INDUSTRIAL HYGIENE SERVICES

Routine Surveys Performed

Lighting
Noise
Ventilation
Heat Stress
Air Sampling- air contaminants, vapors & fumes
Radiation & Microwave

Some Toxic Items Aboard MCB Camp Lejeune

Mercury: inhalation hazard, dental & medical spaces, supply and utility units, mercury produces severe nervous disorders at low exposure levels

Beryllium: inhalation hazard, carcinogen, produces lung cancers, often found in aviation rework operations and dental labs.

Asbestos: inhalation hazard, carcinogen, produces lung diseases and cancer, primarily used as a high temperature insulation, building material, gasket and brake shoe substance.

Chlorine: inhalation and burn hazard, found in water and waste treatment plants.

PCB's : inhalation and skin absorption hazard, carcinogen, produces cancer as well as other serious poisoning effects, used as transformer insulating liquid.

Polyurethane: inhalation hazard, causes lung disorders, found in "instapak" operations and aviation paints.

Lead: inhalation and ingestion poison, causes numerous physical disorders, often found in some paints, primers and rifle range and armory air.

Solvents: Benzene, trichlorethylene etc. some are carcinogenic and severe inhalation hazards.

Welding: metal fumes and toxic vapors, ultraviolet light, burn hazards.

Insecticides: may produce lethal effects if used improperly or without personal protective devices.

Picric Acid: Explosive and unstable if over 10 years old, found in storage spaces for chemicals, medical & dental spaces.

Battery Shops: inhalation and burn hazard areas, often improperly ventilated.

INDUSTRIAL HYGIENE REFERENCES BY SUBJECT

A. Asbestos*

1. OPNAVINST 6260.1A
2. NAVSUPINST 4030.33
3. NAVSEA 5100.2
4. OPNAVINST 5100.19
5. OSHA, Federal Register 1919.1001
6. NSTM Chapter 635
7. SPECNOTE 4410 of 6 Jun 74

*NOTE: This section will probably need revision frequently in the future

B. Hazardous/Toxic Materials

1. NAVAIRINST 3750.1A
2. NAVSUPINST 4030.18A
3. NAVSEAINST 4600.1
4. BUMEDINST 5100.1C
5. BUMEDINST 5100.6
6. NAVMATINST 5100.3A
7. NAVSUPINST 5100.16
8. NAVSEAINST 5100.1
9. NAVSEAINST 5100.5
10. NAVSUPINST 5100.18
11. NAVSUP P-4500
12. BUMEDINST 6200.4A
13. BUMEDINST 6260.12A
14. BUMEDINST 6260.13A
15. BUMEDINST 6260.15
16. BUMEDINST 6260.16A
17. BUMEDINST 6260.22
18. BUMEDINST 6270.2A
19. BUMEDINST 6270.3F
20. BUMEDINST 6270.5A
21. BUMEDINST 6270.6
22. SECNAVINST 6270.3A
23. NAVFACINST 10365.2A
24. NAVFACINST 11014.24B

C. Foam-In-Place

1. NAVSUPINST 4030.34A
2. NAVSEAINST 9597.6
3. NAVSHIPSINST 9940.13A

D. Gases and Breathing Air

1. NAVAIRINST 3750.1A
2. NAVSEAINST 9597.5
3. OPNAVINST 9940.1F
4. NAVAIRINST 10290.1A
5. NAVAIRINST 10332.2B
6. NAVFACINST 11300.24B
7. NAVAIRINST 11300.3A
8. BUMEDINST 6710.56
9. NAVSHIPSINST 9230.12A
10. NAVSEAINST 9597.1

E. Heat Stress

1. OPNAVINST 5100.20A
2. NAVMED P-5010, ch. 3
3. BUMEDINST 6200.7

F. Hearing Conservation

1. BUMEDINST 6260.6B
2. BUMEDINST 6700.35
3. DoDINST 6055.3

G. Mercury

1. BUMEDINST 6260.19
2. NAVSEAINST 5100.3
3. NAVELEXINST 5100.7

H. Battery Charging

1. NSTM 0901-LP-313-0001
2. OSHA Federal Register 1910.151(c)
3. OPNAVINST 5100.19, Ch. 10-2
4. NAVSHIPS 9380
5. NAVSHIPS 9622
6. NAVSHIPS 9300.6.2

I. Welding - Respirators, Local Exhaust

1. OPNAVINST 5100.19
2. OSHA Federal Register 1910.252(F)(3)
3. ANSI Z9.2-1971
4. NSTM 9920
5. DoDINST 6055.2 of 3 May 1978

J. Spray Painting

1. OPNAVINST 5100.19
2. NAVMATINST 5100.3A
3. DoDINST 6055.2

K. Respirators - Grinding, Chipping

1. OSHA, Federal Register
2. ANSI Z88.2, 1969
3. OPNAVINST 5100.19
4. NAVMATINST 5100.3A
5. DoDINST 6055.2

L. Polyurethane - Isocyanates

1. BUMEDINST 6260.16A
2. COMNAVAIRPAC NOTE 4750 of 13 Jan 78

M. Beryllium

1. BUMEDINST 6260.13A
2. BUMEDNOTE 6260

N. Radiation

1. BUMEDINST 6470.12A
2. BUMEDINST 6470.9A
3. BUMEDINST 6470.14A
4. BUMEDINST 6470.16
5. BUMEDINST 6470.13A
6. NAVMATINST 5100.8
7. NAVELEXINST 5100.2
8. NAVELEXINST 5100.3
9. NAVELEX 5100.4
10. NAVELEX 5100.5
11. NAVELEXINST 5100.6A

INTRODUCTORY INDUSTRIAL HYGIENE

DEFINITIONS

A) Industrial Hygiene: is that science devoted to the recognition, evaluation and control of those environmental factors or stresses, arising in or from the workplace, which may cause sickness, impaired health and well being, or significant discomfort and inefficiency among workers or among the citizens of a community. In short: Scientific evaluation and control of the occupational environment.

B) Industrial Hygienist: is a professional having an undergraduate or graduate degree in engineering, chemistry, physics, medicine or related biological sciences who, by virtue of special studies and training, has acquired competence in industrial hygiene and occupational health. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities: (a) to recognize the environmental factors and stresses associated with work and the occupational environment and to understand their effect on man and his physical emotional well being. (b) to evaluate, on the basis of experience and with the aid of quantitative measurement and sampling techniques, the magnitude of these stresses in terms of their effect on man's health and well-being. (c) to prescribe methods to eliminate, control or reduce such stresses in the work environment in order to alleviate their effects.

SCOPE OF INTEREST

Recognition of environmental factors and stresses which influence health requires that the Industrial Hygienist be familiar with work operations and procedures. The categories of potentially toxic substances
CHEMICAL-LIQUID-FUME-MIST-VAPOR-GAS
Physical stresses can result from:
Electromagnetic and Ionizing RADIATION, NOISE, VIBRATION and extremes of TEMPERATURE and PRESSURE and LIGHT
Biological factors include: INSECTS, MITES, MOLDS, YEASTS, FUNGI, BACTERI and VIRUSES.
Ergonomic factors include: monotony, boredom, repetitive motion, worry, work pressure and fatigue.

The effect of any of these stresses may range from a simple annoyance or slight discomfort resulting in inefficiency, all the way to a toxic environment which immediately endangers life or accelerates the aging process of the individual.

OCCUPATIONAL TOXICOLOGY

Important concepts are TOXIC and NON-TOXIC and EXPOSURE TIME or DOSE/RESP
ONSE.
Means by which toxic substances come in contact with the individual are:
by the following modes of entry: INHALATION (primary
Skin absorption
Ingestion
Chemical agents that reach the lungs pass directly into the blood stream, and can be carried to other organs within the body.

SAFETY FOOTWEAR

The great majority of disabling foot injuries are due to dropping heavy materials on the feet or getting the toes caught under them. Remember, your feet are priceless. They serve as the balancing mechanism for the body. Without a full quota of toes it is very difficult to walk or even stand. You only get 10 toes and if one is lost or injured, there's no spare waiting to take its place.

Through years of design, study, and experimentation, safety shoes that will protect against all such ordinary hazards have been developed. Moreover, a sufficient range of styles, shapes, and sizes are available to permit the proper fitting of all normal feet and to give good appearance as well.

There is a good reason to make sure that the workers' feet and toes are protected. In 1978, there were 130,000 disabling injuries due to accidents to the feet and 70,000 due to accidents to the toes in the United States.

These statistics represent individual pain, grief, medical expense, production slow down, sick pay, Workers' Compensation payments, losses due to damaged equipment and materials, and equipment down time.

The vital point is the toe and foot protection. Where the ordinary, high top safety shoe does not do the job as in handling the heaviest types of metal, such as pig iron, additional protection may be required behind the safety cap. This is a safety shoe with safety cap and metatarsal (instep) protection. Trades where instep protection may be required are laborers, welders, mechanics and skilled maintenance men to protect against injuries to the instep.

There are many other special type safety shoes and boots. Example of these are shoes with conductive soles where the elimination of static electricity is important for ordnancemen, non-conductive (metal-free) shoes for electricians and linemen working around live electrical equipment, leather shoes with wooden soles for personnel working on floors that may be uncomfortably hot, rubber or synthetic material safety toe boots for protection against acids, caustic and other liquid chemical hazards and boots for working in wet locations.

Proper fitting is important. Improperly-fitted footwear may cause many ailments, not all of them confined to the foot. The continual wearing of misfitted footwear may affect health, morale, and efficiency. To insure issue of correctly-fitted shoes, they must be tried and checked for fit while the individual, wearing the heaviest socks usually worn, is standing with his weight evenly

distributed on both feet. Individuals required to wear arch supports or other orthopedic appliances must wear such items when shoes are tried on and checked for fit. Prior to making the following tests be sure that the heels are positioned well back into the shoes and that they are firmly laced. The proper size may be determined by trying on various sizes until a proper fit is obtained.

Here are some pointers for selection of try-on sizes for special type feet:

(1) Allow one width greater than the size indicated for a foot with an extremely high instep or for a soft, fleshy foot.

(2) Allow one width narrower than the size indicated for a foot with an extremely low instep or for a thin, bony foot.

(3) Allow one width greater than the size indicated for individuals required to wear an arch support.

(4) Allow one or more widths greater than the size indicated for feet with extreme hammer toes.

(5) As a general rule, when one foot measures longer than the other, the longer foot measures one width narrower. In such cases, select a pair of the longer size and narrower width for the initial try-on fitting.

Here are some pointers for checking for proper fitting:

(1) ARCH FIT. Position left hand on right shoe and right on left shoe over the instep with thumbs on the outer side and fingers pressing firmly against the inner arch close to the soles. Make sure that the leather lies snuggly against the under arch and that it is free from excessive wrinkles or fullness.

(2) BALL-JOINT POSITION. Locate the ball joints with the thumb of each hand. When correctly positioned in the shoe, the ball joint should lie approximately directly above the widest portion of the shoe just ahead of the curvature of the sole into the shank under the arch.

(3) WIDTH. Press both thumbs against the inner and outer portions of each shoe between the instep and toe cap and slowly work each thumb toward the center until they nearly meet. Make sure that the foot fills the shoe without apparent tightness or excessive fullness.

(4) LENGTH. Generally the proper location of the ball-joint is a good indication of correct length. There should be a clearance of at least one-half inch between the end of the longest toe and the end of the shoe. The individual should flex the toes to ascertain that length is adequate for unrestricted movement.

GENERAL CARE OF SAFETY SHOES:

Whenever it is necessary to clean badly soiled shoes, they should be cleaned with a mild soap, preferably saddle soap, and wiped dry. Wet shoes should be dried at room temperature and, to retain shape and retard shrinkage, shoe trees should be used while drying, or shoes should be stuffed firmly with crumpled newspaper. After extreme or repeated wettings, dried shoes should receive a light application of castor or neat's-foot oil.

The leather will be preserved and shoes rendered more water repellent by treatment with any of the following: castor oil, soybean oil, or neat's-foot oil. Frequent applications well rubbed in are more effective than heavy coatings. Shoes may be made quite water repellent by the following treatment:

(1) Melt and mix together: 8 ounces of wool grease, 4 ounces of petroleum jelly, and 4 ounces of paraffin wax.

(2) Stand leather soles in mixture for 15 minutes.

(3) Mixture should be only lukewarm.

(4) Rub mixture on uppers and wipe clean.

CAUTION: DO NOT USE THIS MIXTURE ON RUBBER.

Shoes may be effecitvely treated for mildew resistance by the application of a shoe dressing containing paranitrophenol, Federal Specification O-L-164: Leather Dressing: Mildew Prevention.

Personnel must remember that while safety shoes can prevent or lessen toe injuries, they do not stop the accident that cause such injuries. Many things can be done to reduce foot injuries. Foremost, of course, is for everyone to wear safety shoes, and where necessary, metatarsal guards.

When materials are handled properly, safety shoes become the second line of defense, a form of insurance. Here's a checklist for materials handling:

(1) Be sure material can't fall from work benches and trucks.

(2) Stack materials so the piles are solid.

(3) Follow the instructions you were given for getting materials out of stock piles.

(4) If piled materials should start to slide, don't try to stop them with your feet.

(5) If tall objects must be leaned against benches or walls, make sure they are blocked so they can't fall over.

Foot protection, like so much of safety, is a matter of common sense. You have the know-how to reduce accidents and injuries. You know how materials should be stacked. You know how metal should be handled. And, you have the means of protecting yourself against accidents that occur even though you have done what you could to prevent them. Here, of course, is where safety footwear comes into the picture.

Failure to wear safety shoes, like failure to use other personal protective equipment when needed, is a form of chance taking. Unfortunately, the law of averages catches up with chance takers.

Here is what Marine Corps Bulletin 5101, dated 20 September 1979 states: "It is the responsibility of all supervisors to ensure compliance with safety regulations by employees under their cognizance. Recent safety inspections by the Inspector General of the Marine Corps indicate numerous instances where the immediate supervisor of employees is not enforcing the wearing of personal protective equipment."

Marine Corps Order 5100.8E states: "... in cases of noncompliance with the wearing of personal protective equipment, disciplinary action should be considered as a corrective measure against the offender and the supervisor, as appropriate."

REMEMBER: SAFETY SHOES ARE CONSIDERED PERSONAL PROTECTIVE EQUIPMENT.

As a standard practice in the past, safety shoes have been provided employees working in certain hazardous occupations, i.e. electricians, refrigeration mechanics, ordnancemen, and forestry technicians. Personnel working in other occupations or areas designated as foot hazardous were provided toe guards. It has been concluded at the Department of Defense level that toe guards are no longer considered acceptable substitutes for the issuance of permanent safety shoes; however, in cases where foot protection is necessary on a temporary basis, toe guards may be issued as an interim measure for the protection of personnel.

Marine Corps Order 5100.8E now requires that safety shoes be provided all personnel working in foot hazardous areas where the possibility of injury to the feet exists. Supervisors, equipment operators, and inspectors are excluded from the provision unless they physically work in the area or handle material. The Order further specifies that personal protection equipment - safety shoes - will be provided at Government expense. It is believed at this time that funding for safety shoes will be absorbed by the respective units.

Nonappropriated fund activities must provide personal protection equipment from their own funds, unless provided for in a host-tenant agreement.

As a final reminder, it should be stressed that the responsibility for wearing of safety shoes rests with both the employee and his supervisor.

Safety Toe Footwear for employees shall meet ANSI 241.1 - 1967/1975 standards.

(d) A liquidtight curb installed at the floor penetration to prevent the entrance of flammable liquids into the tunnel or duct.

Chapter 3 Hazards

3-1 Lighting and Power.

3-1.1 Electrical wiring for light, power, heat and signal or control circuits, and electrically operated tools, portable appliances, and devices shall be in accordance with the provisions of NFPA 70, *National Electrical Code*. Article 511 of the *National Electrical Code* shall apply to wiring and equipment within the hazardous areas.

3-1.2 NFPA 30, *Flammable and Combustible Liquids Code*, shall be used to determine the extent of the hazardous area where flammable liquids are stored, handled or dispensed.

3-2 Heating.

3-2.1 General.

3-2.1.1 Heating equipment shall be of an approved type. Improvised furnaces, salamanders, or space heaters shall not be permitted.

3-2.1.2 Fuels used shall be of the type and quality specified by the manufacturer of the heating appliance. Crankcase drainings shall not be used in oil-fired units.

Exception: Heating equipment using crankcase drainings in accordance with NFPA 31, Standard for the Installation of Oil Burning Equipment.

3-2.1.3 No heater employing an open flame or glowing element shall be installed in parking or repair areas, or areas communicating therewith, except as permitted by the provisions of 3-2.2.2 or 3-2.3.

3-2.1.4 Heating equipment shall be installed to conform with NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*; NFPA 31, *Standard for the Installation of Oil Burning Equipment*; NFPA 54, *National Fuel Gas Code*; NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*; and NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment*, as applicable, except as hereinafter specifically provided.

3-2.2 Location of Heating Equipment.

3-2.2.1 Heating equipment, except as provided in 3-2.2.2 and other than suspended unit heaters as covered in 3-2.3, shall be installed in a detached building or room, separated from motor vehicle repair or parking areas by walls or partitions, floors, or floor-ceiling assemblies having a fire resistance rating of not less than two hours. Openings in walls or partitions separating heater rooms from motor vehicle repair or parking areas shall be restricted to those necessary for heating pipes and ducts and shall be located not less than 8 ft (2.4 m) above the floor; openings for ducts shall be protected with approved, automatic fire doors or dampers (*see 2-5.3*). Air for combustion purposes shall be obtained from outside the building. The heating room shall not be used for storage of combustible materials, except for fuel storage as permitted by the standards referenced in 3-2.1.4.

3-2.2.2 Heating equipment may be installed in motor vehicle repair or parking areas where there is no dispensing or transferring of Class I or II flammable liquids (as defined in NFPA 30, *Flammable and Combustible Liquids Code*), or liquefied petroleum gas, provided the bottom of the combustion chamber is not less than 18 in. (.5 m) above the floor, the heating equipment is protected from physical damage by vehicles, and continuous mechanical ventilation is provided at the rate of .75 cfm/sq ft (.75 m^3/min per m^2) of floor area. The heating system and the ventilation system shall be suitably interlocked to ensure operation of the ventilation system when the heating system is in operation.

NOTE: For requirements for devices used to heat solvents used for parts cleaning, see 3-4.7 of this standard.

3-2.3 Suspended Unit Heaters.

3-2.3.1 Approved suspended unit heaters may be used provided they are located not less than 8 ft (2.4 m) above the floor and are installed in accordance with the conditions of their approval.

3-2.3.2 A distance shall be maintained between the heater and its vent and any adjacent combustible material (which is part of the building or its contents) in conformance with NFPA 54, *National Fuel Gas Code*, or NFPA 31, *Standard for the Installation of Oil Burning Equipment*.

3-2.4 Warm Air Heating.

3-2.4.1 Return air openings in motor vehicle repair or parking areas shall be not less than 18 in. (.5 m) above floor level measured to the bottom of the openings. Continuous mechanical ventilation as required in 3-2.2.2 shall be provided when openings are less than 8 ft (2.4 m) above the floor measured to the bottom of the openings.

3-2.4.2 Recirculated air shall not be taken from any floors below grade level.