Heat Stress

Objectives

- Definitions
- Causal factors
- Heat disorders and health effects
- Prevention and control
- Engineering controls
- PPE

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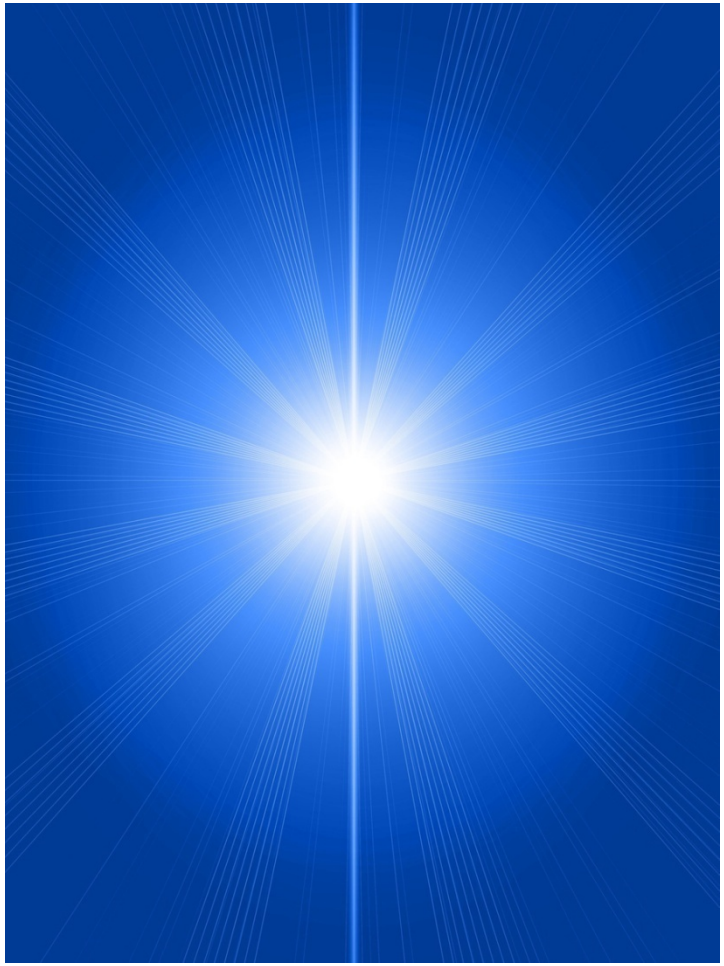
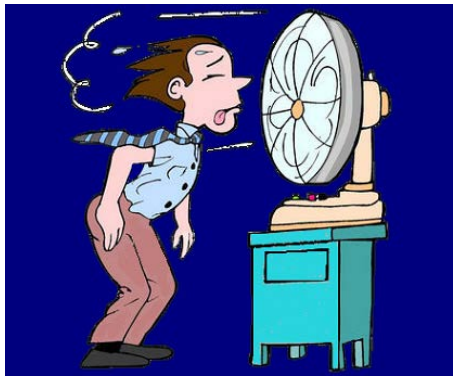
- Work practice controls
- Acclimatization
- Re-acclimating
- Administrative controls
- Work monitoring
- Training



Definitions

- **Heat stress**
  - Sum of environmental and metabolic heat loads on an individual minus the heat loss to the environment, primarily through evaporation

- **Heat strain**
  - Overall physiological response resulting from heat stress



The Four Environmental Factors

- **Temperature**
  - Ambient air temperature
- **Humidity**
  - Amount of moisture in the air
- **Radiant heat**
  - Such as from the sun or a furnace
- **Air velocity**
  - Circulating air

Causal Factors

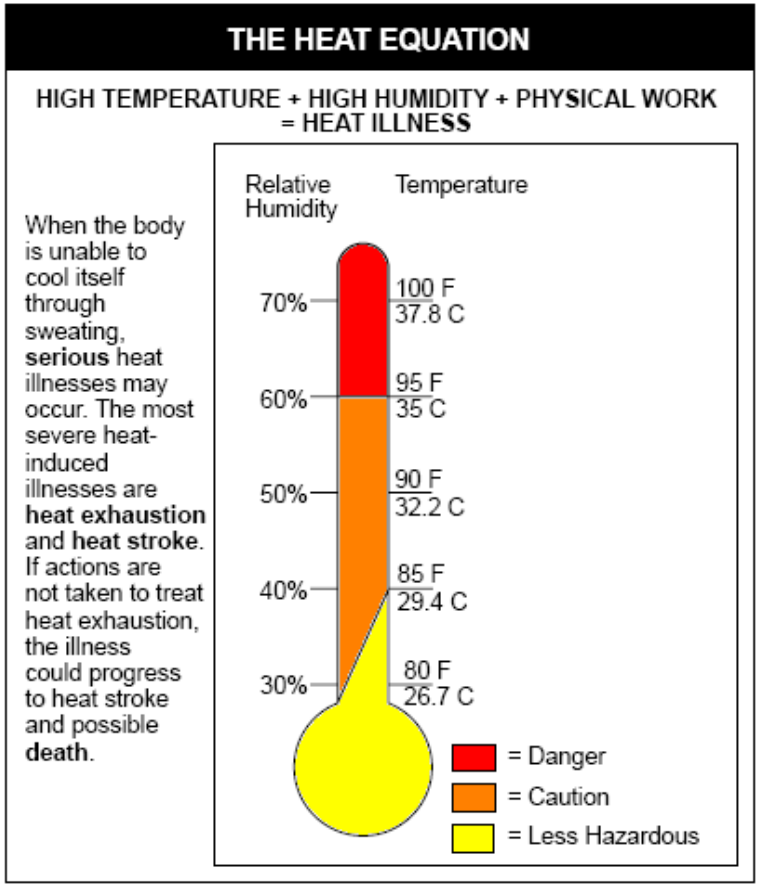
- Age, weight, degree of physical fitness
- Degree of acclimatization, metabolism
- Use of alcohol or drugs

… as well as a variety of medical conditions such as hypertension all affect a person's sensitivity to heat.

Causal Factors

- Prior heat injury predisposes an individual to additional injury
- Type of clothing worn must be considered

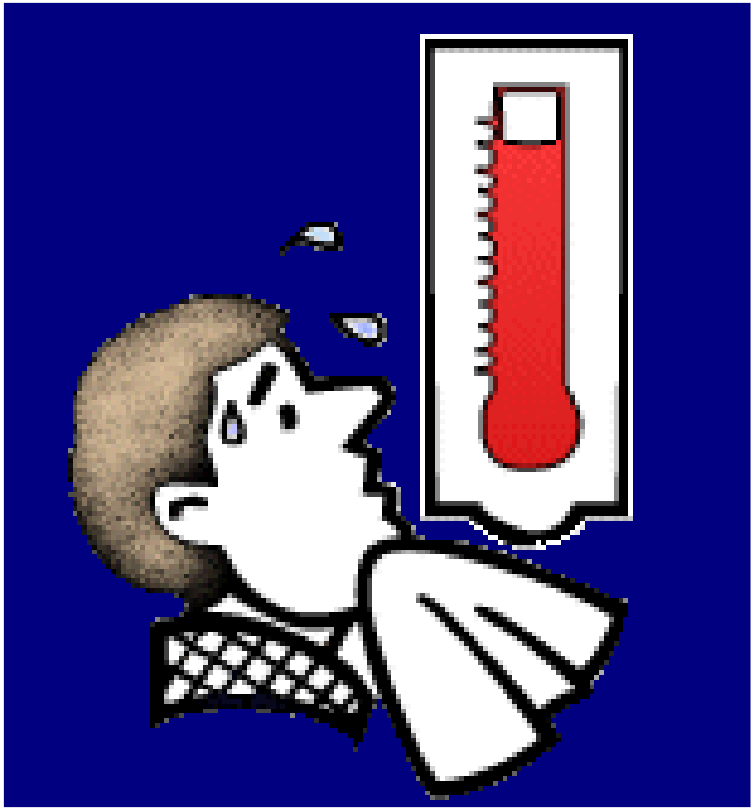
The Heat Equation



American Conference of Governmental Industrial Hygienists (ACGIH)

Heat Disorders and Health Effects

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke



Heat Rash

- Most common problem in hot work environments

- **Symptoms**
  - Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive
  - Sweat cannot freely evaporate from the skin and sweat ducts become plugged

Heat Rash

- **Prevention**
  - Prevented by breathable clothing, thorough cleansing of the skin
- **Treatment**
  - Treated by keeping skin dry, use of cooled sleeping quarters, calamine lotion

Heat Cramps

- May result after excessive water loss, sweating, dehydration

- **Symptoms**
  - Shriveled skin, sunken eyes, dry mouth and tongue
  - Severe pain and cramps in legs and abdomen, fainting or dizziness, weakness, profuse sweating, and headaches

Heat Cramps

- **Treatment**
  - Increase fluid intake, increase salt intake, rest and move to a cool place

Heat Exhaustion

- Blood moves toward outer body to remove heat.
  - Blood pools in the skin leaving less for the brain.

- **Symptoms**
  - Fatigue, headache, dizziness, profuse sweating, rapid pulse, thirst, loss of appetite, nausea, vomiting, and fainting

Heat Exhaustion

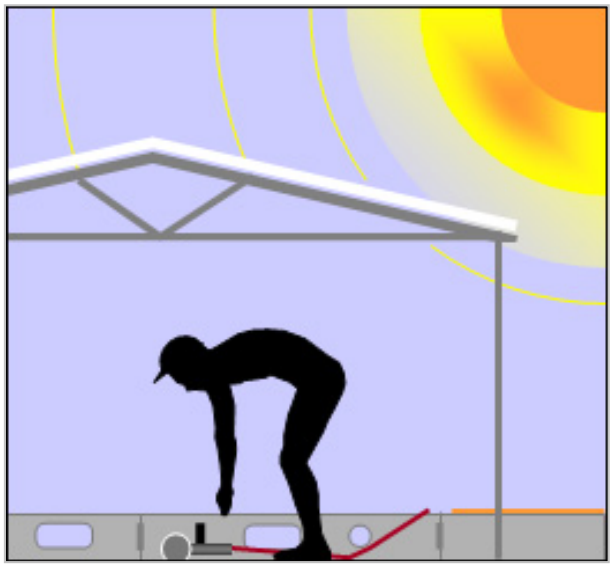
- **Treatment**
  - Get to the shade, cool off, increase fluids, cold wet towels or ice, fan, elevate legs above heart, loosen clothing, don't give any liquids containing alcohol or caffeine, may need IV.
  - If condition worsens, seek medical attention immediately.
  - If left untreated, heat exhaustion can lead to **HEAT STROKE**.

Heat Stroke

- A medical emergency and a life threatening condition caused by the failure of the heat-regulating mechanisms of the body, due to high heat and humidity.
  - Core temperature rises, body stops sweating

Heat Stroke

- **Symptoms**
  - Skin is hot and dry, flushed; rapid pulse; confusion; nausea; convulsions; rectal temp. > 105.8° F; unconsciousness



Heat Stroke

- **Treatment**
  - Remove to cooler location, loosen clothing, immerse in cool water, wrap in wet sheets, cold compresses to the head, neck and groin. ***SEEK MEDICAL ATTENTION IMMEDIATELY.***

Citations for Heat Stress?

- Heat stress hazards are cited using the "General Duty Clause."

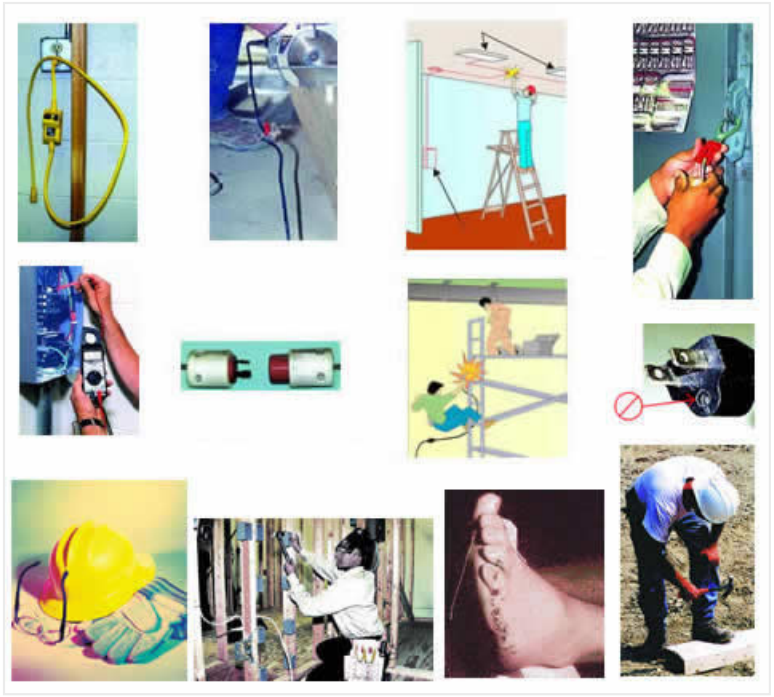
- **General Duty Clause**
  - Each employer shall furnish to each of his employees conditions of employment ***and*** a place of employment that are free from recognized hazards that are causing or are likely to cause death or serious injury or serious physical harm to his employees.

The "General Duty Clause" NCGS 95-129(1)

- The employer failed to keep the workplace free of a hazard to which employees of that employer were exposed ***and:***
  - The hazard was recognized in the industry,
  - The hazard was causing or likely to cause death or serious physical harm, ***and***
  - There was a feasible and useful method to correct the hazard.

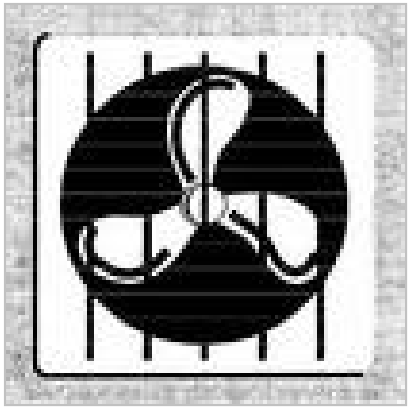
Prevention and Control

- Engineering controls
- Personal protective equipment (PPE)
- Work practice controls



Engineering Controls

- General ventilation
- Air treatment/air cooling – air conditioning
- Local air cooling
- Convection
- Heat conduction
- Radiant heat sources
  - Shielding
  - Insulation and surface modification

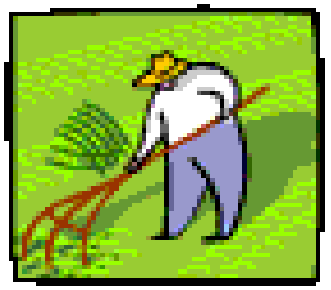


Personal Protective Equipment

- Reflective clothing
- Auxiliary body cooling
  - Ice vests
  - Wetted clothing – low humidity
  - Water-cooled garments – hoods, vests and “long johns”
  - Circulating air – vortex tubes, compressed air

Work Practice Controls

- Perform work activities during cooler periods of the day
- Minimize activity in hot area
- Slow down the work pace
- Reduce the number and duration of exposures
- Wear proper clothing
- Provide recovery areas
- Work rate
  - The fastest way to decrease the rate of heat production is to decrease the work rate.



Acclimatization

- **Acclimatization**
  - Successive heat exposures of at least one hour per day
  - Initially, 20% exposure for the first day, followed by 20% per day increase in exposure over the next four days

Re-Acclimating

- **After long absences**
  - 50% exposure on day back
  - 20% per day increase for the next 2 days
  - Final 10% on the 3rd day

Work Monitoring Programs

- **Personal monitoring**
  - Heart rate
  - Recovery heart rate
  - Oral temperature
  - Extent of body water loss

Training

- Knowledge of hazards
- Predisposing factors – age, etc.
- Signs and symptoms
- PPE
- First aid
- Health effects of heat stroke

Bottom Line

- Excessive heat in the work environment can lead to:
  - Serious physical harm, ***and***
  - Even death
- The keys are:
  - Recognition of the potential, ***and***
  - Prevention

Summary

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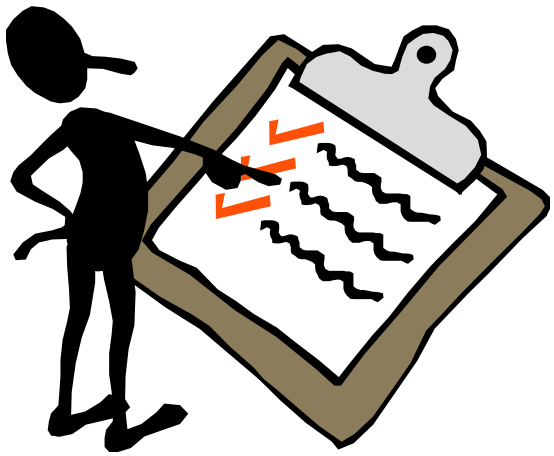

Summary

- Work practice controls
- Acclimatization
- Re-acclimating
- Administrative controls
- Work monitoring
- Training

Thank You For Attending!

Final Questions?