PROBABILISTIC SEISMIC HAZARD ANALYSIS AND THE SIMULATED RESPONSE OF BUILDINGS TO EARTHQUAKE IN NIGERIA

BY

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING, COLLEGE OF ENGINEERING, COVENANT UNIVERSITY, OTA, OGUN STATE.

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF ENGINEERING DEGREE (M.ENG) IN CIVIL ENGINEERING

MAY 2018

DECLARATION

I solemnly declare that I carried out the work reported in this project in the Department of Civil Engineering, Covenant University, Ota, Nigeria under the supervision of Dr. Tokunbo Ofuyatan. I hereby declare to the best of my knowledge that no part of this report has been submitted here or elsewhere in a previous application for award of a degree. All sources of knowledge used have been duly acknowledged.

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CERTIFICATION

We certify that the materials recorded in this project resulted from original research work carried out by **John Oluwatobi Oluwafemi** of the Department of Civil Engineering Covenant University, Ota as a requirement for the award of M. Eng. Degree in Civil Engineering, Covenant University, Ota, Ogun State, Nigeria.

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DEDICATION

This project is dedicated to the Almighty God, the creator of heaven and earth.

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ABSTRACT

The seismic record of Nigeria shows the occurrences of quakes that range from small to medium magnitude as against the belief of some people that Nigeria is aseismic. Researchers in Nigeria have also recently raised alarm that devastating earthquake is likely to be experienced in the nearest future. Hence this research is focused on probabilistic earthquake hazard assessment of Nigeria and the response of building structures against superlative earthquake. In this research the Gutenberg-Richter approach was employed to forecast and to assess the extent of future earthquakes in Nigeria. Distribution models such as Burr, Rayleigh, Exponential, Gamma, t Location scale, and Weibull were also used to establish the distribution and the probability of yearly occurrence of earthquakes in the South-West and Nigeria as a whole. A 3-storey reinforced concrete building was also modeled and subjected to response analysis under a peak ground acceleration of 0.55g so as to ascertain the response of buildings to earthquake in Nigeria. The results of the forecast established that possible future earthquakes in Nigeria will be experienced in the South-West and the probable earthquake magnitudes are as high as 6.0 in the year 2020; 6.5 in the year 2022; 7.0 between the year 2026 and 2027; 7.1 between the year 2027 and 2028 and 7.2 in the year 2028. According to the poison distribution model, the probability of occurrence of the future earthquakes in the forecasted years was found to be 36.79%. The results of the response spectrum analysis also demonstrated a maximum drift of 0.010695m at storey-2 level and a maximum deflection of 90mm at Storey-4 level. Hence, it is better to classify Nigeria as a low seismic country rather than aseismic.

Keywords: Earthquakes, Tremors, Recurrence Interval, Magnitudes, Intensities, Nigeria