

Health and Safety Executive - HM Mines Inspectorate

Major Hazard Topic Inspection Guide

SHAFTS AND WINDING

1. Purpose

This document sets out how inspectors will assess operators' compliance with the relevant statutory provisions in respect of shafts and winding.

Shafts and winding operations present major hazard risks and previous incidents include:

- Markham - 18 killed in 1973 when the cage overwound due to failure of a single line brake component causing the cage to crash into the pit bottom
- Clipstone - the shaft lining failed in 1993 allowing a torrent of water to enter the shaft, flooding the sump and compromising the shaft integrity
- Vaal Reefs (South Africa) - 104 killed in 1995 when an underground locomotive crashed through the shaft side gates and fell onto the cage, causing the detaching hook to open and the cage to free fall 460m to the pit bottom
- Maltby - 18 injured in 2006 when a cage struck a tilting platform at speed and came to rest about 50m below the inset
- Boulby - the suspension frame on a skip failed in 2011 causing serious damage to several hundred metres of buntons eventually coming to rest near the surface.

These and other incidents had serious safety consequences but also had a major impact on the businesses through damage to expensive plant, loss in production and financial loss.

2. Scope

The inspection will focus on the key hazards of shafts and winding and the associated safety management systems for managing the risks. The format of the inspection will follow the Plan, Do, Check, Act structure defined in HSE publication HS(G) 65 - Managing for health and safety and summarised in HSE leaflet INDG 275 - An introduction to managing for health and safety.

The inspection will be undertaken in line with the HID Regulatory Model and will explore the following elements:

- has the mine operator identified the hazards associated with shafts and winding?
- has the mine operator completed suitable and sufficient risk assessments?
- have effective preventative and mitigating barriers been put into place?
- is there an appropriate management system for shafts and winding?
- have roles and responsibilities been allocated for the control and mitigation measures?
- is there a suitable competency management system for shafts and winding?
- are the control and mitigation measures being monitored and reviewed?

3. The intervention

The intervention team may ask the mine operator to provide copies of documentation in advance of the site visit. A review of documentation could take a day or more depending on the scope. Once the documentation has been reviewed, the intervention team will inspect

sample parts of the shaft & winding system and evaluate the effectiveness of the safety management arrangements and risk control systems.

There are many significant major hazards associated with the operation of winding systems and lifts in mine shafts. Inspectors should determine how well the mine operator is controlling the risks by assessing the adequacy of the arrangements for preventing:

- loss of control of the winding engine, resulting in an overwind and high energy collision of the conveyances in the headgear and the shaft bottom
- high speed collision of conveyances or counterweights with each other, or with a fixed part of the shaft or its fixtures and fittings
- failure of a safety critical or single line component, resulting in the detachment and free fall of a conveyance or counterweight through the shaft
- collapse of part of the shaft structure or its fixtures and fittings including pipes and cables, onto a moving or stationary conveyance
- unplanned entry into the shaft of heavy plant

A failure of a shaft and winding system can also result in consequential hazards elsewhere underground, for example the loss of a safe exit or the mine's electrical power supply to safety critical equipment such as ventilation fans and pumps.

In shaft & winding systems, the effects of ageing plant can be significant. Ageing is not directly related to chronological age. There are many examples of old equipment and structures remaining fit for purpose whilst newer equipment and structures showing evidence of accelerated or early ageing e.g. due to corrosion, fatigue, erosion and operation outside safe parameters.

Shaft and winding assets susceptible to ageing include:

- civil engineering structures, such as the engine house foundations, headgear, shaft side structures and shaft linings
- winding engine drive systems, including drums and sheaves
- braking systems
- winding and balance ropes and suspension gear
- conveyances and counterweights
- guides rails and ropes
- shaft services and supports
- electrical supply and power systems
- electrical control and instrumentation systems
- shaft side fencing, gates and associated interlocks and monitoring systems
- landing platforms
- materials handling equipment

Some of these safety critical assets will include single line components and be difficult or time consuming to access and examine thoroughly.

4. Reporting findings and conclusions

Inspectors will summarise the outcome of the inspection with the operator, management team and the safety representatives at the mine whilst on site.

This summary will include the team's assessment on how the operator is complying with the relevant provisions, priorities for any further action and the operators' performance score in accordance with the **Performance Assessment Table** shown below.

Where further action is required to achieve compliance this will be taken in accordance with HSE's Enforcement Policy Statement.

5. Key legislative requirements for mines

Health & Safety at Work etc. Act 1974

Section 2(1), 3(1)

The Mines Regulations 2014

Regulation 7 General duties of the mine operator

Regulation 8 Co-operation

Regulation 9 Health and Safety document

Regulation 10 Management structure

Regulation 11 Competence

Regulation 12 Instructions, rules and schemes

Regulation 15 Maintenance and inspection of equipment

Regulation 36 Shaft construction and modification

Regulation 37 Equipment in relevant shafts and outlets

Regulation 38 Safety features of winding apparatus

Regulation 39 Inspection, maintenance and testing

Regulation 40 Signalling and communication

Regulation 51 Auxiliary equipment

Regulation 54 Escape and rescue plan

Management of Health & Safety at Work Regulations 1999

Regulation 3 Risk assessment

Regulation 5 Health and safety arrangements

Provision and Use of Work Equipment 1998

Regulation 4 Suitability of work equipment

Regulation 5 Maintenance

Regulation 6 Inspection

Lifting Operations and Lifting Equipment Regulations 1998

Regulation 4 Strength and suitability

Regulation 5 Lifting equipment for lifting persons

Regulation 9 Thorough examination and inspection

Regulation 10 Reports and defects

Performance scores

Following the intervention, Inspectors should performance score the mine operator's degree of compliance in accordance with the Table below.

EMM RISK GAP					
EXTREME	SUBSTANTIAL	MODERATE	NOMINAL	NONE	NONE
TOPIC PERFORMANCE SCORE					
60	50	40	30	20	10
Unacceptable	Very Poor	Poor	Broadly Compliant	Fully Compliant	Exemplary
Far below relevant minimum legal requirements. Degree of non-compliance extreme and widespread. Failure to recognise issues, their significance, and to demonstrate adequate commitment to take remedial action.	Substantially below the relevant minimum legal requirements. Degree of non-compliance substantial. Failures not recognised, with limited commitment to take remedial action.	Significantly below the relevant minimum legal requirements. Degree of non-compliance significant. Limited recognition of the essential relevant components of effective health and safety management, but demonstrate commitment to take remedial action	Meets most of the relevant minimum legal requirements. Degree of non-compliance minor and easily remedied. Management recognise essential relevant components of effective health and safety management, and commitment to improve standards.	Meets the relevant minimum legal requirements. Management able to demonstrate adequate identification of the principal risks, implementation of the necessary control measures, confirmation that these are used effectively and subject to review.	Exceeds the relevant minimal legal requirements. Management committed and proactive in devising and implementing an effective safety management system to achieve 'best practice' and beyond legal requirements. Actively seeks to further improve standards.
EMM INITIAL ENFORCEMENT EXPECTATION					
Prosecution / Enforcement Notice.	Enforcement Notice / Letter.	Enforcement Notice / Letter.	Letter / Verbal warning.	None.	None.

Plan	1. There is a health and safety policy that is dated and signed that identifies major hazards, including shaft & winding hazards, and sets out the mine operator's aims and objectives for controlling the risks. 2. The mine operator has in place a suitable management structure which sets out the specific H&S responsibilities for staff at all levels involved in managing shafts and winding major hazard risks. 3. The mine operator and those appointed to the management structure understand their responsibilities and the requirements for safe operation of shafts and winding systems. 4. The arrangements include clear procedures for those with H&S roles or responsibilities in relation to: • how shaft and winding hazards are identified and prioritised • how shaft and winding risk assessments will be completed and outcomes implemented and reviewed • responsibility for the selection of suitable plant and equipment • provision of sufficient competent resources for implementing the policy • provision of independent oversight of the policy 5. Managers and supervisors at all levels accept their responsibilities in relation to controlling shafts and winding risks and lead by example in ensuring that the risk control measures are properly maintained. 6. There is a competency management system for shaft & winding for all employees from the most senior operational managers to front line workers. They have received adequate instruction and training on the hazards and risk control measures and understand: • the potential consequences of any shaft & winding incident • the importance of ensuring that prevention measures are followed properly • the importance of consultation between managers and workers in developing safe systems of work • the role of monitoring in identifying the adequacy of the prevention and mitigation measures 7. There is a management of change system for plant, equipment and organisational change for shafts & winding. 8. The mine operator has a written escape and rescue plan in the event of a shaft and winding emergency, including provision of auxiliary equipment. 9. Adequate arrangements are in place for informing and consulting staff (the Safety Representatives and Safety Committees Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996 (as amended)) 10. There are arrangements for reviewing and revising the policy and plans.
-------------	--

Do	1. The mine operator has a suitable management structure, setting out specific H&S responsibilities and defined performance standards for staff at all levels including: • how risk assessments will be completed, findings implemented and arrangements for review • responsibility for the selection of suitable plant and equipment taking account of its hazard potential in normal and abnormal circumstances • arrangements for inspection, testing and maintenance of plant and equipment • provision of sufficient resources to implement the plan • staff competencies, at all levels, to deliver their responsibilities 2. There are suitable controls to ensure plant and equipment meet relevant health & safety requirements, including the Supply of Machinery (Safety) Regulations 2008 and other relevant supply legislation. 3. The workforce is involved in the design and implementation of operating procedures and informed on changes. 4. There an effective system for reporting deficiencies in risk assessments and operating procedures. 5. There is a suitable written scheme for the inspection, maintenance and testing of shafts and winding apparatus meeting recognises industry practises. This should include an effective system for reporting defects and dealing with them. 6. There is a written scheme for the specification, selection and use of any winding, balance and guide rope, including arrangements for exceeding the maximum stipulated operating life. 7. Shaft & winding operating procedures are clear and up-to-date, readily accessible and reviewed. 8. Escape and rescue provisions are available, maintained and are tested in accordance with defined standards.
-----------	--

Check	1. There systems for: • routine inspections of premises, plant and equipment • checking that management arrangements are implemented and effective • ensuring staff understand and follow procedures 2. There is an effective system for reporting accidents, incidents and near misses and for investigating them. 3. There any arrangements for independent third-party audit. 4. There are periodic audits to assess the effectiveness of the control measures and make improvements where required. 5. The audit programme is risk-based and targeted at major hazard risk control and safety management systems.
Act	1. There are effective arrangements for reviewing performance and implementing the findings. 2. Improvement plans are made and progress monitored. 3. Procedures are reviewed and amended following near misses, incidents and accidents. 4. Remedial action is taken to addressed deficiencies. 5. Major hazard safety performance indicators are in place for shafts & winding systems and used to improve performance.







