OCCUPATIONAL HYGIENE : SIGHTS & SEENS

JJ VAN STADEN

10 November 2016
**Operations**: larger mining and concentrating complexes, refining and smelting sites

- **Unki Complex** (Mr Walter Nemasasi)
  - Unki mine
  - Unki concentrator
  - Support/Service (group)

- **Amandelbult Complex** (Mr William Taylor)
  - Tumela mine
  - Dishaba mine
  - Amandelbult concentrator
  - Support/Services

- **Mogalakwena Complex** (Mr Richard Cox)
  - Mogalakwena mine
  - Mogalakwena concentrators (North and South)
  - Support/Services

- **Rustenburg Processing**
  - All Smelters (Mr Bayanda Mncwango)
  - RBMR (Mr Mark Gilmore)
  - PMR (Mr Fortune Mashimbye)
  - Support/Services

- **Johannesburg – Corporate**
  including some support functions – potential ‘satellite’ with co-located support staff/service

- **Twickenham Project**
  - Mototolo concentrator*

- **Der Brochen Project**

# Rustenburg and Union mine excluded from scope
* Location offers some support synergies
## Zero Harm ZHIA

<table>
<thead>
<tr>
<th><strong>Safety</strong></th>
<th><strong>Occ. Health, Hygiene, Wellness</strong></th>
<th><strong>Environment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Platinum Way, OHSAS 18001, ASW</td>
<td>- IRM.Net <em>(incl. Qmed)</em> - Enablon</td>
<td>- IsoMetrix/IRM.Net - Enablon</td>
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<tr>
<td>- FOGM</td>
<td>- Platinum Way – OHSAS 18001 / AHW</td>
<td>- Platinum Way – ISO 14001/Anglo Env Way</td>
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<tr>
<td>- SPOTM</td>
<td>- Compliance with legal &amp; GTS requirements</td>
<td>- Compliance with legal &amp; other requirements</td>
</tr>
<tr>
<td>- PSM</td>
<td>- Integrated Disease Mng / SAP lockout</td>
<td>- Closure and rehabilitation</td>
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<tr>
<td>- Compliance with Legal &amp; GTS requirements</td>
<td>- Public Health</td>
<td>- Land Management plan</td>
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<tr>
<td>- ORMP</td>
<td>- ORMP</td>
<td>- ORMP</td>
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<td>- LFI</td>
<td>- LFI</td>
<td>- LFI</td>
</tr>
<tr>
<td>- SPPI</td>
<td>- Induction &amp; training integration</td>
<td>- Environmental awareness</td>
</tr>
<tr>
<td>- Mission directed work teams</td>
<td>- Wellness coordinators</td>
<td>- Induction &amp; training integration</td>
</tr>
<tr>
<td>- ABC of Mining &amp; Engineering</td>
<td>- Incentives/Adherence</td>
<td>- People Development</td>
</tr>
<tr>
<td>- Quality Supervision</td>
<td>- VFL</td>
<td>- Effective Communication</td>
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<tr>
<td>- VFL</td>
<td></td>
<td>- VFL</td>
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<tr>
<td>- ELEI</td>
<td>- RFAC – Job Specification</td>
<td>- Water</td>
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<tr>
<td>- Collision Avoidance</td>
<td>- Noise exposure reduction</td>
<td>- Energy and green house gases</td>
</tr>
<tr>
<td>- Winch Signaling</td>
<td>- Radio-aided rapid response</td>
<td>- Waste</td>
</tr>
<tr>
<td>- Safety critical equip maintenance</td>
<td>- TB screening/diagnosis</td>
<td>- Air quality</td>
</tr>
<tr>
<td>- Stakeholder alignment</td>
<td>- Health Awareness</td>
<td>- Effective Inspections</td>
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<tr>
<td>- Noise plans</td>
<td>- Risk based medicals</td>
<td>- Monitoring</td>
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<tr>
<td>- Health status review</td>
<td>- Training</td>
<td></td>
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<tr>
<td>- Rehabilitation &amp; Incapacity</td>
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</tbody>
</table>

**Systems & Reporting** - Enablon roll-out, standardised reporting system, S and SD reporting, SHE document control, availability of SHE documents, leading indicators reports, analytical tool, predictive analysis, people development, effective communication

**SHE Risk & Assurance** – Legal Compliance Assessments, Risk Theme Audits, close-out verification, SHE R&A Manuals/ Standards/ Templates, Major Hazard Assessments; SHE Group Actions; RCM Verification; ORM; LFI

**SHE Projects** - Values, ZHIA, VFL tool, GDI Project, predictive analysis tool, SHE integration (recruitment, induction, training, communication, reward), Journey Model, SHE improvement plan, fatigue management, SHE rep training to include peer education

**Projects (FEL)** - Implementation of the S, H and E strategy as indicated above
**Systems**

- Enablon
- OM-ORM
- Anglo SHE way
- LFI
- Compliance Analysis
- Integrated Health Management
- Product Stewardship
- Health care model & WBHS

1. Review ISO requirements
2. Embed and align the Enablon tool with new SHE way
3. **Configuration & rollout of hygiene ENABLON Module**
4. Review of Integrated Health Management Systems
5. Capacity building & rollout of OM-ORM
6. Further refine Bowties & critical controls
7. **Improve incident classification & management**
8. Effective verification and reporting of legal commitments
9. **REACH Dossier registration & IPA (STF) participation**
10. Implement new health care model & WBHS

**Behaviour/People**

- Zero Harm mind-set
- Leadership & Accountabilities
- Compliance Culture
- Targeted VFL

9. Wellness education - SHE representatives (Wellness Ambassadors)
10. **NIHL: behavioural assessment & training**
11. Health related “talk topics”
12. Show Visible Felt Leadership at all times

**Engineering solutions**

- HPI & HPH Reporting
- Incident Investigations
- Engineering Controls
- Real-time monitoring & iHealth

13. Finalise new classification for health related HPI & HPH
14. Review classification & evaluation of health incidents
15. **Optimisation of integration ventilation systems**
16. Finalise Rock Drill Attenuation & critical control monitoring
17. DPM improvement plans and R&D at mechanised operations
18. **Implement real-time dashboard (iHealth)**

**Wellness in the workplace**

- Proactive prevention programme
- HIV & TB treatment & prevention
- Health Risk Management
- Social Determinants of Health
- Public (Environmental Health)
- Community Health

17. Profile risk populations
18. INH prophylaxis
19. Evaluate social determinants of health
20. Contribute to Social Performance initiatives
21. Monitor food and potable water safety
22. Public health facility compliance
2003 2005 2006 2007 2008 2009 20010 20013 2015

MHSC Summit

Milestones

Employer Summit
CEO commitment

OH5 Noise Committee – Quarterly meetings

Focus Groups:
1. Noise Tracker
2. Rock Drill mufflers
3. HPD Demarcation/ Noise Monitoring

May Day Campaign

Lets Talk Articles / Comic Strips

Noise robot per strategy
2nd generation drills

Roll out of customised HPDs

Way Forward

R&D<100dB
PLATINUM

PLH SHIFT >10% (2009-2015)

NIHL COMPENSATION RAND MUTUAL

- 2009: R2 933 904.00
- 2010: R2 857 896.00
- 2011: R5 137 200.00
- 2012: R8 531 185.00
- 2013: R5 754 367.00
- 2014: R4 712 703.41
HPDs
Attenuation
Mandatory COP
Baseline Risk Assessment
Monitoring programme
Investigations
Hearing Coach
Cap Lamp dosimeter
Early warning
Noise Registers
Rock drill shop Testing
Buy Quite Policy
Demarcation
Mandatory COP
Baseline Risk Assessment
Medical Surveillance
HCP
Present programme in place – Noise strategy
HPDs
Attenuation
Hearing Coach
Early warning Cap Lamp dosimeter
Reporting
MOSH Adoption
Buy Quite Policy
Demarcation
Mandatory COP
Baseline Risk Assessment
Medical Surveillance
Present programme in place – Noise strategy
What are we dealing with?

**Penetration Rate**

Ideal penetration rates is 3min 30s or lower for drilling 1.2m holes. (1.5m drill steel)

**Noise (dBA)**
Over attenuation = High Risk
Current HCP (Hearing Conservation Programme)

Pros

- Counselling with all PLH shifts >5% investigated and submitted to DMR
- Employees >95dB(A) issued with customised HPDs – 94% completed
- Roll out of 2nd generation rock drill (87% completed), noise level reduction from 108dB to 103dB ~ 5kPa
- Training and awareness
- Noise register of all Noise sources
- Buy quite policy (outdated)
- Audiometry - Subjective

Cons

- Based on lagging indicator, requires more early detection
- Psychological behaviour to be assessed
- Critical control monitoring lacking “tagging out”
- Outdated to be revised
- Tagging of HPDs and early warning on control failures
- Mosh adoption?
- No Early detection of hearing loss
Early Detection – Hearing Coach

- The OAE is a technique used to evaluate the inner ear, specifically the outer hair cells
- Objective technique (no malingering possible)
- Visualizes hearing damage in early stage, well before visible on the audiogram
- Monitor use of HPDs
- Monitor individual and group risk profile according to OAE results
- Trend results according to age and shaft
- Questionnaire responses (case history)
- Operational stats
- Operations will be from the medical centre where all employees will visit the HearingCoach office with their annual medical visit
- HC Audiologist to oversee the program
- The basis of our program is to change employees behaviour during and after working hours
- Employees will be identified as follow:
  - Screening: All employees with exposure between 82dB(A) and 95dB(A);
  - Full HC: Employees with NIHL PLH shift of 5% and higher, and employees in risk occupations with exposure above 95dB(A)
Noise Monitoring – Early Detection?

- Conventional noise dosimetry – lagging in nature
- Downloading of noise results used mainly for regulatory reporting without any meaningful analyses,
- Noise results predictable
- Noise readings not taken on the working face.
- Early warning of control failure
Noise Monitoring – Early Detection?

Objective:
Giving risk individuals an early warning of control failure of rock drills

Practical method:

• Noise measurement integrated as part of cap lamp – true noise reading of actual exposure
• Reduces administration of issuing and collection
• Automatically downloads
  • Results obtained immediately
  • Customised reports
  • Action on exception reports
Proposed flow of revised HCP

- Employees with hair cell damages (OAE results)
- Audiometry as part of annual medical surveillance
- Employees with NIHL PLH shift ≥ 5%
- Employees in risk occupations (exposure ≥ 95 dB(A))
- All other employees (exposure ≥ 82 < 95 dB(A))

Employees with PLH > 7%

Audiometry

Hearing Coach programme

6 Point Plan

Investigation & briefing Section 11

2nd Generation Rock Drill issued

Tagging out rock drills >107dB at the rock drill shop. MHSC Milestone

Issued with customised HPD

Fit for purpose HPDs to other employees

Evaluation of compulsory noise zones

Revised noise register with OEM engagement

Tagging of HPDs Access control

Training awareness & psychologic behaviour

Early warning UG of failed control

Revision of noise register with OEM engagement

Tagging out rock drills >107dB

Proposed flow of revised HCP
Noise Strategy - 6 Point tracker

- Customised HPD Fit for Purpose Tagging of HPDs
- 2nd Generation rock drill Noise evaluation – test bench
- Investigation of Noise shift with OEM involvement
- OAE risk stabilisation over period
- Control effectiveness monitoring
- Training awareness and psychological behaviour assessment
## NOISE STRATEGY – 6 POINT PLAN

<table>
<thead>
<tr>
<th>KPI</th>
<th>Bathopele Mine</th>
<th>School of Mines</th>
<th>Siphumelele Mine</th>
<th>Thembelani Mine</th>
<th>Khuseleka Mine</th>
<th>Khomanani Mine</th>
<th>Union North Mine</th>
<th>Union South Mine</th>
<th>Tumela Mine</th>
<th>Dishaba Mine</th>
<th>Unki Mine</th>
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</thead>
<tbody>
<tr>
<td>2nd Generation Rock Drill Replacement</td>
<td>🎉</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🙁</td>
<td>🎉</td>
</tr>
<tr>
<td>Customised Hearing Protection &gt;95dB-8Hr.</td>
<td>🙁</td>
<td>🙁</td>
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<tr>
<td>Noise ICU Early Warning 7.5% PLH</td>
<td>🙁</td>
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<td>🙁</td>
<td>🙁</td>
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<td>🙁</td>
</tr>
<tr>
<td>Rock drill failure tracking 105dB</td>
<td>🎉</td>
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<td>🎉</td>
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<tr>
<td>Behaviour Assessments risk occupations</td>
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<tr>
<td>Fit for purpose HPD roll out</td>
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- **0%-50%**
- **51%-90%**
- **91%-100%**

### Notes
- 2nd Generation Customised HPDs
- Early Warning Noise ICU
- Noise Robot
- MOSH HPD tool & training
Recommendations to the IPA for a voluntary workplace target level – science considerations

- Current OEL – in most jurisdictions: 2000 ng/m³
  - Proposal SCOEL (2011): 5 ng/m³ put on hold after STF contribution

- Heederick et al. confirms previous knowledge (WHO etc.) that 2000 ng/m³ not health protective: sensitization cases observed below that level.

- Risk based approach: risk modelling based upon the ‘Dutch Health Council’:
  - 1% excess risk in workplace (of generating Pt salt sensitization) compared to overall risk.
    - Question: is sensitization to Pt salts a relevant end point for the ‘public in general’?
  - Would lead to a workplace exposure level below 100 ng/m³ (around 40-60 ng/m³)
    - Is it likely that this number will be further ‘refined’ following our 2nd phase epidemiological study?
    - Does a more ‘refined’ number has any relevance when it comes to workplace exposure management?

- Health based approach? Can we define a threshold?
## CHLOROPLATINATE RISK

<table>
<thead>
<tr>
<th>PGM</th>
<th>Endpoint</th>
<th>Interest level</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt series</td>
<td>Resp. sens (PSS)</td>
<td>Definite</td>
<td>Well known effect. Interest will be in the specifics of chloroPt dossiers / how risk is seen to be controlled. Also which Pt substances flagged as Sens(r).</td>
</tr>
<tr>
<td></td>
<td>Genotoxicity</td>
<td>Very likely</td>
<td>Not well reported to date / previously cryptic to externals. Consistent positive in vitro results for certain Pt(II) and Pt(IV) substances. But no classification pending in vivo TP. Could accentuate SVHC designation [if considered alongside Sens(r)]</td>
</tr>
<tr>
<td>Rh series</td>
<td>Genotoxicity</td>
<td>Likely</td>
<td>Appears to be class property of simple Rh3+ salts. Publications on this endpoint limited to date.</td>
</tr>
</tbody>
</table>
Chloroplatinate voluntary target – Control Considerations

**BAY 2 SOLUBLE PLATINUM EXPOSURE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Soluble Platinum (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0.0010</td>
</tr>
<tr>
<td>2007</td>
<td>0.0009</td>
</tr>
<tr>
<td>2008</td>
<td>0.0015</td>
</tr>
<tr>
<td>2009</td>
<td>0.0012</td>
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<tr>
<td>2010</td>
<td>0.0008</td>
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<tr>
<td>2011</td>
<td>0.0010</td>
</tr>
<tr>
<td>2012</td>
<td>0.0006</td>
</tr>
<tr>
<td>2013</td>
<td>0.0003</td>
</tr>
<tr>
<td>2014</td>
<td>0.0000</td>
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</tbody>
</table>

Legend:
- **Green** Average
- **Blue** Year
- **Purple** OEL (0.002mg/m³)
- **Red** OEL (0.0001mg/m³)
Priority Unwanted Event (PUE): The release of soluble platinum & rhodium (known respiratory sensitizers) into working areas located in Bay 1 to Bay 5 at PMR

Key Critical Control: The integrated ventilation system that generates air changes for the dilution of airborne pollutants (incl. soluble platinum & rhodium).

A ventilation system operates in line with specific design parameters consistent with the physical & chemical characteristics of the relevant pollutant. These parameters include – pressure (kPa), velocity (m/s) & volume (m$^3$/s). Parameter measurements are used to determine fan power/efficiency, resistance build-up and leakages

Results of the initial assessment are as follows:

- Current system is performing under positive pressure
- The airflow distribution is not uniform & hotspots were identified
- Fan power distribution was not running optimally (below design fan curve)
- Air leakage of 100 m$^3$/s was detected

Next Steps:

- The ducting integrity will be investigated for leakage points
- The fan impellers will be inspected for pressure loss

Evaluation of the effectiveness of the ventilation system

- Obtained design drawing of ventilation systems
- Measured the actual ventilation parameters
- Simulated actual parameters against design performance specifications
- Measured ambient aerosol concentrations - in order to predict dilution ratios
OCCUPATIONAL HYGIENE REQUIREMENTS

HOW DO WE ACHIEVE IMPROVED COMPLAINECE TO THE MHSA SECTION 12

The key instrument used to manage occupational health and wellness is continual monitoring verifying control effectiveness. A BEST IN CLASS real time monitoring, SHE, legal management framework is required to deliver a step change in occupational hygiene at PMR.
Objective: To provide the operations’ management team & employees with real-time reporting of the performance of critical controls & the ambient concentration of airborne pollutants. To this end, data from a number of real-time monitoring devices located around the plant is collated & analysed to produce accurate information for decision making.

Key components of the monitoring
• For employees: Early warning devices (red/green) in specific work areas
• For supervisors: The system is linked to the SCADA Control System
• For Management: An iHealth Dashboard is available

Incident (HPI) triggers:
- Withdrawal from work area
- Investigation
- Intervention

VISUALISATION OF REAL TIME STATIONS FOR MONITORING SO₂

PMR – Bay 5 - aerosol monitor & velocity sensor installed to monitor dust concentrations
I-HEALTH: CRITICAL CONTROLS

VISUALISATION OF COMPLIANCE TO HEALTH PARAMETERS

- Helicopter view of the operation with status bar indicating operating conditions of critical controls.
- Employees are informed of sub standard conditions from real time monitors at floor level.
- Management also gets notified of real time conditions with action notification.
REAL-TIME MONITORING IMPROVES RESPONSE TIMES

Critical Control Monitoring

Critical Control Monitoring Analysis

<table>
<thead>
<tr>
<th>Tag Name</th>
<th>Description</th>
<th>Status</th>
<th>Value</th>
<th>TimeStamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Speed</td>
<td>Wind Speed</td>
<td>Good</td>
<td>25.5</td>
<td>12/30/2023 12:00 AM</td>
</tr>
</tbody>
</table>

Historical Trend Anemometer Instrument, Direction

Historical Trend Anemometer Instrument, Speed

CONTINUOUS DUST MONITOR
I-HEALTH : X RAY

VISUALISATION OF COMPLIANCE TO HEALTH PARAMETERS

Body Scanners

100.0% Compliance 0% Over-Exposure

Average Transaction Dosage per Scanner (YTD)

<table>
<thead>
<tr>
<th>Scanner</th>
<th>Avg Dose</th>
<th>Total Scans</th>
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<tbody>
<tr>
<td>1</td>
<td>0.833 mSv</td>
<td>10,499</td>
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<tr>
<td>2</td>
<td>0.669 mSv</td>
<td>3,465</td>
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<tr>
<td>3</td>
<td>0.885 mSv</td>
<td>12,048</td>
</tr>
<tr>
<td>4</td>
<td>0.004 mSv</td>
<td>24,419</td>
</tr>
<tr>
<td>5</td>
<td>1.266 mSv</td>
<td>8,463</td>
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</table>

Statistics (YTD)

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
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<tbody>
<tr>
<td>Total Scans (Everyone)</td>
<td>74,425</td>
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<tr>
<td>Maximum Scans (Individual)</td>
<td>351</td>
</tr>
<tr>
<td>Average Scans (Everyone)</td>
<td>61</td>
</tr>
<tr>
<td>Maximum Dose (Individual)</td>
<td>434.3 mSv</td>
</tr>
<tr>
<td>Average Dose (Everyone)</td>
<td>57.5 mSv</td>
</tr>
</tbody>
</table>

Cumulative Dosage per User (YTD)

- Informing employees about all health concerns via real time monitoring
- Validation by management to employees of no over-exposures
- Immediate action management assignment on any set safety limit.
- Real time tracking of employees in all areas making identification of risk employees relative easy

Good Day

New event registered by iHealth event monitor.

For detailed information, please visit the iHealth dashboard: http://osheekronapp01/lHealth/

Event ID: 949 63
Event Start: 2016-08-09 09:51:18.653
Event End: ACTIVE
Duration: TagName: 289A067
Description: HCL analyser
Attribute: PV
Template: APCGasAnalyser
Area: 5AL
Level: 2
Upper Limit: 0.5
Lower Limit: -1
Event Initiation Value: 0.508 ppm
I- HEALTH

Critical control data:

- Design & performance parameters
  - a) Capture velocity
  - b) Transport velocity
  - c) Face velocity
  - d) etc.
- Maintenance schedule
- Critical spares
- Availability & downtime
- Daily checks & inspections

Assign accountability:
- Owner of the unwanted event
- Owner of the critical control

Mark Gilmore, General Manager Precious Metals Refinery, explaining the principles of the iHealth platform to Norman Mbazimba, Deputy Chairman of AASA
# Occupational Health Surveillance Requirements - Pre Work

**Occupation Group:**

**Activity area:** Underground and Surface

**Operation:**
- Non-risk (S)
- Underground (U)
- Surface (SR)
- Other

## Functional Requirements

### (Level of priority: 3 = High; 2 = Medium; 1 = Low; 0 = No priority)

<table>
<thead>
<tr>
<th>AREA</th>
<th>UNDERGROUND</th>
<th>PHYSICAL</th>
<th>CHEMICALS</th>
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### Hazard Exposure

**Risk rating:**
- AA = Very High
- A = High
- B = Medium
- C = Low
- D = Tolerable

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<tr>
<th>AREA</th>
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<th>CHEMICALS</th>
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### Ergonomics

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<tr>
<th>Ergonomics</th>
<th>Physical</th>
<th>Chemical</th>
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### Biological

<table>
<thead>
<tr>
<th>Biological</th>
<th>Physical</th>
<th>Chemical</th>
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### Dust

<table>
<thead>
<tr>
<th>Dust</th>
<th>Physical</th>
<th>Chemical</th>
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### Medical Examinations (months)


## Work Position & Conditions

<table>
<thead>
<tr>
<th>Squat/Reaching</th>
<th>Lower Limb Flexibility &amp; Weight Bearing Ability</th>
<th>Drowning Potential of Drowning</th>
<th>Work Above Head</th>
<th>Standing on a Ladder scaffold</th>
<th>Balance &amp; Equilibrium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

## Additional Notes

1. INITIAL 2. PERIODICAL (6 MONTHS) 3. PERIODICAL (12 MONTHS) 4. PERIODICAL (18 MONTHS) 5. (36 MONTHS) 6. JOB CHANGE 7. WORKPLACE CHANGE 8. ACUTE EXPOSURE 9. EXIT

## Important Senses & Other Requirements

<table>
<thead>
<tr>
<th>Hearing</th>
<th>Vision</th>
<th>Colour</th>
<th>Night</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

## Exclusions

- Respiratory impairment
- Pacemaker
- Seizures
- Epilepsy
- Pregnancy
- Pregnant employee
- Steel implants
- Fear of heights
- Spectacles
- Infectious diseas
- Olfactory
- Ability to read
- Olfactory
- Ability to write
- Olfactory

## Approval

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
</table>

---

Need to obtain as much info here pertaining to the contract and personal info or nature of work, some inherent activities will elude to a risk profile carried with the employee.

Contractor to fill in fields prior to engagement, intent is to gather as much info from the employee regarding work to be performed to deduce risk which would derive medical surveillance.

Contractor to fill in fields prior to engagement, surface.

All compulsory when working.

O/H to assist here in obtaining env/occ health parameters especially where the work execution will take place, might need to verify once initiated.

Once all activities are scrutinised one can deduce PP requirements.

Medical surveillance can now be determined from the populated fields especially considering exclusion or special remarks, pertaining to chronic diseases.

These fields will be filled in concurrently with the surface & Underground.

---

[Diagram with annotations]
# DIESEL PARTICULATE MATTER STRATEGY – 8 POINT PLAN

<table>
<thead>
<tr>
<th>KPI</th>
<th>Low Emission Fuel &lt; 50 PPM</th>
<th>Emission based maintenance programme</th>
<th>Education programme Driver &amp; Workforce</th>
<th>Ventilation Strategy</th>
<th>Purchasing Policy – Buy low emission</th>
<th>DPM Sampling Programme</th>
<th>Risk Based medical Surveillance</th>
<th>PPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>🌸</td>
<td>🎆</td>
<td>🎆</td>
<td>🎆</td>
<td>🎆</td>
<td>🌸</td>
<td>🎆</td>
<td>🎆</td>
</tr>
</tbody>
</table>

**PLATINUM**
BOILERMAKER / CONVEYANCE WORKSHOP AND SANDBLASTING

Generic risk: Health hazards entails, Respiratory irritants (Aluminum), Metal Fume Fever (Beryllium, Copper, Manganese), irritation to the respiratory system, chronic effects, kidney damage, emphysema (cadmium oxides), skin irritation, nose, throat and lung damage (Chromium, Molybdenum, Hydrogen fluoride, O3), bronchitis, retinitis (Vanadium), Noise induced hearing loss, exposure to UV rays and RMF (radio magnetic frequency exposure) emanating from transformers.

WHO MIGHT BE EXPOSED AND HOW

<table>
<thead>
<tr>
<th>Exposed employees:</th>
<th>DMR Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation</td>
<td></td>
</tr>
<tr>
<td>Artisan assistant</td>
<td>40205</td>
</tr>
<tr>
<td>Boilermaker plater</td>
<td>40450</td>
</tr>
<tr>
<td>Engineering aide</td>
<td>40205</td>
</tr>
<tr>
<td>Foreman</td>
<td>40445</td>
</tr>
<tr>
<td>Boilermaker plater</td>
<td>40508</td>
</tr>
<tr>
<td>Rigger</td>
<td></td>
</tr>
</tbody>
</table>

Total: 30 employees

Activity Area:
Surface Workshop:

Process:
Boilermakers manufacture and build structures of steel plate and piping.

Main Health Hazards
Association:
Noise induced hearing loss

Health effects of Welding Fume:
Pneumoconiosis, metal-fume fever, Nausea, Shortness of breath, Muscle pain

Route of entry:
Skin absorption Inhilation

EVALUATION OF CONTROL MEASURES RECOMMENDED

Engineering controls:
Welding fume spreads over the breathing zone due to improper extraction.

At source extraction required, lengthening flexible ducting with remote extraction recommended.

Administrative controls:
Employees must be properly inducted on the risk of exposure to high noise sources.

PPE Controls:
No noise source demarcation on machines

Noise >105 dB measured requires customised hearing protection as ear muffs will not fit under hood

ESTIMATE LEVEL OF EXPOSURE AND OBSERVATIONS

The sandblasting area should be barricaded to reduce environmental noise (measured at 94-97dB). It is also advisable to issue a proper sandblasting hood, with positively induces hood reducing any dust emissions.

Exposure comments:
The Occupational Hygiene Programme is monitoring the following:

<table>
<thead>
<tr>
<th>Estimate level of exposure and confirmed</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hazard</th>
<th>OEL</th>
<th>Risk Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical stresses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>85 dB(A)</td>
<td>A / High</td>
</tr>
<tr>
<td>Electro Magnetic</td>
<td>N/A</td>
<td>C / Low</td>
</tr>
<tr>
<td>Illumination</td>
<td>various</td>
<td>B / Significant</td>
</tr>
<tr>
<td>Thermal stress</td>
<td>WBGT 30</td>
<td>C / Low</td>
</tr>
<tr>
<td>Hand-arm Vibration</td>
<td>1.5 m/s²</td>
<td>C / Low</td>
</tr>
<tr>
<td>Chemical stresses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welding fume</td>
<td>5.0 mg/m³</td>
<td>A / High</td>
</tr>
<tr>
<td>Welding gasses(CO)</td>
<td>100ppm</td>
<td>B / Significant</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>1.0 mg/m³</td>
<td>B / Significant</td>
</tr>
<tr>
<td>Iron Oxide oxide (Fe2O3)</td>
<td>5.0 mg/m³</td>
<td>B / Significant</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>30PPM</td>
<td>C/Low</td>
</tr>
<tr>
<td>Nuisance dust</td>
<td>3.0 mg/m³</td>
<td>C/Low</td>
</tr>
<tr>
<td>Sodium Bicarbonate</td>
<td>3.0 mg/m³</td>
<td>C/Low</td>
</tr>
</tbody>
</table>

*mg/m³: milligrams per cubic meter; OEL: occupational exposure limits; °C: degree celsius; dB(A): decibels (A - weighted); N/A: not applicable; CO: Carbon Monoxide

Please refer to point no. 3 Findings in the main report.
Fatigue Management
Risk Assessment

**STEP 1**
- Electrical Maintenance
- Mechanical Maintenance
- Vehicle Servicing
- Clash & Process Coal
- Building Maintenance
- Overburden Removal
- Coal Hauling
- Drilling & Blasting
- Rehabilitation

Ensure that you have the Activity Worksheets for your Operation sorted before starting the process.

**STEP 2**
The questionnaire should be printed and a copy given to each employee working in a given activity area.

**STEP 3**
The collected data from all individual employees must be grouped into statistical categories. Transfer the obtained data from the questionnaires onto the relevant statistical category worksheet in the tool.

**STEP 4**
The Safety Officer together with Line Management will identify the Workload and Attention levels for each predetermined activity.

**STEP 5**
The VOHE Officer will determine the risk ranking of the working environment (Noise, Airborne Pollutants, Vibration and Temperature) for each activity. Ranking will be based on the Occupational Hygiene Risk Assessment.

**STEP 6**
First the defaults values should be entered. Select the relevant values from the input sheet based on the values obtained from the questionnaire statistical categories.

**STEP 7**
The Identified hazards must be listed on the Risk Ranking table. Each hazard will be listed as well as its ranking in the adjacent column. The average risk rank for the activity will be linked to the Anglo American 5x5 Matrix.

**STEP 8**
The controls that exist and currently instituted to mitigate the identified hazard must be logged in the sheet according to the nature of the category in which they fall.

**STEP 9**

**STEP 10**
The additional controls need to be identified, the list of possible controls as listed in the possible control work—sheet can be consulted. Once identified, they can be logged and actioned to be implemented and the responsible person must be identified and sign for action.
CONCLUSION

• Challenge the norm - beyond legal compliance
• Motivate for OH recognition – vs Safety. Env
• Influence from the insight – SHE Managers
• OH Significance HPI/HPH – Incident investigation and communication
• Fight for the SHE Space (start with ORM)
• Value add beyond legal compliance (PPE, Availabilities, Controlled status)
• Continue to focus on critical control management – *i.e. cap lamp dosimetry & optimisation of rock drill attenuation, real-time monitoring & timeous reporting of control failures*