PROBABILISTIC SEISMIC HAZARD ANALYSIS
AT
ADDIS ABABA, ETHIOPIA

By

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Submitted

in fulfillment of the requirements of degree of

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CERTIFICATE

This is to certify that the thesis entitled "**Probabilistic seismic hazard analysis at Addis Ababa, Ethiopia**" being submitted to the Indian Institute of Technology Delhi, by **Mr. B. Yoseph** is worthy of consideration for the award of the degree of **Doctor of Philosophy** and is a record of the original bonafide research work carried out by him under my guidance and supervision.

To the best of my knowledge, this work in part or full has not been presented to any other university or institute for the award of any degree/diploma.

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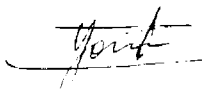

Yoseph B.

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Abstract

Variability of ground motion during earthquakes may be attributed to the source, propagation path, and site characteristics. Simulated strong ground motions using techniques that rely on the description of site- or region-specific ground motion time histories in terms of statistically significant parameters combined with seismological constraints are realistic and are based on a combination of seismological and geotechnical analytical tools. Because of the inherent randomness of the earthquakes and many uncertainties involved in descriptor of the factors, a realistic estimation of ground motions can only be attempted in a probabilistic framework. A rational approach needs to consider both the range and the relative likelihood of possible ground motion levels and the variability in soil and response. An effort is made in the current study to estimate seismic hazard at selected sites in Addis Ababa (AA), Ethiopia. Concepts of probability are consistently applied throughout the study. Seismic source zones that affect AA have been identified. M_{max} estimated using the parametric-historic technique was found to be in close agreement with that of estimated by others. Reference site strong ground motion estimated using NGA (Campbell and Bozorgnia 2007) is found to be appropriate for AA. PSHA at reference site (V_s = 760 m/s) was developed using NGA and ground motion estimated from the finite source model. Hazard on the soil surface was estimated using the state-of-the-art procedure in seismic hazard assessment implementing a fully probabilistic method where the reference site PSHA systematically convolved to the surface. Seismic safety evaluation of Dire dam was carried out and the *FS* obtained for slope stability is sufficiently large to state that the dam will remain stable for the postulated uncertainties in seismic hazard, dam materials and modeling.

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