O14-3 HAZARD ASSESSMENT AND SEISMIC RISK REDUCTION IN ROCK REMOVAL BLASTS ON SITE OF CERNAVODA LOCK OF DANUBE-BLACK SEA CANAL

AURELIAN I. PANTEA[1], **ANGELA N. CONSTANTIN [1]** and MARZA I. VASILE [2]
[1]National Institute of Earth Physics, P.O. Box MG-2, 76900 Bucharest, Romania. E-mail:pantea@infp.ifa.ro, angela@infp.ifa.ro
[2]Seismological Observatory, University of Brasilia - SG 13,CEP: 70910-900, Brasilia-DF, Brasil
E-mail: marza@unb.br

Explosion technologies have been used to clear rocks for building the Danube-Black Sea canal, especially the Cernavoda lock. To pave the way for using such technologies, research had to be carried out to ensure antiseismic protection of vital systems and buildings either existing or under construction in proximity of the canal. The main goal of the research was to assess the hazard and cut down the seismic risk entailed by rock removal blasts.

The studies were aimed at providing antiseismic protection of the exposed parts of the highway, embankment, railroads, overhead power lines, etc., and at controlling and mitigating blast effects on the final walls of the excavation by minimizing the area where the break occurs and radial cracks are generated (Pantea, 1976; Pantea & Marza, 1976). Moreover, the blast technology used for digging the site of Cernavoda lock posed the threat that banks might crumble and crash on the railroad or that railroad embankment might collapse. There was also the danger of ‘bombardment’ as blast gas pressure could have projected rocks into the air, which could have shelled the railroad embankment, power lines or trains standing or rolling in the area.

The resulting seismic data consisted of seismograms which were processed to provide the main dynamic parameters of seismic oscillations (displacements, velocities, frequencies, etc.) arising in the ground as a result of blasts.

The charts in Figure 1 show the oscillation frequencies (v) of a ground particle in terms of the reduced distances (RD) for every component and resultant of the seismic movement, and for every type of explosive and blast procedure.

Table 1 shows the equations of an attenuation of the oscillation frequencies (v) of a ground particle in terms of the reduced distances (RD) for every movement component and for the total resultant, as well as the correlation coefficients and standard deviations.

Table 1

Site’s parameters of the Cernavoda lock, Danube-Black Sea canal

Motion component	Equation used: lg *(v)* = *K* -*M* lg *(D.R.)*		Correlation coefficient *(R)*	Standard deviation *(s)*
	Parameter *(K)*	Parameter *(M)*		
Transverse	1,477	1,153	0,965	0,053
Vertical	1,953	1,173	0,998	0,020
Radial	1,540	0,916	0,985	0,020
Horizontal	1,743	0,961	1,000	0,001
Total Resultant	2,065	1,011	0,933	0,007

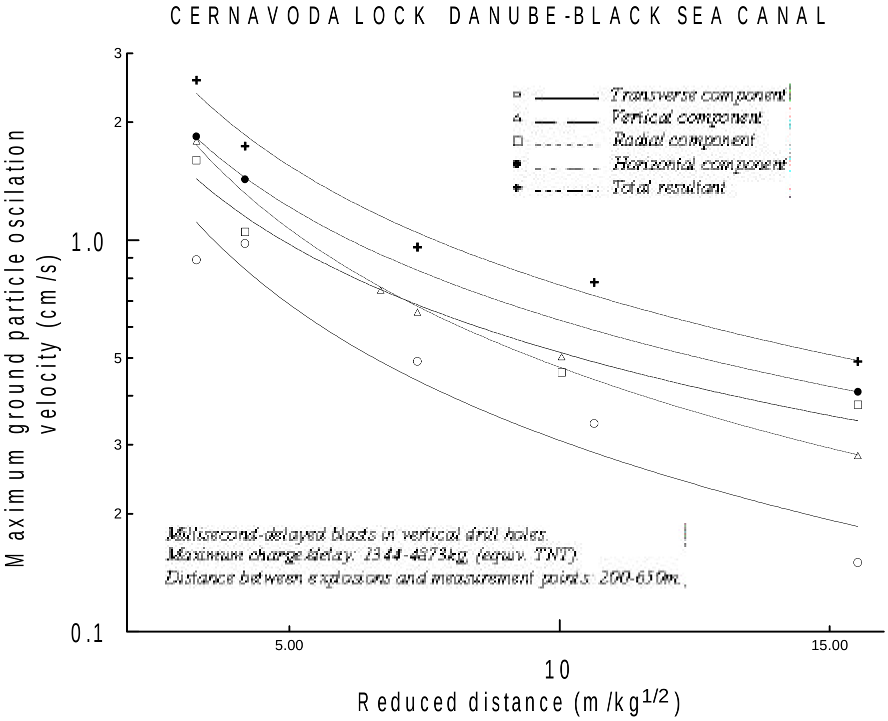

Fig.1. Maximum oscillation velocity of a ground particle in terms of reduced distance (*RD*) for three components: transverse (v_T), vertical (v_T), and radial (v_R), and two resultants: horizontal (v_H) and total (v_{tot})