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# EARTHQUAKE ENGINEERING INTENSITY SCALE: A TEMPLATE WITH MANY USES

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## SUMMARY

The Earthquake Engineering Intensity Scale (EEIS) is a building shaking intensity measure that has been developed along the lines of the Engineering Intensity Scale of the late John A. Blume. This measure, which is in fact a graphical template, allows translation of ground shaking information in the form of response spectra at a site into response/shaking intensity for different kinds of buildings. EEIS can be used as a tool for several purposes, such as: 1) to graphically illustrate damage potential of ground motions; 2) to rapidly identify vulnerable building types after an earthquake; 3) to assess capacity of buildings; 4) to facilitate incorporation of earthquake ground motion and building response data. The EEIS concept also allows tracking the evolution of building code strength requirements. This paper describes the concept of the EEIS and uses a sampling of strong earthquake ground motions with varying characteristics to illustrate some of its uses. The template is also used to provide a chronology of U.S. building code development from its design spectra perspective.

## INTRODUCTION

In the 1970s, in anticipation of possible peaceful use of nuclear arms, John A. Blume developed the Engineering Intensity Scale to monitor building damage potential of nuclear and chemical explosions [1]. Naturally, he suggested that the scale was applicable to earthquake motions as well. His scale utilized response spectra presented in the form of pseudo relative response velocity versus period. Traditionally, though, earthquake intensity measures depend on post-event observations of damage and the absence of damage, and not on any particular ground motion parameter. With the advent of and recordings by dense strong ground motion arrays, large-scale regression studies have been made to develop analytical correlation formulations between traditional earthquake intensity measures, such as Modified Mercalli Intensity (MMI) scale [2], and peak ground motion parameters, such as peak ground acceleration (PGA) and peak ground velocity (PGV). In particular, in the United States, the development of TriNet ShakeMaps brought the automated and rapid ground shaking intensity estimation into wide application [3]. Identifying the damage potential of different parameters obtained from ground motions [4], regression relationships between Instrumental Intensity, $I_{mm}$, (which is proxy for MMI obtained from data recorded

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