What are Reasonably Practicable measures in terms of preventing TMM collisions?

1. Context

The RSA TMM Regulations sec 8.10.1 and 8.10.2 state:

Collisions between trackless mobile machines and pedestrians.

8.10.1 The employer must take **reasonably practicable measures** to ensure that pedestrians are prevented from being injured as a result of collisions between trackless mobile machines and pedestrians.

Collisions between diesel powered trackless mobile machines.

8.10.2 The employer must take **reasonably practicable measures** to ensure that persons are prevented from being injured as a result of collisions between diesel powered trackless mobile machines.

A clear understanding/definition of what **reasonably practicable measures** are is key to a mine's fulfillment of its legal obligation to prevent persons/pedestrians from being injured as a result of TMM collisions with pedestrian or TMM collisions with other TMMs.

The aspect of reasonably practicable is an **international** one, applicable in many mining jurisdictions globally, and indeed generally. In answering the question, the authors were drawing from, amongst others, the Safe Work Australia "INTERPRETIVE GUIDELINE — MODEL WORK HEALTH AND SAFETY ACT THE MEANING OF 'REASONABLY PRACTICABLE" and where applicable modified to integrate into the South African MHSA. The authors acknowledge these sources specifically.

2. Reasonably Practicable is an objective test.

Reasonably Practicable is **not the opinion of any individual or group**; what is 'reasonably practicable' is determined **objectively**. This means that an employer must meet the standard of performance expected of a reasonable person in the employer's position and who is required to comply with the same duty.

There are two elements to what is 'reasonably practicable' in the context of TMM collisions:

- An employer must first consider **what can be done** - that is, what is possible in the circumstances for ensuring health and safety. Practical examples are that pedestrians can be removed from walking in haul ways underground by transporting them in personnel carriers. Another example is that LDVs can be physically separated (by time, route, or barriers) in most surface mining operations.
- The employer must then consider whether it is reasonable in the circumstances to do all that is possible. This means that **what can be done should be done** unless it is reasonable in the circumstances for the employer to do something less. The burden of proof that it is not reasonably practicable to separate LDVs from HMEs or pedestrians from HME in underground haul ways is difficult to imagine.

The approach of what can be done must be done, is consistent with the objectives of the MHSA which includes ensuring that workers and others are provided with the highest level of protection that is reasonably practicable.

3. How to determine what is reasonably practicable – the process

To identify what is or was reasonably practicable, **all of the relevant matters** must be taken into account and weighed up and a balance achieved, that will provide the highest level of protection that is **both possible and reasonable** in the circumstances. Some matters may be relevant to what can be done, while others may be relevant to what is reasonable to do. No single matter determines what is (or was at a particular time) reasonably practicable to be done for ensuring health and safety.

The MHSA makes it clear, however, that an employer cannot avoid responsibility by a contract which gives control to someone else and through that attempting to **contract out** of its obligations. The employer should consider all of the facts and identify and consider everything that may be relevant to the hazards, risks or means of eliminating or minimising the risks.

The **matters** that must always be taken into account and weighed up are the following:

(a) The likelihood of the hazard or the risk concerned occurring

The greater the likelihood of a risk eventuating, the greater the significance this will play when weighing up all matters and determining what is reasonably practicable. If harm is more likely to occur, then it may be reasonable to expect more to be done to eliminate or minimise the risk. Whilst actual past event frequency must be considered in determining likelihood it is more important to determine potential likelihood based on the nature of the workplace design, operator maturity and other organizational drivers such a production bonusses.

(b) Degree of harm that may result if the hazard or risk eventuated

The greater the degree of harm that could result from the hazard or risk, the more significant this factor will be when weighing up all matters to be taken into account and identifying what is reasonably required (what is reasonably practicable) in the circumstances. Clearly, more may reasonably be expected of an employer to eliminate or minimise the risk of death or serious injury than a lesser harm. With TMM collisions it is particularly difficult to scientifically determine the degree of harm with a high degree of accuracy. It is therefore prudent to assume worst case consequence for specific TMM collisions.

(c) What the person concerned (the employer) knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or minimising the risk

The knowledge about a hazard or risk, and any ways of eliminating or minimising the hazard or risk, will be what the employer knows, and what a reasonable person in the employer's position (e.g., a person in the same industry) would reasonably be expected to know. This is commonly referred to as the state of knowledge. An

employer must ensure that he/she makes reasonable effort to gain the required knowledge. With reference to TMM collisions, various ways are available to the employer, for example by:

- consulting their workers and other mines in the industry,
- consulting experts in the field
- undertaking risk assessments and risk analysis,
- analysing previous incidents,
- considering relevant Regulations and Codes of Practice and other sources of information such as:
  - Guideline for the compilation of a mandatory Code of Practice for Trackless Mobile Machines.
  - MOSH Traffic Management Leading Practice adoption guide for surface mines
  - MOSH Traffic Management Technical Guide for for underground mines.
  - MOSH Collision Prevention Systems (CPS) Guidelines. (User requirement specification, functional specification, integrated CPS testing regime).
  - ISO 21815-1:2022 – Earth Moving Machinery – Collision warning and avoidance – Part 1: General Requirements.
  - ISO 21815-2:2021 – Earth Moving Machinery – Collision warning and avoidance – Part 2: On board J1939 communication interface.
  - ISO 21815-3: (under review not published yet) – Earth Moving Machinery – Collision warning and avoidance – Part 3: Risk area and risk level – Forward/reverse motion.
  - SANS, BS, EN. ISO 12100: 2010 – Safety of machinery – General principles for design – Risk assessment and risk reduction.
  - EMESRT: October 2020: Vehicle interaction improvement guide.
  - EMESRT: August 2019: PR-5A: Vehicle interaction systems. (Including vehicle interaction defensive controls model – Controls 1-9).
  - SANS 1589-3:2022: The requirements for braking systems of underground trackless mobile machines Part 3: In-service brake testing (trailers excluded)
  - ISO 3450:2011: Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems.

(d) Knowledge about the hazard or risk

It is reasonably practicable for an employer to:

- **Proactively take steps to identify hazards** within their business or undertaking before they cause an incident, injury, or illness. This should be done before the activity is undertaken or the circumstances occur that result in the risk.
  - the employer must understand the nature and degree of any harm that an identified hazard may cause, how the harm could occur, and the likelihood of the harm occurring. The nature and degree of any harm can only be determined by analysis of specific work methods and operating regimes as applied by the employer's operations. (Traffic Flow and Risk Analysis)

It is also reasonably practicable for an employer to consider and understand, within the available state of knowledge, how the following may cause or increase hazards and risks:

- potential failure of plant, equipment, systems of work or safety measures
- human error or misuse, spontaneity, panic, fatigue or stress, and
- interaction between multiple hazards that may, together, cause different risks.

(e) Knowledge about ways of eliminating or minimising the risk.

Regulations and Codes of Practice made under the MHSA and other relevant legislation, identify ways to eliminate risks to health and safety, so far as is reasonably practicable and where it is not reasonably practicable to eliminate the risk to minimise such risks so far as is reasonably practicable. These measures are referred to as control measures. Control measures that are set out in the MHSA and Regulations must be complied with by mines.

There may be many different ways of eliminating or minimising risks. The mine should identify as many of these risk as it reasonably can, to give it the greatest scope to choose and apply the most appropriate means to eliminate or minimise a specific risk. The ways of eliminating or minimising risks are to be ranked from most effective and reliable to the least effective and reliable (known as the hierarchy of controls, sec 11 of MHSA) and are described later herein.

(f) Availability and suitability of ways to eliminate or minimise risks

This part requires a consideration of not only **what** is available, but also what is suitable for the elimination or minimisation of a specific risk. A risk control that may be effective in some circumstances or environments may not be effective or suitable in others, because of things such as the workplace layout, skills of relevant workers, or the particular way in which the work is performed.

- Equipment to eliminate or minimise a hazard or risk is regarded as being available if it is provided on the open market, or if it is possible to manufacture it.
- A work process (or change to a work process) to eliminate or minimise a hazard or risk is regarded as being available if it is feasible to implement.
- A way of eliminating or minimising a hazard or risk is regarded as suitable if it:
  - is effective in eliminating or minimising the likelihood or degree of harm from a hazard or risk.
  - does not introduce new and higher risks in the circumstances; and
  - is practical to implement in the circumstances in which the hazard or risk exists.

(g) The hierarchy of risk controls

The measures of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking, known as the hierarchy of risk control, is what the MHSA and Regulations require employers to work through, to choose the control that most effectively eliminates or minimises the risk in the circumstances.

- An employer must eliminate health and safety risks as far as is reasonably

practicable. If there are no available or suitable ways to eliminate a hazard or risk, then an employer must consider all available and suitable ways to minimise risks as far as is reasonably practicable by:

- substituting a hazard with something, or a number of things, that gives rise to a lesser risk.
- isolating the hazard from any person exposed to it.
- implementing engineering controls
- minimizing the risk as far as is reasonably practicable by implementing administrative controls, and if a risk still remains, then suitable personal protective equipment must be provided and used.

How far a control may minimise risk, on its own or together with other controls, should be considered when weighing up what can reasonably be done. Some of the controls may lower the likelihood of harm, others may lower the degree of harm that may result, and some may lower both.

(h) Cost of eliminating or minimising the risk.

Although the cost of eliminating or minimising risk is relevant in determining what is reasonably practicable, there is a clear presumption in favour of safety above cost. The cost of eliminating or minimising risk must only be taken into account after identifying the extent of the risk (the likelihood and degree of harm) and the available ways of eliminating or minimising the risk. The costs of implementing a particular control may include costs of purchase, installation, maintenance and operation of the control measure and any impact on productivity as a result of the introduction of the control measure.

A calculation of the costs of implementing a control measure must take into account any savings from fewer incidents, injuries and illnesses, potentially improved productivity and reduced turnover of staff. In identifying whether a particular expenditure is reasonable in the circumstances, the employer must consider:

- the likelihood and degree of harm of the hazard or risk; and
- the reduction of the likelihood and/or degree of harm that will result if the control measure is adopted.

The more likely the hazard or risk is, or the greater the harm that may result from the hazard, the less weight should be given to the cost of eliminating the hazard or risk.

The cost of risk control options, individually and together, may be relevant when deciding which of the available options are reasonably practicable.

If there are a number of options available for eliminating or minimising a risk that achieve the same level of reduction in likelihood or degree of harm, an employer may choose to apply any number of the least costly options.

Cheaper, available and suitable options may be used instead of a costlier option that may further minimise the risk or severity of harm, where the cost of the costlier option is grossly disproportionate to the risk. This will only apply where the cost is high, and the likelihood or degree of harm is low (e.g., a slight chance of minor cuts or strains and the cost of replacing plant would be very high).

Note: Choosing a low-cost option that provides less protection simply because it is cheaper is unlikely to pass a reasonably practicable test.

If the degree of harm is significant (e.g., death or serious injury is at least moderately likely) then it is unlikely that the cost of implementing available and suitable safety measures to eliminate or minimise the risk would ever be so disproportionate to the risk to justify a decision not to do so.

It may be reasonable to expect (and require) an employer to eliminate the risk by ceasing the relevant activity if, after all 'affordable' control measures have been considered, there remains a significant risk of serious injury or illness.
Where the cost of implementing risk controls is grossly disproportionate to the risk – e.g. the cost of engineering changes to plant will be high and there is only a slight risk of minor sprains - then this may mean the use of those controls is not reasonable and not required. This does not, however, mean that the employer is excused from doing anything to minimise the risk as far as is reasonably practicable. It may simply mean that a less expensive way of minimising the likelihood or degree of harm may instead be used.

The question of what is 'reasonably practicable' is to be determined objectively, and not by reference to the employer's capacity to pay or other particular circumstances. **An employer cannot expose people to a lower level of protection simply because it is in a lesser financial position than another employer**.

(i) Capacity to pay is not relevant

If two employers are faced with the same hazard or risk in similar situations, one employer cannot expose people to a lower level of protection **simply because it is in a lesser financial position** than another employer.

If there are options available for eliminating or minimising a risk that achieve the same level of reduction in likelihood or degree of harm, an employer may choose the least costly option. However, choosing a low-cost option that provides less protection simply because it is cheaper is unlikely to be considered a reasonably practicable means of eliminating or minimising risk.

The costs of implementing a particular control may include costs of purchase, installation, maintenance, and operation of the control measure and any impact on productivity as a result of the introduction of the control measure.

Note: If a particular employer cannot afford to implement a control that is not so disproportionate to the risk as to be clearly unreasonable, the employer should not engage in the activity that gives rise to that hazard or risk.

4. Conclusion

A mine is the duty holder to introduce reasonably practicable measures to ensure that persons (pedestrians and operators) are not injured as a result of TMM collisions.

Appendix A may be useful to a mine seeking clarity of the meaning of reasonably practicable in terms of TMM collision prevention measures.

Appendix A: Diagrammatic determination of reasonably practicable