Implats – Impala Rustenburg operations

Engineering Controls Convention: Setting the scene

Nomfundo Nzuza-Moroe, Hearing Conservationist, Wits University

13 June 2025, Emperor's Palace

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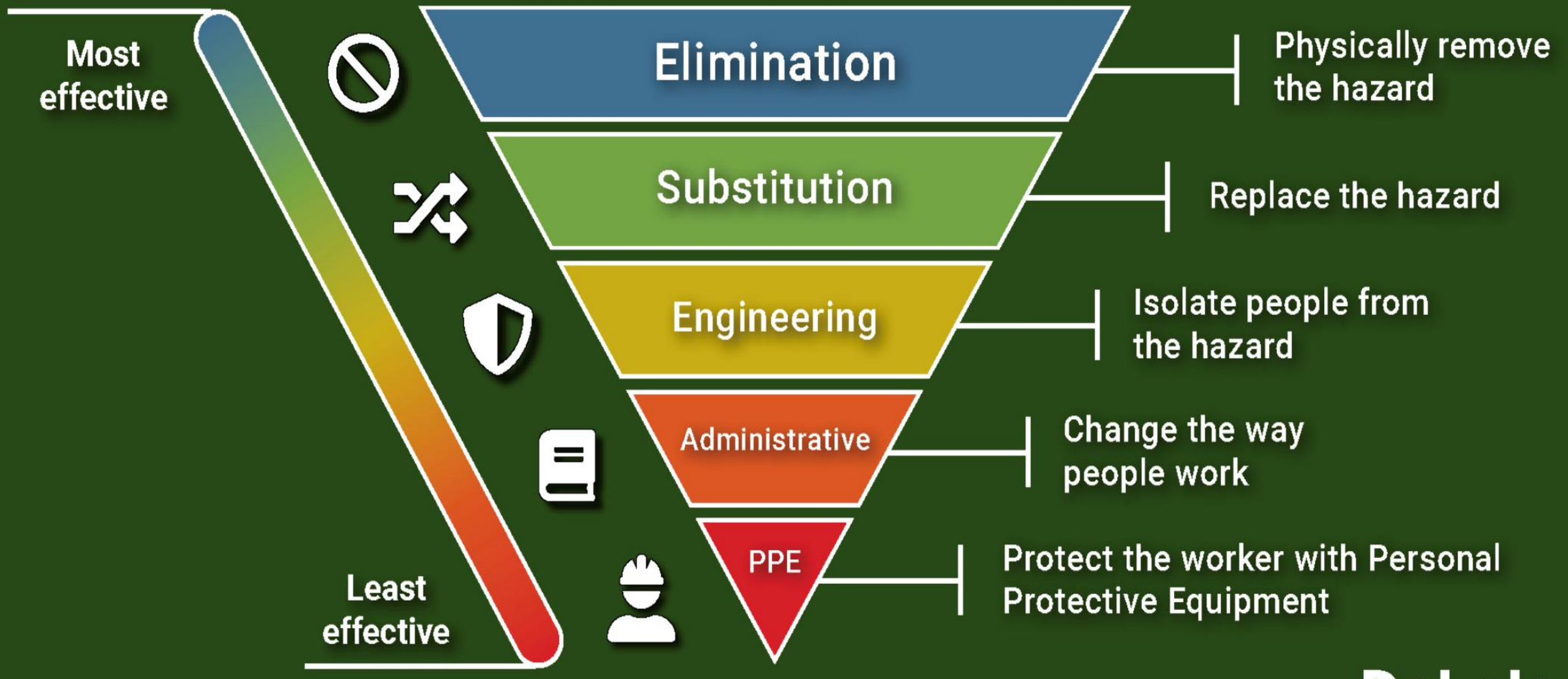
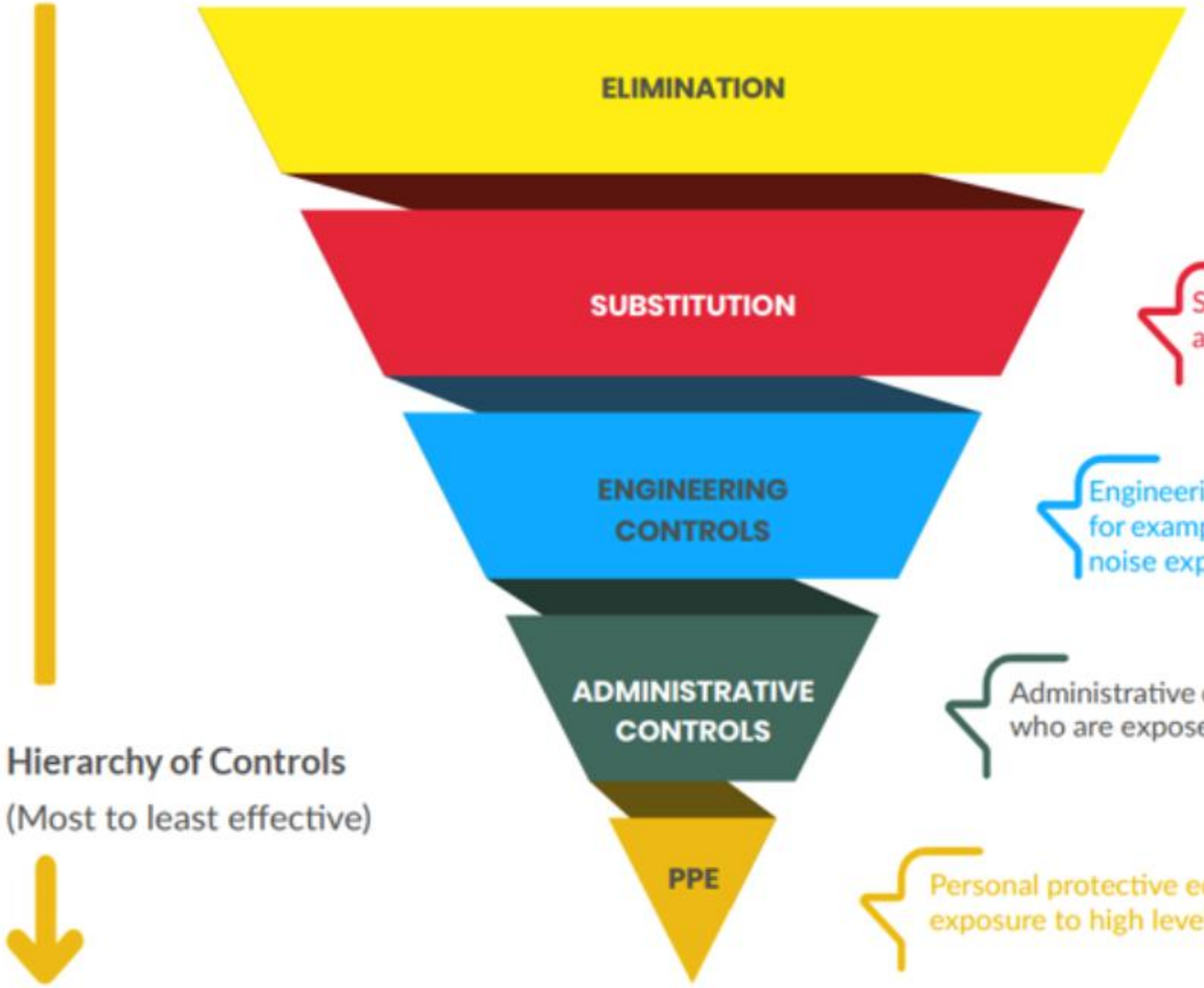
Hierarchy of Controls



Source: NIOSH

Dakota SOFTWARE

Steps to prevent loud noise in the workplace



Elimination is a process that eradicates the noise source it is the most effective way to prevent risks to workers and should always be considered when introducing a new work process, selecting new work equipment and designing the layout of the workstations

Substitution is a process of replacing noisy machinery or equipment with quieter alternatives which would make the job less noisy

Engineering controls are all about making changes to processes, machinery or equipment for example, using barriers, enclosures and absorbent materials help to reduce workers' noise exposure.

Administrative controls are the way work is organised to reduce either the number of workers who are exposed or the length of time they are exposed to noise.

Personal protective equipment protects the users from any adverse effects on hearing caused by exposure to high levels of noise.

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Engineering noise control for mines: Lessons from the world

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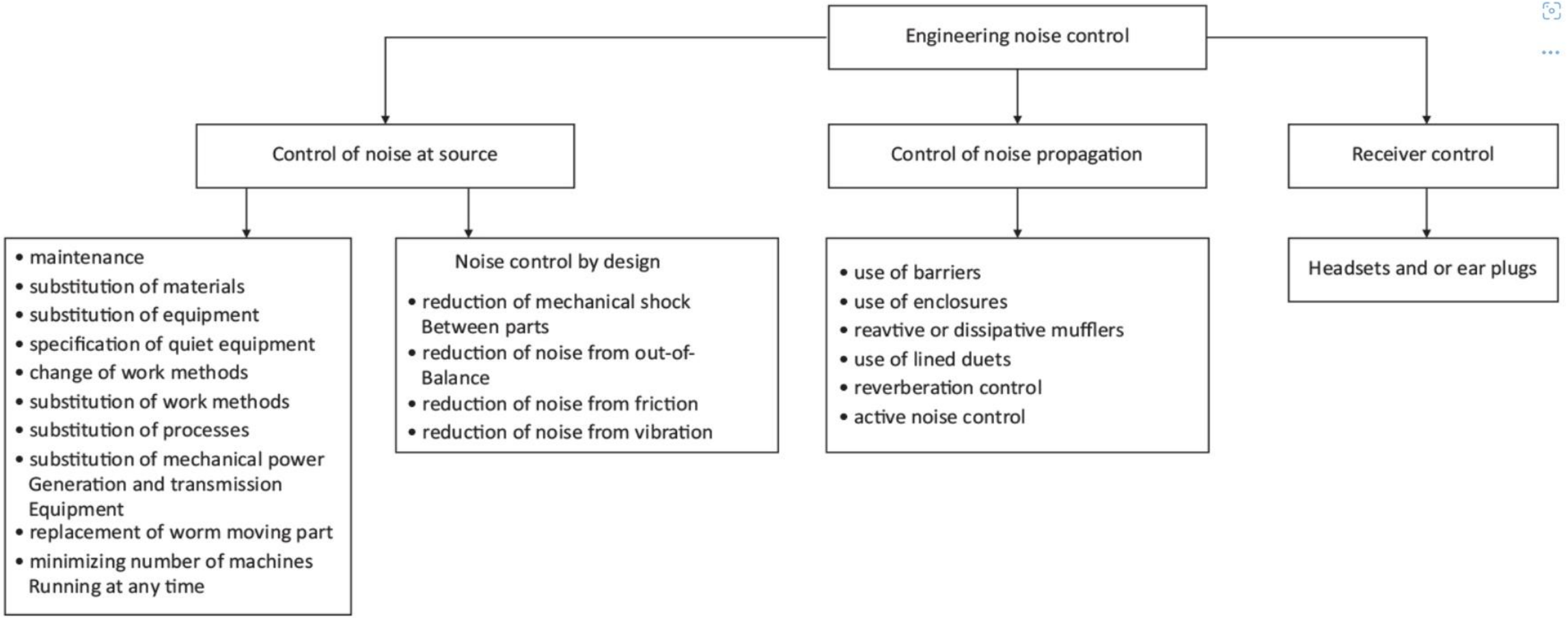
An overview of engineering noise controls.



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Noise Mapping in Mines

- **Nikola et al. (2018)**: Proposed integrating noise control at the **mine design phase**:
  - Use **computer modelling software** for noise mapping.
  - Conduct **baseline characterisation** of the mine area.
  - Estimate machinery noise emissions using **international standards** and **manufacturer data**.
  - Control efforts should **pre-emptively** address potential noise issues.

Lessons from the World

- **Peterson (2018)**:
  - Emphasised **physical workplace changes**:
    - Redesign equipment.
    - Build barriers to shield workers from noise.
- **Manwar et al. (2016)**:
  - Used **European mine data** to predict total mine noise output.
  - Recommends **acoustic barriers** near noisy machinery like crushers.

Control of Noise at Source & Propagation

- **Reeves et al. (2009)**:
  - Suggested:
    - **Sound barriers** and **environmental cabs** for high frequencies.
    - **Plugging panel gaps** to create airtight seals.
    - Use of **absorptive materials** in enclosures.
- **Spencer & Reeves (2010)**:
  - At a talc plant:
    - Sound curtains around fans/crushers reduced noise from **93–104 dBA to 90–94 dBA**.
    - Mill treated with **sound barrier ductwork**.

Control of Noise at Source by Design

- **Peterson, Miller & Yantek (2014, 2018)**:
  - Used **Source Path Contribution (SPC)** for identifying noise sources.
  - Retrofitted noise control on **LHDs and haul trucks**.
  - Achieved **2–9 dB noise reduction**.
- **Saleh, Woskie & Bello (2016)**:
  - Acoustic curtains on fans/crushers reduced noise from **93–104 dB to 88–94 dB**.
- **Camargo et al. (2016)**:
  - Modified **long wall shearer cutting drums** to increase stiffness.
  - Achieved **3 dB noise reduction**.

Unbalanced Machines

Acoustic Curtains