



GUIDELINES FOR THE CONTROL OF HAZARDS IN STOCKPILES AND DUMPS

March 2008

NOTE: These guidelines have been superseded by the Health and safety at opencast mines, alluvial mines and quarries Good Practice Guidelines available on the MinEx website. However, this document contains information you may still find valuable.

CONTENTS

ACKNOWLEDGEMENT	3
1.0 INTRODUCTION.....	3
2.0 HAZARDS OF WORKING STOCKPILES AND DUMPS.....	3
3.0 CHARACTERISTICS OF STOCKPILES AND DUMPS.....	3
3.1 METHODS OF OPERATION:.....	4
3.2 NATURE OF MATERIAL:	4
4.0 SITING AND TYPES OF STOCKPILES AND DUMPS	4
5.0 OPERATIONS USING MOBILE EQUIPMENT AND HIGHWAY DELIVERY VEHICLES	5
5.1 FORMING THE STOCKPILE OR DUMP:	5
5.2 OPERATING THE STOCKPILE OR DUMP:.....	6
5.3 INSTABILITY OF THE STOCKPILE OR DUMP:	6
5.4 FURTHER OPERATING REQUIREMENTS:	6
6.0 QUARRY/MINE FACE TIPPING OR DUMPING.....	6
7.0 HAUL INFORMATION, CONSTRUCTION, AND SAFETY	7
8.0 INSPECTION OF STOCKPILES AND DUMPS	7
9.0 OPERATING INSTRUCTIONS AND TRAINING	7

ACKNOWLEDGEMENT

MinEx would like to thank those who have contributed to the development and review of this guideline. Special acknowledgement is given to Department of Labour (Workplace), Mines and General Workplace Inspectorate, who have allowed their original material to be used as the basis of this publication.

1.0 INTRODUCTION

- A. Injuries to persons engaged in or associated with the operations of tipping on stockpiles or dumping of overburden in mines and quarries are usually serious and often fatal.
- B. These guidelines have been prepared to assist in the prevention of these injuries. They describe principles and practices that should be put into effect and strictly observed by management and operators.
- C. For the guidelines to be fully effective, it is necessary for each operation to prepare operating instructions that are available for reference and training purposes.
- D. These guidelines recognise that conditions and circumstances which determine operating procedures may vary considerably at different operations. For the implementation of these guidelines, it is a requirement that written operating instructions be prepared for each operation and every operator at that operation be issued with a copy of the instructions and undergo a practical test. These operating instructions should be reviewed to reflect changes.

2.0 HAZARDS OF WORKING STOCKPILES AND DUMPS

- A. The hazards of working stockpiles and dumps are generally associated with the nature of:
 - a. the material being stockpiled or dumped
 - b. the configuration and placement of the stockpile or dump
 - c. the mobile equipment being used
 - d. the immediate and overhead environment
 - e. the degree of moisture and drainage of the stockpile or dump
 - f. the method of material retrieval, and undetonated explosives.
- B. These hazards can result in vehicles colliding, going over the face, slipping down subsided edges, rolling over, contacting power lines, getting buried, or any combination of these.
- C. Hazardous situations can develop through unsafe work practices and procedures, equipment failure, unrestricted access by the public and poor planning and layout.

3.0 CHARACTERISTICS OF STOCKPILES AND DUMPS

- A. The characteristics of the types of stockpiles are significant when determining and assessing the hazards and degree of risk. The characteristics of a stockpile are determined by:

- a. the nature of the stockpile or dump in relation to its height and methods of tipping and dumping
- b. the nature of the quarried material being stockpiled or dumped and third
- c. the characteristics of the site.

3.1 Methods of Operation:

- A. BY STACKER. A conveyor stacker may be mounted on wheels which move in a semi-circle. This type of operation has a number of hazards, one being interference with vehicle/equipment movement; another is walking or driving under the stacker. If the stacker is feeding a surge pile, there is a hazard of personnel being drawn down with the feed.
- B. ON GROUND. As placed by mobile equipment or highway delivery vehicles. Adequate area for movement of equipment performing the tipping is essential, particularly where there is a nearby quarry face, or plant. Uneven surfaces can also be hazardous.
- C. ON STOCKPILES AND DUMPS UP TO SIX METRES IN HEIGHT. When tipping is on a stockpile there is a danger of roll over, caused by unstable surfaces and edges or uneven surfaces, by unsafe work practices such as driving with the truck tray raised or failure to use bunding or undermining of the stockpile face. A hazard also exists for persons working in proximity to the base of the face.
- D. ON STOCKPILES AND DUMPS OVER SIX METRES IN HEIGHT. The hazards are the same as for dumps up to six metres; however more serious injuries are likely to occur because of the height. There may also be the possibility of burial of machine loading from the stockpile
- E. FEEDERS. Where there is a buried retrieval feeder under a stockpile, the following hazards may be experienced: cavitations causing sudden collapse, a cone being formed with highly unstable faces, and the possibility of persons being trapped by moving material.
- F. OVER FACES. When tipping over a quarry face the hazards are the same as for C and D.

3.2 Nature of Material:

- A. The nature of the mined material being stockpiled or dumped can be divided into two broad categories:
 - a. GENERALLY UNSTABLE. These products do not compact to form a stable surface. Under cutting of the toe by a front end loader does not usually result in the formation of an acute angle of the face. The hazards are roll over due to an unstable edge or sides of the stockpile, or burial.
 - b. GENERALLY STABLE. These products compact. Loading from the toe of the stockpile may result in the formation of an acute angle or overhang of the face at the edge. Roll-over may occur due to an unstable edge. Burial is also a risk.

4.0 SITING AND TYPES OF STOCKPILES AND DUMPS

- B. The factors determining the siting and design are:
 - a. THE NATURE OF THE MINED MATERIAL. Refer Section 3.2

- b. **THE GROUND** used for the stockpile or dump should be firm and provide a stable foundation. It should be relatively level, properly drained and should not be affected by water courses, which may flood.
- c. **THE VOLUME OF PRODUCT.** The output of a quarry will have an influence on the siting, type and size of stockpile.
- d. **AREA AVAILABLE AND REQUIRED.** The size of the area, irrespective of the type of stockpile, must be sufficient for mobile equipment to operate when dumping and loading out.
- e. **OTHER POTENTIAL HAZARDS.** No stockpile should be formed under or on top of power lines. Eight metres minimum horizontal distance should apply from beneath power lines to the toe of any stockpile or dump. Access shall not be from beneath overhead power lines. High stockpiles should not be located where high wind conditions may suddenly occur.
- f. **ENVIRONMENTAL CONSIDERATIONS.** Siting should ensure the lowest environmental impact possible.

5.0 OPERATIONS USING MOBILE EQUIPMENT AND HIGHWAY DELIVERY VEHICLES

- A. The main hazards associated with tipping or dumping on a stockpile, whatever the height, are instability of the edge and surface. The risk is mobile equipment rolling over the face or overturning on the surface.
- B. Incidents may also occur by malfunctioning equipment and vehicles, unsafe working practices, or climatic conditions. The latter includes slippery surfaces, high winds when the hoist is in the raised position and poor visibility because of rain, or night/dusk working. Tipping at an angle to the lip of the stockpile or dump can cause under-estimation of the distance to the lip.

5.1 Forming the stockpile or dump:

- A. **ACCESS RAMPS.**
 - a. Access must be sited to avoid the possibility of impact with other mobile equipment.
 - b. The ramp should be constructed using a front end loader, bulldozer or other suitable machine and adequately compacted.
 - c. The ramp angle should be such that it is compatible for the safe use of the appropriate mobile equipment.
 - d. Bunds should be constructed at the edges.
- B. **INITIAL TIPPING OR DUMPING.**
 - a. The first tipping or dumping should be at a distance of three metres from the edge, if using an off-highway dumper.
 - b. The lead up to the edge should be compacted and have an upward run to the tipping point. At the sides of the approach and at the tipping point, a bund is to be formed at least the height of the axle of the vehicle used, with the width a minimum of twice the height.

- c. The machine or equipment used to keep the 'tip-head' cleared – the operator should always ensure that they maintain a bund at the 'tip-head' that will prevent the inadvertent movement of vehicles over the face.

5.2 Operating the stockpile or dump:

- A. The methods of tipping after the stockpile or dump is initially formed will depend on the nature of the mined material. The following provides guidance:
 - a. The use of a bund;
 - b. The use of a spotter;
 - c. Tipping in front of the edge and then pushing over.

5.3 Instability of the stockpile or dump:

- A. Instability of a stockpile or dump is a hazard. To avoid this hazard, alternatives are:
 - a. Where practical, there should be two stockpiles or dumps. One where stockpiling or dumping is taking place, the other where loading is being performed.
 - b. Tipping or dumping should be carried out at a distance from where the loading is being performed.
 - c. Where there is a high risk of instability, a suitably instructed 'spotter' should be used.

5.4 Further operating requirements:

- A. Where concurrent loading out is taking place, the location of tipping or dumping will be designated by flags, posts, signs or any other suitable material (on large stockpiles over six metres high). No under-cutting to be allowed.
- B. Non operational areas, unstable surfaces or edges should be isolated to prevent unauthorised access.

6.0 QUARRY/MINE FACE TIPPING OR DUMPING

- A. The hazards are the same as for other tipping and dumping. The risk of serious injury is greater because of the acute angle and height of the face. Recommended practices are as follows:
 - a. The ground at the edge of the face should be inspected before tipping operations commence.
 - b. The location of operation will be designated as in Section 5.
 - c. The initial tipping should not be directly over the edge.
 - d. The initial operations should be directly observed by a second competent person and they should inspect the face and bench after each tipping.
 - e. Mobile equipment should not be permitted to approach the stockpile below until approved by the manager, or the person in charge.
 - f. The operator should carry out a special inspection with their supervisor, or the mine/quarry manager/supervisor after heavy or prolonged rain.

7.0 HAUL INFORMATION, CONSTRUCTION, AND SAFETY

- A. The hazards associated with haul road formation are – road width, gradient, outer edge bunding, drainage, surface cross fall and road surface maintenance to aid braking and traction. Some key controls to apply are as follows:
- a. **Road Width.** Must be suitable for the type and size of vehicles using it.
 - b. **Gradient.** As for road width. Must be designed and constructed for existing plant likely to use the roads. For rigid trucks gradient should not exceed 1:10 the machines braking capabilities may allow deviation from this.
 - c. **Edge Protection (Bunding).** Must be constructed on a solid foundation, using stable material and constructed to half the wheel height of the largest vehicle using the road, or for larger capacity machines 3 – 4 times the front axle height.
 - d. **Drainage.** For areas of high rainfall special attention should be paid to the construction an effective water 'run-off' and collection system. Culverts and water tables designed and constructed with excess capacity to cope with the heaviest of rainfall periods; 'stilling' basins to slow the speed of the water 'run-off'.
 - e. **Surface Cross Fall and Road Surface Maintenance.** To affect lower running costs, fuel savings, increased tyre life, less driver fatigue and greater over all productivity, it is very important that the road surface and cross falls are maintained to a very high standard. Scheduled and regular road maintenance should be carried out to ensure the required standard is kept.

8.0 INSPECTION OF STOCKPILES AND DUMPS

- A. All stockpiles and dumps should be inspected daily and particularly after torrential downpours of rain and earthquakes.

9.0 OPERATING INSTRUCTIONS AND TRAINING

- A. Written operating instructions should be developed for all tipping or dumping operations. These should detail the actions to be carried out during tipping or dumping operations and include inspection regimes.
- B. No operator should be engaged in tipping or dumping operations unsupervised until they have received satisfactory training in the instructions and they have demonstrated, by practical tests, their competency in operating the equipment and their knowledge of the operating instructions.