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Research paper

Investigating the Role of Winged Shear Walls and Their Behavior in the Aftershocks Applied to the Structure and Behavior of the Joints (Case Study: Mashhad Suburbs Meat House Buildings)

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Abstract

Since Iran is one of the most earthquake-prone areas in the world, attention to earthquakes should be one of the main goals of construction experts. In Iran, as a result of the synchronization of sciences such as seismology, structural engineering, geotechnical engineering with the aim of improving the performance of structures against earthquakes and, as a result of increasing their durability and safety, the building design regulations for earthquakes (standard 2800), is presented. Case The review in this article is that the occurrence of severe aftershocks can cause further damage or sometimes collapse and damage to structures that have not been damaged by major earthquakes. Therefore, calculating the probability of increasing vulnerability in important structures such as service structures after the occurrence of the major earthquake, such as hospitals and firefighting centers, and crisis management (especially in Iran, which is an earthquake country), and the importance of studying the behavior of aftershocks is absolutely necessary. In this research, the role of winged shear walls and their behavior in the post-seismic to the structure and then the behavior of the joints have been investigated. Mashhad suburbs, which are of concrete structures, are evaluated for aftershock vulnerability using soft Specialist Etabs and 22SPSS. The results show that, with increasing classes, the maximum amount of shear force distribution in the walls increase. The increase in the wing reduces the horizontal position of the wall. By increasing the length of the wall's wings, the depth decreases. By increasing the height of the structure, walls with 2 meter wings have been able to show relatively good behavior and reduce seismic effects on the structure. In high strength concrete, the effect of high resistance cement consumption on cement consumption has been higher and in connection with 20 hardening tensile joints occurred in bonding behavior. In the connection with the 16th joints, the least increase in hardening and displacement occurred, and the increase in the concrete category caused an increase in damping.

Keywords: *The role of winged shear walls, aftershocks, aftershocks to structures, joining behavior*.

1. Introduction

With regard to the vulnerability of the seismicity of many buildings (even a significant number of buildings that are necessary for the relief and management of the crisis to be able to exploit them after the earthquake), the aftermath of the fire following the failure of the gas pipes, The buildings and decks of bridges and disruptions in vital arteries during the relief phase, the volume and extent of lesions, will pose major problems in crisis management. And it is likely that there will be a possible aftershock loss, so it is necessary to be fully available as soon as possible and before the opportunity is lost before the destructive damage occurred in order to prevent the resulting risks. In this study, the vulnerability of reinforced concrete structures to reinforced concrete walls was evaluated in the post-seismic zone. Preliminary design was a suitable model for investigating the technical and structural conditions and the seismicity of buildings because during earthquakes destruction or any damage Buildings start with its weaknesses. After breaking down the first weak points, earthquake forces endanger future points. Therefore, identifying the weaknesses of the buildings or, in other words, the Diagnosis Standard as the first step, and then examining the appropriate methods of repair and reinforcement, or in other words the standard Therapy (Therapy Standar), as the second major step in the study of the vulnerability of structures to earthquake hazards Arises. Over the past twenty years, there has been an increasing effort to evaluate the seismic resistance of buildings, but due to the diversity of buildings and the complexity of the effects of various factors and parameters on the vulnerability of building shifts, it is very difficult to develop standards for the diagnosis of weaknesses and treatments.

2. Research Scope and Study Method

In this paper, Mashhad suburbs, which have concrete structures, are located in Mashhad, Phase 7 was evaluated for aftershock vulnerability in concrete structures 6, 10 and 11.
The sources used in this research were:

- Post-earthquake reports in Iran.
- Authentic articles in the field of aftershocks and resistance to structures
- Search the Internet resources.
- Studying publications and national building regulations.
- Using Etabs and SPSS specialist software.

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In the descriptive section, by collecting a checklist or ETABS questionnaire, the information obtained from the structural system selection of structural characteristics and the absorption of aftershocks and the effects of secondary and dynamic analysis were described and in the inferential part with the software 22SPSS, the statistical analysis of the collected data from the check The lists were prepared from Mashhad Mehr buildings. Also, in the structural analysis, the IDA additive dynamic analysis using seismotectonic records on concrete structures with a modular form of tunnel and non-linear nonlinear permanent and transient changes and its effects on reducing the bearing capacity of the structure after damage Imported after the occurrence of major vibration.

3. Theoretical

3.1. Winged shear walls

Winged shear walls are among the most common structural forms of reinforced concrete that are considered to be different from the forces on the side. In winged shear walls, when the loading is parallel to the wing, the wall essentially exhibits a different hardness and shape ability than the other direction. Most of the winged walls are created from rectangular walls and should have the required hardness and resistance to be provided. The shear strength is sufficient between the wings and the wall of the wall. The rectangular shear joint is a permafrost perforated overhang in increasing the bending strength and hardness. Increasing hardness and absorbing earthquake forces increase the painless shear stresses, especially at the intersection of the wing and the dead, which can not withstand it and need FRP composites is improving due to quick and easy installation and low maintenance costs as a matter of Drbhsazy are filed. The reason for the superior behavior of the winged walls is undoubtedly the interaction between the wing and the wall of the wall. The irrefutable effect of shear walls on the control of displacement and the simultaneous presence of tension and pressure has made the wing shear walls important.

3.2. Sequel

There is no progressive algorithm to determine whether a spatial window - when it is very small or very large (to minimize the error in the collection of aftershocks). Also, this method can not be extended to a Remote Triggering test, which can be controlled by a very basic aftershock. In addition, aftershocks can have several earthquakes before and after they overlap with spatial and temporal windows with which they correlate. Also, an experiment to estimate that aftershocks can continue for centuries is not possible with a spatial window-time approach. In 2013, Maria Poles conducted a research entitled "Seismicity of Damaged Buildings and Comparison of Nonlinear Static and Dynamic Methods", in which the seismic behavior of damaged buildings is expressed as a function of post-slip capacity, which is the amount of seismic capacity reduced from the point of view The vulnerability and acceleration of the maximum earth and with nonlinear static analysis, the plastic joints are considered to be the correct correction for the single-member vulnerability level, based on the results of the analyzes shown in the nonlinear static analysis based on the functional curves of the coating and dependent on the number of elements in The trap is in the damaged mechanism.

3.3. Aftershocks applied to the structure

In most areas, the released energy is estimated with respect to the aftershocks. For the study of aftershave in Iran, the data of local stations in Iran, which has a forty-year course, has been analyzed. All of the aftershocks were physically combined and, as a result, the auxiliary time function of each region was obtained based on available potential. Then, according to the relationship between the auxiliary and auxiliary depressions, for the earthquake aftershaves of 1962, Buiyin Zahra, 1968, Beyaz plain, 1990 Roodbar, 1990, 499, Ardebil, 2002, Changorah Ajaj, 2004 Baladeh and 2005 Zarand respectively. . Then, the rate of occurrence of aftershocks was obtained and according to the results obtained from aftershaves, the physical state of the shell and its dynamic behavior were determined. By studying the models and reduction curves for aftershocks, it was observed that the model curve of the model has the highest fit with other models for aftershocks (Riazi Rad, 2006).

One of the researchers is a new method for finding the spatial concentration and the earthquake earthquake process in Sichuan, China, based on the introduction of the initial aftershocks into Kuhnen's neural network. Artificial neural networks inspired by the human brain are composed of a number of artificial neurons, these artificial neurons being interconnected by a number of weight vectors. Artificial neural networks are able to categorize large volumes of input data (such as earthquake catalogs) simultaneously and to identify seismic patterns well. Kuhnen artificial neural networks consist of a number of neuronal nerves that interact with each other and show the important statistical characteristics of the input space (first aftershocks). The combination of community-based learning and competition rules creates the Kuhnen's neural network algorithm. When the Kuhnan neural network algorithm converges, the map of the calculated computations by this algorithm accurately assesses spatial concentration and future aftershave process (Madahizadeh, 2010).

3.4. Mashhad Suburbs Meat House Buildings

The share of Khorasan Razavi from the Mehr housing project was about 120,000 units, and now most of it has been made and delivered to the applicants. This unit amount is a lot, and if the earthquake that the experts warn about its occurrence, how much will the downfall of these buildings be? Khorasan Razavi Mehr Housing Plan has been implemented in different locations and in different projects. All building projects do not have the same characteristics. A project may have more resistance. Other projects may have poor resistance. Therefore, an opinion on the resistance of these buildings needs to be considered. The study shows that, given the seismic potential of the province and the conditions of the structures, estimates of damage The result of a moderate and large earthquake in Mashhad and other parts of the province can be said that structures that are newly designed and implemented in accordance with the 2800 regulations are expected to be resistant to medium and large earthquakes and have no minimum complete rupture. In this paper, Mashhad Mehr Suburbs, Phase 7, in concrete structures 6, 10 and 11 according to E, which has concrete structures, has been evaluated.

3.5. Background of internal investigation

In 2012, Ahmed Murat Turk and his colleague stated in an article that the dynamic behavior of the stone block minaret of an Istanbul mosque is analyzed and a seismic rehabilitation method is proposed. Regarding the earthquake in the region, a three dimensional finite element model has been used to determine lateral displacement and failure states under seismic load. Analysis shows that the highest damage occurs usually at the base and below the minaret, and lateral behavior can be improved by reinforcing this section with polymeric fiber sheets (FRP). The results obtained in terms of earthquake conservation are appropriate.

Majid Pouraminian and colleagues in 2014, in an article aimed at investigating the failure mechanism of the Shahab-e-Eden Ahih Historical Tomb, determined the elements of the vulnerable areas of structural failure. Since Ahar, one of the earthquake-prone countries of Iran, is associated with the relative risk of large earthquakes, the presence of numerous faults in this area, as well as the history and importance of cultural and tourism buildings, vulnerability assessment and rehabilitation is inevitable. Due to the low adhesion force in the building, and considering its vulnerability to

previous earthquakes, the building seems to be weak in comparison with the relatively severe earthquake. The purpose of this study was to investigate the vulnerability of this building to earthquake. Selected earthquakes for seismic loading for the maximum horizontal acceleration obtained for this region have been changed. Different results have been studied and after analyzing the finite element model using Ansys software, various analyzes have been done.

Zohreh Sadat, mathematician and colleagues in 2013, stated that the recent earthquakes in the northwestern region of Iran have caused us to study the modeling and the process of aftershocks in this study using the aftershocks in the region. . First, using a total of 436 aftershocks, two earthquakes were identified in the seism tectonic design of the area. In Geology and Seism tectonic Map of the area, there are two faults, and most of the aftershocks were located between these two faults. However, some of the aftershocks were outside of the above range, which can be attributed to the tectonic region. In this way, the aftershock trend shows the failure screen. Based on the drawings and maps of the area, it was determined that the aftershocks are located in the lower part of the fracture zone relative to the main earthquakes and follow the eastern western trend. Therefore, the magnitude of the failures on the ground shows a good agreement with this aftershock modeling. Therefore, in order to rebuild damaged areas, we need to get away from the defect board to minimize the damage.

3.6. Background of foreign research

Constantine and Philip (2016) investigated the vulnerability assessment based on the increasing frequency of reinforced concrete buildings after successive aftershocks, and presented numerical models with damage severity and fracture curves, a new method for variable time-varying time. Kim, in 2017, in his study of the horizontal component of the aftershocks in the field of active faults, in his study, analyzed the additive and spectral properties of nonlinear behavior of concrete structures with a 5% damping, and obtained the results based on which The resulting acceleration in the aftershock is much smaller than the original earthquake, especially in low periods. He provided a model for the optimal performance of buildings in terms of performance versus aftershocks, based on which the remaining composite model presented the effects of aft structure dependent aftershocks.

In the year 2017, Campbell addressed a study on the vulnerability assessment of concrete structures with regard to aftershocks. The aim of this study was to analyze the structure of reinforced concrete under the influence of the coincidence of the main seismicity and its aftershocks and to study the changes in the damage index in different conditions of loads The seismicity is introduced. The data used in his study included accelerated mapping of aftershocks in Japan and California, among which records in the Japanese area were used to analyze structures. Damage analysis was carried out on a concrete pillar series and a simple frame frame of a concrete span with a period of different periods, and the Park and Angle damage index was used to observe the structural damage. The structures under the main earthquake have been subjected to moderate injuries, and then the aftershocks have been traversed from the accelerations to the damaged structures. The results of the study showed that with increasing the maximum acceleration ratio of the aftershocks compared to the main earthquake and increasing the period of the structure, the damage of the structure under the effect of aftershocks will also increase. Finally, changes in the index of damage under the effect of aftershocks into the structure as an unplanned unit are added to the index of damage index to Park and Eng**.**

4. Analysis of the Findings

4.1. Results and modeling of Abaqus

Factors that affect the behavior of external connections are also more or less effective in the behavior of internal joints. In internal joints, due to the shear forces being far more than external joints, the major issue is the inhibition and engagement of flexural arrays of the beam and the satisfaction of the shear bond strength. For these connections, the capture of the core is an important issue. The behavior of these joints is improved by increasing the number of armature joints, reducing the diameter of the reinforcement and increasing the adhesion between the reinforcement and the concrete. In these connections, the presence of cross-reinforcement reinforcement for slipping forces and the shear forces causes the column to rotate and increases the rotation of the beams. The axial load of the column in them, on the one hand, serves to improve the width of the diameter of the cracks and, on the other hand, has a destructive effect on the corners of the upper and lower corners, and the crushing of concrete corners and the elimination of adhesion between the steel and concrete in this area Causes. The forces are transmitted through bonding between the concrete and the reinforcement and the locking hooks. There are tensions in the focusing area. The fittings should be of sufficient strength to facilitate the possibility of large, non-elastic rotation of the beams in the attachment face. The transfer of flexural stresses by the beams to the connecting faces results in the production of large shear forces inside the joint on the horizontal shear plates, resulting in diagonal trunks and shear forces. The experiments have shown that shear strength inside the node can be taken as a function of concrete compressive strength. Regardless of the shear force in the joint, in order to enclose the concrete core in the joint, it must be surrounded by column pillars within the connection with lateral joints, and since the joints are subjected to tensile inversion, the length of inhibition in the connection is critical. . In fact, there are significant tensions in the knot in both the beam steel and the steel column. In this section, modeling and investigating the seismic behavior of shaped joints in prefabricated concrete systems, has been investigated with Abakus software version 6.2. In the modeling of this study, which was done with the Etabs software version 9.7.4, 6 walls were modeled as simple wall, wall with a length of 0.5 m, a wall with a length of 1 m and a wall with a length of 1.5 m and a height of 3 meters Models will be compared and the results of seismic analysis will be compared. Models constructed in 5-meter and 6-meter openings will be subjected to a near-earthquake earthquake that will be selected and applied from the accelerated mapping given in the previous section. The effect of the earthquake field on the type of structure and the profile of the sectional area of the shear wall are among the main objectives of the research. The outputs required for analysis include the structural capacity curve, drag and column forces, the cut-off coefficient, and the section cutting, as well as the formation pattern of plastic elastic joints and their progressive dynamic analysis. Also, the joints of the beam and column have been performed in Abakus software version 6.2 and the shear wall layout in the structure has been modeled to investigate the behavior of external walls in the internal and external openings of the structure.

B) Results and modeling of Etabs

In this section, the modeling of the structures discussed is discussed. The gravity mapping of Tabas earthquake was applied to the structure and the loads loaded on the structure consist of live weight of 200 kg / m 2 and dead load of 650 kg / m 2 applied to the concrete slab roof. The structure was considered at 7, 10, 13 floors and was affected by the earthquake recession, which included the acceleration of the earthquake earthquake in Tabas.

Concrete mix design based on C25 grade concrete. To calculate the target's (average) required resistance of the mixing plan, the security margin provided in the Iranian concrete code is used and it is assumed that the standard deviation of the workshop's re-

sistance is not known. According to the national mix design method, the aggregate mixing modulus is 40/5. Based on this method, the average fracture percentage of the aggregate is calculated to calculate the water content of 33%. To determine the ratio of water to cement, we use the water-to-cement ratio curves - the compressive strength used for different grades of cement and coarse and broken aggregates.

There are two types of reinforced concrete shear walls:

- Slitting in place: In a slit wall, in place to secure the uniformity and continuity of the wall joints, they are hooked to the outer frame.

Pre-fabricated shear joints: Pre-fabricated shear walls provide uniformity and continuity with the preparation of trapezoidal kidneys along the edges of the panel or by connecting the panels to the frame by steel nails. The construction of the wings in the walls is very useful for the stability and shape of the structure.

5. Conclusion

In this study, using explicit dynamic analysis and based on the characteristics of the models, the model is presented in the following table. The components of the models are also model and assembled. Conditions for the 8 models with the information given for different connection states have been made. In all models, the different conditions of the column and the same beam and its dimensions were 30 cm in 30 cm. The steel material density is 7850 kg / m 3, with a Poisson coefficient of 0.3 and a modulus of elasticity of 20x1010, and its plasticity properties are as shown in Figure 4-3. The seismic load in accordance with the form shown in Figure 4-4 is entered. The syntax and assembly elements of the system are also shown.

Table 1: Geometric Properties of Structured Structures

Model	Curtain	Concrete Grade
Model 1	**20**	**C 20**
Model 2	**20**	**C 25**
Model 3	**16**	**C 20**
Model 4	**16**	**C 25**
Model 5	**12**	**C 20**
Model 6	**12**	**C 25**
Model 7	**10**	**C 20**
Model 7	**10**	**C 20**
Model 8	**10**	**C 25**

In the analysis, von Maisse stress was used for analysis. The Von Maison tension is widely used by design engineers to test whether the design can withstand the load conditions. Von Maison's stress is used as a safe haven for design. Von Vanessa's stress tells an engineer that he will fail in his design. The Von Maison tension is used to determine if it can withstand its design to the load conditions provided. The concept of the von-Meijz stress comes from the theory of energy deflection failure. Due to the energy theory, defect distortion occurs.

According to this theory, the surrender occurs when the strain energy of the deflection in a unit volume equals the strain energy of the deflection in a unit volume to reach or exceed the same material in the same elasticity or pressure. This theory is applicable to formable and malleable materials. This theory was developed when it was observed that the yield strength of ductile materials loaded hydrostatically (equal to the main stresses) is much higher than the values obtained by the simple stretch test. This means that surrender is not just tensile or compressive phenomena, but rather in relation to a factor called angular deflection.

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