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Review on Deterministic Seismic Hazard Analysis of Indian Region

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Abstract - India is listed under most earthquake prone countries and many of its region lies under seismically active region. Seismic Hazard in India was analyzed mainly on the basis of geological fault data. Deterministic Seismic Hazard Analysis involves the quantitative estimation of ground shaking hazards at a particular site. Seismic hazard studies are needed for the preparation of earthquake loading regulations and for various earthquake risk management purposes. This paper shows a review on Seismic Hazard Analysis of various part of India by Deterministic approach are discussed here.
Keyword- Peak Ground Acceleration, Deterministic Seismic Hazard Analysis, Maximum Credible Earthquake

I. INTRODUCTION

Occurrence of Earthquake does not give any significant warning. So, generally occurred any time which results in destruction occur. To analysis of Seismic Hazard there are basically two methods are as fallows-
Deterministic Seismic Hazard Analysis Probabilistic Seismic Hazard Analysis

A. Deterministic seismic hazard analysis

Deterministic Seismic Hazard Analysis is the earliest approach taken to Seismic Hazard Analysis originated in nuclear power industry applications and also used for structures.
It provides a base for Probabilistic Seismic Hazard Analysis of earthquake.Deterministic seismic hazard analysis approach uses the known seismic source sufficiently near the site and available historical data of earthquake.
To generate dicrete, single-valued events or models of ground motion at the site.
Typically, one or more Earthquake is specified by magnitude and locations with respect to site. Usually the earthquakes are assumed to occur on the any portion close to site.
The site ground motions are estimated deterministically by the fallowing aspects- given magnitude, source to site distance and the site condition. The scenario consists of the postulated occurrence of an earthquake of a specified size occurring at a specified location.
A typically deterministic seismic hazard analysis can be described as a four-step process (Reiter,1990) as fallows -
Identification and characterization of all earthquakes sources capable of producing significant ground motion at the site. Sources characterization includes definition of each source's geometry and earthquake potential.
Selection of a source-to-site distance parameter for each source zone. In most DSHAs, the shortest distance between the site of interest and source zone is selected.
The distance may be expressed as an epicentral distance or hypocentral distance, depending on the measure of distance of the predictive relationship used in fallowing steps.
Selection of the controlling earthquake generally expressed in terms of some ground motion parameter, at the site.
The selection of controlling earthquake is made by comparing the levels of shaking produced by earthquakes (Identified in step.1) assumed to occur at the distances identified in step 2.
The controlling earthquake is described in terms of its distance from the site and size.
The seismic hazard at the site is formally defined, usually in terms of the ground motions produced at the site by the controlling earthquake. Its characteristics are usually described by one or more ground motion parameters obtained from predictive relationship. Peak velocity, peak acceleration, and response spectrum ordinates are commonly used to characterize the seismic hazard.

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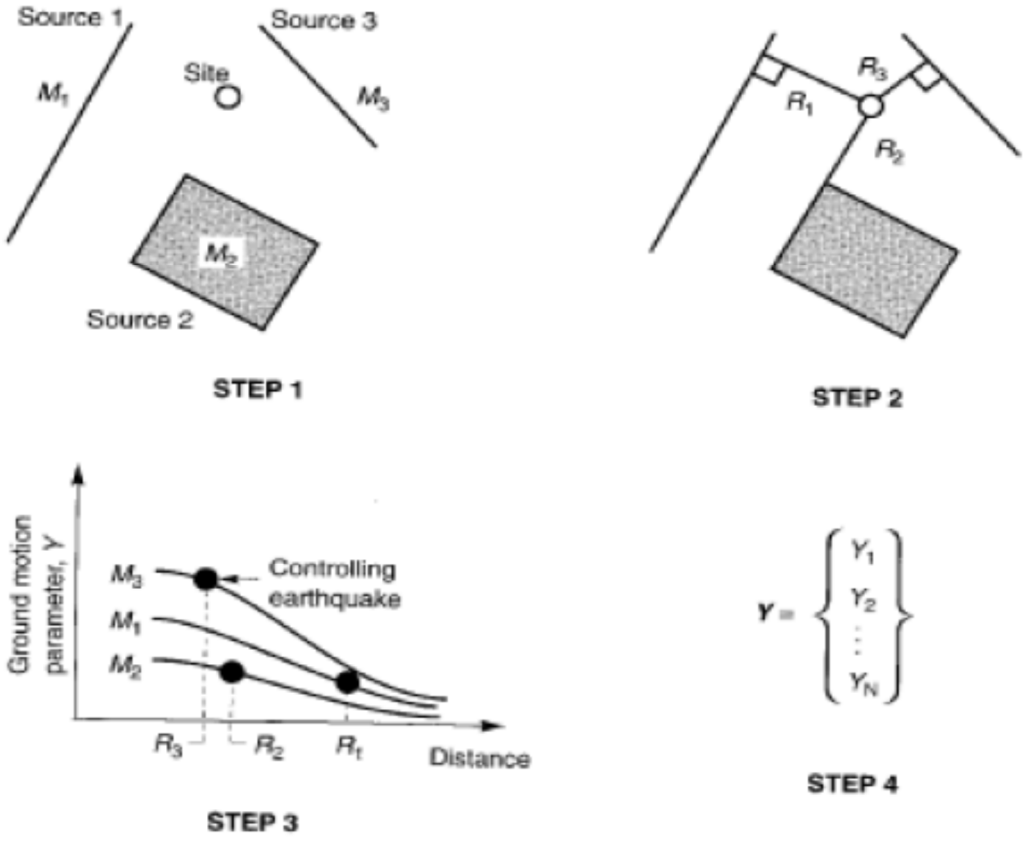

Figure: Four steps of a deterministic seismic hazard analysis

B. Need of Study

The progressive development report of deterministic seismic hazard analysis can help as a ready reference for any future DSHA work. And this report can be use for comparative studies with any future Probabilistic Seismic Hazard Assessment studies.

II. LITERATURE REVIEW

Deterministic Seismic Hazard Analysis (DSHA) uses seismic history and geology to recognize earthquake sources and to deduce the strongest earthquake each source is proficient of producing regardless of time, because that earthquake may occur tomorrow. Those are the Maximum Credible Earthquakes (MCEs), the major earthquakes that can practically be expected. As we cannot safely predict when an earthquake will happen, the MCEs are what a crucial construction should be planned for if the structure is to turn away from surprises.

A. Deterministic Seismic Hazard Analysis of Ahmedabad Region

The deterministic seismic hazard analysis was carried out by K. S. RAO, T. P. THAKER , A. AGGARWAL , T. BHANDARI and S. KABRA. The Peak Ground Acceleration (PGA) values at rock level have been estimated using predictive relationships for the region. The analysis shows that peak ground acceleration from Ahmedabad region has been varied from 0.14 to 0.44 g with maximum credible earthquake (MCE) of magnitude 6.1 generated from East Cambay Fault.

B. Deterministic Seismic Hazard Analysis of Bangalore Region

The deterministic seismic hazard analysis was carried out by Mr. T. G. SITARAM on the BANGLORE region. it is seismically active city . Firstly, microzonation is done on this city and DSHA is a part of this. In this the maximum credible earthquake is obtain by acceleration time history plot. Geological, seismological and Regional investigation for Bangalore section is carried out by considering shear zones, faults and lineaments active around Bangalore to particular distance and earlier period earthquake actions

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in the area by considering seismotectonic activity, maximum credible earthquake has been obtained in 350 km in radius around city. Peak ground acceleration is calculated for various sources by finding the minimum distance b/w Bangalore to source. In term of moment magnitude the maximum credible earthquake found is 5.1 with peak ground acceleration 0.146g.

C. Deterministic Seismic Hazard Analysis of Chennai City

The deterministic seismic hazard analysis was carried out by Ganapathy Pattukandan Ganapathy and S. Rajarathnam. A study on Seismic Hazard Analysis for Chennai city carried out based on deterministic approach using remote sensing and GIS techniques. The seismic potential sources have been identified based on satellite remote sensing data integrated with past earthquake epicenters and limited field checks. Shortest distance from the each seismic source to the Chennai City measured by Arc-Info Measuring tool and the Peak Ground Acceleration (PGA) at bed rock level is calculated for the identified sources with their maximum credible earthquake events using available attenuation relationship formula applicable to Peninsular India. To calculate hazard in the area, a grid is formed dividing each degree of latitude and longitude in to three parts. Arc-GIS layout tool is used to perform the grid analysis. The seismic hazard of Chennai city is expressed in the form of iso-acceleration contours. The estimated maximum PGA from the four seismic source zones was in the range of 0.145g to 0.078g.

D. Deterministic Seismic Hazard Analysis of Dehradun city

The deterministic seismic hazard analysis of Dehradun city was carried out by Mithlesh Kumar. Dehradun city lies under earthquake zone 4. In Dehradun region 24 seismotectonic sources were found. For determining MCE (maximum credible earthquake) they considered the one third of total fault length as rupture length. For PGA value they consider two attenuation models. Peak horizontal acceleration was calculated 0.334g by using attenuation model Sharma (2000) and Peak ground acceleration was 0.4759 by using attenuation model Abrahamson and Lithehiser.

E. Deterministic Seismic Hazard Analysis of Delhi Region

The deterministic seismic hazard analysis was carried out by NEELIMA SATYAM. D and K. S. RAO seismic hazard analysis on Delhi and they find out the peak ground acceleration for this region. Delhi is seismically very active estimation of ground motion parameters is important. Seismological put in that describes the frequency content duration and amplitude of the expected motions are necessary to measure the seismic concert of the structures. Some experiential relations are accessible in the narrative for the evaluation of these ground motions. In this cram, the stochastic finite fault simulation technique which gear the concept of fault discretization wherein the sub events are represented as stochastic point sources is used.

F. Deterministic Seismic Hazard Analysis of Gorakhpur Region

The deterministic seismic hazard analysis of Gorakhpur region was carried out by Sagar Tripathi and Mrs. Sana Zafar. Gorakhpur region lies under most seismically active region of Uttar Pradesh. The seismic risk in provisions of peak horizontal acceleration was estimated to be 0.312g using attenuation model by “Sharma” (2000) and 0.032g using attenuation model by “Iyenger and Raghukanth” (2004).

G. Deterministic Seismic Hazard Analysis of Haryana State

The DSHA of Haryana state was carried out by Nitish Puri and Ashwani Jain. Haryana state comes under seismically active state of India. In Haryana region total 12 Seismogenic sources were found. They used attenuation model developed by National Disaster Management Authority of India. Maximum peak ground acceleration was from 0.023g to 0.514g.

H. Deterministic Seismic Hazard Analysis of Sikkim

The deterministic seismic hazard analysis was carried out by Nath in 2006. Seismic hazard analysis was carried out by deterministic Approach by considering MCE (maximum credible earthquake) for Sikkim and site response analysis was carried out using techniques receiver function and generalized inversion considering strong ground motion data. And also he presented simulation of spectral acceleration and hazard assessment for Sikkim and finally he developed Seismic microzonation map for Sikkim using GIS(Geographical information system).

III. CONCLUSION

Progressive report on Deterministic Seismic Hazard analysis provide quantitative evaluation of the nature of ground shaking in various part of Indian region. This review will help to engineers and researcher a preliminary information on which they can base

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their decisions. Various researches in India in context of deterministic seismic hazard analysis are highlighted with methodology and Peak Ground Acceleration of that site are also mentioned in this paper

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It is to certify that this is my original contribution with the help of publications of references authors.

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