



Quarries National Joint Advisory Committee (QNJAC)

# **Geotechnics, Face & Stockpile Operations**

*Information Sheet 1*

*June 2009*

***Guidance on  
Safe Face Management Operations in Quarries***



**Kaolin and Ball Clay  
Association (UK)**



## **GUIDANCE ON SAFE FACE MANAGEMENT OPERATIONS IN QUARRIES**

### **PREFACE**

The guidance in this Information Sheet has been endorsed by the Quarries National Joint Advisory Committee (QNJAC). Following this guidance is not compulsory and you are free to take other action. Health and Safety Inspectors seek to secure compliance with the law and may refer to the contents of this Information Sheet as illustrating good practice.

### **INTRODUCTION**

1. Faces in quarries need managing and may need to be maintained to control or remove loose material or overhangs, for example after blasting or due to the effects of weathering and/or erosion. This Information Sheet gives guidance to those who have control of working quarries on how to ensure safety during face management operations. The guidance will also be of value to managers, supervisors, contractors, health and safety specialists, the workforce and their representatives.
2. This guidance should be read in conjunction with The Quarries Regulations 1999 and Approved Code of Practice "*Health and safety at quarries*". Nothing in this guidance should take precedence over specific advice from Geotechnical Specialists, whose Geotechnical Assessment(s) should be incorporated into the Quarry Design and 'Excavations and Tips Rules'.

### **HAZARDS and RISKS**

3. It should be presumed that maintenance of rock faces will be necessary in quarries where blasting takes place.
4. Failure to manage faces where a Risk Assessment (being an assessment recorded as part of the health and safety document and required by Regulation 7 of The Quarries Regulations 1999) has identified the need to do so, increases the risks from hazards, which include loose materials falling onto people and plant below. It may also result in an inability to establish a safe stand-off zone at the crest. Where blasting is required, controls must be in place to ensure that a solid, stable face is exposed for the purpose of blast design to prevent associated risks from hazards such as fly rock. Account should also be taken of any changes that could occur in unsupported faces, particularly when re-visiting older faces during quarry development.
5. During face operations the workforce may be exposed to falling materials or to overturning plant if the work is not properly planned and the plant properly positioned and protected, for example by the use of Falling Object Protective Structures (FOPS) and Roll-Over Protective Structures (ROPS). Operators should not rely on FOPS cabs when assessing the level of protection necessary to take into account falling rock and should take into account the relevant standards for such protection.
6. There is also the potential of falls from height, most significantly from the crest or rock pad from which an excavator may operate, and risks arising from slips and trips.

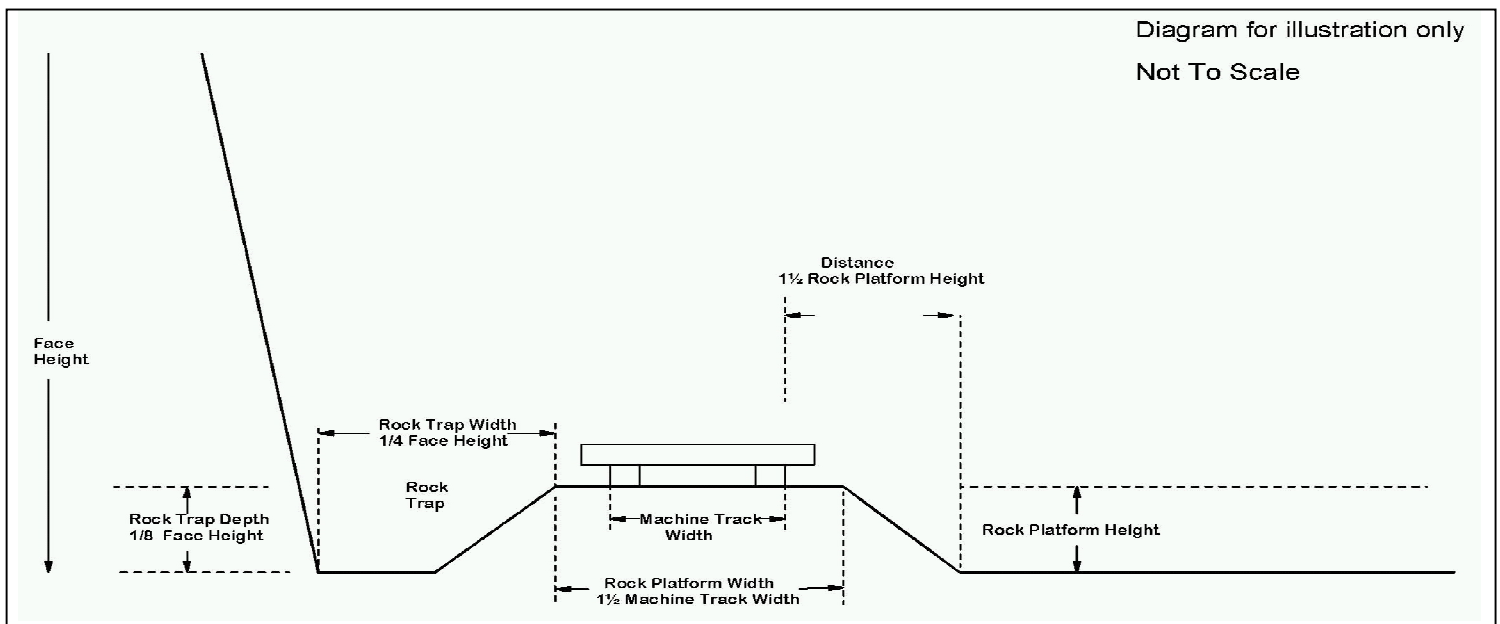
## SAFE METHODS OF WORKING: FACTORS TO CONSIDER

7. When working quarry faces the following should be considered:
- Has the Geotechnical Assessment identified planar, wedge, toppling, rotational or any other type of in-bench failure mechanism or rock fall?
  - Is a rock trap required? If so, has it been incorporated into the Quarry Design and 'Excavations and Tiers Rules'?
  - Does material at the top of the face need to be within the reach or capture capability of the excavator/loader?
  - Is the excavator/loader always in a safe position, for example is the cab outside of the rockfall / sand engulfment zone?
  - Is the excavator/loader capable of controlling the largest rock?
  - Are the excavator/loader, loading pad/platform and rock pile stable?
  - Is the bench wide enough for loading and long-term maintenance operations including access, drainage, scaling, stand-offs, edge protection and rock traps where needed?
  - Have faces, benches and stand-offs been designed stipulating widths, heights and angles, and size and type of excavator/loader?
  - Is the crest susceptible to 'back-break' following blasting operations?

**The objective in maintaining quarry faces is to remove all significant loose material and rocks within the face to prevent danger and to establish a solid, stable rock face. Rocks should be dislodged so that they either fall safely in a controlled manner into the rock trap or are removed in the bucket of the machine**

## ESTABLISHED SAFE METHODS OF WORKING

8. The working methods described below have an established good safety record. A benefit of adopting either of these methods is that this allows a decision to be made in advance concerning the matching of face heights to the plant available to ensure safe working:
- In the case of a 360° backacter excavator, the machine selected should be able to reach the face crest from a safe position with a suitably designed rock trap in place. A Site-specific Risk Assessment will determine the actual design of the rock trap but as a rule of thumb it might be expected to be  $\frac{1}{8}$  of the face height in depth and  $\frac{1}{4}$  of the face height in width (see diagram below).



- b) In the case of a wheeled loader or 360° face shovel working from the quarry floor, the crest should be within the safe reach or capture capability of the machine if no other working procedure is available to manage the face above the reach of the machine.
9. Where quarry operators have chosen to adopt either of the above methods they should ensure that:
- a) the factors referred to in paragraph 7 have been taken into account
  - b) the specific requirements are contained within the 'Excavations and Tips Rules', which must be communicated to the workforce
  - c) the design parameters of the quarry are maintained
  - d) the working method is supervised, monitored and reviewed
10. Should it be necessary or desirable to operate outside of the above methods, even temporarily, then the guidance in the following section should be considered.

### **SAFE METHODS OF WORKING: ADDITIONAL CONSIDERATIONS**

11. Where the way in which the quarry has been developed makes either of the above methods impracticable, then any alternative method will need to be based on a Geotechnical Assessment which justifies the chosen method of working. This may identify the need for more specialist plant and associated operator competencies, and will almost certainly require greater managerial and workforce involvement in planning and monitoring the chosen method.
12. This guidance cannot deal adequately with all the complexities that the Geotechnical Assessment might identify, or the precautions that the adopted methods might need to cover, but the following summary suggests possible broad scenarios that may arise:
- a) The Geotechnical Assessment, or routine inspections (i.e. inspections in accordance with the written scheme required by Regulation 12 of The Quarries Regulations 1999), identify that no face maintenance is necessary (at least in the short term) and face operations can continue.
  - b) the Geotechnical Assessment, or routine inspections, identify that face maintenance is necessary, the existing plant on site does not have sufficient reach from below and from a safe position to undertake this, but plant with sufficient reach from a safe position can be hired in to undertake the work;
  - c) The Geotechnical Assessment, or routine inspections, identify that face maintenance is necessary, but the quarry operator is not able to access plant with sufficient reach from below and from a safe position to undertake the work.
- Where this occurs, face maintenance may be undertaken from the crest in accordance with a procedure detailed in the 'Excavations and Tips Rules' supported by a Geotechnical Assessment. A key requirement of this procedure will be the identification of a safe stand-off zone at the crest and toe to prevent unauthorised access into these zones, and the full involvement of all relevant workers. This method should be the exception due to the additional risks which have to be controlled and, where practicable, the quarry design should address how the above alternative methods (see paragraph 8(a) and (b)) can be implemented in accordance with documented timescales.
13. Any decisions taken must be consistent with the 'Excavations and Tips Rules', communicated to the relevant workers, and the quarry operator must provide sufficient managerial/supervisory attention to monitor the working methods.

## **GEOTECHNICAL SPECIALISTS AND QUARRY DESIGN PLANS**

14. Face maintenance methods will depend upon a number of factors including the type of mineral being worked, topography, geotechnical issues, blast design, availability of plant and the competency of personnel, including plant operators. Geotechnical Specialists have a crucial role in helping quarry operators determine suitable methods of face maintenance and formulating quarry designs. The planning of face geometry in a quarry is a strategic quarry design decision and geotechnical advice should be fully considered.
15. The Quarry Design must consider the final faces (including existing, older faces) prior to closure of the quarry. This guidance does not address these matters.

## **WORKER INVOLVEMENT**

16. This guidance has highlighted the key role that Geotechnical Specialists play in the design and assessment of working quarry faces. Quarry operators are responsible for making and resourcing any decisions made based upon any advice provided. The workforce – employees, their representatives and contractors – has a wealth of practical experience and knowledge to contribute to all aspects of quarry operations including quarry design and methods of working. The workforce can also provide essential feedback on day to day matters such as strata or ground water that could affect face stability. The workforce makes a major contribution to quarry safety. Quarry operators should utilise their capacity to the full and encourage their active participation in managing the risks associated with their work.

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