

# **BLASTING PRACTICE**

## **TECHNICAL BULLETIN No. 8**

### **GENERAL INFORMATION ON VIBRATION AND AIR OVERPRESSURE**

#### **INTRODUCTION**

This Technical Bulletin is intended to provide information to members of the public living close to blasting operations regarding the environmental impact of blast-induced ground vibration and air overpressure.

#### **BASICS ON BLASTING**

Each European country has its own set of rules and regulation regarding the use of explosives. In each country blasting operations can only be undertaken by highly qualified personnel working under strict rules and guidelines.

##### **1. Environmental Impact of Blasting**

When explosives are detonated in a blast hole much of the energy is used to break up and move the rock or concrete. However, there is always some energy left over and this is converted into vibration that travels away from the blast area through both the ground and air. The vibration through the air is generally known as air overpressure.

In the case of demolition vibration can be generated by the impact of the structure on the ground surface.

##### **2. Information on Ground Vibration**

As the ground vibration travels away from the blast area the level rapidly reduces. The level of vibration felt at any location is controlled by the design of the blast, the distance to the blast and the intervening geology.

As the vibration travels through the ground it may arrive at a building and this structure will then also vibrate. If people are inside the building then they may feel that the structure has responded in such a fashion that damage must have occurred.

The level of blast vibration that causes damage to structures has been extensively investigated over many years by researchers worldwide. All of this research has shown that very high levels of vibration are required before damage is likely to occur. Most European countries have national standards outlining the level of vibration below which damage to structures will not occur. Such national standards will commonly refer to a measurement known as Peak Particle Velocity. This parameter is

often known as PPV and refers to the maximum ground speed of a point on the surface as the blast-induced vibration event passes by and is measured in mm/s. The human body is very sensitive to vibration and most people will be able to detect a vibration level of 0.5 mm/s which is far below any levels that are likely to cause even cosmetic damage.

### **3. Air Overpressure**

The vibration that travels away from a blast area through the air is both audible and sub-audible.

Like ground vibration, levels of air overpressure decay rapidly with distance from the blast area. However, in this case the level depends to a great extent on the weather conditions at the time of blasting as well as the blast design. Air overpressure travels through the air slower than vibration through the ground and it will therefore arrive at a location after the ground vibration. This time lag can be as much as several seconds at distances over 1 km.

As the air overpressure travels away from the blast area it may also interact with structures. When such air overpressure waves arrive at a structure it may cause rattling of windows, doors etc.

The level of air overpressure likely to break windows is also very well researched and is incredibly high. Such levels are only likely to be exceeded close to blasting operations employing unconfined explosive charges.

Like ground vibration it is common for air overpressure levels to be recorded as peak levels. In this case the units will be Pascals or decibels.

### **4. Human Response**

As has already been noted the human body is a very sensitive receptor for vibration. This response is enhanced if that person is inside of a structure due to the response of the structure to both the ground vibration and air overpressure. It is also known that structures will also respond acoustically causing even greater concern amongst people inside the structure.

### **5. Environmental Monitoring**

It is good practice to measure the vibration emissions from the blast site at the nearest residence.

### **6. Key Points**

Blasting is necessary in all aspects in our modern society.

Blasting may cause some short-term environmental impact.

Alternatives to blasting exist but usually cause more disturbance and inconvenience.

Blasting is a highly controlled and regulated activity with an outstanding record of safety.