented, and maintained where there is the potential for thermal stress illness. It shall be made available for inspection by employees and their authorized representatives. The Plan must include, at a minimum, the program elements identified in this paragraph (subparagraphs c through g below).

b. Program Administrator. A program administrator shall be designated to manage the regional or center TSP Program, and must meet the requirements of a "qualified person" (paragraph 1603o). The program administrator may coordinate program activities with other qualified persons in the region and center.

c. Employee Information and Training.

(1) Heat. All FAA employees, and their supervisors, whose work responsibilities include tasks where, if no preventive actions (e.g., work practice modifications, PPE) are taken, there is a risk of heat stress injury, must receive training in the seriousness of heat stress. The trainer must be approved by the program administrator, or by another "qualified person" designated by the program administrator. The employees must be taught the symptoms, treatment, and prevention of heat stress, including heat stroke, heat syncope, heat exhaustion, heat cramp, and heat rash. Employees should be alerted to the local conditions and sites which are potentially

problematic. In addition, employees must be furnished with a chart showing the maximum heat stress exposure limits and the required rest periods for different levels of work activity.

(2) **Cold.** All FAA employees and their supervisors, whose work responsibilities include tasks where, if no preventive actions (e.g., work practice modifications, PPE) are taken, there is a risk of cold stress injury, must receive training in the seriousness of cold stress. The trainer must be approved by the program administrator, or by another “qualified person” designated by the program administrator. The employees must be taught the symptoms, severity, treatment, and prevention of hypothermia, frostbite, frostnip, trenchfoot, and chilblain. Employees should be alerted to the local conditions and sites which are potentially problematic. In addition, employees must be furnished with a chart showing the maximum cold stress exposure limits and required warming periods for different combinations of temperature, wind speed, and work activity level.

(3) **Risk Factors.** Heat stress and cold stress training shall include discussion of the risk factors which vary according to the individual, including diseases (e.g., diabetes, heart, vascular, and thyroid problems), general physical fitness, age, and medications. Training shall also emphasize the importance of the individual remaining hydrated, with suggestions for what is likely to be required to accomplish this under various conditions.

(4) Refresher training on thermal stress exposure shall be conducted as needed. The need will be determined by the program administrator, based on an employee’s change of work location or demonstration of inadequate knowledge of thermal stress. The extent of the refresher training will be determined by the TSP program administrator or the qualified person.

d. Acclimatization. The TSP Plan shall address the issue of acclimatization, recognizing that work in conditions of high or low temperature extremes should, where feasible, be performed by workers acclimatized to those conditions.

e. Preventive Measures. The TSP Plan shall address the prevention of thermal stress by means of work practices, personal protective equipment, and engineering controls, as specified in the subparagraphs below:

(1) **Work Practices.** The TSP Plan shall require that specific work practices to reduce thermal stress are in place for all locations where thermal stress is likely to occur.

(2) **Personal Protective Equipment (PPE).** If appropriate for the region’s and/or center’s particular climatic or facility conditions, the TSP Plan shall include a section addressing the use of personal protective equipment as a means of thermal stress prevention.

(3) **Engineering Controls.** The TSP Plan shall require that appropriate engineering controls to reduce thermal stress are in place for all locations where thermal stress is likely to occur. This may include sheltered areas for necessary rest periods.

f. Program Evaluation. The TSP Plan shall include a section addressing periodic evaluation of the regional or center TSP Program.

g. Exposure Limits. The TSP Plan shall present exposure limits for thermal stress. The FAA adopts the limits set forth by the ACGIH in the current annual edition of TLVs[®] and BEIs[®]: Threshold Limit Values for Chemical Substances and Physical Agents; Biological Exposure Indices.