CHAPTER 5 9.5 Physical Environment

NOISE

Noise in the workplace can have both short term and long-term negative effects:

1, it can be annoying,

2, can interfere with verbal communication and mask warnings

3, and can damage workers' hearing

- Noise limits in dB, hearing protection.

Ear is sensitive to sounds between certain frequencies: (20 HZ to 20 KHz)

Exposure in excess of 115 dB without ear protection even for a short duration not recommended.

Exposure in noise of 85 dB – 90 dB can cause hearing damage if the time of exposure is prolonged.

Protecting Your Hearing:

1, Know your Environment, and understanding the noise is the first step for preventing hearing loss

2, Select Appropriate Hearing Protection Devices: earmuffs that cover the ear, ear plugs that insert into the ear canal and canal caps which cover the entrance to the ear canal

Two varieties of hearing protection from simple foam plugs to full earmuff each offering protection (noise reduction) from 25–30 dB.

- Chemicals, what each chemical causes, how minimize risks/protection strategies

FUMES, CHEMICALS, TOXIC METALS AND SOLVENTS

Chemicals

type 1\Gasoline Engine Exhaust (Carbon Monoxide, CO): have no smel, colorless,

symptoms of CO exposure are not immediately apparent, exposure affects brain tissues

Moderate CO poisoning results in:

1, headache.

2, rapid breathing,

3, nausea,

4, weakness,

5, confusion,

6 , and discoloration of the lips and nail beds.

- Chemicals, what each chemical causes, how minimize risks/protection strategies

High exposures result in:

1 the loss of consciousness without other symptoms

2 Headache, nausea and vomiting start with lower exposures,

3 while confusion and collapse, followed by death.

Gasoline Engine Exhaust (Carbon Monoxide, CO) **Safety strategies to minimize the risks to AMTs:**

1, Do not allow the use or operation of gasoline powered engines or tools inside hangars

2, Keep engines tuned, minimizing the production of CO

3, Recognize the symptoms of CO overexposure

4, Use compressed air tools or tools powered by electricity

5, Place a CO monitor in the work area

Type 2 Kerosene Based Fuels

Respiratory exposures to jet fuel are low for most AMTs, but symptoms include:

1, Transient memory deficit (difficulty recalling even common items such as your phone number)

2, Disturbances in consciousness (slow thinking, sense of drunkenness, lightheaded, slurring words)

3, Irritation to eyes and nose (sneezing, runny nose)

4, Nausea and vomiting

5, Headache

6, Staggering

7, Erythema – reddening of the skin

8, Eczema – scaling and flaking of the skin

9, Dermatitis – thinning of the skin with redness and inflammation

Protection Strategies

1, Skin: use gloves, wipe hands clean, wash with soap, do not wash with other solvent

2, Lungs/Respiration: ventilate room, use air supplied respirator

3, Clothing: change clothes, separate soiled clothing from other laundry, wash soiled clothing

- Chemicals, what each chemical causes, how minimize risks/protection strategies

Type 3 Toxic Metals

Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and thallium:

If inhaled, **cause respiratory distress, injected attack nervous system and kidneys**.

Preventative Actions for Toxic Metal Exposure:

1, Substitute a less toxic material for the one in use. (For most AMTs this is not practical)

2, Implement controls such as local exhaust ventilation to control dust and fumes

3, Do not eat or drink in the workplace

4, Use proper respirators, protective eyewear, and coveralls

- **Type 4 Paints and Primers** Chemicals, what each chemical causes, how minimize risks/protection strategies.

Painting can cause a condition known as Occupational Asthma (OA)

Spray painting produces finely atomized particles of paint **These particles enter the lungs and combines with other proteins forming heavy molecules that affect the body's immune system.**

.الربوInflammatory reaction is **OCCUPATIONAL ASTHMA**

PPE required:

1, Negative Pressure Respirators – for use with primers, dopes and water-based paints

2, Positive Pressure Air Line Respirator – for use with paints containing diisocyanatos.

3, Covering – Tyvek spraying suit with gloves.

4, Goggles – When mixing and spraying.

- **Type 4 Hydraulic Fluids** Chemicals, what each chemical causes, how minimize risks/protection strategies

Phosphate ester based hydraulic fluids used in ground equipment and aircraft Available as Skydrol and Hyjet(Skydrol® is fire resistant hydraulic fluid)

Exposure produces burning sensation in eyes and skin.

First aid is flushing eye with water and washing skin with soap and water • Mineral oil in the eye relieves burning sensation and pain.

- Chemicals, what each chemical causes, how minimize risks/protection strategies.

Type 5 Solvents

Solvents: Liquids or gases that can dissolve or extract other substances.

Solvents effect:

1, Can irritate and damage the skin, eyes, and respiratory system.

2, Dissolve the skin's protective barrier of oils, drying and chapping the skin, causing a kind of dermatitis, also burns/irritation of skin

3, Exposure could lead to chronic lung diseases such as bronchitis

4, All solvent vapors can irritate and damage the sensitive membranes of the eyes, nose, and throat.

5, At higher concentrations symptoms are more severe and may include nose bleeds, running eyes, and sore throat

- *Preventative Actions for Solvent Exposure*
  - Use personal protective equipment such as a face shield for splash protection, or an impervious apron for protection of your clothes
  - Consider the use of a citrus-based cleaner to replace the organic solvent for degreasing; however be sure to check that any product substitution or elimination is consistent with established procedures;
  - Organize your work so cleaning is done at a specific cleaning station, using techniques other than those requiring solvents;
  - Avoid reaching into containers filled with solvent. Instead use pliers to grasp an object in a solvent mixture. Wash parts in cleaning baskets with a handle that extends above the solvent mixture;
  - Use only the smallest quantity of solvent necessary for the job;
  - Cover solvents; don't store containers open to the air;
  - Educate yourself and your staff about skin as a major route of solvent entry into the body. Read and follow the manufacturer's directions. Complaints from coworkers may indicate an overexposure;

- ILLUMINATION, definition and levels

Illumination refers to: the lighting both within the general working environment and also in the locality of the AMT and the task he is carrying out.

The concepts of illumination and luminance are associated with the quantity of light falling on or emanating from a surface, respectively.

Illumination is related to the amount of light falling on a surface or an object

For work performed on upper and lateral surfaces of the aircraft, **illumination levels average to 66 foot candles (ft-c) during the day and 51 ft-c for night maintenance work.**

For aircraft repair and inspection, Illuminating Engineering Society: minimum level of 75 ft-c

CLIMATE AND TEMPERATURE

Environmental factors that influence the body's heat load include

1, the ambient temperature,

2, radiant heat,

3, and air velocity

- Body's response to heat: Body response to heat, radiation, evaporation

Body's response to heat

RADIATION (65%)

EVAPORATION (20%)

Primary defense against overheating is sweating which produces heat loss through evaporation.

Vessels in the skin dilate to bring more blood from the inner body to the skin, similar to a radiator as temperature increases, both radiation and evaporation become less effective

As temperature increases, both radiation and evaporation become less effective

At 100% humidity, evaporation is ineffective.

- Heat disorders (heat stroke, heat cramps, heat syncope, heat rash) what they cause, how to deal

Heat Stress and Major Disorders

Five major disorders arise from excessive heat exposure:

1, Heat Stroke; the most serious

• Heat exhaustion, thirst, nausea, weakness and confusion

• Treatment usually involves intravenous hydration.

2, Heat Cramps

• painful muscle spasms that occur after performing strenuous activities, creating severe spasms (lasting one to three minutes) of the muscles

• Treatment requires moving to a cool environment and drinking a salt solution

3, Heat Syncope

• Sudden loss of consciousness due to dilation of blood vessels in the skin, but does not involve the loss of blood flow to the brain that occurs in heat stroke

• Treatment involves moving the victim to a cool environment and having him/her lie down

4, Heat Rash, called prickly heat

• Common skin problem in hot environments

• Red papules which usually appear in the trunk and groin

• Treatment involves moving to cool environments

- Heat Index, what it is, what is combines (temperature, humidity)

Heat Index (HI) is the temperature that the body feels when heat and humidity combine

The HI is a good predictor of when heat stress will produce a heat related illness.

- Working in the Cold Heat Loss processes (evaporation, conduction, convection)

Heat loss originates from three processes.

• **Evaporation** of sweat, causing cooling.

• **Conductive heat loss,** or the transfer of heat from a warm object (the hand) to a cold object (a tool)

• **Convection**, also known as wind chill

• Protecting against the cold involves limiting the loss of body heat by these processes

• Heat loss triggers physiological responses to maintain body temperature

The medical term for low body temperature is **hypothermia**.

Hypothermia can occur at temperatures below freezing.

- Symptoms of cold exposure, how deal with cold exposure

SYMPTOMS FROM OVEREXPOSURE TO COLD
1. Redness or extreme paleness in exposed area.
2. Pain in exposed area, which lead to symptoms in #1.
3. Blisters filled with clear fluid or blood after cold exposure.
4. Difficulty moving areas of exposed skin, clumsiness, poor control of fingers.
5. Scaling and sloughing on the skin following cold exposure.
6. Blackening of skin and loss of movement in exposed areas.
7. Numbness and tingling in exposed areas.

PREVENTING COLD RELATED DISORDERS

RECOMMENDATIONS FOR WORKING IN THE COLD
1. Educate all employees about the risks of cold exposure and develop appropriate preventative strategies for each task.
2. Provide a warm shelter, out of the elements, preferably one supplied with warm beverages.
3. Reduce activities that promote heavy sweating.
4. Preserve manual dexterity by using hand warmers, gloves and frequent breaks to a warm shelter.
5. Apply emollient or moisturizer to the hands regularly, especially if you come in contact with fluids.
6. Use nonconductive tools to prevent frostbite to hands.
7. Require appropriate protective clothing when exposed to the elements.
8. Discourage the use of alcohol to keep warm.
9. Use the buddy system to observe evidence of cold injury or impairment.

- Vibration, what it is causing it, frequency range

Vibration in aviation maintenance is usually associated with the use of rotating or percussive tools and equipment, such as generators.

Low frequency noise, such as that associated with aircraft engines, can also cause vibration

Vibration between 0.5 Hz to 20 Hz is most problematic, as the human body absorbs most of the vibratory energy in this range.

The range between 50–150 Hz is most troublesome for the hand and is associated with vibratory induced White Finger Syndrome (VWF)

Pneumatic tools can produce troublesome vibrations in this range and frequent use can lead to reduced local blood flow and pain associated with VWF.

Vibration can be annoying, possibly disrupting an AMTs concentration.

- 10 ways for safe working environment