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Model Housing Alternative Subjected to Seismic Loads in the Young Village Villa Maria of the District of Nuevo Chimbote, 2018

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Abstract: This thesis investigation sought to propose a housing model that supports seismic loads, this was carried out in the city of Nuevo Chimbote this year. The theories that frame this research are seismic analysis, structural analysis of a masonry dwelling and seismic modeling of said dwelling model, going so far as to say that a dwelling of Masonry can bear seismic loads by applying the reduction coefficient R = 3. In this study, the descriptive analysis method was used, having as a non-experimental-descriptive research type. For this research, the population is the on-site dwelling, thus having the model dwelling for the sample. In addition, for the data collection, a technical sheet for evaluating the structural state of the on-site dwelling and protocols obtained from the Ingeotecnia Consultores y Ejecutores laboratory was used as an instrument, and the data was then processed in the cabinet.

Key words: structural design, seismic design, model home, loads seismic

1. Introduction

The problematic reality at the global level is that in many countries they are frequently affected by the floods and earthquakes that are occurring.

The earthquake registered in western Iran of 7.3 degrees on the Richter scale has caused serious losses to the affected areas where the death toll is already 530 and 7,800 injured, according to official figures. The earthquake that occurred in the Kermanshah province, bordering Iraq, has caused devastation and a considerable number of deaths that have increased in the area due to the progress of the debris removal tasks near the 30,000 homes that were devastated in the zone [1].

In the mentioned paragraph, the terrible consequences of natural phenomena worldwide were revealed, which caused thousands of human losses, leaving homes devastated.

In Peru; All the departments were affected by one of the most disastrous phenomena in the year of 2017, bringing consequences such as: The phenomenon of the coastal child in 2017, left 85 dead, 270 injured and 20 missing. Also; 800,000 people affected and affected. On the other hand, the damages affected 153,339 homes, 7,500 kilometers of landways, 509 bridges, 1,250 schools and many health centers.

Corresponding to the material damages, the highest percentage of damages were land with a monetary value of loss of US $ 1,259 million and housing ES $1,123 million [1].

The Huaraz earthquake of May 31, 1970, 7.8 degrees on the Ricther scale, was one of the most catastrophic in the history of Peru, since around 67,000 people died, with a total of 20,000 missing and wounded 150,000 [1].

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It was considered; The aforementioned is a clear example that the country of Peru is not prepared to withstand natural phenomena such as floods and earthquakes. By the mentioned, awareness and preventive measures necessary for the numbers of victims to decrease by large percentages must be raised.

In Ancash, "Similarly, rainfall and rivers have literally left many people on the street. Thus, the Ancash COER reported that in the mentioned region it had a total of 968 houses destroyed. On the other hand, it generated 2,698 houses that must be rebuilt because they are uninhabitable. Also, As for housing, 3,302 are reported as affected. This is understood as those that suffered some type of impact" [2].

In Chimbote, what happened to millions of people worldwide, nationally and regionally was made known; the reality in which they live and the needs that these people harbor were witnessed since the district of Nuevo Chimbote was isolated due to the fact that the Huambacho bridge was destroyed by the huayco caused by the overflow of the Nepeña river, preventing the exit to the south and in Coishco was also blocked, in the northern part.

The streams were activated in the Lacramarca river, making the Villa María Young People the most affected area in the Nuevo Chimbote district, leaving thousands of people affected and hundreds of homes affected.

The main problem in the Young People of Villa María are the houses that suffered serious damage, causing the majority of its inhabitants to abandon their homes due to the lack of security in the buildings. On the other hand; homes are insecure and vulnerable to the presence of natural phenomena such as floods and earthquakes. Knowing the danger affecting

In Villa María housing, preventive measures were taken that contributed to reducing the risk. This project is a contribution to know and propose solutions to the reality of housing in the Young People of Villa María, which established a model of confined masonry housing safer and that supports seismic forces and floods.

It was considered that said problem has not yet been solved by the inhabitants of the young town Villa María; people do not worry about carrying out an appropriate constructive process of their buildings since it is considered that they do not take into account the necessary parameters for the correct use of them; therefore, it leads to a higher percentage of informal construction in the study area. That is why it presents it

Research seeks to minimize people's economic and social losses through a model house with an innovative design that meets the necessary requirements to withstand flood and seismic loads.

2. Material and Methods

The basis for the construction of a house that supports seismic loads as well as floods are the criteria that must be taken into account for its constructions taking into account the national building regulations; for this reason, the present research aims to design a model house subjected to seismic loads in the Town

Young Villa María, Nuevo Chimbote district, 2018, for this purpose, an on-site evaluation of a typical house was carried out at the choice of the researchers, design the architectural distribution of the model house, carry out the seismic analysis of the model house, structurally design the model house and budget the model house.

The present investigation has a quantitative approach with a non-experimental design since the variable cannot be modified and the phenomena are observed in their own environment.

Tells us that in an investigation Cross-sectional experimental is explanatory when only the variable is described, that is, they only intend to measure or collect information independently, their objective being to indicate how this is related, which is shown below, and is interpreted based on the single variable [3].

It is justified that the present investigation is of great importance for citizens to live in a house that meets the regulatory parameters, ensuring the well-being of themselves. Specifically, the goal is for society to start

building the model housing proposed by the researchers in order to mitigate human and material losses.

The present investigation; brings to the branch of engineering a new knowledge, so that a confined masonry house supports seismic loads with characteristics in the face of flood phenomena that opens doors to future research that can be carried out nationally and internationally in the field of engineering.

According to the scales of the study variables (Nominal and Reason), the document analysis guide and protocol will be carried out, and then they will be analyzed and processed in Excel sheets, Auto CAD 2D, Cinema 4D and ETABS [4].

This research will have as an ethical aspect, intellectual property; since the authors will effectively cite the information collected from the different authors according to the current norm of the Cesar Vallejo university ISO 690 and 690-2. On the other hand; Social responsibility will be taken into account because this thesis involves assertively in the interests of society, ensuring their safety and well-being.

3. Results and Discussion

3.1 Choice of Housing in Situ

For the evaluation of the housing In Situ there are Table 1, which graphs the criteria of the researchers for the choice of housing taking into account the risk map of the district municipality of Nuevo Chimbote and considering the RNE-A-010 General Design Conditions in Chapter I — Design Characteristics, Article 4, specifies the urban parameters that a house must have to be built in the Villa María Youth Village; In Tables 2-3, the measures and areas of the In Situ house are disclosed, it was observed that the passageway has a width of 0.80 m [4]. However, in the RNE-A-010 General Design Conditions in chapter V — Access and Circulation Passages, article 25, subsection e, says that the width inside homes is 0.90 m; therefore, it does not comply, in standard A-010 General Design Conditions in chapter II — Relationship of the Building with the Public Road, article 25, subsection e, says that the width inside homes is 0.90 m; therefore, it does not comply as can be seen in annex No. VI-2, plate A-02; In Table 4 (Evaluation of the technical data sheet) which can be seen in Annex 2.1, it refers to 44% of damage to the In Situ home and according to the National Institute of Health of Guatemala specifies that for the percentage mentioned of the In Situ house is classified as a house with a moderate level of damage, and according to the National Building Regulations a house must meet the minimum parameters established in the different articles of the Peruvian standard. However, the In Situ house does not comply with what is stipulated in both architectural and structural design; In the Tables 5-9, the results of the tests carried out in the Villa María Young People are disclosed, revealing that the resistance of wall is 19 kg/cm^2 and the column, beam and slab is 98, 105 and 110 kg/cm^2 respectively and according to RNE-E-060 Reinforced Concrete indicates that the walls must have a resistance of 65 kg/cm^2 and the mentioned structural elements a resistance of 175 kg/cm^2, therefore, does not comply; Table 10 (Load Meter of the In Situ House) shows the load metrics of the house taking into account the RNE-A-020 Loads — for an adequate calculation in the seismic analysis; In the Table 11 (Center of masses and rigidities of the In Situ house) it refers that the density of walls in the two directions of the In Situ house have a greater difference than is allowed in the RNE-E-070 Masonry In Chapter VI — Structuring, Article 15 details that the density of walls in both directions must be similar; in addition, in article 19.2 it exceeds the specified parameters, therefore it does not comply; in Table 12 (Displacements in two directions of the In Situ house) which discloses the maximum displacement of the house having the mezzanine distortion in X and Y is 0.042 and 0.064 respectively; however, according to RNE-E-030 Earthquake Resistant Design in chapter V Rigidity, Resistance and Ductility Requirements, in Table 11 limits for the distortion of the mezzanine, it

indicates that when they are masonry houses the mezzanine distortion is 0.005; therefore, it does not comply, because the house has a poor distribution of its environments and poor resistance to structural elements, which would cause severe consequences such as the death and injury of its inhabitants.

Table 1 shows the parameters taken into account for the choice of housing on the spot; choosing the house located in the Mz. The tea. 11, making it the most critical for its location, site conditions and for being the most affected by natural phenomena.

Table 2 shows the measurements of the housing area, dimensions of the structural elements such as: column, beam and slab; In addition, the dimensions of the openings found in said chosen dwelling can be viewed in Annex No. VI-2.

Table 3 shows the area of the rooms of the house in situ where they can be seen in Annex N° VI-2, in order to know their area in square meters for each room, taking into account the minimum areas that It is established in standard A-020 — Housing of the National Building Regulations.

Table 1 Conditions for choosing housing in situ.

Ubicacion	Condiciones de sitio	TIPO de vivienda	Habitabilidad
Mas critica	Mas critica	Albanlieria	Habitable

Table 2 On-site housing distribution measures.

MEDIDAS DE LA VIVIENDA IN SITU			
ÁREA DE VIVIENDA	**ANCHO(m)**	**LARGO(m)**	**ÁREA(m2)**
Vivienda in Situ	10	30	300
ELEMENTOS ESTRUCTURALES	**ANCHO(m)**	**ALTURA(m)**	**ÁREA(m2)**
Columnas	0.25	0.25	0.0625
Vigas	0.25	0.20	0.05
Losa		0.20 (espesor de losa)	
VANOS	**ANCHO(m)**	**ALTURA(m)**	**ÁREA(m2)**
Puerta principal	1.00	2.10	2.1
Alfeizar	2,10	0.80	1.68
Puertas de dormitorios	0.80	2.10	1.68
Puertas de baño	0.85	2.10	1.785
Ventana principal	2.00	1.00	2.00
Ventanas interiores	1.00	1.00	1.00

Table 3 Distribution of In Situ housing areas.

DISTRIBUCIÓN VIVIENDA IN SITU	
AMBIENTES	**ÁREA (m2)**
Sala – comedor	32.09
Garaje	19.55
Habitaciones	37.7
Cocina	9,99
Baño	3.53

From Table 4, it is observed that the housing in situ presents an overall damage of 40% considering it to be moderate damage, at the same time said housing is considered as restricted use to be able to inhabit it, the restricted use implies that the structural elements are about to collapse and the data sheet applied in the field demonstrates the criteria and conditions for determining structural damage, this data sheet can be viewed in Annex II.

Table 5 expresses the values of the weights for each sieve indicated by the ASTM-D421 standard, the values are processed in the cabinet using Excel to determine the particle size curve.

Table 4 Structural damage to the model home.

DAÑO ESTRUCTURAL			
DAÑO GLOBAL DE LA VIVIENDA IN SITU			
Clasificación De Daño	Rango (%)		Resultado (%)
Leve	0	30	40
Moderado	31	60	
Severo	61	100	

Table 5 Results of standard laboratory testing of sieve granulometry.

RESULTADOS DE ENSAYOS ESTÁNDAR DE LABORATORIO					
1. ANALISIS GRANULOMETRICO POR TAMIZADO (ASTM - D421)					
Peso Inicial Seco, [gr]			1368.300		
Peso Final Seco, [gr]			1351.500		
Abertura	Peso retenido	Mallas	% RETENIDO	% Retenido Acumulado	% pasa
[mm]			[grs]		
2"	50.800	0.00	0.00	0.00	100.00
1 1/2"	38.100	0.00	0.00	0.00	100.00
1"	25.400	101.60	7.43	7.43	92.57
3/4"	19.050	0.00	0.00	7.43	92.57
1/2"	12.500	4.50	0.33	7.75	92.25
3/8"	9.500	8.90	0.65	8.40	91.60
Nº 4	4.750	33.20	2.43	10.83	89.17
Nº 10	2.000	162.10	11.85	22.68	77.32
Nº 20	1.000	174.70	12.77	35.45	64.55
Nº 40	0.425	226.20	16.53	51.98	48.02
Nº 100	0.150	550.00	40.20	92.17	7.83
Nº 200	0.074	90.30	6.60	98.77	1.23
< N° 200	---	16.80	1.23	100.00	0.00
Grava (%) =	10.83	Arena (%) =	87.94	Finos (%) =	1.23
D10 =	0.16	Cu= D 60	5.00	Cc = (D 30)2	0.61
D30 =	0.28		D 10	D 10 x D 60	
D60 =			0.80		

Table 6 expresses the results of the type of soil in the Villa María area, considering poorly graded sand for the SUCS standard and for AASHTO a sand with fine particle size particles.

Table 7 expresses the result of the bearing capacity of the soil, where it indicates that after 2 meters the soil is stable to be able to lay the foundation of a building, bearing in mind that for a masonry dwelling the A continuous foundation is not more than 1 meter deep, the rest of the space to be able to reach 2 meters has to carry out an improvement of the soil and place a stone over it so as not to allow water contact with the foundation.

Table 6 Results of standard laboratory tests of granulometry by sieving by SUCS and AASHTO standards.

SISTEMA	CLASIFICACION	DESCRIPCION
Arenas Mal Graduadas	SUCS	SP
Arenas Con Partículas Finas De Granulometría	AASHTO	A-1-b (0)

Table 7 DPL standard laboratory test results.

DPL	Penetración (m)	N° de Golpes / 30 cm	Compacidad relativa	Angulo de fricción interna	Descripción	qa (kg/cm2	Terreno de fundación	sucs
	0.20	0						
	0.50	1	16	28	FLOJA	0.696	MALO	RELLENO
	0.80	3	11	21	MUY FLOJA	0.615	MUY MALO	RELLENO
	1.10	4	15	28	MUY FLOJA	0.655	MUY MALO	SP
01	1.40	7	23	28	FLOJA	0.776	MALO	SP
		4	15	28	MUY FLOJA	0.655	MUY MALO	SP
NIVEL FREÁTICO:		17	45	31	MEDIA	1.179	REGULAR	SP
	2.30	21	51	33	MEDIA	1.340	REGULAR	SP
	2.60	22	52	33	MEDIA	1.380	REGULAR	SP

Table 8 expresses the results of the resistance of the structural elements found in the housing in situ; the column has 131 kg/cm^2 is the most resistant to part of the beam and slab with only 122 kg/cm^2.

Table 9 expresses the results of the compressive strengths of a sample of wall extracted from the dwelling in situ that present only 9.44 kg/cm^2, and which in standard establishes that the resistance must be 65 kg/cm^2.

Table 8 Standard sclerometry test results.

Ensayos Estándar de Esclerometría	
Elementos Estructurales	Resistencia (kg/cm2)
Columna	131.00
Viga	122.00
Losa	122.00

Table 9 Compression test results.

Ensayos de Compresión							
Dscp.	Área Neta (cm2)	Área Bruta (cm2)	L (cm)	A (cm)	H (cm)	Presión (kg)	Resistencia a la compresión (kg/cm2)
Muro	324.3	324.3	23	14.1	34	3060	9.44

3.2 Architectural Distribution of the Housing Model

For the architectural distribution of the housing model, there are Tables 13-14 (Distribution of areas of the first and second levels of the model dwelling), which disclose the distribution of the environments and area of the housing model, contrasting with the book by Marcial Blondet — Construction and Maintenance of Masonry Homes, it reveals the characteristics that earthquake resistant homes must have, such as symmetry, dimension, proportion of spans and

according to RNE-A010 — General Design Conditions and A-020 Housing, establish the minimum parameters of the houses so that they have a good behavior in the presence of a natural phenomenon; on the other hand, what the RNE specifies — A-010 General Design Conditions in chapter I — Design Characteristics, article 4, which graphs the urban parameters that must be taken into account for the architectural design of the home, was considered. model as can be seen in annex No. VI-3, plate A-04.

Table 10 expresses the weights of the influencing elements in the on-site dwelling to obtain its own weight for the dwelling, which is 98.89 Tn.

Table 11 shows the coordinates of the center of mass and the center of stiffness to verify their eccentricity in X and Y, which is not acceptable because it exceeds a 5% difference in their directions as indicated by the E-standard. 070 of the National Regulation of Buildings.

Table 12 shows the displacements in X and Y of the housing in situ, which are 0.02785 and 0.05482 respectively; however, in standard E-030 Earthquake Resistant Design in article V, Table 11 Limits for the distortion of the mezzanine of the National Building Regulations indicates that the maximum displacement for masonry houses is 0.005; therefore, it does not comply.

Table 10 In Situ Meter Load Charge.

Metrado de cargas	
Elementos	Peso (Tn)
Losa aligerada	38079.75
Acabados	14341.75
Vigas	1720.80
Muros	40065.84
Columna	840
Alfeizar	6.05
Escalera	1170
Sobrecarga	3070
Total	98.89 Tn

Table 11 Mass center and rigidities of the in situ house.

CENTRO DE MASAS		CENTROS DE RIGIDECES	
X (cm)	Y (cm)	X (cm)	Y (cm)
7.675	5	8.87	5.03

Table 12 Displacements in two directions of the In-Situ house.

DESPLAZAMIENTOS PISO N° 1	
X (mm)	Y (mm)
0.02785	0.05482

Table 13 shows the areas of the environments of the first level model home where its area in square meters for each environment is disclosed, taking into account the minimum areas established in the A-020 standard — Housing of the National Building Regulations.

Table 14 shows the areas of the environments of the second level model home where its area in square meters for each environment is disclosed, taking into account the minimum areas established in the A-020 standard — Housing of the National Building Regulations.

3.3 Seismic Analysis of the Model Home

For the seismic analysis of the model house, in Table 15, it refers that the density of walls in the X and Y direction of the model house is 0.315 and 0.002 respectively, contrasting with the RNE-E-070 Masonry in chapter VI — Structuring, article 15 details that the

Table 13 Distribution of areas of the first level of the model home.

DISTRIBUCIÓN VIVIENDA MODELO Primer Nivel	
AMBIENTES	ÁREA (m2)
Sala – comedor	37.72
Garaje	21.00
Habitaciones (N° 04)	47.88
Cocina	8.19
Baños (N° 05)	21.9
Terraza	10.7
Estudio	8.19
Lavadero y jardín	50.93

Table 14 Distribution of areas of the second level of the model home.

DISTRIBUCIÓN VIVIENDA MODELO Segundo Nivel	
AMBIENTES	ÁREA (m2)
Sala – comedor	37.72
Habitaciones	47.88
Cocina	8.19
Baños	21.9
Terraza	42.68
Estudio	8.19

density of walls in both directions must be similar; Furthermore, in article 19.2 it does not exceed the specified parameters, therefore it does; in Table 20 (Displacements of the model house in two directions) which discloses the maximum displacement of the house having the mezzanine distortion in X and Y is 0.002 and 0.002 respectively; therefore, according to RNE-E-030 Earthquake Resistant Design in chapter V Rigidity, Resistance and Ductility Requirements, in Table 8, Limits for the distortion of the mezzanine, indicates that when they are masonry houses, the mezzanine distortion is 0.005; therefore, it does comply; as can be shown in Annex No. V, which presents all the calculations for the model home.

3.4 Structurally design the model home

For the design of the model home, Table 16 shows that the axial force found in the model home is less than the design axial force of a confined masonry structure; In addition, the design acting axial force is less than 0.15 * f´m, corroborating what the book by Ángel San Bartolomé — Masonry Design specifies, the conditions for the design of the house are met; In Table 17 the steel of the structural elements is graphed complying with the condition that the calculated shear stress of the model house structure is less than the design shear force as specified in the book by Ángel San Bartolomé — Design Masonry; Table 18 shows the steel distribution of the elements taking into account Morales Morales' book, which specifies the parameters for the longitudinal and transverse steel distribution; Table 15 shows that structural elements such as columns must have a depth of 10 cm because it meets the condition that the sum of the acting axial stresses plus bending moment stresses are less than or equal to 1.33 as established Ángel San Bartolomé's book — Masonry Design; Table 16 shows that the wall did not fail in the presence of a natural phenomenon because it meets the condition of the design of stresses perpendicular to the plane, which specifies that the total tensile force must be greater than or equal to the admissible stress moment as established by Ángel San Bartolomé's book — Masonry Design; The aforementioned guarantees the adequate structural design of the model home for the well-being of the inhabitants of the Villa María Young People.

Table 15 shows the coordinates of the center of mass and center of stiffness to verify their eccentricity in X and Y, which is acceptable because it does not exceed 5% difference in their directions such as stated in standard E-070 of the National Building Regulations.

Table 16 shows the result of the conditions provided by the design by axial compression, it was evaluated in both directions in X and Y, selecting the most critical walls of the model home having on the X axis the wall x1 complying with the conditions of this design with a fa = 5.61 Tn-f less than Fa = 9.1 Tn-f and on the Y axis the wall y10 was evaluated, which presents fa = 4.78 Tn-f less than Fa = 9.1 Tn-f.

Table 17 the result of the conditions provided by the design by shear force is observed, it was evaluated in both directions in X and Y, selecting the most critical walls of the model house having on the X axis the wall x1 complying the conditions of this design with a v = 1.85 less than va = 2.01 and on the Y axis the wall y10 that presents v = 1.74 less than va = 2.01 was evaluated, obtaining its steel areas of the elements.

Table 18 shows the results of the steel distribution both in the column that 6 1/2" steel rods must be placed, as well as for the beam that 4 1/2" steel rods will be placed, the reinforcements for both vertical and horizontal will be placed 4 3/8" steel rods and the confining stirrups will be placed as follows [] Ø 1/4", 2@5, 9@10, r@20 cm.

Table 15 Center of mass and rigidities of model housing.

CENTRO DE MASAS		CENTROS DE RIGIDECES	
X (cm)	**Y (cm)**	**X (cm)**	**Y (cm)**
10.8	5	11.815	5.002
X (cm)	**Y (cm)**	**X (cm)**	**Y (cm)**
11.5	5	11.85	4.56

Table 16 Axial compression design.

DISEÑO POR COMPRESIÓN AXIAL				
NIVELEES	EJES	CANTIDAD DE MUROS	1° CONDICIÓN (fa<Fa=9.1) (Tn-f)	2° CONDICIÓN (Esfuerzo Axial=1 < 0.15*f´m (Tn-f)
1° PISO	X	10	5.61	1.89
	Y	21	4.78	1.67
2° PISO	X	10	5.61	1.89
	Y	21	4.78	1.67

Table 17 Design by shear force.

Diseño por Fuerza Cortante						
Muro Crítico	1° Cond. (v < va)	Solera (m2)	Columna (cm2)	Refuerzo Vertical (cm2)	Refuerzo Horizontal (cm2)	Estribos (cm2)
X1	1.85 < 2.01	0.4	625	2.60	2.36	0.64
Y10	1.74 < 2.01	0.4	625	2.45	2.34	0.64

Table 18 Steel distribution.

Distribución de acero	
Elementos	Distribución
Columna y Vigas	6 Ø 1/2" y 4 Ø 1/2"
Refuerzo Vertical	4 Ø 3/8"
Refuerzo horizontal	4 Ø 3/8"
Estribos de Confinamiento	[] Ø 1/4", 2@5, 9@10, r@20 cm

In summary; the design of the model home meets the requirements established by the National Building Regulations such as the symmetry that the environments must have, the density of equivalent walls in both directions, the center of mass and rigidity, minimum measurements that the environments must have and spans of the house, the distortion of the mezzanine complies with the regulations so that the model house can be built by the residents of the Pueblo Joven Villa María at a cost of S/283,745. 20 obtained through the analysis of unit prices and measurements made by the researchers to obtain the budget for the model house located in annex No. VIII, taking into account what the Technical Norm of Metering and Costs and Budgets in Building says. For this, the construction process that the items must have was taken into account taking into account that according to the results of the soil mechanics, it is recommended that the soil improvement be carried out with stone over 1.20 m high with layers of 0.50 m with stone over 10" to 12", 0.30 m from 6" to 8", 0.20 m from 2" to 4" and 0.20 m of gravel; In addition, a plastic should be placed at the end of the last layer of stone over; in addition, the sills must be placed by a seismic joint, because they are independent of the structure, as established by the A-060 Standard for Reinforced Concrete, the facade wall must be made with a waterproofing additive up to 1.50 m in height as established by the A-010 standard for General Design Aspects, The type of brick to be used is solid; In addition, it is recommended that the type of brick to be used is REX, to settle the wall, it should be done at 1.30 m on the first day, the mortar should be 1 cm thick; in addition, at the proportion indicated in plans E-01, place a higher percentage of lime, the teeth between the wall and the column must be 5 cm and the tarration must be 2 cm.

4. Conclusion

In the In Situ house evaluated, a bad geometry was found in the plan that generated torsional effects due to the possibility of an earthquake, asymmetry in its areas, it did not have an improvement in the terrain because the bearing capacity of the soil is 1.14 and the water table at 0.60m from the natural terrain; therefore, in the seismic analysis performed, a maximum drift of 0.02785 and 0.05482 was obtained in the X and Y directions, respectively, which is below the allowable in the E030 Seismic-resistant Design standard of the National Building Regulations.

The architectural design of the model house was carried out based on the RNE, in the A-010 where it specifies regulated and established parameters, counting on the Urban information provided by the municipality of Nuevo Chimbote and mainly the levels for the house were prioritized with the goal of preventing flooding in the future.

The seismic analysis was carried out through the Etabs structural program, determining that the maximum drift of 0.000001 and 0.000003 in X and Y, respectively, which complies with the E-030 Seismic-resistant Design Standard of the National Building Regulations.

The model house was structurally designed having a wall thickness of 15 centimeters and the steel distributions corresponding to columns and beams 6 Ø 1/2" and 4 Ø 1/2", vertical reinforcements 4 Ø 3/8", reinforcement horizontal 4 Ø 3/8" and confining stirrups [] Ø 1/4", 2 @ 5, 9 @ 10, r @ 20 cm, complying with standard E-060 Reinforced Concrete of the National Building Regulations.

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