Analysis of Fragile Nature of the Masonry Building of Fortified Concrete Method based on Coefficients

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Abstract- Brick work infill Reinforced substantial casings are the most well-known sort of constructions utilized for multistorey developments in the agricultural nations. Brick work infills, are the non-underlying component, yet gives protection from the seismic tremor and forestall breakdown of generally adaptable and feeble RC structures. Seismic weakness of this sort of construction has been concentrated in the tremor ground movement. Present investigation centers around the seismic delicacy examination of workmanship in-filled (MI) supported concrete (RC) structures utilizing coefficient based strategy. The coefficient-based technique, is a worked on strategy without limited component investigation, for evaluating ghastly speed increase interest (or on the other hand limit) of structures exposed to quakes. This paper starts with approval investigation of the proposed coefficient-based strategy for workmanship infilled (MI) supported cement (RC) structures. Two, four and six story brick work infilled (MI) built up concrete (RC) structures are planned thinking about an uncovered edge investigation, to gauges the between story float interest and occasional shift factor in light of the pinnacle ground for various arrangement of ground movements. Utilizing coefficient based strategy both ghastly speed increase and ghostly dislodging based delicacy bends under different harm states (as far as IDR) were then built. Delicacy bends got from the coefficient based strategy is contrasted and the SAC FEMA strategy at the breakdown state and are correspondence well. The delicacy bends got utilizing both the strategy can give a palatable weakness evaluation to workmanship infilled supported cement (RC) structures under various recommended harm states (or execution level).

I. INTRODUCTION

The development of multi-story brick work infill (MI) built up concrete (RC) structures has been practice in India throughout the previous few decades. Nonetheless, the nature of plan and development stays variable in all over India. Undoubtedly, even in quake inclined districts of India, fundamental setup considering gravity trouble continues being sharpened without considering the horizontal burden circling back to the construction and the seismic weakness of the RC structure.

Out of all the metropolitan advancement in India might be only 10% of all improvement includes supported concrete (RC) designs of which those fulfill with seismic requirements are unimportant in number. An enormous part of this improvement in India has been laid out only for gravity loads, encroaching upon the Code of Indian Standards for tremor safe plan IS 1893. These constructions performed insufficiently and have experienced a couple of damage in the midst of the 2001 Bhuj seismic quake.

Figure 1: Damage of MI RC building amid 2001 Bhuj Earthquake

II. PREVIOUS WORK

In this study, the advancement of fragility characteristics masonry infilled (MI) Reinforced Concrete (RC) structures are exhibited. Fragility examination is to gauge the seismic vulnerability of structures under the impact of ground movement. Fragility curves (or characteristics) are critical for evaluating the general seismic damage to the structures and to foresee the monetary misfortune assessment, debacle reaction arranging, retrofitting of structures for a past quake occasions. Fragility curves, which graphically speak to the seismic risk to a structure, which characterizes the probabilities of surpassing distinctive recommended damage levels as a component of the intensity measures (IMs) and the peak ground acceleration (PGA), spectral acceleration (Sa) or spectral displacement (Sd) of a tremor. The fragility analyses (Casciati and Faravelli, 1991; Mosalam et al., 1997; Cornell et al., 2002; Lang and Bachmann, 2004; Akkar et al., 2005; Kircil and Polat, 2006; Ramamoorthy et al., 2006; Ellingwood et al., 2007; Lagaros, 2008; Seyedi et al., 2010; Howary and Mehanny, 2011), for assessing the seismic dangers of structures has been generally examined.

In the fragility investigation, the demands (or limit) of the structures are lognormally distributed (Cornell et al., 2002) i.e. the relationship between the demand and IMs can be ordinarily anticipated by a two-parameter model (Cornell et al., 2002; Choi et al., 2004; Ramamoorthy et al., 2006; Ellingwood et al., 2007; Konstantinidis and Makris, 2009). In view of the lognormal distribution, the scatter plots of the demands of structures and comparing IMs are articulated on a logarithmic scale; consequently, a regression analysis can be performed to acquire the bestfitting straight regression comparison, bilinear regression equation (Ramamoorthy et al., 2006), or quadratic relapse mathematical statement (Pan et al., 2010) from the power model. The logarithmic middle and standard deviation of the information concerning the relapse comparisons can be acquired by a basic factual examination. The likelihood of surpassing distinctive damage states for a predetermined IM can be resolved once the logarithmic mean and standard deviation are discovered utilizing the standard ordinary dispersion capacity (Casciati and Faravelli, 1991). The damage conditions of structures are immediate occupancy (IO) state, life safety (LS) state, and collapse prevention action (CP) are indicated by different IDR levels for the execution based configuration proposed by outline rules (ATC, 1996; ASCE, 2000)

III. METHODOLOGY

The step wise procedure to develop the fragility curves as per the coefficient based method is given below.

• Estimate the maximum Inter-storey drift (IDR) ratio values for different peak ground acceleration (PGA) values for the frame selected from a number of ground motions. This may be obtained from existing shake table experiment or computational methods such as nonlinear dynamic analysis of the selected frame. Minimum four pair of values of PGA and IDR drift is required. Fit a logarithmic relationship for PGA values in terms of IDR, PGA = f (IDR).

• Period shift factor (β) using Eq.2.10. The fundamental time period (T0) and time period of the damaged building (Te) can be obtained either from shake table test or computationally. For each PGA values the corresponding period shift factors are computed. Fit a logarithmic linear expression for β in terms of PGA as β = f (PGA).

• Compute drift factor (λ) for the masonry infilled RC building using Eq. 2.17 from the maximum, average inter-storey drift ratio for first mode shape and maximum inter-storey drift ratio from combined mode shape. • Generate PGA values for IDR values varying from 0.1% to 6% in a uniform interval. Compute PSF (β) values for each PGA values. Compute spectral acceleration (SA) values for each set of values of IDR, PSF (β) and drift factor (λ). Estimate the spectral acceleration and spectral displacement demand for the frame. Compute the mean (mX) and standard deviation (σX)

• Construct fragility curve based on coefficient based method, where Pf is the exceedance probability of IDR.

- Development of seismic fragility curves for the same frames based on SAC FEMA method (Cornell et al., 2002) using Eq. 2.19 for the same frames.

- A critical comparison of the fragility curves between coefficients based method and SAC FEMA method

IV. RESULTS

The fragility curves for masonry in filled RC structures in terms of PGA with various number of stories at the CP state performance levels are plotted for both the coefficient based method and SAC FEMA method. The fragility curve for two, four, six storey building obtained from coefficient based method and SAC FEMA method are compared and it can be seen that the results are correspond well. The slight variation of fragility curves in both the methods is mainly due to Uncertainty in dispersions demand (βc, βd/IM, βM) i.e. βc the uncertainty in building definition and construction quality, βM the uncertainty in component modelling, damping and mass assumption and βq due to the behavior of structure and study of component deterioration and failure mechanism consider in SAC FEMA method.

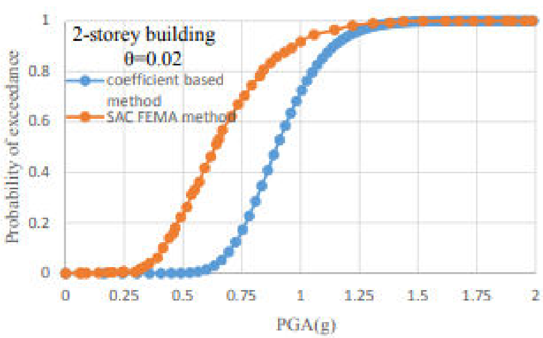

Figure 2: Comparison of fragility curve of two storey MI RC buildings at the CP state (IDR=0.2%)

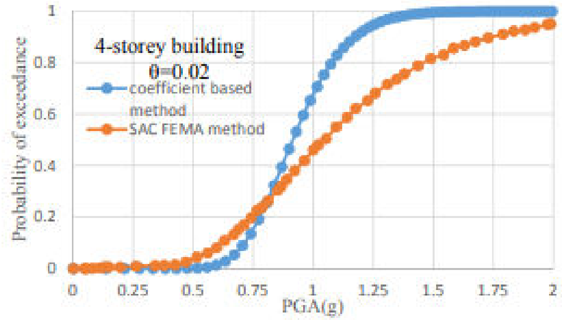

Figure 3: Comparison of fragility curve of four storey MI RC buildings at the CP state (IDR=0.2%)

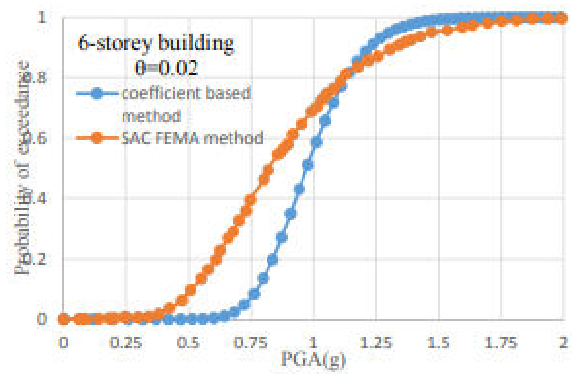

Figure 4: Comparison of fragility curve of six storey MI RC buildings at the CP state (IDR=0.2%)

V. CONCLUSIONS

The main goals of this study are to estimate seismic vulnerability of masonry in filled reinforced concrete structures through seismic fragility analysis and to assess the seismic risk of a structure. To achieve the desire objective the problem is being divided into different sub parts: • Validate and Develop fragility curves of Typical RC frames with number of stories ranging from two to six stories using coefficient based method (Method I) proposed by Lee and Su (2012) • Development of seismic fragility curves for the same frames based on SAC FEMA method (Method II). • A critical comparison of the fragility curves between two methods (Method I and II). To achieve the above desire objectives, an extensive literature review is carried out on following area are (a) the various methodologies for the seismic vulnerability assessment of masonry infilled reinforced concrete buildings as per various international codes and literatures, (b) study of the building performance level or (the Damage States) of the building and (c) fragility curves on masonry infilled (MI) reinforced concrete (RC) framed buildings using coefficient based method (Lee and Su, 2012) and SAC FEMA method (Cornell et al., 2002)

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