

PHYSICAL WORK ENVIRONMENT

**DR. ANKUR GUPTA
IIT BHUBANESWAR**

LECTURE OUTLINE

- Climate of work place
- Heat stress
- Cold stress



CLIMATE OF WORK PLACE

CLIMATE CONTROL

- Four primary variables that define climate:
 1. Air temperature
 2. Humidity - usually relative humidity
 3. Air movement
 4. Radiation from surrounding objects, including the sun
- Most comfortable working environment (called the *comfort zone*)
 - Air temperature = 19 to 26°C (66 to 79°F)
 - Relative humidity = 50%
 - Slow air movement = 0.2 m/s (0.64 ft/sec)

A decorative graphic on the left side of the image consisting of three parallel, wavy vertical lines. The outermost line is white, the middle line is a light blue color, and the innermost line is white. These lines create a stylized, organic shape that resembles a splash or a cloud.

HEAT STRESS

HEAT STRESS

- Occurs when body absorbs more heat than it gives off, raising the body core temperature
- Illnesses resulting from heat stress:
 1. Heat rash - areas of skin erupt into red or white bumps due to inflammation of sweat glands
 2. Heat cramps - spasms of muscles in physical labor
 3. Heat exhaustion - muscle weakness, nausea, dizziness
 4. Heatstroke - fever, dry skin, convulsions, coma (in extreme cases: death)

WORK IN WHICH HEAT STRESS OCCURS

- Foundries (metal casting)
- Boiler operations (steam and power generation)
- Basic metals industries (e.g., iron- and steel-making, aluminum production)
- Hot working of metals (e.g., hot forging)
- Heat treatment of metals and glasses
- Outdoor construction in summertime
- Agricultural work in summertime
- Landscaping in summertime

REDUCING HEAT STRESS

- **Administrative controls:**
 - Provide water for workers
 - Frequent rest breaks
 - Limit times in hot environment
 - Work in the shade, not in the sun
- **Engineering controls:**
 - Provide air conditioning if feasible
 - Provide fans
 - Shield radiant heat sources
 - Wear protective clothing



COLD STRESS

COLD STRESS

- Drop in core body temperature below normal due to net heat loss from combination of low temperature and air movement
- Windchill factor - estimates cooling effect of moving air on exposed skin
- Jobs where cold stress is a problem:
 - Refrigerated warehouses
 - Construction jobs in wintertime
 - Aboard ships in extreme northern climates
 - Research in Antarctica

BODY REACTIONS TO COLD STRESS

- Vasoconstriction - narrowing of blood vessels in the skin (especially in fingers and toes) to keep warm blood away from areas exposed to cold
- Shivering - rapid quivering or shaking of the muscles, which generates heat by increasing metabolism

EFFECTS OF COLD ENVIRONMENTS

- Frostbite - tissue freezes and ice crystals form in tissue cells
 - Commonly occurs in hands and feet
- Hypothermia - when body core temperature is at or below 35°C (95°F)

REDUCING COLD STRESS

- Administrative controls:
 - Limit work times in cold environment
 - Allow frequent breaks to warm hands
 - Drink hot beverages
- Engineering controls:
 - Proper clothing (*layering* principle - multiple layers of clothing)
 - Provide gloves
 - Provide space heaters when building is cold

The left side of the slide features a decorative graphic consisting of two parallel, wavy lines. The outer line is white, and the inner line is a light blue color. These lines create a stylized, organic shape that resembles a splash or a wave, set against the dark blue background.

LECTURE CLOSING

IF YOU WERE.....????

- If you were a project manager leading the installation team for centralized A/C in IIT Bhubaneswar, which type of majors would you like to implement in your design in order to make your service more user friendly and comfortable.....???



GRAFFITI



A decorative graphic on the left side of the image consisting of two parallel, wavy vertical lines. The inner line is a light blue color, and the outer line is white. They extend from the top to the bottom of the frame.

THANK YOU

