

Quarries National Joint Advisory Committee (QNJAC)

Information Sheet 7

(September 2017)

Quarry Design

This information sheet has been developed by the Quarries National Joint Advisory Committee (QNJAC) to help quarry operators, contractors, managers and others make health and safety improvements in the quarry industry. This guidance may go further than the minimum you need to do to comply with the law

Approved by the Quarries National Joint Advisory Committee (QNJAC)
(Version 1: Sept 2017)



Guidance Note on Quarry design in relation to excavations and tips (QNJAC Geotechnical Face & Stockpile Operations Subcommittee)

Introduction

The requirement for “**design**” forms a central tenet of the Quarry Regulations 1999¹ (The term design is used more than 60 times in the Approved Code of Practice)

It is emphasised in Regulation 6 p.1

Regulation 6: General duties of the operator

*(1) It shall be the duty of the operator of every quarry to take the necessary measures to ensure, so far as is reasonably practicable, that the quarry and its plant are **designed**, constructed, equipped, commissioned, operated and maintained in such a way that persons at work can perform the work assigned to them without endangering their own health and safety or the health and safety of others.*

And the subsequent guidance note 32

Regulation 6 is the **underpinning requirement of these Regulations**. It is intended to secure a co-ordinated, proactive approach to the management of health and safety, which ensures that risks are properly controlled.

In particular in part vi of the Regulations the operator is given an absolute duty to ensure the design of excavations and tips avoid placing any person at risk.

Regulation 30: General duty to ensure safety of excavations and tips

*The operator shall ensure that excavations and tips are **designed**, constructed, operated and maintained so as to ensure that -*

- (a) instability; or*
- (b) movement,*

which is likely to give rise to a risk to the health and safety of any person is avoided.

The design is essential so that it can be risk assessed for hazards **prior** to its implementation and all risks managed as development proceeds. It may be possible to design out a *significant hazard* as defined.

Other regulations such as **The Work at Height Regulations 2005**² and **Construction (Design and Management) Regulations 2015**³ also emphasise the requirement for design.

It is the **Operator's duty** to ensure the design is in place.

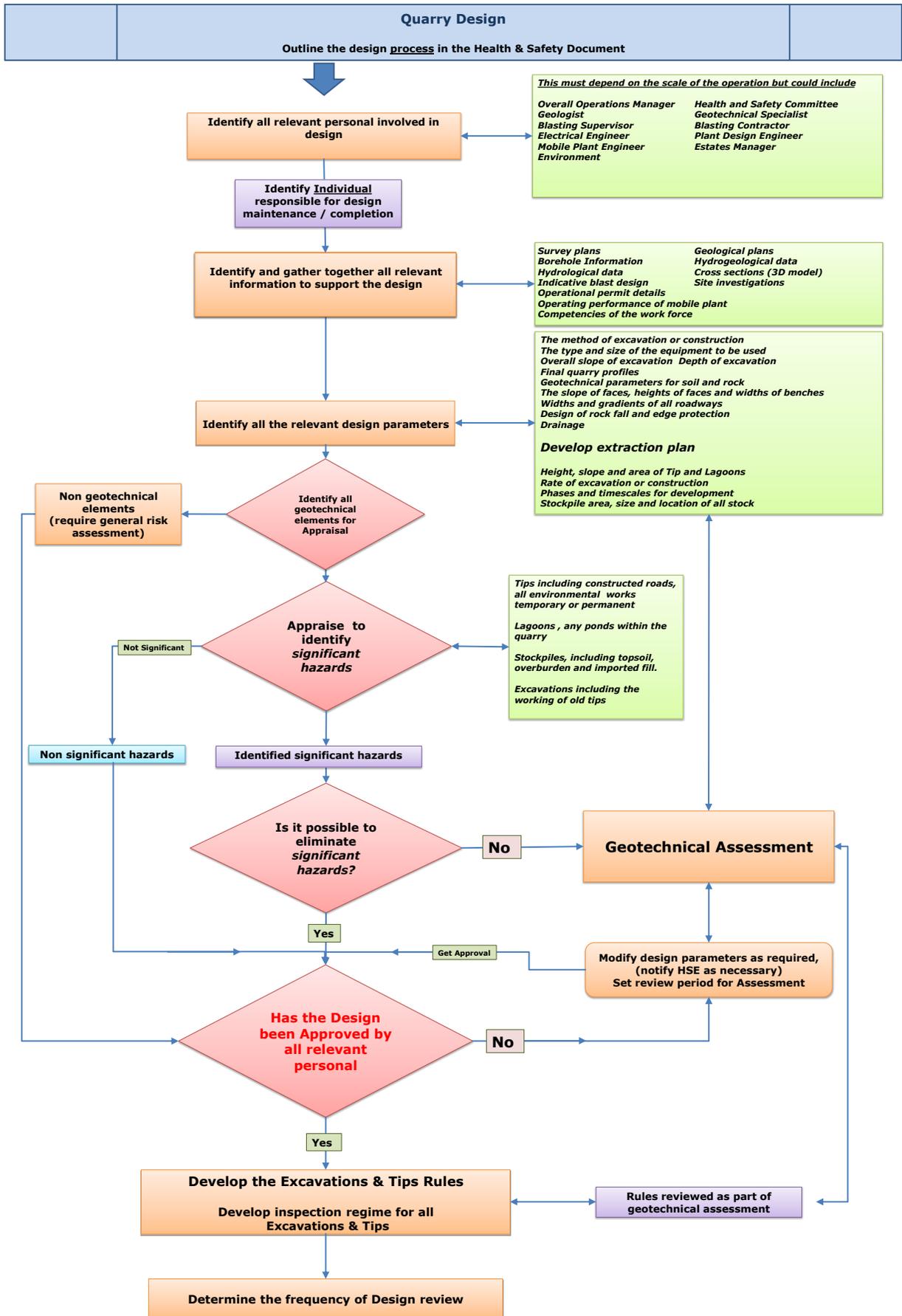
Design is essentially a **process** not a product and it is the detail of this process that will provide evidence that the operation meets accepted good practice and is compliant with the requirements of regulations.

The flow chart provides a possible outline of this process.

¹ [QR 1999 Link](#) available to purchase or download

² [Working at Height Link](#)

³ See Appendix 1 “Which regulations to apply?”



Design Process

Although the nature of quarry design may be profoundly different from site to site the process by which it has been arrived at and the various elements should be clearly laid out in the Health and Safety documentation. Good practice would ensure a named individual is responsible for the maintenance of the design.

In general there are three principal steps to design, subdivided as appropriate:

1. **Pre-commencement**
 - a. Define purpose of structure
 - b. Research solutions and ensure all relevant data is available
 - c. Identification of problems and hazards
 - d. Specification of design
 - e. Detail resources necessary to deliver design
 - f. Presentation of design in an accessible form

2. **During construction (or use)**
 - a. Test design to ensure it is fit for purpose
 - b. Amend design as necessary

3. **On completion**
 - a. Review implementation
 - b. Evaluate and ensure lessons are learned

In practice the design process should be the same across **all** aspects of the quarry but as consequence of past accident inquiries, in particular into the tip failure at Aberfan⁴, the regulations are prescriptive as to the process to be followed in respect of excavations and tips. (Regulation 1999 part VI). In particular the outcome of the design process **must** be appraised for **significant hazards**⁵ (as required by Regulation 32) and if the potential for a *significant hazard* is recognised then a detailed assessment must be made by a *geotechnical specialist*⁶ (as required by Regulation 33).

⁴ [Aberfan Link](#)

⁵ Defined by regulation as:

"hazard" in relation to an excavation or tip means having the potential to cause harm to the health and safety of any person. Guidance indicates that a *significant hazard* would be one that could cause death or serious injury.

⁶ Defined by regulation as:

"geotechnical specialist" means a chartered engineer or chartered geologist who has—

(a) three or more years relevant experience in soil mechanics, rock mechanics or excavation engineering; and
(b) is competent to perform a geotechnical analysis to determine the hazard and risk arising from the excavation or tip being assessed,

Example of design process for stockpile

Responsible individual - **Quarry Manager**

1. Pre construction

Purpose

Stockpile for storage of 15 000 tonnes of 20mm single size limestone sited on quarry floor.

Source of pre-processed material for sale. *(as an example of use)*

Under the terms of the regulations a Stockpile is both a Tip and an Excavation

Relevant data :

Density of 20mm limestone in stockpile	1.7tonnes/m3	- based on measurement
Angle of repose of 20mm limestone	37°	- based on observation
Foundation on insitu limestone		- based on observation
Maximum stockpile height	8m	- permitted height/ <i>Depth of excavation?</i>
Area covered	1800m2	- calculation
Available survey plan of site area		- update as necessary

Problem hazards :

- Must be sited away from existing faces
- Sufficient access to permit safe construction and excavation
- Must not impact on safety or stability of any other tip or excavation

Specification

- Construction detailed construction method, stockpile constructed in layers not more than 2m in height using loader.
- Location as shown on survey plan

Resources

- Size of loader must reach 8m
- Required competency of personnel
- Required competency of supervisor

Presentation

- Design must be appraised for significant hazards as required by regulation 32 *(in normal circumstances it is unlikely that a stockpile would be determined a significant hazard).*
- Tip (stockpile) rules for safe construction and excavation must be prepared as required by regulation 31
- Inspection scheme reviewed to ensure stockpile adequately covered by inspection scheme as required by regulation 12

2. During construction (or use)

- Inspections carried out in accordance with agreed scheme.
- Cycle of appraisals carried out in accordance with original appraisal
- Design reviewed if appraisal or inspection notes a change⁷

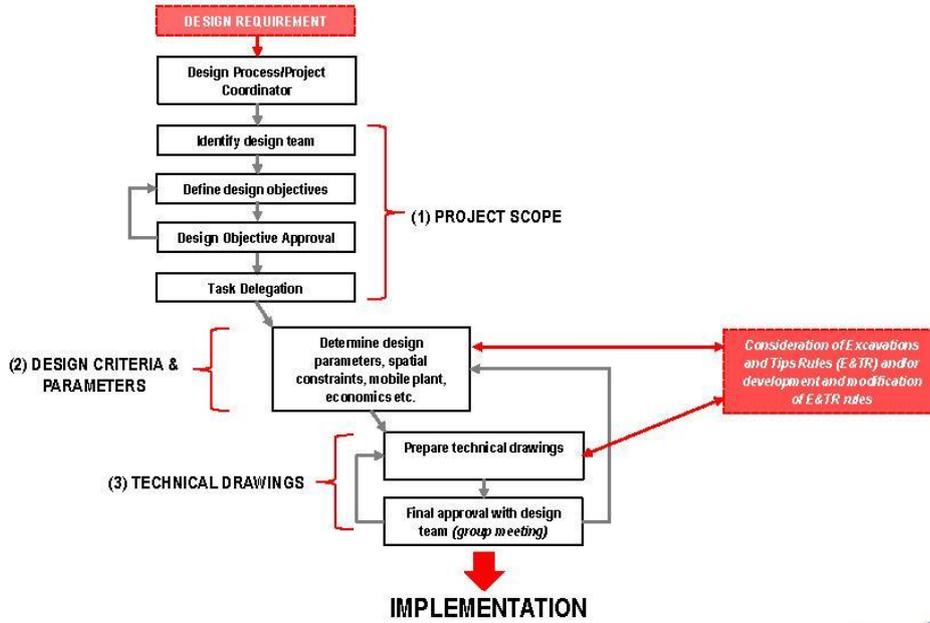
3. On Completion

- In the case of stockpiles material completely removed - no after care necessary.

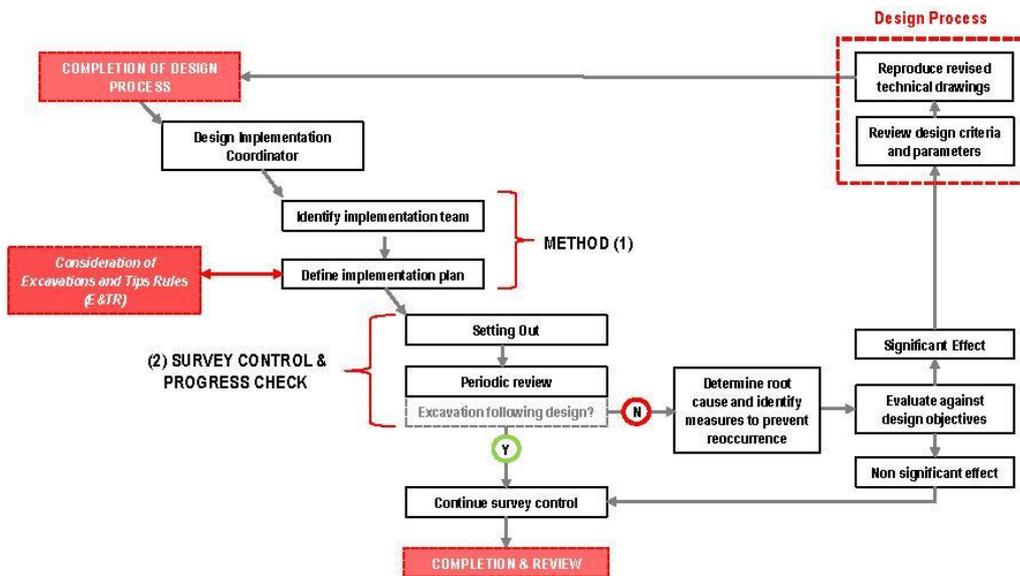
⁷ [QNJAC Management of Change guidance](#)

Example of design flow chart adapted for individual needs

DESIGN PROCESS

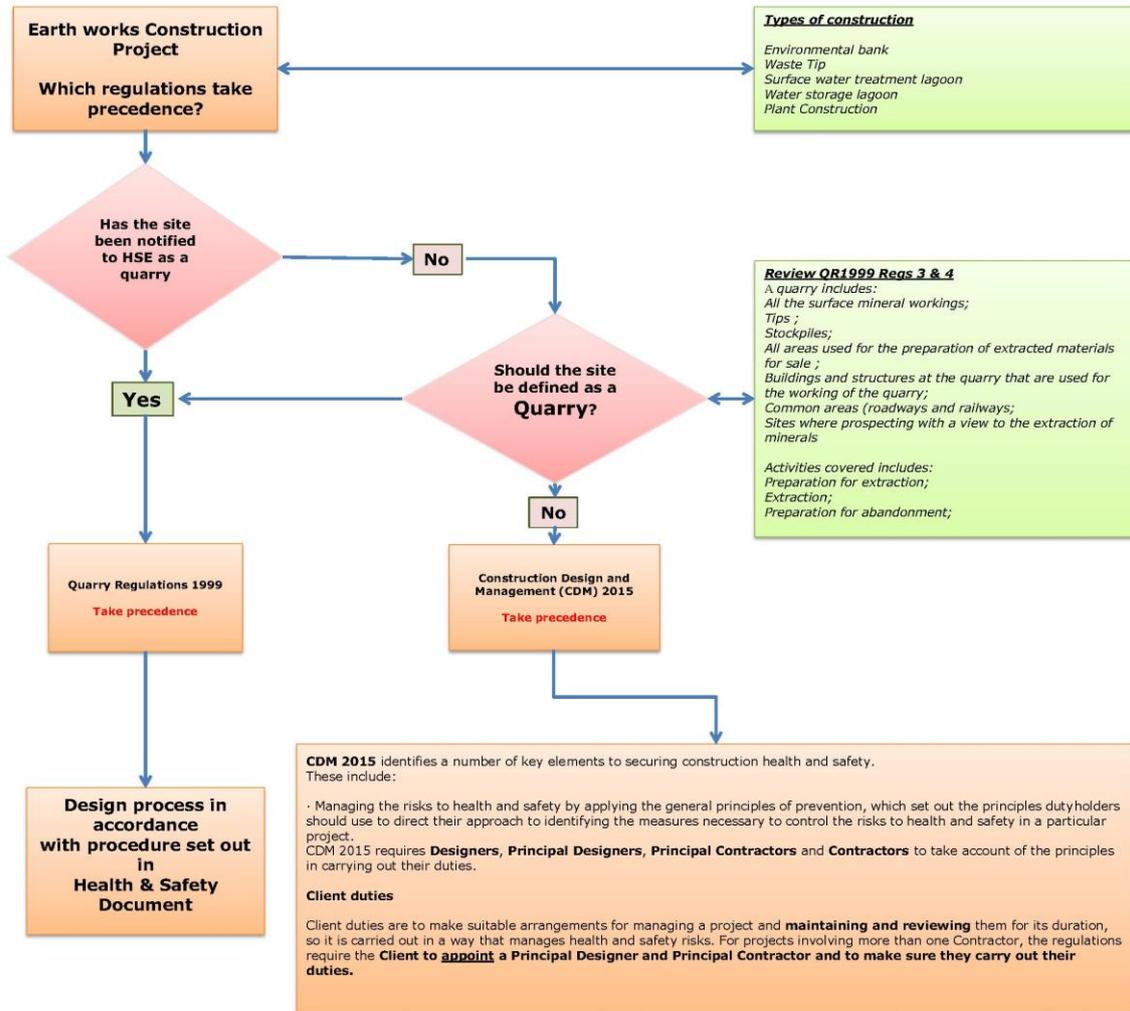


IMPLEMENTATION PROCESS



Appendix 1 Which regulations apply?

Quarry Regulations 1999 or Construction (Design and Management) Regulations 2015⁸



⁸ [CDM 2015 Link](#)