

UNIT 5 LECTURE NOTES

HAZARDS OF TEMPERATURE EXTREMES

Hazards of Temperature Prevention

Important thermal-related terms include:

- Conduction
- Convection
- Metabolic heat
- Environmental heat
- Radiant heat

Heat Stress Defined

Heat stress is the net load to which a worker may be exposed from the combined contributions of:

- Metabolic cost of work
- Environmental factors
- Clothing requirements

Screening Criteria (°C)				
Not-Acclimatized Employees				
Work Demands	Light Work	Moderate Work	Heavy Work	Very Heavy Work
100% Work	27.5	25.0	22.5	—
75% Work 25% Rest	29.0	26.5	24.5	—
50% Work 50% Rest	30.0	28.0	26.5	25.0
25% Work 75% Rest	31.0	29.0	28.0	26.5

OSHA Criteria for Determining the Allowable Work Periods for Employees who are not Acclimatized

Key Heat Stress Concepts

Key heat stress concepts are:

- Heat exhaustion
- Heat cramps
- Heat syncope
- Heat rash

The Goal in Cold Stress

The goal in protecting employees from **cold stress** is to prevent the deep body temperature from falling below 37°C (98.6°F).

Preventing Cold Stress

Cold stress can be prevented by applying the following strategies:

- Medical screening and supervision
- Orientation and training

PPE for Cold Environments

When working in a cold environment, provide the right PPE for the conditions that exist.

PPE For Cold Environments Could Include:

- Face protection
- Ear protection
- Wind-blocking jackets
- Warming vests
- Cold-insulated footwear
- Slip-resistant footwear
- Wind-and-water-insulated clothing
- Head protection
- Wind vests
- Over-suits
- Hand warmers
- Gloves
- Ice cleats
- Glare protection
- Foot warmers

In selecting PPE for cold environments, it is advisable to ask employees to participate. This can provide two benefits:

1. Employees are more likely to wear PPE they picked out (employees are less likely to wear PPE they do not like).
2. The PPE is more likely to fit properly if employees participate in its selection (poor fit is a main reason employees do not wear PPE when they should).

Windchill Factor

Wind or air movement causes the body to lose heat more rapidly and therefore to sense “coldness” beyond what the thermometer registers. This phenomenon is known as the **windchill factor**. This should be considered when planning work schedules.

Cooling Effect of Wind						
Wind Speed (in mph)	Actual Temperature (°F) and Equivalent Temperatures (°F)					
	50	40	30	20	10	0
5	48	37	27	16	6	-5
15	36	22	9	-5	-18	-32
25	30	16	0	-15	-29	-44
35	27	11	-4	-20	-35	-51

Effect of Wind on the Effective Temperature

Hypothermia

The most common form of cold stress is ***hypothermia***.

Effects of Reducing the Core Body Temperature

Core Temperature

Core Temperature		Body's Response
°C	°F	
37.6	99.6	Normal rectal temperature
36.0	96.8	Metabolic rate increases
35.0	95.0	Pronounced shivering
33.0	91.4	Severe hypothermia
30.0	86.0	Progressive loss of consciousness begins
24.0	75.2	Pulmonary edema
20.0	68.0	Cardiac standstill

The Body's Response to Reducing its Core Temperature

Classifying Burns

The most widely used method of classifying burns is by degree: first-, second-, and third-degree burns. The amount of surface area covered by burns is expressed as a percentage of **Body Surface Area (BSA)**.

Burns are also classified as:

- Minor
- Moderate
- Critical

Severity of Chemical Burns

The severity of **chemical** burns depends on:

- The corrosive capability of the chemical
- Concentration and temperature of the chemical
- Duration of contact

Chemical	Potential Harmful Effect
Acetic acid	Tissue damage
Liquid bromine	Corrosive effect on the respiratory system and tissue damage
Formaldehyde	Tissue hardening
Lime	Dermatitis and eye burns
Methylbromide	Blisters
Nitric/sulfuric acid mixture	Severe burns and tissue damage
Oxalic acid	Ulceration and tissue damage
White phosphorus	Ignites in air causing thermal burns
Silver nitrate	Corrosive/caustic effect on the skin
Sodium (metal)	Ignites with moisture causing thermal burns
Trichloroacetic acid	Tissue damage

Chemical "Burns" from Selected Common Chemicals

Hazards of Chemical Burns

The primary hazards associated with chemical burns beyond the damage to the body tissue are:

- Infection
- Fluid loss
- Shock

The most important first aid for chemical burns is **immediate** and continual flushing with water.