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Minimizing Negative Effects of Blasting on underground Structures

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ABSTRACT

The present paper mainly deals with the prediction of blast-induced ground vibration level in Bakhtiary formation at intake of waterway system in Gotvand dam, Iran. For this research the ground vibration components were recorded carefully by means of 3 sets of vibration monitors for 32 blasts during bench blasting in front of tunnels. Then, the data pairs of scaled distance and particle velocity were analyzed by using the USBM equation. At the end of the statistical evaluations, a relationship between peak particle velocity and scaled distance for this site was established with good correlation. Again, other data measurements during tunnel excavation near concrete structures were used to validate the predicted PPV and optimize the blasting patterns to omit the effects of resonance and vibration in USBM (RI-8507) standard. Based on the vibration tests done in Bakhtiary conglomerate, ground vibration induced by underground blasting is at least 3 times greater than vibration induced by bench blasting in the same rock, so constant dynamic factors of the rock mass (Bakhtiary conglomerate) which are related to vibration velocity are changed between 350-420 and 1.63-0.955.

KEYWORDS

Tunnel excavation, vibration effects, PPV, scaled distance, USBM.

1. INTRODUCTION

Construction activities and explosive materials, induced ground and structure vibrations. The influence of construction vibrations on surrounding buildings, sensitive devices and people in urban environments is a significant consideration in obtaining project approvals. Disruption of some business activity, possible structural damage and people annoyance are problems that need to be addressed. The level of ground and structure vibration caused by construction work depends on the construction methods, soil and rock medium, heterogeneity of soil and rock deposit at the site, distance from the source, characteristics of wave propagation at a site, dynamic characteristics of soil and rocks, response characteristics of

fractures and susceptibility rating of the structures [1]. Many of these parameters especially geological and geotechnical condition of rocks cannot be altered, but the quantity of explosive detonated per delay can be estimated with empirical formula and proposed for blast design. Therefore vibrations must be monitored at the beginning of construction and continued during construction to measure geological factors and blast data and to ensure serviceability of vulnerable structures. By selecting the right blasting methods and correct drilling and firing patterns the amount of ground vibrations can be controlled. Present paper mainly deals with the prediction of blast-induced ground vibration level and dynamic site factors and will discuss excavation designing of intake waterway system in Upper Gotvand dam by focusing