What is Significant Risk of TMM Collision?

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.

Clauses 8.10.1 and 8.10.2 define the duty of the employer and the question "What is reasonably practicable for a mine" is answered in a separate document.

The Regulations have two additional subclauses that are mandatory where there is a **significant risk of TMM collisions** on a mine. Clauses 8.10.1 and 8.10.2 place a burden of duty on a mine to reduce TMM collision risk to below significant. The sub clauses only have relevance where an employer **could not or chose not** to introduce other reasonably practicable measures without the use of automatic slowdown and stop technology. The regulations **enforce** the employer's obligation to apply Section 11 of the Act and apply the hierarchy of controls by introducing controls in the order of the effectiveness of the available controls.

It is evident that the employer **cannot**, because of introducing the requirements of the subclauses, use Collision Prevention Systems (CPS) as the **only** measure to fulfil his/her duty in terms of Section 11. It may indeed be necessary for a mine to still take other measures than only CPS. A practical example is the use of centre berms on bi-directional haul roads to prevent head on collisions of two TMMs.

Multiple angles to define significant risk of TMM collisions will be discussed to provide the industry with information, however the employer must adopt its own position and be able to justify and defend it.

2. The MHSA Angle

The term "*significant risk*" is found in the following regulations:

- **Chapter 3**: 3.3.3; 3.3.5; 3.9; 3.16 and 3.28
- **Chapter 4**: 4.2 (b), (b) (ii), (2) (ii), (3) (iv); 4.3 (6); 4.7; 4.11; 4.12; 4.14 (1); 4.16 (2), (5), (5) (a) and (7)
- **Chapter 5**: 5.1 (2) and (4)

- **Chapter 8**: 8.6 (1); 8.6 (2); 8.8 (3) (a), (b), (c), (f), (g), (5) (a) and (6); **8.10 (1), (2), (2.2)**; 8.11 (12); 8.12 (9) (c)
- **Chapter 9**: 9.1 (2)
- **Chapter 10**: 10 (1), (2) (i) (cc), (m), (o) (bb)
- **Chapter 14**: 14.1; 14.4; 14.5; 14.6
- **Chapter 16**: 16.2 (2)
- **Chapter 17**: 17.1 (definition of restricted area); 17.6 (a); 17.7 (a), (c); 7.14 (b) (iv)
- **Chapter 23**: 23.4 (b), (c), (e), (l), (o) (iii),

The term "**significant**" is defined in the Oxford Dictionary as being "noteworthy, of considerable amount or considerable effect or considerable importance".

'**risk**' means the likelihood that occupational injury or harm to persons will occur.

The combined term has NOT been legislated: - The SAMRASS Codebook for Mines States: "It is not possible to legislate the definition of **significant risk**, as this will invariably differ from mine to mine, commodity to commodity or even operation to operation. It is therefore the duty of every employer to conduct a risk assessment as required in terms of Section 11 of the MHSA to determine the significant risks to the safety of persons at that particular mine."

Reportable incidents (significant risk)

CHAPTER 23 of the regulations provides further insight to what is to be considered as significant risk. Chapter 23 deals with **ACCIDENTS AND DANGEROUS OCCURENCES** and what accidents must be reported. A mine can therefore assume that the DMRE consider the incidents in Chapter 23 to be noteworthy and that at least any TMM collision with the potential consequence as listed therein, is **significant**.

23.1 The employer must report to the Principal Inspector of Mines in the manner prescribed in this chapter any accident at the mine that results in: (note: not all sub-sections are listed here)

(a) the death of any employee;

(b) an injury, to any employee, likely to be fatal;

(d) an injury which either incapacitates the injured employee from performing that employee's normal or a similar occupation for a period totalling 14 days or

more, or which causes the injured employee to suffer the loss of a joint, or a part of a joint, or sustain a permanent disability,

(e) an injury, other than injuries referred to in paragraph (d), which incapacitates the injured employee from performing that employee's normal or a similar occupation on the next calendar day.

A logical conclusion therefore is that any TMM collision that will result in an injury to a person(s) that will prevent such person to per a normal or a similar occupation on the next calendar day will be considered significant.

3. The TMM COP Guideline Angle

"THE OBJECTIVE OF THIS GUIDELINE

The objective of this guideline is to enable the employer at every mine to compile a COP, which, if properly implemented and complied with, would improve health and safety in connection with the use of *trackless mobile machines* at a mine.

Section 11 of the MHSA requires the employer to identify and assess the health and safety hazards to which employees may be exposed while they are at work, and record the significant hazards identified and risks assessed. The COP must address how the significant risks identified in the risk assessment process must be dealt with, …"

Most if not all mines consider TMM collisions with pedestrians as **Priority or Material Unwanted Events** (PUE or MUE) that must be prevented. As far as TMM collisions with pedestrians are concerned most mines consider such collisions as **Fatal Risks**. It is clear that all such collisions are considered significant risk.

As for TMM-to-TMM collisions, most if not all mines consider any Heavy Mining Equipment (HME) collision as a priority or material unwanted event and hence significant risk and in particular HME to LDV collisions.

When consideration a general approach to a mine's risk assessment, most such assessment methods use a matrix that states that Risk = Likelihood X Consequence OR Probability X Seriousness of injury. Since it is not possible to scientifically predict the severity of a TMM collision with a pedestrian, or between two TMMs, the only way to prevent the risk is to prevent the collision.

4. The TMM Regulatory Angle

The TMM regulations that were promulgated in 2015 state:

For Underground TMMs:

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.

For Surface TMMs:

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.

At any opencast or open pit mine where there is a **significant risk** of such collisions, such measures must include:

8.10.2.1 Every diesel powered trackless mobile machine must be provided with means to automatically **detect the presence** of any other diesel powered trackless mobile machine within its vicinity; **and**

8.10.2.1(a) upon detecting the presence of another diesel powered trackless mobile machine, the operators of both diesel powered trackless mobile machines shall be warned of each other's presence by means of an effective warning; **and**

8.10.2.1(b) in the event where no action is taken to prevent potential collision, further means shall be provided to retard the diesel powered trackless mobile machine to a safe speed where after the brakes of the diesel powered trackless mobile machine are automatically applied. The prevent potential collision system on the diesel powered trackless mobile machine must "fail to safe" without human intervention.

Clauses 8.10.1.2, 8.10.1.2(a) and 8.10.1.2(b) in the same way addresses auto slow and stop technology required for **Underground** TMMs.

The law does not, in either of the cases, give an option or any interpretation. It states that where there is **significant risk** of collision **8.10.2.1 and all its sub clauses must be implemented.**

It therefore logically follows that, if a mine has implemented a proximity detection and warning technology (EMESRT Level 7 and/or Level 8) on any TMM, those TMMs have been deemed to operate in processes/areas where there is a significant risk of collision and therefore the TMM must be upgraded to automatically slowdown and stop (EMESRT Level 9) after the suspension on regulations 8.10.1.2(b) and 8.10.2.1(b) has been lifted.

Note: It must be emphasised that a EMERST Level 9 system does not necessarily conform to the requirements of a CPS.

5. Conclusion

Automatic slowdown and stop technology to prevent significant risk of TMM collisions is not the only reasonably practicable measure a mine can take to control such risks, however, where a mine has **not** introduced such **other** measures, all 3 angles provide clear expectations that a mine must implement automatic slowdown and stop technology on its TMMs.