Earthquakes

Emergency communication plan for: reuniting after the earthquake if family members are

separated from one another ask a relative or friend as the “ contact person” after the

disaster. Make sure everyone in the family knows the name, address, and the phone

number of the contact personDuring an earthquake: If inside: take cover under a desk or

against the wall and stay there dont leave the building during the earthquakeIf outside:

Stay away from buildings, street lights, and overpasses stay there until the shaking stopsIf

driving: stop quickly and pull to the side of the road stay in the vehicle avoid bridges or

ramps that are damaged by the quake once the shaking has stoppedIf in a public area: do

not panic move away from shelvesAfter an earthquake: be prepare for aftershocks dont

move seriously injured persons unless they need are in immediate danger listen to radio or

television for the latest information stay our of damaged buildingsChecking for damage in

your home: Gas leaks: if you smell gas or hear a hissing or exploding noise, open a

window and leave the building quickly call gas company to turn off the gas NEVER turn

off the gas yourself unless you are a professionalElectrical system damage: if you see

sparks, broken wires, smell hot insulation, turn off the electricity at the fuse box or circuit

breakerSewage and water lines: dont use the toilet if the sewage line is damaged call the

water company if the water pipes are damaged

earthquakes

Colombian Fear

Have you ever lived through an earthquake? Earthquakes are among the

most destructive and powerful forces in nature(McNally 33). Just recently, people in

Colombia lived and many died in an earthquake. This earthquake overwhelmed and

literally shook up the people of Armenia. First, the unexpected earthquake shocked the

people with its high magnitude. For example, authorities said, Mondays quake

measuring 6. 0 on the open-ended Richter scale, also destroyed buildings and triggered

landslides(Colombian Earthquake 1). This shows that for such a big earthquake people

need time to prepare, but the Colombians had no warning. The innocent people of

Armenia thought that day was going to be an ordinary day but they were unfortunately

wrong. In addition, Earthquakes of magnitude 5. 5 or above are the ones that usually do

damage(Fradin 27). The word damage is an understatement; the earthquake left most

of the people buried under rubble. The damage that was done by this force of nature was

too much for these people to handle. The number 6. 0 seems like a little number, but when

you see the damage that was done it doesnt seem so little. Next, many peoples lives were

greatly affected by this sudden tragedy. There are more than 1, 000 dead, perhaps more

than 2, 000 in Armenia alone(Whitbeck 2). Many people lost their family members and

friends that they deeply cared about. One minute people are happy and enjoying life and

the next minute 2, 000 of those happy people are dead. It left over two-thirds of Armenia

in total ruin, and rural village decimated in addition to the loss of life, the injuries and the

damage to the infrastructure(Moreno 20). There was practically none of the towns left. It

all was demolished by the quake. This left many people homeless without safety and

warmth. This disaster made people lose their lives and homes; it left so many people

empty-handed. Finally, the governments effort to aid the situation at hand lacked merit.

Henry Gomez, the governor said, We dont have enough coffins to bury the

dead(Whitbeck 3). The government needs to provide the dead with coffins because it is

just disrespectful not to. The deceased people deserve a proper burial to end their lives

right. In addition, there was little coordination between the Red Cross, Civil Defense

and firefighters, and accused each group of operating like a separate club(Whitbeck 1).

All the rescue teams needed to work together because the unorganization caused chaos. It

is ridiculous that when citizens are really in need of help, other people have to be stubborn

and unhelpful. The government should have done their job and been there for their people.

Colombia was shocked when the earthquake rocked their country and affected so many

people. Since the quake, Colombia is trying to recover from this tragedy that has greatly

impacted their lives. Hopefully, the victims can pick up the pieces left of their lives and put

them back together.

Earthquake San Francisco- 1906

On the morning 12 past 5: 00 San Francisco suffered a major earthquake that killed 3000

people, the earthquake lasted for about 40 seconds and was recorded at 8. 3 on the Richter

Scale.

People ran from there houses and some stayed inside the buildings and were crushed. The

people who ran in the streets were killed by toppled buildings falling from above. There

fire department was efficient but the water pipes that go down the San Andreas Fault were

severed. The fire could not be stopped because there were now water until the next couple

of days. Gas mains blew and caused massive fires all around the city. The city was in the

middle of a great economic boom and almost all was lost on that day. The old buildings

were never made to withstand earthquakes and easily crumbled and fell crushed people.

Some sailers on the coast tried to leave but the waves flew the boats around like toys. The

buildings were made out of unreined forced brick or wood which couldn’t withstand a

earthquake of that magnitude.

After the earthquake, they noticed that the San Andreas Fault shifted a 250-mile long

section witch tore roads and fences. Rivers, roads and power lines were severed and not

aligned with its surroundings. A road across the fault ended up 21 feet north of the road to

the east same with the rivers and creeks.

The earthquake’s most damage were in Los Bonas 30km east of the fault yet there was

little damage along towns to the east side of San Francisco Bay such as Berkely, 25km

east of the fault. And the capital of California Sacramento that was 120km east of the

rupture showed no damage.

Scientists found out that the earthquake originated north of Oregon and south to Los

Angeles a total of 1170 Km.

Knowing now that buildings could not withstand a earthquake with unreiforced brick, the

new San Francisco would have buildings that can handle major earthquakes by

constructing them so that they sway back and fourth rather than just simply crumbling to

the ground killing people.

The San Andreas fault is formed by the Pacific plate sliding north and the North American

plate running South. The two slide together caused the earthquake.

The most recent earthquake in that area today, was in 1990 in San Francisco which

measured around 8. 3 on the richter scale but it wasn’t a bad as the one in 1906.

earthquake

trembling or shaking movement of the earth’s surface. Most earthquakes are minor

tremors. Larger earthquakes usually begin with slight tremors but rapidly take the form of

one or more violent shocks, and end in vibrations of gradually diminishing force called

aftershocks. The subterranean point of origin of an earthquake is called its focus; the point

on the surface directly above the focus is the epicenter. The magnitude and intensity of an

earthquake is determined by the use of scales, e. g., the and the Mercalli scale.

Causes of Earthquakes

Most earthquakes are causally related to compressional or tensional stresses built up at the

margins of the huge moving lithospheric plates that make up the earth’s surface (see). The

immediate cause of most shallow earthquakes is the sudden release of stress along a , or

fracture in the earth’s crust, resulting in movement of the opposing blocks of rock past one

another. These movements cause vibrations to pass through and around the earth in wave

form, just as ripples are generated when a pebble is dropped into water. Volcanic

eruptions, rockfalls, landslides, and explosions can also cause a quake, but most of these

are of only local extent.

See also .

Seismic Waves

There are several types of earthquake waves including P, or primary, waves, which are

compressional and travel fastest; and S, or secondary, waves, which are transverse, i. e.,

they cause the earth to vibrate perpendicularly to the direction of their motion. Surface

waves consist of several major types and are called L, or long, waves. Since the velocities

of the P and S waves are affected by changes in the density and rigidity of the material

through which they pass, the boundaries between the regions of the earth known as the

crust, mantle, and core have been discerned by seismologists, scientists who deal with the

analysis and interpretation of earthquake waves (see). Seismographs (see) are used to

record P, S, and L waves. The disappearance of S waves below depths of 1, 800 mi (2, 900

km) indicates that at least the outer part of the earth’s core is liquid.

Damage Caused by Earthquakes

The effects of an earthquake are strongest in a broad zone surrounding the epicenter.

Surface ground cracking associated with faults that reach the surface often occurs, with

horizontal and vertical displacements of several yards common. Such movement does not

have to occur during a major earthquake; slight periodic movements called fault creep can

be accompanied by microearthquakes too small to be felt. The extent of earthquake

vibration and subsequent damage to a region is partly dependent on characteristics of the

ground. For example, earthquake vibrations last longer and are of greater wave amplitudes

in unconsolidated surface material, such as poorly compacted fill or river deposits;

bedrock areas receive fewer effects. The worst damage occurs in densely populated urban

areas where structures are not built to withstand intense shaking. There, L waves can

produce destructive vibrations in buildings and break water and gas lines, starting

uncontrollable fires.

Damage and loss of life sustained during an earthquake result from falling structures and

flying glass and objects. Flexible structures built on bedrock are generally more resistant to

earthquake damage than rigid structures built on loose soil. In certain areas, an earthquake

can trigger mudslides, which slip down mountain slopes and can bury habitations below. A

submarine earthquake can cause , damaging waves that ripple outward from the

earthquake epicenter and inundate coastal cities.

Major Earthquakes

Notable earthquakes have occurred at Lisbon (1755), Charleston, S. C. (1886), Assam,

India (1897 and 1950), California (1906), Messina (1908), Gansu, China (1920), Japan

(1923), Chile (1960), Iran (1962), Guatemala (1976), Hebei, China (1976), and Armenia

(1988). The Lisbon and Chilean earthquakes were accompanied by tsunami. On Good

Friday, 1964, one of the most severe North American earthquakes ever recorded struck

Alaska, measuring 8. 4 to 8. 6 on the Richter scale. Besides elevating some 70, 000 sq mi

(181, 300 sq km) of land and devastating several cities, it generated tsunami that caused

damage as far south as California. In Feb., 1971, movement of the San Fernando fault near

Los Angeles rocked the area for 10 sec, thrust parts of mountains 8 ft (2. 4 m) upward,

killed 64 persons, and caused damage amounting to 500 million dollars; in 1989, the Loma

Prieta earthquake above Santa Cruz shook for 15 seconds at 7. 1 on the Richter scale,

killed 67 people, and toppled buildings and bridges. Managua, the capital of Nicaragua,

was almost totally destroyed by a severe earthquake that struck in Dec., 1972. An

earthquake measuring 7. 8 on the Richter scale devastated northern Japan in July, 1993. It

is estimated that in the last 4, 000 years over 13 million deaths were caused by

earthquakes.

Earthquakes are happening almost everyday all over the world. Most of the time

earthquakes are not strong enough to be felt by people, but the shaking caused by an

earthquake is recorded by a seismogram. These are located all over the world at different

points. Only occasionally will a larger magnitude earthquake strike and cause damage to

the region. Around the world there are many faults, depending where these faults are plays

a major factor in determining where an earthquake will happen. It is these faults that are

the reason for earthquakes. The type of fault will also determine how often an earthquake

will happen.

A mid-ocean ridge occurs under the sea at a divergent boundary. This is where two plates

are been pulled apart because of tension. This then allows new oceanic crust to be made in

the divergent boundary, as magma rises and eventually sets on the sea floor.

If the plates on either side of the divergent boundary continue to spread then the ocean

slowly becomes larger in width, a process called seafloor spreading. Mid-ocean ridges are

characterised by a crack like valley at the divergent boundary. This crack like valley is

caused by the tension pulling the plates apart, causing normal faulting to occur a number

of times in the divergent boundary.

It is these normal faults that are the cause and therefore the origin of earthquakes at

divergent boundaries. When the tension pulling apart the two plates becomes too much

then the oceanic crust will fracture. This fracturing is caused by many normal faults

happening as shown in the diagram. The normal faults happen because the crust is been

extended. When the tension becomes too much the faults slip vertically. They move a large

distance in a relatively short space of time, this is the cause of the earthquakes at divergent

boundaries.

Divergent boundaries mostly occur on the sea floor and therefore the earthquakes that

happen at these boundaries are distributed along the boundary. This means that the

distributions of earthquakes at divergent boundaries are at shallow depths, where the crust

is been pulled apart. The earthquakes happen at shallow depths because the normal

faulting occurs near the sea floor, as a result of the tension. The normal faults are the

cause of the earthquakes at these divergent boundaries.

The seafloor sees the most intense tectonic activity in the world, meaning that at the sites

of mid-ocean ridges the frequency of earthquakes is very high.

An example of a mid-ocean ridge is the Mid-Atlantic ridge, there the seafloor is spreading

at a rate of about 3cm per year. The frequency of earthquakes at a mid-ocean ridge will

depend on how much tension is happening at that point. The more tension means the more

seafloor spreading, resulting in a higher frequency of earthquakes at a particular

mid-ocean ridge.

Four major oceans make up most of the water in the world, The Atlantic (north ; south),

The Pacific, The Antarctic and The Indian Ocean. Within the basins of these oceans

earthquakes can happen without been caused at Mid-ocean ridges, or a Subduction Zones.

When the earths crust is under tensional forces the crust will become much thinner than

normal, if there is no fault. This means that the crust becomes weaker as it is thinner than

normal. This can happen to the oceanic crust in the ocean basins, but will only cause an

earthquake with a hot spot. A hot spot is an abnormal hot rising area of the mantle that

supplies the lava for volcanoes. If at the same time a hot spot is directly below a thinned

crust then the magma in the hot spot may hold too much pressure to be held by the thinner

weakened crust. If this is the case then the magma can penetrate the lithosphere, and

eventually erupt on the surface. The action of the magma forcing its way up can trigger

earthquakes as it breaks through the crust. When its breaks through the crust at the sea

bed eventually a volcanic island will be formed in the middle of the ocean. Due to plate

movements this can lead to the creation of mid-plate chains of basaltic volcanic islands,

e. g. Hawaii.

The creation of these islands around the world has happened in other places. Frequent

large earthquakes do not happen along the Hawaiian chain, it is an essentially an asesimic

ridge. Therefore the frequency of earthquakes caused in ocean basins by hot spots is very

low.

The distributions of these earthquakes that do occur happen at shallow depths. This is

because the origin is in the crust, which has been thinned because of tension.

A subduction zone is where two plates collide and one is forced below the other, they

occur at convergent boundaries. They collide because of compression forces, pushing

them into each other. One plate is subducted below the other into the mantle, where it will

be recycled. An example of this is shown below with the Pacific plate subducting under the

Eurasian plate.

The two plates want to travel in opposite directions, they want to go straight into each

other. This causes the pressure to build up over a long period of time, as the two plates

push at each other. As time progresses one of the plates will start to be bent downward

under the other one because of the extreme force, however does not slip, just bends. This

is because of the friction between the two plates is enough to allow them to bend, without

slipping. This is a very slow but continuous movement, maybe only a few millimetres

every year. Every fraction moved by the plates increases the build-up of elastic strain

energy within the rock. The rock continues to store this energy from a few decades to a

few thousand years. An earthquake will happen when the strain in the rocks exceeds that

of the limit of the rocks. The fault then ruptures, moving a large distance in a short space

of time. The plates then snap back into a new position, forcing the already undercutting

plate to dive down even further under the other. The collisions of two plates generally

produce large forces in the plates. These forces result in the triggering of the earthquakes

within the subduction zones.

The frequency of earthquakes in Subduction zones is about the same as that in the

mid-ocean ridges. This is because the plates cover the globe, and if they separate in one

place then in another place one-plate sinks below another. This means that the triggering

of an earthquake at a divergent boundary triggers an earthquake at a convergent plate.

Meaning that the frequency of earthquakes at Subduction zones is the same as at

Mid-ocean ridges, which is very high.

The earthquakes at convergent boundaries are distributed at different points. The deep

focus earthquakes occur along the already subducted plate. Shallow focus earthquakes

occur just at the point where one plate starts to be thrust under the other. These

earthquakes tend to be more common than the deeper earthquakes. This is shown on the

diagram on the left. The red dots show the distribution of earthquakes at a convergent

boundary.

Continental shields are extensively flat tectonically stable interiors of the continents,

composed of ancient rocks. Most of the stress that builds up by tectonic movements is

released in earthquakes at the plate boundaries. However stress can also build up in the

interiors of plates. Old fault lines in the plates are weaker than the surrounding rocks,

these old fault lines cover many continents, crossing all over each other. The old faults can

slip if the stress becomes too much from recent plate movements, which will cause an

unexpected earthquake. This can be a problem as many old fault lines are not known, and

many are away from modern plate boundaries that exist today. This is potentially

dangerous as many modern settlements may be at risk from earthquakes, even though they

are not near modern day faults.

The distribution of earthquakes at continental shields is not yet known, as scientists do not

know whether these earthquakes will strike the same region within a plate.

The strength of these inter-plate earthquakes are relatively small, compared to boundary

earthquakes. The frequency is also very small, the last major inter plate earthquake was in

Latur-India in 1993. However they can catch regions totally unexpected because they can

affect areas with no previous earthquake history. Also the energy of the earthquake is

spread out further without losing as much. Due to the older hard rocks that transmit

energy better, than the deformed broken younger rocks. This can cause more damage to a

larger region.

Earthquakes are common events and are happening all the time. They can be caused by

many different factors within the earths interior. Depending on the type of area that they

happen in will determine the strength of the earthquake, and the frequency of earthquakes

within the region. The distribution of earthquakes within an area will much depend upon

what caused the earthquake to happen in the first place. We understand today how

earthquakes are caused, and we can record where they happen every day of the year. This

has helped us to learn and understand about earthquakes in much detail. We now only

miss one important factor that we all would like to know, when and where the next one

will be. In truth it must be said that today we are still not close to predicting earthquakes

even with all the technology that is available.

Bibliography

Understanding Earth 2nd edition by Frank Press and Raymond Siever.

Microsoft Encarta Encyclopaedia 1998.