

# **APPENDIX A**

Major Earthquakes in the United States, Mexico, and Canada, 1700-2004

*Source: U.S. Geological Survey*



<b>Year</b>	<b>Date</b>	<b>Time<sup>1</sup></b>	<b>Place</b>	<b>Magnitude<sup>2</sup></b>
1700	January 26	NA <sup>3</sup>	Cascadia subduction zone	~9
1811	December 16	08:00	New Madrid, MO	~8.1
1812	January 23	15:00	New Madrid, MO	~7.8
1812	February 7	09:45	New Madrid, MO	~8
1823	June 2	08:00	South flank of Kilauea, HI	~7
1836	June 10	15:30	South San Francisco Bay region, CA	~6.5
1838	June	NA <sup>3</sup>	San Francisco Peninsula, CA	~6.8
1843	January 5	02:45	Marked Tree, AZ	~6.3
1857	January 9	16:24	Fort Tejon, CA	~7.9
1865	October 8	20:46	San Jose, CA	~6.5
1868	April 3	02:25	Hilea, southeast Hawaii, HI	~7.9
1868	October 21	15:53	Hayward, CA	~6.8
1871	February 20	08:42	Molokai, HI	~6.8
1872	March 26	10:30	Owens Valley, CA	~7.4
1872	December 15	05:40	North Cascades, WA	~7.3
1873	November 23	05:00	California-Oregon coast	~7.3
1886	August 31	02:51	Charleston, SC	~7.3
1890	April 24	11:36	Corralitos, CA	~6.3
1892	April 19	10:50	Vacaville, CA	~6.4
1892	April 21	17:43	Winters, CA	~6.4
1895	October 31	11:08	Charleston, MO	~6.6
1897	June 20	20:14	Calaveras fault, CA	~6.3
1898	March 31	07:43	Mare Island, CA	~6.3
1898	April 15	07:07	Mendocino County, CA	~6.8
1899	September 4	00:22	Cape Yakataga, AK	7.9
1899	September 10	21:41	Yakutat Bay, AK	8.0
1900	October 9	12:28	Kodiak Island, AK	7.7
1901	March 3	7:45	Parkfield, CA	6.4
1904	August 27	21:56	Fairbanks, AK	7.3
1906	April 18	13:12	San Francisco, CA	7.8

<sup>1</sup>Greenwich Mean Time (GMT)

*Source: U.S. Geological Survey*

<sup>2</sup>Earthquake magnitude as measured on the Richter Scale, which quantifies the ground motion and energy released at the source of the earthquake. Information about measuring earthquakes with the Richter Scale and the Modified Mercalli Intensity Scale is found in Unit 3.

<sup>3</sup>Not Available

<b>Year</b>	<b>Date</b>	<b>Time<sup>1</sup></b>	<b>Place</b>	<b>Magnitude<sup>2</sup></b>
1911	July 1	22:00	Calaveras fault, CA	6.5
1915	October 3	06:52	Pleasant Valley, NV	7.1
1918	October 11	14:14	Puerto Rico	7.5
1918	December 6	08:41	Vancouver Island, B.C., Canada	7.0
1922	January 31	13:17	Offshore Cape Mendocino, CA	7.3
1922	March 10	11:21	Parkfield, CA	6.1
1923	January 22	09:04	Offshore Cape Mendocino, CA	7.2
1925	March 1	02:19	Charlevoix, Quebec, Canada	6.3
1925	June 28	01:21	Clarkston Valley, MT	6.6
1925	June 29	14:42	Santa Barbara, CA	6.8
1926	October 22	12:35	Monterey Bay, CA	6.1
1926	October 22	13:35	Monterey Bay, CA	6.1
1927	November 4	13:51	Offshore Lompoc, CA	7.1
1929	November 18	20:32	Grand Banks, Nova Scotia, Canada	7.3
1932	December 21	06:10	Cedar Mountain, NV	7.2
1933	March 11	01:54	Long Beach, CA	6.4
1933	November 20	23:21	Baffin Bay, Canada	7.4
1934	June 8	04:47	Parkfield, CA	6.1
1935	November 1	06:03	Timiskaming, Quebec, Canada	6.2
1937	July 22	17:09	Salcha, AK	7.3
1938	January 23	08:32	Maui, HI	6.8
1938	November 10	20:18	Shumagin Islands, AK	8.2
1940	May 19	04:36	Imperial Valley, CA	7.1
1946	April 1	12:28	Unimak Island, AK	8.1
1946	June 23	17:13	Vancouver Island, B.C., Canada	7.3
1947	October 16	02:09	Fairbanks, AK	7.2
1949	April 13	19:55	Olympia, WA	7.1
1949	August 22	04:01	Queen Charlotte Island, British Columbia, Canada	8.1
1951	August 21	10:57	Kona, HI	6.9
1952	July 21	11:52	Kern County, CA	7.3
1954	July 6	11:13	Rainbow Mountain, NV	6.6
1954	August 24	05:51	Stillwater, NV	6.8
<b>Year</b>	<b>Date</b>	<b>Time<sup>1</sup></b>	<b>Place</b>	<b>Magnitude<sup>2</sup></b>

1954	December 16	11:07	Fairview Peak, NV	7.1
1954	December 16	11:11	Dixie Valley, NV	6.8
1955	October 24	04:10	Concord, CA	5.4
1957	March 9	14:22	Andreanof Island, AK	8.6
1958	April 7	15:30	Huslia, AK	7.3
1958	July 10	06:15	Fairweather, AK	7.7
1959	August 18	06:37	Hebgen Lake, MT	7.3
1964	March 28	03:36	Prince William Sound, AK	9.2
1965	February 4	05:01	Rat Island, AK	8.7
1965	April 29	15:28	Seattle-Tacoma, WA	6.5
1966	June 28	04:26	Parkfield, CA	6.1
1966	September 12	16:41	Truckee, CA	5.9
1969	October 2	06:19	Santa Rosa, CA	5.7
1971	February 9	14:00	San Fernando, CA	6.7
1975	August 1	20:20	Oroville, CA	5.8
1975	November 29	14:47	South flank of Kilauea, HI	7.2
1979	August 6	17:05	Coyote Lake, CA	5.7
1979	October 15	23:17	Imperial Valley, CA	6.5
1980	January 24	19:00	Livermore, CA	5.8
1980	May 25	16:33	Mammoth Lakes, CA	6.2
1980	May 25	16:49	Mammoth Lakes, CA	5.9
1980	May 25	19:44	Mammoth Lakes, CA	5.9
1980	May 27	14:50	Mammoth Lakes, CA	6.0
1980	November 8	10:27	Gorda Plate, CA	7.2
1983	May 2	23:42	Coalinga, CA	6.4
1983	October 28	14:06	Borah Peak, ID	7.0
1983	November 16	16:13	Kaoiki, HI	6.7
1984	April 24	21:15	Morgan Hill, CA	6.2
1984	November 23	18:08	Round Valley, CA	5.8
1985	September 19	13:17	Michoacan, Mexico	8.0
1985	December 23	05:16	Nahanni, NW Territory, Canada	6.8
1986	May 7	22:47	Andreanof Island, AK	8.0
1986	July 8	09:20	North Palm Springs, CA	6.1
<b>Year</b>	<b>Date</b>	<b>Time<sup>1</sup></b>	<b>Place</b>	<b>Magnitude<sup>2</sup></b>
1986	July 21	14:42	Chalfant Valley, CA	6.2

1987	October 1	14:42	Whittier Narrows, CA	5.9
1987	November 30	19:23	Gulf of Alaska	7.9
1988	March 6	22:35	Gulf of Alaska	7.8
1988	November 25	23:46	Saguenay, Quebec, Canada	5.9
1989	October 18	00:04	Loma Prieta, CA	6.9
1989	December 25	14:24	Ungava, Quebec, Canada	6.0
1991	June 28	14:43	Sierra Madre, CA	5.6
1991	August 17	22:17	Honeydew, CA	7.1
1992	April 23	04:50	Joshua Tree, CA	6.2
1992	April 25	18:06	Cape Mendocino, CA	7.2
1992	April 26	07:41	Offshore Cape Mendocino, CA	6.5
1992	April 26	11:18	Offshore Cape Mendocino, CA	6.7
1992	June 28	11:57	Landers, CA	7.3
1992	June 29	10:14	Little Skull Mountain, NV	5.7
1994	January 17	12:30	Northridge, CA	6.7
1994	September 1	15:15	Cape Mendocino, CA	7.1
1999	October 16	09:46	Hector Mine, CA	7.2
2000	September 3	08:36	Napa, CA	5.0
2001	February 28	18:54	Olympia, WA	6.8
2002	April 20	10:50	Au Sable Forks, NY	5.2
2002	November 3	22:12	Denali Park, AK	7.9
2003	November 17	06:43	Rat Island, AK	7.8
2003	December 22	19:15	San Simeon, CA	6.6
2004	September 28	17:15	Parkfield, CA	6.0

# **APPENDIX B**

Executive Order 12699

*Source: Federal Register, Vol. 55, No. 8, 1990*



## Presidential Documents

Title 3— Executive Order 12699 of January 5, 1990

The President                      Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction

By the authority vested in me as President by the Constitution and laws of the United States of America, and in furtherance of the Earthquake Hazards Reduction Act of 1977, as amended (42 U.S.C. 7701 *et seq.*), which requires that Federal preparedness and mitigation activities are to include “development and promulgation of specifications, building standards, design criteria, and construction practices to achieve appropriate earthquake resistance for new . . . structures, “and” an examination of alternative provisions and requirements for reducing earthquake hazards through Federal and federally financed construction, loans, loan guarantees, and licenses. . . (42 U.S.C. 7704(1)(3,4)), it is hereby ordered as follows:

### Section 1. Requirements for Earthquake Safety of New Federal Buildings.

The purposes of these requirements are to reduce risks to the lives of occupants of buildings owned by the Federal Government and to persons who would be affected by the failures of Federal buildings in earthquakes, to improve the capability of essential Federal buildings to function during or after an earthquake, and to reduce earthquake losses of public buildings, all in a cost-effective manner. A building means any structure, fully or partially enclosed, used or intended for sheltering persons or property.

Each Federal agency responsible for the design and construction of each new Federal building shall ensure that the building is designed and constructed in accord with appropriate seismic design and construction standards. This requirement pertains to all building projects for which development of detailed plans and specifications is initiated subsequent to the issuance of the order. Seismic design and construction standards shall be adopted for agency use in accord with sections 3(a) and 4(a) of this order.

### Sec. 2. Federally Leased, Assisted, or Regulated Buildings.

The purposes of these requirements are to reduce risks to the lives of occupants of buildings leased for Federal uses or purchased or constructed with Federal assistance, to reduce risks to the lives of persons who would be affected by earthquake failures of federally assisted or regulated buildings, and to protect public investments, all in a cost-effective manner. The provisions of this order shall apply to all the new construction activities specified in the subsections below.

(a) Space Leased for Federal Occupancy. Each Federal agency responsible for the construction and lease of a new building for Federal use shall ensure that the building is designed and constructed in accord with appropriate seismic design and construction standards. This requirement pertains to all leased building projects for which the agreement covering development of detailed plans and specifications is effected subsequent to the issuance of this order. Local building codes shall be used in design and construction by those concerned with such activities in accord with section 3(a) and 3(c) of this order and augmented when necessary to achieve appropriate seismic design and construction standards.

(b) Federal Domestic Assistance Programs. Each Federal agency assisting in the financing, through Federal grants or loans, or guaranteeing the financing, through loan or mortgage insurance programs, of newly constructed buildings shall plan, and shall initiate no later than 3 years subsequent to the issuance of this order, measures consistent with section 3(a) of this order, to assure appropriate consideration of seismic safety.

(c) Federally Regulated Buildings. Each Federal agency with generic responsibility for regulating the structural safety of buildings shall plan to require use of appropriate seismic design and construction standards for new buildings within the agency's purview. Implementation of the plan shall be initiated no later than 3 years subsequent to the issuance of this order.

Sec. 3. Concurrent Requirements. (a) In accord with Office of Management and Budget Circular A-119 of January 17, 1980, entitled "Federal Participation in the Development and Use of Voluntary Standards," nationally recognized private sector standards and practices shall be used for the purposes identified in sections 1 and 2 above unless the responsible agency finds that none is available that meets its requirements. The actions ordered herein shall consider the seismic hazards in various areas of the country to be as shown in the most recent edition of the American National Standards Institute Standards A58, *Minimum Design Loads for Buildings and Other Structures*, or subsequent maps adopted for Federal use in accord with this order. Local building codes determined by the responsible agency or by the Interagency Committee for Seismic Safety in Construction to provide adequately for seismic safety, or special seismic standards and practices required by unique agency mission needs, may be used.

(b) All orders, regulations, circular, or other directives issued, and all other actions taken prior to the date of this order that meet the requirements of this order, are hereby confirmed and ratified and shall be deemed to have been issued under this order.

(c) Federal agencies that are as of this date requiring seismic safety levels that are higher than those imposed by this order in their assigned new building construction programs shall continue to maintain in force such levels.

(d) Nothing in this order shall apply to assistance provided for emergency work essential to save lives and protect property and public health and safety, performed pursuant to Sections 402, 403, 502, and 503 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (42 U.S.C. 5170a, 5170b, 5192, and 5193), or for temporary housing assistance programs and individual and family grants performed pursuant to Sections 408 and 411 of the Stafford Act (42 U.S.C. 5174 and 5178). However, this order shall apply to other provisions of the Stafford Act after a presidentially declared major disaster or emergency when assistance actions involve new construction or total replacement of a building. Grantees and subgrantees shall be encouraged to adopt the standards established in section 3(a) of this order for use when the construction does not involve Federal funding as well as when Federal Emergency Management Agency (FEMA) funding applies.

Sec. 4. Agency Responsibilities. (a) The Director of the Federal Emergency Management Agency shall be responsible for reporting to the President on the execution of this order and providing support for the secretariat of the Interagency Committee on Seismic Safety in Construction (ICSSC). The ICSSC, using consensus procedures, shall be responsible to FEMA for the recommendation for adoption of cost-effective seismic design and construction standards and practices required by sections 1 and 2 of this order.

Participation in ICSSC shall be open to all agencies with programs affected by this order.

(b) To the extent permitted by law, each agency shall issue or amend existing regulations or procedures to comply with this order within 3 years of its issuance and plan for their implementation through the usual budget process. Thereafter, each agency shall review, within a period not to exceed 3 years, its regulations or procedures to assess the need to incorporate new or revised standards and practices.

Sec. 5. Reporting. The Federal Emergency Management Agency shall request from each agency affected by this order, information on the status of its procedures, progress in its implementation plan, and the impact of this order on its operations. The FEMA shall include an assessment of the execution of this order in its annual report to the Congress on the National Earthquake Hazards Reduction Program.

Sec. 6. Judicial Review. Nothing in this order is intended to create any right or benefit, substantive or procedural, enforceable at law by a party against the United States, its agencies, its officers, or any person.

THE WHITE HOUSE,  
*January 5, 1990.*

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# Glossary

<b>Acceleration</b>	The rate of change of motion. The rate of increase in ground velocity as seismic waves travel through the earth. The ground moves backward and forward; acceleration is related to velocity and displacement. (Reference: p. 3-17)
<b>Amplitude</b>	The extent of a vibratory movement. The amount of energy released by an earthquake. (Reference: p. 3-15)
<b>Body waves</b>	A category of seismic wave that travels through the earth <i>below</i> and <i>on</i> the surface and is used to determine the earthquake's epicenter. There are two types of body waves—P waves and S waves. (Reference: p. 3-8)
<b>Building configuration</b>	A characteristic of buildings that affects their performance in an earthquake. (Reference: p. 4-9)
<b>Built environment</b>	Any manmade structures such as buildings, transportation lines and structures, communications lines, and utilities. (Reference: p. 1-3)
<b>Cost-effective</b>	A clause in Executive Order 12699 that says that a building should be designed to prevent collapse, not damage. (Reference: p. 2-5)
<b>Damping</b>	The termination or retardation of the motion or vibration of a structure. (Reference: p. 4-7)
<b>Deflection</b>	The extent to which a structural element moves or bends under pressure. (Reference: p. 4-9)
<b>Diaphragm</b>	Horizontal structural elements such as floors and roof systems that are designed to transmit lateral or seismic forces to the vertical elements of the seismic resisting system. (Reference: p. 4-14)
<b>Displacement</b>	The distance an object is moved from a resting position. (Reference: p. 3-18)
<b>Drift</b>	Horizontal swaying of a building. (Reference: p. 4-9)

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<b>Ductility</b>	The quality of certain materials to absorb energy and distort, rather than to suddenly break. Capability of being drawn out or otherwise distort without breaking or fracture. Flexibility is a very close synonym. (Reference: p. 4-8)
<b>Duration</b>	The time interval between the first and last peaks of strong ground motion above a specified amplitude. (Reference: p. 3-17)
<b>Earthquake</b>	<p>The result of the sudden displacement of rock along a fault line. The vibrations of the earth caused by the passage of seismic waves radiating from some source of elastic energy. (Reference: p. 3-6)</p> <p>The sudden motion or vibration in the earth caused by the abrupt release of energy in the earth's lithosphere. The wave motion may range from violent at some locations to imperceptible at others.</p>
<b>Earthquake Hazards Reduction Act of 1977</b>	An act mandating the establishment and maintenance of the National Earthquake Hazards Reduction Program (NEHRP). (Reference: p. 2-3)
<b>Spectral response acceleration</b>	Coefficients shown on maps in the NEHRP <i>Provisions</i> for determining the prescribed seismic forces. (Reference: p. 5-6)
<b>Epicenter</b>	The point on the earth's surface directly above the focus (origination or hypocenter) of an earthquake. (Reference: p. 3-11)
<b>EO</b>	Executive Order (Reference: p. iii)
<b>Executive Order 12699</b>	The most recent and strongest federally mandated effort requiring all new Federal, federally assisted, and federally regulated buildings to be appropriately "seismic resistant." (Reference: p. 1-8)
<b>Fault</b>	A fracture or zone of fractures in rock along which the two sides have been displaced relative to each other parallel to the fracture. The total fault offset may range from centimeters to kilometers. (Reference: p. 3-6)

<b>Federally assisted</b>	Any new construction (or additions to existing buildings) for which any Federal financing (assisted) or the guarantee of any Federal financing is secured. (Reference: p. 2-6)
<b>Federally leased</b>	Any new building or addition in which the Federal Government leases at least 15 percent of the space available. (Reference: p. 2-7)
<b>Federally regulated</b>	Any new construction that will be regulated for structural safety by the Federal Government. (Reference: 2-8)
<b>Hazard (earthquake)</b>	Natural phenomena, such as ground shaking, liquefaction, landslide, surface faulting, tsunami, volcanoes, etc., which occur as a result of tectonic activity and have the potential to cause loss of life, personal injury, and damage to manmade structures. (Reference: p. 1-4)
<b>Horizontal bracing system</b>	Vertical elements such as shear walls, braced frame systems, and moment-resistant systems which help resist lateral forces. (Reference: p. 4-14)
<b>ICSSC</b>	Interagency Committee on Seismic Safety in Construction (Reference: p. 2-4)
<b>Intensity</b>	A measure of ground shaking obtained from the damage done to structures built by humans and changes in the earth's surface. (Reference: p. 3-13)
<b>Isoseismal</b>	Contour lines drawn to separate one level of seismic intensity from another. (Reference: p. 3-11)
<b>Landslide</b>	The dislodging and fall of a mass of earth and rock. (Reference: p. 4-3)
<b>Liquefaction</b>	The conversion (by heat, pressure, or violent motion) of soil and sand into a dense fluid rather than a wet solid mass during an earthquake. (Reference: p. 4-2)

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<b>Magnitude</b>	A measure of earthquake size, determined by taking the common logarithm (base 10) of the largest ground motion recorded during the arrival of a seismic wave type and applying a standard correction for distance to the epicenter. Three common types of magnitude are Richter, P body wave, and surface wave. (Reference: p. 3-12)
<b>Mitigation</b>	A set of actions resulting in permanent improvements, taken to reduce risk of injury and loss of life due to damages to structures during a natural disaster. (Reference: p. 1-7)
<b>Model building code</b>	A published document containing standardized building requirements available for adoption by political units in the United States. These are published by private organizations whose members are local governments. (Reference: p. 5-3)
<b>Model code organization</b>	Building Official and Code Administration (BOCA), Southern Building Code Congress International (SBCCI), International Conference of Building Officials (ICBO) (Reference: p. 5-4)
<b>Modified Mercalli Intensity Scale or mm intensity</b>	Named after Giuseppe Mercalli, an Italian priest and geologist, it is an arbitrary scale of earthquake intensity related to damage produced. (Reference: p. 3-13)
<b>NEHRP</b>	National Earthquake Hazards Reduction Program. (Reference: p. 2-3)
<b>NEHRP's Recommended Provisions for the Development of Seismic Regulations for New Buildings</b>	A report summarizing lessons learned from past seismic events, the most recent research, and a national approach to seismic design—a set of nationally applicable seismic safety guidelines to be used by model code institutions and legislative bodies to establish seismic standards. (Reference: p. 2-4)
<b>New Madrid Fault</b>	A pattern of geologic faults in the area of the common borders of Arkansas, Missouri, Illinois, Kentucky, Tennessee, and Mississippi. (Reference: p. 1-3).
<b>Nonstructural elements</b>	Building elements such as partitions, ceilings, and exterior walls. (Reference: p. 4-7)
<b>OMB Circular A-119</b>	Requires that Federal agencies adopt nationally recognized standards where they are available. (Reference: p. 2-8)

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<b>Period</b>	The elapsed time of a single cycle of a vibratory motion or oscillation. (Reference: p. 4-6)
<b>Plate tectonics theory</b>	The attempt to explain earthquakes, volcanoes, and mountain building as consequences of large horizontal surface motions. (Reference: p. 3-2)
<b>Resonance</b>	The amplification of a vibratory movement occurring when the rhythm of an impulse or periodic stimulus coincides with the rhythm of the oscillation (period). For example, when a child on a swing is pushed with the natural frequency of a swing. (Reference: p. 4-6)
<b>Retrofit</b>	The correction or addition to a building after the initial construction is completed. (Reference: p. 2-11)
<b>Richter Scale</b>	Named after its creator, the American seismologist Charles R. Richter, a logarithmic scale expressing the magnitude of a seismic (earthquake) disturbance in terms of its dissipated energy. (Reference: p. 3-15)
<b>Ring of Fire</b>	The land masses around the Pacific Plate. (Reference: p. 3-4)
<b>Risk (earthquake)</b>	The exposure of persons and manmade structures, such as buildings, pipelines, bridges, etc., to loss of life, personal injury, and damage in the face of an earthquake hazard. Risk may be reduced by designing structures to eliminate the sources of injury and resist damage from earthquake forces. (Reference: p. 1-4)
<b>Seiche</b>	Oscillation (standing waves) of the water in a bay or lake. (Reference: p. 4-4)
<b>Seismic</b>	Of, subject to, or caused by an earthquake or an earth vibration. (Reference: p. 1-4)
<b>Seismic Use Group</b>	A classification assigned in the NEHRP <i>Provisions</i> to a building based on its occupancy and use. (Reference: p. 5-9)

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<b>Seismic hazard maps</b>	U.S. maps that contain quantitative measures from which seismic forces on buildings may be determined. (Reference: p. 5-5)
<b>Seismic Design Category</b>	A classification assigned to a building as defined in the NEHRP <i>Provisions</i> . (Reference: p. 5-9)
<b>Seismic risk maps</b>	Maps developed to give design professionals and emergency response planners an idea of the relative seismic activity of a region. (Reference: p. 3-19)
<b>Seismically resistant design</b>	Building design that evaluates expected horizontal earthquake forces and strengthens the building to withstand these forces. (Reference: p. 1-7)
<b>Seismic activity</b>	The occurrence of earthquakes in space and time. (Reference: p. 1-4)
<b>Seismology</b>	The study of earthquakes. (Reference: p. 2-2)
<b>Robert T. Stafford Disaster Relief and Emergency Assistance Act</b>	Provides programs for Federal disaster response and recovery assistance. (Reference: p. 2-7)
<b>Stiffness</b>	A characteristic of buildings that affects their performance in an earthquake. Stiff building elements may fail abruptly and shatter suddenly in an earthquake. (Reference: p. 4-8)
<b>Subduction</b>	As the edge of a heavier ocean plate is pushed down into the earth's interior by a lighter continental plate, material from the lower plate is "recycled" by melting into the earth's interior. (Reference: p. 3-2)
<b>Surface waves</b>	Seismic waves that follow the earth's surface only, with a speed less than that of S waves. There are two types of surface waves—Rayleigh waves and Love waves. (Reference: p. 3-10)
<b>Topography</b>	The earth's physical features. (Reference: p. 3-12)
<b>Tremors</b>	A low intensity earthquake. (Reference: p. 1-1)

**Tsunami**

A long ocean wave, or tidal wave, usually caused by seafloor movements in an earthquake, landslide, or volcanic eruption. (Reference: p. 4-3)

**Unconsolidated soil**

Fill dirt. (Reference: p. 3-12)

**Velocity**

The speed of an object at an instant in time. The rate of motion. In earthquakes, it is usually calculated in inches per second or centimeters per second. (Reference: p. 3-18)



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