1. INTRODUCTION
Conveyor belts are the most common means of transporting large volumes of minerals and product within all plant at RBM. Due to their design and operating principles they contain many danger points and danger areas. If these danger points and danger areas are not recognized and controlled, they can result in accidents with serious, sometimes even fatal consequences.

The Minerals and Petroleum Development Act and Regulations (29:1996) requires that conveyor belts are designed, equipped, operated and maintained so that they "Do not endanger any person"

To meet this requirement, the following needs to be done:

- The conveyor belt installation must be designed so that it can withstand all normal stresses and strains applied to it in the course of its normal function
- The conveyor belt installation must be equipped with guards, electrical protection, overload protection, interlocks, trip wires and safe access points.
- Personnel using, operating and maintaining conveyor belt installations must be fully aware of the correct and acceptable operating principles as well as safety requirements and potential danger points and danger areas. They must understand the purpose of conveyor belt components, in particular components required to ensure the safety of persons in close proximity to conveyor belt installations.

2. OBJECTIVES
This Procedure will ensure that all persons coming in close proximity of conveyor belt installations are able to:

- Identify danger points and danger areas of a conveyor belt installation
- Be fully aware of the correct behaviour when near to conveyor belt installations
- Be able to know what physical guarding is required to make conveyor belts safe to operate.
- Be fully aware of the correct operation of conveyor belts.
- Know the required control systems, interlocks and emergency stops.

3. RESPONSIBILITY
It is the responsibility of each Engineer and Superintendent to ensure that each person that operates, maintains, cleans, inspects and observes the function of a conveyor belt installation, to be trained in all aspects of this SOP.

It is the responsibility of each person that uses, operates, maintains, cleans, inspects and observes the function of a conveyor belt installation, to apply all aspects of this SOP.
4. COMPONENTS OF A CONVEYOR BELT INSTALLATION

A typical conveyor belt installation consists of the following components:

- A steel structure supporting all the components as well as the walkways, the platforms and the guards.
- The drive consisting of the motor, belt drive, gearbox, holdback and couplings.
- Head, tail and snub pulleys with their associated shafts and bearings.
- Take-up device with take-up and bend pulleys, shafts, bearings and guides.
- Rubber belts with troughing idlers, impact idlers and/or skid plate, return idlers and belt scrapers.
- Feed and discharge chutes with diverters, actuators and liners.
- Tramp iron magnets (Permanent magnets, Electro magnets and cross belt magnets)
- Product samplers with chutes, dividers and collectors (Hammer samplers, cross stream samplers)
- Belt weighing devices
- Guards including nip guards.
- Electric's with local isolators, local stop\start buttons, cables, trip wires, start-up sirens and signals and zero speed switches.

5. IDENTIFICATION OF DANGER POINTS AND DANGER AREAS.

5.1 Nip Points
A nip point exists wherever a belt or vee belt moves onto a pulley or idler where the belt is restricted from moving away from the pulley due to a chute, a skirt plate or excessive tension in the belt. Excessive tension always exists where a belt moves around a pulley but excessive tension can also be present at an idler where the belt leaves the idler in a different direction from the direction the belt leads onto the idler.

The following are typical nip points:

- Belt lead onto head pulley, snub pulley, bend pulley, take-up pulley and tail pulley.
- Belt entering a chute area or skirt plate area where a troughing idler would prevent the belt from being able to deflect away from the chute.
- A narrow gap between a rotating pulley and a fixed, rigid structure like chuting side plates, supporting member or walkway structure.
- Between the leading edge of tripper car wheels and the rails.
- Diverter chute actuators and fixed, rigid structures as well as the diverter blade and the chute side plates.

5.2 Drive and Control Arrangements.

Drive and control components can create the following dangers:

- Exposed rotating shaft ends, couplings, v-belts, and chain sprockets, gears and gearbox tension arms.
- Frayed edges of belts can catch limbs or loose clothing (Loose clothing would be untied shoe laces, torn trousers, loose hanging respirators, unzipped or unbuttoned jackets and oversized overalls.)
- Faulty equipment or slipping belts can create heat and result in fires and/or burns.
- Non-functioning interlocks can create conveyor belt overloads, which will result in belt breakage, spillage falling of the belt and the need to unblock chutes.
- Non-functioning start-up sirens and warning lights will not warn persons in close proximity of conveyor belts.
- A broken or non-functioning trip wire will not allow a conveyor belt to be stopped in an emergency.
- A disintegration of a fluid-drive coupling as a result of a runback of the belt due to a malfunctioning of a holdback

5.3 General Conveyor Belt Area

Conveyor belt installations can break down due to malfunctioning equipment, conveying of hot material, overloading or inadequate maintenance. This will create the following danger areas:

- Uncontrolled run-back of loaded conveyor belt due to hold back failure will accumulate several tons of material at the tail pulley. This runback can also result in the disintegration of a fluid drive coupling.
- A belt breakage will create an unsafe area in front, behind and underneath a conveyor belt due to the unrestrained failing end of the broken belt.
- A belt breakage will render the area below a take-up pulley dangerous due to the falling take-up arrangement.
- Damaged and ragged edges of belts can catch loose clothing and/or limbs.
- Spillage from overloaded or poorly trained conveyor belts can cause serious injury to persons directly below conveyor belt structures.
6. **MAINTENANCE AND HOUSEKEEPING OF CONVEYOR BELTS.**

Conveyor belts require frequent and regular maintenance to ensure that they are safe to operate and do not pose a danger to persons in their vicinity.

6.1 **Housekeeping**

6.1.1 All walkways, platforms, access points and areas below conveyor belts must be free of:

- Redundant equipment and rubbish
- Material build-up and spillage
- Spilled oil, water and waste rags.

6.1.2 Conveyor belt installations must be patrolled and inspected at regular intervals to ensure that:

- The conveyor belts run true and centred.
- The conveyor belt has not been damaged by tramp material like scrap metal, pipes and iron bars.
- No potential dangers exist like large lumps of material sitting on structures and, partially torn belts flapping about.
- All guards are in place and secure.
- All idlers and pulleys are rotating freely.
- Skirting rubbers are in good condition and do not allow spillage to occur.

6.1.3 Where spillage removal requires access to danger points or danger areas (Whether by a part of the body or a tool) the following requirements must be satisfied:

- Conveyor belts must be stopped, isolated and locked out. This requires a Permit to Work.
- No guards must be removed unless the conveyor belt has been stopped, isolated and locked out.
- Tools like shovels, spades, rakes and scrapers must be used, not hand and fingers.
- The area to be worked in must be inspected to ensure that no suspended equipment or spillage can fall onto persons.

6.1.4 Where spillage removal does not require access to danger points and danger areas (whether by a part of the body or a tool) the following requirements must be satisfied:

- No guards, fences and safety interlocks must be removed or made inoperative.
- If spillage must be lashed onto a running conveyor belt this must be done via a purpose designed chute or access point.

6.2 **Maintenance and Repairs**

6.2.1 No maintenance, repairs, lubrication and adjustments must be done on a running conveyor belt or a conveyor belt that has not been isolated and locked out except in the following circumstances:

- Training of a conveyor belt by a trained and competent person.
- Lubrication of bearings and gearboxes where special provision has been made for this purpose (Grease nipples, dipsticks and filler plugs external to guards and/or automatic lubricators.)

6.2.2 No guards or fences must be removed from a running conveyor belt except where the training of a conveyor belt requires the adjustment of head pulleys, tail pulleys and idlers. If this should be necessary the following provisions have to be satisfied:
The work must be done under the control and supervision of a trained and competent person, Access to the danger area must be restricted to the trained and competent person doing the work. All unauthorised persons must be refrained from entering the danger area by placing a knowledgeable and briefed person as a guard at the danger area. The duration of the work must be minimised. The danger area must never be left unattended.

6.2.3 All safety interlocks (sequence, overload, zero speed, trip wires and access gates) must be tested for correct functioning as per preventative maintenance schedules, weekly.

6.2.4 Holdbacks on long, inclined conveyor belts must be tested for correct functioning as per preventative maintenance schedule, but at intervals not exceeding 3 months.

6.2.5 Fluid Drive couplings must be checked for the correct filling of oil, structural integrity of casing, use of correct fusible plug, and correct functioning as per preventative maintenance schedule, but at intervals not exceeding 3 months.

6.2.6 No conveyor belt must be allowed to continue operating with any one of the safety interlocks faulty or inoperative.

6.2.7 Trip wires are there to insure that the conveyor belt can be stopped from anywhere along the conveyor belt. This can be satisfied by ensuring that the trip wire is as tight as possible (without causing unnecessary trips) and that the trip wire extends to the extreme ends and on both sides of the conveyor.

6.2.8 Contact adhesive is often used to join skirting rubbers and to repair conveyor belts and chutes. Contact adhesive is highly flammable and must be handled in the following manner:

- Contact adhesive must not be brought near high heat areas or where flame cutting and grinding takes place.
- Contact adhesive containers must be closed with the correct lid immediately after use and removed to a safe place (preferably outside a building).
- Contact adhesive must not be used in a confined space, as the solvents released are highly flammable and intoxicating.

6.2.9 Belt splicing is a specialist job and is associated with very specific dangers that must be controlled:

- Access to the area to be spliced is often in an elevated position. Use lifelines and harnesses.
- Adhesives used to splice the belt are toxic. Use correct protective equipment (PVA gloves and A3P3 respirators).
- Apply adhesives in well-ventilated areas or if not possible, provide fresh air supply by use of a fan.

6.3.0 The use of mechanical clips to join or repair tears in conveyor belts must be considered a temporary repair and must be replaced with a glued and/or vulcanised conveyor belt splice as soon as possible.

7. OPERATION OF CONVEYOR BELTS

Many safety points mentioned under “Maintenance and Repairs” also apply to the operation of conveyor belts and vice versa.

7.1 Interlocking and Sound Signals

7.1.1 Every conveyor belt must have, as a minimum the following interlocks and safeguards:
- Start-up siren
- Sequence interlock, normally via a zero speed switch.
- Overload protection.
- Belt slip / no start protection
- Trip wire emergency stop.
- Other operational interlocks.
- Access gate interlock. (For unmanned tripper car conveyor belts)

7.1.2 On initiating a start-up sequence, the start-up siren must sound for 15 to 20 seconds prior to the conveyor starting to move.

7.1.3 Where one start-up siren warns of the start-up of more than one conveyor belt, a visual indicator, typically a yellow revolving light must identify the affected and involved conveyor belts.

7.2 General Requirements

7.2.1 Riding on conveyor belts is strictly forbidden

7.2.2 Conveyor belts must not be crossed over other than at head or tail ends platforms / staircases or at specially provided crossover bridges.

7.2.3 Persons must be prevented from crossing under a conveyor belt where the following conditions exist:

- Where the distance between the floor and the return conveyor belt is less than 1200mm.
- Where the size and weight of the product that could fall from the conveyor belt is such that injury would result. In such instances the area below conveyor belts must be a barricaded off and designated cross-under tunnels provided.

7.2.4 Ensure that everyone stands clear before initiating a start-up sequence.

7.2.4 No loose clothing must be worn when working at or near conveyor belt installations. Loose clothing would be:

- Untied shoe laces
- Torn trousers
- Unzipped overall jackets
- Loose hanging respirators
- Ill fitting overalls
- Loose hanging jewellery

7.2.5 Do not allow persons to:

- Touch the moving conveyor belt
- Collect samples from a moving conveyor belt except with an approved tool and at an approved location.
- Try and free jammed idlers

8. Reference Documents

This Procedure has been based on the following documents:

- Mine health and safety act (29/1996) - Chapter 8 (8.9) Machinery and equipment
- Minerals and Petroleum Resources Development Act and Regulations Chapter 20
- COP 45 – Belt Conveyors & Bucket Elevators
- SOP No.E52 GP 01 Machine Guarding Standards and Specifications
• RA 017-12-01 Risk Assessment Conveyor Belt Adhesives
• Machine guarding (SOP No MG-01)
• Standard conveyor guard drawing (Drawing No 000-H-008)
• P.M. Schedules as applicable
• Risk Assessment on: Conveyors and Nip points– Scale calibration & Training (Risk Assessment No.ZZ-RAS-002)
• E45 GP 002 – Conveyor Belt Specification
• E45 GP 003 – Trouble Shooting Guidelines on Belt Problems: Detection and Correction
• E45 GP 004 - RBM ENGINEERING MANUAL: Care and Maintenance of Belt Conveyor
• E45 GP 005 – Installation of belts on conveyors
• E45 GP 006 - Care and Maintenance of Bucket Elevators
• E45 GP 007 – Textile Reinforced Elastomer Conveyor Belt Splicing

9. REVIEW HISTORY

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