

OCCUPATIONAL HEALTH & SAFETY

①

- To prevent workers • Keep production safety • To make a
(prevent loss of workday) safe company

Health: (WHO) A state of complete physical, mental and social well-being and very absence of disease or infirmity.

Safety → LOSS PREVENTION

Health and safety: Systemic and scientific efforts in order to get rid of hazardous conditions in workplaces during work

Safety or loss prevention: The prevention of accidents through the use of appropriate technologies to identify the hazards of a chemical plant and eliminate them before an accident occurs.

Hazard: A chemical or physical condition that has the potential to → Hazard → potential cause damage to people, property or the environment

Risk: A measure of how injury, environmental damage, or economic loss in terms of both the accident likelihood and the magnitude of the loss or injury.

System Attitude Fundamentals Experience Time You

A good safety program: identifies and eliminates existing safety hazards

An outstanding safety program: has management systems that prevent the existence of safety hazards

First law in OHS: Hammurabi Code (Babyl)

Pliny the Elder → wrote a book about diseases of slaves

Pliny Elder → slave diseases

Hippocrates → described lead poisoning (first rec)

Hippocrates → lead poisoning

Plato → identified problems arising from work conditions

Aristotle → issues observed in runners, nutrition of gladiators

Roman Pliny → risks of working in dusty places

Galen → environmental factor in diseases (Miasma theory)

Paracelsus → "right dose differentiates a poison from a remedy"

Paracelsus → right dose

Georgius Agricola → De Re Metallica (mining, refining, smelting metals) → Agricola - Metallica

Mining ...

Bernardino Ramazzini → De Morbis Artificum Diatriba

(father of OHS)

"always inquire about the patient's occupation"

→ Ramazzini FATHER of OHS

The period of Industrial revolution OHS

1802: Health and Moral Acts of Apprentices (first law regulating working hours)

→ BSI
FIRST legal reg. England

1833: Factory Regulations for Machine Guarding (cannot employ younger than 10, (cannot work more than 12 hours those who are younger than 12)

MIN working age 15

1847: Employment Age regulated (max 10 hours)

1867: Law enacted for child workers

ILO → 1919

1. International Labour Organization - ILO (1919)
Government, employer, worker

(2)

WHO → 1948

2. World Health Organization - WHO (1948)

WHO makes OHSS policies

Turkish Period

1865 Dilaverpasa

1865: Dilaverpasa Regulations (first legal regulation in Turkey)

→ accommodation for coal workers

→ maximum 10 hours working

→ A physician should work

Law no 3023 in 1937

Law no 1475 in 1971

Law no 931 in 1967

Law no 4857 in 2003

Law no 6331

→ enacted on June 26, 2011 / June 30, 2012

→ entered into force January 1, 2013

According to the OHSS act workplaces with more than 50 workers must form an OHSS board.

Employer

OHSS officer

Workplace physician

Manager of TIR

Foreman

Worker representative

→ Determine any risks

→ Initiate health and safety training program

→ Define measure to take

→ Conduct relevant inspections

Exceptions of law 6331

1) Activities of the Turkish armed forces, the police and undersecretary of national intelligence organisation except for those employed in workplaces such as factories, maintenance centres, sewing workshops etc.

2) Intervention activities of disaster and emergency units

3) Domestic services

4) People providing services in their own name and on their account only

5) Prison workshop, training, security and vocational case activities within the frame work of improvements carried out throughout the enforcement services for convicts and inmates.

Employers' responsibilities

- Provide OHSS training
- Perform each kind of test and measurement
- Conduct risk analysis and emergency response plan
- Form H&S committee
- Help workers to select OHSS representative

4857 - Labour Law

→ regulate working conditions and work-related rights and obligations (employment contract)

• Employer may break the contract (defined or undefined period)

↳ If employee fails to perform his duties

↳ If wilfully or through gross negligence employee endangers safety or damages equipment

Annual leave

5 years: 14 days 5-15 years: 20 days 15+ years: 26 days

Below 18 and above 65 have at least 20 days

OH&S basic principles

(3)

Planning Continuity Method

OH&S holistic approach *

Occupational organizations State/Government Universities Employers (Employees) Unions

How affected?

Human-beings

- Injury
 - Death
 - Disabling
 - Unemployment
- Workplace
- Damage to the means of production
 - The stopping of production
 - Financial structure disrupted
 - Legal issues

Country

- Social
- Environmental
- Economic

Governmental responsibilities

- Enforcement of legislation
- Workplace inspections
- Dissemination of information
- Promotion of training, education and research
- Providing an incentive-based approaches

Employer responsibilities

- Measure the conditions
- Carry out risk assessment
- Develop coherent policy
- Giving appropriate instructions to workers
- Give priority to collect protective measures

Employee obligations

- Make correct use of equipments
- Cooperate with employer and workers' representative

Fault liability: based on employer's failure to take precautions

Job security (30 weeks)

Training sub-employer (both together)

Hazard classification

Very dangerous
(A class specialist)

Dangerous
(B class specialist)

Less dangerous
(C class specialist)

Health and safety training (when)

- Getting started to work
- The workplace is changed
- The work equipments are changed
- The new technologies are applied

Occupational health: Focuses on general population at workplace. It addresses a broad range of health issues including physical and psychosocial, environment, health practices, personal resources, etc. through programs, policies, and practices.

Accident: An unplanned event that interrupts the completion of an activity, and that may (not) include injury or property damage

Incident refers - those did not cause injury or damage but had potential

Occupational accident:

→ ILO: An expected or unforeseen event that leads to specific damage or injury

> damage, injury

→ WHO: An unplanned event that often lead to personal injury, damage to machinery, tools and equipment, and production stoppage for a while

> " " also machinery damage



Near miss: No loss as a result but risks are realized

Work accident (Law no. 5510)

- Being at workplace
- Due to work carried out by employer
- Being sent on duty elsewhere
- Nursing room, Breastfeeding breaks
- Transportation provided by employer

levels of accident causation

Basic causes: Root of the problem (management decisions, equipment design, human behavior)

Indirect causes: Classified into unsafe acts (human errors) and unsafe conditions (hazardous environment)

Direct causes: Actual event leading injury such as energy release, falls.

Domino approach *

- 1) Social environment
- 2) Fault of person
- 3) Unsafe acts or conditions
- 4) Accident
- 5) Injury

1 - 29 - 300 ratio: On the basis of fatal accident, there are 29 minor injuries in 300 non-injury events

Hazard: Potential which exists at workplaces or may arise from outside the workplace to cause harm or damage which could affect the worker or the workplace.

Any situation, substance, activity, event, or environment that could potentially cause injury or ill health (OHSAS 18001)

e.g.) Spill on floor, broken equipment

workplace hazards

Chemical & Dust

Cleaning products, pesticides, asbestos

ergonomic

Repetition, lifting, awkward postures

Biological

Mold, insects / pests, communicable diseases

Work organization

Things cause stress

Safety

Slips, trips, falls, faulty of equipment

Physical

Noise, temperature, extremes, radiations

$$RISK = \text{Probability} \times \text{Damage}$$

Risk: A measure of probability and severity of a hazard to harm human health, property or environment

potential event

probability

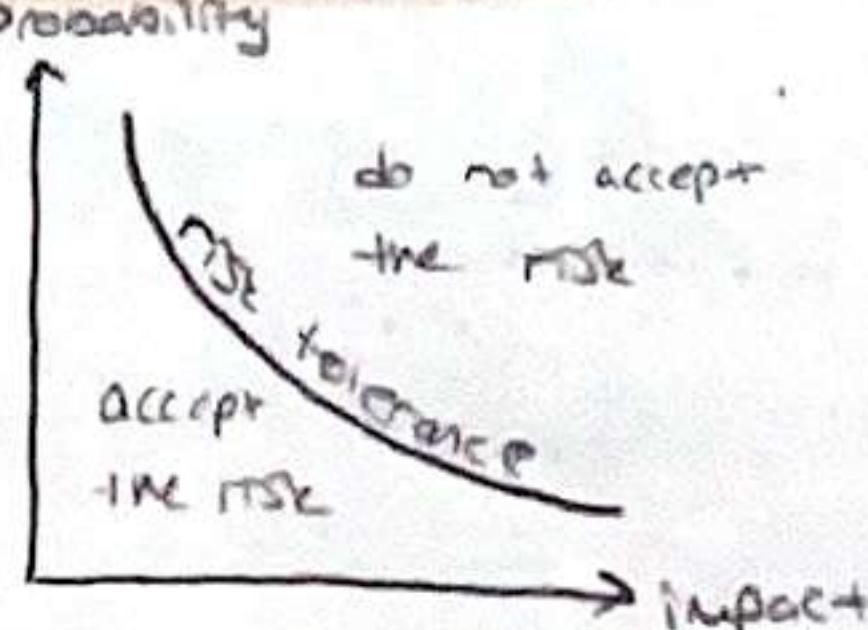
potential severity

Risk assessment: Overall process of estimating the magnitude of risk and deciding whether or not the risk is tolerable

$$\text{Hazard} = \text{probability} \times \text{severity}$$

$$\text{Vulnerability} = \text{susceptibility} \times \text{value}$$

$$\text{RISK} = \frac{\text{Value}}{\text{Time}}$$



- Risk
- Learnable
- Notifiable
- Defensible

- Measurable
- Analyseable

Basic steps in a risk assessment

(5)

- 1) Identify hazards
- 2) Decide who might be harmed and how
- 3) Evaluate the risks and decide on precautions
- 4) Record your findings and implement them
- 5) Review your assessment and update if necessary

- 1) Identify
2) who, how affected
3) risks, precautions
4) record findings, implement
5) update and review

Primary risk factors

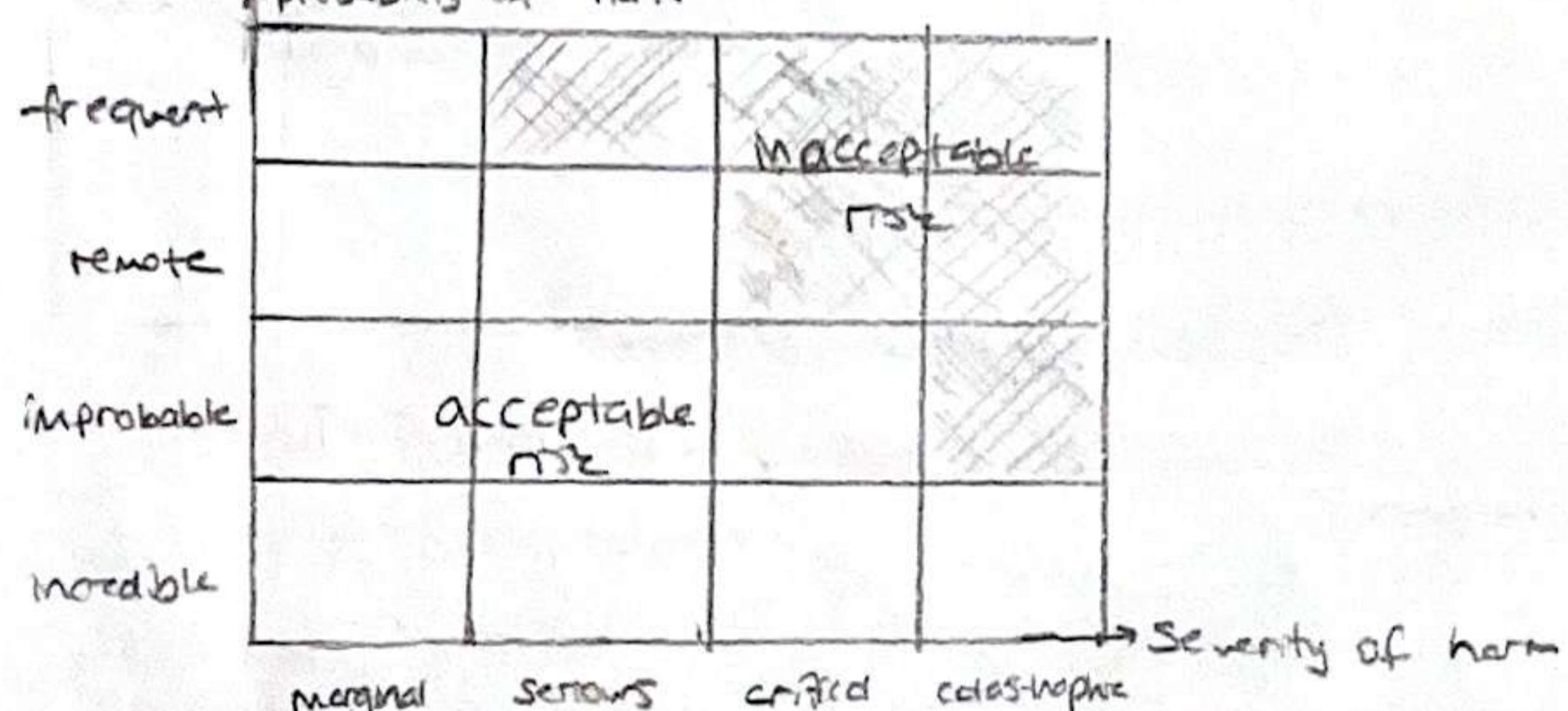
- Repetitive movements
- Forceful movements
- Fixed or awkward postures
- Bending, twisting and heavy lifting

Secondary risk factors

- Contact pressure
- Cold exposure
- Infrequent heavy lifting

Acceptable risk

probabilis of harm



Probability Occurrence period

Very low	Once a year
Low	Once every three months
Moderate	Once a month
High	Once a week
Very high	Every day

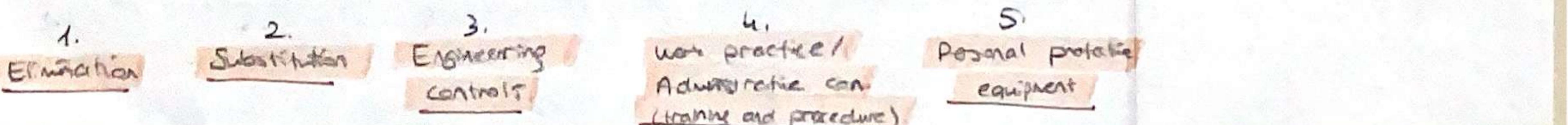
Result

	<u>Classification</u>
Very light	No loss of working hours, requires only first aid
Light	No loss of workforce, requires only first aid
Moderate	Minor injury, requires treatment
Severe	Death, serious injury, occupational health
Very severe	Multiple deaths, permanent disability

e.g.) 2) using less toxic
3) installing machine guard /
ventilation for usage

Hazard control methods

Most effective ← → least effective



If there is no board → employer

↳ board once a month

↳ employer/rep, OHS expert, works. doc
(Chair) (secy)
employee rep, HR manager, chief/boar
+ CM defense expert (not fit)

OHS expert → planning periodic
controls and measurements

Who must do risk assessment?

- 1) Employer
- 2) OHS expert
- 3) Work place doctor
- 4) Working agent
- 5) Authorised staff

Occupational health and safety specialist

Review, evaluate, and analyse work environments and design programs and procedures to control, eliminate, and prevent diseases or injury caused by chemical, physical, and biological agents or ergonomic factors. May conduct inspections and enforce adherence to laws and regulations governing the health and safety of individuals.

Post-accident legal requirements

- Employer's duty: must record and notify Social Security Institution has 3 working days to report accident to SSI
- Occupational physicians must report a confirmed "occupational disease" within 10 days to SGK

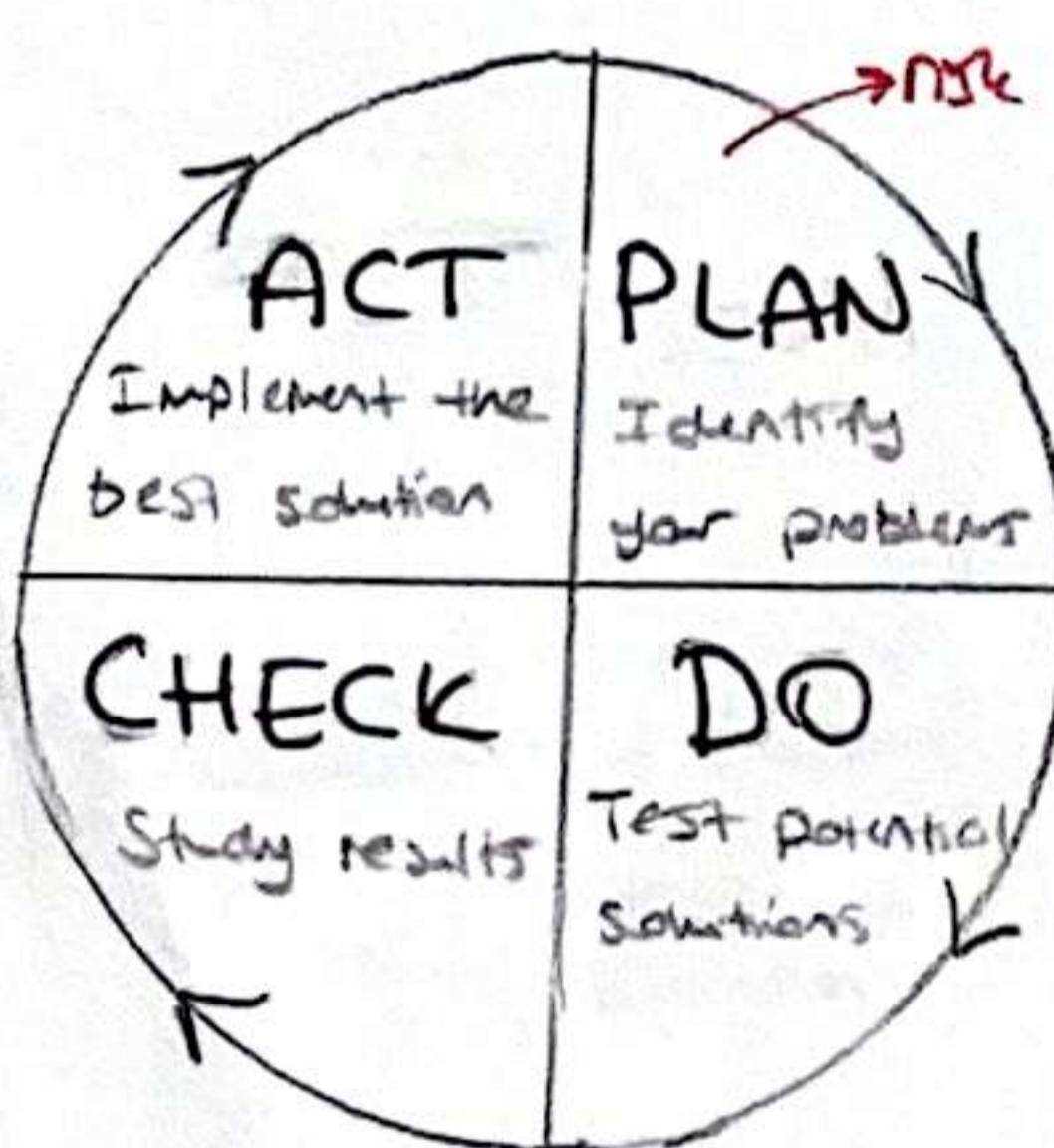
ISO 9001: Product → customer satisfaction

ISO 14001: Environment → environmental protection

OHSAS → 18001: Worker → occupational safety / Policy-Planning-Implementation + ISO 45001 (OHS management)

Organise, plan, control

Deming cycle



Plan: Identify, develop hypothesis about the issue and decide which one to test

Do: Test potential solution on small scale, measure results

Check: Measure effectiveness, decide whether hypothesis supported or not

Act: If solution was successful, implement

Risk assessments have to be renewed;

- Very hazardous workplaces → Every 2 years (16 hr per year)
- Hazardous workplaces → Every 4 years
- Less hazardous workplaces → Every 6 years

training

Local exhaust ventilation (LEV): capture contaminants at the source

Controls

- Engineering
- Proper equipment
- Local exhaust
- Re-designed tools

Administrative

- Changes in work procedures / safety policies / rules
- Schedule changes: adjusting work pace, job rotation, lengthened or additional rest breaks
- Training with goal of reducing duration frequency and severity of exposure

Guarding: physical barriers on machines

Ventilation: removing harmful air

Isolation: keeping hazard in a locked / shielded area

Dampening: using water to stop dust from flying

- Personal protective equipment (PPE)
 - special clothing
 - eye protection
 - hearing protection
 - respiratory protection
- ⑦
- dust, noise, fire
etc.

Occupational disease

Any illness associated with a particular occupation and industry. Resulted from hazards that are present in the work environment.

e.g.) contact dermatitis → chemical hazard

occupational cancer → chemical hazard

Musculoskeletal disease → ergonomic hazard

Silicosis → physical hazard

→ direct cause of disease

→ indirect cause of disease

Work-related disease

Multiple causes where work environment may play a role (by accelerating)

Occupational accident (Labor Law no. 6331) : refers to the event that takes place in workplace, causes death or makes body integrity mentally and physically disabled.

Incubation period refers to time between exposure and appearance of symptoms

Common workplace accidents

- 1) Slip, trip and fall
- 2) Manual handling - moving heavy objects / materials
- 3) Being hit by falling objects
- 4) By inadequate PPE
- 5) Falling from height
- 6) Burn injuries (electrical, overheated machine, chemical burn, direct heat, faulty wiring)
- 7) Vehicle crashes (on the road, at workplace)

More than half occupational accident deaths occurred in the 25-44 years age groups

Types of PPE

- Hearing protection (85 dB +)
- Earplugs
 - insert into ear canal
 - Semi-Msrt ear plugs
 - Held by rigid headband

- Ear muffs
- fit around entire ear

→ Eye and face protection

- glasses
- closed goggles
- X-ray glasses, laser beam glasses, ultra-violet, infrared, visible radiation glasses

Class A hard hats

- Falling objects
- Protect from electrical shocks up to 2200 volts

Class B hard hats

- Falling objects
- Electrical shocks up to 20000 volts

Class C hard hats

- Falling objects
- Bump caps
- lightweight plastic
- protect from bumping head on protruding objects

Helmet colors

White: engineering, managers, supervisors

Blue: Technical operators

Red: fire-fighter

Green: Medical person

Yellow: worker

Orange: Foreman

HAND

metal mesh → sharp

leather → rough surface

vinyl and neoprene → toxic chem.

rubber → electricity

padded → sharp, dirt, vibration, siners

heat resistant → heat

latex → biological

lead-lined → radiation

forearm cuffs → forearm

thumb, finger cots → thumb, finger

mittens → very cold / hot

hand pad → very hot

FOOT

PVC → moisture

butyl → ketones, aldehydes etc

vinyl → solvents, acids etc

nitrile → animal fat etc

disposable → dust areas

BODY

insulated coats and pants

fire / heat / cold

coveralls → chemical

Yellow - warning

→ Hand protection

metal mesh gloves → resist sharp edges and prevent cuts

leather gloves → shield your hand from rough surfaces

vinyl and neoprene gloves → protect your hands against toxic chemicals

rubber gloves → protect when working around electricity

padded cloth gloves → protect your hands from sharp edges, siners, dirt and vibration

heat resistant gloves → protect from heat and flames

latex disposable gloves → protect from germs and bacteria

lead-lined gloves → protect from radiation sources

forearm cuffs → protect forearm

thumb guards and finger cots → protect only thumb or fingers

mittens → protect while working around very cold or hot materials

hand pad → protect while working around very hot materials

→ Foot protection

PVC footwear → protect against moisture and improves traction

butyl footwear → protect against ketones, aldehydes, acids, salts and alkalies

vinyl footwear → resists solvents, acids, alkalies, salts, water, grease and blood

nitrile footwear → resists from animal fats, oils and chemicals

electrostatic dissipating footwear → conducts static electricity to floors that are grounded

electrical hazard footwear → tough rubber to prevent shocks and burns from electricity

disposable footwear → shower slippers, clear polyethylene and non-woven booties used in dust work areas

→ Body protection

insulated coats and pants → fire / heat / cold resistant

sloves and aprons → to reduce splash, make sure the sleeves and aprons are appropriate

coveralls → tyvek use, chemical rated

full body suit → hazardous materials handling, carbon filtering for emergency response

Safety signs

→ green - emergency

emergency information

→ exit



fire



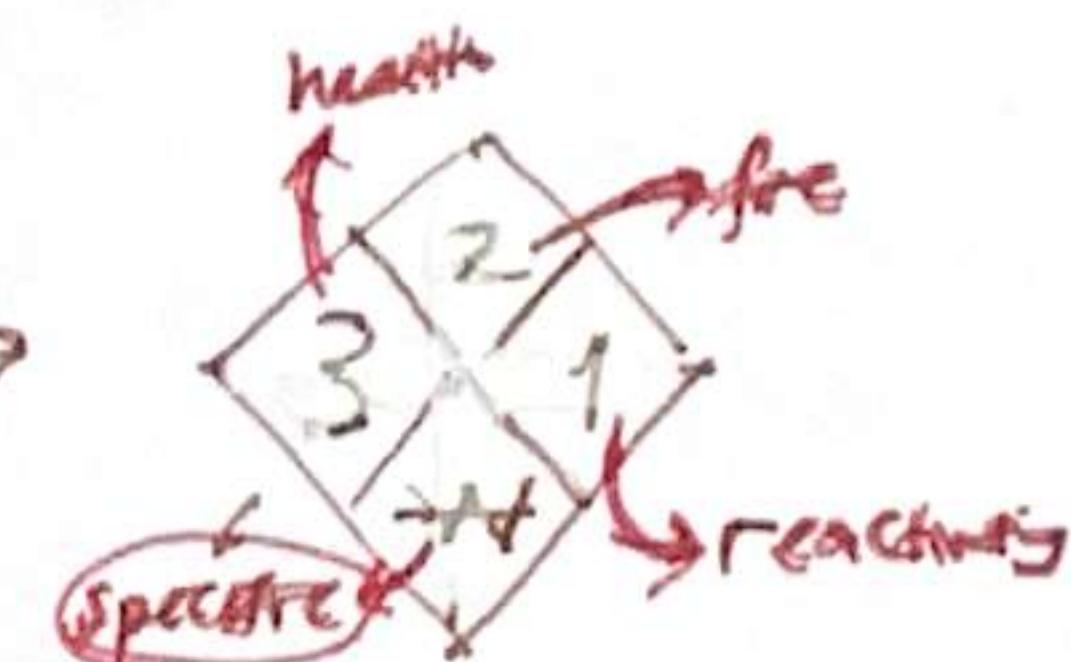
Workplace Hazardous Materials Information System

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Labels

Material Safety Data Sheets
(MSDS)

Worker training



Hazards (R Phrases)

+
Amount (Quantity)

Assessing risk level → Control measures

+
Volatility / Dustiness

Main categories of the workplace danger

- Physical
- Chemical
- Biological
- Psychological
- Ergonomic

Physical risk factors

→ Noise

1) Physical effect: temporary or sudden hearing loss, pain, nervous and circulatory system disorders and hormonal imbalance

→ duration of exposure

2) Interfering with conversations: can lead to decrease work efficiency

3) Physiological effects: fatigue, inability to sleep, insomnia

4) Psychological effects: behavioural disorders, anger, anxiety, stress, general feeling of discomfort

Acoustic trauma → sudden intense sound pressure, damages middle ear and inner ear (cavum organs)

Temporary hearing loss → it is reversible (short-term)

Permanent hearing loss → it is irreversible (long-term)

* Level * Duration * Physiologic signs

Normal 80 dB Noisy work: 95 dB (with protective tools)

→ Vibration m/s² → impact point, intensity, duration

Measurement: Hz (Hz) (point of contact) (acceleration) (time)

Low frequency (2-20 Hz): Found in vehicles (trucks/tractors)

Causes spinal/disk damage

Medium frequency (8-1000 Hz): Found in hand-held power tools.

Causes muscle/joint issues

High frequency (1000+ Hz): Found in stationary machines

Causes sensory and vascular damage

Health effects

- Vascular: constriction of capillaries (e.g. in cold weather/chainsaw users)
- Nervous: Impaired motor coordination and perception
- Skeletal: Damage to bones and joints

Control measures

- Using vibration dampers and isolation
- Avoiding resonant frequencies
- Ensuring dynamic balance of machinery

TLV (threshold limit value)

TWA (time-weighted average)

STEL (short-term exposure limit)

(ceiling)

Tinnitus (ringing in ears)

Threshold of pain 110 ~ 140 dB

→ limit 8-hour shift generally 85 dB

Jack hammer

Glove-arm vibration (white-finger)

→ Pressure

High pressure: Affects divers and underwater workers

Causes confusion, ringing in the ears, and life-threatening strokes

Low pressure: Occurs at high altitudes. As pressure drops, oxygen level decrease

- Symptoms of low pressure: Increased breathing and heart rate, nausea, fatigue, and headache

→ Dustiness

Dustiness levels

- Low: little dust (pellets)
- Medium: dust settles out quickly (granules)
- High: dust clouds remain for minutes (fine powders)

Particle size and body penetration

→ 100-50 microns: stay in the upper-respiratory tract

→ **0.5-5 microns**: reach the lungs and accumulate in alveoli major health risk

→ < 0.5 microns: move in and out of lungs, generally considered harmless

↳ **Small, harmless**

→ Hot and cold

Thermal comfort

temperature, humidity, air velocity

- Optimal temperature: between 15-20°C (18-20°C for light work)
- Heat stress: leads to increased errors, mental fatigue, and poor blood circulation
- Cold stress: affected by temperature air flow rate. Causes "cold burns", freezing, and loss of dexterity (ability to use fingers)
- Safety risk: cold environments increase accident risks by prolonging reaction and reflex times.

→ **Lighting** [Lux (lx)] → cloudless summer day 100,000 lx
overcast day 3000 lx

- Most important sensor in human perception of information (~ 80-90%).

Criteria for good lighting

- Quantity
- Uniformity
- Static
- No glare
- No shadows

Visual fatigue and recovery

- 1) Visual fatigue
- 2) Neural fatigue

Symptoms: watering, double vision, headache, decrease in adaptive power

Recovery method: looking distant objects

Age above 40 require more illumination

2-5x Rule: a 60 years-old worker needs 2-5 times more than 20 years-old one

→ Ultraviolet light

UV light → welding → welding helmet (filter shade 10-14) → welding curtains

→ Heights

full body harness + tied off

→ Forklift (certification)

restricted vision, pedestrian hazard, stability triangle

→ Crane

Overhead hazard, communication / back forth movement

(11)

→ Electrical fields

- Direct contact with electricity
- Electrical arcs
- Thermal burns
- Muscle contractions causing a worker to fall

safe 'touch voltage' (dry)-50V
neutral wire (blue)
in wall outlets (AC)

Chemical risk factors

- Metals
- Solvents
- Gas
- Acids and alkalis
- Pesticides

Material safety data sheet (MSDS)

↳ maximum permissible presence of chemical substance in workplace

Flammable and very flammable substances

ethyl ether, sodium, acetone, hydrogen, lithium, acetylene, ethyl alcohol, potassium

Corrosive substance

sulfuric acid, hydrochloric acid, nitric acid, ammonium hydroxide, sodium hydroxide, chromium trioxide

Toxic substance

Dose which causes death of 50% of experimental animals is defined

LD₅₀ (the lower LD₅₀ more toxic)

Oxidizing agents

Peroxides, hyperperoxides, peroxy esters

Compressed gases

↳ contains large amounts of energy and has high flammability and toxicity potential

Explosive materials

acetylene, acid, hydrogen, nitro compounds, ammonia, organic peroxides, perchlorates, bromates

Harmful, irritant

ammonia, hydrofluoric acid, nitric acid, hydrochloric acid, sodium hydroxide

Determining the damage

- 1) Physical and chemical properties
- 2) How and how much exposed
- 3) Characteristics of exposed person
- 4) Environmental properties

Sensitizer: a chemical that causes an allergic reaction

Chemicals harm the health in three ways

1) Inhalation (breathing)

* most common

breathing dusts, gases, vapors

↳ bronchitis, asthma, cancer

2) Skin absorption

(to skin or eye)

burning of the skin/eye

irritation of skin (dermatitis)

sensitizing effects (contact dermatitis), skin cancer

3) Ingestion (swallowing)

digestive → gastro-intestinal system organs

chemicals may be swallowed

If foods or herbs are contaminated

inhaling dusts → pneumoniosis

Biological risk group 4:

contains agents with no effective treatment and high risk

group 2: contains agents that can cause human disease but unlikely to spread

shift work → psychosocial hazard

ergonomic keyboard design

→ prevent "carpal tunnel"

10-20 cm distance (screen)

Biological risk factors

It is also genetically modified, which can cause any infection, allergy or poisoning

→ microorganisms, cell cultures, human endoparasites, bacteria, viruses, fungi

- The ability of agent make one sick (virulence-pathogenicity)
- Transmission routes
- Host susceptibility
- Environmental factors

Psychological risk factors

→ temperature, humidity, lighting, work-time, shift work, wage, workplace violence, discrimination, mobbing

restlessness, sleep disturbance, burnout syndrome, anxiety, behavioural disorders, biochemical and immune system disorders

work stress → emotional, physical, cognitive reaction of employee

Ergonomics (human factors engineering)

Science of matching job to worker and the product to user covering situations as lifting, lighting, office/foolsete set up; may contribute to injury

interaction between worker and workstation

"Adjusting workspace to best fit the employee"

→ Work station design (foolsets, chairs, space, layout)

→ Work postures (sitting, standing, lifting)

→ Work organization (pace, breaks, variety)

→ Tools, equipments and furniture (body size, gender, posture, vibration, noise, temperature, lighting)

→ Manual materials handling (lowering, pulling, carrying)

→ work environment (ventilation, humidity, vision, noise, temperature)

Associated risk factors: static posture, erroneous posture - neck, head, arms

Associated health concerns: sore feet, swelling of legs, fatigue, low back pain, neck pain

Fire training

Combustion: rapid chemical reaction of fuel or combustible material with combustible material (oxygen). For this reaction start, heat must be given up to a value called ignition temperature.

Fire: Out-of-control combustion. Generally oxygen (21% in the air) is combustible substance. It is important to cut the relationship between combustible material and air.

fuel source of ignition oxygen process of combustion

fire triangle: Class-A: Involving ordinary combustible materials such as wood, paper, cloth, rubber, plastic → solid

Oxygen (O₂) chemical reaction heat Class-B: Involving flammable or combustible liquids like gasoline, oil, grease, petroleum products → liquid CO₂, dry chem powder

fuel Class-C: Caused by flammable gases such as LPG, natural gas, butane, acetone vapors. → gas

Class-D: Involving combustible metals such as Magnesium, sodium, lithium, potassium, zirconium → metal

Flash point: the temperature where a liquid gives off enough vapor to ignite

Causes of fire

- Ignorance
- Accidents
- Sports
- Sabotage
- Natural events

Fire prevention and extinguishing methods

1) **Cooling:** The combustible material is usually cooled with water.

The temperature should be below the ignition temperature (class-A)

2) **Suppression:** A buffer is created between the air and the flammable substance with various substances and the air is prevented from reaching the flammable substance (class-B)

3) **Dispersion:** Removal of combustible materials that can burn but has not yet started to burn from the fire by various methods. (class-C)

• Rescue • evacuation • first aid teams

→ hydrophore systems → sprinkler installations → necessary fire extinguishing and intervention equipment

Scope of training

- Fire extinguisher use training: how to use fire fighting systems such as fire extinguisher and hydrants
- Reporting training: teaching the methods of reporting
- Evacuation and first aid trainings: identifying evacuation routes, how to guide people to evacuate and how to use evacuation equipments

• Training (at least twice a year)

Fire extinguishers

Type	Solids	flammable liquids	flammable gases	electrical equipment	cooking oil, fats
Water	✓	✗	✗	✗	✗
Foam	✓	✓	✗	✗	✓
Dry powder	✓	✓	✓	✓	✗
Carbon dioxide (CO ₂)	✗	✓	✗	✓	✓



→ CO₂ best for electrical fires

→ Water is the most commonly used fire extinguisher agent and cools materials by absorbing heat

→ Foam: cover the surface of burning liquids, cut off air contact, and reduce heat; mechanical and synthetic foams are common.

→ Dry chemical powder: for fuel and electrical fires; sodium bicarbonate is used for class B and C fires, while ammonium phosphate powders are used for class A, B and C, they can stop the chain reaction of combustion

→ Carbon dioxide (CO₂): flammable fuel and electrical fires, it displaces oxygen, but power supply must be cut before intervention

Maintaining portable fire extinguishers

• fully charged and operable • designated locations

• annual maintenance inspection • maintenance date must be recorded

Pull the pin (or other means) to unlock extinguisher

Aim the base (bottom of fire and stand 6-10 feet away)

Squeeze the lever to discharge the agent

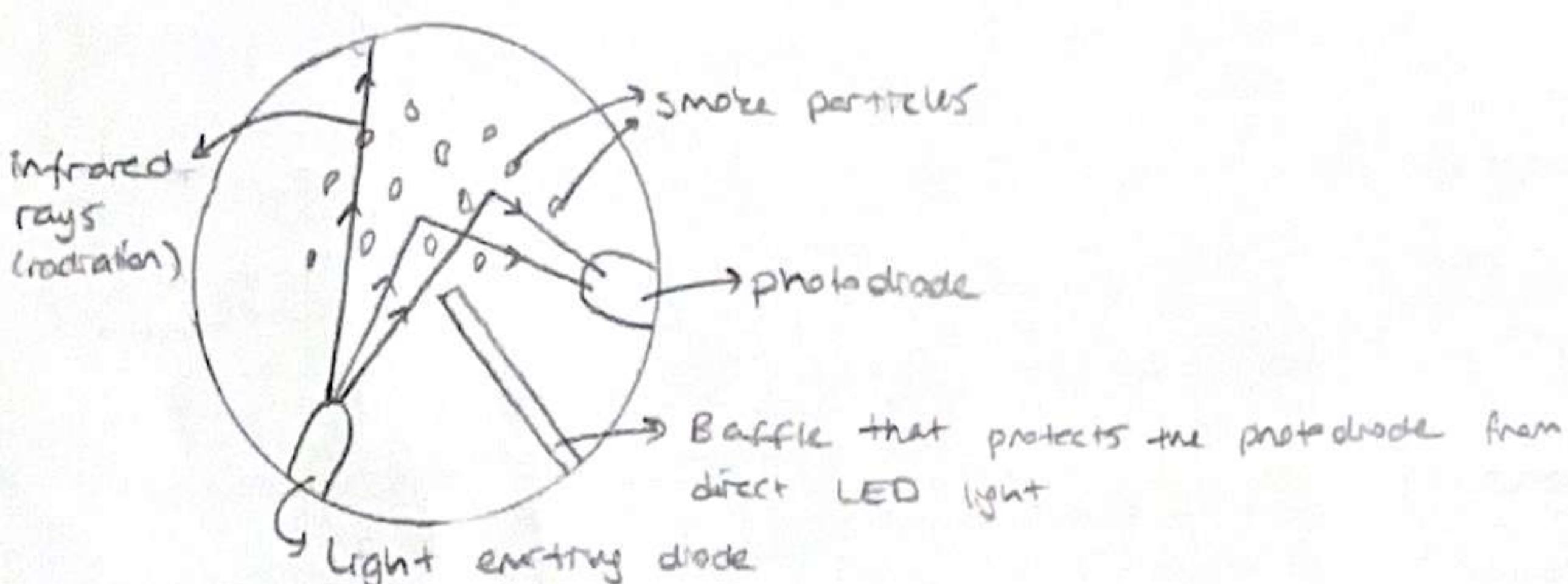
Sweep the spray from left to right until flames are totally extinguished

A	ordinary combustibles (wood, paper, cloth)	water foam dry chem.
B	flammable liquids (gasoline, oil, grease)	CO ₂ dry chem.
C	energized electrical equipment	CO ₂ dry chem.
D	combustible metals (magnesium, titanium)	dry powder agents
F/K	cooking oil and fats	wet chem.

Fire detection systems

→ Ionization smoke detector

Respond fastest to small-particle black smoke from hydrocarbon fires and use a dual-chamber cell to prevent false alarms caused by humidity and temperature changes.



→ Optical smoke detector

Quickly detect thick, white smoke with large particles using light-scattering technology.

→ Flame detector

Detect and warn against flames occurring during a fire.

→ Heat detector

Sense sudden temperature rises by comparing two conductive sensors and are commonly used where smoke detectors are unsuitable; they also alarm at slow temperature increases when the temperature reaches 60°C.

Passive fire protection methods

- Compartmentalization
- Natural ventilation
- Mechanical and electronic ventilation

First Aid

In any accidental or life-threatening situation, until the help of paramedics is provided, the application made without medication in order to save life or prevent the situation from getting worse.

1) Protecting and sustaining life

2) Preventing worsening of the situation

If consciousness is impaired

Airway → opens respiratory tract

Breathing → provides respiration

Circulation → provides circulation

(just expected to be performed by health-care individuals)

3) To facilitate recovery

Airway blockage symptoms

Partial blockage

- Coughing
- Ability to breathe
- Ability to speak

Avoid touching patient, focus on coughing and encourage to cough. Be prepared to intervene swiftly if signs of unconsciousness or cyanosis are observed.

Complete blockage

- Unable to breathe
- Pain, clutching throat, cannot speak
- Complexion becomes blue

Heimlich maneuver (abdominal thrusts) should be performed.

First aid in electric shock

Can cause burns, breathing and circulation problems, loss of consciousness and injuries from falls

1) Ensure the rescuer's safety and cut off electricity or separate victim using non-conductive materials

2) Start artificial respiration if breathing stops and cardiac massage (CPR) if heart stops

3) Cool burns with cold water, do not use water if victim's clothes are on fire

First aid for burns

Caused by fire, electricity, sun, hot liquids, chemicals, or hot metals

1st degree: Redness, pain, swelling; heals in about 48 hours (e.g. sunburn)

2nd degree: Blisters with pain; heals naturally, possible scarring

3rd degree: All skin layers affected; may appear white, brown, or black and may be painless due to nerve damage

Heat burns: cool with cold running water for at least 20 min, remove jewelry, do not burst blisters, cover with clean gauze, give water if conscious

Burns covering more than 20% of the body are life-threatening

Chemical burns: Assess vital signs, call for help, stop contact with chemical, wash with plenty of water for 15-20 min

Heat stroke

Symptoms

Body temperature is above 39°C Skin is dry and red

Blood pressure drops, reduced awareness, loss of consciousness

Confusion and lack of sweating

First aid

rapid and slow cooling but not use ice

1) wetted with water at normal temperature or wrapped in a wet sheet

2) Cooling can facilitate by using fan or creating drafts through open doors and windows

Cold exposure

Caused by prolonged exposure to temperatures around 0°C

Leading to frostbite, shock, slowed vital functions

first-degree: pale, cold skin with numbness; later redness and tingling

second-degree: Swelling, tightness, and fluid-filled blisters

third-degree: irreversible tissue damage with blackened areas

First aid

Involves gradual rewarming with warm water, not bursting blisters and covering wounds with sterile dry dressings

Fracture

Loss of bone integrity due to impact or fall

* closed: skin intact

* open: skin broken → bleeding and infection risk

Symptoms: pain with movement, deformity, swelling, bruising, loss of mobility

* Do not move patient, keep injured limb above heart level

Dislocation

Permanent separation of joint surfaces

Symptoms: deformity, severe pain, swelling, redness, loss of function

* Never reposition the joint, nothing orally

Sprain

Over stretching or tearing of muscles/ligaments

Common areas: ankle, knee, wrist

First aid

- 1) Elevate
- 2) Cold application
- 3) Immobilize

Wounds (Injuries)

Damage to skin/mucosa → infection risk

Spurts, bleeding, tissue damage

Cut wounds: sharp objects

Crush wounds: heavy blunt objects

Infected wounds: late treatment (>6h), dirty, deep, bites/stings

Bleeding

1) Capillary
(lower degree)

2) Vein hemorrhages
(moderate)

3) Arterial
(most dangerous)

First aid

- 1) Direct pressure
- 2) Pressure points
- 3) Tourniquet
- 4) Elevate limb if no fracture
- 5) Check vital signs frequently in 2-3 min

Internal bleeding

Suspect if: restlessness, weakness, drowsiness, cold, pale, moist skin, abdominal pain and hardness, bruising, swelling, thirst, rapid weak pulse and breathing

First aid

* check consciousness, lay flat (shock position) - feet 30 cm up, keep warm, immobilized, no food or drink

Shock

Reduced blood flow to body tissues, mainly due to circulatory system failure. Oxygen and nutrients cannot reach organs sufficiently, brain is affected first.

Poison

Harmful substances enter the body by ingestion, inhalation, skin contact or injection

Poisoning through the skin

Caused by animal/insect bites, pesticides, chemicals

Drowning

Lack of oxygen causes tissue damage.

May result from unconsciousness, tongue obstruction, fluid in airway, choking, lung damage, or gas poisoning.

Transporting patient

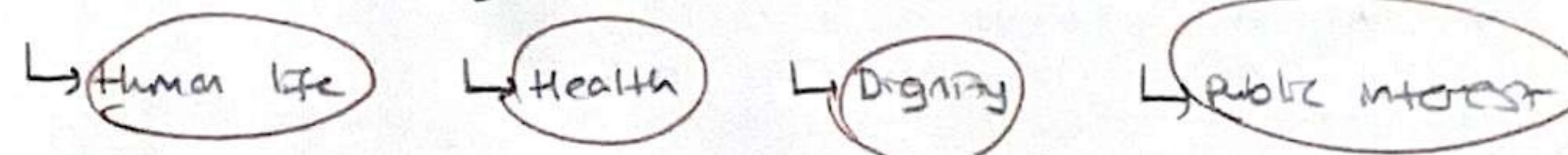
- support body from at least six points
- maintain head-neck-trunk alignment

Ethics in OHSConcept of ethics

System of moral principles, values, standards; distinguish right from wrong, good from bad, and determine what is morally acceptable or unacceptable.

- examines human behavior
- does not create morality, but analyzes, discusses, and evaluates
- provides theoretical framework for moral behavior

Science of morality

Fundamental ethical principles

1. Honesty and impartiality
2. Integrity and trustworthiness
3. Courtesy and respect
4. Commitment to public service
5. Adherence to service standards
6. Commitment to purpose and mission
7. Reporting to competent authorities
8. Avoidance of conflicts of interest
9. Not using authority or clout for personal gain
10. Proper use of public goods and resources
11. Transparency, information sharing, and inclusivity

Unethical behaviors

Corruption, discrimination, political influence in business relations, intimidation and coercion, negligence, exploitation, selfishness, violence and aggression.

Morality - ethics (common)

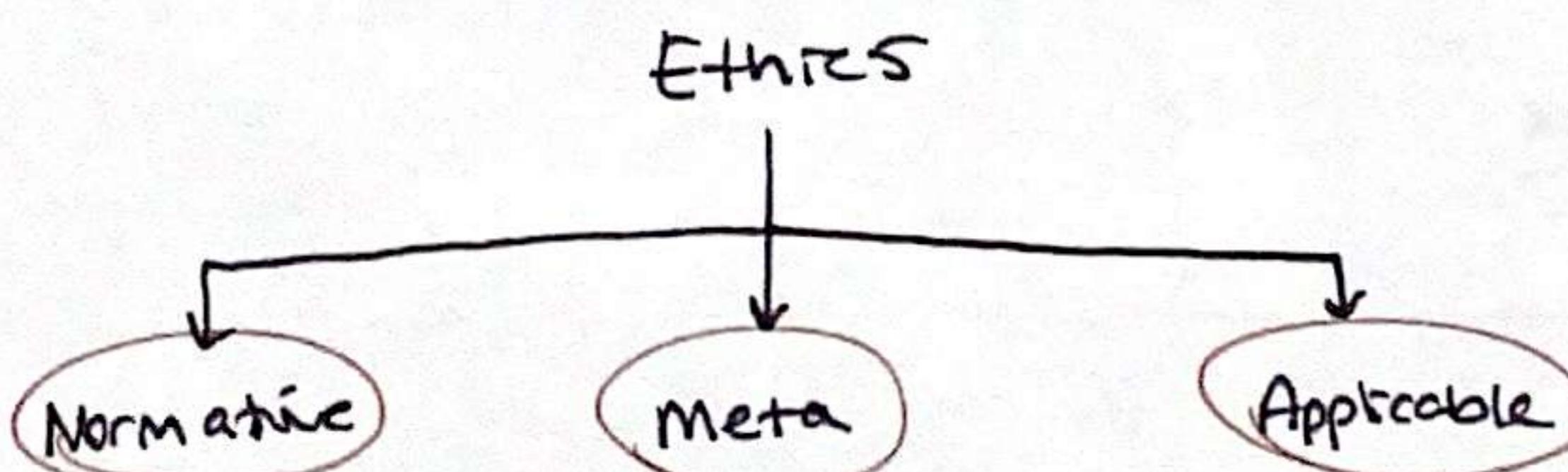
They both encompass the rules of behavior governing individuals' interactions with each other and the principles guiding their relationships.

Morality

Encompasses a set of learned attitudes and behaviors, societal norms expected to be adhered to in one's personal life. Inherent qualities known as temperance within individuals, as well as virtues of goodness and beauty.

↳ unwritten rules accepted in society

"ethics → written enforceable rules"



Normative ethics

↳ How to take action ↳ How to live ↳ What kind of person I should be

meta ethics (analytical approach)

↳ what's bad ↳ what's good

Encompasses information concerning ethical principles, values, and norms guiding human behavior.

negative emotions

fear, fatigue and exhaustion

feeling under pressure, distress and anxiety

positive emotions

feeling good about the decision, experiencing

satisfaction of doing a good job, peace of conscience and peace of mind

Ethic systemsAimed ethics of consequence

- Results and outcomes of action

↳ What benefit does this action bring?

⇒ Consequentialists produce the greatest benefit or happiness

In OHS, if a safety measure reduces accidents and protects majority, even if requires additional cost or effort, it counts as ethical.

↓
workers,
employees
society

Rule ethics

- Duties, rules and universal standards

↳ Is this action appropriate according rules, laws and standards?

In OHS, following safety regulations is mandatory, even if ignoring them seems faster or more profitable

Social contract ethics

- Agreement between individuals and society

↳ Has the individual embraced social principles and standards?

In OHS, employers and employees accept safety rules to ensure mutual protection in workplace.

Personal ethics

- Individual conscience and moral responsibility

↳ Does this action give you inner peace?

In OHS, reporting safety hazard even when not required by law because it feels morally right.

Social life ethics

- Human being and other living beings within society

↳ Does this action respect life and coexistence?

In OHS, ensuring workplace safety not only for employees but also for community and environment

OHS specialist

(19)

- Competence and integrity → decisions based on science, prioritizing worker health
- Professional independence
- Equality and non-discrimination
- Ethical records
- Medical confidentiality
- Aggregate data
- Health-care relations
- Combating abuse
- Social parties
- Ethical supervision

Social corruption (degeneration)

Value confusion: ethical values weaken over time

Utilitarian dominance: self-interest replaces moral principles

Professional ethics

Accuracy: acting truthfully

Legality: compliance with regulations

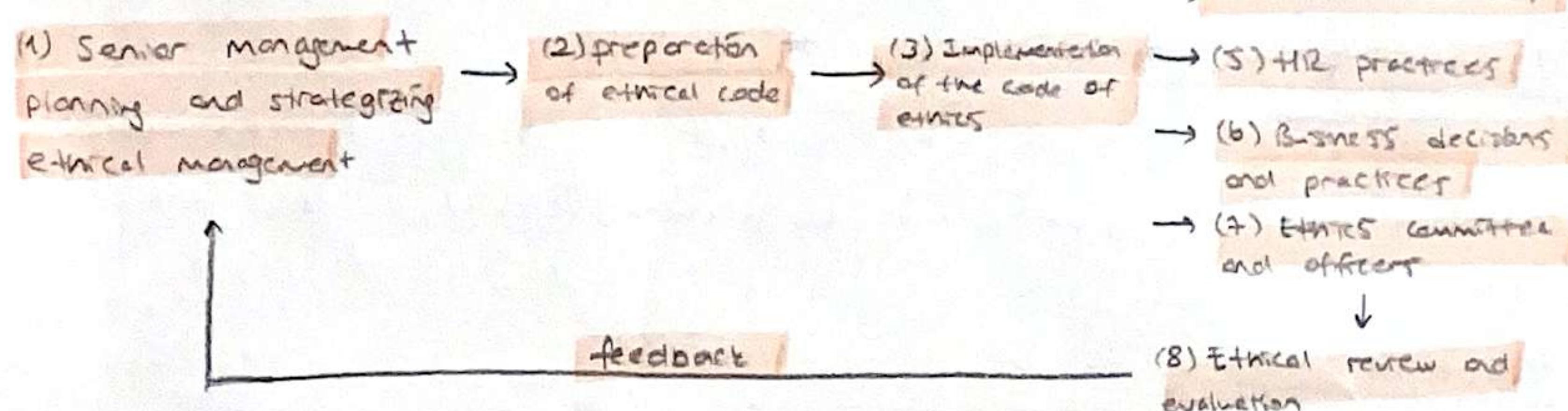
Competence: performing duties with adequate knowledge and skill

Reliability: being trustworthy and consistent

Commitment to profession: loyalty to professional values and standards

Purpose: Individuals working in the same profession, regardless of their location are required to act in accordance with these codes of conduct

Institutionalization of ethics



Ethical behaviors of employees

Extractive: self-interested behavior

Attendant: dutiful behavior

Moralist: prioritizes benefit of institution

Hygiene in the workplace

History

Hippocrates — lead toxicity in mining industry

Cleaning + disinfection = sanitization

Pliny Elder — face mask (animal bladder)
Gum and sulfur from exposure to dust and lead fumes

Galen — pathology of lead poisoning, hazardous exposures of copper miners to acid mists

Agricola — mining diseases (silicosis)

Romazzini — De Morbis Artificum Diatriba (the diseases of workers) (Occupational diseases)

Ulrich Ellenborg — pamphlet on occupational diseases and injuries among gold miners (also carbon monoxide etc)

Percival Pott — Chimney-sweepers Act of 1788

Dr. Alice Hamilton — observed conditions and presented definitive proposals

Occupational Safety and Health Act of 1970 (OSHA)

Purposes

- remove secretions, metabolic waste products and microorganisms
- support physical relaxation and recovery
- reduce muscle tension
- prevent and eliminate unpleasant body odors

Contamination

↳ Physical (glass, nails, hairs, fibers, insects etc)

↳ Chemical (metals, agricultural drugs, detergents, plastics, additives etc)

↳ Biological (mold, parasites, viruses, bacteria etc)

Vaccine-preventable diseases

Tuberculosis, whooping cough, diphtheria, tetanus, measles, rubella, mumps, hepatitis A, hepatitis B, polio, HIV infection (meningitis), influenza (flu), pneumococcal, HAV

Microorganisms

1) Bacteria

Invisible to the naked eye

Form spores by hardening their cells to survive in unfavorable conditions

in 7 hr 2 million, 12 hr 1 billion

↳ Cold loving

(psychrophilic)

↳ Mesophilic

↳ Prefer warm

(thermophilic)

2) Viruses

Smallest, cannot multiply in water and food but can transmitted via them

All of them pathogenic — stomach and intestinal disorders, polio, jaundice, influenza etc
Can reproduce by infecting host cells

3) Parasites

Settle in body of another living organism and majority cause infection there

Water and foodborne diseases

Typhoid

- occurs only in humans
- carriers should not be in food industry
- Chronic carriage
- transmitted through consuming food contaminated by carriers
- Symptoms: persistent fever, relative bradycardia

Cholera

- Transmitted through tract via contaminated food
- May lead high mortality rates due to excessive fluid loss
- Small intestinal infection characterized by severe diarrhea

Malaria

- Most important parasitic infectious disease
- Transmitted by mosquitoes (*Anopheles* species)
- Cold, hot, sweating phase

Hepatitis A

- Transmitted fecal-oral
- Children in developing countries
- not cause chronic infection
- Through blood
- Incubation 4-12 weeks (acute 2-12 weeks)
- 10% chronic

Hepatitis B

Mesothelioma — asbestos