



Title

FRCP Protocol Manual

PURPOSE

To govern and reduce risk associated with activities related to the Samancor Chrome Fatal Risk Protocols

BRIEF DESCRIPTION OF CHANGE

All current Samancor Chrome FRCP's incorporated into a combined manual.

Revision 2 – Changes added to Annexure 1 – page 43

APPROVAL SIGNATURES RECORD			
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1.0 Intent

This Fatal Risk Control Protocol (FRCP) provides the Samancor Chrome mandatory minimum performance requirements in ten key fatal risk areas with the intent to prevent the occurrence of fatalities and significant incidents.


2.0 Reason for Inclusion

Over the past years, many severe and sometimes fatal incidents have occurred at Samancor Chrome. Cause-analysis of the events indicated that the majority of these incidents could be categorised into ten categories. The analysis also indicated that virtually all causes can be linked to a deviation from or disregard of some form of rule or the lack thereof.

These categories are listed under the following:

1. Light Vehicles (LV)
2. Surface Mobile Equipment (SME)
3. Underground Ground Control (UGC)
4. Underground Mobile Equipment
5. Hazardous Materials Management, including Explosives (HAZMET)
6. Molten Materials Management (MMM)
7. Isolation (ISO)
8. Equipment Safeguarding (ES)
9. Working at Heights (WAH)
10. Lifting Equipment (LE)

Following this categorisation of causes, a Gap assessment was done throughout Samancor Chrome on these categories to determine the need for procedural guidance and rules. The outcome of this Gap assessment resulted in the drafting and implementation of the Fatal Risk Control Protocols (FRCPs).

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3.0 Application – Who this applies to

These Protocols apply to all Samancor Chrome controlled sites and activities and include all Samancor Chrome employees, contractors and visitors when involved in controlled activities.

The SHEQ Council is the custodian of the FRCPs and from there, each site GM, with the guidance of the SHEQ Manager, shall identify FRCP protocol champions who will be tasked with the coordination and up-keep of these protocols. Line management at all controlled activities shall participate in maintaining these Protocols relevant to their areas of responsibility.

3.1 Fatal Risk Control Protocols Champions

Protocol	SHEQ Champion
1. Light Vehicles	SHEQ Manager TFC
2. Surface Mobile Equipment	SHEQ Manager TFC
3. Underground Mobile Equipment	SHEQ Manager WCM
4. Underground Ground Control	ECM S&H Manager
5. Hazardous Materials Management	Group Environmental Manager E&Q Manager ECM
6. Molten Materials Management	SHEQ Manager MFC
7. Equipment Safeguarding	SHEQ Manager FM
8. Isolation	SHEQ Manager FM
9. Working at heights	Head of SHEQ
10. Lifting	SHEQ Manager MFC

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4.0 Performance Requirements

The mandatory requirements of these Protocols are signified by the use of the word “shall”. The word “should” indicates that the primary intent is to comply with the full requirements as if they were mandatory. However, there will be circumstances where local conditions may demonstrate that the requirement is either not applicable or an alternative approach is necessary. In cases where “should” has been used in a requirement, variation can only be considered as compliance if the most senior manager of the operation approves it, based on an evaluation of the risk. The risk management approach adopted must be consistent with the SHEQ Risk Management Guideline and follow the Hierarchy of Controls.

Please note: Many of the categories below are governed by Legislation or SANS Codes. The requirements below must be read and implemented as an addition to that.

4.1 Light Vehicles (LV)


A. LIGHT VEHICLE REQUIREMENTS

Light vehicles include all surface light vehicles that are designed for public road use. Examples include:

- Passenger cars (pool cars)
- Pick-ups (utilities, LDVs or bakkies)
- Four wheel and all-wheel drive vehicles, including sports utility vehicles (SUV's)
- Mini busses

Road going vehicles shall have the following minimum safety features:

- Basic roadworthy requirements (brakes, lights, indicators, rear-view mirrors, horn, windscreen, speedometer, wipers, no oil leaks, good tyre condition, etc.)
- Seat belts for all occupants
- A first aid kit for vehicles that are deployed in remote or of off-site areas
- Portable fire extinguisher
- 2 Emergency roadside triangles or 2 beacons and reflective bib to be worn in the event of a roadside breakdown
- Cargo barriers between cab and load, net or load restraint to secure loads and separate passengers from cargo
- Roll-over protection for all light duty vehicles (LDV's)
- Driver side airbag

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- No side-facing seating
- Comply with OEM minimum specifications

Light vehicles should have the following minimum safety features:

- High visibility colour
- If available for vehicle type, a passenger side frontal airbag, electronic stability control (ESC), anti-lock braking system (ABS) and single piece wheel rims


Light vehicles that interact with mobile equipment or enter demarcated areas shall have the following minimum safety features:

- Reflective taping
- Clearly visible amber coloured flashing, revolving or strobe light
- In areas where there is interaction with SMEs, light vehicles will be provided with a high visibility whip with flag with the flag at least 3 meters from the ground
- Clearly audible reverse alarm
- Numbers for positive identification visible from beyond safe approach distance

NOTE: Sites to ensure that their traffic management plans address interaction between pedestrians and vehicles as well as awareness between different types of vehicles on site.

B. PROCEDURAL REQUIREMENTS

1. Seat belts shall be worn at all times by all occupants.
2. A pre-operation vehicle safety check and familiarisation system shall be in place and used by the driver. “No-go” conditions will be clearly indicated on pre-operation checklists.
3. A proper key control system shall be in place at all sites. A formal maintenance inspection and preventative maintenance program shall be in place for all Samancor Chrome vehicles.
4. A system shall be in place to ensure that risks associated with vehicle journeys are managed and controlled. Refer to the Samancor Chrome motor vehicle accident prevention procedure, PR-CRC-SHEQ-014, for risk identification and journey plans.
5. Light vehicles headlights shall be left on at all times when the vehicle is in operation on site.


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6. Mobile phones, whether hands free or not, shall only be used by the driver of a vehicle whilst the vehicle is stationary and in a safe location. On public roads, road ordinance will apply.
7. Controls shall be in place to ensure the safety of people when working on roadways or effecting repairs on vehicle breakdowns. These will entail the placement of warning triangles at least 30 meters on both sides of the place of work. Reference must be made to this effect in the traffic management plan.
8. A site-based review of pedestrian interaction, road design and layouts (including entrance and exit points, intersections and other potential points of interaction between light vehicles and other mobile equipment), shall be conducted and updated when changes to layouts are required. Where possible, traffic segregation should be used to separate pedestrians, light vehicles and other mobile equipment.
9. No passengers shall be transported on the back of a light duty vehicle (LDV) or on seats inside the vehicle that has not been fitted with safety belts.
10. A site-based traffic management plan shall be in place at all sites. Refer to **Appendix 1** for the minimum requirements to be included in a Traffic Management Plan.
11. Proper isolation procedures shall be applied when work is performed on vehicles or when vehicles are left unattended.
12. A change management process approved by the responsible engineer shall accompany all vehicle modifications.

C. PEOPLE REQUIREMENTS

1. All employees, contractors and visitors shall be inducted in road safety and site vehicle hazards.
2. A permit or certification system shall be in place to ensure drivers are competent to drive the specific vehicle in their specific work related environment and conditions. Drivers that are in possession of a public license must have proof of their licenses on their person. Supervisors must have proof that persons allowed to drive light vehicles on site were properly inducted and authorised to drive light vehicles in operational areas on site. This excludes delivery vehicles as licenses shall be checked at security access points and specific roads for deliveries shall be demarcated on the road traffic management plan.
3. A fit-for-work policy shall be in place, incorporating defined action levels for drugs and alcohol, and a fatigue management plan.

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4.2 Surface Mobile Equipment (SME)

A. SURFACE MOBILE REQUIREMENTS


Surface mobile equipment also includes all rigid and articulated trucks (including associated trailers).

Surface mobile equipment shall have the following minimum safety features:

- Seat belts for all occupants
- Adequate lighting for operation and traffic interaction (e.g. headlights, tail, turn, brake, amber strobe or flashing lights on roofs)
- Identified isolation/lockout point in accordance with the isolation protocol
- Adequate walkways, railing, steps/grab handle combinations and boarding facilities including an alternative path of disembarking in case of emergency (exemption for skid steers on alternative path)
- Stairway access with the necessary features to facilitate “3 – point contact” where there is the potential to fall
- For mining SME operations, based on a risk assessment, pedestrian and collision avoidance technology on SMEs or road traffic management plans (based on the legislative requirements) where the change of collisions exist.
- Clearly audible reverse alarms
- 2 Chock blocks for rubber tyre surface mobile equipment (tracked vehicles excluded)
- Auditable horn
- Where applicable, effective windscreen wipers and washers.
- Effective guarding on accessible moving parts (consistent with the equipment safeguarding protocol)
- Numbers for positive identification visible from beyond the safe approach distance
- Portable fire extinguisher
- Two-way radios for positive communication with equipment and/or plant
- “Falling on” protective structure where occupants may be exposed to falling objects
- Underrun protection if a rigid or articulated truck trailer (brake system)

Surface mobile equipment should have the following minimum safety features, unless exempted by risk assessment:

- Approved roll-over protection


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- On-board fire suppression system capable of being activated from both ground and cabin levels
- Side mounted rear view mirrors on both sides of the vehicle
- Enclosed and tightly sealed air-conditioned cabins, with consideration of emergency escape, requirements for noise and dust suppression systems and suitable protective glass (e.g. toughened, laminated, shatterproof)
- Ergonomically sound seating, operator controls and retrofitted devices
- Attachment point for safety chains/slings for towing
- A park brake warning device
- A method for transporting supplies and personal items to and from the operator cabin to enable drivers to continuously maintain three points of contact whilst mounting and disembarking equipment (e.g. back pack or shoulder strap bag) – note that no loose articles that may affect the functions of the pedals in the cab will be allowed inside the cab.
- Design, inspection and maintenance requirements for all roadway networks including collision protection of hazardous and critical plant and equipment. Risk assessments should be carried out prior to any changes to traffic movements.
- Fleet and control consistency, where possible, to minimize operator error when changing machines.

B. PROCEDURAL REQUIREMENTS

1. Seat belts shall be used as intended at all times by all occupants.
2. Safety berms at three quarters the height of the biggest diameter wheel used on site shall be in place along all roadways where SMEs are deployed and roads that run along excavations and dump areas or as determined by a risk assessment. High wall risks must also be taken into consideration.
3. A proper key control system shall be in place at all sites. A procedure and checklist system shall be in place for pre-operation inspection by the operator, including a brake functionality test. Log books shall be maintained and audited, and shall be located on the machine. “No-go” conditions will be clearly indicated on pre-operation checklists.
4. A post-maintenance machine test (scheduled or break down) shall be conducted to ensure stability and lock-out to achieve zero energy status.
5. Parking standards shall include requirements for the immobilization of surface mobile equipment (e.g. chocking or ditches/trenches) and consideration for

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breakdown maintenance activities, isolation of vehicles when work is performed on vehicles or when a vehicle is left unattended.

6. A maintenance and inspection program shall be in place for surface mobile equipment, including critical equipment, components and roadways.
7. A site-based traffic management plan shall be in place. See **Appendix 1** for minimum requirements to be included in a Traffic Management Plan.
8. A procedure shall be in place for what maintenance an operator is allowed to perform.
9. A tyre management system shall be in place to address issues including fire, heating, explosion, electrical contact, separations, maintenance, tyre changes, storage, handling, etc.
10. Mobile phones, whether hands free or not, shall only be used by the driver of surface mobile equipment whilst stationary and in a safe location.

C. PEOPLE REQUIREMENTS


1. Recruitment and induction processes for surface mobile equipment operators shall encompass past work history, site testing, and comprehensive medical examinations that confirm fitness to perform work.
2. Site and area induction of operators shall be performed prior to starting work in a new area.
3. A permit or certification system shall be in place to ensure drivers are competent to drive on site. In addition, a system shall be in place to verify that operators of vehicles have a valid driver's license authorised by the responsible person prior to operating vehicles off-site.
4. A fit-for-work policy that governs the minimum requirements for SME Operators shall be in place. Recruitment and induction processes for surface mobile equipment operators shall encompass past work history, site testing, and comprehensive medical examinations that confirm fitness for work
5. A system shall be in place to manage driver fatigue.

4.3 Underground Mobile Equipment (UME)

A. UNDERGROUND MOBILE EQUIPMENT REQUIREMENTS

Underground mobile equipment shall have the following minimum safety features:


- Seat belts for all occupants – operator seatbelts should be provided and properly used with a device that will isolate the machine if the belt buckle is not engaged.

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- Adequate lighting for operation and traffic interaction (e.g. headlights, tail, turn, brake, strobe or flashing lights of amber colour, red and green indicators for pedestrian and other equipment operators.)
- Identified isolation/lockout point in accordance with the isolation protocol
- Adequate walkways, railing, steps/grab handle combinations and boarding facilities including an alternative path of disembarking in case of emergency (exemption for skid steers on alternative path)
- Collision avoidance technology Reverse alarms
- 2 Chock blocks for rubber tyre surface mobile equipment (tracked vehicles excluded)
- Auditable horn
- Where applicable, effective windscreen wipers and washers
- Effective guarding on accessible moving parts (consistent with the equipment safeguarding protocol)
- Numbers for positive identification visible from beyond the safe approach distance
- On-board fire suppression system that can be activated from the operator's position and from another easily accessible point on the machine on diesel powered equipment and a portable fire extinguisher
- Two-way radios for positive communication with equipment and/or plant
- Falling object protective structure where occupants are exposed to falling objects
- Approved roll-over protection
- Effective and fail safe brakes (note that this aspect is effective when the machine's engine stalls) and a park brake
- A device that automatically immobilizes the machine in the absence of an operator (when the operator opens his door) or in presence of a pedestrian within range (proximity detectors for pedestrian – vehicle – vehicle interaction)
- Red and green lights to indicate pedestrian safe approach areas
- Operator protection against hot hydraulic oil spray
- Means of emergency escape from the operator's cabin
- A means to ensure positive isolation/stabilization of the articulation area when work is performed on the machine.


B. PROCEDURAL REQUIREMENTS

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1. A procedure shall be in place to ensure that pedestrians give right of way to underground mobile equipment. Proper communication between pedestrians and operators must be established.
2. A procedure shall be in place to ensure, as far as reasonable practicable, the separation of people and mobile machines. The 5-meter rule applies and must as far as reasonable practicable be maintained between pedestrians and moving machinery.
3. Risk assessment shall be undertaken as part of the design, selection, commissioning operation, modification, and maintenance process for all underground mobile equipment.
4. Design and maintenance requirements shall be in place for all transport roadways.
5. A formal acceptance process shall be in place for all new (to site) and modified underground mobile equipment prior to commencement of work on site.
6. All people underground shall wear reflective clothing to a recognized standard.
7. Parking rules shall be in place including, but not limited to, the following:
 - Engine should be shut down, park brake applied and isolated before the operator leaves the machine, except where safe operating procedures are authorised by the senior site manager/superintendent responsible for underground operation and supported by documented risk assessment.
 - A system shall be in place to identify the maintenance and inspection requirements for underground mobile equipment (including where the mobile equipment should be located during the work).
 - A proper key control system shall be in place at all sites. A process shall be in place for pre-use and operational checks that clearly defines if underground mobile equipment is safe to operate. "No-go" conditions will be clearly indicated on pre-operation checklists.
 - Controls shall be in place to ensure that the safety of people working in and around unexpected breakdowns. The risk to any attendant employees (e.g. cable handlers) shall be specifically addressed.
 - The site shall have a procedure that governs the repair work on UGMs in the work environment other than in designated workshops and traffic controls when maintaining roadways.

C. PEOPLE REQUIREMENTS

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1. A competency based training system shall be in place for operation and maintenance of underground mobile equipment.
2. Key behaviours necessary to carry out activities associated with mobile equipment safely shall be identified.
3. A fit-for-work policy to perform work shall be in place, incorporating defined action levels for drugs and alcohol and a fatigue management plan.
4. Recruitment and induction processes for UME operators shall encompass past work history, site testing, and comprehensive medical examinations that confirm fitness for work.
5. Site and area induction of operators shall be performed prior to starting work in a new area.
6. A permit or certification system shall be in place to ensure drivers are competent to drive on site. Proof of permit to operate must be kept with the operator at all times. In addition, a system shall be in place to verify that operators of vehicles have a valid driver's license prior to operating vehicles off-site.
7. A fatigue management programme shall be in place.
8. Recruitment and induction processes for underground mobile equipment operators shall encompass past work history, site testing, and comprehensive medical examinations that confirm fitness for work.


4.4 Underground Ground Control (UGC)

This protocol is aimed at preventing falls of ground and uncontrolled ground movement that may occur in underground and surface operations.

A. UNDERGROUND GROUND CONTROL REQUIREMENTS

The following minimum requirements shall be in place for underground ground control:

- Design and selection of equipment used in ground control applications shall meet the requirements specified in the ground control plan. There must be a geotechnical risk control plan for initial, ongoing and changed operations.
- The equipment design shall incorporate removal or separation of workers from unsecured ground, or the equipment shall provide a physical barrier to protect workers in the event of an uncontrolled ground movement from hangingwall, sidewalls or footwall.
- Materials used in the ground support system shall be selected and routinely tested to ensure it meets the required specifications of the ground control plan.


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- Equipment/support used in the ground control system shall be maintained and tested on a regular basis to ensure that it meets the ground control plan requirements and specifications (e.g. torque settings for bolt installation).
- Advances in ground control technology shall be assessed, and appropriate engineering reviews should be conducted to determine if new technology should be implemented or used.

B. PROCEDURAL REQUIREMENTS

1. Initial and ongoing geotechnical analysis and assessment shall be an integral part of the mine design process and carried out by a qualified and competent person/s.
2. The mine design, ground control hazards/risks plan and actual excavation and mining activities must be aligned.
3. There must be a system to ensure the quality of ground support materials and their installation.
4. There must be a system to prevent personnel from going beyond secure/examined ground.
5. There must be a multi-tiered response plan on varying ground conditions.
6. There must be a system to identify and communicate changes of ground conditions to affected personnel.
7. In developing, implementing or altering any ground control system a geotechnical risk assessment process shall be undertaken.
8. Systematic collection and analysis of data shall be in place for management of prevailing and predicted conditions and to assist with identification of triggers and pre-empting changes to the physical conditions.
9. Systematic and ongoing monitoring shall be in place that assesses the quality of the materials, installation and effectiveness of the ground support system.
10. Documented procedures shall be in place to ensure the safe and effective installation and removal of ground support.
11. A documented risk assessment shall be conducted before any remedial work is carried out to improve or regain stability, and appropriate risk reduction measures adopted.

C. PEOPLE REQUIREMENTS

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1. The Appointed Manager, responsible for underground operations, shall authorise the ground control plan and is accountable for its implementation and ongoing effectiveness.
2. Roles and responsibilities shall be assigned to ensure implementation and management of the ground control plan.
3. A competency based training program shall be in place including, but not be limited to the following criteria:
 - Support design principles
 - The ground control plan
 - Placement and removal of supports
 - Recognition of indicators of change that may affect ground stability
 - On-the-job training and assessment
 - Requirements for reporting changes
4. Suitably qualified, competent and experienced person/s shall be involved in the design, planning and implementation of the ground control plan.
5. A process shall be developed and maintained for the ongoing communication between the geotechnical team, operations management and operators. This should include the communication of changes to ground conditions to affected persons.
6. Shift change procedures shall include the requirement to notify relevant personnel of changes to ground conditions and control.

4.5 Hazardous Materials Management (HAZMAT)

This protocol refers to hazardous materials and explosives which may harm people, the environment or community but excludes radioactive materials.


A. HAZARDOUS MATERIALS MANAGEMENT REQUIREMENTS

1. The basis of design of a facility or process, permanent or temporary, which transports, produces, stores, uses or disposes of hazardous materials shall be reviewed, amended as necessary and documented, utilising a process risk assessment tool.
2. A system shall be in place to ensure that all relevant design documents and drawings of current and new buildings and installations associated with this Protocol are up to date, controlled and available.

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3. Provisions shall be made for safe storage, venting, drainage and containment, where required by normal operation and emergency situations, based on a risk assessment.
4. Labelling shall be in place on all storage vessels, containers and tanks. Labelling shall clearly identify the stored material and the risks related to the material (i.e. poisonous, flammable, etc.). Chemicals should only be decanted into approved containers with identification and signage corresponding to the container decanted from.
5. Piping containing hazardous substances shall be clearly marked (refer to SANS Codes). The contents and direction of flow of the piping must be clearly identifiable. Markings on pipes should be at pipe inlet / outlet, control valves, flanges and operating valves.
6. Access control systems appropriate to the risk shall be in place to manage access to areas where hazardous materials are stored and used. This shall also identify specific areas where hazardous materials may be released under certain operational circumstances (e.g. vent opening during process upset) and whatever restrictions are placed on access to those areas.
7. Process control systems shall ensure that the potential for personnel to be exposed to environments where hazardous materials are applied or stored is eliminated wherever possible or reduced to as low as reasonably possible (ALARP).
8. Automatic plant control systems should be in place in hazardous material facilities to eliminate the need for operator intervention and maintain operation within the required parameters. Such systems shall incorporate fail- to-safe systems in the event of emergencies. Where automatic control is not practicable, risk assessment shall be used to identify and implement operational options that reduce risk exposures to ALARP.
9. Fixed and personal gas detection devices shall be considered as options in the selection of potential risk reduction measures. Leak detection devices should be considered as an option in the selection of potential risk reduction measures.
10. Explosives transport vehicles and containers shall comply with legislation.
11. Explosives and initiating systems shall be:
 - Handled and initiated by competent and appointed persons
 - Stored securely in facilities compliant with legislation and appropriately segregated
 - Routinely inspected, inventoried, rotated and stock movements shall be recorded
 - Protected against accidental initiation causes

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12. All blasts, including secondary blasts, shall have a plan detailing the blast design, area details and clearance zones.
13. There shall be a system to prevent drilling into loaded holes or explosives remnants (Misfires).
14. There shall be a system for blasting in hot or reactive areas.

B. PROCEDURAL REQUIREMENTS

1. A site-wide Baseline Risk Assessment must be completed where hazardous materials are used. Points that must be considered is the maximum inventory stored in one area, adequacy of storage facilities, hazardous nature of the substance, potential to cause damage, and possibility of long and short term exposure which can cause harm. This risk assessment process shall include people with relevant subject knowledge or expertise. Consideration should be given regarding the use of external people (e.g. supplier technical officers).
2. Where the hazardous materials baseline shows a specific hazardous material with a significant risk, a documented Issue Based Risk Assessment or Critical Task Analysis is compulsory. Risk reduction using the hierarchy of controls must be applied in the following order (a number of these options may be considered and applied individually, or in combination):
 - Eliminate - the complete elimination of the hazard
 - Substitute - replacing the material or process with a less hazardous one
 - Redesign - redesign the equipment or work processes
 - Separate - isolating the hazard by guarding or enclosing it
 - Administrate - providing controls such as training, procedures, etc.
 - Personal Protective Equipment – use appropriate and properly fitted PPE where other controls are not practical; impact minimisation equipment such as spill clean-up or dust suppression measures must be provided at all storage or application areas.
3. A site hazardous materials register shall be in place for all hazardous materials considered in the baseline risk assessment, containing the following data:
 - Product name
 - Manufacturer or Supplier
 - MSDS available (revision dates reflected on the MSDS and not older than 5 years)
 - Maximum inventory stored in one place

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- Storage location
 - Class of hazardous chemical according to SANS 10228
4. All facilities / activities as identified by means of the Baseline Risk Assessment which has a significant risk rating, resulting from hazardous substances shall provide an emergency response plan specifically formulated for that area and substance which includes:
 - Means of escape in an emergency situation
 - Emergency response teams appropriate to the risk
 - Appropriate safe refuge and assembly areas for people
 - Emergency response equipment for spillage containment, fires, explosions, burns, etc.
 - Appropriate response arrangements with external medical providers e.g. ambulance, hospitals, fire brigade etc.
 - Emergency response procedures appropriate to the hazardous materials and the risk
 - Recovery procedure and disposal of the hazardous material
 - Annual simulation exercises shall be conducted as a minimum
 5. A documented system shall be in place for maintenance, inspection, calibration and testing schedules for critical equipment associated with hazardous materials.
 6. A system shall be in place for the introduction and disposal of hazardous materials, including containers. This system must be approved by the Hazardous Materials Coordinator.
 7. Whenever a new facility, equipment and / or processes for transportation, storage, handling, use and disposal associated with hazardous materials is introduced, or an existing facility or process is modified, a documented Management of Change shall be completed and care should be taken to ensure risk is as low as reasonably practicable (ALARP).
 8. A system shall be in place to ensure that MSDS's are available to all personnel (including first-aiders and medical personnel) involved in the transportation, storage, handling, use and disposal of hazardous materials on site. The MSDS should be provided by the manufacturer and reflect the revision date not be older than five (5) years. Note: The HAZMAT Coordinator should approve whether MSDS for similar chemicals provided by different manufacturers can be used.

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9. Safe operating limits for plant and equipment handling hazardous materials, which have the potential for immediate or long-term harm, shall be clearly defined, documented and available to operations and maintenance personnel.
10. Monitoring systems for hazardous materials shall be in place to ensure that the status of operation is understood and shown clearly at all times. This system shall include an appropriate hand-over between shifts.
11. A system shall be in place to control simultaneous operations involving hazardous materials to avoid mixing of incompatible materials.
12. A system shall be in place to monitor short and long-term exposure of personnel to hazardous materials, which have the potential for harm.
13. Procedures shall be in place for transporting hazardous materials. Where required a hazardous material manifest and supporting documentation shall be completed and transported with the hazardous material. This documentation shall comply with local legislation.
14. There shall be a blast clearance and re-entry procedure for areas that could be affected by the blast.
15. There shall be procedure for handling misfires and destruction of old explosives.

C. PEOPLE REQUIREMENTS


1. A Hazardous Materials Coordinator shall be designated for every site. This person shall be competent in terms of the requirement and be able to understand and evaluate the risks associated with the substances used on site, and be able to identify where additional expert advice can be sourced. The individual shall be responsible to ensure that there is a system in place for assessing the hazardous properties and disposal requirements of materials used, and also provide an “as needed” service to supply, warehousing, operational and SHEQ personnel.
2. A training system shall be in place for operations, maintenance and emergency response roles involving hazardous materials. Use should be made of supplier expertise to supply this training with annual refresher courses if required.

4.6 Molten Materials Management (MMM)

Molten materials management includes smelting processes, tapping, handling and transport of molten materials.

A. MOLTEN MATERIALS MANAGEMENT REQUIREMENTS

- A process risk assessment methodology must be used for facility design risks.
- Equipment must fail to safe in the event of power supply interruption.


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- Facilities must have process control systems, trips, interlocks and automatic shutdown systems as required, to maintain operation within design parameters.
- Molten material carrier transport routes must be dedicated and demarcated and included in the site's Traffic Management Plan.
- Provision must be made for emergency egress at all molten material work areas.
- To avoid explosions, proper and stringent water controls shall be applied at molten materials areas. "Ponding" or accumulation of water is not allowed at MMM areas and must be eliminated. Proper drainage and water management principles shall be applied.
- Tapping and casting equipment and activities must be automated and remotely controlled as far as reasonably practicable.
- Restricted areas must be demarcated in red and have an access control system (red area controls such as flashing lights, early warning, sirens, gates, signage, etc.).
- Safeguards must be provided in areas where there is a risk of personnel being exposed to molten materials or hot surfaces.
- Equipment that can be exposed to molten materials must be resistant to combustion or functional or structural failure.
- Facilities must have secondary containment for molten material spills.
- There must be a system to prevent water or other contaminants in materials being recycled into molten material processes.

B. PROCEDURAL REQUIREMENTS

1. All molten materials processing and handling shall be subject to risk assessment.
2. Procedures shall be in place for all molten materials processing, handling and safe disposal activities.
3. A system shall be in place to ensure that all process drawings are current, and are easily accessible to operations personnel.
4. Monitoring systems shall be in place to ensure that the status of operation is shown clearly at all times. These systems shall include the procedure for a documented hand-over between shifts that records any relevant information/changes in operating status.
5. The safe operating envelope for molten materials will be defined and understood by all process personnel. This shall include the indicators (physical or systems or observation based) that demonstrate that the limits of safe operations are being approached.

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6. Critical equipment shall be defined, and maintenance plans for that equipment shall be documented.
7. Emergency response plans shall be in place, and annual simulation exercises shall be conducted as a minimum. Specialist recovery, first aid and pre-hospitalization trauma care for injuries shall be a component of the emergency response services and shall be tested during simulation exercises.
8. A procedure shall be in place to provide a quarantined store for alloys and other material to be recycled into systems containing molten materials so as to prevent explosions, contamination or other uncontrolled reactions.
9. The management of change process for any operation shall include specific steps to assess the impact of changes on the risk associated with molten materials.
10. The roles and responsibilities for molten materials processing and handling shall be defined and assigned.
11. A competency based training system shall be implemented for operation and maintenance roles involving molten materials processing and handling.

C. PEOPLE REQUIREMENTS


1. All personnel shall be trained in their duties and responsibilities under emergency conditions.
2. All personnel shall be trained on the potential acute health effects of their working conditions and the materials handled.
3. The use of special and effective personal protective equipment shall be monitored and enforced in all areas where this type of control is required.
4. A fit-for-work policy shall be in place, incorporating defined action levels for drug and alcohol and fatigue management plan.

4.7 Equipment Safeguarding (ESG)

This protocol provides for the safeguarding of personnel from the risk exposures related to equipment and machinery.

A. PLANT AND EQUIPMENT REQUIREMENTS

1. Where practicable, plant and equipment shall be designed and manufactured with the primary intent to eliminate the need for additional safeguarding. Safeguarding should be an option only where other potential mitigation measures failed to adequately protect personnel as identified in the risk exposure assessment.


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2. Equipment safeguards shall be designed and constructed to comply with legislation, SANS codes, codes of practice and relevant recognised leading industry practices.
3. The integrity of plant and equipment safeguarding measures shall be continually maintained and monitored.
4. Risk assessments shall be undertaken to identify any safeguarding hazards that require interlock systems as an additional control.
5. Access to equipment shall be controlled and monitored where safeguarding and interlock systems are insufficient to protect persons from moving plant and equipment.
6. Guards shall be bolted into position and shall only be removed by means of a tool and only once equipment is isolated and locked out and a state of zero energy is achieved. Guards shall be replaced prior to plant and equipment being put back into operation.
7. Guards should be designed, where possible, to allow safe adjustment of equipment without requiring the removal of the guard.
8. All hired and contracted equipment shall be reviewed to ensure it meets site equipment safeguarding requirements and the requirements of this Protocol before use on the site.
9. Protective measures must be implemented where safeguards are insufficient to control the risk to as low as reasonably practicable.
10. All powered manually operated rotating machinery and tools must be equipped with an "Auto-Off" (dead man switch) switch. No machine will have the functionality of being locked in the "running" position and the operating switch must return to "off" when released. Pedestal drills and bench grinders shall be provided with a foot control in order to facilitate isolation if hands are caught in moving parts.

B. PROCEDURAL REQUIREMENTS

1. A risk based process shall be used to identify all possible areas where safeguarding is required.
2. All documentation related to the risk assessment and selection of safeguarding equipment shall be retained and controlled.
3. Procedures shall be in place for situations where safeguards on operating plant and equipment needs to be removed temporarily for any purpose. Each situation shall be risk assessed and a Permit to Work issued where work is performed on "live" equipment. This should however not be the norm.

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4. A system shall be in place for the management of change to equipment and/or processes to ensure integrity of safeguarding is maintained and to determine additional requirements for safeguarding.
5. No guarding shall be modified or altered in any way except through the application of a detailed risk-assessment and change management process and approval by the responsible engineer.
6. A site standard shall be compiled to ensure a standard application throughout the site for colour coding, construction material, etc. of safeguarding equipment

C. PEOPLE REQUIREMENTS


1. A training system shall be in place for operations and maintenance that includes the requirements of this Protocol.

4.8 Isolation and Permit to Work (ISO & PTW)

This protocol is aimed at isolation of harmful sources of energy and the management of designated high risk work requiring a permit to work.

A. ISOLATION AND PERMIT TO WORK REQUIREMENTS

1. Purchase and design of equipment shall give due consideration to meeting the requirements of this Protocol.
2. Isolation shall provide for the protection of employees during at work activities and the achievement of a state of “zero energy” through positive isolation/protection and be achieved by the use of locking devices or establishment of a physical barrier or separation. All separations or physical barriers shall be provided with either a permanent or temporarily fitted locking device.
3. All persons exposed to the harmful sources of energy during their activities at work, must use a personal isolation lock to secure the isolation point or its lock box. The “one man, one lock”-rule applies.
4. Personal locking devices shall:
 - Be uniquely keyed
 - Not be combination locks
 - Not have an unauthorised second-party master override key
 - Be of adequate size to ensure that the isolator being isolated engages properly
 - And be kept under the exclusive control of the owning individual, and key(s) shall not be transferred to another person for lock removal.
5. Designated isolation points shall be clearly labelled to identify the circuit or system over which they have direct control. These labels shall be applied by following a

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process of pre-isolation identification using isolation lists, marked drawings etc. (where permanently applied, these labels shall be physically verified prior to the isolation).

6. Lockout boxes, stations or equivalent shall be provided where required.
7. All hired and contracted equipment shall be reviewed to ensure it meets site isolation requirements and the requirements of this Protocol, before use on the site.
8. All designated isolation points fitted with personal locking devices shall be tagged. The isolation tagging system shall ensure that isolation points are positively identified and the reason for the isolation is clearly identified.

B. PROCEDURAL REQUIREMENTS

1. All sites shall have a documented isolation lockout and tag-out system as described in **Appendix 2**.
2. There must be a documented permit to work system as described in **Appendix 2**.
3. The isolation system shall be applied to all activities on site, including contractor activities (e.g. construction, commissioning, operation, maintenance, return-to-service, emergency, modification or demolition of equipment).
4. An additional overall situation and lock out guideline shall be in place and include definitions of appropriate treatment for routine isolations, group, master and/or multiple isolations, short term isolations, long term isolations and the locking out of rotating machinery in workshops when not in use.
5. The isolation guideline should use a risk-based process to determine the appropriate isolation method for any activity (either by way of a full description for specific cases, or by demonstrating the process that shall be followed to achieve the appropriate level of isolation in new activities).
6. A procedure shall be in place for transfer (handover) and return (hand back) of control over the plant or equipment between operations and maintenance teams.
7. A system for formal documented 'clearances' for work to proceed following isolation and de-isolation shall be in place.
8. Documented system-specific isolation procedures shall be in place for critical equipment (such as critical alarms, emergency shutdown devices, relief and blow-down valves, fire and gas detection and protection devices, and other items as designated in the critical equipment register).
9. Specific procedures shall be developed to address software overrides, hard-wire bridging and interlock bypassing.

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10. Document test procedures shall be provided to verify isolation integrity including, but not limited to the following principles:
 - Identification of all energy sources or hazardous materials directly and indirectly associated with the work to be performed
 - Confirmation of those systems requiring isolation
 - Isolating the confirmed energy or hazardous material sources
 - Application of lock/tag (“one man, one lock”-rule applies)
 - Application of isolation tag
 - Trying/testing of all systems and non-redundant isolations when reasonably or feasibly possible (to verify the integrity of the isolation and ensure a zero energy state exists)

11. A procedure based on a risk assessment shall be in place to mitigate hazards in cases where any one of the following is not achievable:
 - A zero energy state
 - A test/try of isolation is not possible, or
 - Use of a locking device is not feasible

12. Formal isolation procedures shall include requirements for investigation, reporting and removal of personal locks/tags by an authorised person other than the originator.

13. A system shall be in place for the management of change of equipment and/or processes for the isolation system, or installed isolations, and shall include specific steps to assess the impact of changes on the risk associated with these changes.

14. The isolation system shall be regularly reviewed to capture any previously unidentified changes and revised when necessary.


C. PEOPLE REQUIREMENTS

1. Site roles for individuals with responsibility for electrical, mechanical, or process isolation management shall be defined.

2. A competency based training system and field assessment shall be in place to approve personnel before they conduct isolation processes.

4.9 Working at Heights (WAH)


This protocol serves to eliminate risk on activities where there is potential for persons to fall, or where a high potential fall hazard exists. Rope rescue is excluded from the scope.

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A. WORKING AT HEIGHT REQUIREMENTS

1. All working at heights equipment shall comply with, and be used in, accordance with relevant approved design standards and manufacturers specifications.
2. Single person anchor points must satisfy legislative requirements and shall be capable of withstanding 150kg for a single person and 220kg for two persons. Where it is not practical to install dedicated anchor points (i.e. ad-hoc work), temporary anchor points capable of withstanding 150kg for a single person, shall be identified through a risk assessment process and shall be approved by a competent person prior to commencement of work.
3. Where personnel are required to work close to an unprotected edge and there is a chance to fall, they shall use personal fall restraint/arrest equipment such as a harness fitted with a lanyard (set at a length to prevent going over the edge) or retractable fall arrest device as a minimum. This shall be attached to an approved point, which will prevent the worker from falling over the edge.
4. Where there is potential to fall, personnel shall wear appropriate personal fall arrest equipment. In such circumstances a full body harnesses, including shock absorbing lanyard or inertia reel, attached to an approved point, is mandatory. The use of body belts for fall arrest is prohibited, except for specialised tasks such as pole-climbing belts worn by specially trained linesmen.
5. Adequate access, platforms or walkways must be provided. Stairways, where practicable, must be used in preference to ladders.
6. All forms of boom type, portable and movable elevated work platforms, suspended work cages as well as platforms used in underground operations shall conform to relevant approved design standards. The following apply:
 - In mining operations platforms shall be designed and approved by a competent person prior to and after erection before employees are permitted to perform work from it. Approved-for-safety-harnesses shall be provided.
 - When work is performed from a work basket that is suspended by a crane, a wire rope sling of the correct safety factor shall be routed through the crane hook as an anchor point for people in the work platform basket who shall wear a correctly fitted harness attached by a lanyard to the sling routed through the crane hook.
 - When work is conducted from a work basket elevated by mechanical means an anchor point shall be provided for people in the work platform basket who shall wear a correctly fitted harness attached by a lanyard to the fixed point inside the basket to restrain workers in event of a mechanical failure.

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- When work is performed on a platform that has no handrails or due to its location (underground operations) poses a threat that people might fall from it, a suitable approved anchor point shall be provided to secure people from falling.

This does not apply to people working from a properly constructed and certificated scaffold with the requisite handrails and toe boards.

7. Where there is the potential to fall from an unprotected, elevated position (e.g. elevated areas with no handrails, stockpile feeder chutes, high walls, water hazards, wharves, etc.), access shall be restricted and properly controlled. Control selection should be preceded by a thorough risk assessment.
8. Where operators regularly need to gain access to places at height on large plant and mobile machinery (e.g. to clean windscreens or filters), access ways should be provided. Ideally, these access ways should have handrails. Where handrails cannot be installed, fall restraint or fall arrest equipment should be considered dependant on the outcome of a risk assessment of each situation.

A. PROCEDURAL REQUIREMENTS

1. Each Samancor Chrome site will have in place Standard Operating Procedures (SOP) for; working at heights and the correct wearing and use of personal fall arrest and fall restraint equipment.
2. There shall be a work permit system in place to control all working at heights.
3. A documented risk assessment shall be in place through which the potential of fall shall be assessed and controls identified to eliminate the risk where reasonably practicable utilizing the Hierarchy of Controls. Such risk assessment shall be conducted before the commencement of work and at any time the scope of work changes or the risk of a fall increases. The risk assessments shall include:
 - Consideration for the potential of objects as well as personnel to fall
 - Selection of appropriate control measures using the hierarchy of controls
 - The possibility for weather and other environmental conditions to influence the working conditions (e.g. wind, rain, snow, dust, gases, poor lighting, temperature etc.)
 - Selection of appropriate equipment
 - Selection of anchor and tie off points
 - Condition of supporting structures such as roofs
 - Selection of appropriate barricading and/or demarcation
 - Fall clearances i.e. length of lanyard + tear-out distance + height of user + safety margin
 - Buddy system and resources for rescue activities when a fall was arrested.


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4. All equipment shall be fit-for-purpose, recorded, numbered, colour coded and must be checked monthly/quarterly depending on the site rule, by a competent person in accordance with recognized standards who shall record the findings in a register provided by the engineer. Typical equipment included in these controls are:
 - Lifelines
 - Safety harness and lanyards
 - Working at height safety slings
 - Elevated and moveable work platforms
 - Work platforms
5. Where the work method requires persons to detach and re-attach at height, a dual lanyard system shall be utilised to ensure that at least one connection point is maintained at all times.
6. Where the use of personal fall arrest equipment is required, a person shall not work alone and there shall be other personnel in the vicinity that can raise the alarm and initiate rescue operations immediately, should a person fall and be suspended in the harness.
7. Control measures should be in place to prevent tools, materials and other objects from falling from height.
8. Demarcation and warning signage should be placed on all lower levels where personnel or objects may fall.
9. Personnel operating elevated work platforms and cages shall be trained and certified for the specific equipment they are using.
10. The site emergency response plan/s should include plans for the rapid retrieval of personnel in the event of a fall from height i.e. response time is critical if a person is to avoid suspension trauma.

B. PEOPLE REQUIREMENTS

1. Sites shall conduct a screening process to ensure selected personnel are fit to work at heights. Specific consideration shall be given to personnel who suffer from fear of heights or illnesses such as ear infection or who is placed on medication that may impair vigilance or medical conditions, such as vertigo and epilepsy, as well as considering the weight of the person using the harness. (**Note:** The individuals' weight may not exceed the specified safe working load of the harness).
2. All persons involved in the erection and adjustment of scaffolding shall be adequately trained and competent in the erection and adjustment of scaffolding. No person except those designated to erect or adjust scaffolding may tamper with or adjust any scaffolding.

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- All persons engaged in work covered by this Protocol shall be adequately trained and assessed for competency.

4.10 Lifting Operations (LO)


Any activity involving the lifting of a suspended load using a machine or device (excluding dragline and hoisting operations) is covered by this protocol.

Cranes must have the minimum safety features:

- Labelled lockable isolation switch
- Overload protection
- Air-conditioning of cabins where its occupants are exposed to temperature extremes, dust, noise, etc.
- Clearly legible signs warning not to disturb the operator when busy with a lift
- Load cells on cranes other than automated cranes
- External rated capacity lighting on mobile cranes including vehicle loading cranes
- Load moment indicators on cranes other than electric overhead travelling cranes, portal cranes or automated stacker cranes
- Identification numbers that enable clear and positive individual crane identification from beyond the safe approach distance
- Free fall capability locked out and disabled if installed
- Load rating charts in an understandable language on mobile and vehicle loading cranes
- Manuals available in an understandable language.

A. LIFTING OPERATIONS REQUIREMENTS

- All electrical cranes shall have power supply isolation points capable of being positively locked.
- Cranes shall be ergonomically acceptable to the site and have fall protection systems provided which adheres to the Working at Heights protocol.
- Cranes with free-fall capability must have a physical locking system to lock out this feature when not in use, without a physical locking system that disables and isolates its free-fall capability, shall not be used.
- Overhead cranes and hoists shall have overload protection when their lifting capacity exceeds 5 tons.


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5. Where a crane cabin is still in use for crane operation, it should be air-conditioned in accordance with environmental conditions to an acceptable temperature and provide clear view of the operational area.
6. Vehicle loading cranes shall have sufficient engineering controls to safeguard the operator and prevent the operator from being crushed during lifting operations.
7. All crane hooks shall be fitted with positive locking safety catches as per OEM standard except in situations where the hook is not provided with a facility for these latches such as hot work crane hooks.
8. The safe working load (SWL), maximum mass load (MML) or working load limit (WLL) shall be clearly identified and marked on all lifting equipment and shall not be exceeded.
9. Load cells and load moment indicators shall be used on all cranes. External rated capacity lighting should be used on all mobile cranes.
10. All lifting equipment used shall comply with the requirements of the relevant approved design standard for which the minimum requirement will be the relevant SANS or ISO standard.
11. A competent person shall ensure that lifting equipment is not subjected to environmental conditions for which it is not intended and designed.
12. All lifting equipment, except for those used for the lifting of hot metal, shall be colour coded in accordance with the periodical inspection interval for the site.
13. Load charts shall be available for use in all mobile cranes.
14. The elimination of the need to work under suspended loads shall be pursued. Where working under suspended loads is unavoidable, controls shall be in place to eliminate or minimise the risks to personnel.


B. PROCEDURAL REQUIREMENTS

1. Detailed lifting plans / risk assessments are required for points above and shall be approved by a competent supervisor.
2. Pre-task meetings shall be held prior to critical lifts to ensure all personnel understand how it is to be executed. The crane operator and riggers must be given sufficient time to familiarize themselves with the environment and lifting conditions. Refer to **Appendix 3** for critical crane lift features.
3. No mobile crane shall perform a lift if its outriggers are not fully deployed and locked. The competent person in charge of the lift shall ensure that the ground

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surface below the outriggers is firm enough to supply adequate support for the outriggers. Only machines designed for pick and carry operations may be used for that purpose.

4. No loose lying items shall be allowed on a piece of equipment being lifted.
5. The lifting of personnel with cranes shall only be carried out using approved workbaskets or cages. Cranes used for this purpose shall be approved as suitable for man-riding operations.
6. Crane operators and crew shall be able to communicate in a common language and must be able to use the correct crane signals.
7. A register or registering system of all lifting equipment should be maintained.
8. There shall be a system for documented pre-operational crane inspections.
9. Cranes shall not be exposed to side loading forces.
10. All cranes and lifting equipment shall be identifiable with a unique identity code or number.
11. The Chrome Maintenance Council's SOP on Lifting Equipment PR-CMC-ENG-001 "Lifting Equipment and Lifting Operations" must be read and applied in conjunction with the FRCP requirements on Lifting Equipment (To obtain the SOP refer to Chrome Maintenance Council)


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Appendices


SHEQ Protocol Links

DOCUMENT REFERENCE	SPECIFIC FRCP REQUIREMENTS
SHEQ Management Protocol:	
Leadership, Planning and Accountability	<ul style="list-style-type: none"> All personnel must have clearly defined and documented roles and responsibilities. The use of effective personal protective equipment shall be monitored and enforced in all areas where this type of control is required. There must be emergency response plans and procedures for effective response to emergencies that are tested and reviewed on a regular basis, and communicated to potentially affected personnel. Sites must have emergency response equipment, which is maintained, inspected and tested at specified intervals to enable effective response to potential emergency events.
SHEQ Hazards and Risk	<ul style="list-style-type: none"> The assessment of risks must use an appropriate risk assessment methodology and be undertaken as part of the design, selection, commissioning, operation and modification of plant and equipment and processes. Risk assessments must be documented and readily available to potentially affected personnel. The management of risk of exposure of personnel to risk events must include the use of the Hierarchy of Controls and focus on the elimination control.
Change	<ul style="list-style-type: none"> There must be a Management of Change system to manage change to plant and equipment, systems and people.
Awareness, Competence and Behaviour	<ul style="list-style-type: none"> There must be a competency based training system that includes a training needs analysis (including induction and retraining requirements), and competency and skills matrices. There must be a behaviour based observation system that focuses on behaviours associated with this Protocol with the results shall be used to determine any need for the revision of procedures and training.
Design, Construction and Commissioning	<ul style="list-style-type: none"> The selection, design, manufacture and acceptance of plant and equipment must be fit for purpose and in accordance with relevant legislation, design standards, codes, leading practices and the requirements of this Protocol. There must be a system to ensure that all relevant design documents and drawings are current, controlled, retained and readily accessible.
Operations and Maintenance	<ul style="list-style-type: none"> All activities must be subject to risk assessment using an appropriate risk assessment method.

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	<ul style="list-style-type: none"> • There must be documented procedures for all critical activities. • There must be a system to plan, document and carry out maintenance, inspection and testing (including critical equipment) to maintain safety and integrity. • Safe operating limits must be clearly defined and documented for hazardous materials and molten materials facilities where loss of containment could lead to harm. • Key operating parameters must be measured, documented and monitored for hazardous materials and molten materials facilities. • There must be a system for documented hand over of plant and equipment between shift personnel and/or operators.
Health and Hygiene Protocol:	
Health Surveillance	<ul style="list-style-type: none"> • A system must be in place to monitor exposure of personnel to materials, which have the potential for immediate or long-term harm.
Fatigue Management	<ul style="list-style-type: none"> • There must be a fit-for-work system, consistent with the Samancor Chrome Health and Hygiene Protocol, which includes fatigue management plans.
Drug and Alcohol Programs	<ul style="list-style-type: none"> • There must be a fit-for-work system, which includes defined action levels for drugs and alcohol.

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Appendix I Minimum Requirements for Traffic Management


The following *minimum* requirements apply:

Light Vehicle specifics

- Vehicle and pedestrian interaction controls
- Setting of appropriate speed limits for vehicle types and road surfaces overtaking protocol
- Procedures for light vehicles entering hazardous or restricted areas or areas where surface mobile equipment is active
- Procedures for delivery vehicles entering sites and hazardous or restricted areas
- Route indicators and specific rules governing routes, i.e. load limits, height limits, prohibitions, directions, restricted areas, etc.
- Clear communication protocols
- Standards for safe following distances based on operational circumstances, environmental conditions and near sight (blind spot) limitations of other mobile equipment
- Installation and maintenance of road traffic control signs as appropriate to the work site
- Parking procedures e.g. safe parking distances / locations and required barriers from heavy mobile equipment and pedestrians.

Surface and Underground Mobile Equipment specifics

- Segregation of pedestrians, light vehicles and heavy mobile equipment where possible – clear instructions with regards to pedestrian and SME interaction controls
- Setting of appropriate speed limits, and installation and maintenance of road signage
- Right-of-way rules (including overtaking restrictions)
- Access planning in areas identified as hazardous and having significant associated risk
- Procedures for heavy duty delivery vehicles entering sites and hazardous or restricted areas

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- Route indicators and specific rules governing routes, i.e. load limits, height limits, prohibitions, directions, restricted areas, etc.
- Systems to control movement of mobile equipment in areas accessible to pedestrians, into and out of workshops, and for controls on pedestrian and light vehicle movement around mobile equipment
- Designated parking areas for heavy vehicles and light vehicles including around maintenance areas
- Systems to control approaching, refuelling, parking, boarding, disembarking, and isolation by production and maintenance crews
- Areas of refuge
- Equipment operators or drivers shall be out of the cabin and dismounted onto ground level when their direct involvement with maintenance or servicing is not required
- Guidelines for abnormal road conditions (e.g. rain, high winds) giving “go/no- go” criteria and stating the responsible person for this decision
- Clear communication procedures for visibility and interactions between all vehicles
- Truck loading/unloading procedures – to avoid material or objects falling from the vehicle
- Guidelines for wide or abnormal loads including off-site transport
- A dust control and water management plan for roads, mining and haulage operations shall be in place. Consideration shall be given to extreme wet weather and the issue of over watering roads
- Systems to control equipment use within the vicinity of overhead power lines and for underground services when excavations are done
- Procedures shall be in place to ensure surface mobile equipment only operates on sufficiently stable surfaces and on gradients that are within the limits of safe operation.

Appendix II Isolation and Permit to Work Features

An isolation system must include aspects of:

- Provision of protection through a ‘zero energy’ physical barrier or separation with emphasis on achieving a state of “zero energy”
- Use of effective personal isolation locks and lockboxes

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- Use of information tags at isolation points or lockboxes to identify the isolated equipment and those who are working on it
- A risk-based process to determine appropriate isolation protocols and methods considering the design and duty of each isolation point, the duration of isolation and the tasks to be performed (e.g. confined space work)
- Try/test procedures to verify positive isolation
- Arrangements when isolations cover one or more shift changeovers, and the transfer of isolations between different workgroups
- Provision for the removal of personal locks/tags by a person other than the originator
- Precautions where either a zero energy state, test/try of isolation or the use of a locking device is not practicable or achievable
- Roles and responsibilities for persons involved in isolation.

A Permit to Work system for approving and managing designated high-risk work such as:

- Work that may interfere with or affect an active process
- Critical lifting operations
- Working in a confined space
- Working at heights
- Hot work
- Working with radiation sources
- Excavation and ground/surface penetration
- High voltage work.

The system must include the aspects of:

- Definition of the types of work that require a permit (or clearance)
- Documentation to be used for various types of work
- Interaction with the isolation system
- Pre-work Risk Assessment and management of the task
- Preparation, authorisation, acceptance and validity period of a permit
- Provisions for change of permit holder
- Roles and responsibilities for those involved with the permit to work system
- Handover of plant and equipment between operations and service providers.

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Appendix III Critical Crane Lifts

Critical crane lifts are those lifts with the following features:

- When the load weight is 75% or more of the rated capacity of the crane
- When the load to be lifted, is swung or placed out of the operators view
- Made with more than one crane
- Where the arcs of operation of two or more cranes can overlap
- Adverse environmental conditions
- When near or over unprotected plant, operations and processes
- Using more than one hoist
- Involving non-routine or technically difficult rigging arrangements
- Hoisting personnel with a crane or derrick
- Involving hazardous materials or explosives
- Involving submerged loads
- Where the centre of gravity could change
- Where the crane operator believes should be critical
- When in the proximity of live electrical conductors.

Note: Please refer to the Chrome Maintenance Council SOP. Nr. for guidance of critical lifts

Appendix IV Generic Definitions

Competency: A combination of attributes such as knowledge, skills, abilities and attitudes providing adequate assurance of successful performance.

Competency Based Training: Training which develops the skills, knowledge and attitudes required to achieve competency Protocols. Competencies are carefully selected to align with the chosen role. Satisfactory completion of training is based on achievement of and testing of the knowledge of all specified competencies.


Contractor: An individual, company or other legal entity that carries out work or performs services under a contract for service. This includes sub-contractors.

Critical activity: An activity or activities where conduct outside expected performance has the potential to result in a Major Accident Event.

Critical equipment: A piece of equipment or a structure whose failure, or not performing to design specification, has the potential to result in a Major Accident Event.

Critical equipment register: A concise summary of all critical equipment that includes its design function (including operating limits), a unique identification, required performance Protocols (e.g. minimum reliability) and maintenance requirements.

Critical procedure: A procedure (or step in a procedure), divergence from which has the potential to result in a Major Accident Event.

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Critical system: A system (hardware or software, including human behaviour) whose operation outside expected performance has the potential to result in a Major Accident Event.

Emergency: An abnormal occurrence that can pose a threat to the safety or health of employees, customers, or local communities or which can cause damage to assets or the environment.

Employee: An individual who works for Samancor Chrome under a contract of employment.

Hazardous materials: Substances that have the potential to pose a significant risk to the health and safety of people or the environment.

Major Accident Event: Any incident with the potential to lead to any of the following:

- A fatality
- Serious environmental effects, including impairment of ecosystem function
- Ongoing significant social issues
- Significant adverse attention from national media or non-government organisations (NGO), or loss of licence to operate.

Molten Material: Materials that are solid at ambient temperature and pressure, but liquid at the elevated temperature of a particular process.

Personnel: People engaged in work for, and on behalf of, Samancor Chrome, including employees, people on temporary contracts and contractors.

Practicable: The extent to which actions are technically feasible, in view of cost, current knowledge and known best practices.

Procedure: A specified way to carry out an activity or a process.

SANS: South African National Standards

System: A set of arrangements, responsibilities and authorities aimed at ensuring the achievement of defined outcomes.

Visitor: A person visiting a Samancor Chrome site who is not a Samancor Chrome employee or contractor at that site.

Appendix V FRCP Specific Definitions


FRCP 1: Light Vehicles

Light Vehicle: A surface vehicle which:

- Can be or is registered for use on a public road
- Has four or more wheels
- Seats a maximum of 16 adults (including the driver)
 - That where registered, could be legally driven on a public roadway by a driver issued with a public road driver's licence
 - Does not exceed 3.5 tonnes gross vehicle mass (GVM).

Light vehicles may include:

- Samancor Chrome owned or leased vehicles (LDVs and Pool Cars)
- Hired vehicles (e.g. Avis, Budget)
- Contractor or supplier vehicles operating on company property
- Private vehicles used for work related activities

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Road Going Vehicle: All surface light vehicles that are designed for public road use.

Roll Over Protective Structure (Protection): A structure that reduces the possibility of a seat-belted operator from being crushed should the vehicle roll over.

FRCP 2 SURFACE MOBILE EQUIPMENT and FRCP 3 UNDERGROUND MOBILE EQUIPMENT

Mobile Equipment: Surface Mobile Equipment and Underground Mobile Equipment. It is not *road going vehicles*, nautical, rail equipment, elevated work platforms, and relocatable plant such as crushers and stacking conveyors.

Operator Protection: Protection for the occupants from the risk of "front to rear" (ducktail) collision. Examples are extended front bumpers, collision avoidance technology, underrun protection, or cab reinforcement.

Park Brake Warning Device: A warning device that warns the operator when leaving the cab that the park brake has not been set correctly.

Collision Avoidance Technology: Cameras, radar, radio frequency detection, etc. to assist operators to see and avoid collisions.

Critical Defects: Defects that may result in a fatal incident (e.g. defects of steering, brakes, wheels and tyres, lights, access systems, fire suppression systems, oil and fuel leaks).

Day Time Running Lights: The use of low beam head lights.

Ducktail: The rear extension of the tray of a rear dump mine haul truck installed principally to reduce spillage of carried material onto the road surface.

Falling Object Protective Structure ("Fall on" Protection): A structure that protects a seat-belted operator from being injured by falling objects. A structure erected over the operation cabin that will protect the operator or passengers from injury should a chance exist that material in weight exceeding the maximum load limit of the existing roof may fall on the vehicle.

Fail Safe Brakes: A spring applied braking device, automatically activated whenever the engine stops or malfunction of brake system occurs.

Fire suppression system: A system installed on a machine to suppress a fire on a machine. It is not a hand held fire extinguisher.

In Vehicle Monitoring System: A system that monitors and records vehicle activities to, as a minimum, enable response to at-risk driver behaviours.


Ladder: An access system inclined from the horizontal more than 50 degrees.

Roadway Network: A system of roadways, parking areas and controls including:

- Roadway and intersection design parameters such as width, camber, gradient, drainage, and super elevation
- Collision protection of hazardous and critical plant and equipment
- Safety berms, road delineators, signage, traffic control structures and devices
- Segregation of pedestrians from vehicles in high risk areas
- Segregation of road going vehicles from mobile equipment in high risk areas
- Segregated parking areas for road going vehicles and mobile equipment.

Roll-Over Protective Structure (Protection): A structure that reduces the possibility of a seat-belted operator from being crushed should the machine roll over.

Safety Berm: A structure normally constructed of competent dirt and rock to a sufficient height to help prevent vehicles from falling into voids and excavations.

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Safety Chains: Chains of an appropriate capacity attached between the towing vehicle and the towed device fitted in case the towing hitch fails.

Stairway: An access system inclined from the horizontal at an angle greater than 20 but not more than 50 degrees.

Surface Mobile Equipment: Includes haul trucks, water trucks, graders, dozers, loaders and integrated tool carriers, and also other equipment such as excavators, forklifts, mobile cranes, backhoes, and bobcats.

Site Traffic Rules: Rules and procedures that dictate how a site's traffic and road system and flow is controlled in a safe manner.

Underground Mobile Equipment: Mobile rubber tyre and tracked equipment designed or modified and intended for underground mining operations including face production and development equipment

Underrun Protection: A protective structure normally fixed at the rear of trucks to prevent following vehicles from going under the rear tray or trailer of truck in the event of a collision.

FRCP 4: Underground Ground Control

Geotechnical Risk Control Plan: The mine site plan which sets out the method which the mine will manage the control of ground and approved by the SSE. It is synonymous with Code of Practice, Strata Management Plan, Roof Control Plan and Ground Control Management Plan.

Multi-Tiered Ground Response Plan: A plan in which additional levels of support or monitoring may be added according to *triggers* defined under that plan.

Falls of Ground: Uncontrolled falls (detachment or ejection) of ground of any size that causes (or potentially causes) injury or damage.

Secure Ground: Ground that is supported in accordance with the geotechnical risk control plan, or unsupported ground, which has been assessed as not requiring support in accordance with the geotechnical risk control plan.

Triggers: Specific signs or indications of ground deterioration or geological degradation which a mine site has determined to and specified as requiring additional levels of monitoring or support or a modified sequence of mining.

FRCP 5: Hazardous Materials

Hazardous Materials Coordinator: A competent person who assesses the hazardous properties and disposal requirements of hazardous materials, and provides advice for the management of the associated risks.

Hazardous Materials Register: A register of all hazardous materials on site.

Explosives: Substances or mixture of substances capable of producing an explosion.

Misfires: Any explosives which have failed to explode.


Secondary blasts: The blasting operations not associated with production from in-situ ground which can take place at any time during a shift to remove obstructions or reduce big rocks in size, but excludes the blasting of shot holes drilled in in-situ rock.

FRCP 6: Molten Materials

Restricted areas: An area in which there are special measures used to prevent or minimise contact with molten materials.

Secondary containment: A structure designed to capture spills or leaks from the primary container.

FRCP 7: Equipment Safeguarding

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Auto-off: A system designed to remove power when control of equipment is lost or a component fails.

Guard: A physical barrier that prevents or reduces access to a danger point or area.

Interlock: A device that causes or prevents an action from occurring.

Machinery: An assembly of linked parts or components, at least one of which moves.

Protective device: A protective device that is not a guard such as an interlock, mechanical restraint device, trip or other sensor switch.

Protective measures: Measures that include procedures, supervision, access control systems, permit to work systems, training and use of personal protective equipment.

Safeguard: A *guard* or *protective device* designed to protect persons from danger. It does not include administrative controls.

FRCP 8: Isolation and Permit to Work

Confined Space: An enclosed or partially enclosed space that is at atmospheric pressure during occupancy and is not intended or designed primarily as a place of work, and-

(a) is liable at any time to:

- have an atmosphere which contains potentially harmful levels of contaminant;
- have an oxygen deficiency or excess; or
- cause engulfment; and

(b) could have restricted means for entry or exit.

Isolation Point: A device that isolates energy sources.

Hardwire Bridging: The use of a device to override the functionality of process/equipment control systems

High Voltage: Any voltage greater than 1000V (AC) or 1500V (DC) between conductors or above 900 VDC between conductors and earth up to 220kV or as defined by local legislation.

Hot work: Welding, flame cutting or other fire or spark producing operation.


Isolation system: A system for ensuring the provision of positive protection through a zero energy barrier or other separation method.

Lock Box: A box used to lock up **System Isolation Lock** keys that are securing isolation points. The Lock Box is secured using the personal isolation locks of the individuals within a work team. Lock Boxes are typically used where there a large number of people locking on or multiple isolation points.

Designated high risk work: Work such as critical lifting operations, working in a confined space, working at heights, hot work, working with radiation sources, excavations, high voltage work etc. that requires a **permit to work**.

Personal Isolation Lock: An isolation lock provided to an individual for securing an **isolation point** or **lock boxes**. They must:

- Have a single and unique key
- Not be a combination lock
- Not have a master override key
- Be assigned with a key to an individual
- Be specifically identified, distinguishable from other types of locks, and be highly visible.

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Permit to Work system (PTW): A system for approving and managing designated high-risk work.

Positive isolation: Where a proven isolation has been achieved and physical barriers prevent transmission of all forms of energy.

Software Overrides: The use of software to override the functionality of process/equipment control systems.

System Isolation Locks: Locks used to secure isolation points where a **lock box** is used.

Try / Test: A test to confirm that the harmful energy has been isolated effectively. Some examples are:

- Observing pressure indicators, venting to atmosphere, observing discharge end of lines, opening drain valves, etc.
- Gas testing
- Testing by attempting to restart after isolation
- Test the equipment or process by use of appropriate test equipment.

FRCP 9: Working at Heights

Anchor Point: A point of attachment on a structure to which a fall restraint / fall arrest system may be secured.

Barricade: Barrier used to keep people away from areas that may be dangerous.

Edge protection: A barrier or enclosure to prevent a person falling.

Fall Arrest System: A combination of equipment and components connected together designed to stop a person from striking a lower level or an obstruction during a fall. Includes as a minimum a full body harness, shock absorbing lanyards or **inertia reel device** and an appropriate helmet with chinstraps.

Fall Restraint System: A combination of a harness, line and anchorage, which will physically prevent the person from reaching an unprotected edge.

Inertia Reel Device: A mechanical device that arrests a fall and allows freedom of movement (also known as a self-retracting lanyard or fall-arrest block).

Lanyard: An assembly of a line and components which will enable a connection between a harness and an anchorage point.

Work Platform: Elevated, suspended or movable platform used to support or elevate workers e.g., scaffold, elevating work platforms.

FRCP 10: Lifting Operations.


Crane: Any powered device intended for raising and lowering a load and moving it horizontally.

Critical lift: A high risk lift such as heavy weights, multiple hoists, etc. that requires additional controls in place.

Lifting Plan: A plan that reviews a proposed lift with the specific intent of providing assurance that the lift can be executed in a safe manner.

External rated capacity lighting (ECRL): Clearly visible lights mounted externally to a crane to indicate the loaded state of the crane.

Lifting Equipment: Any device used to connect a load to a crane and which does not form part of a load (e.g. wire rope slings, chain slings, fibre slings, hooks and fittings, swivels, shackles, eye bolts, rigging screws, wedge sockets,).



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Load cell: An electronic device that provides a digital indication of the load on the crane hook.

Load Moment Indicator: A device that calculates the moment from boom length, boom angle and load cells.

Lifting Operations: Operations using a crane and lifting equipment that involve the raising, lowering or suspension of a load.

ANNEXURES

ANNEXURE NUMBER	ANNEXURE NAME	FILE
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2.	Signature Record	 PR-CRC-SHEQ-FRCP-1-10.pdf

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