

# ANGLO GOLD ASHANTI

## MAJOR HAZARD CONTROL STANDARDS

MANAGEMENT STANDARD		
<b>MAJOR HAZARD CONTROL STANDARDS</b>		
<b>POLICY CUSTODIAN</b>	Group Sustainability	
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# ANGLOGOLDASHANTI

## CONTENTS

Major Hazard Control Standards Intent	Page 3
1. Aviation	Page 5
2. Confined Space Entry	Page 6
3. Electrical Installations	Page 7
4. Energy Isolation	Page 8
5. Equipment Safeguarding	Page 9
6. Explosives	Page 10
7. Fires	Page 11
8. Ground Control	Page 12
9. Hazardous Materials	Page 13
10. Heavy Mobile Equipment	Page 14
11. Inundation, Inrush and Submergence	Page 15
12. Lifting Operations	Page 16
13. Light Vehicles	Page 17
14. Pressurized Systems	Page 18
15. Rail-Bound Transport	Page 19
16. Underground Ventilation	Page 20
17. Underground Vertical Transport	Page 21
18. Working at Height	Page 22

# MAJOR HAZARD STANDARDS INTENT



## Introduction

Safety is our first value and we reaffirm our objective to provide workplaces which are free from work-related injuries, incidents and illnesses.

## Context

To support the risk management process, the Major Hazard Control Standards forms a critical part of the AngloGold Ashanti Safety Framework. The Standards present leading practice control requirements aimed to eliminate or minimise the likelihood of experiencing an occupational fatality or high severity incident within the context of a specific activity or risk area.

## Structure of the Major Hazard Controls

Controls for each major hazard are categorised into two broad areas – Critical Controls and Defences.

## Critical Controls

Critical controls have been identified through Bow Tie analysis and are listed in the Major Hazard Standards. The controls that are listed are Global controls that shall be incorporated into all Operations/Sites, including exploration, unless the specific hazard is not present at that Operation/Site. Performance standard requirements for the critical control may be varied slightly to meet with Regional/Country Statutory requirements but shall meet with the intent of the critical control. Extra Operation/Site level critical controls will need to be assessed and implemented to ensure that the top event is adequately controlled.

Critical controls are those which if compromised will lead to the development of the top event or significantly increase the consequences and will include:

- Those controls if compromised to any extent will render all other controls in the same pathway or multiple pathways ineffective realising the top event.
- Those controls which independently will prevent the top event to realise, even on failure of other controls in the same or multiple pathways.

## Defences

Defences that are listed in the Major Hazard Standards are Global controls that shall be incorporated into all operations/sites unless the specific hazard is not present at that Operation/Site. Defences are controls that ameliorate or reduce the consequence/likelihood of the unwanted event. Extra defences will need to be assessed and implemented at the Operation/Site level to ensure that the hazard is adequately controlled. Note that personal risk assessment processes (Job Safety Analysis/SLAM) have not been listed as a control or defence in most MHS's as it is implied that these controls will be undertaken automatically, as appropriate, for all work/where a hazard or risk exists.

## Application

Critical controls and defences for each major hazard shall be implemented at each AngloGold Ashanti managed operation. Compliance shall be assessed and where instances of non-compliance exist, compliance management plans shall be developed and approved by the most senior individual at the operation, with copy to the respective Chief Operating Officer, Regional SVP, Corporate Safety Function and Regional Safety Function. In addition to the critical controls and defences identified, the requirements of national and local legislation must be complied with. As an outcome of a risk assessment, exemption to specific requirements from this Standard, may be authorised by the accountable Chief Operating Officer.

- A Bowtie risk analysis to complement this Standard to be undertaken by operations.
- As an outcome of a risk assessment, exemption to specific requirements from this Standard, may be authorised by the accountable Chief Operating Officer.

## Implementation period

Full compliance is required within 3 years from the original date of approval, 27 July 2016 (Any extension is dependant on EXCOM approval)

## Control Monitoring

All AngloGold Ashanti managed operations shall establish control registers and institute critical control monitoring programs to assure and/or improve on-going effectiveness. Critical control deviation action plans should receive priority.

## GLOSSARY (to be read in addition to the relevant Major Hazard Standard)

MHS		DEFINITION
Confined Space Entry	Confined space vs hazardous space / atmosphere	<p>“<b>Confined space</b>” means an enclosed, restricted, or limited space in which, because of its construction, location or contents, or any work activity carried on therein, a hazardous substance may accumulate or an oxygen-deficient atmosphere may occur, and includes any chamber, tunnel, pipe, pit, sewer, container, valve, pump, sump, or similar construction, equipment, machinery or object in which a dangerous liquid or dangerous concentration of gas, vapour, dust or fumes may be present.</p> <p>An <b>atmosphere is “hazardous”</b> when: it has too much or too little oxygen; or, it contains flammable, combustible or explosive agents; or, it contains contaminants (for example, fumes, dusts, mists) that could pose an immediate threat to life or interfere with a person's ability to escape unaided from a confined space.</p>
Electrical Installations	Voltage Levels	<p>Where there is no local standards the following shall be applied in line with International Electrotechnical Commission (IEC 60038):</p> <ul style="list-style-type: none"> <li>– Low Voltage - up to 1000V</li> <li>– Medium Voltage - 1000V to 35kV</li> <li>– High Voltage - 35kV to 230 kV</li> <li>– Extra High Voltage - above 230 kV.</li> </ul>
	Extra Low Voltage	International Electrotechnical Commission define an ELV circuit as one in which the electrical potential of any conductor against earth (ground) is not more than either 25 volts RMS (35 volts peak) for alternating current, or ripple-free 60 volts for direct current under dry conditions.
Heavy Mobile Equipment	Positive ventilation for Cabins	A system that filters the outside air and guides it into the sealed vehicle cabin. Additionally, the system creates a protective positive pressure inside the vehicle cabin.
	Positive communications system	Positive communication is between light vehicle drivers or pedestrians and HME operators to ensure safe entry, exit and transiting of operating areas. The communication must provide the HME operator with an awareness of where the light vehicle or pedestrian are at all times within the HME operating area and should be received and confirmed by all parties in the operating area.
	Berms	A berm is a level space, shelf, or raised barrier separating two areas. It can serve as a border barrier.
Ground Control	Fall of Ground	Any uncontrolled release and fall of soil or rock material from that causes, or has potential to cause harm to people or damage equipment. This does not include the controlled release during scaling activity.
	Unsupported Ground	A workplace that has not all ground support activities completed as per the ground support standard for that area. This includes complete bolting and surface support
	Secure Ground	Ground that is supported in accordance with the ground control plan, or unsupported ground which has been formally assessed by a geotechnical competent person as not requiring support in accordance with the ground control plan and authorised for entry by the most senior manager
	Competent person	A person with specific graduate training in rock/geotechnical engineering, or a government certificate equivalent, with suitable experience in the field of application / operation and a member of a professional body whose continuous professional development points are up to date
	Domain Mapping (sometimes also called geotechnical blockiness index or GBI mapping)	A rapid mapping system for recording general geotechnical conditions throughout entire mine workings. It provides continuous coverage and thus context for the more detailed mapping and show the distribution of geotechnical conditions across mine areas. Domain classes are customised for each mine site to describe the range of geotechnical characteristics, to ensure that the domains are simple to identify when mapping, but still adequately describe the variability in the rock mass conditions.

# 1. AVIATION

## INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the use of fixed wing, rotary wing, unmanned aerial vehicles (UAV) and executive travel (aviation).

Aviation activities including the use of fixed/rotary wing and UAV's by AngloGold Ashanti employees, contractors and visitors, and applies to - Commercial Scheduled and Non Scheduled Airline Transportation, Passenger Charter Operation - Fixed Wing and Helicopter, Cargo Charter Operation - Fixed Wing and Helicopter, Survey and Land Seismic Operations – Fixed Wing, Helicopter and UAV.

## CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

### Aerodrome (Owner/Operator)

- **Aerodrome Daily & Weekly Inspections** -Including cleaning program of parking pads (i.e. foreign object damage walk downs).
- **Fuel Testing** - Testing of the fuel supplied shall be conducted in-line with Aviation fuel testing requirements. The Pilot-in-Command will ensure that the quality of the fuel being uplifted is acceptable for operation of the aircraft.
- Passenger **manifest and weight** control.
- Fencing of Aerodrome - where AngloGold Ashanti owns and operates the aerodrome.
- Flight Safety Foundation Basic Aviation Risk Standard (or minimum equivalent) critical controls implemented

### Commercial Scheduled, Non Scheduled Airline Transportation, Cargo Charter

- **Selection of Operator** - Passenger Charter Operations - Flight Safety Foundation Basic Aviation Risk Standard accredited SGS certification body Airline Risk Calculator requirements. Separate selection criteria for Charter flights etc. (IATA) as per the AngloGold Ashanti Aviation Procedure.
- **Aviation audits** shall be conducted on an annual basis (frequency may be increased due to risk). These include full audits and desktop reviews for airlines used for once-off events.

## DEFENCES (Other controls to be implemented)

- **Executive Travel Requirements** - Limitation on number/level of who can travel together on same flight as per the AngloGold Ashanti Aviation Procedure.
- Commercial Scheduled and Non Scheduled Airline Transportation - International and regional flights should be with airlines that are members of International Air Transport Association (IATA) and hold IATA Operational Safety Audit (IOSA) accreditation.
- Passenger Charter Operation - Contracted aircraft shall be Basic Aviation Risk Standard accredited and risk assessed against the SGS certification body Airline Risk Calculator requirements. Should they be a member of International Air Transport Association (IATA) and hold IATA Operational Safety Audit (IOSA) accreditation, they can be used.
- Cargo Charter Operation - Basic Aviation Risk Standard accredited with no passenger operations being conducted.
- Geophysical Survey Operations Fixed Wing and Helicopter - Operators shall hold International Airborne Geophysics Safety Association (IAGSA) accreditation.
- Unmanned Aerial Vehicle operations shall meet the requirements of Aviation Procedure (unless local statutory requirements meet or exceed these requirements).
- Personal route plan for individual travel must be booked with approved travel providers and/or registered with GTSC (or equivalent) to ensure adequate journey management is in place to mitigate and manage travel and transit risks.
- Travel requirements with airlines, aircraft charter companies and airborne geophysical surveys (including drone operations) must be audited by the AngloGold Ashanti appointed Aviation Advisor prior to using their services.
- Airspace exclusion zones shall be assessed for their applicability to operations, commercial airspace during blasting operations and existing infrastructure, where there is a possibility for unwanted aircraft operations.

## 2. CONFINED SPACE ENTRY

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents arising from entry into confined spaces.*

*For the purposes of this guideline, a confined space is an enclosed or partially enclosed space not intended or designed primarily to be occupied by a person, within which there is a risk of :*

- *Having at any time an unsafe oxygen range (<19.5% or > 23.5%) .*
- *Contaminants, including concentrations of any gas that may cause injury from fire or explosion, or loss of consciousness.*
- *Engulfment.*
- *Any space which can give rise to any of the above conditions for the duration of a task being undertaken therein, shall be considered to be a confined space.*

*Entry to a confined space occurs when a person's head or upper body is within the boundary of the space.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- The **Site/Region procedure** for entry to a confined space and **Site Confined Space Register** shall be used to determine whether the area is a confined space or hazardous and if it requires a permit to work.
- A **confined space entry permit** shall be issued by a competent person before any work is carried out in a confined space
- **Purging/flushing** of the confined space shall be carried out prior to entry as part of the isolation activity. The atmosphere shall be monitored during the task inside the space where there is an identified risk.
- **Multi gas measuring instruments** shall be provided and used by a competent individual to monitor all relevant atmospheric contaminants within a confined space while work is being carried out. **Temperature monitoring** shall be in place where environmental conditions present a risk.
- All work in a confined space shall take place under a permit-to-work system which includes a **lock out, tag and isolation system**.
- **Extra ventilation** shall be introduced into the space where required to maintain a safe atmosphere.
- Confined space work shall only be conducted by those **personnel who are suitably trained, competent and must comply with the relevant equipment safe working parameters**.
- **Build-up of materials** that may cause entrapment or inundation must be adequately **removed or washed down to render the area safe** before any person enters the confined area.
- A trained and competent **Confined Space Standby** shall be in place at all times to control access into and out of the confined space and activate immediate response.
- All confined spaces shall be individually identified and labelled.
- An emergency plan shall be in place for all work in confined spaces.

### DEFENCES (Other controls to be implemented)

- Applicability of the risk associated for thermal stress (hot and cold) shall be assessed prior to entry into the space and will then be mitigated if the risk is present.
- Accomplishing work from outside confined spaces shall at all times be the preferred method of work, after all alternatives to avoid entry have been considered and evaluated.
- Toxicity of atmosphere for hazards shall be determined and limits for exposure identified and implemented during risk assessment process.
- Communication system shall be in place that has redundancy built into the system (not just voice primary). This can include 2-way communications and is for both communications into the confined space (larger spaces) but primarily to communicate with emergency services if required.
- Extra low voltage equipment shall be used within a confined space for illumination and where there is a potentially explosive atmosphere, such equipment will be intrinsically safe.
- A confined space register listing all confined spaces on site, including contractor equipment, third-party service provider equipment, and leased equipment, shall be maintained and kept current.
- As part of the confined space register, hazardous spaces should also be identified and managed (does not meet with the definition of a confined space but presents as a fatality potential).
- The emergency response team co-ordinator (or equivalent) should be notified of any work to be carried out in a confined space such that they are aware of the potential for possible call-out. The risk assessment for the confined space entry work permit must be signed off by the emergency response co-ordinator (or equivalent) prior to entry.

## 3. ELECTRICAL INSTALLATIONS

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents where and when there is the potential for interaction with electrical installations, systems, and equipment.*

*This guideline refers to all low, medium and high voltage electrical systems installed on AngloGold Ashanti sites.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- For all medium voltage (and higher) work, including the excavation or opening up of cables, **Switching plans and/or Permitting systems** and correct isolate, de-energise and lock out procedures shall be in place and utilised.
- **Test for Zero** potential and test for dead shall be carried out using approved electrical test instrumentation and PPE prior to working on electrical installations.
- All switching stations with medium voltage or higher (>1KV) to be equipped with **remote control or open/close operator stations** which ensure switching is completed at a safe distance, ideally outside electrical buildings / enclosures. Racking of medium or higher voltage circuit breakers shall be conducted with the correct PPE worn.
- All sub-stations or motor control centres (MCCs) to be **locked at all times** and individuals not to be allowed access unless escorted by a duly authorised person.
- Ensure **physical discharge** of stored energy from electrical equipment disconnecting from all potential sources of electrical energy before any electrical maintenance is conducted.
- **Isolation, de-energise, lock out and tag out process** shall ensure no accidental switching can take place, with the application of an identification tag detailing the persons responsible for applying the lockout.
- Correct **earthing, bonding and over current protection** shall be adhered to at all times on all Low, Medium and High Voltage installations. Correct testing and Results to be completed and filed for future reference.
- All low and higher voltage electrical circuits shall be equipped with effective over-current and earth fault protection appropriate for the design of the installation. All domestic voltage systems 110/220 Vac will be fitted with 30mA earth leakage protection.
- **Training and competency** shall meet the applicable national or local codes, all regulatory and statutory requirements and appropriate recognised industry standards

### DEFENCES (Other controls to be implemented)

- All electrical installations shall be designed, constructed, tested, inspected, placed into service, and maintained in accordance with applicable national or local codes, all regulatory and statutory requirements and appropriate recognised industry standards.
- Operations with electrical installations shall have comprehensive, accurate, and current procedures and processes which detail all aspects of electrical installation operation and maintenance in line with this standard, and as per applicable national or local codes, all regulatory and statutory requirements and appropriate recognised industry standards.
- Effective warning signage, including electric flash signage, rated voltage and first aid procedures are to be posted as required.
- Consideration to be given to HME/Surface Mobile equipment interaction with powerlines (included into permitting and procedures)
- Every medium or high voltage (>1KV) installation to be equipped with fire fighting equipment and/or arc detection and a first aid kit which includes burn treatment and supplies. All other low voltage installations are to be equipped based on the outcome of a risk assessment.
- An effective means to exist to warn of and isolate alternate energy sources such as VT supplies, generation supplies, back feeds, and ring feed circuits.
- An effective system including routine load testing and low battery warning alarms to be in place to manage battery tripping units.
- All buried cables with low or higher voltage to be installed with an effective means of warning (i.e. warning tape, tiles, etc.) and to be effectively marked with cable route markers as per local statutory requirements. Each site to maintain an effective excavation permit system.
- All electrical installations with low or higher voltage to be equipped with an overall facility single line diagram, log book, and list of competent / authorised persons and emergency contact numbers.
- Equipment safeguards not to be overridden or bypassed by any individual.
- Work on live electrical installations, systems or equipment is not allowed. Only under controlled conditions, during testing or phasing of medium voltage, may work be undertaken by trained and competent individuals in possession of a valid live work permit approved by an authorised individual. Testing of low voltage may be done by competent Electricians wearing appropriate PPE.
- All personnel working on electrical installations, systems, and equipment to wear PPE as prescribed in applicable codes, regulations and standards. Where conflicts arise, the higher prescription shall be applied.

## 4. ENERGY ISOLATION

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the uncontrolled release of energy or hazardous materials.*

*The process of isolation ensures separation of people from any uncontrolled energy sources or other types of hazard which could cause injury on contact. "Isolation" means to physically remove any connection or means to supply any form of energy or the introduction of hazardous material to plant, equipment, or process.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- First principal of isolation – **De-energise, engineering lock-out** (mechanical, electrical, chemical, heat, kinetic etc.), **tested for zero energy/test for dead**, drained/bled (tanks, pipes/ hydraulics etc.) and tagged to prevent any accidental start-ups.
- **A isolation, lock-out, and tagging procedure** shall be in place describing all details of the **AGA Isolation process** to ensure correct isolation and that all equipment is made safe prior to gaining access or commencing any task and prevention of any energy build-up after isolation and / or release.
- **Isolation lists** developed by competent persons to **identify isolations** required to rectify any particular work safe from stored energy or start-up across an entire operation.
- Isolation activities shall only be performed by **competent individuals**
- Isolation for all tasks shall form part of the **Permit to Work** process
- Hazards and potential for harm from uncontrolled energy release for any activities shall be **identified during the Work Package planning** phase and risk based process, and appropriate mitigations and **points of isolation identified and documented**.
- Isolation shall provide positive protection against harm (for all possible energy sources) and be achieved by the use of **mechanical locking devices** or the establishment of **physical barriers or separation**.
- All Isolation points **labelled and lockable**.

### DEFENCES (Other controls to be implemented)

- Equipment requiring isolation shall have locking devices that:
  - ◇ Can be uniquely keyed, either to the specific lock or, where multiple keyed alike locks are used by a single individual, to an individual person.
  - ◇ Does not have an unauthorised second-party master override key.
  - ◇ Are kept under the exclusive control of the site permit authorities and those individuals forming part of the formal isolation process (where a device like an isolation box is used)
- The isolation, lockout and tagging procedure shall describe all requirements to ensure that isolation requirements are met. The following processes should also be described in addition:
  - ◇ Handover and hand back of plant and equipment between operations and maintenance,
  - ◇ Transfer of isolations between shifts or different work groups, and
  - ◇ Bridging requirements.
- A commissioning tag / live work procedure and system shall be utilised for "test and move" processes where a piece of machinery has to be energised to validate repairs/work. A procedure shall be in place, and risk assessment undertaken, to mitigate hazards in special cases where any one of the following is not achievable:
  - ◇ A zero energy state.
  - ◇ A test/try of isolation is not possible.
  - ◇ Use of a locking device is not possible or practicable.
- Processes shall be in place to manage isolations where simultaneous activities being carried out could give rise to potential multiple sources of energy requiring isolation.
- Personal locks and or isolation devices shall not be removed without the appropriate process and approval being granted prior to removal. Process and approval shall be as per procedure.
- A matrix (Tag out Lock out list), including all energy sources, by equipment shall be developed in the planning phase.
- Specific procedures shall be developed and implemented to address overrides (bridging software / hardware) where applicable on approval of the Engineering / Maintenance Manager
- All equipment, whether purchased or fabricated (including leased and contracted equipment) shall have the capability to be physically de-energised and locked from all energy sources, and freed or rendered harmless from stored energy and hazardous materials.
- Training shall be provided for all personnel who may encounter isolation activities, including permit issuers, permit holders and persons performing isolations. General awareness training shall also be provided for all personnel to ensure controls instituted are not over-ridden, bypassed, or rendered ineffective.



## 5. EQUIPMENT SAFEGUARDING

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents where and when there is the potential for human interaction with moving parts or potential moving parts of plant and equipment.*

*For the purposes of this guideline, safeguarding encompasses the various types of guarding and barriers used to safeguard and separate people from machinery and plant (both mobile/ fixed/power tools) in use at AngloGold Ashanti sites.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Engineering lock-out and isolation** with verified zero energy before beginning work shall be considered the first choice of safe guarding before any guards or barriers are removed.
- A risk based process shall be applied to consider application of the following controls, during normal operations:
  - ◇ **Protection systems** to trip operating machinery if personnel enter the danger zone shall be installed to prevent contact with moving machinery.
  - ◇ **Guarding shall be fitted** to all rotating or moving parts where a hazard for entanglement or injury exists as well as areas where there is a presence of extreme temperature, release of pressure, hazardous chemical vapours, etc.
  - ◇ An **emergency stop and/or emergency trip switches/pull wires** shall be installed for all equipment where the risk of human interaction with moving parts of plant and equipment exists.
- **Hold back/Independent braking systems and or devices** shall be installed wherever applicable to provide protection against reverse torque runaways of conveyors (only applicable to inclined conveyors), chairlifts and aerial rope ways.
- **Demarcation** in areas where there is temporary **restricted access or limited space**. Demarcation is to be fitted with information tags and removed on completion of work.
- **Barricades** in place, effective, maintained and verified to control personnel/equipment from moving into high risk areas.

### DEFENCES (Other controls to be implemented)

- All plant and equipment shall be operated and designed with consideration to relevant energy sources and to eliminate the need for guarding and appropriate interlocking.
- Where additional interlocks or safeguarding are identified or required or need to be changed on plant or equipment, an Engineering change control process shall be followed.
- Physical guards or barriers shall be constructed of suitable materials and will meet or exceed all regulatory and statutory requirements, standards and codes of practice
- Where the removal of safeguards is necessary on operating equipment, for example for the purposes of fault finding, testing, and commissioning, a safe operating procedure shall be in place and a Job Safety Analysis (JSA) completed before the task is actioned.
- Guards shall be replaced and interlocks restored prior to equipment being put back into normal mode of operation.
- OEM guarding on all portable power hand tools shall be in place during all operations (guarding fitted and in good operational repair).
- All portable hand tools/power equipment shall be fitted with an OEM dead man switch (unable to be locked on for operation). Any retro fitted switches shall be subject to a formal change management assessment.
- A process/system shall be in place to routinely inspect and verify the effectiveness of the safeguards e.g. guards, barricades, inter trips / interlocks, etc.
- Permanent barricades, bollards and demarcation, shall be used in areas to indicate travel ways and prohibited areas around critical equipment where inadvertent contact with equipment is possible. Critical equipment shall be risk assessed and the risk mitigation strategies put in place.
- Where there is possible interaction between people and moving parts of equipment, pre-start alarm and delay shall be installed to warn employees of the imminent start-up of the equipment e.g. conveyor belts.

## 6. EXPLOSIVES

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising while working with explosives.

The purposes of this AngloGold Ashanti Standard is to clearly define the requirements for the handling and use of explosives. In some instances, local legislation may have more stringent requirements which then take precedence.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Earthing and Bonding** - annual tests are to be conducted by a suitably qualified person (storage facilities and magazines protection in place).
- **Weather monitoring system** (lightning and extreme weather) inclusive of earthing /lightning protection and cessation of blasting/work activities.
- **Treatment of miss-fire** prior to drilling or other activities, and enforcement of exclusion zone around misfires to prevent drilling in proximity to any misfire.
- **Separation of explosives and accessories** - isolation of explosives from detonators/initiators.
- **The use of safety fuse is prohibited.** Electronic, remote initiation techniques are to be utilised for all blasting processes to allow for all multiple blasts to be initiated from a safe location.
- **Training and competence**—Shot firers and all personnel who handle explosives are **adequately trained and pass competency** assessments. This is to include all statutory and local accreditations to purchase, store, transport, and use explosives as required for individuals.
- **Explosive management plan** to include as a minimum the following: security and storage, transporting and handling, signage and guarding, firing, equipment, disposal and emergency plans
- **Blast guard** (person or physical barrier) to be in place prior to detonation to prevent inadvertent access to the blast area.
- Open Pit Blast patterns to be protected by a **windrow** of a minimum of 0.5 of a metre in height to restrict entry to the pattern by vehicles and equipment.
- **Hot work permit** - permit requires the inspection of equipment/ material for explosives prior to cutting/welding/grinding operations within 10m of any storage facilities, magazines, explosives vehicles etc. Local procedure is to specify minimum distance work can be conducted from areas that hold explosives.

### DEFENCES (Other controls to be implemented)

- Records including the type and volume of explosives used, moved, transported, and stored to be maintained and readily available.
- Stock management and control procedures to be in place.
- A formal chain-of-custody, including inventory checks and transferor and transferee sign-off to accompany all transport transfers.
- All required government and local accreditations to purchase, store, transport, and use explosives to be in place for the site/company or relevant contractor.
- Blasting system (Blasting Manual/Design) -description of processes shall be in place for all Operations and Projects (including demolition activities) where blasting is required.
- All vehicles used for carrying explosives to be designed for purpose of carrying explosives and shall meet the following requirements:
  - ◇ All legally required placards, markings, and signage
  - ◇ Lockable storage boxes constructed of non-sparking material or lined with non-sparking material
  - ◇ Provision for separate storage of detonators and explosives should the two be carried on the same vehicle
  - ◇ A flashing light of different colour to all other vehicles on site to identify it as an explosives carrying vehicle
  - ◇ An appropriate earthing strap or chain to ensure no build-up of static electricity on the vehicle
  - ◇ Dry chemical fire extinguishers, one mounted at the front of the vehicle and another mounted at the rear
- All entrances to a pattern blocked by a physical barrier which must be moved for every entry and exit of every vehicle. This must include a red pyramid-shaped cone with "Danger Explosives Keep Out" reflective signage
- Mobile phones, radio transmitters, and other electrical or magnetic items which can induce electrical current are not permitted near explosives unless intrinsically safe.
- Storage of all explosives to occur in magazines / explosives boxes located in secure compounds / areas.
- For shot firers and associated specific explosive employees a system for security clearance to be in place.
- Environmental effects and community impacts associated with blasting, including noise, concussion, vibration, and fumes, to be considered when creating a blast plan.

## 7. FIRES

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents arising from fires and explosions.*

For the purposes of this AngloGold Ashanti Standard Fire protection applies to all and provides recommended minimum fire protection requirements for:

- Surface plant and infrastructure (such as buildings, offices, surface mobile plant, processing plants, stockpiles, conveyor belts and other fixed plant),
- Open cut operations, and
- Underground operations.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Condition/remote monitoring** of heat build-up in equipment bearings, gearboxes, tail/head/take up pulleys etc. must include **interlocks for tripping equipment** as determined through a formal risk assessment.
- **Electrical installations** as per standards- Inclusive of arc detection, automatic suppression, fire extinguishers, routine infra red inspections as determined by risk assessment of the specific installation.
- **Hot work procedure and permit** shall be in place and used at all Operations/Project.
- **Fire detection system** as determined by risk assessment or legislative requirement.
- Appropriate **Refuge bays/chambers** including temporary refuge bays shall be in place, operational and maintained as per statutory requirements as a minimum and based on a formal risk assessment process.
  - ◊ Be located not further than 750 meters from any working place, unless statutorily more restrictive (excludes vertical shafts).
  - ◊ Be maintained in a “life sustaining” condition (i.e. be provided with sufficient breathable air /oxygen drinking water, first aid kit, logbook, and be sealed in such a manner as to prevent inflow of noxious / toxic gas or fumes). Not be constructed of combustible materials or the services to it routed or located above combustible materials (e.g. conveyor belt installations).
  - ◊ Be of sufficient size as to accommodate all personnel working in the area.
  - ◊ Have display signage indicating the location of refuge bay with maximum number of personnel that can be accommodated.
  - ◊ Be equipped with communication equipment to allow direct contact with the emergency control centre.
- **Automatic fire suppression systems** - Critical equipment and installation protection.
- All personnel to be **trained on local emergency evacuation procedures**, routes, and muster points (and refuge chambers in the case of underground operations).

### DEFENCES (Other controls to be implemented)

- A Fire Prevention Plan to be developed through a process of risk assessment.
  - ◊ The plan to be used for day to day management of fire risks and to explain the fire risks present at an operation and detail methods to manage identified risks, such as inventory control, housekeeping, segregation, containment, escape and response.
  - ◊ The fire prevention plan to include a location plan reflecting the position of all firefighting systems, the location and type of extinguishers, and other firefighting equipment, as well as the position of muster points to be used in the event of a fire.
- Where risk assessment identifies a fire risk present, continuous thermal monitoring, smoke and/or carbon monoxide detection and an automatic fire suppression system to be provided.
- Where fire risk is ‘moderate’ or above, structures etc. are to be constructed of non-flammable materials with appropriate fire ratings, separated from possible ignition sources and protected or located away from collision hazards.
- A fire detection system to be installed at in-take and return airways where personnel may be potentially exposed to smoke, gas, fumes, or excessive heat generated by a fire.
- Flammable material storage to be designed, operated/segregated, and maintained in accordance with applicable codes, regulations and standards.
- Flammable liquids/gases, hose routing, electrical cabling for mobile and fixed equipment is to be risk assessed
- Fixed fuel/oil transfer systems and depots are to be capable of being physically isolated in the event of a fire.
- Placarding and relevant signage to be displayed at all flammable material storage areas/containers/vehicles/electrical installations in accordance with applicable codes, regulations and standards.
- Flammable material storage areas/containers/vehicles and to be fit-for-purpose and have adequate restraints/ containment.
- Flash-back arresters to be installed on oxy-acetylene equipment.
- All cylinders, and in particular, acetylene cylinders, to be stored in an upright position, secured at a designated area with clear markings and roof covering from direct sunlight. Storage area should meet or exceed Country/Region Statutory requirements
- Tyres are to be stored in a manner which prevents the spread of fire, according to the approved fire load.
- Fire suppression systems shall be installed as per the HME fire suppression guideline.
- Any remotely controlled equipment to be fitted with remote-control activation of the fire suppression system.
- Conveyor belts/skirting and support units (identified through a formal risk assessment) are to be fire resistant. If specific items are not fire resistant (steel belted) risk reduction measures inclusive of automatic fire detection and suppression are to be in place to mitigate the risk
- Separate locations for hot work should be designated, clearly indicated and maintained.
- Machines that develop a condition where heat sources or fuel sources may lead to a fire to be stopped and repaired before further operation.
- Competency requirements for equipment operators to include awareness of the types of fires and the associated equipment and methods to control and fighting fires.
- Where feasible a mutual agreement for shared emergency services between mines/local services is to be in place.
- Chimney activation – Prevention of underground vent district impacting on another through gas/smoke (as per fire sealing plan).

## 8. GROUND CONTROL

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from falls of ground — rock fall, rock burst and ground collapse —in mining and exploration activities.

For the purposes of this “Ground Control” standard, all items pertaining to the “Ground Support Standard” control refers mainly to underground operations and the discrete scenarios where ground support is utilised in the open pit environment

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- An **Excavation Monitoring Strategy** will be defined for all workings, including means, frequency and prescriptive specifications.
  - ◇ Inspections and *Domain Mapping* (as per site procedure) will be completed for all entry mining areas, and this data shall be collated in 3D space with all other available geotechnical information.
  - ◇ Reconciliation against the designed/predicted behaviour/geometry will be conducted monthly, or as specified in design or TARP.
  - ◇ TARPs will be defined considering strategy & area conditions.
- The design of **Ground Support Standards**, including work procedures, shall ensure no person enters/work under *unsupported ground*.
  - ◇ All mining entry areas will have a Ground Support Standard signed off by the most senior mining/operational manager.
  - ◇ Ground Support Standards will be designed by a *Geotechnical Competent Person* and cater for instability mechanisms relevant to the different excavation geometries on the mine.
  - ◇ Standards will cater for the potential change in rock mass conditions induced by surrounding mining activities.
  - ◇ Reinforcement in all entry areas will have suitable face plates.
- ◇ Surface support will be installed in all permanent infrastructure unless otherwise specified by *Geotechnical Competent Person*.
- A **Hazard Control Procedure** will be in place for identification, demarcation, communication and amelioration of geotechnical hazards.
  - ◇ Competency tested personnel will be involved in scaling and making safe activities (in-cycle and ad-hoc).
  - ◇ Scaling, making safe and washing down will be conducted following the blasting of new excavation perimeters prior to accessing.
  - ◇ Hazard demarcation (barriers as required) will be placed in field, marked on operative work plan and recorded in Hazard Register.
  - ◇ Operative work plans will include signoff of geotechnical engineer accountable for the area.
- The **Geotechnical Design** shall be completed by a *Geotechnical Competent Person* prior to inclusion in the Mine Plan and accommodate the uncertainties and variabilities in structure & rock mass conditions (incl. hydrological considerations), ground support requirements, extraction sequence & schedules, geo-hazards, infrastructure, mitigation of failures and legislative requirements.
  - ◇ All current design parameters will be captured in a register.

### DEFENCES (Other controls to be implemented)

- Develop and maintain (annual review) a **Ground Control Management Plan (GCMP)**, as an integral part of the mining processes.
  - ◇ The GCMP will define roles and responsibilities and serve as basis for the on-going communication between the technical functions, ops management, contractors and operators.
  - ◇ The GCMP will describe criteria and amelioration options for each adopted *risk-benefit* design.
  - ◇ The GCMP will define strategies for designs, excavation monitoring, operational implementation considerations and QA/QC, and reference related procedures, standards and protocols.
- All mines will have access to a **Geotechnical Competent Person** (Snr Geotechnical Engineer as defined in the *Discipline Health Framework*) who has relevant skills and experience in the mining method, ground- and excavation conditions in the mining operation.
- Production- and limit **blasting practices** (incl. design) will ensure the long term integrity of the excavation and infrastructure.
- In developing, implementing, or altering any **Ground Support Standards**, a risk assessment process is to be undertaken and documented, with relevant personnel sign-off.
  - ◇ Standards will consider the capacities, properties and tolerances of the different reinforcement and support units (and materials) individually and as a whole within the proposed standard.
  - ◇ Standards to include specifications of materials utilised.
  - ◇ Conduct QA/QC to ensure all installations, materials and equipment meet the required engineering and performance specifications.
  - ◇ Support development with life >5 years with fully encapsulated bolts to prevent corrosion and ensure functional life of excavation.
  - ◇ Proceduralize removal/replacement of ground support not performing effectively and for recovery of trapped equipment/resources.
  - ◇ Design with adequate redundancy to address controlling factors .
  - ◇ Ground support used should be integrated into the mine excavation design and consistent with excavation size.
  - ◇ Standards will cater for equipment capabilities insofar as possible, without adversely impacting the efficiency of the support system.
  - ◇ Where routine scaling is required the effectiveness of support components will be assessed and the standard reviewed.
- ◇ Where a Fall of Ground occurs the standard will be reviewed and updated, referencing the investigation actions/recommendations.
- ◇ Use temporary support where mining method requires stope entry prior to primary support system installation.
- ◇ Review travel ways/back area ground support, based on frequency of use and condition of support.
- **Plant and Equipment** to have required physical capabilities, e.g. Remote/autonomous control; reach & range; FOPS.
  - ◇ Mechanised ground support installation at all times unless not practically possible. Personnel to work from *secure ground* with handheld equipment.
  - ◇ Excavation monitoring/rock mass testing equipment must be fit-for-purpose and calibrated at least annually.
- Integrated **risk management** processes, pertaining to the design, construction, amelioration or entry of any excavation, will be conducted by suitably qualified, competent and experienced person(s).
  - ◇ A documented risk assessment will be conducted for change management and prior to remedial work carried out to improve or regain stability. Appropriate risk reduction measures have to be applied & approved in writing by *Geotechnical Competent Person*.
  - ◇ Emergency response plan to recover trapped workers be in place.
  - ◇ Prohibit access to *unsupported* areas or geotechnical hazard zones (including old workings), except in specific emergency situations declared or as approved in writing by the GM .
- Before **exploration activities** commences, a risk assessment to evaluate the potential for landslides on access routes, natural embankments, and cuts with heights exceeding 3m is to be undertaken .
  - ◇ Excavations of depth-to-width ratio's >1 and depths >2m will have appropriate support equipment to brace the excavation.
  - ◇ Placed material not to compromise excavation stability (i.e. 2m deep excavation – material >6 m from edge).
  - ◇ Consult a *geotechnical competent person* to provide assurance on local geotechnical conditions & adopted risk mitigation measures.

## 9. HAZARDOUS MATERIALS

### INTENT

*To eliminate or minimise the risk of fatalities, illness, injuries, and incidents arising from the processing, storage, handling, production, transport, recycling, and disposal of hazardous materials.*

*For the purposes of this AngloGold Ashanti Standard "Hazardous material facility" means the buildings, containers, or equipment which contains a process of any material which has been determined to have a health hazard or physical hazard.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- Permit to work - permit to perform maintenance and non-routine work on equipment containing hazardous materials (**added to current permit to work system / process**).
- **Lock out and isolation** - correct type of lock out applied and verified for zero energy/ability to loose containment within that system.
- **Asset** (Structural and / or Process) **Integrity Monitoring** - Periodic at intervals not exceeding annual (depending on risk) inspections.
- **Guarding/Barricading** -permanent bollards/guards/height restrictors in place to prevent contact of structures by mobile equipment.
- **Bunding/self-containment/booms/absorbent material** processes in place to reduce the volume/amount of spill that could occur.
- **Training and Competence**- A competency-based training system to be in place for operations, maintenance, and emergency response roles involving hazardous materials and potential side effects (i.e. radioactivity/Cyanide).
- All facilities which have a recognised risk from hazardous materials to provide an **emergency response plan**.
- Security, access control systems, and hardware to be in place, appropriate to the risk to **manage access** to areas where hazardous materials are stored and used
- **Material Safety Data Sheets (MSDS's)** are available to affected personnel involved in the transportation, storage, handling, use, and disposal of hazardous materials on site, including contractors and first responders.

### DEFENCES (Other controls to be implemented)

- All specifications for the design and/or modification of hazardous materials facilities to be subject to a risk assessment which includes hazardous material selection, transport, production, storage, handling, use, and disposal.
- Formal risk assessment shall be conducted for primary and secondary containment requirements where hazardous materials have the potential for fatality/permanent disability.
- Provisions for safe containment, drainage, and venting, where required by normal operations or emergency situations, to be based on a process risk-assessment tool such as HazId and HazOp.
- Labelling and assessment against the compatibility Matrix and related MSDS (Material Safety Data Sheets) to be in place on all storage vessels, containers, and tanks pursuant to local or international standards. As a minimum, labelling to clearly identify the carried or stored material, warehouses and sites.
- Piping containing hazardous material to be marked and colour coded such that the contents and direction of flow can be readily identified.
- Equipment to be designed and operated to fail in a safe condition during event or interruption to electric, hydraulic, or pneumatic energy sources.
- Automatic process control systems to be in place in hazardous material facilities to eliminate the need for operator intervention and maintain operation within the safe operating envelope.
- Fixed and personal detection devices appropriate to the hazard are to be considered as options in the selection of risk reduction measures (warning devices).
- A site register to be in place for all hazardous materials.
- A system to be in place to identify and document maintenance, inspection, testing schedules, and procedures for critical equipment associated with hazardous materials.
- A system to be in place whereby the introduction and disposal of hazardous materials, including containers, to be approved by the site hazardous materials co-ordinator, environmental department or equivalent prior to introduction or disposal and should include proper decontamination of plant and equipment.
- Safe operating limits for plant and equipment handling hazardous materials that have the potential for immediate or long-term harm, to be clearly defined, documented, and up to date to reflect current plant arrangements. These to be available to operations and maintenance personnel.
- Processes and controls to be in place to manage simultaneous operations involving hazardous materials to avoid mixing of incompatible materials.
- A system shall be in place for the management of change of equipment and/or processes for transportation, storage, handling, use and disposal shall include specific steps to assess the impact of changes on the risk associated with hazardous materials.
- Identify process areas where hazardous materials may be released under certain operation circumstances (i.e., venting, discharge, etc.)
- A medical surveillance process to be in place to monitor short and long-term exposure of personnel to hazardous materials which have the potential for immediate and long-term harm.
- Hazardous Substance emergency response drills are to be conducted as required (minimum of annually) to test the effectiveness of the emergency response plan and medical preparedness. Drills shall be based on risk and potential exposure for the specific Operation/Project/Hazardous Chemical
- A formal memorandum of understanding (or equivalent) and a formal process of liaising with local authorities and emergency response teams shall be in place to ensure continued readiness on their part and an understanding of the nature of the hazardous materials in use at the relevant Operation/Project.

## 10. HEAVY MOBILE EQUIPMENT

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the use of Heavy Mobile Equipment (HME).

“Heavy Mobile Equipment” includes equipment such as dump trucks, graders, dozers, loaders, haul trucks, and pressurized road tankers. For other surface and underground mobile equipment (such as shovels, water trucks, excavators, forklifts, mobile cranes, buses, backhoes, bobcats, and other trucks heavier than light vehicles) where application of requirements may not be practical, a risk-based approach may be used to determine which requirements should be adhered to”.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Pre-use checklists** Includes operational checks.
- **System to ensure Fitness for Work** - To ensure adequate measures are taken to manage & prevent impairment from issues relating to fatigue, drugs & alcohol etc.
- **Traffic management plan** to include as a minimum the following: Road design, road rules, layouts, signage, windrows / berms requirements; Traffic/Pedestrian segregation methods; speed limits; Access controls to active mining areas; change management for traffic changes; parking; extreme weather; dust control; floating/towing requirements; emergency crash and break-down
- **Authorisation system** is in place to ensure that drivers of HME are authorised and verified as competent to operate that type of vehicle (may be manual or electronic)
- **Training and Competence**—Training programme is to ensure **verification of competency** for each machinery type and is to encompass refresher training is provided to maintain minimum skills for both HME Operators and HME Supervisors (awareness of hazards associated with Operations). Refresher training shall be risk assessed to identify frequency of training or on implementation of a new change that could have a material impact as assessed in the change management process.
- **Brake Test** to be conducted as per OEM recommendations for different vehicle types.
- A **maintenance and inspection program** shall be in place for all Heavy Mobile Equipment.
- Remote loading operations used underground are to be conducted using **Teleremote Systems only** to ensure operator isolation from the remotely operated HME.
- Berms, barricades, barriers, or other systems to be at least half (½) largest wheel height of equipment and must be in place along roadways, excavations, dump locations, and other areas to prevent equipment from entering hazardous areas, falling over or by creating a hazardous situation as determined by the risk assessment. Berms etc. must be made of competent material.
- A tyre management system to be in place to address issues including fire, heating, explosion, electrical contact, separations, maintenance, tire changes, etc.
- All vehicles will have seat belts for all occupants.

### DEFENCES (Other controls to be implemented)

- Heavy mobile equipment to have the following minimum safety features:
  - ◇ Adequate lighting (i.e. headlights, tail, turn, brake, strobe, flashing lights)
  - ◇ Identified isolation/lockout control point(s).
  - ◇ Adequate walkways, railing, steps/grab handle combinations, and boarding facilities, including an alternate path of disembarking in case of an emergency.
  - ◇ Reversing alarm/Horn.
  - ◇ Effective guarding on accessible moving parts (consistent with equipment safeguarding standards).
  - ◇ Signage on equipment that allows clear and easy identification from a distance.
  - ◇ Approved or certified roll-over protection system (ROPS) - Risk based, only applicable to vehicles operated on surface.
  - ◇ Falling object protective structure (FOPS) for underground vehicles. - Risk based
  - ◇ An automatic fire detection and positive pressure suppression system (a system that is activated by a loss in pressure) with manual activation points.
  - ◇ Positive ventilation for cabins
  - ◇ Positive communications system
  - ◇ Fail to safe brake system
- A formal risk-based selection and acceptance process to be in place for all new (to site) and modified surface mobile equipment prior to commencement of work on site.
- In Vehicle Monitoring System (IVMS) to be utilised for managing driver behaviours/condition monitoring/proximity warning/vehicle performance. Any exceptions to IVMS must be formally risk assessed and the risks mitigated.
- Design, inspection, and maintenance requirements to be in place for all roadways including collision protection, critical plant and equipment.
- Site/Operation/Project is to have defined traffic rules for all vehicles inclusive of safety distances between vehicles and communication requirements.
- Positive Communication system to be in place and utilized where practical. Use of horn to advise the equipment is moving, i.e. one to communicate that the equipment will start, two horn sounds to advise is going forward and the back alarm when it is going back).
- Mobile phones in HME cabins are discouraged and should only be allowed following a risk assessment. Should the risk assessment permit, mobile phones, whether hands-free or not, to only be used by the driver of HME while it is stationary and in a safe location. Essential two way radio communication related to formal work. Instructions and fatigue management related communication are permitted.
- Recruitment, induction, training/verification of competency, certification processes for mobile equipment operators

# 11. INUNDATION, INRUSH AND SUBMERGENCE

## INTENT

To eliminate or minimize the risk of fatalities and injuries resulting from inrushes inundation or submergence caused by the uncontrolled/unmonitored mass movement of materials.

For the purposes of this AGA Standard working near or with water are defined as:

- **Submergence:** dip or immersion in a liquid or slurry.
- **Inrush:** an unplanned or uncontrolled flood of liquid, gas or material with potential to create a hazard.
- **Flooding:** an overflow of a large amount of water/slurry beyond its containment limits.

## CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Inundation management plan** to include as a minimum the following: weather information & water levels requiring monitoring, emergency plans, signage & restricted areas, and evacuation triggers for surface & underground operations
- **Analyses and implementation** of controls to cater for climatic conditions, storm water runoff and groundwater inflow.
- **Cover drilling** will be conducted in areas where potential water bearing structures and/or historical/unmapped mine voids are present and holes will be cement grouted as required. Drilling will be conducted by competent personnel experienced in high pressure water using suitable equipment
- **Bulk heads, dam walls, water channels and storage facilities** will be designed by a Professional Engineer, designs kept in a design register and the locations depicted on the annual mining plan.
- **High Level Water Alarm** – Set critical operating water level limits to avoid overflow and consequent damage to infrastructure / submergence of conveyances and flooding of shaft bottom infrastructure
- **Potential flooding:** define areas with slow drainage which may be prone to flooding. Define areas with fast drainage prone to flash floods. Apply special emphasis on the pit and infrastructure locations.
- Provide a map showing the areas that are in the zone of potential flooding where site infrastructure may be at risk.
- The **design, construction and operation of tailings storage facilities** shall meet the requirements of the AGA Tailings Management Framework
- **Backfill material specification** is to be based on adequate investigation that ensures the stability of the fill material and prevention of liquefaction or re-mobilising.
- **Annex holes**—All drainage holes should be appropriately barricaded to prevent inadvertent access.
- Prior to mining near underground water sources or old workings, **water should be drained or pumped to below the current working level.** If this is not practical, a minimum safe approach distances to be determined and maintained
- Where underground mining activities are close to the base of oxidation or the surface, the **surface area should be fenced or barricaded off.**

## DEFENCES (Other controls to be implemented)

### Conventional Underground Operations

- All steel and concrete components of boxfronts, as well as the chute and door, should be designed to withstand the pressure as defined by relevant industry standards.
- Boxfronts should be designed such that the chute operator is removed from the “line of fire” and is provided with an emergency escape route
- Provision to be made to clear hang ups without entering the ore pass, and workers barring hang ups through the box front to be protected from falling rocks.
- In-stope ore passes designed to ensure that excess water and / or mud is not allowed to enter the ore pass.
- All drill holes are to be appropriately grouted to prevent water inflow if in a situation that they could pose a threat, e.g. holes into, or near underground aquifer.
- Consideration to be given to the effects of rapid air or hydraulic movement in the vicinity of passes during operations and the sudden release of hang-ups.
- Material tonnage movement in passes should be monitored (material in = material out) to detect hang-ups and identify excessive wear in the pass.
- Each site to develop and implement appropriate water management control systems, catering for the site-specific climatic conditions and to prevent sudden integrity loss of water storage facilities.
- Strategic dewatering equipment to be kept on-site and rapidly deployable in the case of unexpected water ingress to the shaft or workings.
- De-watering pumps (electrical pumps) - pumps have secondary power supplies available for backup.
- Inspection of shaft bottom dewatering infrastructure.
- Groundwater level Monitoring System.
- SCADA (or similar) monitoring of dam levels and process water reticulation.

### All Operations

- A hydrological assessment to be conducted to identify precautions required when mining close to flowing or standing surface water.
- A risk assessment should be conducted at each site to identify where there is exposure to inrush, inundation, or submergence of conveyances or ramp portals.

## 12. LIFTING OPERATIONS

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from lifting and rigging operations.

For the purposes of this AngloGold Ashanti Standard, lifting operations is considered to be work to be done for lifting or lowering loads and includes its attachments. Equipment covered would include lifts, cranes (mobile and gantry), forklifts and the associated attachments including ropes, slings, hooks, shackles, eyebolts, rope and pulley systems, crawl beams and any form of mechanical or electrical hoist. In some instances, local legislation may have more stringent requirements which then take precedence.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- All lifting equipment shall be **inspected** in accordance with applicable national or local regulatory codes, all regulatory and statutory requirements and appropriate recognised industry standards. To be done at a minimum of quarterly intervals where there are no local/statutory requirements etc.
- Lifting equipment shall be **clearly marked and tagged** for clear identification so that compliance in respect of testing and inspection can be checked.
- **Limit switches/overload protection** shall be fitted and interlocked with mobile and overhead cranes where appropriate and applicable to prevent lifts outside the safe working or cut off limits.
- Mobile Crane **level interlocks** shall be fitted where applicable to prevent lifting if cranes are not level.
- **Lifting and drop zones** shall be clearly demarcated and barricaded for fixed lifting/offloading areas or for major and complex lifts.
- A **lift plan or study** shall be in place and planned for every major and complex lift (lower level risk assessment processes for continuous forklift/HIAB style lifts).
- All personnel involved in lifting operations shall be **trained and competent** to do so in accordance with applicable national or local codes, all regulatory and statutory requirements and appropriate recognised industry standards.
- All lifting equipment used on AngloGold Ashanti sites shall be **de-signed to a factor of safety** and overhead / mobile cranes shall have **automatic braking** fitted as determined through risk assessment.
- **Non Destructive Testing/ full load testing /physical measurement/relevant testing protocols** shall form part of regular inspections on lifting equipment where applicable
- The **safe working load (SWL) or working load limit (WLL)** will be clearly identified and marked on all cranes and lifting equipment. These limits are not to be exceeded.
- A **register** of all lifting equipment shall be maintained.
- **Fabricated lifting equipment** shall not be used unless properly engineered, load tested, and certified by a competent individual (i.e. Mechanical Engineer) in accordance with relevant standards.
- Cranes shall be subject to **pre-use visual inspections** of ropes, sheaves, hoses, and general conditions. Inspections shall include tests to confirm the correct operation of all limit switches, shutdowns, load indicators, alarms, and other safety devices.

### DEFENCES (Other controls to be implemented)

- A procedure describing all the requirements, processes and activities involved in lifting operations, including inspection regimes, establishing lifting plans and training of personnel for lifting operations on AngloGold Ashanti sites shall be in place.
- All electric cranes shall have power supply isolation point(s) capable of being positively locked.
- Damaged or out-of-certification lifting equipment shall be clearly identified and quarantined/destroyed to prevent inadvertent use.
- All crane hooks shall be fitted with positive locking safety catches.
- A pre mobilization inspection process is to be in place to ensure that Contractor cranes and associated lifting equipment meet with both AngloGold Ashanti and local statutory requirements.
- Cranes to have a physical locking system that disables and isolates its free-fall capability.
- All cranes and lifting equipment shall be identifiable with a unique identity code or number.
- All cranes and lifting equipment design standards shall comply with the relevant ISO standard. In countries where the requirements of the relevant national standards exceed (i.e. are more restrictive) the requirements of the ISO standard, the national standard shall apply.
- Load charts shall be available to the crane and lifting equipment operator.



## 13. LIGHT VEHICLES

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the use of on and off road light vehicles.

A "light vehicle" is a vehicle which can be licensed and registered for use on a public roads, has four or more wheels (excluding quad motorcycles), seats a maximum of 12 adults (including the driver), can be operated by a driver issued with a standard basic-level public road driver's license, and the gross vehicle weight (GVW) does not exceed 4.5 tons.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Traffic management plan** to include as a minimum the following:  
Road design, road rules, layouts, signage, windrows / berms requirements; Traffic/Pedestrian segregation methods; speed limits; Access controls to active mining areas; change management for traffic changes; parking; extreme weather; dust control; floating/towing requirements; emergency crash and break-down
- **Authorisation system** is in place to ensure that drivers of vehicles are authorised and verified as competent to operate that type of vehicle (may be manual or electronic).
- System to ensure **Fitness for Work** - To ensure adequate measures are taken to manage & prevent impairment from issues relating to fatigue, drugs & alcohol etc.
- **Pre-start checks** - category fault section on pre-start.
- A **maintenance and inspection** program shall be in place for all Light Vehicles
- Vehicle specification Roll Over Protection (**ROPS**) or New Car Assessment Program (**NCAP**) - dependent on risk assessment and application, specification and or maintenance availability.
- Training and Competence—Training program is to ensure **verification of competency** for light vehicles and extra training provided where required (i.e. driving in remote areas/4WD). Refresher training shall be risk assessed to identify frequency of training or on implementation of a new change that could have a material impact as assessed in the change management process.
- Safety belts for all occupants

### DEFENCES (Other controls to be implemented)

- Brake Test to be conducted as per OEM recommendations for different vehicle types before entering active mining areas.
- Light vehicles to have the following extra safety features fitted:
  - ◇ A fire extinguisher and first aid kit as required by risk assessment
  - ◇ Emergency roadside triangles or beacons
  - ◇ Signage appropriate for the location and driving condition, allowing for easy and positive vehicle identification. In locations where this could be a security concern, this requirement can be waived.
  - ◇ Cargo barriers and load restraints designed for carrying loads (other than passengers), or that are unable to have cargo separated from the vehicle occupant carrying space
  - ◇ Radios for positive communication in active mining areas
  - ◇ Reverse alarms and flag poles for operational mining areas
- Maximum load limits and capacity to be clearly marked on all vehicles fitted with tow bars, winches, and/or cargo areas (bed)
- A change management process to accompany all vehicle modifications, including the attachment of any equipment.
- Running lights (low-beam head-lamps) to be left on at all times when the vehicle is in operation.
- Mobile phones, whether hands-free or not (mobiles), to only be used by the driver of a vehicle while the vehicle is stationary and in a safe location.
- Light vehicles working within a mine (open pit or underground) to be run on Diesel fuel.
- In Vehicle Monitoring System (IVMS) to be utilised for managing driver behaviours/condition monitoring/proximity warning/vehicle performance. IVMS requirement based on formal risk assessment.
- All employees, contractors, and visitors to be inducted in the appropriate road safety and site vehicle hazards.
- No passengers shall be allowed to be transported in the rear of LDV's, Trucks or Pickups unless such have been designed specifically for this purpose.

## 14. PRESSURIZED EQUIPMENT

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the uncontrolled release of energy from pressurised equipment and systems.*

*Pressure equipment means steam boilers, pressure vessels, piping, safety valves and other components/assemblies subject to pressure loading.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Pressure release valves** - mechanical device, set at a pre-determined value to safely dump/vent the excessive pressure. Only applicable on "designated pressure vessels"
- **Blowdown valves and rupture discs**, as a second line of defence, where installed or required by legislation, need to be maintained.
- **Permit to work** on equipment (Pressure/Boiler) - permit issued after Job Safety Analysis and Personal Risk Assessment to determine energies involved to align with the Isolation and lock out procedure (including exclusion zone requirements).
- All pressure containing equipment to be included in the site's **planned maintenance system** and include detailed inspection procedures and intervals. Detailed records of inspections are to be retained as per Regional/Country requirements.

### DEFENCES (Other controls to be implemented)

- **Structural integrity measurement:** NDT All pressurised equipment, regardless of pressure rating, to be designed, constructed, tested, inspected, placed into service and maintained in accordance with OEM specifications, applicable national standards and appropriate internationally recognized industry standards.
- Flow control - Controlling the flow of water/steam in and out (Where applicable).
- All pressurised equipment, regardless of pressure rating, to be designed, constructed, tested, inspected, placed into service and maintained in accordance with OEM specifications, applicable national standards and appropriate internationally recognized industry standards.
- An equipment register with unique equipment or serial numbers physically marked or tagged shall be in place to record compliance of all pressure vessels (inclusive of mobile plant).
- All new and refurbished/repared pressure vessels to be clearly marked with a unique identifier, maximum working pressure as verified by an independent competent person, date first placed into service, Maximum Allowable Working Pressure (MAWP) and Maximum Test Pressure (MTP).
- Specific documentation for pressure vessels to meet local regulatory requirements with register of all pressurized equipment and vessels, including unique identifiers, contents, and maximum working pressure to be maintained.
- Relief devices to have a set-pressure below the maximum working pressure of the equipment being protected and to vent to an appropriately designed system (i.e., drain) or, alternatively, to a safe area.
- Check valves to be designed to impede flow and are not to be used to control or isolate pressure.
- All instrument connections on pressure containing devices to be provided with a means of safe isolation and to be appropriately rated.
- Through risk assessment, a process to be in place to ensure flexible hoses, temporary piping to be clamped/ restrained/ designed to prevent whipping and or becoming a projectile in the event of a connection failure. Equipment should be oriented in a direction where personnel and escape routes are not in the potential line of fire.
- All storage and racking systems to be designed and installed with positive latching restraint system which prevents cylinders from tilting out of the rack.
- Engineering change management process shall be in place to assess all of the risks associated for all engineering/process changes to pressure vessels.
- Pressure testing with volatile / flammable fluids is not to be conducted.
- Only competent and authorized personnel to be permitted to work with or on pressure equipment.

## 15. RAIL-BOUND TRANSPORT

### INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the use of rail-bound transportation equipment.

"Rail-bound transportation equipment" includes all rail mounted equipment designed specifically for rail bound locomotives, personnel transporters and all transport machinery with a machine-mounted operator.

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Front driven trains** where the train is operated **from the direction of travel** (exclude underground conventional development, shunting of cars on stations) to be used rather than conventional trains.
- Rail Vehicle-to-rail vehicle **proximity detection devices** to provide collision-avoidance protection.
- **Proximity Device** systems will be used for protection between drive units and not "machinery" i.e. other RBE.
- **Auto coupling devices** with the locking mechanism able to be applied from a position of safety (ore hoppers).
- **Fail-to-safe designed** brakes, locomotive controllers and primary power isolation mechanisms
- **Rail bound traffic plan** which is inclusive of (Mine standards, Guidelines and Track Bound Equipment Code of Practices to include as a minimum the safe operating width, height, inclination, surface, management of restricted areas, rail design, layouts, signage, segregation, speed zoning, parking rules, requirements for unattended break downs, etc.
- A **key control system** to prevent unauthorised operation.

### DEFENCES (Other controls to be implemented)

- Controls for pre-use and operational checks, including appropriate brake tests (i.e., Static and dynamic brake tests) to define clearly that transport equipment is safe to operate.
- A permit or certificate system to ensure operators are competent and authorized to operate the type and class of underground equipment in its intended environment.
- Layout of cabins should take into consideration the ergonomics of seating, operator controls, and retrofitted devices
- Adequate illumination capabilities.
- Speed limiting devices.
- The Guard Car shall be a properly designed guard car to ensure the safety of the guard must be used and not modified hoppers etc.
- A system to indicate direction of travel (i.e., alternate lighting system).
- A coordinated rail signalling system is to be implemented and maintained - where required by formal risk assessment.
- Maintenance and inspection requirements for all transport railways and equipment, e.g. measurement of track gauge and super-elevation; rail-crown wear, brakes, steering, etc. The system to ensure records is kept of all maintenance and inspections.
- Set requirements for personal protective equipment and effective reflective clothing.
- A formal selection and acceptance process for all new (to site) and modified underground transport equipment prior to commencement of work on site.
- Through risk assessment, either/or Rail Sprags and De-railing device and warning signs to be utilised for rail maintenance activities
- Re-railing procedure to be created and implemented with correct and certified equipment/tooling
- Electronic signalling system between guard and driver where guard can invoke an emergency stop at any time when outside of caboose or guard car

# 16. UNDERGROUND VENTILATION

## INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from inadequate ventilation flow in underground working places. .

Underground mine ventilation provides a flow of air to the underground workings in a mine with sufficient volume to dilute and remove dust, noxious and flammable gases and to regulate the temperature. This ensures that a safe and healthy environment, optimal for production, is maintained.

## CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Emergency Response Plan** (To be defined by the individual Operation) includes, as a minimum, the following:
  - Adequate, safe and demarcated **escape routes and second outlets**.
  - Workplace induction, **emergency response** training and evacuation drills.
  - **Early warning** of dangerous conditions via personal flammable gas and carbon monoxide gas measuring instruments.
  - **Testing of Emergency Systems** will be carried out at intervals as identified from a formal risk assessment or Statutory/Country requirements.
  - **Refuge chambers** in place, maintained and designed as per AngloGold Ashanti and Statutory requirements.
- **Fire Hazard Standard** with specific reference to hazardous materials and equipment, quantity thereof and protection measures required when sited in intake airways.
- **Monitor of critical ventilation equipment** via to ensure optimal operation as well as timeous response during failure.
- **Pre-start checks** – Competent person checklist includes measurement of ventilation flow, temperature, flammable and noxious gas before a working place is declared safe for work to continue (where the applicable risks are present).
- **Continuous Assessment** to ensure compliance to ventilation standards, regulations and industry best practises.
- A **plan of the mines ventilation system** is kept onsite at the mine that shows: the direction, course and volume of air currents, and the position of all air doors, stoppings, fans, regulators and ventilating devices, within the mine
- **Self-Contained Self Rescuers (SCSR's)** and cap lamp to be worn by all personnel in the underground environment.

## DEFENCES (Other controls to be implemented)

- Adequate planning and ventilation circuit design with verification of expected results by a ventilation simulation program such as VUMA.
- Fitness for Work screening for exposure to thermal environment, inclusive of both heat and cold stress)
- Real time gas monitoring of carbon monoxide/dioxide levels in the underground environment to detect and indicate fire. (application determined through a formal risk assessment or applicable legislation)
- Monitoring of the underground environment to detect other noxious gases (i.e. CH<sub>4</sub>, CO<sub>2</sub>, NO<sub>x</sub>). Monitoring process shall be risk assessed and may be either/or fixed or personal monitoring
- A change management process to reassess the adequacy of the ventilation following a change in the production plan.
- Start-up procedure and a ventilation layout for all new working places. Ensure switching is only conducted in ventilated areas.
- Interlocks of ventilation systems need to be enforced when they are not installed in through ventilation areas, when flammable gas risk is present.
- A system to be in place to ensure that all employees, contractors, and visitors, when changing from workplace, receive adequate workplace induction that includes emergency response training and evacuation drills.
- Periodic, risk based inspections of underground environmental conditions and analysis thereof at a minimum of a quarterly basis unless stipulated in local Statutory requirements

# 17. UNDERGROUND VERTICAL TRANSPORT

## INTENT

To eliminate or minimise the risk of fatalities, injuries, and incidents arising from the use of underground vertical transportation equipment.

Transport of people, equipment and product in a vertical shaft for mining purposes

## CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Mechanically Interlocked devices** related to interaction between bell brake (not necessarily a mechanical interlock), clutch brake, skip door open, measuring flasks (electrical monitoring and interlock only – no mechanical), shaft gates on multiple loading deck station, station safety devices (not all mechanical).
- Bank and sub-bank or **station gate/door** leading into the shaft will have a **locking mechanism** that can only be operated by the Banksman or Onsetter.
- **Pneumatic or electrically interlocked shaft station primary and secondary stopping devices** which fail into the safe mode in event of pneumatic pressure or electrical failure. Fail-to-safe.
- **Automatic trip of winders** in event of slack/, tight rope condition on any automatic or manual winders and or in the case of a loss of signal conditions on a manual Man winder.an end of wind trip.
- **Cage / Skip arresting devices**, Jack catches and spectacle plates installed operated, and maintained.
- **Winder brakes** shall be fitted with fail safe braking systems, either spring applied hydraulic lift brake systems or pneumatic dead weight systems.
- **Speed and distance** controllers.
- **Jack catches** are to hold a cage in one position after it has been disconnected from the winding rope during the occurrence of an overwind.
- Design, **maintenance and integrity of shaft infrastructure**, which includes **movement monitoring** systems as well as monitoring of **in-shaft services infrastructure** - where the risk exists.
- **Shaft communication systems** (shaft phone or ECAM type systems) for use during shaft repairs or examination fitted with loss of signal alarms to indicate that communications have been lost.
- Additional shaft examinations when shaft bottom is flooded to determine **water levels** and to **deploy emergency pumping equipment**.
- Emergency **back-up power systems** for moving personnel winder from mid-shaft to the nearest lower level for safety.
- Slack rope detection in the form of an electronic load cell device either mounted between the attachments and the conveyance transom or under the sheave wheels

## DEFENCES (Other controls to be implemented)

- Risk assessments undertaken as part of the design, selection, commissioning, operation, modification, and maintenance processes for all vertical transport equipment.
- Controls as required by the local regulating authorities shall be included as additional requirements to the following systems:
  - Rope miss coil devices (BMR type winders)
  - Locked-bell, call-bell, and bell-recorder installed, operated, and maintained.
  - Continuous rope condition monitors for those installations/shafts running with reduced factor of safety on winding ropes or where rope life problems are experienced or rapid deterioration of rope condition has historically occurred.
  - Guide / gauge distometers - for shaft systems with shaft barrel movement or shaft pillar extraction.
- A formal selection and acceptance process to be in place for all new (to site) and modified underground vertical transport equipment prior to commencement of work on site.
- A system to be in place to identify the maintenance and inspection requirements for underground vertical transport equipment. The system to ensure records is kept of all maintenance and inspections. Whilst shaft examinations are conducted communication devices (at least two ECAM communication sets) are to be situated inside of the conveyance (not external).
- Procedure to follow in case ECAM communication is lost.
- Controls to be in place for pre-use and operational checks to clearly define transport equipment is safe to operate.
- A system to be in place to monitor all shaft services such as communication and power cables as well as water, slurry and compressed air pipes and their corresponding supporting infrastructure.
- Testing of emergency systems and procedures as required.
- Winding Engine drivers / Shaft Masters/Shaft Examination log book to be kept and maintained.
- A procedure to be in place to ensure no person rides illegally on top of any vertical transport equipment.
- A system to be in place to ensure persons operating equipment are suitably trained and found competent.
- PFD's (personal flotation device/life preserver) only to be worn on top of conveyance in inspection basket and not whilst piloting the conveyance from inside the actual conveyance. May be taken with personnel inside but not worn. Requirement only where examinations are being done under flooding conditions.

## 18. WORKING AT HEIGHT

### INTENT

*To eliminate or minimise the risk of fatalities, injuries, and incidents arising from falls while working at height.*

*For the purposes of this AngloGold Ashanti Standard, working at heights is considered to be whenever a task involves working at a height greater than or equal to 2 metres. In some instances, local legislation may have higher requirements which then take precedence.*

### CRITICAL CONTROLS (AngloGold Ashanti Global Priority)

- **Work Package planning** shall consider the risks and address requirements specific to each task at the planning and scheduling stage for working at height. This needs to be included in work details and Job Safety Analysis (JSA) requirements.
- There shall be a **permit to work system** in place to control all non-routine Working at Heights not covered by written procedures.
- An approved, in-date (quarterly inspected and certified annually) **full body harness** including appropriate fall protection system shall be attached to a safe anchor point identified through a risk assessment process, and shall be worn when working from height.
- **Permanent anchor points** shall be tested and inspected at a minimum of yearly intervals and be in-date (single person anchor points shall be capable of withstanding 15kN). Frequency may increase if exposed to forces that may decrease the integrity of the anchor point.
- Appropriate **signage and barricades** shall be in place prior to starting work at height.
- Systems shall be in place to ensure working at heights work is limited only to those **personnel who are suitably trained and competent** and must comply with the relevant equipment safe working parameters/fitness for work for work at heights.
- All vertical openings shall be adequately demarcated and barricaded and have appropriate signage.

### DEFENCES (Other controls to be implemented)

- New built plant and equipment shall be designed to minimise the need to work at height and provide safe means of access for inspection, maintenance and operations.
- An equipment register and tagging system shall be in place to record compliance of all working at heights equipment inclusive of fixed and portable ladders.
- All forms of portable, movable elevated work platforms and suspended work cages shall conform to relevant approved design standards and be inspected periodically.
- All platforms, scaffolds and any other temporary structures shall be constructed only under the direction of competent and authorised persons
- The integrity and Safe Working Load (SWL) of surfaces to be accessed or worked on are to be assessed prior to access to avoid a person falling through, i.e. skylight sheeting and supporting mesh, brittle or corroded materials.
- Secure working areas (flooring securely fastened in place and/or mesh, railings, or solid barriers) shall be used wherever practicable in preference to elevated work platforms, ladders, access ways or other forms of access.
- Grid removal should be done by work permit and assure physical barriers avoid human access
- Dual lanyard system shall be used where work entails the necessity to detach and reattach at height.
- As per hierarchy of control, stairs, scaffolding and fixed ladders shall be used as preference for access rather than mobile ladders.
- Access ways shall have handrails, kickboards and non-slip step nosing.
- Fixed ladders shall be fitted with cages that meet relevant design standards/statutory requirements/height over 2 meters and placed where stairs or access ways are not practicable.
- A system should be in place to prevent tools, materials and other objects from being dropped from height e.g. wrist lanyards.
- Standard work procedures shall be in place for the correct wearing and use of approved personal fall-arrest and fall-restraint equipment for all work at height (through risk assessment and planning).
- Where the use of personal fall arrest equipment is required, the person shall not work alone.
- The site emergency response plan(s) shall include plans for rapid retrieval of personnel in the event of a fall from height. Response Plans shall include training requirements for rescue teams and for the use of specialised rescue equipment.



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