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## Earthquake VS Blasting

(Richter Scale)

(Peak Particle Velocity)

by Wade Hutchison

There are fundamental differences between earthquake activity and blasting activity. Blasting activity has a relatively small crater zone. The definition of crater zone is identified as the area where the hearth is actually physically displaced in a permanent fashion. The principle effect from blasting is the transmission of energy through the ground in the form of vibration. An earthquake has a more significant area where the ground is permanently displaced or shifted. The magnitude of an earthquake is considerably larger than that of conventional blasting. A different scale has been designed to measure the energy associated with an earthquake. This scale is called the Richter Scale (Modified Mercalli Scale). The Richter Scale is set up to define seismic events that increase with tremendous magnitude. Each number on the Richter Scale represents approximately 10 times more energy than the previous number. This relationship is set up to define a magnitude of earth motion event as it relates to its impact on a house.

Peak particle velocity is the normative measurements for blasting operations and is designed to measure the intensity of ground motion. On the peak particle velocity scale we slightly more than double the energy as we move from 1.0 inch per second to 2.0 inches per second peak particle velocity as contrasted with an increase 10 times when we move from 1.0 to 2.0 on the Richter Scale. The Richter Scale and Peak Particle Velocity are both curvilinear in nature; however, their curves characteristics are tremendously different. These differences are evidenced by Table 1 (on the following page).

The physical soil displacement from an earthquake is tremendously different than the physical soil displacement from a blast. Earthquakes can generate significant physical displacement over a great distance while soil displacement are on the order of a few then thousandths of an inch when you are outside the crater zone of a blast. Based on this disparity of between blasting

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vibration and earthquake vibration it is easy to see that blasting requires specialized analysis, calculations and definitions, apart from the Richter Scale used to measure earthquakes effects on a structure. Analysis, calculations and definition associated with earthquakes do not directly transfer to blasting due to differences of frequency, intensity, and magnitude.

<u>Richter Scale</u> <u>Magnitude</u>	<u>Energy (Pounds</u> <u>of Explosives)</u>	<u>Peak Particle</u> <u>Velocity</u>
4	200,000,000	1457.47
3	20,000,000	230.99
2	2,000,000	36.61
1	200,000	5.80
0	20,000	0.91
-1	2,000	0.15
-2	200	0.02
-3	20	0.004
-4		0.0006

TABLE 1

Peak particle vibration calculations prepared from Dupont formulas based on average distance for energy values that coincide with published earthquake data relating Richter Magnitude with pounds of explosive energy.



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## ***Terrorism Impacts Blasting Industry Record Keeping***

During the last several years the events of September 11th have significantly impacted record keeping requirements of every blasting operation. ATF Regulations mandate a close tracking be maintained for all explosives.

The new ATF Regulations require Blast Logs, Travel Manifests, and Blasting Magazine Inventory Sheets to balance precisely. The additional record keeping requirements of the new laws can be laborious. However, they are worthwhile. Contractors failing to comply with these changes have been penalized with fines and revocation of their license.

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