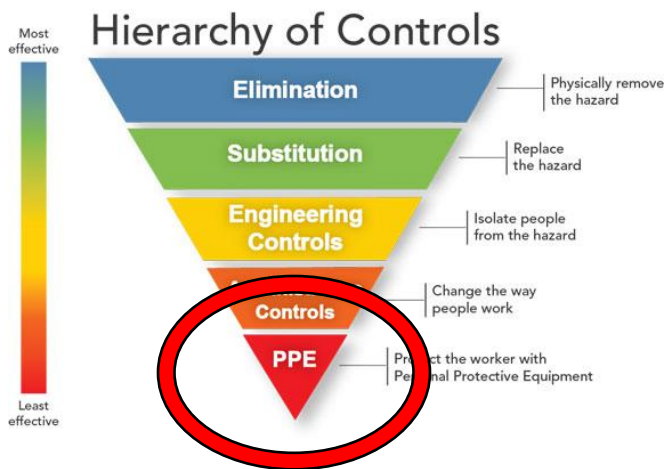




Put chemical management into practice
SELECTING AND USING PERSONAL
PROTECTIVE EQUIPMENT

Selecting and using personal protective equipment



- Requirements as per ZDHC CMS
- Basic principle and scope of personal protection
- Selecting respiratory protection
- Selecting skin/eye protection
- Propagating good personal protection practices
- Exercise

Requirements as per ZDHC

- ZDHC CMS reference:
- 3.5.8 - Personal Protective Equipment
- Expected deliverables as per ZDHC CMS
 - Procedure for PPE Use



Personal protection

Principles and scope

- Personal hygiene
- Personal protective equipment (PPE)

Remember!

A PPE is the last barrier between the contaminant and you!

- Consider PPE as an immediate but temporary solution or as the the last solution if the contaminants cannot be controlled otherwise.



Personal protection

Principles and scope

Against chemical exposure

- by inhalation
- by skin contact
- by absorption through eyes



Selecting respiratory protection



- Against exposure from airborne contaminants in form of
 - Solid or liquid particles (dust, mist, aerosols)
 - Vapours
 - Gases
- By inhalation and partly eye absorption (depending on type of mask)

Selecting respiratory protection

Factors for consideration

- Routine use or non-routine use
- Workplace hazards
- Physical characteristics
- Physical demand of the work
- Respirator capabilities and limitations



Selecting respiratory protection

Non-routine uses

Examples:

- entries into confined spaces
- oxygen-deficient atmospheres and
- emergencies.

Special need and attention:

- impose risk that is immediately dangerous to life and health (IDLH)
- exposure to airborne contaminants likely to cause death or permanent adverse health effects, or prevent escape from such an environment.
- IDLH atmospheres affect the worker acutely as opposed to chronically



Selecting respiratory protection

Assess exposure to be addressed

- Identify airborne contaminants where possible
- Match specifications and limitations of respirator
- Consider abnormal conditions that may cause the concentration to rise
- Think in terms of „Worst case scenarios“
- Apply substance – specific requirements



Selecting respiratory protection

Basic types

- Air purifying respirators (APR)
 - Disposable
 - Reusable
- Atmosphere-supplying respirators or supplied-air respirators (SAR)



Selecting respiratory protection

Air purifying respirators (APR)

- Types
 - Filters (for solid and liquid particulates e.g. dust, aerosols)
 - Cartridges (for gases and vapours)
 - Canisters (used with gas mask)
- Prerequisite of use
 - Atmospheric oxygen level > **19.5%**



Selecting respiratory protection

Air purifying respirators (APR)



Disposable APR for solid and liquid particulates only!

Distinguishing filters types

- Efficiency rating
 - (e.g. 95%, 99%, 100% also known as HEPA)
- Resistance level
 - N (not resistant to oil)
 - R (resistant to oil)
 - P (oil proof)
- Quarter, half or full face

Selecting respiratory protection

Air purifying respirators (APR)



Reusable APR with cartridges

Cartridge type

- Colour coded to indicate for which chemical (groups)
- Half- or full face
- Single/double cartridge
- Verify Protection Factor (PF)

Selecting respiratory protection

Air purifying respirators (APR)

Check APR cartridge colour coding with your PPE supplier!

Color code	Filter / cartridge type	for which chemicals indicated
	AX	Gases and vapor of organic compounds with boiling point > 65 °C
	A	Gases and vapors of organic compounds with boiling point < 65 °C
	B	Inorganic gases and vapors e.g. chlorine, hydrogen sulphide, hydrogen cyanide
	E	Sulphur dioxide, hydrogen chloride
	K	Ammonia
	CO	Carbon monoxide
	Hg	Mercury vapor
	NO	Nitrous gases including nitrogen monoxide
	Reactor	Radioactive iodine including radioactive methyl iodide
	P1 -P3	Particles

Calculating required protection factor (PF)



PF =

Concentration of contaminant

Occupational exposure limit (OEL)

For example:

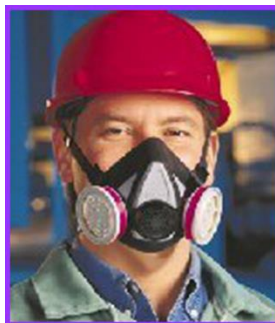
- Contaminant concentration in ambient air = 500 mg/m³
- OEL = 10 mg/m³

$$PF = 500/10 = 50$$

Protection factors (PF) of common air purifying respirators



Paper Disposable APF - 5



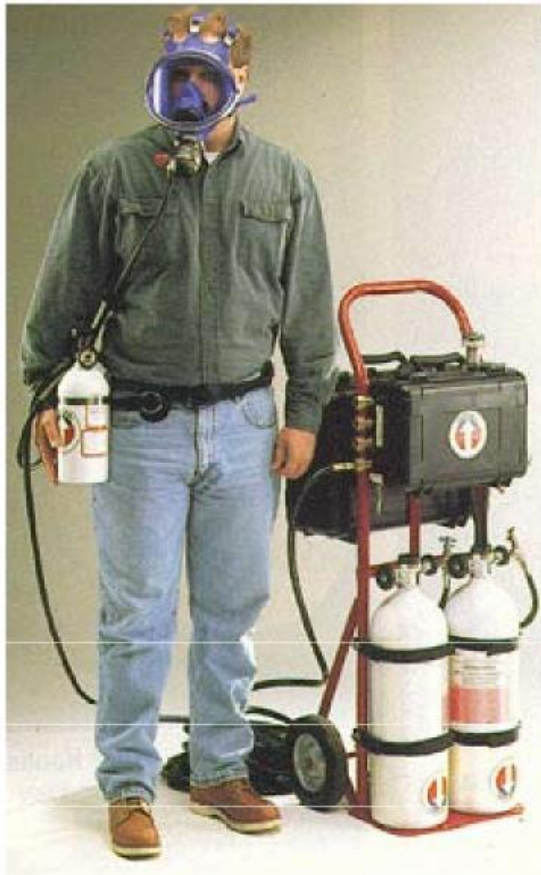
Half-Mask APF - 10



Full-Face (FF) APF - 50

Selecting respiratory protection

Atmosphere-supplying respirators or supplied-air respirators (SAR)

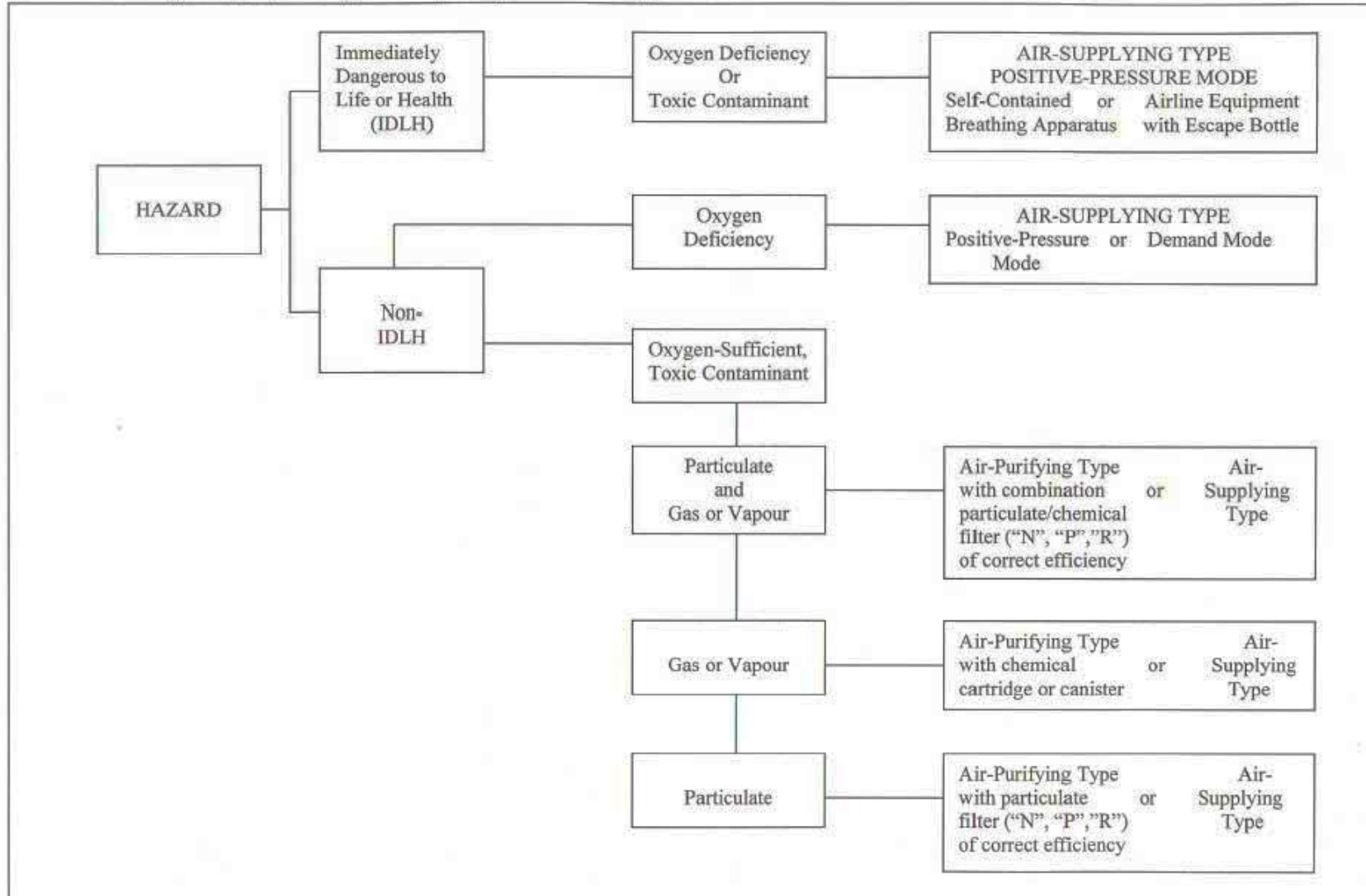


Basic types

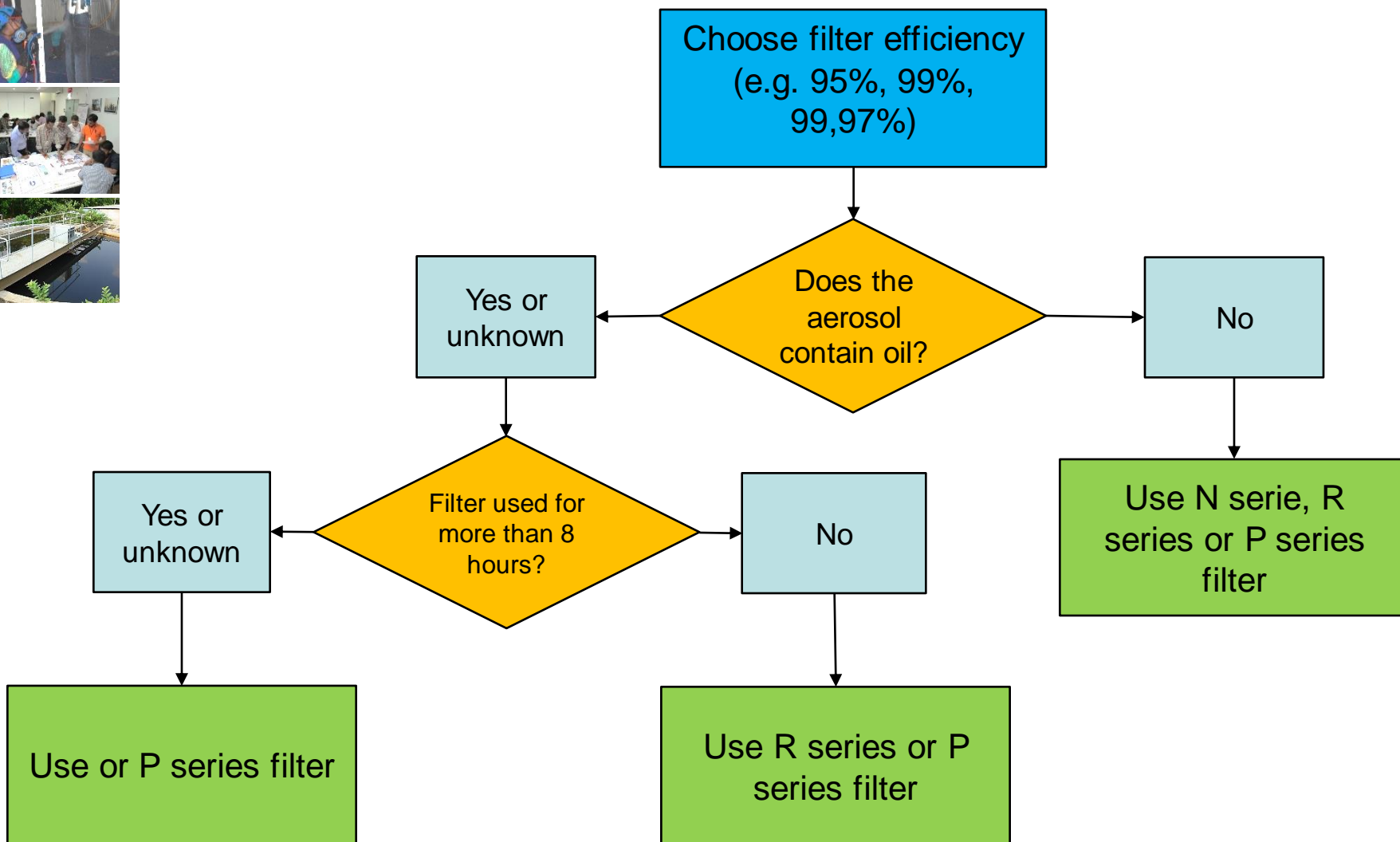
- Self-contained breathing apparatus (SCBA)
- Air-line supplied-air respirator
- Protective suits that totally encapsulate the wearer's body and incorporate a life-support system (e.g. biohazard suits).

Selecting respiratory protection

Choosing an Appropriate Type of Respiratory Protective Equipment



Selecting respirator filter type



Selecting respiratory protection

For additional consideration

Be aware of the life time of cartridges and filters and plan for replacement!

- Lifetime depending on intensity and conditions of use (e.g. humidity, temperature)
- Check the recommended service life indicators for cartridges and canisters
- Verify detectability of filter or cartridge breakthroughs (e.g. odor, smell, irritation) and make users aware of the same



Respirator protection programme

Where respirators required, establish respiratory protection programme covering

- Procedures for selecting respirators
- Medical evaluations of users
- Fit testing procedures
- Procedures for ensuring air quality and quantity
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and maintaining respirators
- Training of users on respiratory hazards and correct use of respiratory protective equipment



Selecting PPE for skin and eyes



Skin

- Protective gloves and clothing to prevent skin exposure (gloves, apron, boots)

Eye

- Protective glasses, goggles or face shield

Selecting PPE for skin and eyes



- Consult with section 8 in safety data sheets (GHS) on type of recommended chemical protective material
- Be aware of limitations of protective materials
 - **Permeation rate** (rate at which chemical moving through the material)
 - **Breakthrough time** (duration of chemical to permeate completely through the material)
 - **Degradation** (physical deterioration of material due to contact with a chemical e.g. getting stiffer or softer, brittle, weaker,...)

Selecting PPE for skin and eyes

Gloves

- Check task and task requirements (flexibility, grip and touch sensitivity needed)
- Identify all hazards e.g. list of the chemicals, physical hazards (e.g. abrasion, tearing, puncture, fire/flames, temperature) as well as effects of skin exposure
- Determine type of contact (e.g., occasional contact or splash protection or continuous immersion of hands) and contact period
- Consider what hazards may be presented by the use of the protective clothing itself. For example, protective clothing can contribute to heat stress; reduced dexterity; rip or tactile functions; poor comfort; or may contribute to skin conditions.
- Consider decontamination and disposal procedures.



Propagating good personal protection practices



Remember to provide required training (initial, refresher) such as on

- hazards and effects of contact with chemical
- limitations of personal protective equipment
- when and how to use
- when and how to clean or dispose of personal protective equipment

Propagating good personal protection practices



Do you, the managers and supervisors as role models for good personal protective practices in your company act ?

Remember to provide required training (initial, refresher) such as on

- hazards and effects of contact with chemical
- limitations of personal protective equipment
- when and how to use
- when and how to clean or dispose of personal protective equipment

Exercise

Denim spraying operations

- Potassium permanganate spray concentrations ranges from 5 grams per liter to 12.00 grams per litre.
- Workers are engaged in 10 hour shifts in the spraying area, working for about six to eight hours a day, with one hour lunch break and one 15 minute tea break each in the morning and afternoon and the rest of the time waiting for material to be moved.
- Most workers remain in the work area during the tea breaks.



Exercise

Denim spraying operations

- Air quality measurement indicates average concentration of 0.4 mg/m³ the exposure limit (TWA), with peaks of 0.8 mg/m³ in the work area and 1.5 at the point of spraying operation
- As per the safety data sheet, TWA is 0.1 mg/m³.



Exercise

Denim spraying operations



- The spray areas are equipped with water curtains, but these are not switched on.
- The area is ventilated by large extraction fans mounted at the wall above the spraying booth which blow the exhaust air towards the neighbouring garment unit.
- The workers in the area wear surgical masks, which look new and fairly clean at the time of your visit.

Exercise

Denim spraying operations

Your tasks in groups:

1. Assess the hazards and risk situation
2. Identify the control gaps
3. Suggest exposure control measures, including personal protection

Time: 30 minutes

