Effective Position Of Shear Wall For Higher Rise For Time History Analysis

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Abstract- *There in forced concrete buildings are subjected to lateral loads due to wind and earthquake and these forces are predominant especially in tall and slender buildings. In order to resist these lateral loads, shear walls are providing din the building as a lateral load-resistingelement, which inherently possesses sufficient strength and stiffness. The importance of shear walls in mitigating the damage to reinforced concrete structures is well documented in the literature. The shear walls are generally classified into three categories on the basis of aspect ratio of the shear wall (height/width ratio) viz., short, squat and slender shear walls. The short shear wall, though not very common, has the aspect ratio less than unity.*

In order to carry out the above analyses, the finite element program has been developed in FORTRAN with state-of- the- art material and geometric modeling. The program is capable of performing static as well as dynamic analyses in linear and non-linear regimes

Elements are being used predominantly in modeling the shear wall geometry and resulted in a better performance for both thick and thin shells. Since the formulation based on the classical shell theory has been found to be mathematically complex, the use of degenerated shell element came into picture and was found promising when it was first developed for the analysis of moderately thick plates and shells. Nevertheless, the element suffered from locking phenomenon.

Keywords- shear wall, Deformation,Failure modesReinforced Concrete.

I. INTRODUCTION

In the 21st century, there has been the tremendous growth in the infrastructure development in the developing countries, especially India, in terms of construction of buildings, bridges and industries etc. This infrastructure development is mainly due to the growing population and to fulfill their demands. Since the land is limited, there is a huge scarcity of land in urban cities. To overcome this problem tall and slender multi-storied buildings are constructed. There is a high possibility that such structures are subjected to huge lateral loads. These lateral loads are generated either due to wind blowing against the building or due to inertia forces induced by ground shaking (excitation) which tends to snap the building in shear and push it over in bending. In the framed buildings, the vertical loads are resisted by frames only, however, the lateral resistance is provided by the infill wall panels. For the framed buildings taller than 10-stories, frame action obtained by the interaction of slab sand columns is not adequate to give required lateral stiffness (Taranath,2010) and hence the framed structures become an uneconomical solution for tall buildings. The lateral forces due to wind and earthquake are generally resisted by the use of shear wall system, which is one of the most efficient methods of maintaining the lateral stability of tall buildings. In practice, shear walls are provided in most of the commercial and residential buildings up to thirty storeys beyond which tubular structures are recommended. Shear walls may be provided in one plane or in both planes. The typical shear wall system with shear walls located in both the planes and subjected to lateral loads is shown in Fig. 1. In such cases, the columns are primarily designed to resist gravity loads.

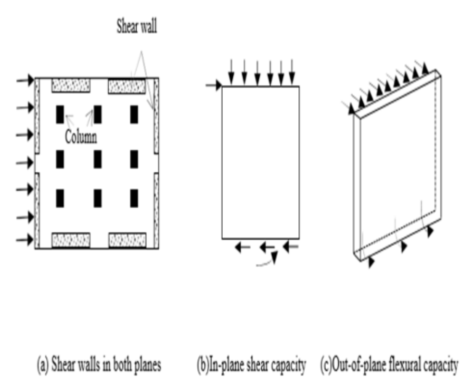


Fig.1: Buildingplanconfigurationofshearwall

The shear walls are expected to resist large lateral loads (due to earthquake or wind) that may strike "in-plane"[Fig.1 (b)] and" out-of- plane"[Fig.1(c)]to the wall. The in-plane shear resistance of the shear wall can be estimated by subjecting the wall to the lateral loads as shown in Fig. 1(b). On the other hand, the flexural capacity can be estimated by subjecting the shear wall to the out-of-plane lateral loads as shown in Fig. 1(c). During extreme earthquake ground motions, the response of a structure is dependent upon the amount of seismic energy fed in and how this energy is consumed. Since the elastic capacity of the structure is limited by the material strength, survival generally re lies on the ductility of the structure to dissipate energy. At higher loads, in elastic de formation arises which are permanent and imply some damage. The damages generally vary from minor cracks to major deterioration of structure, which may be beyond repair. It has been learnt from past experiences that the shear wall buildings exhibit excellent performance during the severe ground motion due to stiff behavior at service loads and ductile behavior at higher loads thus preventing the major damage to the R C buildings (Fintel,1977). The behavior of shear wall can be ascertained well by observing the deflected shape. The deflected shape of the tall shear wall is dominated by flexure and that of short shear walls by shear as shown in Fig.2.

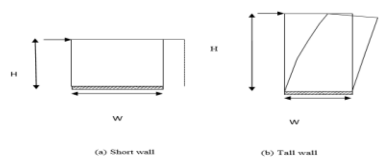


Fig.2: In-plane deformation of shear wall

Thus, in the case of tall shear wall, the deflected shape can be determined using the simple bending theory by ignoring sheared formation. However, it becomes necessary to include shear deformation in the case of short walls. The total deformation of a shear wall is the sum of the (I) flexural deformation, (ii) shear deformation, and
(iii) Slip deformation as shown in Fig.3.

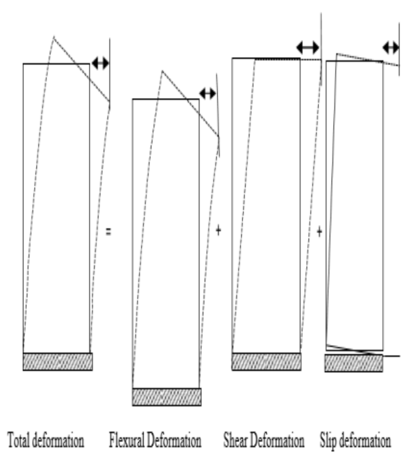


Fig.3: Deformation of shear wall

Though tall shear wall is to be precisely defined as structural walls, however, for simplicity, it is denoted as shear wall only. Several experimental and analytical investigations have been performed in assessing the behavior of the shear walls (Rahimian2011; Klingeretal. 2012; Paulayand Priestley 1992;Atimtay and Kanit2006; Elnashaietal .1990;Taranath 2010;Lefasetal .1990; Derechoetal .1979; Mullapudietal.2009; Paknahad et al. 2007; Thomsen and Wallace (1995, 2004); Ghorba nirenani et.al. 2012). On the basis of above investigations, it was found that shear walls possess certain inherent characteristics if designed and detailed properly.

The strength, stiffness and ductility are the essential requirement sof shear wall andneed to be assessed for its structural performance (Derecho et al. 1979; Far vash any et al.2008; IS 13920 1993; IS 4326 1993). Strength limits the damage and stiffness reduces the deformation in the shear wall. Ductility, defined as ability to sustain in elastic deformations without much strength and stiffness degradation, has been considered very essential requirement, especially under severe dynamic loading conditions. Hence, the basic criteria that the designer has to satisfy while designing shear walls in earthquake resistant structures are as follows:

- To impart adequate stiffness to the building so that during moderate seismic disturbances, complete protection against damage, particularly to non-structural components, is guaranteed.
- To provided equate strength to building in order to ensure that an elastic seismic response does not result in more than superficial structural damage.
- To provide adequate structural ductility to building in order to dissipate energy for the situation when the largest disturbance to be expected in the region does occur. Even the extensive damage, perhaps beyond the possibility of repair, is accepted under extreme conditions, but prevention of sudden collapse must have been sure under any dire circumstances.Sometimes, shear walls are pierced with openings to fulfill the functional as well as architectural requirements of buildings. The structural response of shear wall may be influenced by the presence of openings, depending upon their sizes and their positions. The present study aims to accomplish this task by investigating the response of shear walls in the presence of openings.

1.2 CLASSIFICATION OF SHEAR WALLS

Based on several experimental and analytical investigations, the shear walls are mainly classified on the basis of (i) structural materials (ii) aspect ratio, and (iii) geometry.

1.2.1Based on structural materials

Depending on the structural materials, shear walls are usually classified as (i)steel shearwall (ii) timber shear wall (iii) reinforced masonry shear wall, and (iv) RC shear wall.

Though steel shear walls are considered to have excel lent strength to weight ratio, its use is normally restricted to industrial structures due to high initial cost. The timber shear walls, light weight structure, are very advantageous in the cold region; its use is not advisable for high-rise structures due to its limited strength. Similarly, reinforced masonry shear walls are not permitted beyond four storeys because of inherent instability of tall buildings. The RC shear walls are very prominently used in common residential and commercial complexes and hence been the subject of intense research for many decades.

1.2.2Based on aspect ratio

The ratio of height (H) to width (W) of the shear wall, generally referred as aspect ratio, is one of them most important parameters influencing the structural behavior of shear wall. The classification of shear walls based on aspect ratio is shown in Fig. 4. The shear wall I s considered to be short if the aspect ratio is less than unity. The short shear walls Were extensively used in the early 1920' s to provide the line of defense in military operations though not with the name ‘shear walls’.

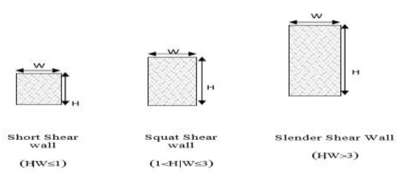


Fig.4Classification of shear wall on the basis of aspect ratio

The shear walls are considered squat if the aspect ratio lies between one and three. The squat and short shear walls generally fail in shear, which is often undesirable since they result in brittle failure (Paulay and Priestley, 1992). On the other hand, the shear walls with aspect ratio greater than three is considered slender shear wall. In case of slender shear walls, flexure mode predominates and, therefore, the shear deformation is generally neglected in the analysis. The analysis of squat shear walls becomes complex due to heavy coupling off flexural and shear modes. The crack sin the lower portion of the shear wall are common irrespective of their aspect ratio. These cracks usually originate at bottom portion of shear wall at an angle of 45' with respect to horizontal axis and referred as diagonal cracks. For slender and squat shear walls these cracks are extended up to full width of the shear wall, however, for short shear walls these cracks terminates home where within the width of the shear wall depending on the aspect ratio.

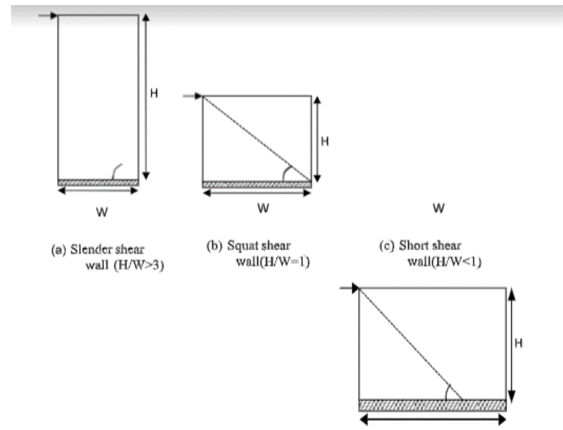


Fig.5 Typical lender, squat, and short shear walls

Moreover, for the slender shear, walls the cracks are concentrated near the bottom of the shear wall, however, for short and squat shear walls these cracks are found to be smeared throughout the height of shear wall. The orientation of diagonal cracks in typical lender, squat, and short shear walls is shown in Fig.5.

1.2.3 Geometry of shear wall

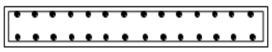
Based on the geometry of shear wall, there may be many types of reinforced concrete shear walls such as (a) rectangular shear walls, (b)Bar bell shaped shear walls,
(a) Flanged shear walls, (d) coupled shear walls, (e) framed shear wall, (f) column supported shear wall, and (g) core shear wall. Out of all shear walls, rectangular shear walls, bar bell shaped shear walls and flanged shear walls are quite common and adopted in practice. Hence, the current section deals with these types of shear wall only.

1.3 RECTANGULAR SHEAR WALLS WITHOUT BOUNDARY ELEMENTS

The plane rectangular shear wall is the simplest form of shear wall in which only horizontal and vertical reinforcement are provided. The vertical and horizontal reinforcing bars are provided at a uniform spacing throughout the shear wall as shown in Fig. 6. The vertical reinforcement not only provides flexural as well as shear resistance, but also controls the shear cracking and improves the ductility. Horizontal reinforcement provides partial shear strength. Nevertheless, the edges experience high compressive and tensile stresses which necessitate the need to strength enthuse portions. The strengthening of the edge scan be accomplished by any one of the following means.

1.4 RECTANGULAR SHEAR WALLS WITH BOUNDARY ELEMENTS

In order to strength end the shear wall as well to prevent the over stressing of the ends, the rectangular shear wall is generally being provided with the extra reinforcement at the ends without any increase in thickness of shear wall. Such type of shear walls are commonly known as rectangular shear wall with boundary elements and these end regions of the walls with increased reinforcement are called boundary elements (Murthy,2004), which adds confinement to the concrete. To achieve this confinement in the boundary elements, vertical as well as horizontal bars are provided at much closer spacing as shown in Fig. 7.



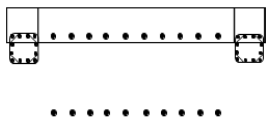


Fig.6: Section of rectangular shear wall without boundary elements

Fig.7: Section of rectangular shear wall with boundary elements

The shear walls with boundary elements, enhances the shear resistance and ductility of the shear wall, however, no significant increase in flexural capacity is observed. Never the less, this confinement enables concrete to sustain the load reversals without losing strength. Shear walls with boundary elements are commonly used in shear wall buildings of shorter height (i.e. up to five storeys).

1.5 BARBELL SHAPED SHEAR WALL

Sometimes, the steel in boundary elements becomes very large to accommodate with in normal thickness. Hence, there is a need to increase the thickness of the shear wall at the ends. Such shear walls are known as bar bell shaped shear walls, as shown in Fig.8.

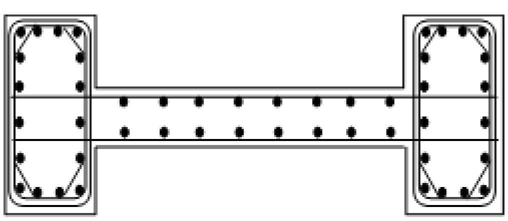


Fig. 8: Barbellshapedshearwallwithboundaryelements

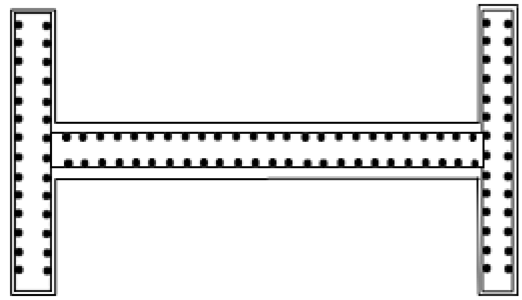


Fig.9: Flanged shear wall

The ends are known as boundary elements. The bar bell shaped shear walls are somewhat stronger and more ductile than the simple rectangular type of uniform section. These walls are generally designed to possess higher shear strength and hence failure is designed to take place by yielding of steel. Nevertheless, bar bell shear walls are very rigid during severe ground motion and hence attracts larger inertia forces and dissipate lot of energy by cracking, which is difficult to repair. Bar bell shaped shear walls are particularly strong in developing moment-capacity. These types of shear walls are frequently used for tall multi- storeyed buildings where both vertical load.

The flanged shear walls are widely used in nuclear power plants as well as in the elevator core soft high-rise buildings. Flanged shear walls are preferred over the rectangular shear walls when the aspect ratio of the shear wall exceeds unity. Though the flanges are out-of-plane to the web as shown in Fig.9, it has been observed that the performance of flanged shear walls has been found to be better in resisting bending stresses as compared to rectangular shear walls. However, flanged shear walls do not enhance shear capacity as much as the moment, because the flange does not increase the gross area as it does the moment of inertia. The flanged shear walls are mostly suitable for tall multi-storey buildings where vertical load carrying capacity as well as lateral load resistance is important.

1.6 FAILURE MODE SO FORCE SHEAR WALL

In order to characterize the behavior of RC shear wall, it is essential to understand the failure modes of RC shear wall. The failure modes of the shear wall are greatly influenced by (i) aspect ratio, and (ii) cross-sectional geometry. Slender shear walls, designed for flexural strength, behave like a vertical slender cantilever beam, and therefore, primary mode of deformation of slender shear wall is bending. On the other hand, the design of short/squat shear walls is governed by shear strength and possesses significant amount of shear deformation in addition to bending deformation. In the short/squat shear walls, shear transfer takes place byte truss action which provides a stiffer system than that for slender walls. Unlike slender shear walls, squat shear walls do not show any significant difference in behavior under monotonic and reversed cyclic loading. Several experimental investigations have been conducted over the period of last five decades in order to assess the failure modes ofthe shear wall (Thomsen and Wallace 1995, 2004). The different failure modes namely, flexure, shear, crushing, sliding and rocking are discussed in the current section.

1.6.1 Shear failure mode (diagonal tension failure)-A brittle failure mode

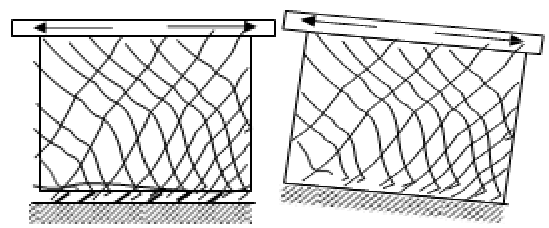
Shear failure mode is generally not the desired failure mechanism and is considered unsafe. This type of failure is mainly due to the diagonal tension and hence shear failure is also known as diagonal tension failure. Due to shear failure, the vertical load carrying capacity of the shear wall is lost even at relatively low strains. Shear failure is the common mode of failure of squat shear walls as shown in Fig.10(a), where achieving ductility is a herculean task. Due to high shear stresses and relatively low flexural stresses, shear walls develop principal tensile stresses with approximately 45' inclinations. Since the tensile strength of concrete is considered very low in comparison to compressive strength, the cracks are formed during the early stages of loading itself. The diagonal cracks are effectively restrained by providing horizontal reinforcement. Nevertheless, if the horizontal reinforcement provided is less or insufficient to Sustain diagonal tensile stresses then the diagonal tension failure occurs. The horizontal reinforcement improves the inelastic response of shear walls subjected to high nominal shear stress by reducing shear deformation. However, the horizontal reinforcement is in effective in resisting sliding shear.

1.6.2 Crushing failure mode-A brittle failure mode

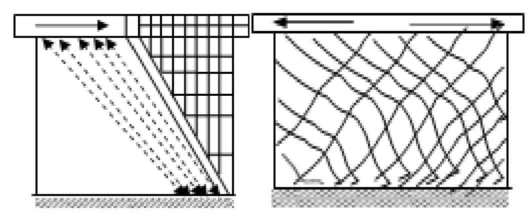
Crushing failure mode occurs due to the diagonal compression because of inadequate confinement of the compression zone. This mode of failure is the most unsafe of all mechanisms and such failures are considered very brittle as crushing of concrete takes place prior to yielding of steel. The diagonal compression failure becomes more severe under reversed cyclic loading conditions. The crack pattern due to diagonal compression failure mode is shown in Fig.10 (b).

1.6.3 Flexural failure mode-A ductile failure mode

Flexural failure mode, a ductile failure mode, is a very safe mechanism and is considered an ideal choice of failure modes. Flexural failure is generally observed in the caseOf slender shear walls as shown in Fig.11 (a), and such mode of failure is very difficult to attain in the case of squat and short shear walls. They develop a predominantly horizontal crack pattern in the lower hinging region after a few cycles of in elastic deformation. Nevertheless, under reversed cyclic loading, slender shear walls show less flexural strength and deformation in comparison to monotonic loading. Moreover, the actual flexural capacity of the wall is generally found to be significantly higher than the design flexural capacity, due to strain hardening of the vertical reinforcement. It has been observed that for the same amount of vertical reinforcement, shear walls having reinforcement concentrated in the boundary elements possess higher flexural capacity and higher ultimate curvature than the walls having uniformly distributed reinforcement (Paulay and Priestley,1992).

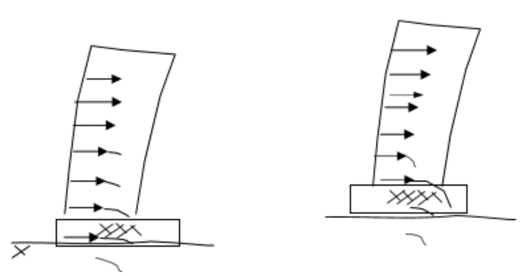


(a) Diagonal tension failure (b)Diagonal compression failure



(a)Sliding shear failure (d) Rocking failure

Fig.11:Failure modes of the short/squat shear wall



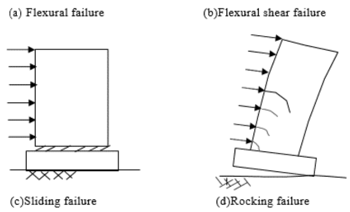


Fig.12:Failure modes of the short/squat shear wall

1.6.4 Sliding shear failure model

Sliding shear failure mode is caused primarily because of horizontal crack formation at the interface of wall and foundation. This mode of failure is responsible for significant degradation of stiffness and pinching of hysteresis loops. Sliding shear failure mode can be recognized by sliding of the wall along the construction joint at the base. The sliding shear failure for short/squat and slender shear walls are shown in Fig.12 (c)and Fig.12(c) respectively. Sliding shear failure is especially more common in wall shaving considerably low aspect ratio. The sliding shear failure can be minimized by providing diagonal reinforcement. Moreover, diagonal reinforcement contributes to the flexural strength and improves the energy dissipation capacity. However, in practice, the diagonal reinforcement is replaced with horizontal and vertical reinforcement due to practical difficulties. Though sliding is not generally a desired failure mode, but appears to have happened widely, particularly at poorly formed and compacted construction joints. Since the gravity load carrying capacity is not altered in a sliding shear failure, it is not inherently an unsafe mechanism. The sliding shear failure can be minimized by maintaining high axial load to lateral load ratio.

1.6.5 Rocking failure mode

Rocking has probably saved many walls that would otherwise have failed if theyHad rigid foundations. The rocking failure for short/squat shear wall and slender shear wall are depicted in Fig. 12 (d) and Fig. 12 (d) respectively. Although inherently a simple mechanism, rocking is dynamically complex but considered a very safe mechanism of failure.

1.6.6 Methods of Analysis of Shear Wall

In the early days, several conventional analytical methods were developed and adopted for the elastic analysis, specifically to shear wall. The popular conventional methods may be enumerated as (i) Continuous Connection Method, (ii) Transfer Matrix Method, (iii) Wide Column Analogy or frame analysis, (iv) Discrete Force Method, etc. Nevertheless, these methods involve assumptions of linear elasticity and cannot be programmed to handle complex problems, especially under severe earthquake ground motion. The Finite Element Method (FEM) has been the most versatile and successfully employed method of analysis to accurately predict the structural behavior of reinforced concrete shear walls in linear as well as in non-linear range under static and dynamic loading conditions. The analytical procedures of the shear wall maybe broadly categorized into(i)Linear Elastic Procedure, (ii)Linear Dynamic Procedure, (iii)Non-linear Static Procedure, and (iv)Non-linear Dynamic Procedure.

1.3 Problem statement

“EFFECTIVE POSITION OF SHEAR WALL FOR HIGHER RISE FOR TIME HISTORY ANALYSIS”

1.4Objectives of the study

The objectives of the study is as listed below,

- Investigation of dynamic behavior of high rise structure by response spectrum method as per IS 1893 Part1-2016
- Study of parameters such as diaphragm mass displacement, time period, base shear, mode shapes and modal mass participation ratios
- Study of parameters such as modal frequencies and acceleration in response spectrum load cases in both X and Y direction.

1.5 Scope of the study

In this project the modeling of multistoried building with plan irregularity will be done. In accordance with IS1893-2002 for simulation purpose finite element analysis Staad-Pro will be used, various studies on T-shape and L-shape Building with variation of height will be done.

II. STATE OF DEVELOPMENT

2.1 Arjun P et.al “Dynamic Analysis of RCC Framed Structure using different Shear Wall Locations”2020

The current work analyses and designs a 13-story RCC building with varying shear wall positions utilising IS: 456-2000 and ETABS software. For seismic analysis, the equivalent linear lateral force technique for zone-IV, soil type mediums as defined in IS 1893:2016, part-1, and response history analysis utilising Bhuj earthquake data are used. The three following parameters, including mode period, storey relocation, and base shear, are calculated and explained using the limit equilibrium lateral force technique, as well as the findings of the dynamic analysis. Proper placement of the punching shear results in increased lateral force resisting capability in RCC structures. These steel structures must be placed in strategic positions to enhance the stiffness of the structure and minimise dislocation due to earthquake. When designing a multi-story building, it is critical that the whole structure efficiently resists lateral stresses such as earthquakes as well as wind loads operating on it. These lateral loads are the primary cause of downward displacement and the formation of tensile pressures in structures. As a result, structures should have increased stiffness and strength to withstand lateral stresses. To achieve both of these, shear wall constructions were among the most structural support systems.

2.2 Shaik Akhil Ahamad et.al "Dynamic analysis of G + 20 multi storied building by using shear walls in various locations for different seismic zones by using Etabs"2020

The purpose of this work is to examine the use of shear walls at various positions across a G + 20 multi-story condominium property, as well as the nature of the construction exposed to earthquakes via the use of Static Analysis. The storey drift, shear forces, maximum permissible dislocation, and longitudinal irregularity of a multi-story structure with G + 20 are all evaluated. So this whole structure is analysed and modelled using a well-known FEM integrated programme called Etabs 2015 in all of India's seismic zones as defined by IS 1893 (Part-1) 2016. The equation of motion in this project is performed on type -III (i.e., soft soil) for an elastic shape in strategy in all the regions specified, and it is come to the conclusion that the configuration with retaining wall (i.e., Case C) placed concentrically will expect a high level of all seismic specifications when especially in comparison to the frameworks without retaining wall (i.e., Case A) and with framed structure around one end (i.e., Case B). Technical experts are primarily essential to determine how a structure behaves when exposed to forces applied, and appropriate stiffness is essential for high-rise structures to withstand horizontal forces generated by winds as well as disasters. To deal with horizontal forces, such as lateral stresses caused by earthquakes, and to increase rigidity to the superstructure, shear walls are incorporated to the inside of the proposed structure. Constructors are primarily concerned with identifying how a structure behaves when exposed to forces applied, and appropriate stiffness is essential for high-rise structures to withstand horizontally forces generated by winds as well as earthquake. To deal with forces applied, such as lateral stresses seismic activity, and to increase rigidity to the superstructure, steel structures are incorporated to the inside of the proposed framework.

2.3 Majd Armali Et.al "Effectiveness of friction dampers on the seismic behavior of high rise building VS shear wall system"2019

The purpose of this study is to explore the efficacy of employing dampers as a passively energy dissipation device and to provide some recommendations for optimising the quantity of dampers in a structure. Frictional dampers provide additional damping in combination with the proper stiffness, providing a unique and aesthetically pleasing option for controlling the seismic performance of tall buildings in high-risk locations. The novel aspect of this study is the in-depth seismic analysis of an unbalanced concrete members (RC) structure situated in a high-risk seismic zone utilising genuine earthquakes seismic activity. For a high rise structure, the dynamic performance of this energy dissipation structural approach is compared to the reaction of the traditional method (shear wall system). To achieve this goal, a nonlinear multimodal time history analysis is done utilising the El Centro earthquakes dataset for a 40-story reinforced concrete high-rise structure employing four distinct damper type forms. To demonstrate the response enhancement provided by damping, storey accelerations, deformations, base shear pressures, and storey drifts for the same structure are determined by the standard fixed base structure (shear wall system). The results indicate that a tower block may stay operable during a seism if the location and quantity of dampers are optimised. Population growth, particularly in third world nations, necessitates higher, more adaptable, and lighter structures. The majority of these nations have a higher danger of earthquake, necessitating tighter regulation over construction seismic behaviour. Several approaches, however, exist for minimising the force generated by an earthquakes shock.

2.4 N K Fasil et.al "The State of the Art on Seismic Isolation of Shear Wall Structure using Elastomeric Isolators"2018

Base isolation is a term that refers to the notion of introducing flexibility into the horizontal supports of a structure and ensuring that the duration of the construction is longer than the length of the earthquakes operating on it. The applicability of several types of rubberized boundary elements and their efficiency in reducing interstorey drifts or maximum acceleration of buildings is examined in this article. Additionally, the influence of retaining wall on isolated foundation structures is investigated. Prior to beginning, it is necessary to have a basic understanding of isolators and its many kinds. This is indeed a review essay that was written mainly part of something like the thesis work.

2.5 Arun Kumar Singh et.al "Highway Safety" 2017

The building of structures and highways is critical for every nation's progress. The highway economy accounts for a significant portion of the nation's economy, since transportation in India is mostly reliant on highways. When accidents occur on the roadway, there is a significant loss. Numerous items, such as milk, powdered milk, fruits, and vegetables, arrive at their destinations on a restricted or defined schedule. Caused by accidents, the roadway was gridlocked. Highway safety is crucial for occupational accidents and economic benefit. The primary objective of this research study is to examine road infrastructure and the methods employed to achieve it. Roadway safety is determined by a number of variables, including traffic volume, impetus to the development, collision factor, curves given on the route, and the highway's orientation. Highway safety is assessed using the statistical approach of analysis and use of GIS.

2.6 Swetha K S et.al "Effect of Openings in Shear Wall"2017

This research is conducted on a seven-story frameshear internal walls utilising elastoplastic analysis and the numerical simulation programme ETABS. The purpose of this research is to determine the time period, relocation, base shear, storey drift, and storey accelerate of a boundary elements with vertical, horizontally, and zigzag apertures and by adjusting the fraction of zigzag apertures. The comparison findings indicated that the timeframe, dislocation, base shear, storey drift, and storey accelerate, as well as the area surrounding the apertures, are all dependent on the opening configuration. Finally, it is recommended that the zigzag pattern of apertures in shear walls be used in practise, since it gives a performance advantage of 4% over alternative arrangements. Additionally, a configuration with a boundary elements and entryways tried to arrange in a zigzag pattern with an inlet and outlet less than 16.67 percent of the shear wall area performs approx 4% better in shear strength, storey deformation, time period, storey drift, and storey maximum speed than that of a configuration with only an having opened area bigger than 16.67 percent of the shear wall area. - Shear walls are often employed as a vertical unique structure in contemporary high-rise structures to counteract the lateral stresses caused by wind and earthquake. A type of construction may have several apertures to accommodate functional needs such as entryways, which may significantly alter the building's total seismic performance.

2.7 Chengqing Liu et.al"Shaking Table Test and Time-history Analysis of High-rise Diagrid Tube Structure"2017

The elastic results are depicted and shake table test findings agreed well, confirming the elastic moment analysis's validity. Using analysis and testing, the dynamic features and reactions of the model tower's acceleration, displacement, and strain under varying major earthquake action were determined. On the basis of similar law with shaking tabletop test results, the dynamic reactions of the model architecture were determined. According to research, the diagrid tube structure deforms slightly when subjected to seismic loading; the primary mode of vibration is translation, with little torsional effect; this same whiplash effect has a negligible influence on the development; and the girder member nations, diagrid nodes, and flexural rigidity at the bottom of the barrel are all weak points. The diagrid tube in smooth tube is a novel sort of positive building foundation systems that is progressively being used in top of buildings. Hangzhou West Towers is the first greater in China to include a diagrid tubular in tube construction. To investigate the building's earthquake resistance, an elastic moment analysis and vibrating table experiment were done.

2.8 Hezha Lutfalla Sadraddin et.al "Fragility assessment of high-rise reinforced concrete buildings considering the effects of shear wall contributions"2016

This article investigates the influence of shear wall designs on the seismic reactions of high-rise reinforced concrete structures using the fragility analysis approach. Four recent average RC structures with identical produce a significant and height but differing lateral load resisting infrastructure components were first planned using the normal code approach. To account for uncertainty in earthquake movements, sixteen actual ground motion combinations were reduced and then perpendicularly implemented to the four RC modeling techniques during the Creating Genuine Analysis (IDA). Fragility equations were then generated based on the IDA findings for the 3 limit states of little damage, substantial damage, & collapse to demonstrate the probable comparison of seismic reactions in both the x and y dimensions for the four structures. It was noted that usually, the addition of shear walls improves the seismic performance of structures at all limit states. Nonetheless, shear wall arrangement has a considerable influence on the seismic behaviour of lowering regular RC structures, and shear force walls are typically more successful at enhancing a building's seismic performance than exterior shear walls.

2.9 MD Afroz Patel et.al "A Study on Positioning of Different Shapes of Shear Walls in L Shaped Building Subjected to Seismic Forces" 2016

In this work, an L-shaped high-rise structure with various shear wall locations and forms is analysed. The ETABS programme is used to evaluate the highrise in order to identify different factors such as timeframe, base shear, storey drift, and storey relocation. The study's findings are given in diagrammatical fashion, and the effects of numerical characteristics are analyzed using different earthquake analysis techniques including ESA RSA and incremental dynamic analysis. A research was conducted to determine the optimal position and shape of retaining wall in an L-shaped high rise structure. Shear walls are structural elements that are used to reinforce RCC structures. It is critical to determine the most effective, efficient, and optimum position of shear walls. Shear walls become necessary for the inside of a structure when the external walls are unable to give additional strength and rigidity.

2.10 R.Resmi et.al "A REVIEW ON PERFORMANCE OF SHEAR WALL"2016

The purpose of this research is to examine the elements that influence the productivity of shear walls, such as their location, construction, and the alternative additional. This article gathers evaluations of shear wall seismic response. A shear wall seems to be a structural part that is used to resist lateral forces operating on a superstructure. Those sidewalls are particularly critical in seismically active areas, where shear stresses on the structure are increased by disasters. Structural systems have increased strength, flexibility, and resistance to in-plane stresses applied along their length. Structures with correctly built and detailed shear swalls have shown exceptional performance in previous earthquakes. Numerous research investigations on the designing of shear walls and their response to seismic loading have been done.

III.CONCLUSION

This chapter discussed briefly the literatures related to the topic, "Effective Position Of Shear Wall For Higher Rise For Time History Analysis: A Review". From the review papers studied, we can summarize that, A shear wall seems to be a structural component used to withstand lateral stresses on a superstructure. These sidewalls are especially important in seismically active locations, because catastrophes increase shear loads on the structure. The most effective, efficient, and optimal location of shear walls must be determined. A study was carried out to evaluate the best location and design of retaining walls in an L-shaped high-rise project. Shear walls are often employed as a vertical unique structure in contemporary high-rise structures to counteract the lateral stresses caused by wind and earthquake. A type of construction may have several apertures to accommodate functional needs such as entryways, which may significantly alter the building's total seismic performance. A configuration with an inlet and outlet less than 16.67 percent of the shear wall area performs approx 4% better in shear strength, storey deformation, time period, and storey maximum speed.

REFERENCES

[1] Hisamuzzaman, M., Saif, F. A., & Mia, M. S. (2020). MOST EFFICIENT LOCATION OF SHEAR WALL IN A BUILDING ACCORDING TO BNBC 2015. Icrice, 2–7.

[2] Akhil Ahamad, S., & Pratap, K. V. (2020). Dynamic analysis of G+20 multi storied building by using shear walls in various locations for different seismic zones by using Etabs. Materials Today: Proceedings, 43(xxxx), 1043–1048. https://doi.org/10.1016/j.matpr.2020.08.014

[3] P., A., & N., D. (2020). Dynamic Analysis of RCC Framed Structure using different Shear Wall Locations. Journal of Structural Technology, 5(3), 21–30. https://doi.org/10.46610/jost.2020.v05i03.004

[4] Armali, M., Damerji, H., Hallal, J., & Fakih, M. (2019). Effectiveness of friction dampers on the seismic behavior of high rise building VS shear wall system. Engineering Reports, 1(5), 1–14. https://doi.org/10.1002/eng2.12075

[5] Fasil, N., & Pillai, S. (2018). The State of the Art on Seismic Isolation of Shear Wall Structure using Elastomeric Isolators. Revista Internacional de Investigación de Ingeniería y Tecnología (IRJET), 5, 4–6.

[6] Ogbu, C. (2018). Journal of Civil Engineering and Environmental Sciences. Journal of Civil Engineering and Environmental Sciences, December 2013, 050–055. https://doi.org/10.17352/2455-488x.000028

[7] Liu, C., Ma, K., Wei, X., He, G., Shi, W., & Zhou, Y. (2017). Shaking table test and time-history analysis of high-rise diagrid tube structure. Periodica Polytechnica Civil Engineering, 61(2), 300–312. https://doi.org/10.3311/PPci.9243Journal, I. (n.d.). Effect of Openings in Shear Wall.

[8] Md Afroz Patel, & Prof. Shaik Abdulla. (2016). A Study on Positioning of Different Shapes of Shear Walls in L Shaped Building Subjected to Seismic Forces. International Journal of Engineering Research And, V5(07), 480–487. https://doi.org/10.17577/ijertv5is070460

[9] Chouhan, M., & Makode, R. K. (2016). Dynamic Analysis of Multi-Storeyed Frame-Shear Wall Building Considering SSI Maikesh Chouhan *, Ravi Kumar Makode **. 6(8), 31–35.

[10] Serafinska, Özenç, G. and K. (2016). I. introduction ii. review of literature 2.1. I.f