SHEAR WALL EFFECTS ON BUILDINGS IN SEISMIC ZONE- 2 AS PER (BNBC 2020)

A Project and Thesis submitted in incomplete satisfaction of the prerequisites for the honor of Degree of Bachelor of Science in Civil Engineering

by

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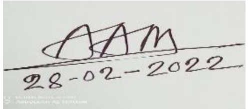
Certification

This is to guarantee that the accompanying understudies chipped away at the undertaking and proposition "Shear wall effects on buildings in the seismic zone- 2 as per BNBC 2020 (BNBC 2020) utilizing ETABS" under my immediate oversight in the research centers of the Department of Civil Engineering, Faculty of Engineering, Daffodil International University, in fulfillment satisfaction of the necessities for the 4-year education in science in structural science certification. On the first of March 2022, the work was shown.

Signature of the candidates



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The task and theory named "Shear wall effects on buildings in the seismic zone- 2 as per (BNBC 2020) using ETABS" was put together by Abdullah Al Mamun, ID No: 182-47-769. Meeting: summer 2018 has been acknowledged as good in halfway satisfaction of the necessities for the level of Bachelor of Science in Civil Engineering on March 2022.

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f_c'	Compressive strength of concrete
f_y	Yield strength of steel
E_s	Modulus of Elasticity
ε_y	Strain
SW	Shear wall
FF	Floor finish
DX	Dead load
DY	Live load

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Above all else, I offer my thanks to Allah, otherwise called God. Then, at that point, I'd need to utilize this opportunity to thank our exploration and thesis supervisor. Md. Mehedi Hassan Bhuiyan, Lecturer of the Department of Civil Engineering for your enduring obligation to help, inspire and drive us all through this undertaking. Without his supportive ideas and help, my postulation would be difficult to finish. Much obliged to you additionally for giving us to choose this proposal theme.

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ABSTRACT

The RCC structural building in this study is a rectangular form with a plan area of 768 m^2 and a floor-to-floor height of 3 meters. The objective of this study is Shear wall effects on buildings in seismic zone-2 as per BNBC 2020. The analysis is the process of evaluating a structure's response under various load combinations. The method of identifying the structure's requirements is known as design. After analysis of several gravity loads to design a rectangular shape building, including a LL a FF and a PW value used according to BNBC 2020 (BNBC 2020) regulation. In Seismic Zone 2, earthquake loads have also been applied from the foundation to the top or roof of the building. After making seven case studies by changing different shapes of a shear wall to check deflection under the limit according to BNBC 2020 (BNBC 2020). After that case, SW7 which is a Shear wall dimension and square column size of 1500mm was suitable because of the minimum displacement of this case. It's been discovered that column size is important in this study, but shear wall shape and dimension have an impact.

CHAPTER 1

INTRODUCTION

1.1 General

The number of high-rise buildings both for residential and commercial reasons has increased dramatically in recent years (By 2002). Shear wall structures are now widely recognized as a sensible and cost-effective addition to multistory buildings. Walls around elevators, staircases, and utility shafts provide good lateral as well as gravity load resistance. Torsion, bending moment, and shear forces in all directions are effectively resisted by closed and partially closed section shear walls, especially when appropriate stiffness and strength are supplied around door apertures and some other penetrations through all these core walls.

The exceptionally high in-plane solidness and strength make the shear divider appropriate for supporting tall structures. A structure with arrows pointing at the edges of each level or roof to depict wind or seismic force. The horizontal surface functions as deep beams to transfer loads to vertically resisting parts A and B. These shear walls, in turn, serve as cantilever beams, carrying weights down to the foundations. They have to deal with a lot of things.

1) A variable shear that peaks at the base,

2) A bending moment that causes vertical tension near its loaded edge and compression at the far edge.

3) Vertical compression is caused by regular gravity loading from the structure.

If shear walls and frames are used in medium to low buildings, it is acceptable to assume that the shear walls will attract all lateral loads, allowing the frame to be designed solely for gravity loads. In shear wall systems, it is very crucial to try to plan the wall layout so that gravity load stresses reduce lateral load tensile stresses. They can design with the bare minimum of reinforcement as a result of this. Shear wall systems have been found that perform well in earthquakes, therefore ductility becomes a key design concern. Unlike rigid frames, the solid structure of shear walls tends to limit planning where open internal space is required. However, they are well adapted to hotels and residential structures, where the floor-by-floor repetitious planning permits the walls to be vertically continuous and act as superb acoustic and fire insulators between rooms and flats. In a tall building, proper and effective usage of shear walls has resulted in its optimal use for forwarding as well as wind bracing. However, structural engineers must place shear walls in such a way that they will have the least impact on the structures' function and appearance.

1.2 BEHAVIOR OF SHEAR WALL SUBJECTED TO LATERAL LOAD

To offer sufficient stiffness overall directions against laterally stresses, particular considerations must be made when designing tall buildings. Wind, earthquakes, and possibly even bomb effects can cause lateral loads. While subjected to lateral stresses, the shear wall's flexural behavior takes precedence, and shear effects are minimal. The rigid frame action of the shear walls resists lateral loads, the floor slabs acting like girders & shear walls acting like columns. Aside from stress issues, vibrations & lateral sway of a building must be taken into account to maintain occupant comfort. Buildings' function and appearance will suffer as a result.

1.3 Background of the study

The ascent in the number of tall structures in Bangladesh, as well as the presentation of new and changed sorts of development, has required a careful comprehension of the framework conduct of perplexing shear-type structures. The admiration of the circumstance is the underlying advance in the examination. The change of a two-layered structure into the three-layered collection with comprises of sections radiates is finished. A basic strategy, but exceptional consideration should be utilized while demonstrating shear dividers and lifting your center.

Much study and development of techniques for modeling shear walls have been done at universities but by practicing engineers over the last four decades. Continuous medium technique, broad column method, equivalent comparable frame method, two-column analogies method, single warping-column modeling method, membranes finite element method, and other methods of analysis have been established so far. For structural analysis, several commercial computers programs have been developed. The continuous medium approach and the wide column method, in particular, are employed for coupled shear walls. The stresses obtained from a shear wall study using an equivalent frame have been demonstrated to be comparable to those obtained from a finite element analysis using a mesh of similar size. This system is like that of stresses are delivered by changing over the edge powers. For PC investigation of a different center oppressed stacking or a center which is essential for and collaborates evenly with a bigger encompassing construction, a genuinely basic two-section model is used. The diversions and stresses of two-segment relationship models were viewed as inside 10% and 20% of those of more point by point and exact shell component models, separately. To communicate each of a center's types of conduct, a segment model was planned with an additional seventh degree of adaptability per hub to demonstrate distorting. That seventh level of opportunity, nonetheless, is excluded from the bundle program. The most reliable outcomes are gotten utilizing the layers limited component strategy. It creates a decent result and is appropriate for research, however it is badly arranged for reasonable designers. Programming like Fem package then again is easy to utilize, saves time, and is promptly accessible. Subsequently, the demonstrating systems for the shear divider and lift center utilizing the projects open in Bangladesh are examined.

1.4 Objective of this study

Different attire shear wall effect on an 8267 square foot industrial building in zone 2 as per BNBC 2020 (BNBC 2020).

1.5 Outline of Thesis

In chapter 1: Basic idea of a Shear wall, objectives of the study, the background of the study.

In chapter 2: The following segment specifies what has been done previously and what sort of work has been utilized in the shear wall,

In chapter 3: What I have made modeling and determined the necessary information for the investigation.

In chapter 4: we analyzed and how we accomplished & Evaluation results/analysis. The results such as Max Story displacement and deflections.

Chapter 5: This part contains significant research of the recommendations and proposal for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A composing study sums up what has been expounded on a specific point by equipped scholastics and subject matter experts. It's normal to be drawn closer for follow-up as a different undertaking, even though it's more normal for an article, to concentrate on a report, or proposition. The creator's motivation in building an inventive review is to pass on in the persona of themselves per client whether information furthermore speculations have as of now been placed out regarding a matter, as well as their resources and defects. As proposed by a particular subject, composing reviews helps the understudies. Composed surveys can fill in as a beginning stage if you just have a restricted measure of time, as expressed by lead research. Composing surveys gives a comparative advantage.

2.2 Overview

The writer should address what they have advanced up to this point from exploring books and what they have realized later on. The per-user should be persuaded in the wake of perusing this section that the creator's arranged examination will assume a fundamental part in encouraging that discipline.

2.3 Shear Wall

A shear divider is an upward component of a primary framework that is intended to oppose in-plane horizontal powers, like a breeze and seismic burdens. Shear divider configuration is administered in numerous wards by BNBC 2020 (BNBC 2020) Code and the International Residential Code. Here is the detailed 3D skeleton view of Shear Wall in figure 2-1 below -

Type of shear wall-

A) RCC shear wall
B) Concrete shear wall

C) Composite steel shear wall

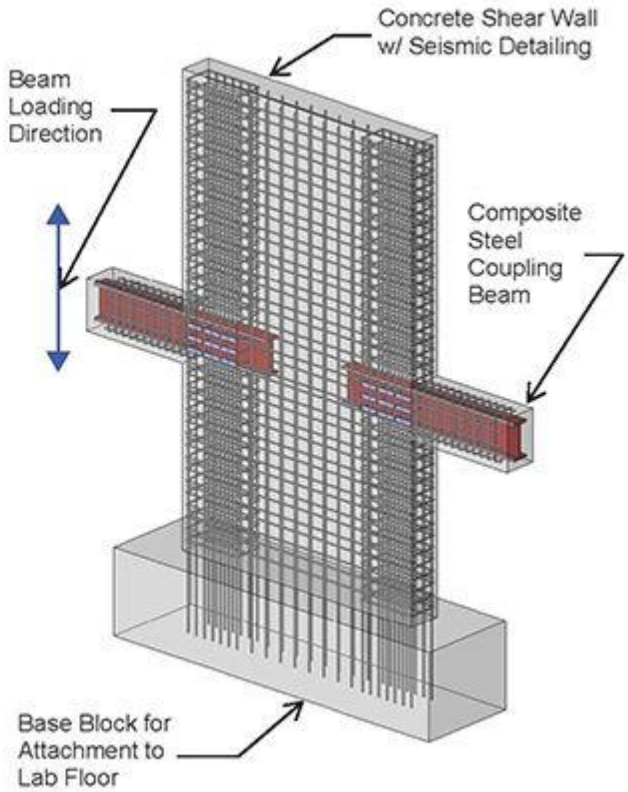

Figure 2-1: Detail 3D skeleton view of Shear Wall

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2.4 Literature review

The papers beneath were distributed throughout the past couple of years by an assortment of different creators.

(Bell and Elms 1972) There is a proposal for a constitutive model for forecasting the cyclic responses of reinforced concrete structures. The model uses a smeared crack technique with perpendicular permanent cracks and a plane stress assumption. The model's predictions are first compared to existing experimental evidence on shear walls that have been subjected to monotonic and cyclic loads. The same model is then applied to the fem analysis of a complete shear retaining wall that was tested at Spec's Truly outstanding Engineering Laboratory under a significant number of different loading reversals caused by seismic loading. A double and a three-dimensional model of the test sample were both used in the finite element analysis. The concrete model's capacity to reproduce the most crucial features.

(Shinozuka, Yun, and Seya 1990) This research looks at two different aspects of wind engineering, both of which are stochastic. Methods for digitally creating sample function of a wind speeds field are the first topic. The proper application of the time & space domain study of wind-induced structural reaction requires this type of digital production of sample functions. This is especially relevant when considering Carlo solutions to the issues that aren't accessible to frequency or wavenumbers domain analysis. The second topic is the dependability study of building structures subjected to multiple natural hazards within the context of current probabilistic risk assessment processes.

(Kunnath et al. 1991) The seismic response of various types of built-up substantial buildings has been seen to be influenced by the in-plane flexibility of floor-chunk frameworks. The assumption of bendable floor stomachs is widely used to work on developing tests that do not have important errors in seismic reaction prediction by and large constructions. Nonetheless, the impact of gut adaptability on specific types of structures, such as lengthy structures as well as structures with even or vertical balances, cannot be overlooked. Furthermore, if the floor component boards break or give as a result of articulated in-plane cuts, the seismic response of the entire structure framework may be altered. In the seismic study of RC Structures, this paper proposes a reorganized macro modeling plan to concentrate the impact of inelastic floor adaptability.

(Wallace 1994) The interest for cross-over support at the edges of RC underlying dividers with square shape, T-molded, and the free weight formed cross-area is resolved to utilize an insightful methodology. The power and example of divider strain are determined by contrasting the projected uprooting prerequisites on the primary frameworks to the reproduction mode put on the divider cross-areas. The proportion of divider cross-sectional region to floor space, the divider region proportion and course of action, the divider pivotal burden, and the workmanship proportions are recognized to be the key factors deciding the divider strain dissemination. The required cross-over steel for substantial restriction and the length of the divider cross-areas requiring substantial constringent are determined utilizing the processed divider strain circulation.

(Brencich, Gambarotta, and Lagomarsino 1998) An approach for the tri simplified analysis of buildings is proposed, based on a two-node macro element, and developed to account for the overturning, damage, or frictional shear mechanisms observed experimentally in masonry panels. Combining shear walls and flexible floor diaphragms yields the total performance of structures to horizontal forces imposed on vertical loads. The former is built up of macro components that represent piers and mandrels, as well as stiff elements that represent undamaged areas of the walls, whose displacements regulate the shear wall's kinematics. Following the imposition of restrictions resulting from the shear walls' connections to one another and the floor diaphragms, a simplified non-linear problem is constructed and solved using an algorithm.

(Tezcan and Alhan 2001) A model-type building was chosen to analyze the influence of torsion on the shear and bending values of vertically structural members. By relocating the shear walls, torsional variation has been established in the structure. Three cases with varied stiffness centers for 1, 5, & 10-story structures were studied. Each instance was examined using both equivalent seismic loading and analysis and design methodologies, and the findings were compared. A 5-story building with one nonorthogonal & two orthogonal shear walls was analyzed to examine the effect of non-directionality on the distributions of moment and shears of the vertically structural elements. The non-orthogonal walls have been considered in three different orientations.

(Wen, Hu, and Chau 2002) The overall experience has shown that structural damage caused by seismic earthquakes is highly dependent on the site condition and focal point distance. In this research, the 21-story shear divider building built in Hong Kong in the 1960s is used to illustrate these two implications. The delicacy harm probability framework of such a building is analyzed as far as the pliability element, which is calculated from the percentage of story yields shear to between the story seismic shear, for various plan quake powers and site conditions. A higher risk of harm is obtained for a gentler site condition for elevated structures, and harm is more severe for far-field earthquakes than for near to handle quakes

(Zhao and Astaneh-Asl 2007) In tall structures, the shear divider framework is one of the most commonly used sidelong burden opposing frameworks. The investigative and insightful analyses of composite shear divider structures are the focus of this study, which includes an outline and discussion of the findings. In addition, the study investigates the incorporation of dazzling structures innovation into the design of these frameworks. A steel limitation outlines, as well as a structural steel shear divider with such a supported considerable divider, joined aside to make up the composites shear divider framework. The steel shear divider is bolted to the supporting substantial divider and bonded to the limit outline.

(Www and Chandiwala 2008) According to previous seismic tremor records, there has been an increase in the desire for quake opposing structures, which can be met by incorporating shear divider frameworks into the design structures. To achieve economy in supported concrete, building structures, the fundamental section layout has been meticulously completed to obtain reasonable substantial sizes and optimum steel Individuals' usage The analyst, in the current paper had tried to make the second occur at a specific point. By taking various parallel burdens, the seismic burden may be counted. Underlying frameworks that are opposed, varying the number of floors, and varied shear divider locations in seismic zone II Bangladesh were discovered.

(Mohan 2011) The dynamic character of the heap should be considered in any seismic tremor mitigation strategy. In any case, for fundamental conventional structures, the use of the same straight static approaches is frequently sufficient. Many codes of training allow this for standard, low-to medium-ascent structures, and it begins with a gauge of pinnacle seismic load defined as a capacity of the code's borders. The identical static study can thus be useful for low to moderate structures with few coupled longitudinal torsional modes, where only the primary mode toward each direction matters. Large buildings, where second and higher modes can be prominent, or structures having torsional impacts, are less suitable for the technique and necessitate more complex strategies to be used in these circumstances.

(Chandurkar and Pajgade 2013) RC structural walls, also known as shear walls, are key earthquake resisting elements in building seismic design. Structural walls are an efficient bracing technique with a lot of lateral load resistance capability. Because the seismic reaction of such seismic shear walls dominates the response of buildings, it is critical to assess a seismic response of walls adequately. The major goal of this research is to find a solution to shear wall placement in multi-story buildings. Four separate models were used to investigate the effectiveness of shear walls. The first model is a bare-frame structural system, whereas the other three are dual-type structural systems. A ten-story structure in the zone I, zone II, zone III, or zone IV is subjected to an earthquake load. In both scenarios, when a column is replaced with a shear wall, parameters such as lateral displacement, story drift, and total ground-floor cost are calculated.

(LovaRaju and Balaji 2015) This work is about non-linear frame analysis for various shear wall placements in such a building frame. The goal of this research is to find the best position for a shear wall in a multi-story building. The first model is a bare-frame structural system, whereas the other three are dual-type structural systems. According to BNBC, an earthquake load was applied to an eight-story building located in zones II, III, and IV. ETABS software was used to conduct the analysis. For several models, pushover contours have been constructed and compared. In the case of displacement or base shear, structures with shear walls at appropriate locations are more significant.

(Titiksh 2017) Even though the shear walls were reduced to twice the height of an original structure, the models displaced satisfactory performance in terms of drift and displacements. Story drift rose by nearly 40%, floor displacement increased by 15%, story forces towards the bottom floors fell by almost 25%, and stiffness decreased by almost 90% at the Applications Impact of Curtailment of Framed Structure for Moderate Rise Structures degree of curtailment. The procedure for calculating the best shear wall curtailment level. Their findings backed up our initial premise that reducing shear walls at intermediate levels will show to be a beneficial design method for medium and high-rise structures, rather than being negative.

(Munde and Meshram 2018) In high-rise buildings, shear wall systems are one of the most commonly employed lateral load resisting techniques. Shear walls are used in construction to resist lateral loads and support the weight of the building. RCC shear walls have high in-plane stiffness, allowing them to resist huge horizontal masses while also supporting gravity masses, making them useful in a variety of structural engineering applications. There is a variety of literature to choose from when it comes to style. However, there isn't much in the literature about the decision to locate a shear enclose the multi-story building. The location of the shear wall has an impact on the building's overall performance. It's critical to place shear enclose a proper area for a building's effective and economical functioning.

(Mariyam and Jamle 2019) After reviewing papers related to slabs that this is designed for multistory buildings to eliminate the projection of beams and provide the shear wall to provide the stiffness to a building upon learning the research paper has different themes as well as reviewing the articles relating to a slab that it will be designed for multistory buildings to eliminate the forecast of beams, supplying the shear wall to provide the stiffness to a building upon learning this research paper has different themes & evaluating the articles relating to the flat slab that it is So, in this study, the slabs shear wall interaction during wind loading has been recognized with both the aid of this paper evaluated, to suggest technical work for the worst wind effects.

(Ahamad, Pal, and Choudhary 2020) This paper discusses how to use an analytical method and the STAAD-pro program to determine the ideal site for a porch. It also covers the consequences of multistory structures' seismic and non-seismic behavior. The paper's main goal is to examine how seismic waves affect skyscrapers and multistory buildings. Non-seismic areas are also included in the investigation.

(Khan and Jamle 2020) The writing study was conducted by assessing and studying information targets from various test papers. It has already been established that a legitimate investigation should be conducted before moving forward in any theme to uncover the ebb & flow research done. The most recent thing has also been obtained in the double design structures. As a result, it's critical to increase the stiffness in key regions of the structure to create a stronger one that can withstand something similar to horizontal stacking.

(Patidar and Jamle 2020) In today's world, the primary focus is on using a double system in a multistory structure to lessen the lateral loads pressing on it. In the current trend, the research topic of reducing lateral stress is becoming more and more popular. As a result of this upward trend, safe high-rise structures emerge. To contribute, the current study depicts a survey of work on shear wall utilization in dual structures according to Indian Standards. This study focuses on a comparative concerning the research trend here on a current topic, and after the survey, thorough results are presented in conclusions, which serve as the study's objectives.

(Reshma et al. 2021) Earthquakes cause tremendous damage to the earth's surface, which results in calamity. An earthquake is less damaging to a framed structure. The shear wall, which efficiently resists horizontal shear in such types of constructions, is critical. The shear wall is made up of flexural components that provide enough rigidity to the structure to successfully resist displacement. The behavior of structures with shear walls in various locations under various seismic zones is investigated in this study, both longitudinally and transversely. A dynamic response spectral analysis is carried out utilizing the design program ETABS and the BNBC (BNBC 2020) code. Base shear, period, drift ratio, and displacement are all investigated for a 20-story RCC building. To conduct a comparison analysis, it is necessary to take into account a variety of factors.

(Mahmoud and Salman 2021) The created models in ETABS, as well as the design spectra of a selected zone, are used to undertake dynamic analysis. As for performance metrics, story displacements, drift, shear, and moments of both conventional & ductile building models are examined and compared for several design modifications. Furthermore, the highest and lowest building models are subjected to pushover analyses. In terms of the weight of reinforcement bars, the cost estimates of ductile & conventional walls are analyzed and compared. Furthermore, sensitivity analysis is carried out due to the difficulty of the installations of ductile shear walls. When compared to ductile construction, conventional design significantly increases both induced seismic reactions and expense.

2.5 Summary

A column is "used largely to support axial compression loads," according to the legal standards, whereas a wall is "used to enclose nor separate spaces." Different forms of shear walls are utilized in construction, however not all reinforced walls are shear walls. The primary function of a base shear would be to resist lateral forces caused by earthquakes or wind. Planar shear walls, linked shear walls are the three main types of shear walls. The behavior of such a wall is determined by the building's overall structural system, as well as the wall's shape and plan position. Shear wall failure mechanisms are also affected by the wall's shape, size, and height.

CHAPTER 3

MODELING AND ANALYSIS

3.1 Introduction

Configuration is the most common way of deciding the design's details. The assessment and plan of construction by hand would consume most of the day. Any construction review and plan can be finished quickly with the assistance of programming. The fundamental objective of this venture is to dissect and plan a business structure with different shear divider arrangements, for example, a traditional shear divider, a level piece with drop boards, a different state of a shear divider, and a structure with a load-bearing divider. A business building is one that utilizations no less than half of its floor space for business purposes. ETABS programming (ETABS - Documentation - Computers and Structures, Inc. - Technical Knowledge Base, n.d.) was utilized to inspect the impacts of seismic and wind pressures on structures with different shear dividers. Making with an ordinary divider is one that is upheld by standard bars and segments and pieces. The heap ventures out from the chunk to the sections and shear divider the segments to the pillars, and the shafts to the establishment

3.2 Building with Shear Wall

In this RCC underlying structure, the structure has a Rectangular-shape and is 32m x 24m in arrangement, with sections divided at 4m from one focus to another. The aspect building is addressed in the going with a figure, with a floor-floor stature of 3m. In this building I make different types of shear walls here is the figure-3-1 & 3-2 below-

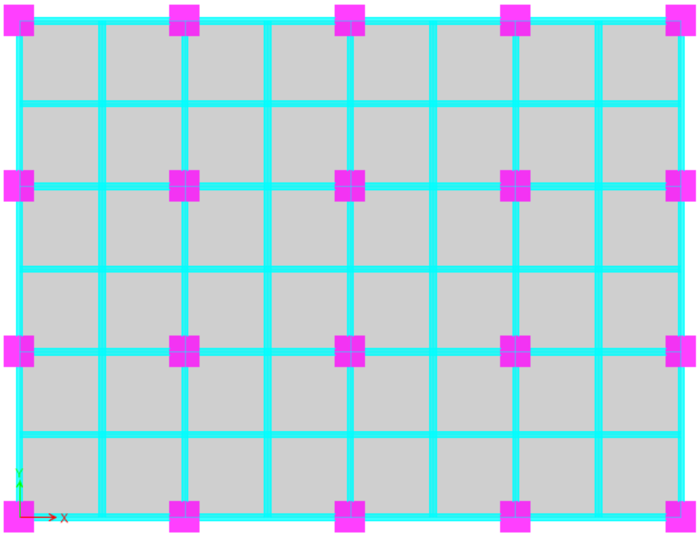

Figure 3-1 2D plan of 8^{th} story rectangular shape building

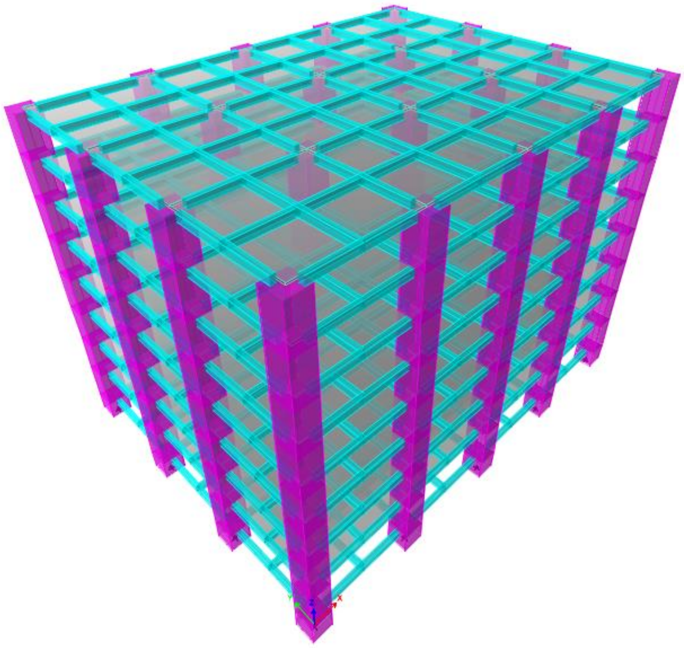

Figure 3-2 3D plan of 8th story rectangular shape building

3.3 Computer Software Used

All of the design demonstration and examination was finished with the assistance of ETABS (ETABS - Documentation - Computers and Structures, Inc. - Technical Knowledge Base, n.d.).

The displaying was done in three aspects, with straight versatile examination examples. A graph from data analysis was also generated using Microsoft Excel (Excel 2021 - Microsoft Lifecycle | Microsoft Docs, n.d.).

3.4 Code Followed

For design by using ETABS (ETABS - Documentation - Computers and Structures, Inc. - Technical Knowledge Base, n.d.) for design I used ACI318- 08 (ACI:318 2019) and for Wind load and Earthquake I used AISC7-10, (ASCE/SEI 7-10 2013) or (BNBC 2020) Design Integrity Blog, n.d.) code must be followed because ETABS software so followed code such as – AISC7-10 (ASCE/SEI 7-10 2013).

3.5 Materials Specifications

Material Specifications alludes to the material's depiction, which incorporates prerequisites, Resilience, the period of usability, details, providers, and security data. Material specifications are shown on table 3-1 below-

Table 3-1 Material Specifications

Material	**Specifications**
Grade of Concrete	Fc = 4000psi
SW thickness	Ft = 50mm
Grade of Steel	Fey= 415N/mm^2
Density of Concrete	Dc= 25kn/m^3
Web thickness	Wt.=50mm

3.6 The Building's Gravity Loads

Gravity loads incorporate "dead," or extremely durable, loads, which are the heaviness of a construction's divider floor tiles, surfaces, and mechanical frameworks, as well as "live," or transient, loads, which are the heap of a design's substance and individuals, including the heaviness of snow.

According to BNBC 2020 (BNBC 2020) or modern construction Specifies the base plan powers include dead load and live load and Earthquake load on the structure. In table 3-2 here is the parameters and loads are shown below-

Table 3-2 Loads on Building

Parameters	Loads
LL	4.8 KN/m^2
FF	1.2 KN/m^2
PW	33% LL

Table 3-2 shows that in an advanced design, we utilize a LL of 4.8KN/m on each floor beside the housetop, which uses a LL of 2.9KN/m. In our construction, we used FF 1.2KN/m2 and used floor finish PW (20-25) psf. According to BNBC 2020 (BNBC 2020). we can use alternatively 34 percent of a LL or a minimal of 1.2 KN/m for part walls, however, we utilized the minimum value of 1.2 KN/m2, which we changed to 3.584 KN/m2 after our analysis.

3.7 Wind Load

Wind load is the "load" imposed on a structure by airspeed and air density. Suction pressure is created when low-pressure zones emerge here on building as a consequence of elevated winds. Some are so strong that they can even lift the roof corner off a house. On table 3-3 wind information for investigation are shown below.

Table 3-3 Wind information for investigation

Boundary	Esteem
Air speed (m/hr.)	147
Transparency type	B
Importance factor	1
Floor range	GB to Top floor

In table 3-3 portrays that the Wind load as we probably are aware Wind loads still up in the air by the breeze speed and the shape (and surface) of the structure, which makes them challenging to expect. Any finished or under-tension impacts might be exacerbated by the structure. For My Rectangular shape building I utilized the breeze speed 147 mph as Dhaka city. Our openness type is B. significance factor 1

3.8 Seismic tremor Loads

Seismic load, which speaks to the transmission of a seismically agitation to a structure, is one of the essential notions in earthquake engineering. It can happen at a structure's ground contact surfaces, adjoining structures, or via gravity waves from a tsunami. I used zone-2 here is the seismic data for zone-2 are shown in table 3-4 below-

Table 3-4 Seismic data for seismic zone 2

Boundary	Esteem
Seismic zone	Zone 2
Zone factor	0.15
Type of soil	R_1
Site coefficients, Sc	2.7
Site Coefficient Sa	1.35
Signification factor	1
Mathematical coefficient factor, RE	8
Ct	0.016,0.9

3.9 Design Load Combination

According to BNBC 2020 (BNBC 2020) "statement 2.7.3 presumptions" for "Blends of Load impacts for Strength Design Method" are followed, and according to condition 2.7.3.1 the heap mixes are accounted, i.e.

Load Combination

1.4M1

1.2M1+1.6M2

1.2M1+M2

1.2M1+0.8AM1

1.2M1-0.8AM1

1.2M1+0.8AM2

1.2M1-0.8AM2

1.2M1+1.6AO1+M2

1.2M1-1.6AO1+M2

1.2M1+1.62AO+M2

1.2M1-1.6AO2+M2

1.2M1+AM1

1.2M1-AM1

1.2M1+AM2

1.2M1-AM2

0.9M1+1.6AO2

0.9M1-1.6AO1

0.9M11+1.6AO2

0.9M1-1.6AO2

0.9M1+AM1

0.9M1-AM1

0.9M1+AM2

0.9M1-AM2

3.10 Work process Step

The work process step summarizes what I did throughout the entire project.

Step 1: I choose a rectangular form building as my plan, and then we followed the design code, which is BNBC2020 (BNBC 2020).

Step 2: I created material properties such as beams, columns, slab sections and of the shear wall.

Step 3: I introduced several types of loads, analyzed them, and then we presented our findings in Chapter 4.

3.11 Summary:

In this section, we took a building at the essentials of demonstrating and examination of structures with shear dividers, as well as the plan and investigation programming that was utilized. The code was followed. Displaying of the structure, portrayal Various kinds of burdens that are forced on structures and constructions process of work.

CHAPTER 4

RESULT AND DISCUSIONS

4.1 Introduction

In this part, I will introduce our discoveries, which depend on the review and investigation of the rectangular shape of building. As per the investigation of the multi-story business fabricating, the story disturbing second changes in direct extent to story tallness. Besides, the practices of rectangular shape structures to the imploding seismic zone 2 is almost indistinguishable. The worth of story float migration expanded with story rise until the eight story, when it arrived at its pinnacle, and afterward started to break down. Mode structures are found by careful examination, and conceivable it'll be found that lopsided plans destroy more than even structures.

4.2 The Story Displacement due to Earthquake and Wind load

Maximum surface displacement with wind and earthquake load in seismic zone-2 in BNBC 2020 (BNBC 2020). This is a G+8th story commercial building, so I can use different shape of shear wall in different position 1500X1500 mm column size, shear wall 250 mm, slab thickness 125 mm, beam shape 500x300 mm, flange thickness 50 mm, and various seismic co-efficient values in zone 2 according to BNBC 2020 (BNBC 2020) I tracked down the different location of shear wall in my rectangular shape of commercial buildind and show the seismic and wind load tremor displacement , I made 7 different case which are shown in figures 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7 below as a case SW 1, 2, 3, 4, 5, 6 & 7.

CASE SW1- Fig 4-1 Shows Rectangular building model without shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-8 & 4-9

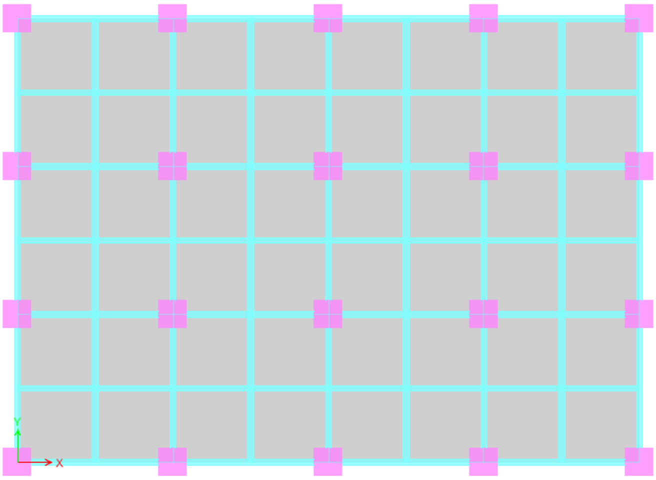

Figure 4-1 2D plan of 8th story rectangular shape building case SW1

Case SW2 -Figure 4-2 shows rectangular building model with shear wall in each four corner-with in L shape X direction 4m, and 8m for Y-direction shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-10 & 4-11

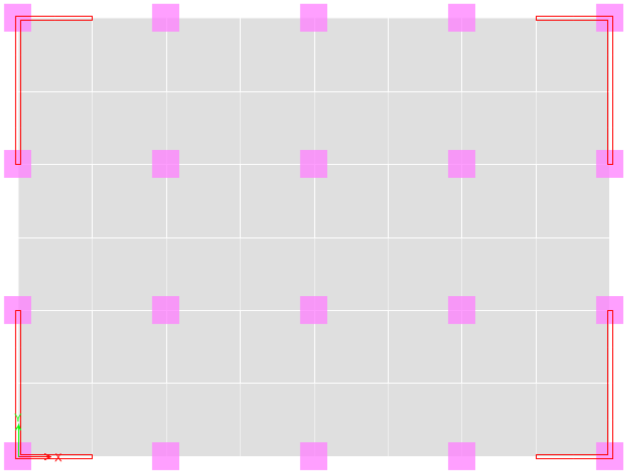

Figure 4-2 2D plan of 8th story rectangular shape building case SW2

Case SW3 -Figure 4-3 shows rectangular building model with shear wall in each four corner X direction 4m, and 4m for Y-direction shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-12 & 4-13

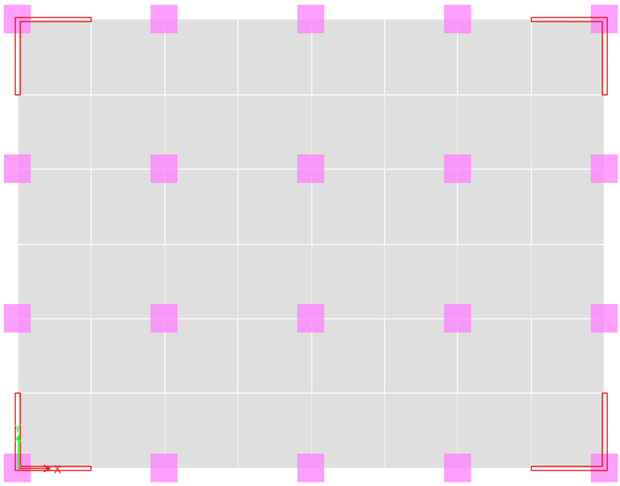

Figure 4-3 2D plan of 8th story rectangular shape building case SW3

Case SW4 -Figure 4-4 shows rectangular building model with shear wall in three corner side X-direction 4m, and 4m for Y-direction shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-14 & 4-15

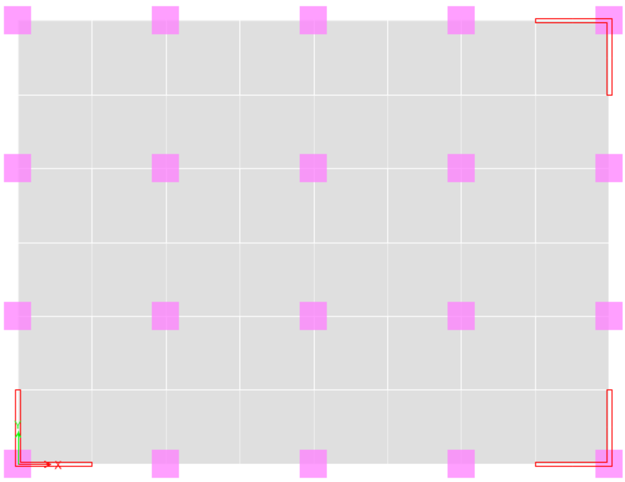

Figure 4-4 2D plan of 8th story rectangular shape building case SW4

Case SW5 -Figure 4-5 shows rectangular building model with shear wall in two corner side X direction 4m, and 4m for Y-direction shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-16 & 4-17

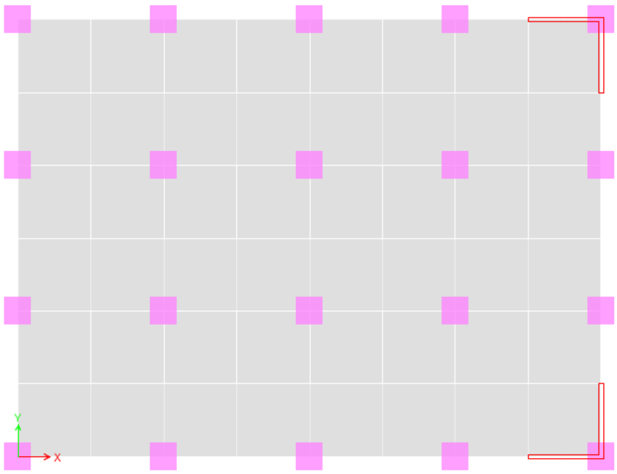

Figure 4-5 2D plan of 8th story rectangular shape building case SW5

Case SW6-Figure 4-6 shows rectangular building model with shear wall in one corner side X direction 4m, and 4m for Y-direction. Shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-18 & 4-19

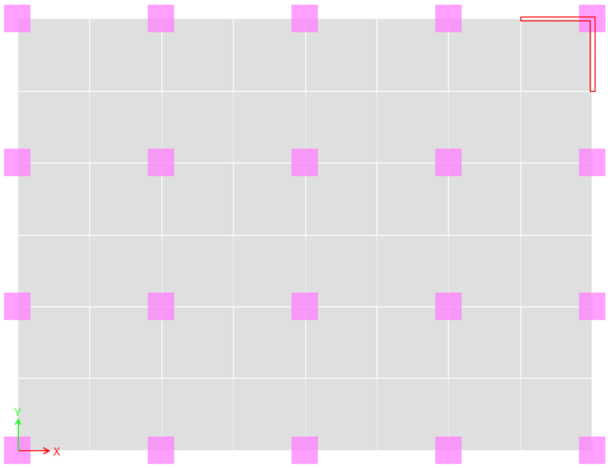

Figure 4-6 2D plan of 8th story rectangular shape building case SW6

Case SW7 -Figure 4-7 shows rectangular building model with shear wall in four corner side X direction 8m, and 8m for Y-direction shear wall then after this case was analyzed in ETABS in Seismic zone 2 as per BNBC (BNBC 2020), the result and reactions of wind load and earthquake were presented in figure 4-20 & 4-21.

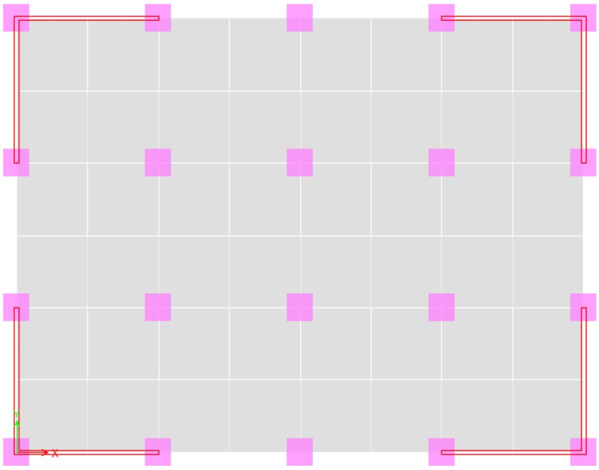

Figure 4-7 2D plan of 8th story rectangular shape building case SW7

For case SW1 earthquake and wind load displacement on the building model in both directions (x and y directions). figure 4-8 and 4-9 show as below-

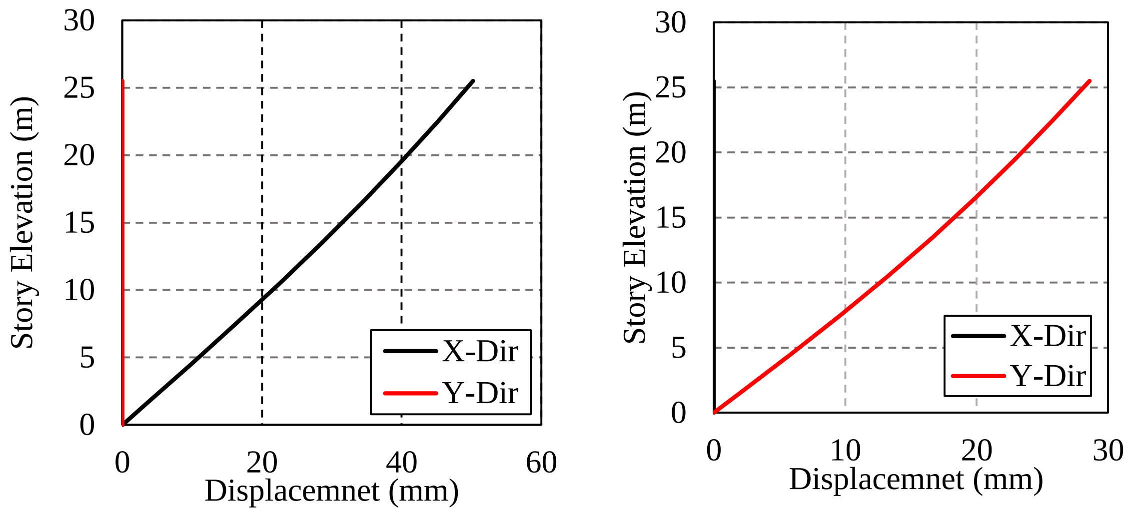

Figure 4-8 Earthquake load displacement for case SW1

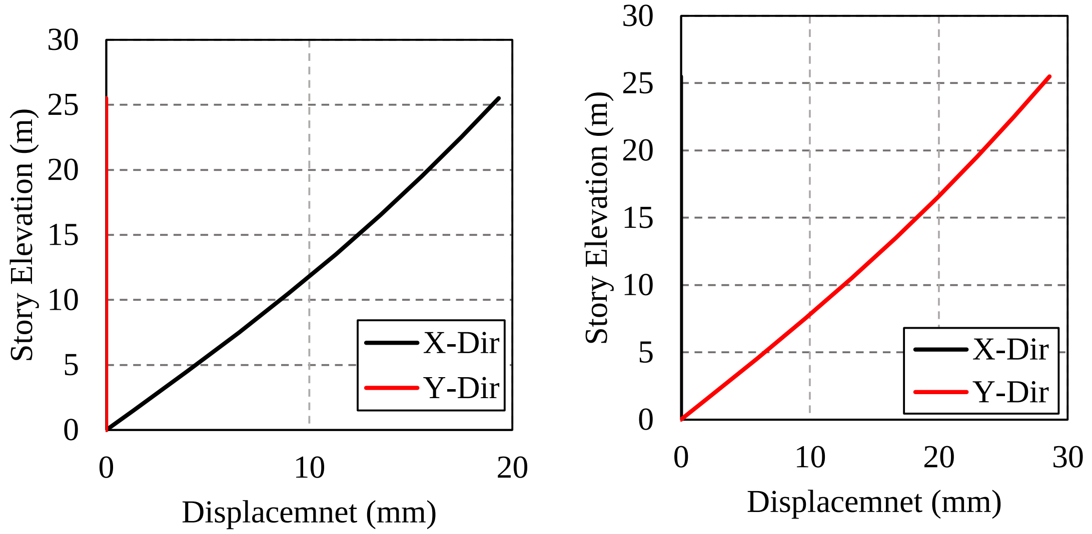

Figure 4-9 Wind load displacement for case SW1

For case SW2 earthquake and wind load displacement on the building model in both directions (x and y directions). figure 4-10 and 4-11 show as below-

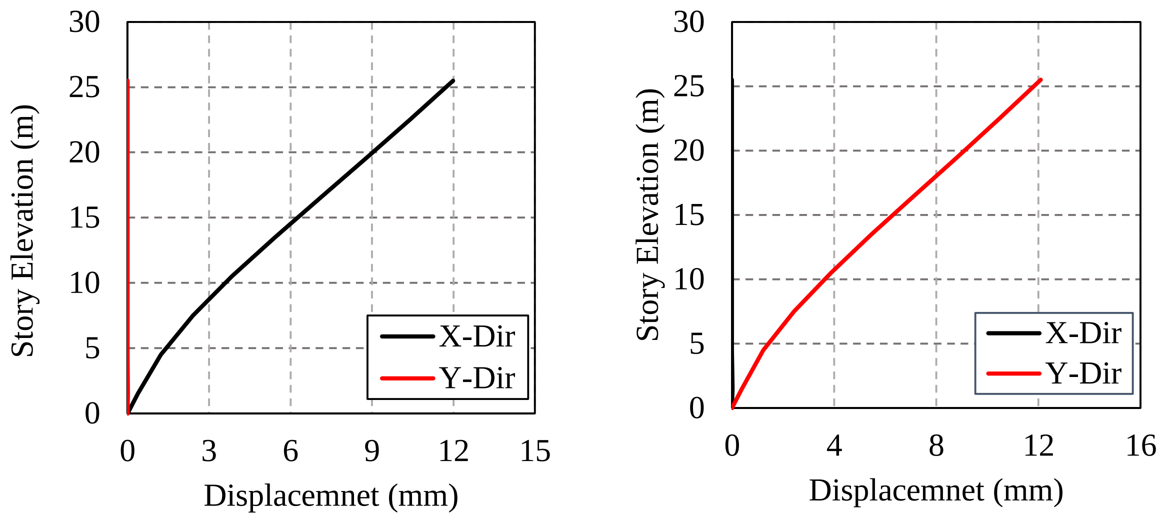

Figure 4-10 Earthquake load displacement for case SW2

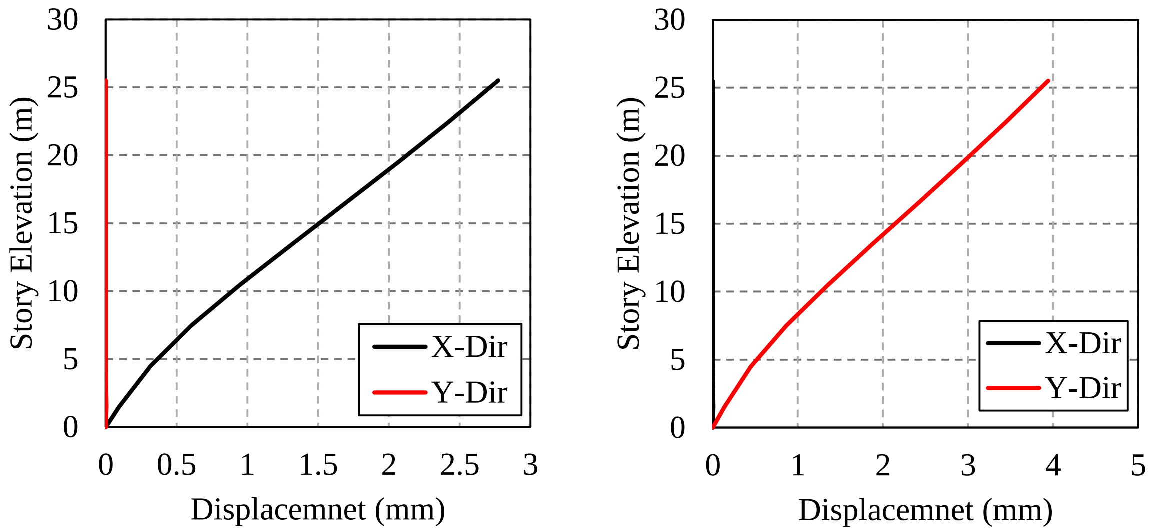

Figure 4-11 Wind load displacement for case SW2

For case SW3 earthquake and wind load displacement on the building model in both directions (x and y directions). figure 4-12 and 4-13 show as below-

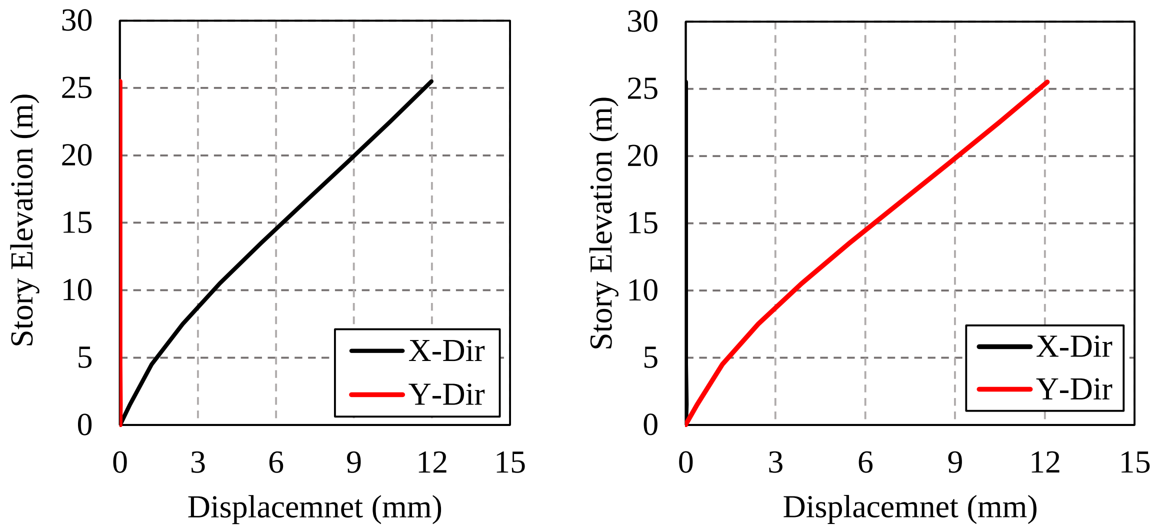

Figure 4-12 Earthquake load displacement for case SW3

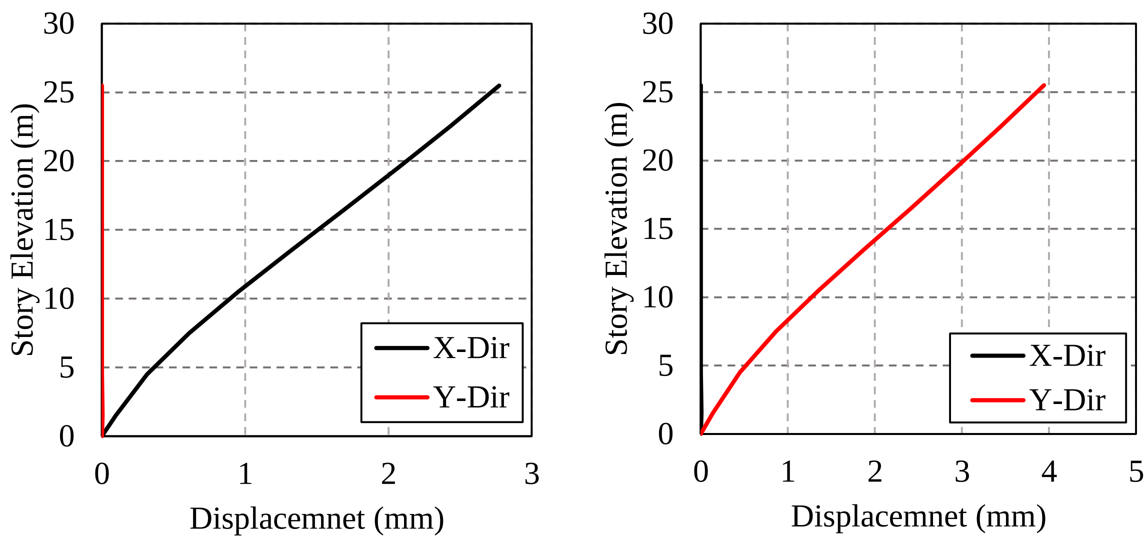

Figure 4-13 Wind load displacement for case SW3

For case SW4 earthquake and wind load-displacement on the building model in both directions (x and y directions). Figures 4-14 and 4-15 show as below-

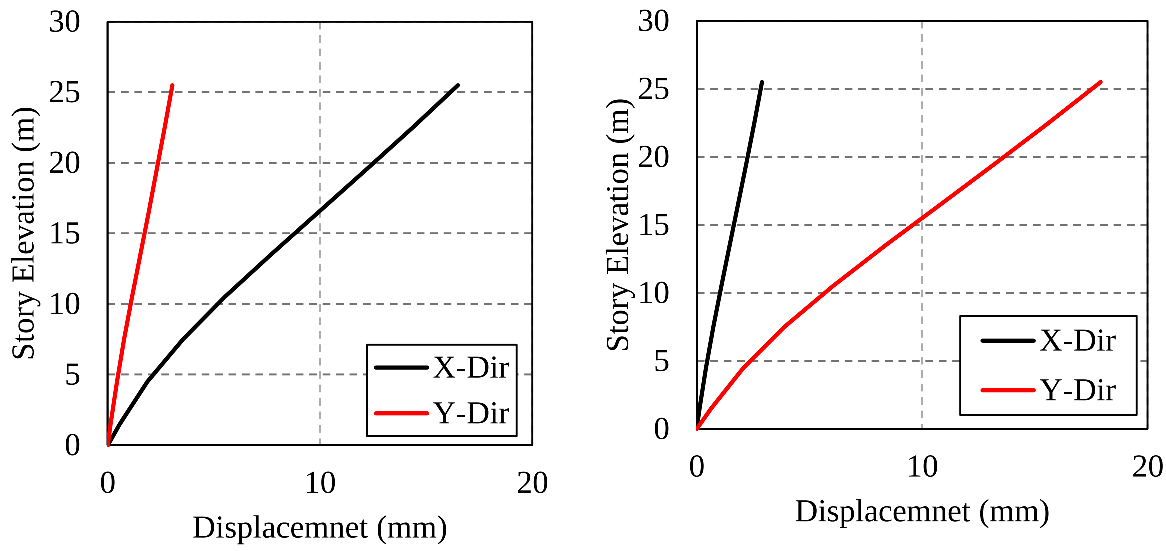

Figure 4-14 Earthquake load-displacement for case SW4

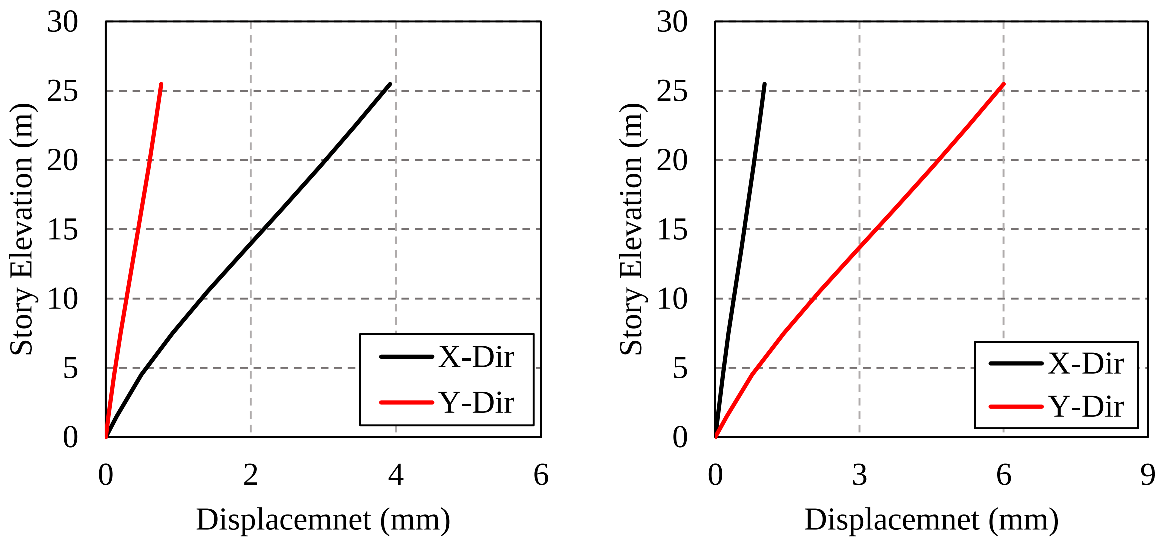

Figure 4-15 Wind load-displacement for case SW4

For case SW5 earthquake and wind load-displacement on the building model in both directions (x and y directions). Figures 4-16 and 4-17 show as below-

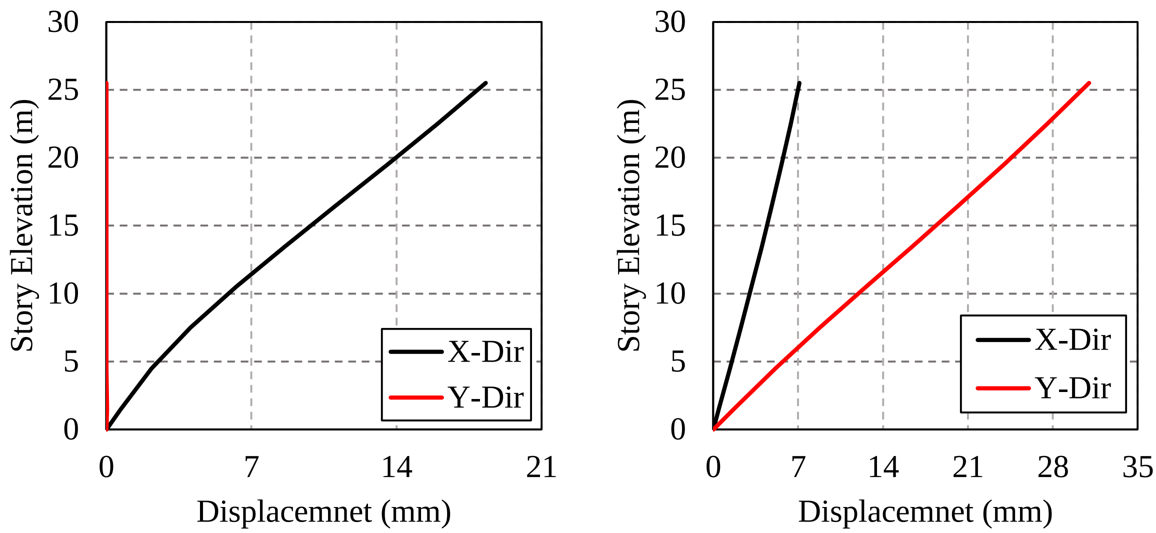

Figure 4-16 Earthquake load-displacement for case SW5

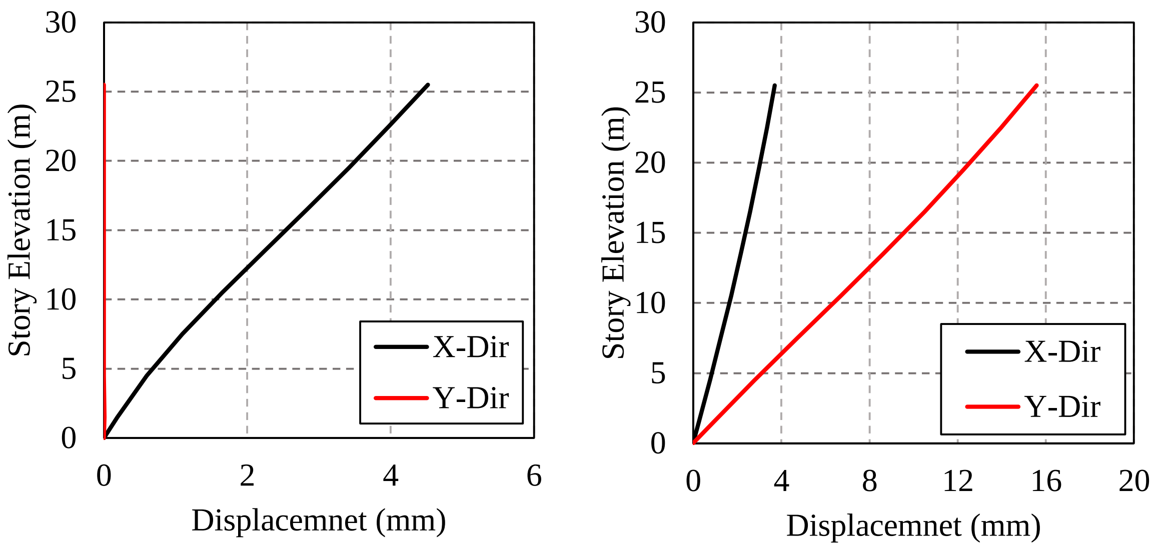

Figure 4-17 Wind load-displacement for case SW5

For case SW6 earthquake and wind load-displacement on the building model in both directions (x and y directions). Figures 4-18 and 4-19 show as below-

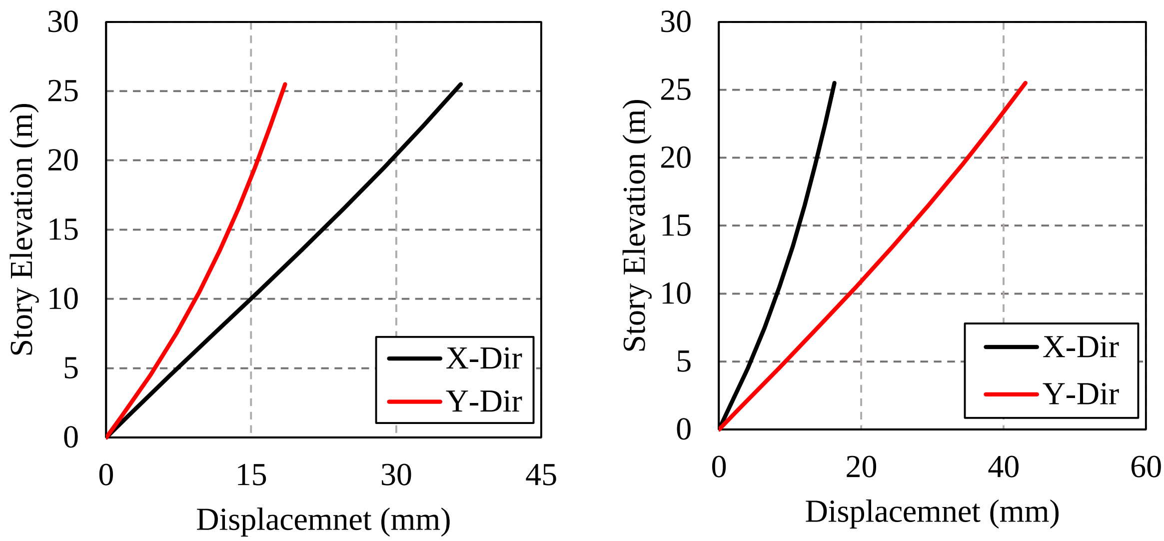

Figure 4-18 Earthquake load-displacement for case SW6

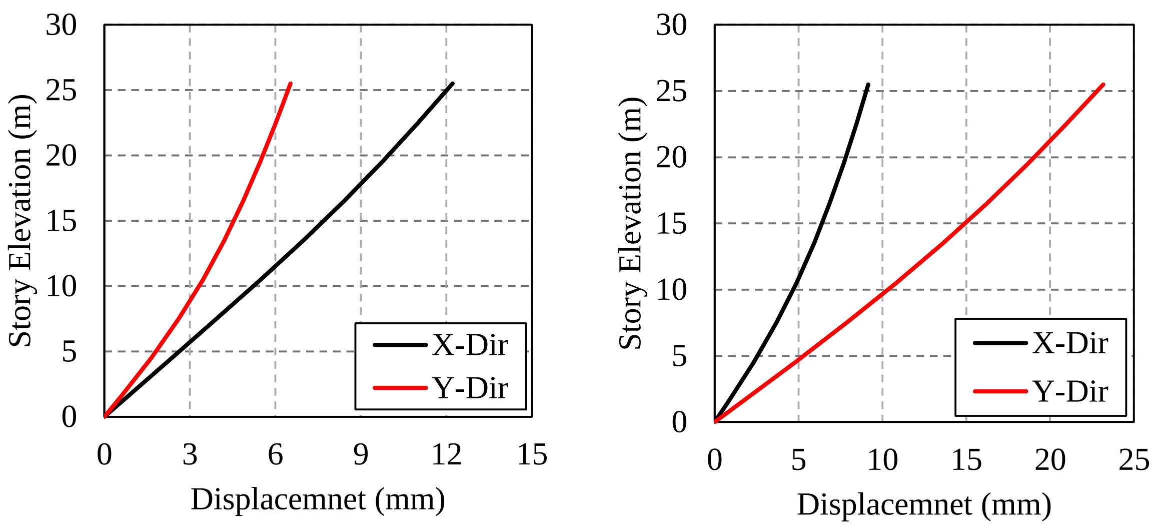

Figure 4-19 Wind load-displacement for case SW6

For case SW6 earthquake and wind load-displacement on the building model in both directions (x and y directions). Figures 4-20 and 4-21 show as below-

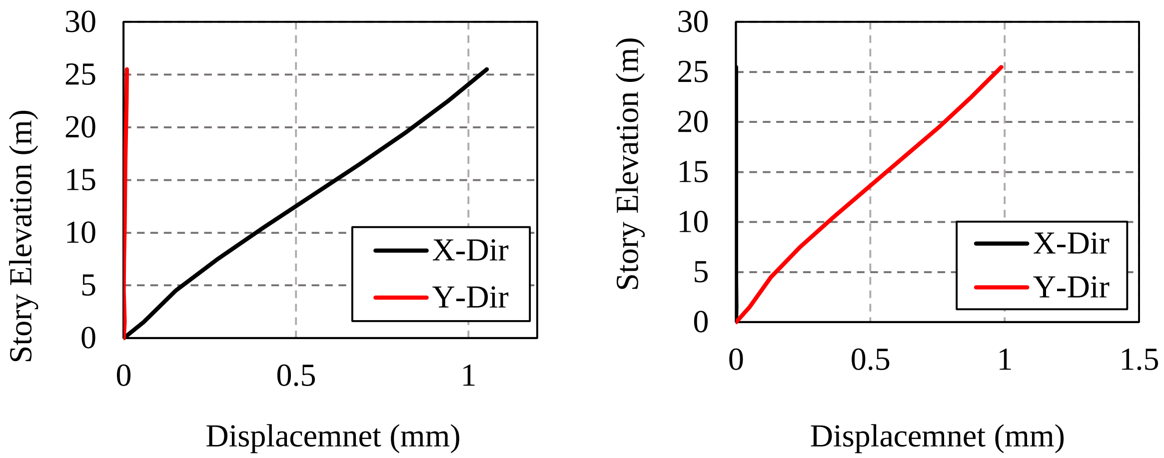

Figure 4-20 Earthquake load-displacement for case SW7

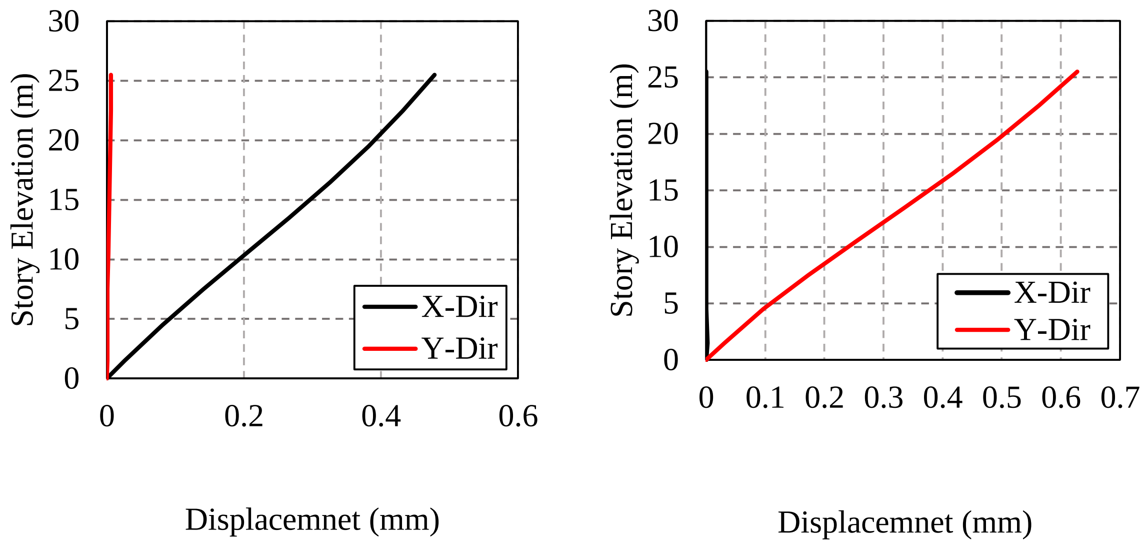

Figure 4-21 Wind load-displacement for case SW7

4.3 Summary

The primary target of this study was to observe a fitting segment breadth as well as shear divider after making an equivalent section size as well as a shear divider in different tremors, I clarified the quake and wind load distortion I acquired in the wake of displaying examination in this part. I got segment aspects of 1500x1500 mm and a shear wall of 250 mm for use in my rectangular-formed structure.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusions

This chapter summarizes the experimental outcomes to finalize the seismic behavior of an s seismic zone 2 in structures with rectangular shape buildings with shear walls.

a) After several case analysis, SW7 show better behavior in seismic and wind load effect and SW1 is show extreme behavior.
b) After analysis that the displacement due to the earthquake in the x-direction is decreased 97.9% and the displacement due to wind in the x-direction is decreased 97.5% when the shear wall was used. Also, the displacement due to earthquake in the y-direction is decreased 98.12% and the displacement due to wind in the y-direction is decreased 97.80% when the shear wall was used, compared to without shear wall.
c) After analysis from 7 cases, I got the minimum displacement due to earthquake and wind load in case SW7. So, case 7 is more suitable for this rectangular shape building.

5.2 Future Recommendation

The modern structure is used by shear walls. I performed modeling and analysis on a G+8 multistory building in seismic zone-2. We could get the story dispersion by using different values in zone-2.

i) A base shear wall for protected casing gets less focus than bracing systems and shear dividers in RCC and other constructions.
ii) While especially in comparison to exposure casing removing, displacing lowers to presenting reinforcement and shear walls for RCC structures strategic plan.
iii) In the case of apartment buildings, there is a current trend toward flat plate slab construction. As a result, it is advised to investigate the impact of flat plate slabs on shear wall building modeling.

iv) The analysis was performed on a uniaxially symmetrical structure for simplicity and also to avoid torsional effects. A detailed study on asymmetric configuration is recommended that future research consider the rotational effect.

v) The sectional property of a member or element in a tall building may not be uniform all through the height. As a result, it is advised to investigate varying sectional properties so over tallness of a high-rise building.

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