**GEOTECHNICAL SELF AUDIT**

**Introduction**

This self-audit has been produced by a working group of QNJAC which comprises industry experts from varied backgrounds, the Trade Unions and HSE.

The purpose of this document is to provide a structured framework to enable organisations to carry out self-audits of geotechnical procedures to prove their effectiveness as well as identifying weaknesses in the systems on site that could lead to serious injury or loss of life. It can be used and adapted by any organisation that creates excavations and tips for the purposes of extraction and quarrying and where the requirements of the Quarries Regulations 1999 apply.

Serious incidents can and do occur. There have been numerous serious incidents over the years, many of which have had the potential to result in fatal injury. A recurring failure of the industry has been in the inability to manage change correctly and this, coupled with deficiencies in inspections, the lack of understanding around geotechnical assessment and the design process gives an ongoing and fundamental cause for concern that the required improvements are not being made. A geotechnical self-audit process is seen as a fundamental first step in identifying key issues on site and providing a basis for following up and addressing such defects. Such an audit should cover the following key activities:

* Management of the design process including change;
* Effectiveness and suitability of design documents;
* Site inspections;
* Training and competence of individuals;
* On the job assessment of knowledge;
* Supervision and refresher training;
* Accurate and representative documentation including notifications;
* Audit and review of effectiveness of control measures.

All elements combine to form a safe system of work. A failure of one or more critical elements may lead to a failure of one or more designed slope features on site, and the consequences therefore can be fatal. It is essential to consider all of the individual elements that make up the design of excavations and tips and to routinely inspect their ongoing safety and stability. To help achieve that, this audit sheet provides a useful set of questions to ask in order to check the soundness of the combined elements of the site geotechnical system including consideration of the people who work within those systems and procedures. Human error is a significant factor in many incidents. A procedure in itself will not prevent an accident. Do not ignore the people who are required to implement the operation of a robust site and particularly in regard to their competency and confidence in discharging their roles.

The findings of the audit can be recorded and used to write an action plan which is a record made of all the actions required to be taken as a result of the audit. It is a good idea to assign responsibilities and proposed dates for action to be completed as part of the action plan, to increase the likelihood of the matters raised being addressed.

**Scope**

The self-audit is not exclusive to the quarrying and extractive industries. The same risks exist across a wider range of industries including all those activities where stockpiling of granular material takes place.

**Carrying out the audit**

Allow enough time to carry out the audit. At large sites it is likely that the audit will have to be carried out over several days. Plan the time and stay to plan as far as possible. The audit does not have to be done in one go, so be realistic. The audit process is part of the function of supervision and monitoring so it is useful if it is seen to be a regular on-going process rather than a one-off event.

Remember that the purpose of the audit is to uncover weaknesses in the system. **Finding weaknesses is therefore to be considered a success and the action taken as a result of the audit may prevent serious accidents or death.**

Planning the audit is critical. The size of the site and complexity of excavation, tips, stockpiles and lagoons is likely to be a significant factor in terms of the amount of planning required. However, regardless of the size of the organisation there are key considerations at the planning stage. For example;

* Involve the workforce. Ensure that the workforce is fully briefed on the purpose of any audit and encourage them to become involved.
* Remember that it is often the workforce who are the most informed.
* Encouraging a ‘just culture’ will help you discover more.

People are critical to the audit:

* Decide who will carry out the audit, it may be an individual or teams.
* Take time to brief them and train them if necessary.
* Check their competence and understanding of the process.
* Make time available to them.

There are a number of ways the audit can be carried out. The questions move through a logical sequence and follow under the headings of Quarry/Site, Processes and People. There is also flexibility to split the task of auditing amongst members of a team with responsibilities for different areas of the site, for example. It is not so important as to how the audit is carried out or over how long a period, but rather it is the rigour and integrity that matters.

It is important to remember contractors, and they should be included in the audit process. Regular contractors may be responsible for load & haul, drill & blast and other activities so involve them in the audit process including any planning so that they can contribute their knowledge and understanding. For other contractors check that procedures for managing excavations and tips are in place, and that they are understood and effective.

**Please also refer to other QNJAC Geotechnics Working Group-Publications either through** [**www.QNJAC.COM**](http://www.qnjac.com) **or via the QNJAC App:**

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| GUIDANCE NOTE-Safe Face Management Operations in Quarries - Information Sheet 1 |
| GUIDANCE NOTE- Excavation and Tip Rules in Quarries - Information Sheet 2 |
| GUIDANCE NOTE-Quarry Design- Information Sheet 5 |
| GUIDANCE NOTE-Managing Change-Information Sheet 3 |
| GUIDANCE NOTE-Duties of the Operator -Information Sheet 4 |
| TOOL BOX TALK-Inspections of Rock Faces |
| GUIDANCE NOTE-Abandonment or Ceasing of Operations at Quarries-Information Sheet 6 |
| TOOL BOX TALK-Construction of Solid Tips |
| TOOL BOX TALK-Management of Stockpiles |
| TOOL BOX TALK-Blast Designs & Techniques to improve Quarry face stability |
| TOOL BOX TALK-Face Surveying |
| TOOL BOX TALK-Information & Engagement |
| TOOL BOX TALK-Overburden Stripping |

**Note: The term “quarry” is used throughout the audit form and denotes all forms of open pit extraction such as opencast sites, clay pit workings, chalk pits, sand & gravel extraction areas as well as quarries.**

**Please answer Y, N or Not Applicable (N/A)**

**SITE GEOTECHNICAL– SELF AUDIT**

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| **QUARRY/SITE** |
| **General Questions** | **Y** | **N** | **ACTIONS/COMMENTS or N/A** |
| 1. Is there an appointed Geotechnical Specialist for the quarry? **(see Regulation 33)**
 |  |  |  |
| 1. Have all the excavations/tips/stockpiles been subject to a geotechnical appraisal by a competent person under Regulation 32 to determine if there are any significant hazards requiring a geotechnical assessment? **(see Regulation 32)**
 |  |  |  |
| 1. Is there a current and applicable Geotechnical Assessment available for the quarry? **(see Regulation 33)**
 |  |  |  |
| 1. Does the Geotechnical Assessment contain conclusions regarding the design and the operation of excavations and tips at the quarry? **(see Regulation 33)**
 |  |  |  |
| 1. Is the quarry being developed and managed in accordance with an approved Design or Designs as outlined in the Geotechnical Assessment? **(see Regulation 33)**
 |  |  |  |
| 1. Do all excavations, tips, stockpiles and lagoons at the quarry have an approved design?**(see Regulation 30)**
 |  |  |  |
| 1. Does the quarry have a set of Excavations & Tips Rules which are relevant to all of the existing or planned excavations, tips, stockpiles and lagoons at the quarry? **(see Regulation 31)**
 |  |  |  |
| 1. Are all daily, weekly/monthly, post blast and other inspections being completed and recorded in accordance with the frequency recommended by the Geotechnical Specialist? **(see Regulation 12)**
 |  |  |  |
| 1. Are there any new excavation, tip, lagoon or stockpile features planned for the next 12-24 months?
 |  |  |  |
|  If the answer to question 9) is Yes, will the Regulation 32 Appraisal process be used to manage the change and the design process to determine whether the new feature is a significant hazard? **(see Regulation 32)** |  |  |  |
| 1. Are there any closed or dormant features (e.g. Low Risk Tips) that will become active during the next 12-24 months?
 |  |  |  |
|  If the answer to question 10) is Yes, will the Regulation 32 Appraisal process be used to manage the change and the design process to determine whether the active feature is a significant hazard? **(see Regulation 32)** |  |  |  |
| 1. Has the quarry been affected by unexpected occurrences such as geological anomalies, rockfall or ingress of groundwater and is there a possibility of the quarry being affected by such events in the future?
 |  |  |  |
|  If the answer to question 11) is Yes, has/ will the Regulation 32 Appraisal process be/been used to manage the change and determine whether the anomaly represents a significant hazard?**(see Regulation 32)** |  |  |  |
| 1. Does the Quarry Boundary Plan show a boundary which accurately reflects the area of the quarry where the Quarries Regulations need to be applied? **(see Regulation 16)**
 |  |  |  |
| 1. Does the geotechnical assessment for the site consider and take account of hazards which impact persons, property and apparatus located beyond the site boundary? (Including underground and overhead utilities/ services). **(see Regulation 33)**
 |  |  |  |
| If the answer to question 13) is Yes, does the Geotechnical Assessment provide practical design information as to mitigating the risk of failure in such circumstances? |  |  |  |
| 1. Does the quarry have Risk Assessments in place for the activities covered by the Excavations & Tips Rules and other key design documentation? **(see Regulation 12)**
 |  |  |  |
| 1. Are all persons who are required to have competency in the management of geotechnical issues at the quarry, aware of all of the Significant Hazards which have been defined for the quarry? **(see Regulation 9)**
 |  |  |  |
| 1. Is there a periodic review of Health & Safety measures in place? Specifically in relation to geotechnical matters. This may take the form of a Geotechnical Audit conducted by the Operator. **(See Regulation 11)**
 |  |  |  |
| If the answer to question 16) is Yes, are there review mechanisms in place for the quarry to consider lessons arising from experience gained within by other relevant operators or industries? |  |  |  |
| 1. Are engineered rockfall slope/ protection installations present on at the quarry? (e.g. netting, bolting, fence, retaining structures, drainage systems etc)-As applying to hard rock sites. If the answer to question 17) is Yes,please also answer the questions below if relevant to your quarry:
 |  |  |  |
| Are close out installation reports available at the quarry? |  |  |  |
| Do the reports specify lifespan, inspection, maintenance requirements, purpose etc? |  |  |  |
| Are specialist inspections being carried out in accordance with the recommended frequency? |  |  |  |
| Have any recommendations arising from the last specialist inspection been completed? |  |  |  |
| **QUARRY/SITE** |
| **Excavation/ Faces** |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Does the Geotechnical Assessment and other design documents for the quarry contain design information giving the required slope angles for individual quarry faces and for the overall face angle taken from the crest of the quarry at surface to the toe of the face at the base of the excavation? Such design information is required for all extractive operations which are deemed a significant hazard and includes both Hard Rock and Sand (&Gravel) environments. **(see Regulation 33)**
 |  |  |  |
| 1. Does the Geotechnical Assessment and other design documents for the quarry contain design information giving the required bench levels (above datum) together with the required minimum widths of those benches? The stipulated bench widths should also cover the required horizontal width of any bench stand-off at base of overburden. Such design information is required for all extractive operations which are deemed a significant hazard and includes both Hard Rock and Sand (&Gravel) environments. **(see Regulation 33)**
 |  |  |  |
| 1. Is the excavation profile which includes faces and benches based on designs arising from an appropriate analysis of the stability of the slopes as they are being worked within the quarry? **(see Regulation 30)**
 |  |  |  |
| 1. If applicable, Is the site in possession of a recent discontinuity survey? (Discontinuities are fractures, joints, faults and bedding planes which can be instrumental in inducing rock slope failure). These surveys are often used by the geotechnical specialist as a basis for calculating the stability of the materials to be worked within the quarry. Please state the date of the last applicable discontinuity survey for the quarry. (see Regulation 33)
 |  |  |  |
| 1. Does the Geotechnical Assessment and any other design documentation give recommendations as to mitigating the prevention of accidents due to instability of the materials being worked or the operation of machinery? Such recommendations can include the design criteria required to construct and maintain rock traps, toe-bunds and edge protection bunding. **(see Regulation 33)**
 |  |  |  |
| 1. Does the quarry suffer from regular or periodic rockfall or failure of loose material close to the crest of the face in any particular area or locality within the quarry? If so please detail how this is managed and reported.
 |  |  |  |
| 1. Does the quarry suffer from instability induced by weather events such as high rainfall, strong wind or freezing temperatures? If so, please detail how this is managed and reported.
 |  |  |  |
| 1. Does the quarry have property and equipment belonging to third parties such as dwellings, utilities, pipes and cables either crossing the site or adjacent to the site boundary and which could be potentially at risk from quarry operations? If so, please detail how this is managed and the risk mitigated. Please consider the impact of any blasting in your response. **(see Regulation 33)**
 |  |  |  |
| 1. Does the quarry have adequate fencing and signage to reasonably prevent the entry of any persons who could then be exposed to the hazards inherent in the quarry face and void operations. **(see Regulation 16)**
 |  |  |  |
| **Lagoons** |  |  |  |
| 1. Does the Geotechnical Assessment and other design documents at the quarry contain detailed information giving the required design for constructing, operating and maintaining the lagoons at the quarry? **(see Regulation 33)**
 |  |  |  |
| 1. Are the lagoons inspected by persons with the required competence and in accordance with a regular cycle of inspections as determined by the Geotechnical Specialist? **(see Regulation 12)**
 |  |  |  |
| 1. Does the quarry have an up to date record of the volumes/ quantities of materials being deposited in the lagoons? **(see Regulation 36)**
 |  |  |  |
| 1. Do the quarry lagoons have adequate fencing and signage in place to reasonably prevent the egress of any persons from being exposed to the hazards inherent in the presence of the lagoons? **(see Regulation 16)**
 |  |  |  |
| 1. Do the quarry lagoons have adequate life rings/ rescue ropes/ flotation devices to reasonably provide means of escape should any persons fall into the one or other of the lagoons at the quarry? **(see Regulation 15)**
 |  |  |  |
| 1. Is the design profile for the lagoons on site based on an appropriate analysis of the construction materials used together with an assessment of the impact of cycles of use (including draw- down rate) and the maximum holding capacity of the lagoons? **(see Regulation 33)**
 |  |  |  |
| 1. Has a minimum freeboard been determined for each lagoon? (The freeboard is the highest level that the contents of the lagoon are allowed to reach as defined by the design). **(see Regulation 33)**
 |  |  |  |
| 1. Are the lagoons regularly inspected for defects including malfunctioning or blocked pipework and any signs of unexpected outflow or seepage? **(see Regulation 12)**
 |  |  |  |
| 1. Is the lagoon constructed above original ground? (Lagoons of this type can be particularly hazardous and require specific design and inspection regimes) **(see Regulation 33)**
 |  |  |  |
| If the answer to question 35) is Yes, has the potential impact upon all of the surrounding persons and property been fully considered in the design and operation of the lagoon? |  |  |  |
| 1. Will the Regulation 32 Appraisal process be used to manage the required change and the design process in respect of any capping or desilting operations required for the lagoons at the quarry?**(see Regulation 32)**
 |  |  |  |
| **Tips** |  |  |  |
| 1. Does the Geotechnical Assessment and other design documents at the quarry contain detailed information giving the required design for constructing, operating and maintaining the tips at the quarry? Such design information is required for all extractive operations which are deemed as a significant hazard and includes both Hard Rock and Sand (&Gravel) environments.

**(see Regulation 33)** |  |  |  |
| 1. Are the designs for the tips on the site based on appropriate analysis of the potential of the materials being stored in the tip to remain stable during the duration of quarry operations? **(see Regulation 33)**
 |  |  |  |
| 1. Does the quarry keep an appropriate record of the nature, quantity and location of the material being tipped on-daily basis during active tipping operations so that the stability of the tip can be fully assessed. **(see Regulation 36)**
 |  |  |  |
| **Stockpiles** |  |  |  |
| 1. Are all stockpiles being managed in accordance with the approved design? Please note that such design information is given in the geotechnical assessment? (Also please note that all stockpiles can present a hazard depending on material type, the height and construction of the stockpile and the way in which vehicles and personnel interact with the stockpile. All stockpiles must have a set of design criteria which must not be exceeded or disregarded) **(see Regulation 33)**
 |  |  |  |
| 1. Will the Regulation 32 Appraisal process be used to manage the required change and the design process in respect of any requirements to the height, slope and footprint of the stockpiles at the quarry?**(see Regulation 32)**
 |  |  |  |
| 1. Are all stockpiles adequately demarcated and signposted so as to avoid any confusion or mis-identification which could lead to increased hazard? **(see Regulation 4)**
 |  |  |  |
| **QUARRY/SITE-GEOTECHNICAL PROCESSES** |  |  |  |
| 1. Has the Operator for the quarry been identified and appointed as the person in overall control of the quarry as required by the Quarries Regulations (1999)? **(see Regulation 2)**
 |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. Has the Operator appointed a Competent Individual to be in charge of the operation of the quarry at all times as required by Regulation 8 of the Quarries Regulations? **(see Regulation 8)**
 |  |  |  |
| 1. Is there an understanding on the site as to who is competent to carry out an Appraisal at the quarry? **(See Regulation 32)**
 |  |  |  |
| 1. Is there an understanding as to who is appointed by the operator to complete Geotechnical Assessments at the quarry? **(See Regulation 33)**
 |  |  |  |
| 1. Do the Geotechnical Assessments for the quarry contain a CLEAR conclusion as to the SAFETY & STABILITY of the excavations, lagoons, stockpiles and tips?**(See Regulation 33)**
 |  |  |  |
| 1. Is the quarry provided with clear and concise recommendations following a visit by a Geotechnical Specialist?**(See Regulation 33)**
 |  |  |  |
| 1. Is the Geotechnical Assessment for the quarry reviewed and updated on a regular basis as agreed with the appointed Geotechnical Specialist? **(See Regulation 33)**
 |  |  |  |
| 1. Are the Geotechnical Assessments for the quarry used to communicate hazards and risks to operatives, supervisors and contractors? **(See Regulation 33)**
 |  |  |  |
| 1. Is the relevant design information for all excavations, tips, stockpiles and lagoons readily available and accessible within the Geotechnical Assessment documents for the quarry. **(See Regulation 33 & Schedule 1)**
 |  |  |  |
| 1. Are the Excavation & Tips Rules for the quarry site reviewed and amended on a periodic basis? **(see Regulation 31)**
 |  |  |  |
| 1. Are the Excavation & Tips Rules specific and relevant to the quarry operations? **(see Regulation 31)**
 |  |  |  |
| 1. Are the excavation and tips rules used to communicate site working arrangements and design criteria to operatives, supervisors and contractors? Can they demonstrate understanding of the parts which are relevant to them?
 |  |  |  |
| 1. Have all the current Significant Hazards on the quarry identified by the Geotechnical Specialist in the Geotechnical Assessment been reported or notified in writing on an hazard-by-hazard basis to the Health & Safety Executive? (HSE) **(see Regulation 37)**
 |  |  |  |
| 1. Is there an Appraisal completed for every hazard on the site?. **(see Regulation 32)**
 |  |  |  |
| **PEOPLE** |
| **Inspections** | **Y** | **N** | **ACTIONS** |
| 1. Have all of the Significant Hazards which have been defined for the quarry been explained to all personnel working on the quarry who have responsibilities? Is there evidence of this?-Please discuss this requirement with all personnel and determine their awareness of such information. **(see Regulation 7)**
 |  |  |  |
| 1. Are all people responsible for carrying out daily / weekly inspections adequately trained and competent in geotechnical matters such that they can effectively carry out all inspections? **(see Regulation 12)**
 |  |  |  |
| 1. Are those persons who are assigned to carry out inspections competent to identify defects? **(see Regulation 9 & 12)**
 |  |  |  |
| If the answer to question 59) is Yes, is there a clear procedure in place for reporting the defects identified during an inspection and escalating if required? |  |  |  |
| 1. Is the inspection regime at the quarry considered to be robust in identifying,reporting and rectifying defects? Do the inspections reflect conditions observed in the quarry?**(see Regulation 12)**
 |  |  |  |
| 1. Do all persons making significant physical changes to the quarry, e.g shotfirers, explosives supervisors, excavator and shovel drivers, dozer drivers, have a good understanding of the design parameters and control measures put in place for theirs and others safety? Is there evidence of this? Please discuss this requirement with all personnel and determine their awareness of such information. **(see Regulation 30)**
 |  |  |  |
| 1. Do persons who are assigned to conduct inspections have sufficient time and resource to carry out all required inspections and to identify and report defects correctly?Is there evidence of this?- Please discuss this requirement with all personnel and identify if there are any restrictions regarding time allowed for such inspections. **(see Regulation 12)**
 |   |  |  |
| 1. Does the appointed Geotechnical Specialist participate in the process of formulating the periodic inspection regime for the quarry? **(see Regulation 12)**
 |  |  |  |
| **Training** |  |  |  |
| 1. Has the Competent Individual received geotechnical competency training to a recognised qualification level?

 (Please provide details) **(see Regulation 9)** |  |  |  |
| 1. Have the geotechnical issues and hazards specifically relating to the quarry been explained to all personnel? Is there evidence of this? Please discuss this requirement with all personnel and determine their awareness of such issues and hazards. **(see Regulation 9)**
 |  |  |  |
| 1. Does the appointed Geotechnical Specialist deliver site-specific geotechnical training to all personnel? **(see Regulation 9)**
 |  |  |  |
| If the answer to question 66) is Yes, does the site-specific geotechnical training include provision for operatives to receive such training? |  |  |  |
| ALL ‘NO’ RESPONSES SHOULD BE ASSIGNED AN IMPROVEMENT ACTION. WHERE THIS IS NOT FELT POSSIBLE, THE ISSUE SHOULD BE ESCALATED TO THE MANAGEMENT TEAM AND HEALTH & SAFETY SPECIALIST. WHERE REQUIRED THE APPOINTED GEOTECHNICAL SPECIALIST SHOULD BE CONSULTED |  |  |  |

Signed:

Print Name:

Job Title of Person Completing Audit

Date of Audit Completion: