

GUIDELINE FOR THE COMPILATION OF A
MANDATORY CODE OF PRACTICE FOR

T R A C K L E S S
M O B I L E S
M A C H I N E S



MINE HEALTH AND SAFETY INSPECTORATE



mineral resources

Department:
Mineral Resources
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DEPARTMENT OF MINERAL RESOURCES

MINE HEALTH AND SAFETY INSPECTORATE

GUIDELINE FOR THE COMPILATION OF A

MANDATORY CODE OF PRACTICE FOR

TRACKLESS MOBILE MACHINES



CHIEF INSPECTOR OF MINES



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PART A: THE GUIDELINE

1. FOREWORD

- 1.1 The Commission of Inquiry into Safety and Health in the Mining Industry chaired by the Honorable Mr. Justice RN Leon identified haulage and transport accidents as the second largest category of accidents in mines.
- 1.2 In an initiative to solve this problem, a tripartite sub-committee was established under the auspices of the Mining Regulation Advisory Committee (**MRAC**). The task group prepared a report which recommended amongst other items that a guideline for a mandatory **COP** for **trackless mobile machines** be drafted. As a consequence the guideline was issued on 30 November 2000 and came into force on 31 May 2001.
- 1.3 In 2011, the Mine Health and Safety Council (MHSC) noted that accidents involving **trackless mobile machines** were still at an unacceptably high level. The **MHSC** requested **MRAC** to review the legislation with the view of incorporating minimum performance standards. **MRAC** recommended that, in addition to revising the Guideline, regulations dealing specifically with **trackless mobile machines** should also be published. This recommendation was agreed to by the MHSC. This guideline should therefore be read in conjunction with the **trackless mobile machines** regulations.

2. LEGAL STATUS OF GUIDELINES AND COPs

In accordance with section 9(2) of the **MHSA** an employer must prepare and implement a **COP** on any matter affecting the health or safety of employees and other persons who may be directly affected by activities at the mines if the Chief Inspector of Mines (**CIOM**) requires it. These **COPs** must comply with any relevant guideline issued by the **CIOM** (section 9(3)). Failure by the employer to prepare or implement a **COP** in compliance with this guideline is a breach of the **MHSA**.

3. 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.

4. ACRONYMS AND DEFINITIONS

4.1 Definitions

Words defined in the **trackless mobile machine** regulations have the same meaning in this guideline.

4.2 Acronyms

In this guideline for a **COP** or any amendment thereof, unless the context otherwise indicates:

"COP" means Code of Practice.

"DMR" means Department of Mineral Resources.

"MHSA" means Mine Health and Safety Act, 1996 (Act No. 29 of 1996).

"MRAC" means Mining Regulation Advisory Committee.

"OEM" means original equipment manufacturer.

"SIMRAC" means Safety in Mines' Research Advisory Committee.

"Trackless Mobile Machine" means any self-propelled mobile machine that is used for the purpose of performing mining, transport or associated operations underground or on surface at a mine and is mobile by virtue of its movement on wheels, skids, tracks, mechanical shoes or any other device fitted to the machine, but excludes:

- Rail bound equipment; and
- Scraper winches, monorail installations, static winches, winding machinery installations and any equipment attached thereto.

5. SCOPE

This guideline covers the significant health and safety aspects associated with the design, application, organisational work methods, competency criteria for operators as well as the provision of personal and protective equipment as it relates to **trackless mobile machine**.

6. MEMBERSHIP OF TASK GROUP

6.1 This document was prepared by the **MRAC** Task Group on Haulage and Transport.

6.2 The members appointed in 2012 to revise the guideline were the following:

Messrs.	DJ Janse van Rensburg (Chairperson)	-	State
	AA Coutinho	-	State
	J Coetzee	-	State
	M Llale	-	Labour
	B O Connor	-	Employers
	J Bezuidenhout	-	Employers
	M Thuesen	-	Employers
	G Smith	-	Employers
	C Smith	-	Employers
	W Allen	-	Employers
	C Porteous	-	Employers
	W Stemmet	-	Employers

P Vorster	-	Employers
P Redelinghuys	-	Employers
N. Pienaar	-	Employers
M. van Heerden	-	Employers
J. Pretorius	-	Employers
J Bezuidenhout	-	Employers
F Schwab	-	Employers

PART B: AUTHOR'S GUIDE

1. The **COP** must, where possible, follow the sequence laid out in Part C: "Format and content of the **COP**." The pages as well as the chapters and sections must be numbered to facilitate cross-referencing. Wording must be unambiguous and concise.
2. It should be indicated in the **COP** and on each annexure to the **COP** whether:
 - 2.1 The annexure forms part of the guideline and must be complied with or incorporated in the **COP** or whether aspects thereof must be complied with or incorporated in the **COP**; or
 - 2.2 The annexure is merely attached as information for consideration in the preparation of the **COP** (i.e. compliance is discretionary).
3. When annexures are used the numbering should be preceded by the letter allocated to that particular annexure and the numbering should start at one (1) again. (e.g. 1, 2, 3 ... A1, A2, A3 ...).
4. Whenever possible illustrations, tables, graphs and the like should be used to avoid long descriptions and/or explanations.
5. When reference has been made in the text to publications or reports, references to these sources must be included in the text as footnotes or side notes as well as in a separate bibliography.

PART C: FORMAT AND CONTENT OF THE MANDATORY COP

1. TITLE PAGE

The **COP** should have a title page reflecting at least the following:

- 1.1 Name of mine;
- 1.2 The heading: "Mandatory Code of Practice for the Operation of **“Trackless Mobile Machines”**;
- 1.3 A statement to the effect that the **COP** was drawn up in accordance with Guideline **DMR 16/3/2/2-B2** issued by the **CIOM**;
- 1.3 The mines reference number for the **COP**;
- 1.5 Effective date; and
- 1.6 Revision dates.

2. TABLE OF CONTENTS

The **COP** must have a comprehensive table of contents.

3. STATUS OF MANDATORY COP

Under this heading the **COP** must contain statements to the effect that:

- 3.1 The mandatory **COP** was drawn up in accordance with guideline **DMR 16/3/2/2-B2** issued by the **CIOM**;
- 3.2 This is a mandatory **COP** in terms of section 9(2) of the **MHSA**;
- 3.3 The **COP** may be used in an accident investigation/inquiry to ascertain compliance and also to establish whether the **COP** is effective and fit for purpose;
- 3.4 The **COP** supersedes all previous relevant **COPs**; and
- 3.5 All managerial instructions or recommended procedures (voluntary **COPs**) and standards on the relevant topics must comply with the **COP** and must be reviewed to ensure compliance.

4. MEMBERS OF THE DRAFTING COMMITTEE

- 4.1 In terms of section 9(4) of the **MHSA** the employer must consult with the health and safety committee on the preparation, implementation or revision of any **COP**.

- 4.2 It is recommended that the employers should, after consultation with the employees in terms of the **MHSA**, appoint a committee responsible for the drafting of the **COP**.
- 4.3 The members of the drafting committee assisting the employer with the drafting of the **COP** should be listed giving their full names, designations, affiliations and experience. This committee should include competent persons sufficient in number effectively to draft the **COP**.

5. GENERAL INFORMATION

Relevant information relating to the mine must be stated in this paragraph. The following minimum information must be provided:

- 5.1 A brief description of the mine and its location;
- 5.2 The commodities produced;
- 5.3 The mining methods/mineral excavation processes;
- 5.4 A description of the trackless transport systems, used in/or at the mine, listing the types of **trackless mobile machines** and indicating the machine population; and
- 5.5 Other relevant **COPs**.

6. TERMS AND DEFINITIONS

Any word, phrase or term of which the meaning is not absolutely clear or which will have a specific meaning assigned to it in the **COP**, must be clearly defined. Existing and/or known definitions should be used as far as possible. The drafting committee should avoid jargon and abbreviations that are not in common use or that have not been defined. The definitions section should also include acronyms and technical terms used.

7. RISK MANAGEMENT

- 7.1 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, having regard to the requirements of sections 11(2) and 11(3) that, as far as reasonably practicable, attempts should first be made to eliminate the risk, thereafter to control the risk at source, thereafter to minimize the risk and thereafter, insofar as the risk remains, provide personal protective equipment and to institute a programme to monitor the risk.
- 7.2 To assist the employer with risk assessment, all possible relevant information such as accident statistics, ergonomic studies, research reports, manufacturer's specifications, approvals, design criteria and performance figures for all relevant types of **trackless mobile machines** should be obtained and considered. A list

of relevant **SIMRAC** project reports is attached as Annexure 1, which is attached merely for information purposes.

- 7.3 The application and technical specifications of all types of **trackless mobile machines** used at the mine must be available to enable proper hazard identification and risk assessment to be performed. This information should include items such as, type, make, mass, payload, dimensions, prime mover, power, speed, brakes, turning circles, safety devices and signaling arrangements. The information for those **trackless mobile machines** associated with significant risks must be kept readily available at the mine.
- 7.4 In addition to the periodic review required by section 11(4), the **COP** should be reviewed and updated after every serious incident involving **trackless mobile machines**, or if significant changes are introduced to procedures, mining and ventilation layouts, mining methods, plant or equipment and material.

8. ASPECTS TO BE ADDRESSED IN THE MANDATORY COP

The **COP** must set out how the significant risks assessed and identified in terms of the risk assessment process referred to in paragraph 7.1 above will be addressed. The **COP** must cover at least the aspects set out below unless there is no significant risk associated with that aspect at the mine.

8.1 Design and specification register

In order to ensure that all **trackless mobile machines** are appropriate for the specific circumstances at the mine and are used within their designed and operating specifications, the **COP** must describe the following information as a minimum for all **trackless mobile machines** in use:

- a) Type and model of **trackless mobile machines** (LHD ED 7, LDV 2.4 Diesel Hilux etc.).
- b) Original equipment manufacturer (**OEM**).
- c) Maximum design capacity (cubic meters, tons, number of passengers etc.).
- d) Maximum designed speed (km/h).
- e) Minimum turning circle (metres).
- f) Maximum designed operating gradient (degrees to the horizontal).
- g) Gross mass in kilograms.
- h) Minimum dimensions (mm).
- i) Maximum operating dimensions (mm).
- j) Prime mover (electrical, battery, diesel etc.).
- k) Designed rated power (kW).
- l) Maximum towing capacity (kg).
- m) Manual, remote or remotely controlled.
- n) Types of brakes (S = service, P = park, E = emergency and N/A = not applicable).

8.2 Braking systems

8.2.1 In order to ensure that the braking systems of **trackless mobile machines** are appropriate for the specific circumstances at the mine, the **COP** must describe, per type and model of **trackless mobile machine**, the types, design, methods of application and combinations of braking systems installed. The following braking systems must be installed in the manner, in which the **trackless mobile machine** is operated, requires the use of such a system for safe operation:

- Service brake,
- Park brake,
- Emergency brake or
- A combination of the above.

8.2.2 Testing of braking systems

The **COP** must describe the procedures for testing of braking systems to ensure functionality in terms of brake design specifications, including the following:

- a) Static testing of braking systems;
- b) Where appropriate, dynamic type or other tests;
- c) Recording and safe keeping of test results, for a period to be specified in the **COP**.

8.3 Protection of the operator and passengers

In order to ensure that operators and passengers are protected, the **COP** should describe at least the following devices, where applicable, to protect them whilst in **trackless mobile machines**:

- 8.3.1 From objects falling on them; and
- 8.3.2 In the event of a roll-over.

8.4 Inadvertent movement of a trackless mobile machine

In order to ensure that there is no inadvertent movement of a **trackless mobile machine**, the **COP** should describe the devices and procedures to be used by the operator not to leave a **trackless mobile machine** unattended until it is secured to prevent it from:

- 8.4.1 Inadvertently moving;
- 8.4.2 Inadvertently running out of control; or
- 8.4.3 Being set in motion by an unauthorised person.

8.5 Safe boarding/alighting and working on trackless mobile machines

In order to ensure that persons can safely board, alight and work on **trackless mobile machines**, the **COP** must describe the design of equipment and procedures in place to provide for the safe boarding onto, alighting from or working on **trackless mobile machines**.

8.6 Design and operation of tow-bars and coupling devices

In order to ensure that persons are protected from risks during the use of tow-bars and coupling devices, the **COP** should describe at least the following:

- 8.6.1 Measures to ensure that the design of tow-bars and coupling devices are in accordance with an appropriate SANS or international standard. Any tow-bars or coupling devices not designed in accordance with a SANS or international standard shall be approved by a registered professional engineer;
- 8.6.2 The methods and procedures to be used for the safe coupling, towing/pushing and de-coupling of **trackless mobile machines**; and
- 8.6.3 The methods and procedures to prevent inadvertent de-coupling of any **trackless mobile machine** being towed or pushed.

8.7 Illumination

In order to ensure that **trackless mobile machines** are visible to persons and to enable the operator to identify the presence of persons and hazards timely, the **COP** must describe at least the following illumination provisions on **trackless mobile machines**:

- 8.7.1 Light intensity, type, numbers, size, spread and range of light beams;
- 8.7.2 The distinction between front, rear and side lights including colour coding;
- 8.7.3 Positioning of lights to indicate the width of the **trackless mobile machines**;
- 8.7.4 Installation and adjustment of lights;
- 8.7.5 The use and position of reflectors;
- 8.7.6 Procedure in case of a luminaire or lamp failure; and
- 8.7.7 The use of adjustable lights to illuminate places critical to safe operations.

8.8 Physical constraints to operator vision

In order to ensure that persons are protected, the **COP** must describe the constraints to the vision of the operator from the driving position for different **trackless mobile machines** and different conditions must be identified and noted on area plans to be included as annexures to the **COP**. An example of such an area plan is attached as Annexure 2, which is attached merely for information purposes.

8.9 Remote and remotely controlled trackless mobile machines

In order to ensure that persons are protected from the risks associated with remote and remotely controlled **trackless mobile machines**, the **COP** must describe the conditions under which remote and remotely controlled **trackless mobile machines** may be used, including:

- 8.9.1 Measures to ensure that only one remote control device per **trackless mobile machine** are used to control the motion of the **trackless mobile machine** at any one time;
- 8.9.2 Measures to ensure that all remote and remotely controlling devices are stored, issued and used only by the persons authorised by the employer to do so;
- 8.9.3 Warning signs indicating the use of remote and remotely controlled **trackless mobile machines**;
- 8.9.4 The use of a **trackless mobile machine** only within the sight of the operator including sight via a camera and video screen;
- 8.9.5 The demarcation of safe operating zones around **trackless mobile machines**; and
- 8.9.6 A procedure for changing over from remote to manual control.

8.10 Maintenance and inspection of trackless mobile machines

In order to ensure that the maintenance and inspection of **trackless mobile machines** are appropriate for the specific circumstances at the mine, the **COP** must describe:

- 8.10.1 Scheduling of maintenance, inspections and over inspections.
- 8.10.2 The use of pre-use checklists to identify components critical for the safe operation of the type of **trackless mobile machines** and keeping of such completed checklists for at least three months.
- 8.10.3 The conditions under which **trackless mobile machines** may be used, for example "go", "go but" or "no go" options.
- 8.10.4 Changing wheels and rims.
- 8.10.5 Changing, inflating and repairing of tyres.
- 8.10.6 Changing components where significant risk may exist.
- 8.10.7 The adequate support of **trackless mobile machines** or any of its components which may inadvertently fall on persons.
- 8.10.8 Battery changing procedures on battery powered **trackless mobile machines**.

- 8.10.9 Control and safety systems to be maintained for battery charging facilities, including the identifying of all the possible related risks and methods to address them.
- 8.10.10 Control and safety systems to be maintained for fuel handling facilities, including the identifying of all the possible related risks and methods to address them.
- 8.10.11 Other aspects such as rigging, welding, exposure to toxic liquids or fumes, dust, firefighting, roadways, emergency preparedness and the use of hazardous substances associated with the operation and maintenance, must be addressed unless covered in another **COP**.
- 8.10.12 Safely isolating, de-energizing relevant sources of energy and locking out a **trackless mobile machine**.

8.11 Health and safety provisions on trackless mobile machines

In order to ensure that health and safety provisions on **trackless mobile machines** are appropriate for the specific circumstances at the mine, the **COP** must describe the health and safety provisions applicable to each type of **trackless mobile machine**, which provisions must at least include:

- 8.11.1 Safety devices to negate unexpected incapacitation of the operator or fatigue management procedures;
- 8.11.2 Vibration control;
- 8.11.3 Protection against noise to which the operator is exposed; and
- 8.11.4 Procedures to prevent persons from being injured as a result of:
 - a) Pedestrians required to interact with **trackless mobile machines** during repair work in a work place or in a travelling way or road way.
 - b) Pedestrians required to interact with **trackless mobile machines** during maintenance work in a work place or in a workshop.
 - c) The interaction of the **trackless mobile machines** with each other and with persons during the refueling processes.
 - d) The interaction of the **trackless mobile machines** with each other and with persons during traction battery replacement.
 - e) Other **trackless mobile machines** being parked or operating in close vicinity of haul trucks at loading and / or discharge points.
- 8.11.5 Procedures for the installation, operation and maintenance of proximity detection and collision avoidance systems, where such systems are required;
- 8.11.6 A suitable ergonomic operating environment; and
- 8.11.7 Visual or audible signals, including the codes for the signals, used for communication.

8.12 Trackless mobile machines to be operated by competent authorised persons

In order to ensure that **trackless mobile machines** are operated by competent authorised persons, the **COP** must describe:

- 8.12.1 Procedures and criteria to recruit/select, appoint, educate and train persons to operate **trackless mobile machines**;
- 8.12.2 Keeping of records relating to the formal training of operators of **trackless mobile machines**; and
- 8.12.3 Procedures for the written site-specific appointment and record keeping of competent persons to operate **trackless mobile machines**, including the written acknowledgement and acceptance of the appointment.

8.13 Design of excavations and roadways

In order to ensure that the design of excavations and roadways where **trackless mobile machines** operate are appropriate for the circumstances and the types of **trackless mobile machines** being used at the mine, the **COP** must describe at least the following:

- 8.13.1 The design and layout of mining excavations and specifically roadways, underground inclines and declines considering pertinent aspects such as calculations relating to power, brakes, deceleration, holding, skidding, surface friction, incline angle and numbers of persons potentially exposed to the associated significant risks.
- 8.13.2 Safe height, width and turning circle clearances.
- 8.13.3 Standards for identification and marking of dangerous areas, obstructions, or restricted clearances.
- 8.13.4 The design and location of run-off areas to slow down vehicles in the case of a runaway, where the risk assessment of the mine indicates the need for such run-off areas.

8.14 Operating procedures

In order to ensure the safe operation of **trackless mobile machines**, the **COP** must describe at least the following:

- 8.14.1 Safe start-up, operation, parking and shut-down procedures;
- 8.14.2 The procedures to be used on any roadway and underground incline or decline;
- 8.14.3 Traffic rules and road signs, including speed, authority to move, right of way and restricted entry with regard to dangerous areas, obstructions or restricted clearances;

- 8.14.4 Where more than one **trackless mobile machine** travel in an underground incline or decline at any one time in either direction, procedures to ensure this is done safely;
- 8.14.5 Procedures to ensure a **trackless mobile machine** is towed or attended to for repairs under controlled conditions;
- 8.14.6 General safety rules relating to the interaction between pedestrians, cyclists and **trackless mobile machines**;
- 8.14.7 Procedures for the safe loading, transport and unloading of persons, equipment, material, minerals or explosives on or from **trackless mobile machines**;
- 8.14.8 Procedures to ensure **trackless mobile machines** entering mine premises pose no significant risk; and
- 8.14.9 Procedures for the safe towing or pulling of trailers and skid mounted machinery by **trackless mobile machines**.

8.15 Illumination of environment

In order to ensure adequate illumination of the environment in which **trackless mobile machines** operate, the **COP** must describe at least the following:

- 8.15.1 Positioning and spacing of lights;
- 8.15.2 Intensity and dispersion of light;
- 8.15.3 Reflectivity of the surrounding area; and
- 8.15.4 Steps to be taken in case of illumination failure.

8.16 Visibility of trackless mobile machines, trailers, skid mounted machinery and persons

In order to ensure the visibility of **trackless mobile machines**, trailers, skid mounted machinery and persons, the **COP** must describe at least the following:

- 8.16.1 The placing of signs to warn against the presence of parked, stationary and broken down **trackless mobile machines**, trailers and skid mounted machinery that are poorly visible;
- 8.16.2 Measures to ensure the visibility and safety of pedestrians, cyclists or other persons in the proximity of **trackless mobile machines**; and
- 8.16.3 Timeously warning provisions where persons are required to work where **trackless mobile machines** operate, for both the operator and such persons.

8.17 Inclines and declines

The **COP** must describe:

- 8.17.1 The devices and procedures to be used for safe operation within any incline or decline where **trackless mobile machines** are used;
- 8.17.2 Where installed, run-off areas to slow down vehicles in the case of a runaway; and
- 8.17.3 Measures must be in place that shall allow only one **trackless mobile machine** travelling in an incline or decline at any one time in either direction except when being towed or attended to for repairs, and under controlled conditions.

8.18 Raising/lowering, suspension and transport of persons

Describe the methods for the use of **trackless mobile machines** for the raising, lowering, transportation or suspension of persons generally and in emergency situations.

8.19 Personal protective equipment

In order to ensure that the personal protective equipment is appropriate for the circumstances and the types of **trackless mobile machines** being used at the mine, the **COP** must describe the types of and procedures for the issue, use and control of personal protective equipment.

PART D: IMPLEMENTATION

1. IMPLEMENTATION PLAN

- 1.1 The employer must prepare an implementation plan for its **COP** that makes provision for issues such as organisational structures, responsibilities of functionaries and programs and schedules for this **COP** that will enable proper implementation of the **COP**. (A summary of/and a reference to, a comprehensive implementation plan may be included.)
- 1.2 Information may be graphically represented to facilitate easy interpretation of the data and to highlight trends for the purpose of risk assessment.

2. COMPLIANCE WITH THE COP

The employer must institute measures for monitoring and ensuring compliance with the **COP**.

3. ACCESS TO THE COP AND RELATED DOCUMENTS

- 3.1 The employer must ensure that a complete **COP** and related documents are kept readily available at the mine for examination by any affected person.
- 3.2 A registered trade union with members at the mine or where there is no such union, a health and safety representative on the mine, or if there is no health and safety representative, an employee representing the employees on the mine, must be provided with a copy of the written request to the manager. A register must be kept of such persons or institutions with copies to facilitate updating of such copies.
- 3.3 The employer must ensure that all employees are fully conversant with those sections of the **COP** relevant to their respective areas of responsibility.

ANNEXURE 1: References

(for information only)

List of relevant SIMRAC project reports

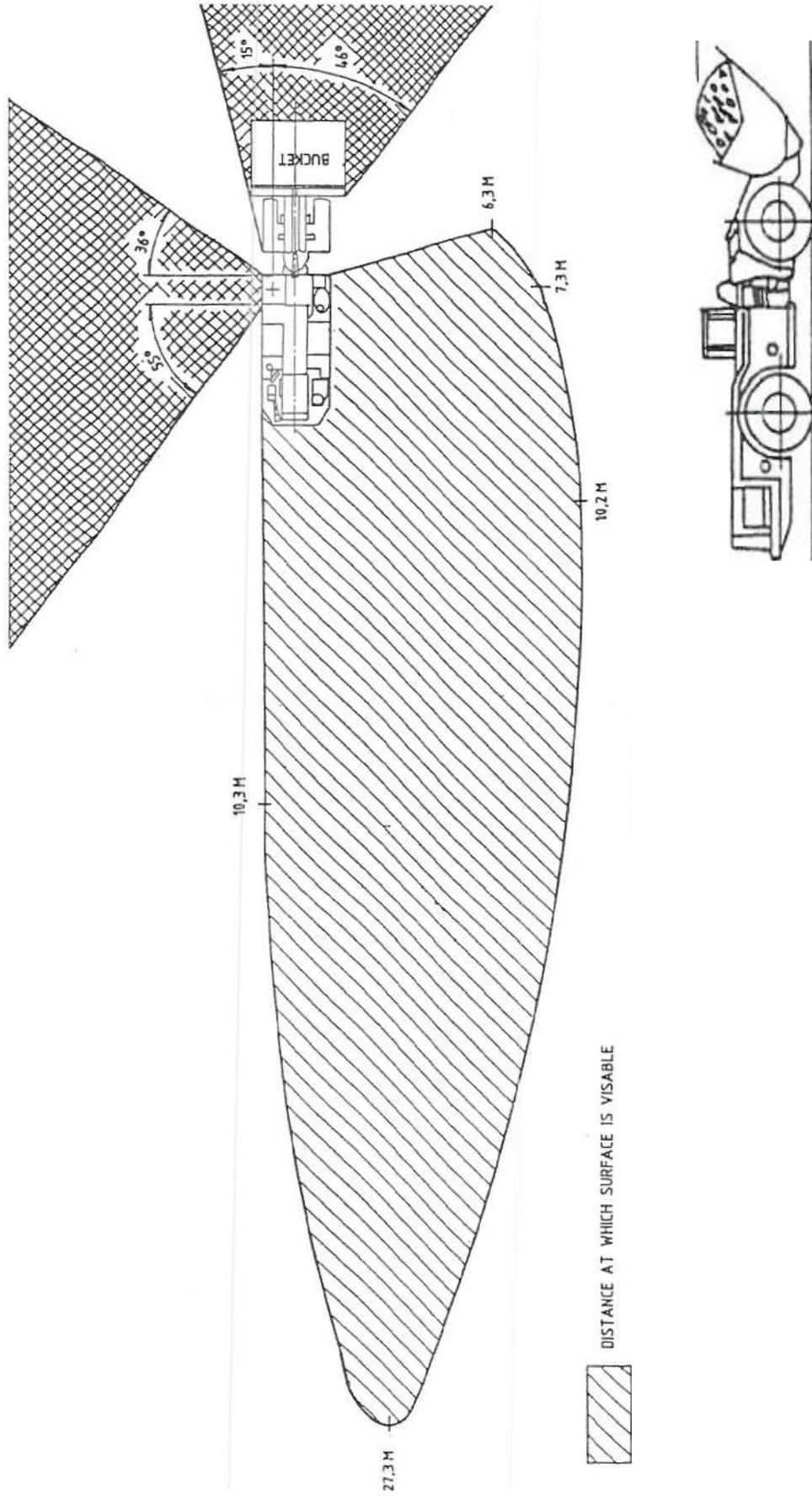
- COL 033 Review of illumination problems pertaining to S.A. collieries.
- COL 203 Engineering and human factors in machinery and transport accidents.
- COL 341 Guidelines for the development of safer use of mobile machines.
- COL 416 The influence of ergonomics of trackless machines on safety and health.

- COL 451 Assessment of illumination and visibility standards in coal mines.
- COL 506 Investigate the causes of transport and tramming accidents on collieries
- GEN 010 Control of diesel exhaust emissions in underground workings.
- GEN 109 Develop remote control systems for mining equipment.
- GEN 420 Methods whereby noise levels of mining equipment may be reduced.
- GEN 501 Investigation of safety and health benefits of standoff controls.
- GEN 503 The measurement of vibration characteristics of mining equipment.
- GEN 603 An ergonomics strategy for the South African mining industry (not finalized yet).

- OTH 202 Transport and tramming accidents on mines other than gold, coal and platinum.

- OTH 308 Influence of road design, construction and practices on transport accidents.

ANNEXURE 2: Area visibility plan



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