Environmental Conditions Summary



과목: 인간공학실험1분반

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I. Illumination

1. The Nature of Light

The amount of illumination striking a surface from a point source follows the *inverse-square law:* Illuminance(lx) = candlepower(cd) /

The luminous intensity of a light source is measured in lumens emitted by the source per unit solid angle. The unit of luminous intensity is the candela(cd). Where D is the distance from the source in meters.

2. Lamps and Luminaires

The term *lamp* is a generic term for an artificial source of light. A *luminaire*, however, is a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect lamps to the power supply.

3. The Concept of Visibility

Visibility refers to how well something can be seen by human eye. Visibility, therefore, involves human judgement.

4. Effects of Lighting on Performance

Lighting parameters can only effect the visual aspects of a task, but task performance is usually made up of a combination of visual, cognitive, and motor components.

5. How much is Enough?

The first step in the IES procedure is to identify the type of activity to be performed in the area for which illumination recommendations are sought. And also recommends minimum illumination levels of safety.

6. Distribution of Light

The overall level of illumination in the environment, one must also consider the distribution of light and its effects on visual comfort and task performance.

7. Glare

Glare is produced by brightness within the field of vision that is sufficiently greater than the luminance to which the eyes are adapted so as to cause annoyance, discomfort, or loss in visual performance and visibility.

8. Lighting and The Elderly

II. Climate

1. Heat Exchange Process

The heat exchange process of the body can characterized by the following formula:

= change in body heat content, M = metabolism, W = work performed, R radiative heat exchange, C = convective heat exchange, E = evaporative heat loss

2. Measurement of Thermal Conditions

Five basic components that make up the thermal environment. 1) air temperature or dry-bulb temperature, 2) relative humidity of the air, 3) wet-bulb temperature, 4) mean radiant temperature, 5) air velocity

The Oxford Index, or WD (wet-dry) index, is a simple weighting of wet-bulb (WB) and dry-bulb (DB) temperatures.

WD = 0.85 WB + 0.15 DB

3. Thermal Comfort and Sensations

Draught has been identified as one of the two most annoying environmental factors in workplaces and the most annoying factor in offices. Low Humidity can result in dryness in the nose and throat, dry skin, and chapped lips.

4. Heat Stress

The first line of defense against heat stress is the cardiovascular system. Two basic responses: 1) the blood vessels in the skin dilate. 2) an increase in heart rate.

Individual Differences 1) Physical fitness 2) Aging 3) Gender 4) Body fat 5) Alcohol.

The reduction of heat stress can best be accomplished by a systematic and comprehensive approach. Changes can be made to the atmospheric conditions, the task, and the worker and the use of appropriate protective equipment.

5. Cold Stress

Physiological Effects of Cold Stress 1) Vasoconstriction 2) shivering

Protection from Cold Stress 1) Proper Clothing 2) Use of Gloves 3) Use of Auxiliary 4) Use of Rewarming Facilities.

III. Noise

1. How Loud Is It?

Sound Level Meter Scales: The many indices of loudness, noisiness, and annoyance are based on A scale (the unit is dBA).

Loudness is a subjective or psychological experience related to both the intensity and the frequency of sound.

Insofar as cumulative noise effects are concerned, the long-term average sound-level was the best measure for the magnitude of environmental noise. This long-term average is designated the equivalent sound level (Leq).

2. Noise and Loss of Hearing

1) Normal Hearing and Hearing Loss, 2) Occupational Hearing Loss, 3) Temporary Hearing Loss from Continuous Noise, 4) Permanent Hearing Loss from Continuous Noise, 5) Hearing Loss from Noncontinuous Noise

3. Physiological Effects of Noise

The onset of a loud noise will cause a startle response, characterized by muscle contractions, blink, and head-jerk movement. In addition, larger and slower breathing movements, small changes in heart rate, and dilation of the pupils occur.

4. Effects of Noise on Performance

(1) Short-term memory: Over 95dBA, (2) Performance of simple, often will show improvement as a result of noise, (3) If a person has to react at definite times, and continuous loud noise (over 95dBA) on performance

5. Noise Exposure Limits

Exposure to any sound level at or above 80 dBA causes the listener to incur a *partial dose* of noise.

6. The Annoyance of Noise

Noise exposure itself usually does not account for even half the variance in community reactions.

7. Handling Noise Problems

A noise problem can be controlled by attacking the noise at the source, along its path from the source to the receiver, and at the receiver.

1) Control at the Source, 2) Control along the path, 3) Control at the Reciever

IV. Motion

1. Motion And Orientation Senses

The implication of such investigations is that misperceptions of the true upright direction may occur when there is a conflict between the sensations of gravity and visual perceptions; in such as a case one’s visual perceptions usually dominate, even when they are erroneous.

2. Whole-Body Vibration

The evidence suggests that short-term exposure to vibration causes only small physiological effects which are of little practical significance.

The casual link between long term exposure to whole-body vibration and specific physiological damage is not clear.

Performance Effects of Vibration: 1) Visual Performance, 2) Motor Performance, 3) Neural Processes

3. Acceleration

Acceleration is a rate of change of motion an object having some mass. Acceleration forces applied to an object, like a person, can be either linear or rotational.

1) Headward, 2) Footward, 3) Forward, 4) Backward, 5) Lateral,

One way to provide protection is to assume a posture which increases the tolerance to the direction of acceleration being experienced.

4. Weightlessness

Some of temporary effects that have been observed include aberrations in cardiac electrical activity, changes in the number of red and white blood cells, lose of muscle tone, and loss of weight.

5. Illusions During Motion

When humans are in motion, they receive cues regarding their whereabouts and motion from sense organs, especially the semicircular canals, the vestibular sacs, the eyes, the kinesthetic receptors, and the cutaneous senses.

1) Disorientation from False Sensations, 2) Disorientation Resulting from Misperception.

6. Motion sickness

Motion sickness is associated with most forms of travel – cars, boats, trains, and even camels, but not horses.