The role of the Occupational Hygienist in determining PPE in the workplace

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SAIOH

- Not for profit organisation, professional body
- Registered in terms of the Companies Act
- ±1000 professional certified members

Membership categories:	
Three levels of certification: ✓Assistants ✓Technologists ✓Hygienists	Other membership offerings: ✓Certified ✓Non-certified ✓Organisational

SAIOH International Standing

- Member of IOHA - *International Occupational Hygiene Association*
- SAIOH Certifications are recognised by the IOHA NARC (National Accreditation Recognition Committee)
- MoUs signed with:

❑ NIOSH - *National Institute for Occupational Safety and Health, USA*

❑ BOHS – *British Occupational Hygiene Society*

❑ AIHA – *American Industrial Hygiene Association*

❑AIOH – Australian Institute of Occupational Hygiene (advance stage)

❑ OHTA – *Occupational Hygiene Training Association* (for ATP – *Approved Training Providers – consultants and universities*)

SAIOH Demographics

Occupational Hygiene Assistant (OHA)	Female	Male	% Female	% Male
South Africa	290	261	53	47
Botswana	3	5		
Namibia	1	3		
Tanzania	0	1		
Occupational Hygiene Technologist (OHT)	Female	Male	% Female	% Male
South Africa	87	114	43	57
Botswana	3	3		
Namibia	2	1		
Australia	0	1		
New Zealand	1	0		
Occupational Hygienist (OH)	Female	Male	% Female	% Male
South Africa	50	141	26	74
Botswana	1	0		
Namibia	0	2		
United States of America	0	1		
Total (of the three OH categories)	Female	Male	% Female	% Male
	438	533	45	55

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The role of OH in determining PPE in the workplace

Legal provision

PPE legal requirements and homologations in RSA:

- National Regulator for Compulsory Specifications Act, 2008 (Act No. 5 of 2008); Sect 14
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

Technical requirements: Occupational Legislations

- **General Safety Regulations, 1989 (GNR 1031) under OHS Act, 1993 (Act 85 of 1993):**
  - ✓ Reg 2, sub-reg 2: Employer shall take steps to reduce the risk as much as is practicable, free of charge and maintain in good and clean condition
  - ✓ Reg 2, sub-reg 3, Paragraph (e) protective ointments, ear-muffs, ear-plugs, respirators, breathing apparatus, masks, etc
- **MHS Act, 1996 (29 of 1996)**
  - ✓ Section 6(2) Employer must ensure that sufficient quantities of all necessary PPE is available.
  - ✓ Workers should use PPE as required and keep it in good working condition
  - ✓ Guideline for the Compilation of a Mandatory Code of Practice on the Provision of Personal Protective Equipment for Women in the South African Mining Industry

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Technical requirements: NRCS

Section 1 and 14 of the NRCS Act, 2008:

- No person may import, display, offer, advertise or export for or in pursuance of a sale, have in possession for the purpose of sale, trade, manufacture or export, or supply a commodity, product or service to which a compulsory specification appliers***, unless such a commodity, product or service complies with the compulsory specification concerned***.
- All RPD's that are sold, manufactured and supplied in, imported into and exported from the Republic of South Africa shall comply with the requirements of the
  - ✓ ***Compulsory Specification for Respirators*** (Referred to as VC8072:2003) as published by GN No. R. 369 (G Gazette No. 25040)
  - ✓ ***Compulsory Specification for Breathing Apparatus*** (Referred to as VC8073:2003) as published by GN No. R. 370 (G Gazette No. 25040)

Technical requirements: NRCS ……(2)

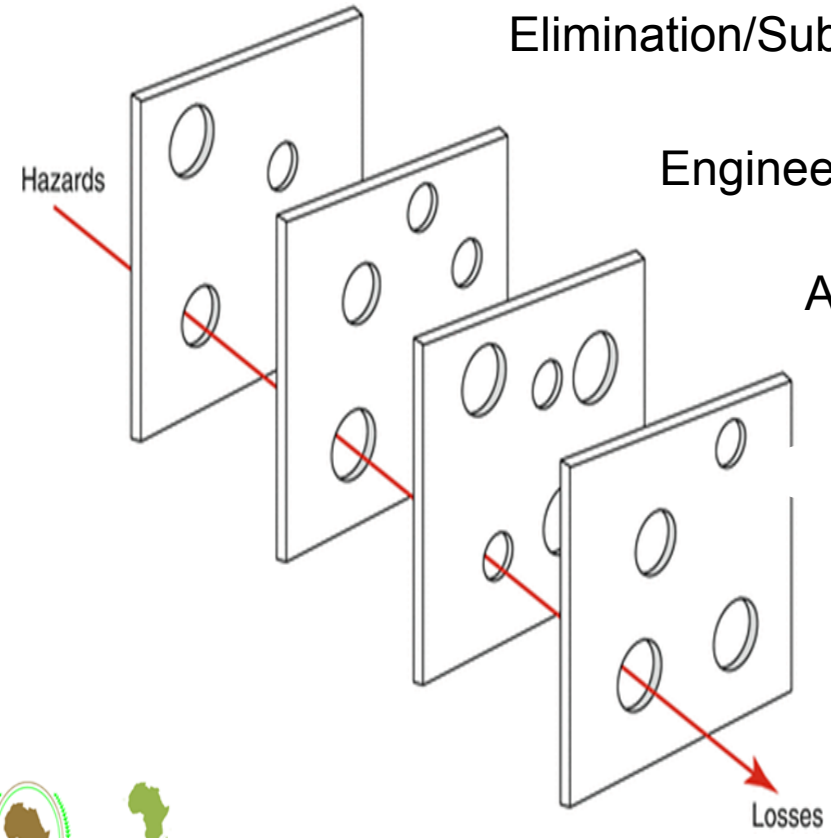
- **Administrative:**
  - ✓ Letter of authority
  - ✓ Consumer recourse (can report non-homologated PPE to the CMM)
  - ✓ There is a list of homologated RPDs in South Africa

PPE Principles

- Last resort (Engineering control are not feasible or being considered)
- Last resort but an important worker exposure control
- PPE programme comes after other policies, and programmes (OHS Programmes)
- More often it would include but not limited to:
  - ✓ OHS Policy
  - ✓ OHS Programme (Integrated Safety Management System)
  - ✓ Code of practices and guidelines
- Occupational Hygiene vs Occupational Safety

Principles: Swiss Cheese Model

- PPE/RPDs are not fashion garments, but exactly as the name suggests.
- OH motivates employees to properly wear PPE
- Encourages importance of teamwork: VFL, etc



Elimination/Substitution

Engineering controls

Administrative controls

Personal Protective Equipment

Though they are a last resort, they form part of an important barrier to prevent worker exposure

The role of OH in RPD program

- RPDs Program Administration
  - ✓ SAIOH registered OH: up to date with latest trends, emerging diseases, advance technologies, and regulatory changes on respiratory protection.
  - ✓ Lead or co-lead the PPE and respiratory program
  - ✓ PPE procurement specifications, in consultation with the PPE and RPD committee

Respiratory hazards and exposure assessment

- Main responsibilities of the RPD Program Manager:
  - ✓ Health risk assessment
  - ✓ Exposure assessment (concentration levels)
  - ✓ Selection
  - ✓ Record keeping
  - ✓ Evaluation of the program
  - ✓ Program auditing (external)
- Mode of transmission: ingestion, skin contact, and inhalation
- Inhalation is the major route of exposure

Classification of respiratory hazards are:

- Oxygen deficiency
- Gas and vapor contaminants (Immediate or no immediate danger to life or health)
- Particulate contaminants (Aerosols): (Immediate or no immediate danger to life or health)
- Combination of gas, vapors, and particulate contaminants (Immediate or no immediate danger to life or health)

Standard operating procedures

- RPD SoP should include
  - ✓ when and where RPDs should be used,
  - ✓ procedure on procurement of RPDs,
  - ✓ medical disqualification or fitness,
  - ✓ *facial hair policy,*
  - ✓ *fit testing,*
  - ✓ maintenance, etc.
- NB! The SoP policy process requires contribution from GHR, legal, medical, safety, occupational hygiene, and management.

Control of respiratory hazards

- Any hazard control should start with elimination, substitution, engineering, administration controls, if not practicable then RPDs should be made available.
- Occupational Hygienist should assist the team in the selection of the best control measure
- Care must be taken not to substitute the hazard of concern with a different hazard
- Skills to test products if they are specified in the SDS

Control of respiratory hazards

- E.g. 10 years ago when the NPES was launched in RSA
  - ✓ The traction enhancement system for locomotives used silica sand
  - ✓ One of the major railway companies took a bold step to substitute silica sand with ballast-rite
  - ✓ The hygienist advised the procurement on the specifications
  - ✓ Supplier provided a SDS which stated that the material did not contain silica, Chromium (VI), etc.
  - ✓ Suppliers were not requested to supply proof of such claim from an accredited laboratory
  - ✓ 10 years down the line the hygienist decided to take sample for analysis, what a shock!

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Medical evaluation for respiratory fitness purposes

- Development of occupational health risk exposure profile (OHREP)
- Classification of health and safety critical jobs in an organisation
- Determination of demarcation zones

Proper selection of RPDs

- Nature of hazardous operations or process
- The type of respiratory hazards (physical, chemical, and warning properties)
- Physical characteristics of the work environment
- Work time or season which respirator must be provided (hot/cold)
- Physical demands of the work activities

Proper selection of RPDs

- Limitations of the different types of respirators
  - ✓ Certain gases can enter the body through other routes of exposure other than by inhalation
  - ✓ E.g. Ammonia: in concentration ≥3% can cause skin burns especially on moist skin. Suitable gloves should be worn in addition to RPDs
  - ✓ Hydrocyanic acid at room temperature can penetrate the skin, cause systemic poisoning, although this happens at a higher concentration than that of inhalation
- Three classes of respirators: air purifying, air supplied, and self-contained breathing apparatus (SCBA)

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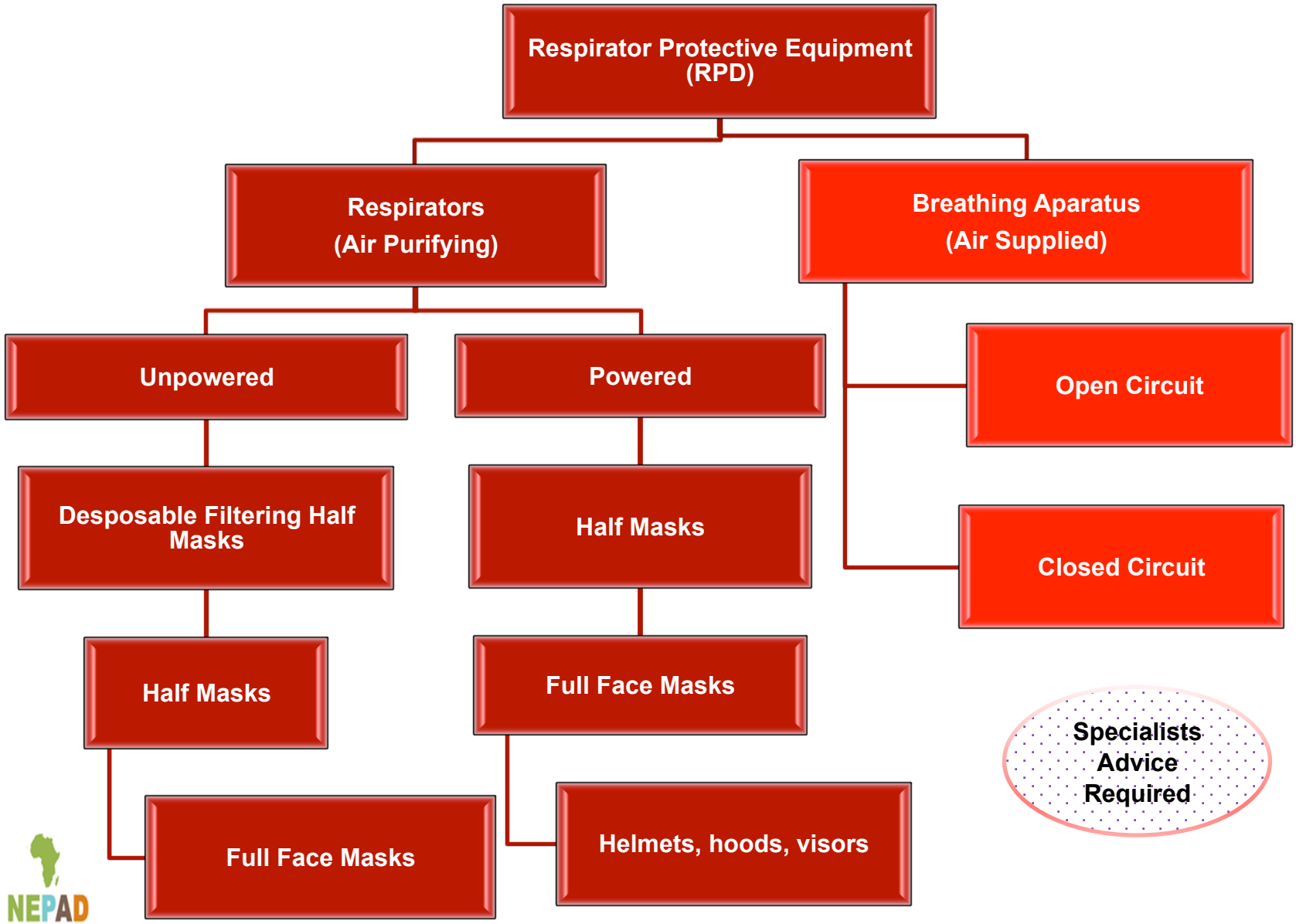
Schematic representation of the RPDs



Education and training

Respirator fit testing

- Protection factor- a measure of the overall effectiveness of a respirator
- Assigned Protection Factor (APF) is the expected occupational level of respirator protection provided by a properly functioning selected respirator or class of respirators to workers who are properly fitted and trained
- NB! The APF must be greater than the occupational exposure concentration (C_{air}) divided by the occupational exposure limit (OEL).
- ***APF≥ C_{air}/OEL***

Respirator fit testing (2)

- Similar concept is Maximum Use Concentration (MUC) is a maximum occupational exposure concentration where a worker is expected to be adequately protected when using a selected respirator or class of respirators.
  - ✓ NOTE! MUC is the upper limit from which a class of a respirator is expected to offer protection
  - ✓ If the exposure level approaches the MUC, the next higher level class of respirator should be selected
  - ✓ Obtained by multiplying the APF by the OEL
  - ✓ ***MUC=APF x OEL***
  - ✓ NB! Employers must not apply MUCs to conditions that are IDLH; instead, they must use respirators listed for IDLH

Almost same principles for HPDs

- Health Risk Assessment
- Exposure assessment
  - ✓Noise Demarcation Zones (SANS 10108:2017)
  - ✓Occupational Health Risk Exposure Profile (OHREP)
  - ✓Hearing Conservation Programme (HCP)
- Control measures: Selection of HPDs

HPD Attenuation Rating

- International best practices requires that hearing protectors be labeled with their *Noise Reduction Rating* (NRR) - (EPA)
- Lab fit testing of HPD, literature has shown that it is almost impossible to achieve NRR at a workplace (OSHA)
- **OSHA strongly recommended a 50% correction factor** when estimating field attenuation
- NIOSH Noise Derating recommend:
  - ✓ Earmuffs: 25%
  - ✓ Foam earplugs: 50%, and
  - ✓ Pre-molded earplugs: 70%

Calculations used for decision making:

- Amongst many other calculations, these are for HPD selection criteria

- **Single Protection:**
  - *Estimated Exposure (dBA) = TWA (dBC) - [NRR x 50%], or*
  - *Estimated Exposure (dBA) = TWA (dBA) - [(NRR - 7) x 50%]*

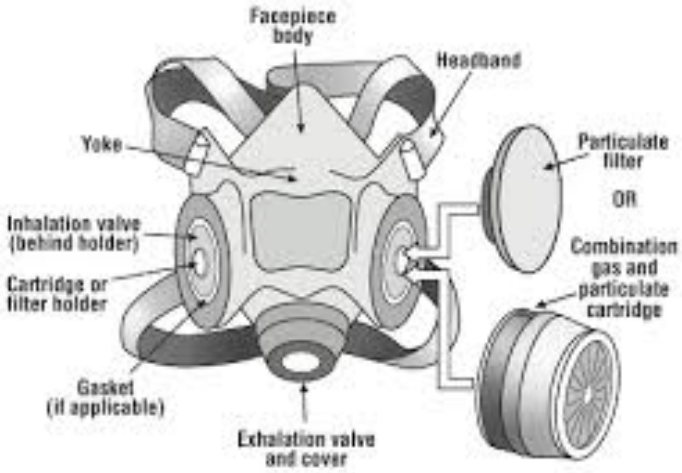
TWA = 95 dB	**NRR = 30 (11.5)**	**EE (dBA) =83.5**

- **Dual Protection:**
  - *Estimated Exposure (dBA) = TWA (dBC) - [(NRRh x 50%) + 5], or*
  - *Estimated Exposure (dBA) = TWA (dBA) - {[(NRRh - 7) x 50%] + 5}*

TWA = 109 dB	***Earplug: NRR = 29 (16)*** **Earmuff: NRR = 25 (+5)**	**EE (dBA) = 93**

Cleaning, inspection, maintenance, repair, and storage

- Designated person
- Qualification of the designated person
- Cleaning and inspection procedures
- Frequency of cleaning, inspection and maintenance
- Instruction on how to order and obtain correct parts or filters



The basic parts of a typical half-facepiece respirator are shown.
Two common options are illustrated on the right.
Both sides of the respirator would take the same type of filter or cartridge.

Conclusion

- Occupational hygiene: anticipation, recognition, evaluation and control
- Certified members are internationally recognised
- Selection of hazard control requires a team (Tripartitism)
- Use of Multi-Criteria Decision Analysis (MCDA)

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