

## Terms of Reference for Vibration Monitoring of Quarry Blasting

### 1. Introduction

Malta has a number of quarry operators that are engaged in the extraction of resource particularly through blasting operations. The Malta Environment and Planning Authority (MEPA) is responsible for overseeing the implementation of regulations and legal obligations related to quarry operations. In this regard, the Authority will require the monitoring of vibration levels from blasting operations so as to ensure minimal environmental impacts.

The following Terms of Reference (TORs) are being published so as to provide quarry operators with details as to how and what is required in order to monitor vibrations from blasting operations in quarries. These TORs also establish the following responsibilities:

- (i) The permit holder is obliged to contract suitably qualified and recognized monitoring service providers for the assessment of vibration analysis for blasting in quarries;
- (ii) The monitoring service provider is obliged to adhere to all responsibilities stipulated in the TORs and submit all the documentation as requested by the Authority.
- (iii) The choice of the blast design and technique is the sole responsibility of the permit holder. All blasting operations should be carried out by suitably qualified and competent persons.**

The process has been sub-divided into 3 steps/phases; (i) method statement (ii) monitoring of blast vibrations and (iii) vibration monitoring report.

### 2. Phases

These TORs provide guidance on the documentation that needs to be submitted to the Authority prior to the commencement of the blasting operations. Below is a brief overview of each and every phase, including details regarding the compilation of the method statements and associated vibration monitoring reports. It is important to note that all necessary forms may be downloaded from the MEPA website on the following link [www.mepa.org.mt/blastmonitoring](http://www.mepa.org.mt/blastmonitoring).

#### 2.1 Phase 1 – Method Statement

Prior to the commencement of operations, the quarry operator, through the monitoring service provider, is to propose a method statement, subject to approval by the Authority. The Method Statement shall be reviewed as required by the Authority, and shall include the following:

- (i) Details of applicant and monitoring service provider
- (ii) Details of site (quarry)
- (iii) Monitoring points
- (iv) Parameters (to be monitored)
- (v) Details of equipment
- (vi) Geological and topographic information

A detailed overview of the information that needs to be compiled and submitted to the Authority is given below:

- (i) Details of applicant and monitoring service provider– This section is to include details of the person who is responsible for the quarry and who is currently running operations within the installation, together with details of the monitoring service provider. A detailed company profile highlighting the expertise and experience in monitoring services and/or related field/s should be highlighted in this section. The choice of the service provider is subject to approval by the Authority.
- (ii) Details of the site (quarry) – This section should include details on the exact location of the quarry in which blasting operations are to be conducted. All data should be geo-referenced on latest orthophoto maps and base maps as issued by the Authority and should:
  - i. Include an A4 or A3 sized plan;
  - ii. Be of scale of 1:10,000 or 1:2,500 as appropriate;
  - iii. Show all existing development (land uses and main activities) within 250 meters of the boundary site including all roads and buildings;
  - iv. Indicate in red the outline of the quarry;
  - v. Indicate in blue the exact area within the quarry that is earmarked for blasting;
  - vi. Indicate the main sensitive receptors, which include structural areas, buildings, historical monuments, residences, sites of geological, archeological and ecological importance, and any other structures and sensitive land uses which could be affected by the blasting operations;
  - vii. Identify any buffer zones or areas of influence that are likely to be effected by vibrations (as per limit values stipulated in section 4.1 of the Guidance document)
  - viii. Indicate the proposed vibration monitoring points.
- (iii) Monitoring points – This section should include details regarding the location of the monitoring points, monitoring distance (from the blasting area) and equipment. These parameters shall be in line with the guidelines provided in the British Standards; BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites. Vibration, and BS ISO 4866:2010 Mechanical vibration and shock-vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.
- (iv) Parameters (to be monitored) – This section must include details of the parameters that will be recorded in order to analyse vibration levels. Parameters that must be taken into account include; peak particle velocity (PPV), frequency and air overpressure. Measurements of each parameter shall be made in accordance to BS 5228-2: 2009 and BS ISO 4866:2010. Operator is also to submit details as to how air overpressure from blasting operations will be minimised.
- (v) Details of equipment – This section should contain details regarding the type of equipment/instrument to be used in order to measure vibration levels. The instrumentation normally comprises transducers, signal conditioning and data recording elements. Details regarding the sensitivity, frequency range (of vibration frequency) of the equipment and reliability of output data should also be included in this section.

- (vi) Geological and topographic information – This section should include details regarding distinctive geological and geo-morphological features of the quarry and adjacent areas. This information aids in better interpretation of the vibration monitoring data.

A hard copy and a soft copy of the method statement and supporting documentation must be submitted to MEPA on the following address/email:

**Address:** Vibration Monitoring of Quarry Blasting  
Environmental Permitting and Industry Unit  
Malta Environment and Planning Authority  
Environment Protection Directorate  
P.O Box 200  
Marsa  
GPO 01

**Tel:** 2290 – 0000  
**Fax:** 2295 – 2295  
**E-mail:** [environmental.permittingquarries@mepa.org.mt](mailto:environmental.permittingquarries@mepa.org.mt)

MEPA will subsequently review the data submitted and where necessary request further information.

## **2.2 Phase 2 –Monitoring of blast vibrations**

Following the submission of the method statement and subsequent approval from the respective Authorities, the operator shall be authorised to commence blasting operations subject that all the conditions and regulations related to the monitoring of vibration levels are fully complied with.

The Authority has issued a guidance document regarding best practices related to vibration monitoring from quarry blasting. These guidelines provide threshold levels for ground vibration, air overpressure and frequency (of a blast), together with other specifications related to location, design and the required sensitivity of the monitoring equipment.

## **2.3 Phase 3 – Vibration Monitoring Report**

This document shall be compiled upon completion of the blasting operations and monitoring (of blasting vibrations). The vibration monitoring report shall consist of:

- (a) A report identifying the number and location of the monitoring stations in relation to the site in which the mineral is being extracted. This information should correspond with the data submitted in the method statement;
- (b) Details regarding the date, time and duration for each blast session;
- (c) A detailed report of the parameters measured and values achieved. Measurements of each parameter shall be made according to the relevant (vibration) limit values stipulated in BS ISO 4866:2010;
- (d) A meteorological report. Monitoring shall preferably be carried out in non-windy conditions so as to limit the effect on air overpressure readings. Meteorological conditions shall be recorded and appropriately accounted for;
- (e) A comparison of the resultant vibration monitoring data with relevant (vibration) limit values stipulated in BS ISO 4866:2010.

- (f) A clear indication of exceedances (if any), together with an interpretation of the data explaining the cause of such exceedance/s. In addition, the report shall also include mitigation measures to prevent further exceedances in the future. This information must be submitted prior to any further requests for blasting operations in the same area.

The vibration monitoring report shall be submitted to the Authority, on the same address provided in section 2.1, within 5 (five) days of completion of (blasting) operations. In the event of complaints from individual residents and/or entities, the service provider is obliged to provide a copy of the blast monitoring results, and explain the contents of such, to the complainants, within a time period to be determined by the Authority.