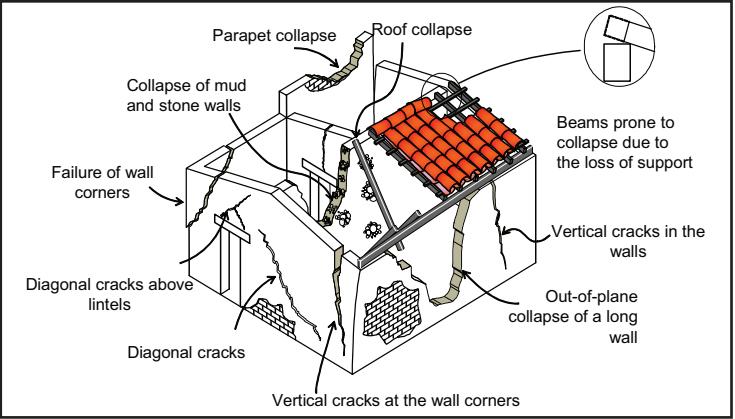


SOURCE 12: ADOBE DEFINITION

Adobe is a mud material made from local soil. Very often organic material such as grass or animal manure is incorporated for extra strength. Adobe is extremely durable in dry climates and has extensive thermal properties.

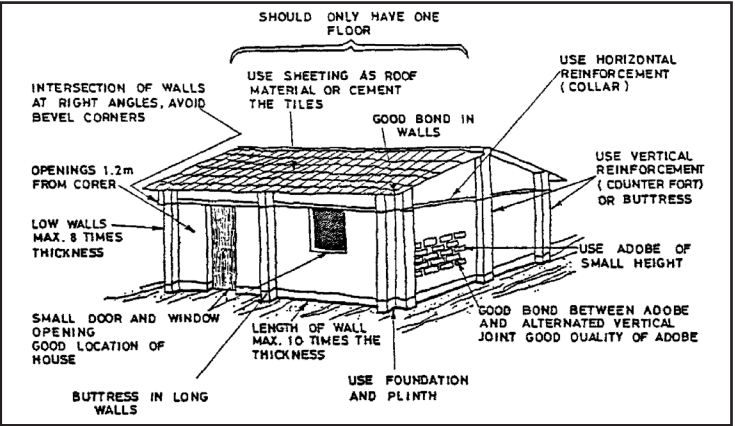
Source: Adapted from Marcial Blondet, G. V., 2003

SOURCE 13: PROBLEMS ASSOCIATED WITH TRADITIONAL ADOBE HOUSES



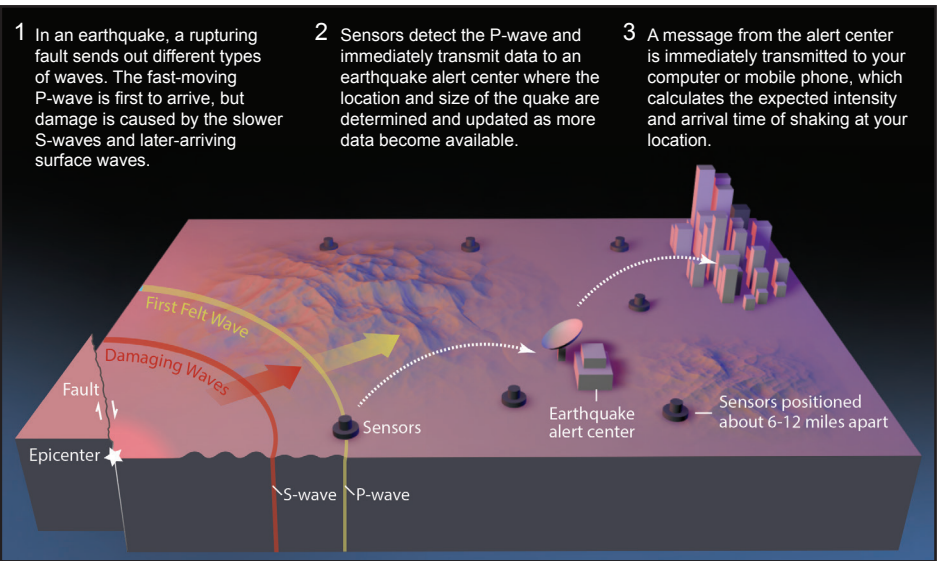
Source: Marcial Blondet, G. V., 2003

SOURCE 15: BUILDING CODES TO REINFORCE ADOBE BUILDINGS AGAINST SEISMIC MOVEMENT



Source: Arya, A., 2005

SOURCE 17: HOW SHAKEALERT WORKS



Source: U.S. Geological Survey, 2015

SOURCE 14: CHILEAN SEISMIC DESIGN CODE

The Chilean Seismic Design Code (CSDC) is used by the Chilean government to design, build, and rebuild houses, commercial buildings and public buildings. The building code sets out the minimum requirements for the reinforcement of buildings to withstand an earthquake. Adobe houses can be reinforced to mitigate the problems associated with traditional adobe houses. The code plans for the safety of occupants in the design of concrete commercial buildings. Important public buildings, such as hospitals, water works and power plants, use the code to increase the specifications of design so that major public services are maintained in the event of an earthquake. The building code responds to the importance of the building, the weight of the building and the expected movement of the soil foundation in an earthquake.

Source: Adapted from Ministry of Housing and Urbanism, 2010 and National Institute of Standardization, 1997

SOURCE 16: THE ALTO RIO IN CHILE AFTER THE 2010 EARTHQUAKE



A collapsed building (the Alto Rio) lays in ruins after an earthquake in Concepcion, Chile.

Source: China Daily, 2010

SOURCE 18: SHAKEOUT PLUS TSUNAMI EVACUATION DRILL



Source: Southern California Earthquake Center, 2015

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Monday 6 June 2016

Stimulus

Geography

Year 11 — Data response test

A world map illustrating the global distribution of earthquakes. The map uses a color-coded system to represent earthquake magnitude and depth, with symbols for plate boundaries and active volcanoes. The legend in the top left corner provides the following information:

- Earthquake Magnitude:**
 - 7.0 - 7.5 (Small red circle)
 - 7.5 - 8.0 (Medium red circle)
 - 8.0 - 8.5 (Large red circle)
 - 8.5 + (Very large red circle)
- Earthquake Depth (km):**
 - 0 - 69 (Red circle)
 - 70 - 299 (Green circle)
 - 300 + (Blue circle)
- Plate Boundaries:** Yellow lines
- Active Volcanoes:** Yellow triangles

The map shows a high concentration of earthquakes along plate boundaries, particularly in the mid-ocean ridges and subduction zones. Active volcanoes are also concentrated along these boundaries. A north arrow and a scale bar (Scale: not available) are located in the bottom left corner.

Diagram illustrating various plate tectonic boundaries and volcanic activity:

- Volcanic Island Arc**: Shown on the left, featuring a **Strato-volcano**.
- Subduction Zone**: Indicated by arrows showing one plate moving under another.
- Oceanic Spreading Ridge**: A boundary where two oceanic plates move apart.
- Subduction Zone**: Another instance of one plate moving under another, leading to a **Trench**.
- Volcanic Arc**: A series of volcanoes formed at the edge of a continental plate being subducted.
- Rift Zone**: A boundary where two continental plates move apart.
- Hot Spot Volcano-Seamount**: Formed by a **Hot Spot Plume** rising from the **Asthenosphere** through the **Lithosphere**.
- Lithosphere**: The rigid upper layer of the Earth's crust.
- Asthenosphere**: The hotter, plastic layer below the lithosphere.
- Oceanic Crust**: The crust beneath the ocean.
- Continental Crust**: The thicker crust beneath continents.
- Subducting Plate**: The oceanic plate moving beneath the continental plate.

Figure 10.10 Earthquake distribution and slab profile in the South American Plate. The figure consists of three main parts: two cross-sections (C-C' and D-D') and a map of the South American Plate.

Cross-section C-C': Shows the slab profile and earthquake distribution along a north-south profile. The x-axis represents distance from -200 km to 1,000 km, and the y-axis represents depth from 0 km to -600 km. The trench axis is marked at 0 km. Earthquake hypocenters are plotted as red circles, with a yellow circle indicating a nucleation point and year of occurrence (1960). Active volcanoes are marked with yellow triangles. The slab profile is shown as a yellow area.

Cross-section D-D': Shows the slab profile and earthquake distribution along a north-south profile. The x-axis represents distance from -200 km to 600 km, and the y-axis represents depth from 0 km to -400 km. The trench axis is marked at 0 km. Earthquake hypocenters are plotted as red circles, with a yellow circle indicating a nucleation point and year of occurrence (1960). Active volcanoes are marked with yellow triangles. The slab profile is shown as a yellow area.

Map: Shows the South American Plate with earthquake distribution. The x-axis represents distance from -200 km to 1,000 km, and the y-axis represents depth from 0 km to -600 km. The trench axis is marked at 0 km. Earthquake hypocenters are plotted as red circles, with a yellow circle indicating a nucleation point and year of occurrence (1960). Active volcanoes are marked with yellow triangles. The slab profile is shown as a yellow area. The map includes labels for Salta, San Miguel De Tucuman, Asuncion, Valparaiso, Santiago, Concepcion, and Argentina (ARG). A scale bar indicates 0 to 1,000 km. A north arrow is present.

MAP EXPLANATION

Magnitude classes

- 5.5–5.7
- 5.7–6.0
- 6.0–6.3
- 6.3–6.6
- 6.6–6.9
- 6.9–7.1
- 7.1–7.4
- 7.4–7.7
- 7.7–8.0
- Greater than 8.0

Depth of focus

- Less than 69 km
- 70–299 km
- Greater than 300 km

Mean slab depth

- 60 km
- 100
- 200
- 300
- 400
- 500
- 600

Plate boundaries

- Subduction
- Transform
- Divergent
- Inferred

Country Boundary

1911 8.0–8.2 Magnitude

Source: Adapted from USGS, 2015

CHILE EARTHQUAKE OF 2010

Magnitude: 8.8
Date: Feb. 27, 2010 3:34 am (local)
Location: 35.8° S 72.7° W
Depth: 35 km (21.75 mi)

Perceived Shaking

- Severe
- Very strong
- Strong
- Moderate

--- Fault lines

► Represents the subduction of one plate under another

⊙ Epicentre

Map Labels: SOUTH AMERICAN PLATE, NAZCA PLATE, Peru-Chile Trench, CHILE, ARGENTINA, PACIFIC OCEAN, Coquimbo, La Serena, Illapel, Salamanca, San Juan, Mendoza, San Felipe, Santiago, Viña del Mar, Valparaíso, San Antonio, Rancagua, San Fernando, Curicó, Talca, Linares, Constitución, Cauquenes, Chillán, Talcahuano, Coronel, Concepción, Lota, Arauco, Lebu, Cañete, Angol, Los Angeles, Nueva Imperial, Temuco, Villarrica, Lanco, Valdivia, Los Lagos.

Scale: 0 50 100 mi / 0 75 150 km

Coordinates: 32°, 36°, 40°, 76°, 72°

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<i>Property type</i>	<i>Number of claims</i>	<i>Amount (in \$ millions)</i>
Residential	189,451	1,256
Automotive	4,678	22
Commercial	24,276	1,334
Industrial	2,840	1,423
TOTAL	221,245	4,035

91%

No. of people affected	No. of injuries	No. of deaths	Estimated total cost of damage	No. of residential buildings affected	No. of adobe houses affected	Length of roads damaged or destroyed	No. of hospitals affected	No. of fishing boats destroyed	No. of uninsured houses affected	% Reduction of Chile's GDP
12 880 000 or 75% of population	>12 000	>525	US\$30 billion	370 051	135 433	1553 km	130	710	180 600	18%

FIGURE EXPLANATION

10% in 50 year peak ground acceleration

0-0.2 m/s^2
0.2-0.4
0.4-0.8
0.8-1.6
1.6-3.2
3.2-6.4
6.4-9.8

Relative plate motion

7-20 mm/yr
21-40
41-60
61-80
81-110

Plate boundaries

- Subduction
- Transform
- Divergent
- Others

A bar chart titled 'Number of residences affected by different levels of damage' showing the impact of an event on various types of housing. The Y-axis represents the number of residences in thousands, ranging from 0 to 80. The X-axis lists five types of residences: Coastal, Urban adobe, Rural adobe, Government housing, and Private housing. For each type, three bars represent the level of damage: Destroyed (yellow), Major damage (orange), and Minor damage (dark grey). The data shows that while Coastal, Urban adobe, and Rural adobe residences have relatively low numbers of destroyed and majorly damaged homes, Government housing and Private housing have significantly higher numbers of minor damage, with Private housing also showing a notable increase in major damage.

Type of residence	Destroyed (thousands)	Major damage (thousands)	Minor damage (thousands)
Coastal	8	9	15
Urban adobe	26	28	15
Rural adobe	25	20	22
Government housing	5	15	50
Private housing	18	37	76