NATIONAL BUILDING CODE

TECHNICAL STANDARD OF BUILDING E.030

“EARTHQUAKE-RESISTANT DESIGN”

TECHNICAL BUILDING STANDARD E.030

PERMANENT TECHNICAL COMMITTEE NTE E-030 EARTHQUAKE RESISTANT DESIGN

President : Dr. Javier Piqué del Pozo

Vice president : MSc Eng. Alejandro Muñoz Peláez

Technical Secretary: SENCICO

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CHAPTER 1 GENERAL

1.1 Objective

a) This Technical Standard stablish the minimum conditions for the Earthquake-Resistant Design of the buildings.
b) Until specific national standards for structures such as reservoirs, tanks, silos, bridges, transmission towers, docks, hydraulic structures, tunnels, and all those whose seismic behavior differs from that of buildings are available, the values of Z and S from Chapter II must be used, amplified according to the importance of the structure, considering international practice.

1.2 Scope

a) It is mandatory at the national level.
b) It applies to the design of all new buildings, the strengthening of existing ones, and the repair of structures that are damaged by seismic action.

1.3 Philosophy and Principles of Earthquake-Resistant Design

The philosophy of earthquake-resistant design consists in:

a) Avoid human losses.
b) Ensure the continuity of the basic services.
c) Minimize property damages.

It is well known that to give complete protection against every earthquake is not technically or economically feasible for most buildings. In accordance with such philosophy, it has been established in this standard the following design principles:

a) The structure must not collapse or cause serious damage to people, although could have important damages, due to severe seismic movements that may occur in site.
b) The structure should endure ground movements qualified as moderate for the project site; the structure could experience repairable damages within the acceptable limits.
c) Essential buildings, defined in Table N° 5, will have special considerations oriented to achieve that the building remains operating after a severe earthquake.

1.4 Approval of Other Structural Systems

The use of structural systems different from those indicated in 3.3 is approved by the Ministry of Housing, Construction, and Sanitation through a study that demonstrates that the proposed alternative produces adequate results in terms of stiffness, seismic resistance, and ductility.

1.5 Other Prevention Measures

In addition to what is indicated in this standard, measures must be taken to prevent disasters that may occur as a result of seismic movement, suc as tsunamis, fire, the release of hazardous materials, massive landslides, or others.

1.6 Nomenclature

For the purposes of this technical standard, the following nomenclatures are considered:

- C Seismic amplification coefficient.
- C_T Coefficient to estimate the predominant period of a building.
- D_i Lateral displacement of the center of mass of level i in the pure translation (restricting the turns in plant) due to the forces f_i.
- e_i Accidental eccentricity of level i.
- F_i Horizontal seismic force of level i.
- g Gravity acceleration.
- h_i Height of story i with respect to ground level.
- h_{ei} Height of story i.
- h_n Total height of building in meters.
- M_{ti} Accidental torsion moment in story i.
- m Number of modes used in modal combination.
- n Number of stories in the building.
- P Total weight of the building.
- P_i Weight of story i.
- R Reduction coefficient of seismic solicitations.
- r Maximum elastic structural response expected.
- r_i Maximum elastic responses corresponding to mode i.
- S Soil amplification factor.
- S_a Spectrum of pseudo accelerations.
- T Fundamental period of the structure for static analysis or period of a mode in dynamic analysis.
- T_P Period that defines the spectral platform for seismic amplification coefficient.
- T_L Period that defines the beginning of seismic amplification coefficient zone with constant displacement.
- U Use and importance factor.
- V Seismic base shear of the structure.
- Z Zone factor.
- R_0 Basic coefficient of reduction of seismic forces.
- I_a Factor of irregularity in elevation.
- I_p Factor of irregularity in floor.
- f_i Lateral force of level i.
- $\bar{V}_s$ Average velocity of propagation of shear waves.
- $\bar{N}_{60}$ Weighted average of the standard penetration tests.
- $\bar{S}_u$ Weighted average of shear strength in undrained condition.

1.7 Earthquake-resistant Structural Conception

Must be taken into account the importance of the following aspects:

- Symmetry, both in the distribution of masses and rigidities.
- Minimum weight, especially in high floors.
- Proper use and selection of construction materials.
- Adequate resistance against lateral loads.
- Structural continuity, both in plant and elevation.
- Ductility, understood as the structure deformation capacity beyond the elastic range.
- Limited lateral deformation.

- Inclusion of resistance successive lines (structural redundancy)
- Consideration of local conditions.
- Good constructive practice and rigorous structural supervision.

1.8 General Considerations

Every building and its parts will be designed and built to resist the required seismic demands in the standard, following the specifications of the pertinent codes to the used materials.

Is not necessary to consider simultaneously wind and earthquake effects.

Must be considered the possible effect of partition walls, parapets and other attached elements in the structure seismic behavior. The analysis, the reinforcement details and the anchorage must be done according this consideration.

In accordance with the earthquake-resistant design principles of the item 1.3, it is accepted that the buildings may have inelastic incursions against severe seismic demands. Thus, the design seismic forces are a fraction of the elastic maximum seismic demand.

1.9 Project Presentation

The plans, descriptive memory and technical specifications of the structural project, must be signed by the college civil engineer responsible of the design, who will be the only one authorized to approve any modification.

The plans of the structural project must include the following information.

a) Earthquake-resistant structural system.
b) Fundamental period of vibration in both principal directions.
c) Parameters to define the seismic force or the design specter.
d) Shear force in the base used for the design, in both directions.
e) Maximum displacement of the last floor and the maximum relative displacement of mezzanine.
f) The location of the accelerometers stations, if needed according the Chapter 9.

CHAPTER 2 SEISMIC HAZARD

2.1 Seismic Zones

Peru is divided in four zones, as shown in Figure N°1. The zonation is based on the spatial distribution, source parameters and attenuation of earthquakes, as well as the neotectonic information. Appendix N°02 displays the list of provinces and districs and their corresponding seismic zones.

SEISMIC ZONES

FIGURE N° 1

Every zone is correlated to a site coefficient Z as shown in Table N°1. This coefficient represents the peak ground acceleration (PGA) for stiff soil type with a probability of exceedance of 10 percent in 50 years. The PGA is expressed in gravity or g.

Table N° 1 SITE COEFFICIENT “Z”	
ZONE	Z
4	0,45
3	0,35
2	0,25
1	0,10

2.2 Seismic Microzonation and Site Studies

2.2.1 Seismic Microzonation

It requires multi-disciplinary approaches in order to assess the earthquake-induced phenomena such as soil liquefaction, landslides, tsunamis, and others. These studies contribute to estimate the response of soil layers under earthquake excitations and thus to explain the variation of earthquake characteristics on the ground surface; as well as establish the design requirements for the construction of new buildings and certain types of structures.

The results obtained from microzonation studies are very useful in the following cases:

- Places for urban development.
- Reconstruction of damaged zones.

2.2.2 Specific Site Response Analyses

These analyses are similar to the microzonation study, but not at all in its extension. These studies are only applied to the investigated area and provide information about the variation of earthquake characteristics on the ground surface. The main objective is determined the seismic design parameters.

The site surveys must conduct at heavy industrial sectors, industries that generate explosive, flammable and polluting materials.

The seismic design parameters must not be lower than the coefficients established by this code.

2.3 Getechnical Characterization

2.3.1 Site Profiles

For this building code, site profiles classify according to the average shear wave velocity ($\bar{V}_s$). For cases where measured $\bar{V}_s$ data is not available, site profiles can also classify in terms of the average standard penetration resistance $\bar{N}_{60}$ for cohesionless soils estimated from the Standard Penetration Test (SPT), and the average undrained shear strength ($\bar{S}_u$) for cohesive soils. These properties are determined of the top 30 m of the subsurface profile extending from the base of the foundation, as indicated in the section 2.3.2.

For cohesionless soils, $\bar{N}_{60}$ is calculated using only the cohesionless soil layers. In terms of cohesive soils, the undrained shear strength $\bar{S}_u$ is computed using the average result from cohesive soil layers.

The methodology explained above is also applicable for heterogeneous soils (cohesionless and cohesive). If $\bar{N}_{60}$ for cohesionless soils and $\bar{S}_u$ for cohesive soils criteria differ, the site must be assigned to the category with the softer soil.

The types of site profiles are five:

a. Site Class S_0: Hard Rock

This site corresponds to intact bedrock with shear wave velocity $\bar{V}_s$ greater than 1500 m/s. This category must be supported by shear wave velocity measurement either on site or on profiles of the same rock type in the same formation with an equal or greater degree of weathering and fracturing. Where hard rock conditions are known to be continuous to a depth of 30 m, surficial shear wave velocity measurements are permitted to be extrapolated to assess $\bar{V}_s$.

b. Site Class S_1: Rock or Very Dense Soils

This site corresponds to rocks with different degrees of fracturing, competent rocks, very dense soils with shear wave velocities $\bar{V}_s$ ranging from 500 to 1500 m/s, including when the foundation is constructed on:

- Fractured rock, with an unconfined compression strength qu greater or equal that 500 kPa (5 kg/cm^2).
- Very dense sand or dense sandy gravel, with $\bar{N}_{60}$ greater than 50.
- Very stiff clay (with a thickness larger than 20 m), with an undrained shear strength $\bar{S}_u$ greater than 100 kPa (1 kg/cm^2) and its mechanical properties are increasing gradually with the depth.

c. Site Class S_2: Stiff Soils

This site corresponds to stiff soils, with shear wave velocities $\bar{V}_s$ ranging from 180 to 500 m/s, including when the foundation is constructed on:

- Dense sand, medium to coarse, or sandy gravel, medium, with SPT resistance values $\bar{N}_{60}$ within 15 and 50.
- Stiff cohesive soil, with an undrained shear strength $\bar{S}_u$within 50 kPa (0,5 kg/cm^2) and 100 kPa (1 kg/cm^2), and its mechanical properties are increasing gradually with the depth.

d. Site Class S_3: Soft Soils

This site corresponds to soft soils, with shear wave velocities $\bar{V}_s$ less than or equal to 180 m/s, including when the foundation is constructed on:

- Fine to medium sand, or sandy gravel, with SPT resistance values $\bar{N}_{60}$ less than 15.
- Soft cohesive soil, with an undrained shear strength $\bar{S}_u$within 25 kPa (0,25 kg/cm^2) and 50 kPa (0,5 kg/cm^2), and its mechanical properties are increasing gradually with the depth.
- Sites that not correspond to S_4, with a total thickness greater than 3 m and having the following characteristics: plasticity index P greater than

20, moisture content ω greater than 40%, and undrained shear strength $\bar{S}_u$ less than 25 kPa.

e. Site Class S_4: Special Soils

This site corresponds to very soft soils as well as the places where geologic and/or topographic conditions are particularly unfavorable, so a site response analysis must be performed. A site qualifies under the criteria for Site Class S_4 as long as the results of the geotechnical analysis indicates that.

Table N°2 shows the site classification for the different types of soil profiles:

Table Nº 2
SITE CLASSIFICATION

Site Class	$\bar{V}_s$	$\bar{N}_{60}$	$\bar{s}_u$
S_0	> 1500 m/s	-	-
S_1	500 m/s a 1500 m/s	> 50	>100 kPa
S_2	180 m/s a 500 m/s	15 a 50	50 kPa a 100 kPa
S_3	< 180 m/s	< 15	25 kPa a 50 kPa
S_4	The classification depends on the geotechnical analysis		

2.3.2 Definitions of Site Class Parameters

The definitions presented in this section must apply to the upper 30 m of the site profile, extending from the base of the foundation. The symbol i refers to n distinct layers in the top 30 m, where some of the n layers are cohesive and others are not, m is the number of cohesionless layers and k is the number of cohesive layers.

a. Average Shear Wave Velocity, $\bar{V}_s$

The average shear wave velocity must be determined in accordance with the following formula:

$$\bar{V}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n}\left(\frac{d_i}{V_{si}}\right)}$$

Where d_i is the thickness of each one of the n layers and V_{si} is the shear wave velocity (m/s).

b. Average Standard Penetration Resistance, $\bar{N}_{60}$

$\bar{N}_{60}$ must only be determined for cohesionless soil layers of the upper 30 m of the site profile, in accordance with the following formula:

$$\bar{N}_{60} = \frac{\sum_{i=1}^{m} d_i}{\sum_{i=1}^{m}\left(\frac{d_i}{N_{60i}}\right)}$$

Where d_i is the thickness of the m cohesionless soil layers, and N_{60i} is the corrected SPT value.

c. Average Undrained Shear Strength, $\bar{S}_u$

$\bar{S}_u$ must only be determined for cohesive soil layers of the top 30 m of the site profile, in accordance with the following formula:

$$\bar{s}_u = \frac{\sum_{i=1}^{k} d_i}{\sum_{i=1}^{k} \left(\frac{d_i}{s_{u\,i}} \right)}$$

Where d_i is the thickness of the k cohesive soil layers, and S_{ui} is the undrained shear strength (kPa).

Other Important Considerations:

In the case that geotechnical studies are not mandatory or the soil properties are unknown for the upper 30 m, the engineer can assume appropriate site class parameters based on his experience and knowledge.

For deep foundation systems like piles, the site profile is determined of the upper 30 m, extending from the pile top.

2.4 Site Coefficients (S, T_P y T_L)

The site profile that describes the local site conditions is determined in accordance of the soil amplification factor S and the period site coefficients T_P and T_L given in Tables N°3 and N°4, respectively.

Table N° 3
SOIL AMPLIFICATION FACTOR “S”

ZONE \ SOIL	S_0	S_1	S_2	S_3
Z_4	0,80	1,00	1,05	1,10
Z_3	0,80	1,00	1,15	1,20
Z_2	0,80	1,00	1,20	1,40
Z_1	0,80	1,00	1,60	2,00

Table N° 4
PERÍODS “T_P” Y “T_L”

	Site Class			
	S_0	S_1	S_2	S_3
T_P (s)	0,3	0,4	0,6	1,0
T_L (s)	3,0	2,5	2,0	1,6

2.5 Seismic Amplification Factor (C)

According to the local site conditions, the site amplification factor (C) is determined in accordance with the following equations:

$T < T_P$	$C = 2{,}5$
$T_P < T < T_L$	$C = 2{,}5 \cdot \left(\frac{T_P}{T}\right)$
$T > T_L$	$C = 2{,}5 \cdot \left(\frac{T_P \cdot T_L}{T^2}\right)$

T is the period according to items 4.5.4 and 4.6.1.

This coefficient means the amplification factor due to the acceleration of the structure with respect to the ground acceleration.

CHAPTER 3 CATEGORY, STRUCTURAL SYSTEM AND BUILDING REGULARITY

3.1 Building Category y Importance Factor (*U*)

Each Structure shall be classified according to the category indicated in Table N° 5. The importance or usage factor (*U*), defined in Table N° 5 will be used according to the realized classification. For buildings with base isolation systems may be considered $U = 1$.

Table N° 5
BUILDING CATEGORY AND FACTOR "U"

CATEGORY	DESCRIPTION	FACTOR *U*
A Essential buildings	A1: Health establishments from the Health Sector (public and private) of the second and third level, as regulated by the Ministry of Health.	See Note 1
	A2: Essential buildings whose function should not be interrupted immediately after a severe earthquake occurs, such as: - Health establishments not included in category A1. - Ports, airports, municipal facilities, communications center. Fire stations, military and police headquarters. - Electricity generation and transformation plants, reservoirs and water treatment plants. All those buildings that could serve as shelter after a disaster, such as educational institutions, technology institutes and universities. Buildings whose collapse may represent an additional risk, such as large ovens, factories and deposits of flammable or toxic materials, are included. Buildings that store archives and essential state information.	1,5
B Important buildings	Buildings where large numbers of people are met such as cinemas, theaters, stadiums, coliseums, shopping malls, passenger terminals, penitentiary establishments, or those where valuable patrimonies like museums and libraries meet are stored. Grain stores and other important warehouses for the supply are also considered.	1,3
C Common buildings	Buildings where large numbers of people are met such as cinemas, theaters, stadiums, coliseums, shopping malls, passenger terminals, penitentiary establishments, or those where valuable patrimonies like museums and libraries meet are stored. Grain stores and other important warehouses for the supply are also considered.	1,0
D Temporal buildings	Provisional facilities for deposits, booths and others similar.	See note 2

Note 1: New buildings with category A1 will have base isolation systems when they are in seismic zones 4 and 3. In seismic zones 1 and 2, the responsible entity can decide whether or not to use base isolation systems. If base isolation system is not used in seismic zones 1 and 2, the value of U shall be at least 1.5.

Note 2: In these buildings must be provided adequate strength and stiffness for lateral actions, at the discretion of the designer.

3.2 Structural Systems

3.2.1 Reinforced Concrete Structures

All reinforced concrete elements that make up the earthquake resistant structural system shall satisfy the provisions of Chapter 21 "Special provisions for seismic design" of Technical Standard E.060 Reinforced Concrete of the RNE.

Moment Frames: At least 80% of the shear force at the base acts on the columns of the frames. In the case of structural walls, they shall be designed to withstand a fraction of the total seismic action in accordance with their stiffness.

Structural Walls: System in which seismic resistance is predominantly given by structural walls on which at least 70% of the shear force at the base acts.

Dual: Seismic actions are resisted by a combination of frames and structural walls. The shear force taken by the walls is between 20% and 70% of the shear at the base of the building. Frames shall be designed to withstand at least 30% of the shear force at the base.

Buildings of Limited Ductility Walls (EMDL): Buildings characterized by having a structural system where seismic and gravity load resistance is given by reinforced concrete walls of reduced thickness, in which confined ends are dispensed and the vertical reinforcement is arranged in a single layer.

With this system, a maximum of eight floors can be built.

3.2.2 Steel Structures

The systems listed below are part of the Earthquake Resistant Structural System.

Special Moment Frames (SMF)
These frames must provide a significant inelastic deformation capacity through the yielding by bending of beams and limited yielding in the panel zones of columns. Columns shall be designed to have a greater strength than the beams when they reach the deformation hardening zone.

Intermediate Moment Frames (IMF)
These frames must provide limited inelastic deformation capacity in their elements and connections.

Ordinary Moment Frames (OMF)
These frames must provide a minimum inelastic deformation capacity in their elements and connections.

Special Concentrically Braced Frames (SCBF)
These frames must provide a significant inelastic deformation capacity through the post-buckling strength in braces in compression and creep in braces in tension.

Ordinary Concentrically Braced Frames (OCBF)

These frames must provide limited inelastic deformation capacity in their elements and connections.

Eccentrically Braced Frame (EBF)
These frames must provide a significant inelastic deformation capacity mainly due to the yielding by bending or shear in the zone between braces.

3.2.3 Masonry structures

Buildings whose earthquake resistant elements are walls based on masonry units of clay or concrete. For purposes of this Standard, no distinction is made between confined or reinforced masonry structures.

3.2.4 Wooden structures

In this group are considered buildings whose resistant elements are mainly based on wood. Truss systems and braced structures type post and beam are included.

3.2.5 Earth structures

Buildings whose walls are made with units of earth masonry or in-situ rammed earth.

3.3 Category and structural systems

According to the category of a building and the zone where it is located, it must be projected using the structural system indicated in Table N ° 6 and following the irregularity restrictions of Table N ° 10.

<table>
<tr><th colspan="3">Table N° 6 (*)
CATEGORY AND STRUCTURAL SYSTEM OF BUILDINGS</th></tr>
<tr><th>Building category</th><th>Zone</th><th>Sistema Estructural</th></tr>
<tr><td rowspan="2">A1</td><td>4 & 3</td><td>Base isolation systems with any structural system.</td></tr>
<tr><td>2 & 1</td><td>Steel structures type SCBF, OCBF and EBF.
Reinforced concrete structures: Dual Systems, structural walls.
Confined or reinforced masonry.</td></tr>
<tr><td rowspan="2">A2 (**)</td><td>4, 3 & 2</td><td>Steel structures type SCBF, OCBF and EBF.
Reinforced concrete structures: Dual Systems, structural walls.
Confined or reinforced masonry.</td></tr>
<tr><td>1</td><td>Any structural system.</td></tr>
<tr><td rowspan="2">B</td><td>4, 3 & 2</td><td>Steel structures type SMF, IMF, SCBF, OCBF and EBF.
Reinforced concrete structures: Moment frames, dual Systems, structural walls.
Confined or reinforced masonry.
Wooden structures.</td></tr>
<tr><td>1</td><td>Any structural system.</td></tr>
<tr><td>C</td><td>4, 3, 2 & 1</td><td>Any structural system.</td></tr>
</table>

(*) For buildings with lightweight roofing, any structural system can be used.

(**) For small rural constructions, such as schools and medical posts, traditional materials may be used following the recommendations of the standards for such materials.

3.4 Structural Systems and Basic Coefficient of Reduction of Seismic Forces (R_0)

Structural systems will be classified according to used materials and the seismic-resistant structural system in each direction of analysis, as indicated in Table No. 7.

When, in the direction of analysis, the building presents more than one structural system, the lowest coefficient R_0 will be taken.

Table N° 7
STRUCTURAL SYSTEMS

Structural System	Basic Coefficient of Reduction R_0 (*)
Steel:	
Special Moment Frames (SMF)	8
Intermediate Moment Frames (IMF)	5
Ordinary Moment Frames (OMF)	4
Special Concentrically Braced Frames (SCBF)	7
Ordinary Concentrically Braced Frames (OCBF)	4
Eccentrically Braced Frame (EBF)	8
Reinforced concrete:	
Frames	8
Dual	7
Structural walls	6
Limited Ductility Walls	4
Reinforced and confined concrete	3
Wooden (Using allowable stresses)	7 (**)

(*) These coefficients will only apply to structures in which the vertical and horizontal elements allow dissipation of the energy while maintaining the stability of the structure. They do not apply to inverted pendulum structures.
(**) For allowable stress design.

For earth constructions, refer to the RNE Standard E.080 "Adobe". This type of constructions is not recommended in S_3 soils, nor S_4 soils.

3.5 Structural Regularity

Structures should be classified as regular or irregular for the following purposes:

- Satisfy restrictions of Table No. 10.
- Establish procedures for analysis.
- Determine the R coefficient of reduction of seismic forces.

Regular Structures are those that in their resistant configuration to lateral loads, do not present the irregularities indicated in Tables N ° 8 and Nº 9.

In these cases, the factor I_a or I_p will be equal to 1,0.

Irregular Structures are those that present one or more of the irregularities indicated in Tables N ° 8 and N ° 9.

3.6 Irregularities Factors (I_a , I_p)

The factor I_a will be determined as the smallest of the values in Table Nº 8 corresponding to the structural irregularities, in height, in the two directions of analysis. The factor I_p will be determined as the lowest of the values in Table Nº 9 corresponding to the structural irregularities, in plant, in the two directions of analysis.

If, when Tables No. 8 and 9 are applied, and different values of factors I_a o I_p were obtained for the two directions of analysis, the lowest value of each factor should be taken for the two directions of analysis.

Table N° 8 **STRUCTURAL IRREGULARITIES IN HEIGHT**	**Irregularity Factor I_a**
Stiffness Irregularity – Soft floor Irregularity of stiffness exists when, in any of the analysis directions, in an intermediate story, the lateral stiffness is less than 70% of the lateral stiffness of the immediately superior story or is less than 80% of the average lateral stiffness of the three adjacent upper levels. Lateral stiffness can be calculated as the ratio between the shear force at the intermediate story and the corresponding relative displacement, both evaluated under the same loading condition. **Resistance Irregularity – Weak floor** There is resistance irregularity when, in any of the directions of analysis, the inter-story resistance under shear forces is less than 80% of the resistance of the next upper inter-story.	**0,75**
Stiffness-Extreme Irregularity (See Table Nº 10) Extreme irregularity of stiffness exists when, in any of the analysis directions, in an intermediate story, the lateral stiffness is less than 60% of the lateral stiffness of the immediately superior story or is less than 70% of the average lateral stiffness of the three adjacent upper levels. Lateral stiffness can be calculated as the ratio between the shear force at the intermediate story and the corresponding relative displacement. **Resistance-Extreme Irregularity (See Table Nº 10)** There is resistance-extreme irregularity when, in any of the directions of analysis, the inter-story resistance under shear forces is less than 65% of the resistance of the next upper inter-story.	**0,50**
Mass or Weight Irregularity There is mass or weight irregularity when the story weight, determined according to Item 4.3, is greater than 1.5 times the weight of an adjacent story. This criterion does not apply to roofs or basements.	**0,90**

Vertical Geometry Irregularity The configuration is irregular when, in any of the directions of analysis, the plan dimension of the lateral force-resisting structure is greater than 1.3 times the corresponding dimension in an adjacent story. This criterion does not apply to roofs or basements.	**0,90**
Discontinuity in Resisting Systems The structure is characterized as irregular when in any element that withstands more than 10% of the shear force there is a vertical misalignment, either by a change in orientation or by an axis displacement of magnitude greater than 25% of the corresponding dimension of the element.	**0,80**
Extreme Discontinuity in Resisting Systems (See Table Nº 10) There is extreme discontinuity when the shear force that resists the discontinuous elements, as described in the previous item, exceeds 25% of the total shear force.	**0,60**

Table N° 9 **STRUCTURAL IRREGULARITIES IN PLAN**	**Irregularity Factor** I_p
Torsional Irregularity Torsional irregularity exists when, in any analysis direction, the maximum relative inter-story displacement at one end of the building ($\Delta_{máx}$) in that direction, calculated including accidental eccentricity, is greater than 1.3 times the average relative displacement at the ends of the same inter-story under the same load condition (Δ_{prom}). This criterion only applies to buildings with rigid diaphragms and only if the maximum relative story displacement is greater than 50% of the allowable displacement indicated in Table No. 11.	**0,75**
Extreme Torsional Irregularity (See Table Nº 10) There is torsional irregularity when, in any of the directions of analysis, the maximum relative displacement of inter-story at the end of the building, calculated including accidental eccentricity ($\Delta_{máx}$), is greater than 1.5 times the average relative displacement at the ends of the same inter-story under the same load condition (Δ_{prom}). This criterion applies only to buildings with rigid diaphragms and only if the maximum relative inter-story displacement is greater than 50% of the allowable displacement indicated in Table No. 11.	**0,60**
Reentrant Corner The structure is classified as irregular when it has reentrant corners whose dimensions in both directions are greater than 20% of the corresponding total dimension in plan.	**0,90**

Diaphragm Discontinuity The structure is classified as irregular when the diaphragms have abrupt discontinuities or significant variations in stiffness, including openings greater than 50% of the gross diaphragm area. There is also irregularity when, on any of stories and for any of the directions of analysis, there is some cross-section of the diaphragm with a net resistant area of less than 25% of the total cross-sectional area of the same direction calculated with the dimensions total of the story.	**0,85**
Non-Parallel Systems There is irregularity when in any of the directions of analysis, the lateral force-resisting elements are not parallel. It does not apply if the axes of frames or walls form angles less than 30°, or when non-parallel elements resist less than 10% of the story shear force.	**0,90**

3.7 Restrictions on Irregularity

3.7.1 Building Category and Irregularity

According to the building category and the area where it is located, it must be projected respecting the restrictions to the irregularity of Table N° 10.

Table N° 10
CATEGORY AND REGULARITY OF BUILDINGS

Building Category	Zone	Restrictions
A1 y A2	4, 3 & 2	No irregularities allowed
	1	No extreme irregularities allowed
B	4, 3 & 2	No extreme irregularities allowed
	1	No restrictions
C	4 & 3	No extreme irregularities allowed
	2	No extreme irregularities allowed, except in buildings up to 2 floors or 8 m in total height
	1	No restrictions

3.7.2 Transfer Systems

The transfer systems are structures of slabs and beams that transmit forces and moments from discontinuous vertical elements to others of the lower story.

In seismic zones 4, 3 and 2 structures with transfer system are not allowed in which more than 25% of gravity loads or seismic loads at any story are supported by vertical elements that are not continuous until the foundation. This provision does not apply to the last story of buildings.

3.8 Coefficient of Reduction of Seismic Forces, *R*

The coefficient of reduction of seismic forces will be determined as the product of the coefficient R_0 determined from Table Nº 7 and the factors I_a , I_p obtained from Tables Nº 8 and Nº 9.

$$R = R_0 \cdot I_a \cdot I_p$$

3.9 Seismic Isolated Systems and Dissipation Energy Systems

Seismic isolation systems or energy dissipation systems are permitted in the building, as long as they comply the provisions of Chapter II of this Standard are complied with, and to the extent that the requirements of the following document are applicable:

“Minimum Design Loads for Building and Other Structures”, ASCE/SEI 7, current edition, Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia, USA.

The installation of seismic isolation systems or energy dissipation systems shall be subject to specialized technical supervision by a civil engineer.

CHAPTER 4 STRUCTURAL ANALYSIS

4.1 General Considerations for the Analysis

For regular structures, the analysis can be made considering that the total of the seismic force is acting independently in two predominant orthogonal directions. For irregular structures should be assumed that the seismic force is acting in the most unfavorable direction for the design.

Vertical seismic forces are considered in the design of vertical elements, in very large horizontal elements, in post-stressed and pre-stressed elements and cantilevers of a building. It is considered that the vertical seismic force is acting in the elements simultaneously with the horizontal seismic force, and the analysis is made in the most unfavorable direction.

4.2 Models for the Analysis

The model for the analysis will consider an adequate spatial distribution of masses and stiffnesses to calculate the most significant aspects of the dynamic behavior of the structure.

For purposes of this Standard, reinforced concrete and masonry structures might be analyzed considering the inertia moment of its cross-section area, ignoring cracking and reinforcement rebars.

For buildings where can be assumed that floor systems work as rigid diaphragms, a lumped-mass model with three degrees of freedom, associated to two orthogonal components for horizontal translation and one component for rotation can be used. For that case the elements deformations must be coordinated through the rigid diaphragm condition, and the plan distribution of the horizontal forces must be done as a function of the stiffness of the resistant elements.

It should be verified that the diaphragms have enough stiffness and resistance to assure the distributions mentioned above, on the contrary, their flexibility for the seismic force distribution should be taken into account.

The model should include the partition walls that are not properly separated.

For stories that do not constitute rigid diaphragms, the resistant elements will be designed for the horizontal forces that directly correspond to them.

For the buildings in which its predominant structural elements are walls, a model that takes into consideration the interaction between walls in perpendicular directions should be considered (H walls, T walls and L walls).

4.3 Weight of the Structure (P)

The weight (P), will be calculated by adding to the permanent and total load of the structure a percentage of the live load that will be determined as following:

a. For buildings included in categories A and B, 50% of the live load shall be taken.
b. For buildings included in category C, 25% of the live load shall be taken
c. For depots, 80% of the total weight storaged can be taken.
d. For rooftops and floors 25% of the live load can be taken.
e. For tank, silos and similar structures 100% of the load they can support shall be considered.

4.4 Seismic Analysis Procedures

It should be used one of the following procedures:

- Static analysis or equivalent static forces (item 4.5).
- Spectral modal dynamic analysis (item 4.6).

The analysis will be made considering a model with a linear-elastic behavior and with the reduced seismic forces.

Time-history dynamic analysis procedure, described in item 4.7, can be used for verification purposes, but in no case it will be mandatory as a substitute of the procedures indicated in items 4.5 and 4.6.

4.5 Static Analysis or Equivalent Static Forces

4.5.1 Overview

This method represents the seismic forces through a system of horizontal forces acting in the mass center of each story of the building.

This procedure can be used to analyzed all the structures, regular or irregular, located in seismic zone 1, structures classified as regulars according to the item 3.5 with no more than 30 m of height and structures of reinforced concrete walls, reinforced masonry walls or confined masonry walls with no more than 15 m of height, even if they are irregulars.

4.5.2 Base Shear Force

The total shear force acting in the base of the structure, corresponding to the direction considered will be determined through the following expression:

$$V = \frac{Z \cdot U \cdot C \cdot S}{R} \cdot P$$

The minimum value for C/R should be considered:

$$\frac{C}{R} \geq 0,11$$

4.5.3 Seismic Force Distribution in Height

The horizontal seismic forces in any level i, corresponding to the direction considered, will be calculated through:

$$F_i = \alpha_i \cdot V$$

$$\alpha_i = \frac{P_i (h_i)^k}{\sum_{j=1}^{n} P_j (h_j)^k}$$

where n is the number of the stories of the building, k is an exponent related with the fundamental period of vibration of the structure (T), in the direction considered, which is calculated according as follows:

a) For T less than of equal to 0,5 seconds: k = 1,0.
b) For T greater than 0,5 seconds: k = (0,75 + 0,5 T) ≤ 2,0.

4.5.4 Fundamental Period of Vibration

The fundamental period of vibration for each direction will be estimated with the following expression:

$$T = \frac{h_n}{C_T}$$

Where:

C_T = 35 For buildings with resistant elements in the direction considered are only:

a) Reinforced concrete frames without shear walls.
b) Ductile steel frames with moment-resistant connections, without bracing.

C_T = 45 For buildings with resistant elements in the direction considered are:

a) Reinforced concrete frames with walls in the elevator boxes and stairs.
b) Braced steel frames.

C_T = 60 For masonry buildings and for all dual reinforced concrete buildings, with structural walls and low ductility walls.

Alternatively, it can be used the following expression:

$$T = 2\pi \cdot \sqrt{\frac{\left(\sum_{i=1}^{n} P_i \cdot d_i^2\right)}{\left(g \cdot \sum_{i=1}^{n} f_i \cdot d_i\right)}}$$

Where:

- f_i is the lateral force at level i corresponding to a distribution in height similar to the first mode in the direction of the analysis.
- d_i is the lateral displacement in the center of mass of level i in pure translation (restricting plan rotations) due to the forces f_i. the displacements will be calculated assuming a linear-elastic behavior of

the structure, and for the case of reinforced concrete and masonry structures, considering cross-section areas without cracking.

When the analysis does not consider the stiffness of the non-structural elements, the fundamental period T should be taken as 0,85 of the obtained value with the above formula.

4.5.5 Accidental Eccentricity

For structures with rigid diaphragm, the force acting in each level (F_i) will be assumed to be acting in the mass center of the corresponding level, and besides the eccentricity of the structure, the effect of the accidental eccentricity should be considered (for each direction of the analysis), as is indicated as follows:

a) In the mass center of each level, in addition to the acting static lateral force, an accidental moment (M_{ti}) will be applied and it will be calculated as:

$$M_{ti} = \pm F_i \cdot e_i$$

For each direction of analysis, the accidental eccentricity for each level (ei) will be considered as 0,05 times the building dimension in the perpendicular direction of the analysis.

b) It can be assumed that the most unfavorable conditions can be obtained considering the accidental eccentricities with the same sign for all stories. Only the increases of the horizontal forces can be considered but not the diminutions.

4.5.6 Vertical Seismic Forces

The vertical seismic force will be considered as a fraction of the weight equal to 2/3 $Z \cdot U \cdot S$.

In very large horizontal elements, including cantilevers, a dynamic analysis with spectrums defined in item 4.6.2 will be required.

4.6 Spectral Modal Dynamic Analysis

Any structure can be designed using the dynamic analysis results by spectral modal combination as specified in this item.

4.6.1 Modes of Vibration

The modes of vibration can be determined by an analysis procedure that considers appropriately the stiffness characteristics and mass distribution of the structure.

In each direction, the modes of vibration considered are those where the sum of effective masses is at least 90 % of the total mass, but at least the first three predominant modes in the direction of the analysis should be taken into account.

4.6.2 Spectral Acceleration

For each horizontal direction analyzed an inelastic spectra of pseudo-accelerations defined by the following expression will be used:

$$S_a = \frac{Z \cdot U \cdot C \cdot S}{R} \cdot g$$

For the analysis in the vertical direction a design spectra with values equal to 2/3 of the design spectra used for the horizontal directions, considering the values of C, defined in Section 2.5, except for the very short period zone ($T < 0.2T_P$) in which it is considered:

$$T < 0.2T_P \quad C = 1 + 7{,}5\left(\frac{T}{T_P}\right)$$

4.6.3 Combination Criterion

Through the combination criterion indicated, the expected maximum elastic response (r) can be determined for the internal forces in the elements of the structure as well as for the global parameters of the structure, such as the base shear force, story shears, overturning moments, total and relative story displacements.

The expected maximum elastic response (r) corresponding to the total effect of different modes of vibration used (r_i) can be determined by using the complete quadratic combination of the calculated values for each mode.

$$r = \sqrt{\sum\sum r_i \, \rho_{ij} \, r_j}$$

Where r represents the modal responses, displacements or forces. The correlation coefficients are defined by:

$$\rho_{ij} = \frac{8\beta^2 (1+\lambda)\lambda^{3/2}}{(1-\lambda^2)^2 + 4\beta^2 \lambda (1+\lambda)^2} \qquad \lambda = \frac{\omega_j}{\omega_i}$$

β, fraction of the critical damping, that can be assumed as a constant and equal to 0,05 for each mode

ω_i , ω_j are the angular frequencies corresponding to the modes i, j

Alternatively, the maximum response can be estimated through the following expressions:

$$r = 0{,}25 \cdot \sum_{i=1}^{m} |r_i| + 0{,}75 \cdot \sqrt{\sum_{i=1}^{m} r_i^2}$$

4.6.4 Minimum Shear Force

For each direction considered in the analysis, the shear force at the base of the building cannot be less than 80 % of the calculated value according to item 4.5 for regular structures, nor less than 90 % for irregular structures.

If it is necessary to increase the shear force to fulfill the minimum requirements indicated, all other results should be scaled appropriately, except the displacements.

4.6.5 Accidental Eccentricity (Torsional Effects)

The uncertainty in the location of the mass centers for each level can be considered through the accidental eccentricity perpendicular to the earthquake direction equal to 0,05 times the dimension of the building in the perpendicular direction to the analysis direction. For each case the most unfavorable sign should be considered.

4.7 Time – History Dynamic Analysis

The time-history dynamic analysis can be used as a complementary procedure of the specified procedures in items 4.5 y 4.6.

In this analysis type, a mathematical model of the structure that considers the histerecical behavior of the elements should be used, determining the response against a set of ground accelerations through direct integration of the equilibrium equations.

4.7.1 Acceleration Records

A set of three records of ground accelerations will be used at least for the analysis, each of them will include two components in orthogonal directions.

Each set of ground accelerations will contain a pair of components of horizontal accelerations, choosen and scaled from individual events. The accelerations records will be obtained from events whose magnitudes, distance to the fault and source mechanism are consistents with the maximum earthquake considered. When the required number of appropriate records are not available, synthetic records can be used to reach the required number.

For each pair of horizontal components of the ground motion, a pseudo-spectral acceleration will be generated, using the square root of the sum of the squares (SRSS) of the calculated spectral values for each component separately, with 5% of damping. Both components will be scaled by the same factor, so that in the range of periods between 0,2 T and 1.5 T (with T as the fundamental period), the average of the spectral values SRSS obtained for every set of records will not be less than the corresponding ordinate of the design spectrum, calculated according to item 4.6.2 with R = 1.

For the generation of the synthetic records, C values defined in the intem 2.5 should be considered, but not for a zone with very short periods ($T < 0,2\ T_P$), where the following expression will be considered:

$$T < 0,2\ T_P \qquad C = 1 + 7,5 \cdot \left(\frac{T}{T_P}\right)$$

4.7.2 Models for the Analysis

The spatial mass distribution of the structure should be presented correctly in the mathematical model.

The elements behavior will be modeled consistently with the laboratory test results, and it has to be taken into account the fluency, the strength degradation, the stiffness degradation, the pinching of the hysteretic curve and all the important aspects of the structural behavior shown by the tests.

The elements strength will be obtained based on the material strength expected values, hardening due to deformation and strength degradation due to the cyclic loading.

It is allowed to assume linear properties for those elements whose behavior remains in the elastic range as is shown by the analysis.

It is allowed to assume a viscous equivalent damping with a maximum value of 5 % of the critical damping, besides the dissipation due to the hysteretic behavior of the elements.

It can be assumed that the structure is perfectly fixed to the base, or alternatively, consider the flexibility of the foundations if applicable

4.7.3 Processing of the results

In case that at least seven set of ground motion records are used, the design forces, elements deformations and story drift, will be evaluated from the average of the corresponding maximum result obtained in the analysis. If the number of records used were less than seven, the design forces, the deformations and the story drift will be avaluated from the maximum values obtained in all the analysis.

The maximum story drift should not exceed 1,25 times the values indicated in Table Nº 11.

The elements deformations will not exceed 2/3 times of those for which they would lose their bearing capacity under vertical loads or for those that will get a strength reduction of more than 30 %.

To verify the element strength, the analysis result will be divided by R = 2, using the standards applicable for each material.

CHAPTER 5 STIFFNESS, STRENGTH AND DUCTILITY REQUIREMENTS

5.1 Determination of Lateral Displacements

For regular structures, the lateral displacements will be calculated multiplying by 0,75 R the result obtained from the lineal and elastic analysis with the reduced seismic stresses. For irregular structure, the lateral displacement will be calculated by multiplying by 0,85 R the result obtained from the linear elastic analysis.

For the calculation of lateral displacement, the minimum C/R indicated in the item 4.5.2 and the minimum base shear specified in the item 4.6.4 won’t be considered.

5.2 Permissible Lateral Displacements

The maximum relative story displacement, calculated according to item 5.1, should not exceed the fraction of the story height (Drift) indicated in Table N° 11.

Table N° 11
IMITIS FOR LATERAL STORY DISPLACEMENT

Predominant Material	(Δ_i / h_{ei})
Reinforced concrete	0,007
Steel	0,010
Masonry	0,005
Wood	0,010
Reinforced concrete building with law ductility wall	0,005

Note: The limits of distortion (Drift) for structures of industrial use will be established by the designer, but in no case they will exceed twice the values of this Table.

5.3 Seismic Separation Joints between Buildings (s)

Every structure should be separated from other close structure, from the level of natural area, a minimum distance s to avoid the contact during an earthquake

This distance will not be lower than 2/3 of the sum of maximum displacements of the adjacent building, nor lower than:

$$s = 0{,}006\, h \geq 0{,}03 \text{ m}$$

Where h is the height measure from the level of natural area to the level considered to evaluate s.

The building will be moved away from the adjacent properties, the distances will not less than 2/3 of the maximum displacement calculated according to item 5.1 nor less than s/2 if the existing building has a regulatory seismic joint. In the case that there is no regulatory seismic joint, the building should be separated from the existing building the value of $s/2$ that corresponds plus the value $s/2$ of the neighboring structure

5.4 Redundancy

When there is an element in the structure, wall or frame, where the force is 30% or more of the total horizontal base shear force acting in any inter story, the element shall be designed for 125% of that force.

5.5 Verification of the Ultimate Resistance

In case there is realized an analysis of the Ultimate Resistance it will be use the specification of the ASCE/SEI 41 SEISMIC REHABILITATION OF EXISTING BUILDINGS. This disposition does not constitute a requirement of this Standard.

CHAPTER 6 NON-STRUCTURAL ELEMETS, APENDIXES AND EQUIPMENT

6.1 Overview

Nonstructural elements are those that, whether connected or not to the system resistant to horizontal forces, contribute mass to the system but their contribution of the rigidity is not significant

For non-structural elements that are joined to the earthquake resistance structural system and should accompany the deformation of the structure, it must be ensured that in case of fault they should not cause damage

Within the nonstructural elements that must have adequate resistance and rigidity for seismic action they included.

- Fences, partitions, parapets, prefabricated panels.
- Architectural and decorative elements between ceilings veneers.
- Glasses and curtain wall
- Hydraulic and sanitary installations
- Electrical installations
- Gas installations.
- Mechanical equipment
- Furniture whose instability means a risk

6.2 Professional Responsibility

The professional who elaborate the different projects will be responsible for providing the nonstructural elements with adequate resistance and rigidity for seismic action

6.3 Forces of Design

Nonstructural elements, the anchor, and connection will have to be designed to resistance a seismic horizontal force in any direction (F) associated to his weight (P_e), whose resultant one be able to be supposed applied in the center of masses of the element, as indicated then.

$$F = \frac{a_i}{g} \cdot C_1 \cdot P_e$$

Where a_i is the horizontal acceleration at the level where the nonstructural element is supported, or anchored, to the structural system of the building. This acceleration depends on the dynamic characteristic of the structural system of the building and must be evaluated by means of a dynamic analysis of the structure.

Alternatively the following equation can be used:

$$F = \frac{F_i}{P_i} \cdot C_1 \cdot P_e$$

Where F_i is the lateral force in the level where the nonstructural element is calculated according to the numeral 4.5 and P_i the weight of the above mentioned level.

The values of C_1 will be taken from Table N° 12.

Table N° 12 VALUES OF C_1	
- Elements that on having failed outside they could precipitate out of the building and whish fault contain danger for people or other structures.	3,0
- Walls and partitions inside of building	2,0
- Tanks on the roof, house of machine, pergolas, parapets in the	3,0
- Rigid equipment connected rigitly to the floor	1,5

To calculate the forces of design on wall, partitions and in general nonstructural elements design with distributed mas, the force F will be taken a distributed load uniform by a unit area. For wall and partitions supported horizontally in two consecutive levels, the average of the acceleration of the two levels will be taken.

6.4 Mínimum Horizontal Force

In no level of the building the force F calculated with the item 6.3 will be less than $0{,}5 \cdot Z \cdot U \cdot S \cdot P_e$.

6.5 Vertical Seismic Forces

The seismic vertical force will be considered to be 2/3 times the horizontal stress.

For equipment supported by elements of big lights elements, including floats, a dynamic analysis shall be required with the spectra defined in the item 4.6.2.

6.6 Non Structural Elements Located on Base of Structure, Under Base and Fences

Nonstructural elements located at or below the base of the structure (Basement) and fences shall be designed with horizontal force calculated with:

$$F = 0{,}5 \cdot Z \cdot U \cdot S \cdot P_e$$

6.7 Other Structures

For Signs, chimneys, tower and communication antennas installed at any level of the building, the design strength will be established considering the dynamic properties of the building and the structure it be installed. The design strength should not be less than the correspondent to the calculated one with the methodology proposed in this chapter with a minimum value of C_1 of 3,0.

6.8 Design using the Method of Admissible Stresses

When a nonstructural element or the anchor are designed using the Method of Admissible Stresses, the seismic forces defined in this chapter shall be multiplying by 0,8.

CHAPTER 7 FOUNDATIONS

7.1 Overview

The structure support assumptions must be in accordance with the foundation subsoil characteristics.

The applied pressure on soil used in the Allowable Strength Design (ASD) must be determined using the forces obtained from the seismic analysis factored by 0.8.

7.2 Bearing Capacity

Every Geotechnical study must consider the effects of earthquake to obtain the bearing capacity of soil foundations. In case of soil prones to liquefaction, the geotechnical prospection and geotechnical study must evaluate the liquefaction potential and the proper solution.

7.3 Overturning Moment

Both the superstructure and foundation must be designed against seismic overturning moment following items 4.5 or 4.6. The safety factor of forces result of the application of this Manual must be greater than or equal to 1.2.

7.4 Foundations on soft or low bearing capacity soils

Isolated foundation and piles into soils type S_3 y S_4 located in Zone 4 and 3 must have connection elements between them, which must bear in traction and compression, a minimum horizontal load equal to 10% the applied vertical load to foundation.

Beam foundations in both directions must be provided in case of soils of bearing capacity less than 0,15 MPa.

In case of piles and caisson beam fundations must be used or, piles and isolated foundations must be designed taken in account rotation and deformation caused by the horizontal force. Piles must have a tensile steel reinforcement equal to at least 15% the bearing vertical load.

CHAPTER 8 EVALUATION, REHABILITATION AND RETROFITTING OF STRUCTURES

The damage structures by earthquakes shall be evaluated, rehabilitated or retrofitted in order to correct structural defects and recovery the capacity to resist a new seismic event, following the seismic design philosophy specified in Chapter 1.

8.1 Evaluation of structures after an earthquake

After a seismic event, the structure shall be evaluated by a civil engineer, who should decide if the structure is in good condition or need retrofitting, strengthening or demolition. The study shall consider geotechnical characteristics of site.

8.2 Rehabilitation and retrofitting

The rehabilitation or retrofitting shall provide adequate combination of stiffness, resistance and ductility to the structure to improve the behavior due earthquakes.

The rehabilitation or retrofitting project will include the details, procedures and constructive system to follow.

The seismic rehabilitation and retrofitting of structures follow guidelines of National Building Regulation (RNE). Only in exceptional cases may be used other criteria or procedures different to RNE, with technical justification and approval of the owner and the competent authority.

Essential buildings may be intervene using the criteria of incremental seismic retrofit and to extent applicable, using established criteria in the guideline “Engineering Guideline for Incremental Rehabilitation”, FEMA P-420, Risk Management Series, USA 2009.

CHAPTER 9 INSTRUMENTATION

9.1 Accelerometric Stations

An accelerometer station is a secure space with sufficient area, housing a triaxial acceleration sensor, a signal recording, storage, and transmission system from the recording point to the processing center. The station must have suitable conditions for accurately recording seismic vibrations, with controlled timing, and stable and secure electrical power.

The accelerometer stations are provided by the owner and must comply with the technical specifications set by the Geophysical Institute of Peru (IGP), according to the document "Technical Specifications for Accelerometric Recorders and Minimum Requirements for their Installation, Operation, and Maintenance."

Buildings that, individually or collectively, have a roofed area equal to or greater than 10,000 m2, must have an accelerometer station installed at ground level or at the base of the building.

For buildings with more than 20 floors or those equipped with seismic dissipation or base isolation devices, regardless of their height, an additional accelerometer station is required. This station should be installed at the roof or at the level immediately below the roof in addition to the one at the base.

The implementation of what is established in this section is part of the other operational facilities of the common assets and services on the habitable core level of the building.

9.2 Location requirements

The accelerometric station shall be install at a suitable area, with easy access for maintenance and proper illumination, ventilation, stabilized power supply.

The area shall be away from sources that generate any type of anthropic noise.

The instrumentation plan shall prepare by designers of each specialty and clearly indicated in the architectural, structures and installation planes of the building.

9.3 Maintenance

The operational maintenance of the parts, components consumables, service of instruments, shall be provided by the buildings/department owner, under municipality control and shall be supervised by the IGP. Responsibility owner will be maintained for 10 years.

9.4 Data availability

Recorded information by the instruments will be integrated to the National Geophysical Data Center and will be available to the public.

APPENDIX N° 1 SUGGESTED PROCEDURE FOR THE DETERMINATION OF SEISMIC ACTIONS

Seismic actions for structural design depend on the seismic zone (Z), soil profile (S, T_P, T_L), building usage (U), seismic-resistant system (R), dynamic characteristics of the building (T, C), and its weight (P).

STAGE 1: SEISMIC HAZARD (Chapter II)

The steps in this stage depend solely on the location and characteristics of the project's foundation terrain. They are not influenced by the building's characteristics.

Step 1: Zone Factor Z (section 2.1)
Determine the seismic zone where the project is located based on the seismic zoning map (Figure No. 1) or the Table of provinces and districts in APPENDIX N°02. Determine the zone factor (Z) according to Table No. 1.

Step 2: Soil Profile (section 2.3)
Based on the results of the Soil Mechanics Study (SMS), determine the type of soil profile according to section 2.3.1, which defines 5 soil profiles. The classification is based on parameters indicated in Table No. 2, considering averages for the strata within the first 30 m below the foundation level. When soil properties are not known to a depth of 30 m, the professional responsible for the SMS determines the soil profile type based on known geotechnical conditions.

Step 3: Site Parameters S, TP, and TL (section 2.4)
The soil amplification factor is obtained from Table No. 3 and depends on the seismic zone and the type of soil profile. The periods T_P and T_L are obtained from Table No. 4 and depend solely on the type of soil profile.

Step 4: Construct the Seismic Amplification Factor C versus Period T Function (section 2.5)
It depends on the site parameters T_P and T_L. Three ranges are defined: short, intermediate, and long periods, and the expressions in this section are applied to each range.

STAGE 2: BUILDING CHARACTERIZATION (Chapter III)

The steps in this stage depend on the characteristics of the building, such as its category, structural system, and regular or irregular configuration.

Step 5: Building Category and Usage Factor U (section 3.1)
The building category and the usage factor (U) are obtained from Table No. 5.

Step 6: Structural System (sections 3.2 and 3.3)
Determine the structural system according to the definitions in section 3.2. Table No. 6 (section 3.3) defines the allowed structural systems based on the building category and the seismic zone in which it is located.

Step 7: Basic Seismic Force Reduction Coefficient, R_0 (section 3.4)
Obtain the value of the coefficient R_0 from Table No. 7, which depends solely on the structural system.

Step 8: Irregularity Factors I_a, I_p (section 3.6)
The factor I_a is determined as the minimum of the values in Table No. 8 corresponding to height irregularities. The factor I_p is determined as the minimum of the values in Table No. 9 corresponding to plan irregularities. In most cases, it can be determined whether a structure is regular or irregular based on its structural configuration. However, in cases

of Stiffness Irregularity and Torsional Irregularity, it is verified with the results of the seismic analysis as indicated in the description of these irregularities.

Step 9: Irregularity Constraints (section 3.7)
Verify the irregularity constraints according to the building category and zone in Table No. 10. Modify the structure if the constraints in this table are not met.

Step 10: Seismic Force Reduction Coefficient R (section 3.8)
Determine $R = R_0 \cdot I_a \cdot I_p$

STAGE 3: STRUCTURAL ANALYSIS (Chapter IV)
In this stage, the structural analysis is carried out. Criteria for developing the mathematical model of the structure are suggested, the calculation of the building's weight is outlined, and analysis procedures are defined.

Step 11: Analysis Models (section 4.2)
Develop the mathematical model of the structure. For reinforced concrete and masonry structures, consider the properties of gross sections, ignoring cracking and reinforcement.

Step 12: Estimation of Weight P (section 4.3)
Determine the weight (P) for the seismic force calculation by adding to the total permanent load a percentage of the live load, which depends on the usage and category of the building, as defined according to the information in this section.

Step 13: Seismic Analysis Procedures (section 4.4 to 4.7)
The analysis procedures considered in this Standard are defined, which include static analysis (section 4.5) and modal spectral dynamic analysis (section 4.8).

Step 13A: Static Analysis (section 4.5)
This procedure is only applicable to structures that meet the requirements stated in section 4.5.1. The static analysis involves the following steps:

- Calculate the base shear $V = \frac{Z \cdot U \cdot C \cdot S}{R} \cdot P$ for each direction of analysis (section 4.5.2).
- To determine the value of C (Step 4 or section 2.5), estimate the fundamental vibration period of the structure (T) in each direction (section 4.5.4).
- Determine the distribution of seismic force over the height for each direction (section 4.5.3).
- Apply the obtained forces at the center of mass of each floor. Additionally, consider accidental torsional moments (section 4.5.5).
- Consider vertical seismic forces (section 4.5.6) for elements where necessary.

Step 13B: Dynamic Analysis (section 4.6)
If choosing or required to conduct a modal spectral dynamic analysis, the following steps should be taken:

- Determine the modes of vibration and their corresponding natural periods and participating masses through dynamic analysis of the mathematical model (section 4.6.1).
- Calculate the inelastic spectrum of pseudo-accelerations $S_a = \frac{Z \cdot U \cdot C \cdot S}{R} \cdot g$ for each analysis direction (section 4.6.2).
- Consider accidental eccentricity (section 4.6.5).
- Determine all force and displacement results for each mode of vibration.

- Determine the maximum expected response corresponding to the combined effect of the considered modes (section 4.6.3).
- Scale all force results (section 4.6.4) considering a minimum shear at the first floor that is a percentage of the shear calculated for the static method (section 4.6.3). Do not scale displacement results.
- Consider vertical seismic forces (section 4.6.2) using a spectrum with values equal to 2/3 of the most critical spectrum for horizontal directions, for elements where necessary.

STAGE 4: STRUCTURAL VALIDATION
Based on the analysis results, it is determined whether the proposed structure is valid, ensuring that it complies with the regularity and stiffness requirements outlined in this chapter.

Step 14: Review of Analysis Assumptions
With the results of the analyses, review the irregularity factors applied in step 8. Based on these, verify whether the values of R remain unchanged or are modified. In the case of using the static analysis procedure, verify what is indicated in section 4.5.1.

Step 15: Irregularity Constraints (section 3.7)
Verify the irregularity constraints according to the building category and zone in Table No. 10. If there are irregularities or extreme irregularities in buildings where they are not allowed according to that table, modify the structure and repeat the analysis until a satisfactory result is achieved.

Step 16: Determination of Lateral Displacements (section 5.1)
Calculate the lateral displacements according to the instructions in this section.

Step 17: Allowable Distortion (section 5.2)
Verify that the maximum interstory drift obtained in the structure with the calculated displacements from the previous step is less than the values indicated in Table No. 11. If not satisfied, review the structure and repeat the analysis until the requirement is met.

Step 18: Building Separation (section 5.3)
Determine the minimum separation to other buildings or the property boundary according to the instructions in this section.

APPENDIX N° 2 SEISMIC ZONATION

The seismic zones in wich the Peruvian territory is divided, for the puspose of this standartd are shown in Figure 1

The provinces of each area are specified as follows:

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LORETO	MARISCAL RAMON CASTILLA	RAMON CASTILLA	1	ALL DISTRICTS
		PEBAS		
		SAN PABLO		
		YAVARI		
	MAYNAS	ALTO NANAY	1	ALL DISTRICTS
		BELÉN		
		FERNANDO LORES		
		INDIANA		
		IQUITOS		
		LAS AMAZONAS		
		MAZÁN		
		NAPO		
		PUNCHANA		
		PUTUMAYO		
		SAN JUAN BAUTISTA		
		TNTE. MANUEL CLAVERO		
		TORRES CAUSANA		
	REQUENA	SAQUENA	1	ONE DISTRICT
		REQUENA	2	TEN DISTRICTS
		CAPELO		
		SOPLÍN		
		TAPICHE		
		JENARO HERRERA		
		YAQUERANA		
		ALTO TAPICHE		
		EMILIO SAN MARTÍN		
		MAQUÍA		
		PUINAHUA		
	LORETO	NAUTA	2	ALL DISTRICTS
		PARINARI		
		TIGRE		
		TROMPETEROS		
		URARINAS		
	ALTO AMAZONAS	LAGUNAS	2	ONE DISTRICT
		YURIMAGUAS	3	FIVE DISTRICTS
		BALSAPUERTO		
		JEBEROS		
		SANTA CRUZ		
		TNTE. CÉSAR LOPEZ ROJAS		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LORETO	UCAYALI	CONTAMANA	2	ALL DISTRICTS
		INAHUAYA		
		PADRE MÁRQUEZ		
		PAMPA HERMOSA		
		SARAYACU		
		ALFREDO VARGAS GUERRA		
		YANAYACU		
	DATEM DEL MARAÑON	MANSERICHE	2	FOUR DISTRICTS
		MORONA		
		PASTAZA		
		ANDOAS		
		BARRANCA	3	TWO DISTRICTS
		CAHUAPANAS		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
UCAYALI	PURÚS	PURÚS	1	ONE DISTRICT
	ATALAYA	RAIMONDI	2	ALL DISTRICTS
		SEPAHUA		
		TAHUANÍA		
		YURÚA		
	PADRE ABAD	CURIMANÁ	2	ALL DISTRICTS
		IRAZOLA		
		PADRE ABAD		
	CORONEL PORTILLO	CALLERÍA	2	ALL DISTRICTS
		CAMPOVERDE		
		IPARÍA		
		MANANTAY		
		MASISEA		
		NUEVA REQUENA		
		YARINACOCHA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
MADRE DE DIOS	TAMBOPATA	INAMBARI	1	ALL DISTRICTS
		LABERINTO		
		LAS PIEDRAS		
		TAMBOPATA		
	TAHUAMANU	IBERIA	1	ALL DISTRICTS
		IÑAPARI		
		TAHUAMANU		
	MANU	FITZCARRALD	2	ALL DISTRICTS
		HUEPETUHE		
		MADRE DE DIOS		
		MANU		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
PUNO	SANDIA	ALTO INAMBARI	1	THREE DISTRICTS
		SAN JUAN DEL ORO		
		YANAHUAYA		
		CUYOCUYO	2	SEVEN DISTRICTS
		LIMBANI		
		PATAMBUCO		
		PHARA		
		QUIACA		
		SAN PEDRO DE PUTINA PUNCO		
		SANDIA		
	SAN ANTONIO DE PUTINA	ANANEA	2	ALL DISTRICTS
		QUILCAPUNCU		
		SINA		
		PEDRO VILCA APAZA		
		PUTINA		
	CARABAYA	AYAPATA	2	ALL DISTRICTS
		COASA		
		CRUCERO		
		ITUATA		
		SAN GABÁN		
		USICAYOS		
		AJOYANI		
		CORANI		
		MACUSANI		
		OLLACHEA		
	HUANCANÉ	COJATA	2	ALL DISTRICTS
		HUANCANÉ		
		HUATASANI		
		INCHUPALLA		
		PUSI		
		ROSASPATA		
		TARACO		
		VILQUE CHICO		
	MOHO	HUAYRAPATA	2	ALL DISTRICTS
		MOHO		
		CONIMA		
		TILALI		
	PUNO	COATA	2	THREE DISTRICTS
		CAPACHICA		
		AMANTANI		
		ACORA	3	TWELVE DISTRICTS
		ATUNCOLLA		
		CHUCUITO		
		HUATA		
		MAÑAZO		
		PAUCARCOLLA		
		PICHACANI		
		PLATERIA		
		PUNO		
		SAN ANTONIO		
		TIQUILLACA		
		VILQUE		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
PUNO	AZÁNGARO	AZÁNGARO	2	ALL DISTRICTS
		ACHAYA		
		ARAPA		
		ASILLO		
		CAMINACA		
		CHUPA		
		JOSÉ DOMINGO CHOQUEHUANCA		
		MUÑANI		
		POTONI		
		SAMAN		
		SAN ANTON		
		SAN JOSÉ		
		SAN JUAN DE SALINAS		
		SANTIAGO DE PUPUJA		
		TIRAPATA		
	CHUCUITO	DESAGUADERO	3	ALL DISTRICTS
		HUACULLANI		
		JULI		
		KELLUYO		
		PISACOMA		
		POMATA		
		ZEPITA		
	EL COLLAO	CAPAZO	3	ALL DISTRICTS
		CONDURIRI		
		ILAVE		
		PILCUYO		
		SANTA ROSA		
	LAMPA	CALAPUJA	2	THREE DISTRICTS
		NICASIO		
		PUCARÁ		
		CABANILLA	3	SEVEN DISTRICTS
		LAMPA		
		OCUVIRI		
		PALCA		
		PARATIA		
		SANTA LUCÍA		
		VILAVILA		
	MELGAR	ANTAUTA	2	ALL DISTRICTS
		AYAVIRI		
		CUPI		
		LLALLI		
		MACARI		
		NUÑOA		
		ORURILLO		
		SANTA ROSA		
		UMACHIRI		
	SAN ROMÁN	JULIACA	3	ALL DISTRICTS
		CABANA		
		CABANILLAS		
		CARACOTO		
	YUNGUYO	YUNGUYO	3	ALL DISTRICTS
		ANAPIA		
		COPANI		
		CUTURAPI		
		OLLARAYA		
		TINICACHI		
		UNICACHI		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AMAZONAS	CAHACHAPOYAS	ASUNCION	2	ALL DISTRICTS
		BALSAS		
		CHACHAPOYAS		
		CHETO		
		CHILIQUÍN		
		CHUQUIBAMBA		
		GRANADA		
		HUANCAS		
		LA JALCA		
		LEVANTO		
		LEYMEBAMBA		
		MAGDALENA		
		MARISCAL CASTILLA		
		MOLINOPAMPA		
		MONTEVIDEO		
		OLLEROS		
		QUINJALCA		
		SAN FRANCISCO DE DAGUAS		
		SAN ISIDRO DE MAINO		
		SOLOCO		
		SONCHE		
	BAGUA	ARAMANGO	2	ALL DISTRICTS
		BAGUA		
		COPALLIN		
		EL PARCO		
		IMAZA		
		LA PECA		
	BONGARÁ	CHISQUILLA	2	ALL DISTRICTS
		CHURUJA		
		COROSHA		
		CUISPES		
		FLORIDA		
		JAZAN		
		JUMBILLA		
		RECTA		
		SAN CARLOS		
		SHIPASBAMBA		
		VALERA		
		YAMBRASBAMBA		
	CONDORCANQUI	EL CENEPA	2	ALL DISTRICTS
		NIEVA		
		RÍO SANTIAGO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AMAZONAS	LUYA	CAMPORREDONDO	2	ALL DISTRICTS
		COCABAMBA		
		COLCAMAR		
		CONILA		
		INGUILPATA		
		LAMUD		
		LONGUITA		
		LONYA CHICO		
		LUYA		
		LUYA VIEJO		
		MARÍA		
		OCALLI		
		OCUMAL		
		PISUQUÍA		
		PROVIDENCIA		
		SAN CRISTOBAL		
		SAN FRANCISCO DEL YESO		
		SAN JERONIMO		
		SAN JUAN DE LOPECANCHA		
		SANTA CATALINA		
		SANTO TOMÁS		
		TINGO		
		TRITA		
	UTCUBAMBA	BAGUA GRANDE	2	ALL DISTRICTS
		CAJARURO		
		CUMBA		
		EL MILAGRO		
		JAMALCA		
		LONYA GRANDE		
		YAMON		
	RODRÍGUEZ DE MENDOZA	CHIRIMOTO	2	ELEVEN DISTRICTS
		COCHAMAL		
		HUAMBO		
		LIMABAMBA		
		LONGAR		
		MARISCAL BENAVIDES		
		MILPUC		
		OMIA		
		SAN NICOLÁS		
		SANTA ROSA		
		TOTORA		
		VISTA ALEGRE	3	ONE DISTRICT

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
SAN MARTÍN	BELLAVISTA	BELLAVISTA	2	ALL DISTRICTS
		ALTO BIAVO		
		BAJO BIAVO		
		HUALLAGA		
		SAN PABLO		
		SAN RAFAEL		
	HUALLAGA	SAPOSOA	2	ALL DISTRICTS
		EL ESLABON		
		PISCOYACU		
		SACANCHE		
		TINGO DE SAPOSOA		
		ALTO SAPOSOA		
	LAMAS	LAMAS	3	ALL DISTRICTS
		ALONSO DE ALVARADO		
		BARRANQUILLA		
		CAYNARACHI		
		CUÑUMBUQUI		
		PINTO RECODO		
		RUMISAPA		
		SAN ROQUE DE CUMBAZA		
		SHANAO		
		TABALOSOS		
		ZAPATEROS		
	MARISCAL CÁCERES	JUANJUÍ	2	ALL DISTRICTS
		CAMPANILLA		
		HUICUNGO		
		PACHIZA		
		PAJARILLO		
		JUANJUICILLO		
	PICOTA	PICOTA	2	ALL DISTRICTS
		BUENOS AIRES		
		CASPISAPA		
		PILLUANA		
		PUCACACA		
		SAN CRISTOBAL		
		SAN HILARION		
		SHAMBOYACU		
		TINGO DE PONAZA		
		TRES UNIDOS		
	MOYOBAMBA	MOYOBAMBA	3	ALL DISTRICTS
		CALZADA		
		HABANA		
		JEPELACIO		
		SORITOR		
		YANTALO		
	RIOJA	RIOJA	3	ALL DISTRICTS
		AWAJÚN		
		ELÍAS SOPLÍN VARGAS		
		NUEVA CAJAMARCA		
		PARDO MIGUEL		
		POSIC		
		SAN FERNANDO		
		YORONGOS		
		YURACYACU		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
SAN MARTÍN	SAN MARTÍN	CHIPURANA	2	FOUR DISTRICTS
		EL PORVENIR		
		HUIMBAYOC		
		PAPAPLAYA		
		TARAPOTO	3	TEN DISTRICTS
		ALBERTO LEVEU		
		CACATACHI		
		CHAZUTA		
		JUAN GUERRA		
		LA BANDA DE SHILCAYO		
		MORALES		
		SAN ANTONIO		
		SAUCE		
		SHAPAJA		
	TOCACHE	TOCACHE	2	ALL DISTRICTS
		NUEVO PROGRESO		
		POLVORA		
		SHUNTE		
		UCHIZA		
	EL DORADO	SAN JOSÉ DE SISA	3	ALL DISTRICTS
		AGUA BLANCA		
		SAN MARTÍN		
		SANTA ROSA		
		SHANTOJA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
HUÁNUCO	HUÁNUCO	HUÁNUCO	2	ALL DISTRICTS
		AMARILIS		
		CHINCHAO		
		CHURUMBAMBA		
		MARGOS		
		PILLCO MARCA		
		QUISQUI		
		SAN FRANCISCO DE CAYRÁN		
		SAN PEDRO DE CHAULÁN		
		SANTA MARÍA DEL VALLE		
		YARUMAYO		
		YACUS		
	HUACAYBAMBA	HUACAYBAMBA	2	ALL DISTRICTS
		CANCHABAMBA		
		COCHABAMBA		
		PINRA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
HUÁNUCO	**LEONCIO PRADO**	RUPA-RUPA	**2**	ALL DISTRICTS
		JOSÉ CRESPO Y CASTILLO		
		MARIANO DÁMASO BERAÚN		
		DANIEL ALOMÍA ROBLES		
		FELIPE LUYANDO		
		HERMILIO VALDIZÁN		
	MARAÑON	HUACACHUCRO	**2**	ALL DISTRICTS
		CHOLON		
		SAN BUENAVENTURA		
	PUERTO INCA	PUERTO INCA	**2**	ALL DISTRICTS
		CODO DEL POZUZO		
		HONORIA		
		TOURNAVISTA		
		YUYAPICHIS		
	YAROWILCA	CHAVINILLO	**2**	ALL DISTRICTS
		CAHUAC		
		CHACABAMBA		
		CHUPAN		
		JACAS CHICO		
		OBAS		
		PAMPAMARCA		
		CHORAS		
	PACHITEA	PANAO	**2**	ALL DISTRICTS
		CHAGLLA		
		MOLINO		
		UMARI		
	AMBO	AMBO	**2**	ALL DISTRICTS
		CAYNA		
		COLPAS		
		CONCHAMARCA		
		HUÁCAR		
		SAN FRANCISCO		
		SAN RAFAEL		
		TOMAY KICHWA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
HUÁNUCO	HUAMALÍES	ARANCAY	2	EIGHT DISTRICTS
		CHAVÍN DE PARIARCA		
		JACAS GRANDE		
		JIRCAN		
		MONZON		
		PUNCHAO		
		SINGA		
		TANTAMAYO		
		LLATA	3	THREE DISTRICTS
		MIRAFLORES		
		PUÑOS		
	DOS DE MAYO	CHUQUIS	2	THREE DISTRICTS
		MARÍAS		
		QUIVILLA		
		LA UNION	3	SIX DISTRICTS
		PACHAS		
		RIPÁN		
		SHUNQUI		
		SILLAPATA		
		YANAS		
	LAURICOCHA	BAÑOS	3	ALL DISTRICTS
		JESÚS		
		JIVIA		
		QUEROPALCA		
		RONDOS		
		SAN FRANCISCO DE ASÍS		
		SAN MIGUEL DE CAURI		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
PASCO	OXAPAMPA	OXAPAMPA	2	ALL DISTRICTS
		CHONTABAMBA		
		HUANCABAMBA		
		PALCAZU		
		POZUZO		
		PUERTO BERMÚDEZ		
		VILLA RICA		
	PASCO	HUACHON	2	EIGHT DISTRICTS
		HUARIACA		
		NINACACA		
		PALLANCHACRA		
		PAUCARTAMBO		
		SAN FRANCISCO DE ASÍS DE YARUSYACÁN		
		TICLACAYÁN		
		YANACANCHA		
		CHAUPIMARCA (c. de Pasco)	3	FIVE DISTRICTS
		HUAYLLAY		
		SIMON BOLIVAR		
		TINYAHUARCO		

		VICCO		
	DANIEL A. CARRION	YANAHUANCA	3	ALL DISTRICTS
		CHACAYAN		
		GOYLLARISQUIZGA		
		PAUCAR		
		SAN PEDRO DE PILLAO		
		SANTA ANA DE TUSI		
		TAPUC		
		VILCABAMBA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
JUNÍN	CHANCHAMAYO	CHANCHAMAYO	2	ALL DISTRICTS
		PERENÉ		
		PICHANAQUI		
		SAN LUIS DE SHUARO		
		SAN RAMON		
		VITOC		
	SATIPO	COVIRIALI	2	ALL DISTRICTS SIX DISTRICTS
		LLAYLLA		
		MAZAMARI		
		PAMPA HERMOSA		
		PANGOA		
		RÍO NEGRO		
		RÍO TAMBO		
		SATIPO		
	TARMA	ACOBAMBA	2	SEIS DISTRITOS THREE DISTRICTS
		HUASAHUASI		
		PALCA		
		PALCAMAYO		
		SAN PEDRO DE CAJAS		
		TAPO		
		HUARICOLCA	3	TRES DISTRITOS
		LA UNION		
		TARMA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
JUNÍN	CONCEPCION	ANDAMARCA	2	FOUR DISTRICTS
		COCHAS		
		COMAS		
		MARISCAL CASTILLA		
		ACO	3	ELEVEN DISTRICTS
		CHAMBARA		
		CONCEPCION		
		HEROÍNAS DE TOLEDO		
		MANZANARES		
		MATAHUASI		
		MITO		
		NUEVE DE JULIO		
		ORCOTUNA		
		SAN JOSÉ DE QUERO		
		SANTA ROSA DE OCOPA		
	CHUPACA	AHUAC	3	ALL DISTRICTS
		CHONGOS BAJO		
		CHUPACA		
		HUACHAC		
		HUAMANCACA CHICO		
		SAN JUAN DE JARPA		
		SAN JUAN DE YSCOS		
		TRES DE DICIEMBRE		
		YANACANCHA		
	HUANCAYO	PARIAHUANCA	2	TWO DISTRICTS
		SANTO DOMINGO DE ACOBAMBA		
		CARHUACALLANGA	3	TWENTY SIX DISTRICTS
		CHACAPAMPA		
		CHICCHE		
		CHILCA		
		CHONGOS ALTO		
		CHUPURO		
		COLCA		
		CULLHUAS		
		EL TAMBO		
		HUACRAPUQUIO		
		HUALHUAS		
		HUANCAN		
		HUANCAYO		
		HUASICANCHA		
		HUAYUCACHI		
		INGENIO		
		PILCOMAYO		
		PUCARA		
		QUICHUAY		
		QUILCAS		
		SAN AGUSTÍN		
		SAN JERONIMO DE TUNÁN		
		SAÑO		
		SAPALLANGA		
		SICAYA		
		VIQUES		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
JUNÍN	JAUJA	APATA	2	FOUR DISTRICTS
		MOLINOS		
		MONOBAMBA		
		RICRAN		
		ACOLLA	3	THIRTY
		ATAURA		
		CANCHAYLLO		
		CURICACA		
		EL MANTARO		
		HUAMALI		
		HUARIPAMPA		
		HUERTAS		
		JANJAILLO		
		JAUJA		
		JULCAN		
		LEONOR ORDOÑEZ		
		LLOCLLAPAMPA		
		MARCO		
		MASMA		
		MASMA CHICCHE		
		MUQUI		
		MUQUIYAUYO		
		PACA		
		PACCHA		
		PANCÁN		
		PARCO		
		POMACANCHA		
		SAN LORENZO		
		SAN PEDRO DE CHUNAN		
		SAUSA		
		SINCOS		
		TUNANMARCA		
		YAULI		
		YAUYOS		
	JUNÍN	CARHUAMAYO	2	TWO DISTRICTS
		ULCUMAYO		
		JUNÍN	3	TWO DISTRICTS
		ONDORES		
	YAULI	CHACAPALPA	3	ALL DISTRICTS
		HUAY-HUAY		
		LA OROYA		
		MARCAPOMACOCHA		
		MOROCOCHA		
		PACCHA		
		SANTA BÁRBARA DE CARHUACAYÁN		
		SANTA ROSA DE SACCO		
		SUITUCANCHA		
		YAULI		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CUSCO	CALCA	CALCA	2	ALL DISTRICTS
		COYA		
		LAMAY		
		LARES		
		PÍSAC		
		SAN SALVADOR		
		TARAY		
		YANATILE		
	URUBAMBA	CHINCHERO	2	ALL DISTRICTS
		HUAYLLABAMBA		
		MACHU PICCHU		
		MARAS		
		OLLANTAYTAMBO		
		URUBAMBA		
		YUCAY		
	PAUCARTAMBO	CAICAY	2	ALL DISTRICTS
		CHALLABAMBA		
		COLQUEPATA		
		HUANCARANI		
		KOSÑIPATA		
		PAUCARTAMBO		
	ANTA	ANCAHUASI	2	ALL DISTRICTS
		ANTA		
		CACHIMAYO		
		CHINCHAYPUJIO		
		HUAROCONDO		
		LIMATAMBO		
		MOLLEPATA		
		PUCYURA		
		ZURITE		
	QUISPICANCHIS	ANDAHUAYLILLAS	2	ALL DISTRICTS
		CAMANTI		
		CCARHUAYO		
		CCATCA		
		CUSIPATA		
		HUARO		
		LUCRE		
		MARCAPATA		
		OCONGATE		
		OROPESA		
		QUIQUIJANA		
		URCOS		
	PARURO	ACCHA	2	ALL DISTRICTS
		CCAPI		
		COLCHA		
		HUANOQUITE		
		OMACHA		
		PACCARITAMBO		
		PARURO		
		PILLPINTO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CUSCO	CANCHIS	ALTO PICHIGUA	2	ALL DISTRICTS
		COMBAPATA		
		MARANGANI		
		PITUMARCA		
		SAN PABLO		
		SAN PEDRO		
		SUYCKUTAMBO		
		TINTA		
	CANAS	CHECCA	2	ALL DISTRICTS
		KUNTURKANKI		
		LANGUI		
		LAYO		
		PAMPAMARCA		
		QUEHUE		
		TÚPAC AMARU		
		YANAOCA		
	ACOMAYO	ACOMAYO	2	ALL DISTRICTS
		ACOPIA		
		ACOS		
		MOSOC LLACTA		
		POMACANCHI		
		RONDOCAN		
		SANGARARÁ		
	CUSCO	CCORCA	2	ALL DISTRICTS
		CUSCO		
		POROY		
		SAN JERONIMO		
		SAN SEBASTIÁN		
		SANTIAGO		
		SAYLLA		
		WANCHAQ		
	LA CONVENCION	ECHERATE	2	ALL DISTRICTS
		HUAYOPATA		
		MARANURA		
		OCOBAMBA		
		PICHARI		
		QUELLOUNO		
		QUIMBIRI		
		SANTA ANA		
		SANTA TERESA		
		VILCABAMBA		
	CHUMBIVILCAS	CAPACMARCA	2	FOUR DISTRICTS
		CHAMACA		
		COLQUEMARCA		
		LIVITACA		
		LLUSCO	3	FOUR DISTRICTS
		QUIÑOTA		
		SANTO TOMÁS		
		VELILLE		
	ESPINAR	CONDOROMA	3	ALL DISTRICTS
		COPORAQUE		
		ESPINAR		
		OCORURO		
		PALLPATA		
		PICHIGUA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
HUANCAVELICA	**CHURCAMPA**	ANCO	**2**	ALL DISTRICTS
		CHINCHIUASI		
		CHURCAMPA		
		COSME		
		EL CARMEN		
		LA MERCED		
		LOCROJA		
		PACHAMARCA		
		PAUCARBAMBA		
		SAN MIGUEL DE MAYOC		
		SAN PEDRO DE CORIS		
	ACOBAMBA	ACOBAMBA	**2**	ALL DISTRICTS
		ANDABAMBA		
		ANTA		
		CAJA		
		MARCAS		
		PAUCARÁ		
		POMACOCHA		
		ROSARIO		
	TAYACAJA	COLCABAMBA	**2**	TEN DISTRICTS
		DANIEL HERNÁNDEZ		
		HUACHOCOLPA		
		HUARIBAMBA		
		QUISHUAR		
		SALCABAMBA		
		SAN MARCOS DE ROCCHAC		
		SARCAHUASI		
		SURCUBAMBA		
		TINTAY PUNCU		
		ACOSTAMBO	**3**	SEVEN DISTRICTS
		ACRAQUIA		
		AHUAYCHA		
		HUANDO		
		ÑAHUIMPUQUIO		
		PAMPAS		
		PAZOS		
	ANGARAES	CHINCHO	**2**	ONE DISTRICT
		ANCHONGA	**3**	ELEVEN DISTRICTS
		CALLANMARCA		
		CCOCHACCASA		
		CONGALLA		
		HUANCA HUANCA		
		HUAYLLAY GRANDE		
		JULCAMARCA		
		LIRCAY		
		SAN ANTONIO DE ANTAPARCO		
		SECCLLA		
		STO TOMÁS DE PATA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
HUANCAVELICA	**HUANCAVELICA**	ACOBAMBILLA	3	ALL DISTRICTS
		ACORIA		
		ASCENSION		
		CONAYCA		
		CUENCA		
		HUACHOCOLPA		
		HUANCAVELICA		
		HUAYLLAHUARA		
		IZCUCHACA		
		LARIA		
		MANTA		
		MARISCAL CÁCERES		
		MOYA		
		NUEVO OCCORO		
		PALCA		
		PILCHACA		
		VILCA		
		YAULI		
	CASTROVIRREYNA	ARMA	3	ELEVEN DISTRICTS
		AURAHUA		
		CASTROVIRREYNA		
		CHUPAMARCA		
		COCAS		
		HUACHOS		
		HUAMATAMBO		
		MOLLEPAMPA		
		SANTA ANA		
		TANTARÁ		
		TICRAPO		
		CAPILLAS	4	TWO DISTRICTS
		SAN JUAN		
	HUAYTARÁ	SAN ANTONIO DE CUSICANCHA	3	THREE DISTRICTS
		PILPICHACA		
		QUERCO		
		AYAVÍ	4	THIRTEEN DISTRICTS
		CORDOVA		
		HUAYACUNDO ARMA		
		HUAYTARÁ		
		LARAMARCA		
		OCOYO		
		QUITO ARMA		
		SAN FRANCISCO DE SANGAYAICO		
		SAN ISIDRO		
		SANTIAGO DE CHOCORVOS		
		SANTIAGO DE QUIRAHUARA		
		SANTO DOMINGO DE CAPILLAS		
		TAMBO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AYACUCHO	HUANTA	AYAHUANCO	2	ALL DISTRICTS
		HIGUAIN		
		HUAMANGUILLA		
		HUANTA		
		LLOCHEGUA		
		LURICOCHA		
		SANTILLANA		
		SIVIA		
	LA MAR	ANCO	2	ALL DISTRICTS
		AYNA		
		CHILCAS		
		CHUNGUI		
		LUIS CARRANZA		
		SAN MIGUEL		
		SANTA ROSA		
		TAMBO		
	HUAMANGA	ACOCRO	2	TEN DISTRICTS
		ACOSVINCHOS		
		AYACUCHO		
		JESÚS NAZARENO		
		OCROS		
		PACAYCASA		
		QUINUA		
		SAN JOSÉ DE TICLLAS		
		SANTIAGO DE PISCHA		
		TAMBILLO		
		CARMEN ALTO	3	FIVE DISTRICTS
		CHIARA		
		SAN JUAN BAUTISTA		
		SOCOS		
		VINCHOS		
	VILCASHUAMÁN	CONCEPCION	2	ONE DISTRICT
		ACOMARCA	3	SEVEN DISTRICTS
		CARHUANCA		
		HUAMBALPA		
		INDEPENDENCIA		
		SAURAMA		
		VILCASHUAMÁN		
		VISCHONGO		
	HUANCASANCOS	CARAPO	3	ALL DISTRICTS
		SACSAMARCA		
		SANCOS		
		SANTIAGO DE LUCANAMARCA		
	CANGALLO	CANGALLO	3	ALL DISTRICTS
		CHUSCHI		
		LOS MOROCHUCOS		
		MARÍA PARADO DE BELLIDO		
		PARAS		
		TOTOS		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AYACUCHO	PÁUCAR DEL SARA SARA	COLTA	3	ALL DISTRICTS
		CORCULLA		
		LAMPA		
		MARCABAMBA		
		OYOLO		
		PARARCA		
		PAUSA		
		SAN JAVIER DE ALPABAMBA		
		SAN JOSÉ DE USHUA		
		SARA SARA		
	SUCRE	BELÉN	3	ALL DISTRICTS ALL DISTRICTS
		CHALCOS		
		CHILCAYOC		
		HUACAÑA		
		MORCOLLA		
		PAICO		
		QUEROBAMBA		
		SAN PEDRO DE LARCAY		
		SAN SALVADOR DE QUIJE		
		SANTIAGO DE PAUCARAY		
		SORAS		
	VÍCTOR FAJARDO	ALCAMENCA	3	TODOS LOS DISTRITOS
		APONGO		
		ASQUIPATA		
		CANARIA		
		CAYARA		
		COLCA		
		HUAMANQUIQUIA		
		HUANCAPI		
		HUANCARAYLLA		
		HUAYA		
		SARHUA		
		VILCANCHOS		
	PARINACOCHAS	CHUMPI	3	SIX DISTRICTS
		CORACORA		
		CORONEL CASTAÑEDA		
		PACAPAUSA		
		SAN FRANCISCO DE RAVACAYCU		
		UPAHUACHO		
		PULLO	4	TWO DISTRICTS
		PUYUSCA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AYACUCHO	LUCANAS	AUCARA	3	TEN DISTRICTS
		CABANA		
		CARMEN SALCEDO		
		CHAVIÑA		
		CHIPAO		
		LUCANAS		
		PUQUIO		
		SAN JUAN		
		SAN PEDRO DE PALCO		
		SANTA ANA DE HUAYCAHUACHO		
		HUAC HUAS	4	ELEVEN DISTRICTS
		LARAMATE		
		LEONCIO PRADO		
		LLAUTA		
		OCAÑA		
		OTOCA		
		SAISA		
		SAN CRÍSTOBAL		
		SAN PEDRO		
		SANCOS		
		SANTA LUCÍA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
APURÍMAC	COTABAMBAS	CALLHUAHUACHO	2	ALL DISTRICTS
		COTABAMBAS		
		COYLLURQUI		
		HAQUIRA		
		MARA		
		TAMBOBAMBA		
	GRAU	CHUQUIBAMBILLA	2	ALL DISTRICTS
		CURASCO		
		CURPAHUASI		
		GAMARRA		
		HUAYLLATI		
		MAMARA		
		MICAELA BASTIDAS		
		PATAYPAMPA		
		PROGRESO		
		SAN ANTONIO		
		SANTA ROSA		
		TURPAY		
		VILCABAMBA		
		VIRUNDO		
	ABANCAY	ABANCAY	2	ALL DISTRICTS
		CHACOCHE		
		CIRCA		
		CURAHUASI		
		HUANIPACA		
		LAMBRAMA		
		PICHIRHUA		
		SAN PEDRO DE CACHORA		
		TAMBURCO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
APURÍMAC	CHINCHEROS	ANCO-HUALLO	2	ALL DISTRICTS
		CHINCHEROS		
		COCHARCAS		
		HUACCANA		
		OCOBAMBA		
		ONGOY		
		RANRACANCHA		
		URANMARCA		
	ANDAHUAYLAS	ANDAHUAYLAS	2	THRITEEN DISTRICTS
		ANDARAPA		
		HUANCARAMA		
		HUANCARAY		
		KAQUIABAMBA		
		KISHUARA		
		PACOBAMBA		
		PACUCHA		
		SAN ANTONIO DE CACHI		
		SAN JERONIMO		
		SANTA MARIA DE CHICMO		
		TALAVERA		
		TURPO		
		CHIARA	3	SIX DISTRICTS
		HUAYANA		
		PAMPACHIRI		
		POMACOCHA		
		SAN MIGUEL DE CHACCRAMPA		
		TUMAY HUARACA		
	AYMARAES	CHAPIMARCA	2	FIVE DISTRICTS
		COLCABAMBA		
		LUCRE		
		SAN JUAN DE CHACÑA		
		TINTAY		
		CAPAYA	3	TWELVE DISTRICTS
		CARAYBAMBA		
		CHALHUANCA		
		COTARUSE		
		HUAYLLO		
		JUSTO APU SAHUARAURA		
		POCOHUANCA		
		SAÑAYCA		
		SORAYA		
		TAPAIRIHUA		
		TORAYA		
		YANACA		
	ANTABAMBA	ANTABAMBA	3	ALL DISTRICTS
		EL ORO		
		HIAQUIRCA		
		JUAN ESPINOZA MEDRANO		
		OROPESA		
		PACHACONAS		
		SABAINO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
TUMBES	CONTRALMIRANTE VILLAR	CASITAS	4	ALL DISTRICTS
		ZORRITOS		
	TUMBES	CORRALES	4	ALL DISTRICTS
		LA CRUZ		
		PAMPAS DE HOSPITAL		
		SAN JACINTO		
		SAN JUAN DE LA VIRGEN		
		TUMBES		
	ZARUMILLA	AGUAS VERDES	4	ALL DISTRICTS
		MATAPALO		
		PAPAYAL		
		ZARUMILLA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
PIURA	HUANCABAMBA	CANCHAQUE	3	ALL DISTRICTS
		EL CARMEN DE LA FRONTERA		
		HUANCABAMBA		
		HUARMACA		
		LALAQUIZ		
		SAN MIGUEL DE EL FAIQUE		
		SONDOR		
		SONDORILLO		
	AYABACA	AYABACA	3	SIX DISTRICTS
		JILILÍ		
		LAGUNAS		
		MONTERO		
		PACAIPAMPA		
		SICCHEZ		
		FRÍAS	4	FOUR DISTRICTS
		PAIMAS		
		SAPILLICA		
		SUYO		
	MORROPON	BUENOS AIRES	3	SIX DISTRICTS
		CHALACO		
		SALITRAL		
		SAN JUAN DE BIGOTE		
		SANTA CATALINA DE MOSSA		
		YAMANGO		
		CHULUCANAS	4	FOUR DISTRICTS
		LA MATANZA		
		MORROPON		
		SANTO DOMINGO		
	PIURA	CASTILLA	4	ALL DISTRICTS
		CATACAOS		
		CURA MORI		
		EL TALLÁN		
		LA ARENA		
		LA UNION		
		LAS LOMAS		
		PIURA		
		TAMBO GRANDE		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
PIURA	PAITA	AMOTAPE	4	ALL DISTRICTS
		ARENAL		
		COLÁN		
		LA HUACA		
		PAITA		
		TAMARINDO		
		VICHAYAL		
	SECHURA	BELLAVISTA LA UNION	4	ALL DISTRICTS
		BERNAL		
		CRISTO NOS VALGA		
		RINCONADA LLICUAR		
		SECHURA		
		VICE		
	SULLANA	BELLAVISTA	4	ALL DISTRICTS
		IGNACIO ESCUDERO		
		LANCONES		
		MARCAVELICA		
		MIGUEL CHECA		
		QUERECOTILLO		
		SALITRAL		
		SULLANA		
	TALARA	EL ALTO	4	ALL DISTRICTSS
		LA BREA		
		LOBITOS		
		LOS ORGANOS		
		MÁNCORA		
		PARIÑAS		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LAMBAYEQUE	FERREÑAFE	CAÑARIS	3	TWO DISTRICTS
		INCAHUASI		
		FERREÑAFE	4	FOUR DISTRICTS
		MANUEL A. MESONES MURO		
		PITIPO		
		PUEBLO NUEVO		
	LAMBAYEQUE	SALAS	3	ONE DISTRITC
		CHOCHOPE	4	ELEVEN DISTRICTS
		ILLIMO		
		JAYANCA		
		LAMBAYEQUE		
		MOCHUMI		
		MORROPE		
		MOTUPE		
		OLMOS		
		PACORA		
		SAN JOSÉ		
		TÚCUME		
	CHICLAYO	CAYALTÍ	4	ALL DISTRICTS
		CHICLAYO		
		CHONGOYAPE		
		ETEN		
		ETEN PUERTO		
		JOSÉ LEONARDO ORTIZ		
		LA VICTORIA		
		LAGUNAS		
		MONSEFÚ		
		NUEVA ARICA		
		OYOTÚN		
		PATAPO		
		PICSI		
		PIMENTEL		
		POMALCA		
		PUCALÁ		
		REQUE		
		SANTA ROSA		
		SAÑA		
		TUMÁN		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CAJAMARCA	HUALGAYOC	BAMBAMARCA	2	ALL DISTRICTS
		CHUGUR		
		HUALGAYOC		
	SAN IGNACIO	CHIRINOS	2	FIVE DISTRICTS
		HUARANGO		
		LA COIPA		
		NAMBALLE		
		SAN IGNACIO		
		SAN JOSE DE LOURDES	2	TWO DISTRICTS
		TABACONAS		
	CELENDÍN	CELENDÍN	2	ALL DISTRICTS
		CHUMUCH		
		CORTEGANA		
		HUASMIN		
		JORGE CHÁVEZ		
		JOSÉ GÁLVEZ		
		LA LIBERTAD DE PALLAN		
		MIGUEL IGLESIAS		
		OXAMARCA		
		SOROCHUCO		
		SUCRE		
		UTCO		
	CUTERVO	CALLAYUC	2	FOURTEEN DISTRICTS
		CHOROS		
		CUJILLO		
		CUTERVO		
		LA RAMADA		
		PIMPINGOS		
		SAN ANDRÉS DE CUTERVO		
		SAN JUAN DE CUTERVO		
		SAN LUIS DE LUCMA		
		SANTA CRUZ		
		SANTO DOMINGO DE LA CAPILLA		
		SANTO TOMÁS		
		SOCOTA		
		TORIBIO CASANOVA		
		QUEROCOTILLO	3	ONE DISTRICT
	JAÉN	BELLAVISTA	2	EIGHT DISTRICTS
		CHONTALI		
		COLASAY		
		HUABAL		
		JAÉN		
		LAS PIRIAS		
		SAN JOSÉ DEL ALTO		
		SANTA ROSA		
		POMAHUACA	3	FOUR DISTRICTS
		PUCARÁ		
		SALLIQUE		
		SAN FELIPE		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CAJAMARCA	SAN MARCOS	GREGORIO PITA	2	FOUR DISTRICTS
		ICHOCÁN		
		JOSÉ MANUEL QUIROZ		
		JOSÉ SABOGAL		
		CHANCAY	3	THREE DISTRICTS
		EDUARDO VILLANUEVA		
		PEDRO GÁLVEZ		
	CHOTA	ANGUIA	2	TWELVE DISTRICTS
		CHADÍN		
		CHALAMARCA		
		CHIGUIRIP		
		CHIMBAN		
		CHOROPAMPA		
		CHOTA		
		CONCHAN		
		LAJAS		
		PACCHA		
		PION		
		TACABAMBA		
		COCHABAMBA	3	SEVEN DISTRICTS
		HUAMBOS		
		LLAMA		
		MIRACOSTA		
		QUEROCOTO		
		SAN JUAN DE LICUPIS		
		TOCMOCHE		
	CAJABAMBA	SITACOCHA	2	ONE DISTRICT
		CACHACHI	3	THREE DISTRICTS
		CAJABAMBA		
		CONDEBAMBA		
	CAJAMARCA	ENCAÑADA	2	ONE DISTRICT
		ASUNCION	3	ELEVEN DISTRICTS
		CAJAMARCA		
		CHETILLA		
		COSPÁN		
		JESÚS		
		LLACANORA		
		LOS BAÑOS DEL INCA		
		MAGDALENA		
		MATARA		
		NAMORA		
		SAN JUAN		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CAJAMARCA	CONTUMAZÁ	CHILETE	3	ALL DISTRICTS
		CONTUMAZÁ		
		CUPISNIQUE		
		GUZMANGO		
		SAN BENITO		
		SANTA CRUZ DE TOLEDO		
		TANTARICA		
		YONÁN		
	SAN MIGUEL	BOLÍVAR	3	ALL DISTRICTS
		CALQUIS		
		CATILLUC		
		EL PRADO		
		LA FLORIDA		
		LLAPA		
		NANCHOC		
		NIEPOS		
		SAN GREGORIO		
		SAN MIGUEL		
		SAN SILVESTRE DE COCHAN		
		TONGOD		
		UNION AGUA BLANCA		
	SAN PABLO	SAN BERNARDINO	2	ALL DISTRICTS
		SAN LUIS		
		SAN PABLO		
		TUMBADEN		
	SANTA CRUZ	ANDABAMBA	2	ALL DISTRICTS
		CATACHE		
		CHANCAYBAÑOS		
		LA ESPERANZA		
		NINABAMBA		
		PULÁN		
		SANTA CRUZ		
		SAUCEPAMPA		
		SEXI		
		UTICYACU		
		YAUYUCAN		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LA LIBERTAD	BOLÍVAR	BAMBAMARCA	2	ALL DISTRICTS
		BOLÍVAR		
		CONDORMARCA		
		LONGOTEA		
		UCHUMARCA		
		UCUNCHA		
	PATAZ	BULDIBUYO	2	ALL DISTRICTS
		CHILLIA		
		HUANCASPATA		
		HUAYLILLAS		
		HUAYO		
		ONGON		
		PARCOY		
		PATAZ		
		PIAS		
		SANTIAGO DE CHALLAS		
		TAURIJA		
		TAYABAMBA		
		URPAY		
	SÁNCHEZ CARRION	COCHORCO	2	TWO DISTRICTS
		SARTIMBAMBA		
		CHUGAY	3	SIX DISTRICTS
		CURGOS		
		HUAMACHUCO		
		MARCABAL		
		SANAGORAN		
		SARÍN		
	SANTIAGO DE CHUCO	ANGASMARCA	3	ALL DISTRICTS
		CACHICADÁN		
		MOLLEBAMBA		
		MOLLEPATA		
		QUIRUVILCA		
		SANTA CRUZ DE CHUCA		
		SANTIAGO DE CHUCO		
		SITABAMBA		
	GRAN CHIMÚ	CASCAS	3	ALL DISTRICTS
		LUCMA		
		MARMOT		
		SAYAPULLO		
	JULCÁN	CALAMARCA	3	ALL DISTRICTS
		CARABAMBA		
		HUASO		
		JULCÁN		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LA LIBERTAD	OTUZCO	AGALLPAMPA	3	ALL DISTRICTS
		CHARAT		
		HUARANCHAL		
		LA CUESTA		
		MACHE		
		OTUZCO		
		PARANDAY		
		SALPO		
		SINSICAP		
		USQUIL		
	CHEPÉN	CHEPÉN	4	ALL DISTRICTS
		PACANGA		
		PUEBLO NUEVO		
	ASCOPE	ASCOPE	4	ALL DISTRICTS
		CASA GRANDE		
		CHICAMA		
		CHOCOPE		
		MAGDALENA DE CAO		
		PAIJÁN		
		RÁZURI		
		SANTIAGO DE CAO		
	PACASMAYO	GUADALUPE	4	ALL DISTRICTS
		JEQUETEPEQUE		
		PACASMAYO		
		SAN JOSÉ		
		SAN PEDRO DE LLOC		
	TRUJILLO	EL PORVENIR	4	ALL DISTRICTS
		FLORENCIA DE MORA		
		HUANCHACO		
		LA ESPERANZA		
		LAREDO		
		MOCHE		
		POROTO		
		SALAVERRY		
		SIMBAL		
		TRUJILLO		
		VÍCTOR LARCO HERRERA		
	VIRÚ	CHAO	4	ALL DISTRICTS
		GUADALUPITO		
		VIRÚ		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
ÁNCASH	ANTONIO RAYMONDI	CHACCHO	2	THREE DISTRICTS
		CHINGA		
		LLAMELLIN		
		ACZO	3	THREE DISTRICS
		MIRGAS		
		SAN JUAN DE RONTOY		
	HUARI	ANRA	2	SIX DISTICS
		HUACACHI		
		HUACCHIS		
		PAUCAS		
		RAPAYÁN		
		UCO		
		CAJAY	3	TEN DISTRICT
		CHAVÍN DE HUANTAR		
		HUACHIS		
		HUANTAR		
		HUARI		
		MASIN		
		PONTO		
		RAHUAPAMPA		
		SAN MARCOS		
		SAN PEDRO DE CHANA		
	ASUNCION	ACOCHACA	3	ALL DISTRICTS
		CHACAS		
	CARHUAZ	ACOPAMPA	3	ALL DISTRICTS
		AMASHCA		
		ANTA		
		ATAQUERO		
		CARHUAZ		
		MARCARÁ		
		PARIAHUANCA		
		SAN MIGUEL DE ACO		
		SHILLA		
		TINCO		
		YUNGAR		
	CARLOS F. FITZCARRALD	SAN LUIS	3	ALL DISTRICTS
		SAN NICOLÁS		
		YAUYA		
	CORONGO	ACO	3	ALL DISTRICTS
		BAMBAS		
		CORONGO		
		CUSCA		
		LA PAMPA		
		YÁNAC		
		YUPÁN		
	MARISCAL LUZURIAGA	CASCA	3	ALL DISTRICTS
		ELEAZAR GUZMÁN BARRON		
		FIDEL OLIVAS ESCUDERO		
		LLAMA		
		LLUMPA		
		LUCMA		
		MUSGA		
		PISCOBAMBA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
ÁNCASH	PALLASCA	BOLOGNESI	3	ALL DISTRICTS
		CABANA		
		CONCHUCOS		
		HUACASCHUQUE		
		HUANDOVAL		
		LACABAMBA		
		LLAPO		
		PALLASCA		
		PAMPAS		
		SANTA ROSA		
		TAUCA		
	POMABAMBA	HUAYLLÁN	3	ALL DISTRICTS
		PAROBAMBA		
		POMABAMBA		
		QUINUABAMBA		
	SIHUAS	ACOBAMBA	3	ALL DISTRICTS
		ALFONSO UGARTE		
		CASHAPAMPA		
		CHINGALPO		
		HUAYLLABAMBA		
		QUICHES		
		RAGASH		
		SAN JUAN		
		SICSIBAMBA		
		SIHUAS		
	HUAYLAS	CARAZ	3	ALL DISTRICTS
		HUALLANCA		
		HUATA		
		HUAYLAS		
		MATO		
		PAMPAROMAS		
		PUEBLO LIBRE		
		SANTA CRUZ		
		SANTO TORIBIO		
		YURACMARCA		
	YUNGAY	CASCAPARA	3	ALL DISTRICTS
		MANCOS		
		MATACOTO		
		QUILLO		
		RANRAHIRCA		
		SHUPLUY		
		YANAMA		
		YUNGAY		
	HUARAZ	COCHABAMBA	3	ALL DISTRICTS
		COLCABAMBA		
		HUANCHAY		
		HUARAZ		
		INDEPENDENCIA		
		JANGAS		
		LA LIBERTAD		
		OLLEROS		
		PAMPAS		
		PARIACOTO		
		PIRA		
		TARICA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
ÁNCASH	**BOLOGNESI**	ABELARDO PARDO LEZAMETA ANTONIO RAYMONDI AQUIA CAJACAY CANIS CHIQUIAN COLQUIOC HUALLANCA HUASTA HUAYLLACAYAN LA PRIMAVERA MANGAS PACLLON SAN MIGUEL DE CORPANQUI TICLLOS	**3**	ALL DISTRICTS
	RECUAY	CATAC COTAPARACO HUAYLLAPAMPA LLACLLIN MARCA PAMPAS CHICO PARARIN RECUAY TAPACOCHA TICAPAMPA	**3**	ALL DISTRICTS
	AIJA	AIJA CORIS	**3**	TWO DISTRICTS
		LA MERCED HUACLLÁN SUCCHA	**4**	THREE DISTRICS
	OCROS	ACAS CAJAMARQUILLA CARHUAPAMPA CONGAS LLIPA OCROS S.CRISTOBAL DE RAJÁN SANTIAGO DE CHILCAS	**3**	ALL DISTRICTS
		COCHAS SAN PEDRO	**4**	TWO DISTRICTS
	HUARMEY	COCHAPETI HUAYAN MALVAS	**3**	THREE DISTRICTS
		CULEBRAS HUARMEY	**4**	TWO DISTRICTS
	SANTA	CÁCERES DEL PERÚ MACATE MORO	**3**	THREE DISTRICS
		CHIMBOTE COISHCO NEPEÑA NUEVO CHIMBOTE SAMANCO SANTA	**4**	SIX DISTRICS
	CASMA	BUENA VISTA ALTA CASMA COMANDANTE NOEL YAUTÁN	**4**	ALL DISTRICTS

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LIMA	CAJATAMBO	CAJATAMBO	3	ALL DISTRICTS
		COPA		
		GORGOR		
		HUACAPON		
		MANÁS		
	OYON	ANDAJES	3	ALL DISTRICTS
		CAUJUL		
		COCHAMARCA		
		NAVÁN		
		OYON		
		PACHANGARA		
	YAUYOS	ALIS	3	TWENTY NINE DISTRICTS
		AYAUCA		
		AYAVIRÍ		
		AZÁNGARO		
		CACRA		
		CARANIA		
		CATAHUASI		
		CHOCOS		
		COCHAS		
		COLONIA		
		HONGOS		
		HUAMPARA		
		HUANCAYA		
		HUANGÁSCAR		
		HUANTÁN		
		HUAÑEC		
		LARAOS		
		LINCHA		
		MADEAN		
		MIRAFLORES		
		QUINCHES		
		SAN JOAQUÍN		
		SAN LORENZO DE PUTINZA		
		SAN PEDRO DE PILAS TANTA		
		TOMAS		
		TUPE		
		VIÑAC		
		VITIS		
		YAUYOS		
		OMAS	4	THREE DISTRICTS
		QUINOCAY		
		TAURIPAMPA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS

LIMA	**HUAROCHIRÍ**	CALLAHUANCA	3	TWENTY FIVE DISTRICTS
		CARAMPOMA		
		CHICLA		
		HUACHUPAMPA		
		HUANZA		
		HUAROCHIRÍ		
		LAHUAYTAMBO		
		LANGA		
		LARAOS		
		MATUCANA		
		SAN ANDRÉS DE TUPICOCHA		
		SAN BARTOLOMÉ		
		SAN DAMIÁN		
		S. JERONIMO DE SURCO		
		SAN JUAN DE IRIS		
		SAN JUAN DE TANTARANCHE		
		SAN LORENZO DE QUINTI		
		SAN MATEO		
		SAN MATEO DE OTAO		
		SAN PEDRO DE CASTA		
		SAN PEDRO DE HUANCAYRE		
		SANGALLAYA		
		SANTA CRUZ DE COCACHACRA		
		SANTIAGO DE ANCHUCAYA		
		SANTIAGO DE TUNA		
		ANTIOQUÍA	4	SEVEN DISTRICTS
		CUENCA		
		MARIATANA		
		RICARDO PALMA		
		SAN ANTONIO DE CHACLLA		
		SANTA EULALIA		
		SANTO DOMINGO DE OLLEROS		
	CANTA	CANTA	3	FOUR DISTRICTS
		HUAROS		
		LACHAQUI		
		SAN BUENAVENTURA		
		ARAHUAY	4	THREE DISTRICTS
		HUAMANTANGA		
		SANTA ROSA DE QUIVES		
	HUARAL	ATAVILLOS ALTO	3	NINE DISTRICTS
		ATAVILLOS BAJO		
		IHUARÍ		
		LAMPÍAN		
		PACARAOS		
		SAN MIGUEL DE ACOS		
		SANTA CRUZ DE ANDAMARCA		
		SUMBILCA		
		VEINTISIETE DE NOVIEMBRE		
		AUCALLAMA	4	THREE DISTRICTS
		CHANCAY		
		HUARAL		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LIMA	**HUAURA**	CHECRAS		

		LEONCIO PRADO	3	FOUR DISTRICTS
		PACCHO		
		SANTA LEONOR		
		ÁMBAR	4	EIGHT DISTRICTS
		CALETA DE CARQUÍN		
		HUACHO		
		HUALMAY		
		HUAURA		
		SANTA MARÍA		
		SAYÁN		
		VEGUETA		
	CAÑETE	ZÚÑIGA	3	ONE DISTRICT
		ASIA	4	FIFTEEN DISTRICTS
		CALANGO		
		CERRO AZUL		
		CHILCA		
		COAYLLO		
		IMPERIAL		
		LUNAHUANÁ		
		MALA		
		NUEVO IMPERIAL		
		PACARÁN		
		QUILMANÁ		
		SAN ANTONIO		
		SAN LUIS		
		SAN VICENTE DE CAÑETE		
		SANTA CRUZ DE FLORES		
	BARRANCA	BARRANCA	4	ALL DISTRICTS
		PARAMONGA		
		PATIVILCA		
		SUPE		
		SUPE PUERTO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
LIMA	**LIMA**	ANCON		

		ATE		
		BARRANCO		
		BREÑA		
		CARABAYLLO		
		CHACLACAYO		
		CHORRILLOS		
		CIENEGUILLA		
		COMAS		
		EL AGUSTINO		
		INDEPENDENCIA		
		JESÚS MARÍA		
		LA MOLINA		
		LA VICTORIA		
		LIMA		
		LINCE		
		LOS OLIVOS		
		LURIGANCHO-CHOSICA		
		LURIN		
		MAGDALENA DEL MAR		
		MIRAFLORES		
		PACHACÁMAC		
		PUCUSANA		
		PUEBLO LIBRE	**4**	ALL DISTRICTS
		PUENTE PIEDRA		
		PUNTA HERMOSA		
		PUNTA NEGRA		
		RÍMAC		
		SAN BARTOLO		
		SAN BORJA		
		SAN ISIDRO		
		SAN JUAN DE LURIGANCHO		
		SAN JUAN DE MIRAFLORES		
		SAN LUIS		
		SAN MARTÍN DE PORRES		
		SAN MIGUEL		
		SANTA ANITA		
		SANTA MARÍA DEL MAR		
		SANTA ROSA		
		SANTIAGO DE SURCO		
		SURQUILLO		
		VILLA EL SALVADOR		
		VILLA MARÍA DEL TRIUNFO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
CALLAO	**CALLAO**	BELLAVISTA		

		CALLAO	4	ALL DISTRICTS
		CARMEN DE LA LEGUA-REYNOSO		
		LA PERLA		
		LA PUNTA		
		VENTANILLA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
ICA	CHINCHA	SAN PEDRO DE HUACARPANA	3	ONE DISTRICT
		ALTO LARÁN	4	TEN DISTRICTS
		CHAVÍN		
		CHINCHA ALTA		
		CHINCHA BAJA		
		EL CARMEN		
		GROCIO PRADO		
		PUEBLO NUEVO		
		SAN JUAN DE YANAC		
		SUNAMPE		
		TAMBO DE MORA		
	PALPA	LLIPATA	4	ALL DISTRICTS
		PALPA		
		RÍO GRANDE		
		SANTA CRUZ		
		TIBILLO		
	ICA	ICA	4	ALL DISTRICTS
		LA TINGUIÑA		
		LOS AQUIJES		
		OCUCAJE		
		PACHACÚTEC		
		PARCONA		
		PUEBLO NUEVO		
		SALAS		
		SAN JOSÉ DE LOS MOLINOS		
		SAN JUAN BAUTISTA		
		SANTIAGO		
		SUBTANJALLA		
		TATE		
		YAUCA DEL ROSARIO		
	NAZCA	CHANGUILLO	4	ALL DISTRICTS
		EL INGENIO		
		MARCONA		
		NAZCA		
		VISTA ALEGRE		
	PISCO	HUANCANO	4	ALL DISTRICTS
		HUMAY		
		INDEPENDENCIA		
		PARACAS		
		PISCO		
		SAN ANDRÉS		
		SAN CLEMENTE		
		TÚPAC AMARU INCA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AREQUIPA	LA UNION	ALCA	3	ALL DISTRICTS
		CHARCANA		

		COTAHUASI		
		HUAYNACOTAS		
		PAMPAMARCA		
		PUYCA		
		QUECHUALLA		
		SAYLA		
		TAURIA		
		TOMEPAMPA		
		TORO		
	CAYLLOMA	ACHOMA	**3**	NINETEEN DISTRICTS
		CABANACONDE		
		CALLALLI		
		CAYLLOMA		
		CHIVAY		
		COPORAQUE		
		HUAMBO		
		HUANCA		
		ICHUPAMPA		
		LARI		
		LLUTA		
		MACA		
		MADRIGAL		
		SAN ANTONIO DE CHUCA		
		SIBAYO		
		TAPAY		
		TISCO		
		TUTI		
		YANQUE		
		MAJES	**4**	ONE DISTRICT
	CASTILLA	ANDAGUA	**3**	ELEVEN DISTRICTS
		AYO		
		CHACHAS		
		CHILCAYMARCA		
		CHOCO		
		MACHAGUAY		
		ORCOPAMPA		
		PAMPACOLCA		
		TIPÁN		
		UÑON		
		VIRACO		
		APLAO	**4**	THREE DISTRICTS
		HUANCARQUI		
		URACA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AREQUIPA	**AREQUIPA**	ALTO SELVA ALEGRE	**3**	TWENTY ONE DISTRICTS
		AREQUIPA		
		CAYMA		

		CERRO COLORADO		
		CHARACATO		
		CHIGUATA		
		JACOBO HUNTER		
		JOSÉ LUIS BUSTAMANTE Y RIVERO		
		MARIANO MELGAR		
		MIRAFLORES		
		MOLLEBAYA		
		PAUCARPATA		
		POCSI		
		QUEQUEÑA		
		SABANDIA		
		SACHACA		
		SAN JUAN DE TARUCANI		
		SOCABAYA		
		TIABAYA		
		YANAHUARA		
		YURA		
		LA JOYA	4	EIGHT DISTRICTS
		POLOBAYA		
		SAN JUAN DE SIGUAS		
		SANTA ISABEL DE SIGUAS		
		SANTA RITA DE SIGUAS		
		UCHUMAYO		
		VÍTOR		
		YARABAMBA		
	CONDESUYOS	CAYARANI	3	THREE DISTRICTS
		CHICHAS		
		SALAMANCA		
		ANDARAY	4	FIVE DISTRICTS
		CHUQUIBAMBA		
		IRAY		
		RÍO GRANDE		
		YANAQUIHUA		
	ISLAY	COCACHACRA	4	ALL DISTRICTS
		DEAN VALDIVIA		
		ISLAY		
		MEJÍA		
		MOLLENDO		
		PUNTA DE BOMBON		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
AREQUIPA	CAMANÁ	CAMANÁ	4	ALL DISTRICTS
		JOSÉ MARÍA QUÍMPER		
		MARIANO NICOLÁS VALCÁRCEL		

		MARISCAL CÁCERES		
		NICOLÁS DE PIÉROLA		
		OCOÑA		
		QUILCA		
		SAMUEL PASTOR		
	CARAVELÍ	ACARÍ	4	ALL DISTRICTS
		ATICO		
		ATIQUIPA		
		BELLA UNION		
		CAHUACHO		
		CARAVELÍ		
		CHALA		
		CHAPARRA		
		HUANUHUANU		
		JAQUI		
		LOMAS		
		QUICACHA		
		YAUCA		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
MOQUEGUA	GENERAL SÁNCHEZ CERRO	CHOJATA	3	TEN DISTRICTS
		COALAQUE		
		ICHUÑA		
		LLOQUE		
		MATALAQUE		
		OMATE		
		PUQUINA		
		QUINISTAQUILLAS		
		UBINAS		
		YUNGA		
		LA CAPILLA	4	ONE DISTRICT
	MARISCAL NIETO	CARUMAS	3	FIVE DISTRICTS
		CUCHUMBAYA		
		SAMEGUA		
		SAN CRISTOBAL DE CALACOA		
		TORATA		
		MOQUEGUA	4	ONE DISTRICT
	ILO	EL AGARROBAL	4	ALL DISTRICTS
		PACOCHA		
		ILO		

REGION (DPTO.)	PROVINCE	DISTRICT	SEISMIC ZONE	NUMBER OF DISTRICTS
TACNA	TARATA	CHUCATAMANI	3	ALL DISTRICTS
		ESTIQUE		
		ESTIQUE-PAMPA		
		SITAJARA		

		SUSAPAYA		
		TARATA		
		TARUCACHI		
		TICACO		
	CANDARAVE	CAIRANI	3	ALL DISTRICTS
		CAMILACA		
		CANDARAVE		
		CURIBAYA		
		HUANUARA		
		QUILAHUANI		
	JORGE BASADRE	ILABAYA	4	ALL DISTRICTS
		ITE		
		LOCUMBA		
	TACNA	PALCA	3	ONE DISTRICTS
		ALTO DE LA ALIANZA	4	EIGHT DISTRICTS
		CALANA		
		CIUDAD NUEVA		
		INCLÁN		
		PACHIA		
		POCOLLAY		
		SAMA		
		TACNA		