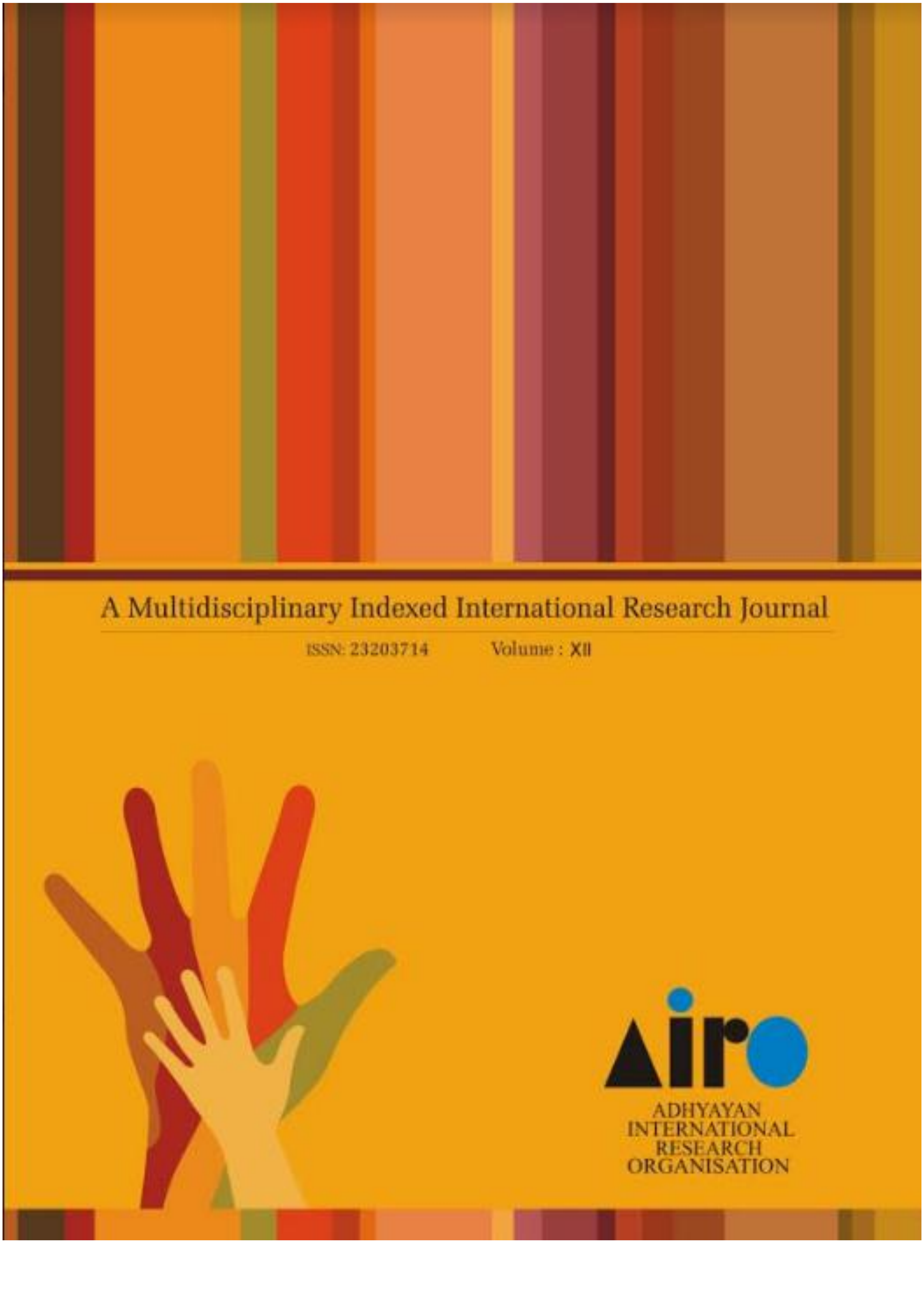
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COMPARATIVE STUDY ON CONCRETE STRUCTURE AND TALL BUILDINGS BASED ON SEISMIC DESIGN

MOHD SAMEER SHEIKH
BASIT RASHEED
Research Scholar, NIMS University, Shobhanagar, Jaipur
Guide: Bipin Kumar Singh
(Assistant Professor in Civil Engineering Department in NIMS University, Shobhanagar, Jaipur Rajasthan INDIA
Co-guide:- Vikas Kumar Pandey
Assistant Professor in Civil Engineering Department in NIMS University, Shobhanaga,r Jaipur, Rajasthan INDIA
Email id:

ABSTRACT: Nowadays, in current tall buildings, parallel burdens actuated by wind or quake powers are frequently opposed by an arrangement of multi-outriggers. An outrigger is a stiff beam that associates the shear walls to exterior columns. At the point when the structure is subjected to horizontal powers, the outrigger and the columns oppose the revolution of the center and consequently altogether diminish the sidelong avoidance and base minute, which would have emerged in a free center. Amid the most recent three decades, various investigations have been completed on the examination and conduct of outrigger structures. In any case, this inquiry is remained that what number of outriggers system is required in tall buildings. Strengthened concrete walls are generally utilized as the essential sidelong compel opposing framework for tall buildings. As the apparatuses for directing nonlinear reaction history examination have enhanced and with the coming of execution based seismic design, reinforced concrete walls and core walls are frequently utilized as the main parallel constrain opposing framework. Legitimate demonstrating of the heap versus disfigurement conduct of strengthened concrete walls and link beams is fundamental to precisely anticipate essential response quantities. Given this basic need, a diagram of displaying approaches proper to catch the parallel load reactions of both slim and stout reinforced concrete walls, and additionally link beams, is introduced. Demonstrating of both flexural and shear reactions is tended to, and also the potential effect of coupled flexure–shear behavior.

KEYWORDS: Exploration, Pattern, Buildings, Seismic Design, Reinforced Concrete, Structure.

INTRODUCTION: The west coast of the India, a highly seismic region, is seeing a resurgence in the design and construction of tall buildings (characterized here as buildings 240 feet (73 meters) or taller). A significant number of these buildings use superior materials and framing systems that are not generally utilized for building construction or that fall outside the stature furthest reaches of current buildings codes. By and large, prescriptive arrangements of administering building codes are observed to be excessively prohibitive, driving to designs that are outside the breaking points of the code prescriptive arrangements. This is reasonable through the option arrangements statement of building codes. For instance, the International Building Code [1], which governs construction in a great part of the Indian states "An option material, design, or strategy of construction should be endorsed where the building official finds that the proposed configuration is tasteful and consents to the aim of the arrangements of this code is at any rate what might as well be called that recommended in this code in quality, strength, effectiveness, fire resistance, durability, and safety." When the option arrangements proviso is summoned, this ordinarily prompts an execution based outline including advancement of a plan particular criteria, website particular seismic hazard examination, determination and adjustment of ground motions, improvement of a nonlinear computer investigation model of the building, execution confirmation investigations, improvement of building-particular points of interest, and peer review by tall buildings design specialists. Experience picked up in the utilization of this approach has discovered its way into composed rules [2-4]. These reports for the most part characterize what should be considered, yet leave significant scope in their execution with the goal that the designer is not overly constrained. This paper reviews the as of now acknowledged ways to deal with execution based seismic design of tall buildings in India Presents illustrations, and portrays applicable research findings and needs.

REVIEW OF LITERATURE: Tall building advancement incorporates distinctive complex parts, for instance mass trading, style, innovation, civil regulations, and authoritative issues. Around these, business concerns have been the basic managing variable. This new building sort itself won't not have been possible, in any case, without supporting advances. A structural transformation - the steel skeletal structure - and furthermore resulting glass window trimming divider systems, which occurred in Chicago, has provoked the present circumstance with the-symbolization tall building. The advancement of tall buildings and tall building structural systems nearly takes after that of material, analysis and non-structural system, (mechanical), improvements. The earliest buildings were developed of stone work. Chicago's sixteen stories Monadnock building is the tallest masonry structure [4]. Such apparently absurd extents were required by code. The taller the building, the more noteworthy the volume of brick work was required per unit range of floor space. These early structures gave natural strength against toppling minutes in their outrageous dead loads. Structural systems for tall buildings have encountered heartbreaking changes since the finish of the conventional rigid housings in the 1960s as the pervasive kind of structural framework for steel or cement tall buildings [8]. With the improvement of the tubular shapes even now acclimating to the International Style, such changes in the auxiliary shape and relationship of tall buildings were required by the developing structural designs in design in conjunction with the budgetary solicitations and mechanical developments in the spaces of sound structural analysis and design made possible by the presence of fast digital computers. Starting in the 1980s, once-normal Miesian tall buildings were then, all things considered, exchanged by the finish parts of postmodern, valid, dia-matrix and DE constructivist proclamations [9, 10]. This was not undesirable in light of the fact that the new period of tall buildings broke the redundancy of the outside tower structure and offered ascend to novel elevated structure portrayals. Innovative structural systems including tubes, mega frames, center and-outrigger systems, falsely damped structures, and blended steel-cement systems are a rate of the new developments since the 1960s.

THE NEW GENERATION OF TALL BUILDINGS IN INDIA: Urbanregions along the west coast in India are seeing a boom in tallbuilding construction.Figure 1a illustrates recent developments and plans in San Francisco, where buildingsas tallas 1200 ft (370 m) are under study. Many of thebuildings are residential or mixed-use (including residential) occupancy, though economic changes may lead to alternative functions including office occupancies. To meet functional and economicrequirements, many of the newbuildings are using specialized materialsand lateral-force-resisting systemsthat do not meet the prescriptive definitions and requirements of currentbuildingcodes.Figure 1b and c illustrate the framingsystem of a 60-story buildingin San Francisco. Theseismic force-resisting systemis reinforced concrete core walls with buckling-restrained steeloutrigger braces along one axis. The designatedgravity framing comprises an unbounded post-tensioned flat-platesystem [5]. As the buildingresponds to anticipated earthquake groundshaking, the flatplate and its supportingcolumns will undergo deformations and develop internal forces that must be considered as part of thedesign. In addition to the corewall system shown inFigure 1, other framing systems including moment frames, steel-plate walls, and other innovativesystems are being considered for variousbuildings, each with its own special designneeds.

Figure-1 (a) San Francisco skyline projection

Figure-1 (b) Core wall elevation

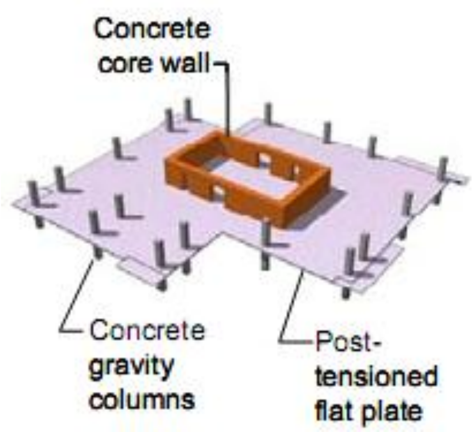
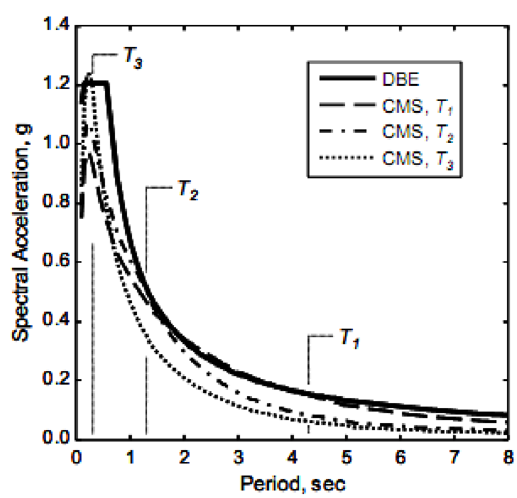
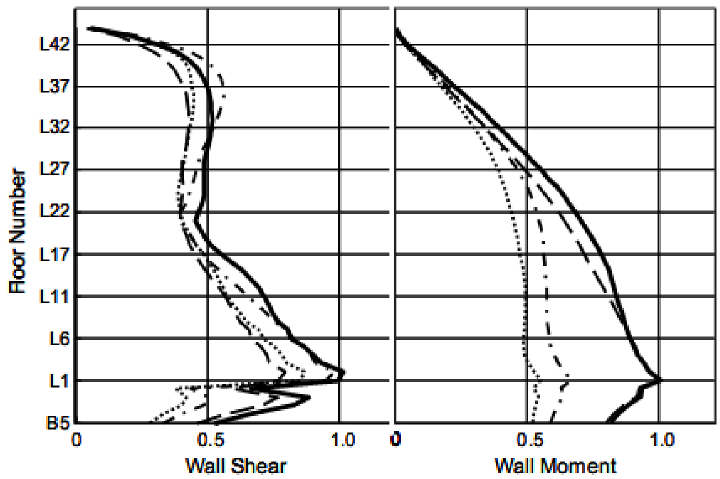


Figure-1 (c) Floor framing perspective

SEISMIC HAZARD ANALYSIS AND DESIGN GROUND MOTIONS: Seismic ground shaking for the most part is resolved utilizing site-particular seismic hazard investigation considering the area of the building regarding causative shortcomings, the provincial and nearby site-particular geologic characteristics, and the selected earthquake hazard levels. The examination delivers a uniform hazard response range characterizing linear spectral speeding up values for various periods and hazard levels. It additionally distinguishes which speculative tremors overwhelm the seismic hazard at the site. From this, an arrangement of (quite often seven) ground movement sets predictable with the site conditions and with the magnitude, distance, and system of the dominant earthquakes is chosen for use in nonlinear dynamic examination of an investigative model of the building. Since greatness unequivocally impacts recurrence substance and length of ground motion, it is alluring to utilize records from seismic tremors inside 0.25 magnitude units of the target magnitude [6]. Term can be particularly vital for tall buildings due to the time required to develop vitality in long stretch structures. For destinations near dynamic shortcomings, chose movements ought to contain a proper blend of forward, in reverse, and impartial directivity steady with the site [7]. The chose ground movements by and large are controlled to better fit the objective direct reaction range utilizing either scaling or range coordinating. Scaling includes applying a steady factor to singular sets of horizontal ground movement records to make their reaction all the more nearly coordinate the design spectrum over a scope of periods. Spectrum matching is a procedure whereby singular ground movement records are controlled (for the most part in the time space by expansion of wave bundles) to modify the direct reaction range of the movement so it coordinates the target design response spectrum. Coming about movements ought to be contrasted with unique movements with guarantee the first character of the movements is not modified excessively.



(a) Response spectra

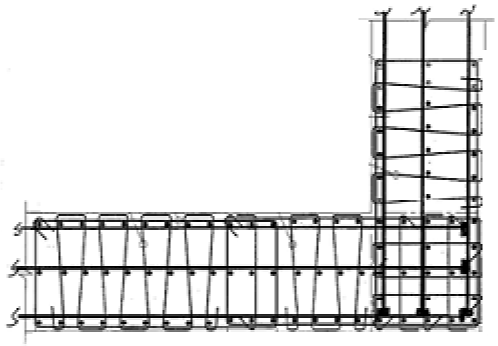


(b) Peak building responses

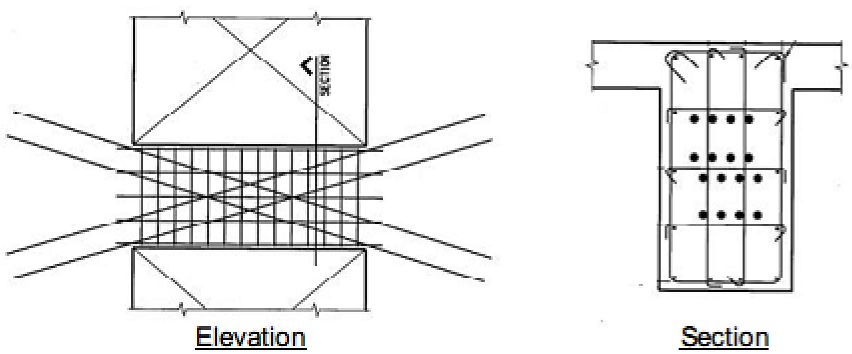
Figure 2 presents results of an investigation of the utilization of ground movements scaled to various reaction spectra. DBE alludes to the design basis seismic tremor reaction range of ICC (2006), which is generally proportionate to a uniform peril range, and CMS alludes to the conditional mean spectrum conditioned on a single period; three such spectra are indicated comparing to each of the initial three translational modes of vibration (in one plane) of a tall core wall building model. The contingent mean spectra match the DBE ghostly speeding up at the objective time frame, however for the most part have bring down reaction ordinates for periods far from the objective. A few ground movement records were chosen to roughly coordinate the DBE and CMS spectra, and afterward were utilized to energize a nonlinear analytical model of the building. Figure 2b shows results of nonlinear dynamic investigations; for shears the outcomes are the mean in addition to one standard deviation of the pinnacle story shears and for minutes the results are the mean of the pinnacle story minutes (these factual measures regularly are utilized as a part of current design practice). It can be watched that the envelope of the CMS comes about is almost as extensive as the DBE comes about, and in this case there are areas where the CMS esteems are higher (ascribed to ground movement varieties and problem nonlinearities). For the most part, little benefit is gotten from the CMS results for reaction amounts ruled by a single mode, and just minimal advantage is acquired from reaction amounts with commitments from more than one mode. Given the high cost of creating the spectra, the ground motions, and the building responses, situation based ground movements as of now are not utilized for tall building designs.

DESIGN CRITERIA: A design criteria archive by and large is produced by the designer to clearly and concisely impart to the design team, the building official, and the associate commentators the purpose and the procedure of the building structural design. A well-prepared report will probably incorporate information and talk with respect to the building and its area; the seismic and wind compel opposing frameworks; test conceptual drawings; codes and references that the design incorporates to some extent or full; special cases to previously mentioned code prescriptive arrangements; execution goals; gravity, seismic, and wind stacking criteria; load combinations; materials; strategies for examination including software and modeling procedures; acknowledgment criteria; and test information to help utilization of new components. The document is arranged ahead of schedule for endorsement by the building official and companion commentators, and might be altered as the design advances and the building is better caught on. The design criteria report must characterize how the design is expected to meet or surpass the performance expectations natural in the building code. A typical layman viewpoint on tall buildings is that their execution ought to surpass the execution of "ordinary "buildings. This point of view gets from impression of high occupancy, crisis response challenges, and the consequences for provincial picture in case of harm to an iconic building. Another point of view is that commanding exceptional execution targets for one class of building would be point of reference setting with minimal specialized premise yet with imperative (typically negative) economic consequences. These plainly are public policy issues that ought to be openly bantered about either on a national scale (through the model/national building codes) or at a local scale (through a law in local government). Notwithstanding, given that the main role of building codes is assurance of life safety and public welfare, qualities of tall buildings that present higher dangers than normal buildings could be considered for enhanced performance. Illustrations that fall into this class are cladding and its dock, and emergency ingress and egress.

STRUCTURAL PROPORTIONING AND DETAILING: A significant percentage of recent high-rise building construction in India has been for residential and mixed-use occupancies. Thus, much of it has been of reinforced concrete, and the majority of those have used reinforced concrete core walls. Some concrete and steel framing, and some steel walls, also are used. Under design-level earthquake ground motions, the core wall may undergo inelastic deformations near the base (and elsewhere) in the presence of high shear. Ductile performance requires an effectively continuous tension chord, adequately confined compression zone, and adequate proportions and details for shear resistance. In locations where yielding is anticipated, splices (either mechanical or lapped) must be capable of developing forces approaching the bar strength. Furthermore, longitudinal reinforcement is to be extended a distance 0.8lw past the point where it is no longer required for flexure based on conventional section flexural analysis, where lw is the (horizontal) wall length. Walls generally are fully confined at the base and extending into subterranean levels. Confinement above the base may be reduced (perhaps by half) where analysis shows reduced strains, though strains calculated by nonlinear analysis software generally should be viewed skeptically as they are strongly dependent on modeling assumptions (modeling procedures should be validated by the engineer of record against strains measured in laboratory tests). The reduced confinement usually continues up the wall height until calculated demands under maximum expected loadings are well below spelling levels. Transverse reinforcement for wall shear generally is developed to the far face of the confined boundary zone; otherwise, the full length of the wall is not effective in resisting shear. Figure 3a shows an example detail for boundary element confinement and anchorage of shear reinforcement using headed bars. Another accepted detail is to lap the horizontal shear reinforcement with an equal area of hoops or U-bars inserted into the boundary. Hooks on the horizontal reinforcement may not be feasible given the large diameter of the horizontal bars. Coupled core walls require ductile link beams that can undergo large inelastic rotations. In typical cases, the small aspect ratio and high nominal shear stress dictate use of diagonally reinforced coupling beams. To facilitate construction, link beams are now construc ted using full cross section confinement rather than individual diagonal confinement (Figure 3b).



(a) Wall



(b) Coupling beam

Figure 3 – Typical wall and link beam details

Away from the core walls, gravity loads commonly are supported by post-tensioned floor slabs supported by columns. Slab-column connections are designed considering the effect of lateral drifts on the shear punching tendency of the connection. In most cases, stud rails or other systems are used to reduce the likelihood of punching around the columns. For post-tensioned slabs, which are most common, at least two of the strands in each direction must pass through the column cage to provide post-punching resistance.

CONCLUSION: Performance based tremor engineering increasingly is being utilized as a way to deal with the design of tall buildings in India Available software, research results, and encounter increased through genuine building applications are giving a premise to successful use of nonlinear examination methodology. Critical contemplations incorporate meaning of execution goals, determination of information ground movements, construction of a suitable nonlinear analysis model, and judicious interpretation of the outcomes. Executed legitimately, nonlinear dynamic examination particular to the basic framework and seismic environment is the most ideal approach to distinguish nonlinear dynamic reaction attributes, including yielding instruments, related interior strengths, misshaping requests, and specifying necessities. Extents and points of interest better than those acquired utilizing the prescriptive necessities of the building code can be dictated by such investigation, prompting more noteworthy trust in building performance attributes including serviceability and safety. Despite the fact that execution based designs already are under way and are prompting improved designs, a few research needs have been distinguished, the investigation of which can additionally enhance design practices.

REFERENCES:

1. ACI 318 (2008). Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary, American Concrete Institute, Farmington Hills, MI.

2. Elwood, K.J., and M.O. Eberhard (2009). “Effective Stiffness of Reinforced Concrete Columns,“ ACI Structural Journal, V. 106, No. 4, pp. 476-484.

3. Ross, D.E. 2004. HVAC Design Guide for Tall Commercial Buildings, Atlanta, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

4. LATBSDC (2008). An Alternative Procedure for Seismic Analysis and Design of Tall Buildings Located in the Los Angeles Region, Los Angeles Tall Buildings Structural Design Council.

5. CTBUH (2008). Recommendations for the Seismic Design of High-Rise Buildings, Council on Tall Buildings and Urban Habitat.

6. SEAONC (2007). SEAONC Recommended Administrative Bulletin for San Francisco, Structural Engineers Association of Northern California, San Francisco.

7. Baker, J.W. and C. A. Cornell (2006). Spectral shape, epsilon and record selection, Earthquake Engineering and Structural Dynamics, 35, 1077-1095.

8. Abrahamson, N.A. (2006). Seismic hazard: Problems with current practice and future developments. Proc. of the First European Conference on Earthquake Engineering and Seismology, Geneva, September 4-7, 2006.

9. ASCE 7-05 (2005). Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers.

10. Bray, J.D., and A. Rodriguez-Marek (2004). Characterization of forward-directivity ground motions in the near-fault region, Soil Dynamics and Earthquake Engineering, 24, pp. 815-828.