

It is Allah Who created the seven heavens and of the earth the same number, the Command descending down through all of them, so that you might know that Allah has power over all things and that Allah encompasses all things in His knowledge.

(Qur'an, 65:12)

TRAINING MATERIAL FOR RELIGIOUS LEADERS (EARTHQUAKE PREPAREDNESS)

NON STRUCTURAL HOUSEHOLD LEVEL VOLUNERABILITY RISK REDUCTION

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1. INTRODUCTION:

Traditionally most people believed that disasters happened and there was nothing they could do to protect themselves. But local religious leaders will slowly dispel the idea. As part of a project aimed at reducing the impact of disasters on people and their assets, religious leaders and Imams may play important role to motivate and make aware the people about the preparedness to reduce the risk of earthquakes.

The communities where Faith is an inseparable and most important part of everybody's lives, religious leaders play a significant role in educating and awareness building people. Also where communal worship in a specific place is the common practice, religious leaders would have invaluable access to the public. Considering their influence on the beliefs of the believers, they could be highly instrumental in passing the correct messages on earthquake safety and house-hold vulnerability reduction measures to the public, or to affect the improper attitude and practices among the communities.

If the religious leaders and Imams are trained, sensitized and mobilized, they can play a very vital role in the preparedness and risk reduction of potential earthquake hazards in the Bangladesh. The religious leaders have strong roots at all levels in and segments of the society.

The religious leaders can mobilize the public to initiate, unite and prepare themselves with regard to earthquake risk reduction. The opportunity of strong belief in the Bangladesh society can attribute to make public aware about the non structural vulnerabilities reduction at the house hold level.

The specific days and occasion of the worship, prayers and other annual events of religion will be the great opportunity for the public awareness about the subject. Keeping in view the various efforts undertaken by various civil society organizations, important role of religious leaders neglected or very minimum in the account of risk reduction and preparedness.

The training material is prepared, keeping in view some basic concepts such as what is earthquake, what people can do to reduce their impact, and how to get this information across to ordinary people without causing panic.

The main message of the theme is don't be afraid, be prepared. After the completion of training, the Imams of respective religious places will use during Friday sermons to advice people "what can be done to reduce non structural vulnerabilities with regard to earthquake.

The training material covering two themes which includes the knowledge (in relation with science) and religion and skills.

1.1 AIM OF THE MATERIAL

The basic aim of this manual is to equip 'trainers' to impart training to religious leaders and sensitize them with regard to public awareness and role of religious leaders and imams before, during and after the earthquake.

1. Provide an overview of and basic concept of earthquake;
2. Provide an overview of History of earthquakes in the Bangladesh and recent great earth quakes in the region;

3. Understand the definition of vulnerability in general and non structural vulnerability specifically.
4. Understand the measures to reduce non structural vulnerabilities at house hold level;
5. Clear the role of religious leaders to mobilize the public to take initiate
6. Understand the strategies and tools for the public awareness in respect Bangladesh context.

2. What is Earthquake and Causes

The modern science describes earthquakes are sudden, rapid vibrations of the earth caused by sudden rapture and shifting of rock beneath the earth's surface. The vibrations of the earth can range from barely noticeable to disastrously destructive. There are three causes of earthquake and described briefly as below:



1. Tectonic quakes are, by far, but the most common, devastating and most difficult to predict. They are caused by stresses setup by movements of a dozen or so huge plates that form the earth's crust. Most earthquakes occur at the boundaries of the plates, where two plates slide over, under and collide against each other. Some earthquakes are do occur in the middle of plates.

2. Volcanic quakes are seldom very large or destructive; they often precede or accompany volcanic eruptions.

3. Artificially produce earthquakes are earthquakes induced by activities such as the filling of new reservoirs or the pumping of fluids deep into the earth through wells. This type of earthquakes can be noticeable but are hardly destructive.

2.1 Earthquake in the perspective of Holy Qur'an

Allah surely creates all these disasters as "**warnings**" to mankind. He is exalted in power and He has power over all things. Allah testifies to this in the verse:

**Say: "He has power to send calamities on you, from above and below."
(Surah al-An'am 6:65)**

In Surah Az-Zalzalah, **99**: 1-4 we read:

- 1-When the earth is severely quaked
- 2-And the earth throws out its heavy burdens
- 3- And man enquires "What has come over it?"
- 4-On that day, it will tell its information.

¹The Arabic word zilzalah means 'earthquake'. The above verses are quoted from the Surah, the Earthquake. These verses are believed to refer justifiably to the earthquake expected to occur on the Day of Judgment; however, we should take due notice of its wider sense, depicting earthquakes in general. The fourth verse announces that men will be informed on that day. A terrible disaster like an earthquake, associates in one's mind destruction in the first place causing material damage and bodily injury leading to a general terror and panic. This announcement must have astounded the public. "What may God have meant by this?" has been the question often asked, but remaining without answer.

The Qur'an directs our attention to places where earthquakes can be expected to take place so that we can deepen our studies. If we give up our tradition of reciting the Qur'an merely for the souls of those who have departed, but instead take it as a guide for our life, we can reach the truth hidden in it.

"We have sent down to you a book explaining all things, a guide, a Mercy and glad tidings for those who submit." Surah, **An-Nahl or The Honey Bee, 16: 89**

Seismology is the study of earthquakes. Muslim scientists contributed to Seismology when Western civilization was in the dark ages. Al-Masudi who died in Cairo in 957 CE may be called the "Pliny of the Arabs".

In his celebrated work **The Meadows of Gold**, Al-Masudi has described an earthquake, and the first windmill which was also invented by a Muslim.

2.2 Are Calamities a Punishment?

Calamities bring suffering and it is not necessarily a punishment for a sin one has committed, but it may be a test and trial for some people. Allah allows some people to suffer in order to test their patience and steadfastness. Even Allah's Prophets and Messengers were made to suffer. Moreover, Allah sometimes allows some people to suffer to test others, how they react to them.

Whenever we encounter suffering we should ask ourselves, "**Have we broken any law of Allah?** Is the cause of the problem our own misdeeds?" In that case, we should correct the situation. "Could it be a punishment?" Let us repent and ask forgiveness and reform our ways. "Could it be a test and trial for us?" Let us work hard to pass this test. Believers face sufferings with prayers, patience, repentance and good deeds.

Allah says: "Only those who are patient shall receive their reward in full, without reckoning."
(Az-Zumar 39: 10)

¹ **TSUNAMIS AND EARTHQUAKES:** by Ibrahim B. Syed, Ph. D.
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Those who did good deeds find the reward for their good deeds waiting for them with Allah, and those who did evil will find the punishment for their evil deeds waiting for them. Good and evil cannot be equal, and the patience of the one who was tested and bore it with patience will not be wasted with Allah. Indeed, those who were not tested in this world may wish that they had suffered similar calamities when they see the high status attained by those who bore calamities with patience. There is a great deal of evidence to this effect in the Qur'an and Sunnah. Examples of this are as follows:

Allah says: "And certainly, We shall test you with something of fear, hunger, loss of wealth, lives and fruits, but give glad tidings to the patient." (Al-Baqarah, 2: 155)

The Messenger of Allah (peace and blessings be upon him) said: "How wonderful is the affair of the believer, for all of it is good, and that applies to no one except the believer. If something good happens to him he gives thanks, and that is good for him, and if something bad befalls him he bears it with patience and that is good for him." (Reported by Muslim)

From this, it should be clear to you that the calamities that befall those who seem to us to be innocent— and indeed befall all people —are not necessarily a punishment. Rather they may be a mercy from Allah, but our minds and reason are imperfect and are often unable to understand the wisdom of Allah in such matters. Either we believe that Allah is more just than us, and wiser, and more merciful towards His creation, so we submit to Him and accept His will while also acknowledging our inability to understand the true nature of our own selves.

²Moreover, the Prophets and Messengers are the most beloved of creation to Allah, yet despite that, they were the most severely tested of mankind and suffered the most calamities. Why? It was not a punishment for them, and it was not because of their insignificance before their Lord. Rather it is because Allah loves them and has stored for them a perfect reward that they will enjoy in Paradise, and He decreed that these calamities should befall them so that He might raise them in status. He does whatever He wills, however He wills, whenever He wills; none can put back His judgment, none can repel His command, and He is All-Wise, All-Knowing. And Allah is Most High, Most Knowledgeable and Most Wise. Source: www.islam-qa.com

3. ³Qur'an and Science

Science is not a divine revelation but it provides a means for the welfare of man and to better understanding the creation of Allah(SWT), the natural phenomena and their purpose. In simplest terms science means knowledge and Islam exhorts its followers to relentlessly pursue knowledge. The Noble Qur'an, Allah (SWT) ordained His servants to pray to Him thus:

" O Lord! Increase me in knowledge." (20: 114)

It is reported that the Messenger of Allah (SWT) peace be upon him to have once said, " Learning comprises treasure houses whose keys are queries." Prophet Muhammad (pbuh) encouraged the

² Source: www.islam-qa.com

³ Science and Quran, by Ibrahim B. Syed, Ph. D.
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spirit of investigation and analysis of facts. One of the most inspiring Ayath (verses) in the Qur'an is the following:

" And He has subjected to you, as from Him, all that is in the heavens and on earth: behold, in that are signs indeed for those who reflect." (45: 13)

To reflect is really the scientific spirit, which leads to understanding and discoveries about Allah's (SWT) creation and natural phenomena. Allah (SWT) guides the efforts of the scientists to meaningful purposes.

4. ⁴Why suffering and calamities exists

“Indeed Allah is All-Powerful (Al-'Aziz) and He is able to do all things ('ala kull sha'in qadir). The Qur'an has mentioned this hundreds of times. It is also mentioned in the Qur'an that Allah is the Creator and He is the Best Creator. “Glory be to Allah, the best Creator.” (Al-Mu'minun: 14).

Why do pain and sufferings exist in the world. We find sickness, old age and death. We see things that are ugly, people who are insane and foolish. There are storms, earthquakes, floods, draught and famine. We also see people commit sins, show disloyalty, unfaithfulness, greed and insincerity. We see people commit rapes, murders; they fight and make wars. We know all these and many more problems. There are evils caused by human beings and there are natural disasters. There are suffering for individuals and there are those that involve a large number of people.

But we also know that this is not the whole story. Besides all these negative things, we also see beauty, health, prosperity, life, birth, wisdom, intelligence, growth and progress. We also see goodness among people, faith, sincerity, charity, love and the spirit of sacrifice. We also see a lot of virtue and piety. It is wrong to see one side of the coin and not to see the other side. Any philosophy that concentrates on one aspect of the creation and denies or ignores the other side is partially true and partial truths are no truth at all.

It is also the fact that the element of good is more in the creation than the element of evil. We all see that there are more people who are healthy than those who are sick. There are more that eat well than those who starve.

There are more that lead decent life than those who commit crimes. Goodness is the rule and evil is the exception. Virtue is the norm and sin is the aberration. Generally trees bear fruits, the flowers bloom, the winds move smoothly.

But then the question is why does Allah allow these exceptions to the rules?

Let us ask this question to understand Allah's ways in His creation. The Qur'an tells us that good, evil and whatever happens in this world happens by Allah's Will. Only Allah knows fully His Will. We finite beings cannot grasp fully His infinite Will and Wisdom. He runs His universe the way He deems fit. The Qur'an tells us that Allah is Wise and everything that Allah does is right, just, good and fair. We must submit and surrender to His Will. The Qur'an has not given us all the

⁴ <http://en.allexperts.com/q/Islam-947/Islam-Explain-Suffering.htm>

details about Allah's Will, but it has enlightened us with the guidance that is useful and sufficient for us. There are several points that we should keep in our mind to understand this issue:

1. First of all, Allah did not make this world a permanent world. This is a temporary world and everything here has a time limit. When its times comes it will die, come to an end and finish. Neither the good things of this world are forever, nor the bad things eternal. We are here for a short time and we are being tested. Those who will pass this test will find an eternal world that is perfect and permanent. Those who will fail this test shall see the evil consequences of their sins and corruption.
2. Allah has placed a physical law and a moral law in this universe. Allah allows suffering to occur when one or more of these laws are broken. The physical law is based on cause and effect. Sickness comes if one does not take care of one's health or is exposed to infections. A car accident occurs when one is not alert, or drives in a careless manner, or if the cars are not checked, roads and freeways are not made and kept in right shape, or the traffic laws are not right or not properly enforced. Study of causes and effects is very important to facilitate safeguards. Even here we should keep in mind that Allah often saves us and He does not let us suffer from every negligence. How many times it happens that we are not careful and still we reach safely to our destinations. The way people drive in some cities, it is a miracle that more accidents do not happen and more people do not suffer. Allah says:

“(Allah) Most Gracious! It is He Who has taught the Qur'an. He has created man: He has taught him speech (and Intelligence). The sun and the moon follow courses (exactly) computed; and the herbs and the trees both (alike) bow in adoration. And the Firmament has He raised high, and He has set up the Balance (of Justice), in order that you may not transgress (due) balance. So establish weight with justice and fall not short in the balance. It is He Who has spread out the earth for (His) creatures.” (Ar-Rahman:1-10)

The way we exceed the measures set by Allah and violate His laws of cause and effect is incredible. It is really the mercy of Allah that we are saved. Strictly speaking, the question should not be why does Allah allow suffering, but how much Allah protects us and saves us all the time in spite of our violations and negligence. The Qur'an says:

“If Allah were to punish people according to what they deserve, He would not leave on the back of the (earth) a single living creature: but He gives them respite for a stated Term: when their Term expires, verily Allah has in His sight all His servants.” (Fatir:45)

3. Suffering can also be a test and trial for some people. Allah allows some people to suffer in order to test their patience and steadfastness. Even Allah's Prophets and Messengers were made to suffer. Prophet Ayyub (Job) is mentioned in the Qur'an as a Prophet who was very patient. Good people sometimes suffer but their sufferings heal others and bring goodness to their communities. People learn lessons from their good examples. Martyrs die for their faith, soldiers give their lives for their nations and this brings liberation and freedom for their people.
4. Allah sometimes allows some people to suffer to test others, how they react to them. When you see a person who is sick, poor and needy, then you are tested by Allah. Allah is there with that suffering person to test your charity and your faith. In a very moving Hadith Qudsi (Divine Hadith) the Prophet, peace be upon him, said:

“Allah will say on the Day of Judgment, ‘O son of Adam, I was sick and you did not visit Me.’

He will say, 'O my Lord, how could I visit You, when you are the Lord of the Worlds.' Allah will say, 'Did you not know that My servant so-and-so was sick and you did not visit him? Did you not know that if you had visited him, you would have found Me there?' Allah will say, 'O son of Adam, I asked you for food and you fed Me not.' He shall say, 'O my Lord, how could I feed you and you are the Lord of the Worlds?' And Allah will say, 'Did you not know that My servant so-and-so was in need of food and you did not feed him? Did you not know that if you had fed him, you would have found that to have been for Me?' 'O son of Adam, I asked you for water and you did not give Me to drink.' The man shall say, 'O my Lord, how could I give You water, when You are the Lord of the Worlds?' Allah will say, 'My servant so-and-so asked you for water and you did not give him to drink water. Did you not know that if you had given him to drink, you would have found that to have been for Me. (Muslim, Hadith no. 4661)

So to summarize, we can say that sufferings occur to teach us that we must adhere to Allah's natural and moral laws. It is sometimes to punish those who violate Allah's natural or moral laws. It is to test our faith in Allah and to test our commitment to human values and charity. Whenever we encounter suffering we should ask ourselves, "Have we broken any law of Allah?" Let us study the cause of the problem and use the corrective methods. "Could it be a punishment?" Let us repent and ask forgiveness and reform our ways. "Could it be a test and trial for us?" Let us work hard to pass this test.

Believers face the sufferings with prayers, repentance and good deeds. The non-believers face the sufferings with doubts and confusions. They blame Allah or make arguments against Him.

5. Basic terms and interpretation in the local context

Disaster A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk management The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster risk reduction (disaster reduction) The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

The disaster risk reduction framework is composed of the following fields of action, as described in ISDR's publication 2002 "Living with Risk: a global review of disaster reduction initiatives", page 23:

Risk awareness and assessment including hazard analysis and vulnerability/capacity analysis;

Knowledge development including education, training, research and information;

Public commitment and institutional frameworks, including organizational, policy, legislation and community action;

Application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments;

Early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.

Preparedness Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction changing attitudes and behavior contribute to promoting a "culture of prevention".

Recovery Decisions and actions taken after a disaster with a view to restoring or improving the

pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Recovery (rehabilitation and reconstruction) affords an opportunity to develop and apply disaster risk reduction measures.

Structural / non-structural measures Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.

Vulnerability The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

For positive factors, which increase the ability of people to cope with hazards, see definition of capacity.

6. History of earthquakes in the Bangladesh

Geographically Bangladesh is located close to the boundary of two active plates: the Indian plate in the west and the Eurasian plate in the east and north. As a result the country is always under a potential threat of earthquake of any magnitude at any time,

A total of about six lacks incidents of quakes of different magnitudes occur annually throughout the world of which that of magnitudes 6-7, 7-8 and above 8 are 120, 18 and 1, respectively.

The records in Bangladesh during the last 175 years shows total number of 47 earthquakes 25 occurred.

- In 1865, terrible shock was felt, during the second earthquake occurred in the winter of 1865, although no serious damage occurred.
- In 1869, known as Cachar Earthquake. Severely felt in Sylhet but no loss of life. The steeple of the church was shattered, the walls of the courthouse and the circuit bungalow cracked and in the eastern part of the district the banks of many rivers caved in.
- In 1885, known as the Bengal Earthquake. Occurred on 14 July with 7.0 magnitude and the epicenter was at Manikganj. This event was generally associated with the deep-seated Jamuna Fault.
- On 10th January 1869, there was a severe earthquake with 7.5 magnitude in the eastern part of the country. Epicenter of the earthquake was at Jaintia Hills. It affected most parts of Sylhet town and surrounding areas.
- On July 14, 1885 an earthquake occurred causing considerable damage in Sirajganj-Bogra region and more severe damages have been reported in Jamalpu-shepur-Mymensingh regions. The magnitude is estimated to be in the region of 7.0 in Richter scale. During the studies for Jamuna Bridge a through study was done as it was located around 8 KM south of Sirajganj and Bolt(1987) concluded that epicenter might have been near the Bogra fault system.
- In 1897 on 12th June a major earthquake, known as the **Great India Earthquake** with a magnitude of 8.7 hit a large part of the country. This earthquake caused serious damage to masonry buildings in Sylhet town where the death toll rose to 545. This was due to the collapse of the masonry buildings. The tremor was felt throughout Bengal, from the south Lushai Hills on the east to Shahbad on the west. In Mymensingh, many public buildings of the district town, including the Justice House, were wrecked and very few of the two-storied brick-built houses belonging to Zamindars survived. Heavy damage was done to the bridges on the Dhaka-Mymensingh railway and traffic was suspended. The river communication of the district was seriously affected (Brahmaputra). Loss of life was not great, but loss of property was estimated at five million Rupees. Rajshahi suffered severe shocks, especially on the eastern side, and 15 deaths were recorded. In Dhaka damage to property was heavy. In Tippera masonry buildings and old temples suffered a lot and the total damage was estimated at Rs 9,000.
- 1930 Known as the Dhubri Earthquake. Occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri, Assam. The earthquake caused major damage in the eastern parts

of Rangpur district.

- 1934 Known as the Bihar-Nepal Earthquake. Occurred on 15 January with a magnitude of 8.3 and the epicenter at Darbhanga of Bihar, India. The earthquake caused great damage in Bihar, Nepal and Uttar Pradesh but did not affect any part of Bangladesh. Another earthquake occurred on 3 July with a magnitude of 7.1 and the epicenter at Dhubri of Assam, India. The earthquake caused considerable damages in greater Rangpur district of Bangladesh.
- 1950 Known as the Assam Earthquake. Occurred on 15 August with a magnitude of 8.4 with the epicenter in Assam, India. The tremor was felt throughout Bangladesh but no damage was reported.
- 1997 May 8 an Earthquake occurred in Sylhet with a magnitude of 5.6 of which the epicenter was found in north east Sylhet near Jaintiapur and led to cracking of number of buildings in an around Sylhet. It was recorded that there was an impact to Sylhet airport buildings, Grameen Bank building in Barlekha, school building near Jaintiapur.
- 1997 Occurred on 22 November in Chittagong with a magnitude of 6.0. It caused minor damage around Chittagong town.
- 1999 Occurred on 22 July at Maheshkhali Island with the epicentre in the same place, a magnitude of 5.2. Severely felt around Maheshkhali island and the adjoining sea. Houses cracked and in some cases collapsed.
- 2003 Occurred at 5:17 a.m. on 27 July at Kolabunia union of Barkal upazila, Rangamati district with magnitude 5.1. There was damage to masonry buildings and traditional houses were reported and around 500 mud-wall houses have been collapsed, two people have been killed and around 100 have been injured. The maximum intensity is estimated to be VII EMS (Ansary et al, 2003)

6.1 Examples of different earthquakes in the region (China, Pakistan, Indonesia and India)

Earthquakes strikes without warning. They may occur any time of the day or night. Each year, 70 to 75 damaging earthquakes occur through out the world. In the Asia during the past decade, several strong earthquakes have occurred. The following are some of them.

1. On 12 May 2008, an earthquake of magnitude 7.9 and depth 19km occurred in China (Sichuan), more than 68,516 people dead, missing 19,350, injured 365,399 and evacuated 15,148,840. Total about 5,360,000 buildings and damaged buildings: more than 21,000,000. So, what can we do to protect our self, our home and different materials from earthquakes?.
2. An earthquake measuring 7.6 on the Richter scale struck the northern areas of Pakistan and India on 8 October 2005. Its epicenter was 19 km northeast of Muzaffarabad. Azad Jammu Kashmir (AJK) and North West Frontier Province (NWFP) were severely affected. Since that day, more than 1,200 aftershocks have been recorded in the region, some of them close to 6.0 on the Richter scale. More than 73000 people died. Most buildings in the affected area had poor earthquake resilience. Of the total housing stock, 84 percent was damaged and destroyed in AJK and 36 percent was damaged or destroyed in NWFP. The 3.2 million to 3.5 million people have been affected by the disaster.
2. The Great Tsunami of 26 December 2004 in the Indian Ocean: Tsunami waves of up to ten meters swamped the smaller outlying islands of Sumatra, Indonesia as well as its northern and western coastal areas. According to the official reports (Ministry of Health) 166,320 people were killed, 127,774 are still missing and 655,000 people were displaced in Northern Sumatra. A total of 110 bridges were destroyed, 5 seaports and 2 airports sustained considerable damage, and 82% of all roads were severely damaged.
3. January 26, 2001- An earthquake occurred in a western state of India, centering in the town of Bhuj in Gujarat, an industrial and agricultural state, and killing over 10,000 people, making it one the deadliest earthquake in the last ten years.

6.2 Common effects and impacts of the earthquake What are the common

Ground shaking from earthquakes can destroy structures such as buildings and bridges resulting in death, injuries and expensive property damages; disrupt flow of gas, electric and telephone services. Buildings with foundations resting on unstable foundations are at high risk because they can be shaken off their mountings during an earthquake.

Earthquakes can also trigger environmental hazards to both urban and rural areas in the several ways including landslides, land faulting, liquefaction, tsunamis and flash floods. Finally, there is formidable threat of fire.

- Faulting:** Faulting is the breaking up of the land, caused by an earthquake. Buildings that straddle an active fault may be damaged.
- Landslides:** Landslides comprise mass of soil and rocks that crumble down the slopes of mountains, hills or cliffs as a result of any shaking due to earthquake. In severe cases, people can be buried alive.
- Tsunamis:** Tsunamis are large ocean waves that occur when the ocean floor or coastal area is tilted or offset when it is hit by a strong earthquake. It could become a towering wall of water 15 meters high or more by the time it reaches the shore where it is capable of causing much damage, possibly destroying the entire coastal settlements.
- Liquefaction:** Liquefaction usually occurs in the area where the soil is soft, loose and saturated with water. As a result of shaking due to earthquake, the soil moves and behaves like quicksand affecting any structure on the surface to sink or tilt.
- Human impacts** Earthquakes may result in disease, lack of basic necessities, loss of life, higher insurance premiums, general property damage, road and bridge damage, and collapse of buildings or destabilization of the base of buildings which may lead to collapse in future earthquakes. The most significant human impact is loss of life
- Floods** Floods may be a secondary effects of earthquakes, if dams are damaged.

7. What is Vulnerability and Factors contributing in the Vulnerability?

7.1 Vulnerability: The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

- unplanned urbanization;
- over population;
- poorly constructed structures;
- lack of coordination between institutions concerned;
- inadequacy of recovery tools and;
- lack of awareness.

7.2 Measures to reduce the vulnerability

- earthquake-related awareness campaigns;
- retrofitting existing buildings;
- strengthening building inspection system;
- proper implementation of building code and;
- training for masons, architects and engineers.

8. Why non structural vulnerability reduction important

A major way in which loss of life and injury can be reduced in a major earthquake is by undertaking a nonstructural vulnerability. This involves a visual inspection of each room of a property to identify furniture and fittings that could topple or break in the event of an earthquake and cause injury and/or restrict access to exits, trapping the occupants.

Non-structural hazard mitigation is one of the least expensive ways to decrease the incidence of injury. Here are a few of the identified hazards and some suggested solutions.

8.1 Structural and non structural parts of a Building:

In the every building it may be small house, office or big building, they have base on structures. These structures are divided into two categories structural and non structural. In this handout we discuss the topic non structural components of the building it may be small consists on one room or a big multi story building.

8.2 Structural parts

The structural portions of a building are those that resist gravity, earthquake, wind, and other types of loads. These are called structural components and include:

- columns;
- beams
- floor or roof sheathing,
- slabs, or decking;
- walls and foundations.

For buildings planned by design professionals, the structure is typically designed and analyzed in detail by a civil or structural engineer.

8.3 Nonstructural parts

The nonstructural portions of a building include every part of the building and all its contents with the exception of the structure in other words, everything except the columns, floors, beams, etc. Common nonstructural components includes following three categories:

1. Building Utility Systems

- Batteries and Battery Rack
- Diesel Fuel Tank
- Electrical Bus Ducts and Primary Cable System
- Fire Extinguisher
- Water Heater: Corner Installation
- Water Heater: Wall Installation
- Piping
- Chiller
- Air Compressor (or other HVAC Equipment)
- HVAC Distribution Ducts

- Residential Chimney

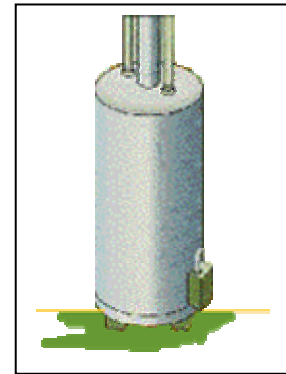
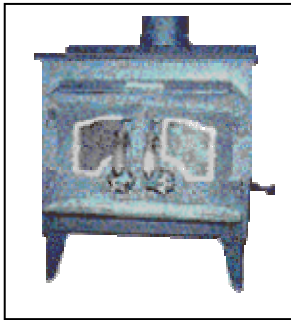
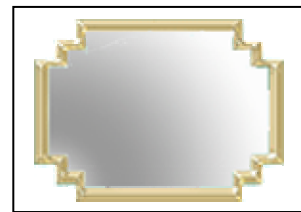
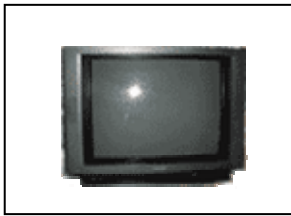
2. Architectural Elements

- Built-In Partial-Height Partitions
- Built-In Full-Height Partitions
- Suspended T-Bar Ceilings
- Suspended Light Fixtures
- Pendant Light Fixtures
- Stairways
- Windows
- Un-reinforced Brick Parapets
- Veneer
- Freestanding Walls or Fences
- Exterior Signs

3. Furniture and Contents

- Large Computers and Access Floors
- Desktop Computers and Office Equipment
- Tall Shelving: Freestanding
- Library Stacks
- Tall Shelving: Wall Unit
- Tall File Cabinet
- Flexible Connection for Gas or Fuel Lines
- Drawer and Cabinet Latches
- Freestanding Wood Stove
- Compressed gas Cylinders
- Containers of Hazardous Materials
- Fragile Artwork
- Freestanding Half-Height Partitions
- Miscellaneous Furniture

8.4 Some Pictures of non structural furniture and other contents of the Building



8.5 Behavior of non structural items during the earthquake

Earthquake not kills but structures kill. As we have discussed about structural and non structural concepts and how much they will generate destruction when quakes happens. So that it is important to understand and get knowledge about the non structural components of our houses. We can reduce our vulnerability just adaptation of the few cost effective measures. When the earthquake occurs, anything that can move, fall, break or cause a fire could be a hazard during an earthquake. Imagine what would happen if you picked up each room in your home and shook it.

1. **Window and mirror glass:** Sharp shards may fall or be thrown across a room.
2. **Heavy furniture:** Furniture will move and fall during many types of disasters, especially tall, top-heavy items.
3. **Gas appliances:** Your stove, water heater, furnace, clothes dryer, etc. may run on natural gas or propane. Unsecured gas appliances may crush someone or rupture their gas feed line during a quake. If these objects move or topple the resulting gas leak may destroy your home, a home which would otherwise have survived with only minor damage.
4. **Refrigerators:** Refrigerators are extremely heavy and most of them are on wheels. Because of their weight they may crush someone if they move and tip.
5. **Hanging pictures, mirrors, clocks etc:** Anything simply hanging on a wall will come to flying off in a large shake.
6. **Beds located near windows:** Plate glass may break during a disaster.

9. Non structural risk reduction tips

9.1 Earthquake and our home:

Earthquakes occur suddenly with little or no warning, during any season and at any time of day. Although the West Coast generally has the greatest earthquake activity, the potential for earthquakes exists in almost every corner of the United States.



On 12 May 2008, an earthquake of magnitude 7.9 and depth 19km occurred in China (Sichuan), more than 68,516 people dead, missing 19,350, injured 365,399 and evacuated 15,148,840. Total about 5,360,000 buildings and damaged buildings: more than 21,000,000. So, what can we do to protect our self, our home and different materials from earthquakes?.

This session will help you by providing information about:

- key areas of our home that are especially susceptible to damage;
- ways we can reduce damage to our home and belongings; and,
- what we can do to protect our self and our family.

9.2 What Our Home Experiences, if there is earthquake

Imagine that a strong earthquake strikes where we live. Loose items fall and break. Cabinets and bookcases tip over, blocking exits. Dust billows everywhere. Gas and water lines break, and phone and electrical service are interrupted for days. Our home may collapse, slide off its foundation or simply come apart at the seams.



9.3 What We Can Do

You can protect your home by modifying it, with regards to nonstructural retrofits protect your home's contents against damage with little cost and efforts.

9.4 Examples of retrofits include:

- securing water heaters, large appliances, bookcases, pictures and bulletin boards;
- latching cabinet doors; and
- using safety film on windows.



9.5 Nonstructural retrofits

Now will learn inexpensive and easy ways to protect our self against some of the damage earthquakes can cause inside our home.

Start by looking for objects that could fall and break during an earthquake.

Consider items such as water heaters, bookcases and light fixtures, as well as items that are difficult to replace because they have monetary or sentimental value. As we conduct our inspection, think about ways in which we can protect them from damage.



Bookcases

It's true that bookcases are great for storing books, toys and supplies. They can, however, shake and tip over in an earthquake, causing considerable damage or injury. For this reason, make sure all bookcases are securely fastened to nearby walls.

One way to do this is to attach either L-brackets or Z-brackets to the bookcase and the wall after pre-drilling holes in each. Be sure to use a bracket that can accommodate the fasteners you are using.

Attaching the bracket to the bookcase

- For wood bookcases, attach the bracket with #8 (or larger) wood screws. The screw should be long enough to secure the bracket to the shelf without punching through and creating a sharp edge.
- For plastic and metal bookcases, use #8 (or larger) machine screws with washers and nuts to ensure that the bracket will stay in place. The screw should be long enough to accommodate the bracket, shelf, washer and nut.

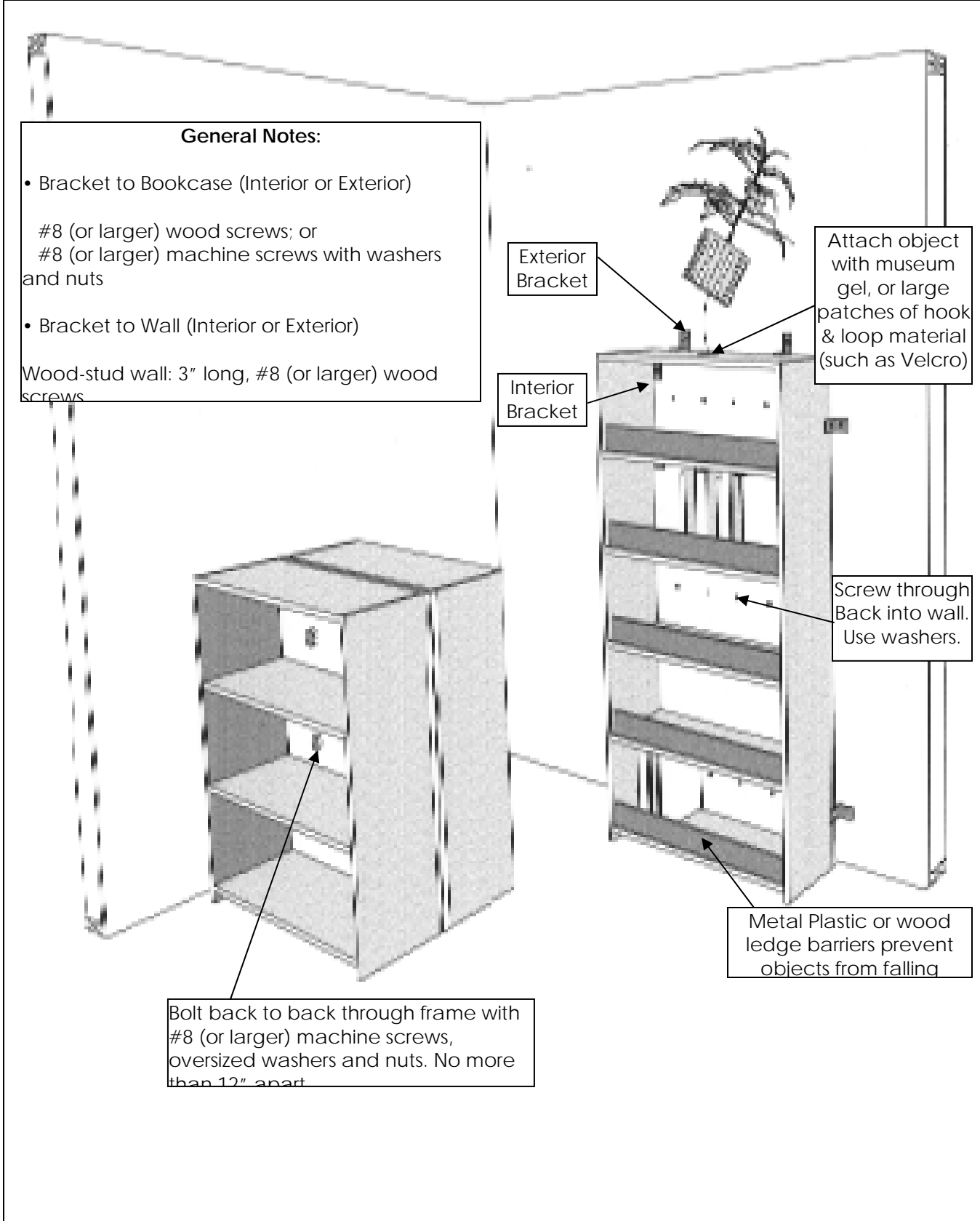
Attaching the bracket to the walls

For wood stud walls, use 3-inch long #8 (or larger) wood screws to attach each bracket to the wall. Place screws in the wood studs to assure that they are properly supported. Use a stud locator to find the best places.

- For stone or masonry walls, place plastic anchors in the holes before you screw in 3-inch long #8 (or larger) screws or consider using 3/16-inch diameter (or larger) masonry screws.
- For a bookcase with a solid back, you can pass screws directly through the back into the wall. Use washers to spread contact over a larger area between the screw and the bookcase's back. If you are working with a wood stud wall, use a stud locator to find the best locations for the 3-inch long #8 (or larger) wood screws. For a stone or masonry

wall, use plastic anchors with the #8 (or larger) screws or use 3/16-inch diameter (or larger) masonry screws.

- You can prevent items on shelves from falling by installing ledge barriers made from strips of wood, metal or plastic.
- Cut them to fit the shelf and attach them with glue or mechanical fasteners. You can finish the barriers to match the shelves. See Figure
- Place heavy items on lower shelves.
- You can stabilize bookcases that are not against walls by attaching them back-to-back with #8 (or larger) machine screws, oversize washers and nuts. See Figure
- Affix large, heavy items, such as plants and aquariums, and other breakables directly to the shelf to keep them from falling. You can apply hook and loop material (such as Velcro®) or museum gel (or museum wax) to secure these items. For added protection, use metal, plastic or wood ledge barriers. See Figure



Cabinets and Drawers

Like bookcases, cabinets can tip over and their doors can open, spilling their contents.

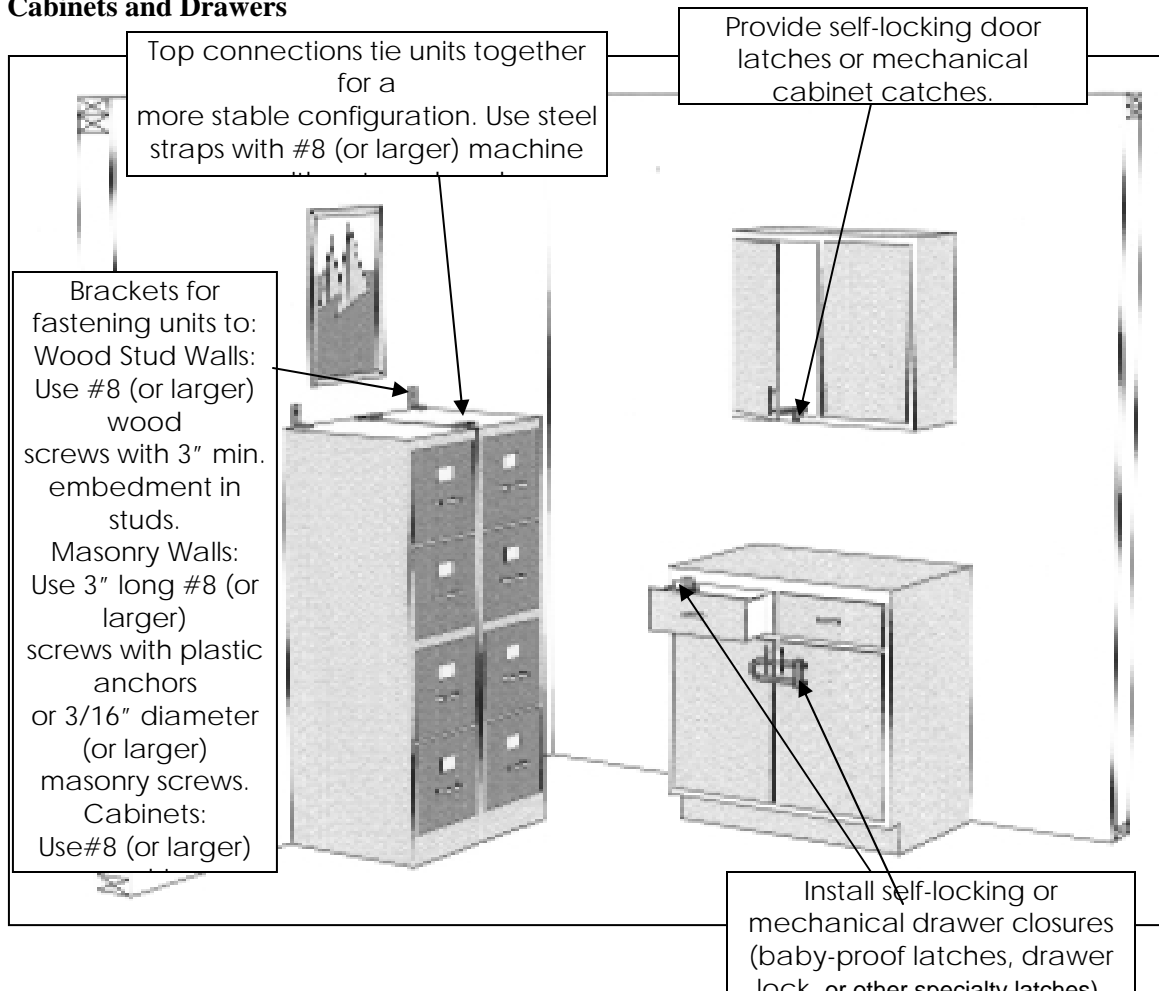
Furthermore, the drawers, which sometimes have sharp edges, can slide out and hurt you, or your family.

To secure them, do the following:

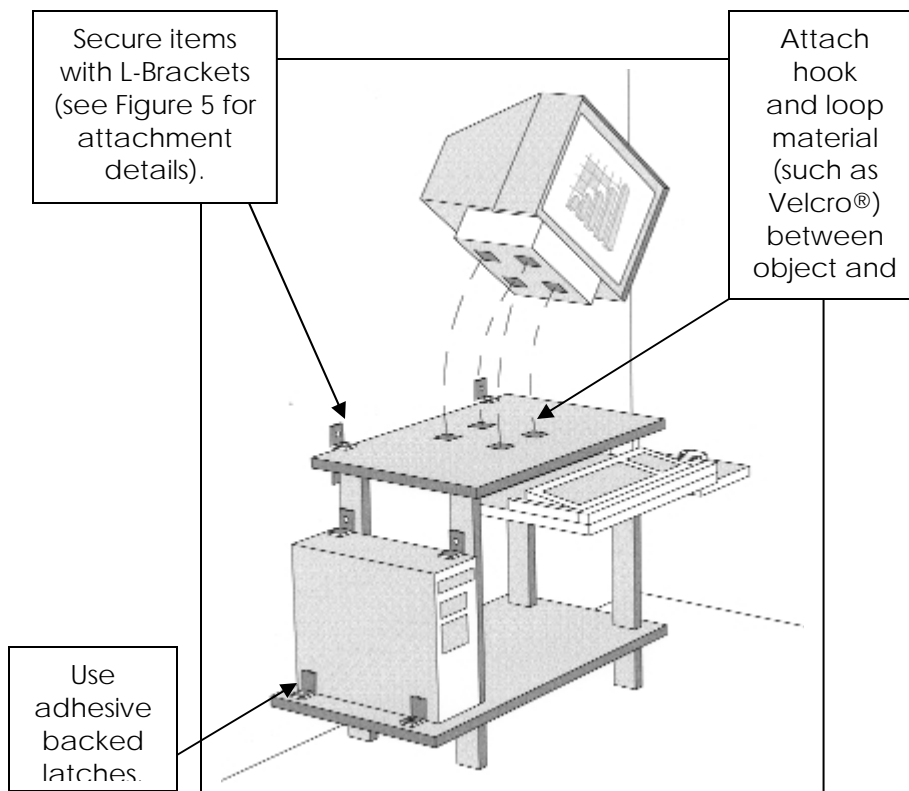
- Attach cabinets to the wall and floors using L-brackets or Z-brackets. Again, be sure to use brackets that can accommodate the diameter of the fasteners. You should follow the specific directions given in **Figure** and in the “Bookcases” section for securing the bracket to the wall and cabinet.



Cabinets and Drawers



- You can fasten several units together to form a wider footprint using #8 (or larger) machine screws.
- Attach simple mechanical or self-locking latches to cabinet drawers so they cannot slide open.
- Install mechanical or self-locking latches to prevent your cabinet doors from swinging open and spilling their contents. Your local hardware store has a large variety of latches, many of which are small, unobtrusive and easy to operate.
- Most of us place heavy objects such as televisions, computers and stereos on top of cabinets, bookcases and tables. You should fasten these items down so they will not slide off during an earthquake. Several methods of attachment are shown in Figure.



Picture Frames and Bulletin Boards

The photographs, bulletin boards and artwork you display in your home add to its character. But these items can easily fall during an earthquake if you do not fasten them properly to a wall in the following way:

- Use closed screw-eyes, instead of traditional picture hangers, for securing picture frames, bulletin boards and mirrors.
- Depending on the weight of the object and the screw-eye's maximum weight limit, screw one or more closed screw eyes into wall studs. Use a stud finder to figure out where to put them.
- Attach picture wire to one side of the frame. Thread the wire through the closed screw-eye, fastening it securely to the other side of the frame. See **Figure**.
- If you use an open screw-eye instead of a closed screw-eye, be sure to close it with pliers once you have hung the picture.
- Always mount heavy or sharp wall hangings away from areas where they could fall on children.



Picture and diagram

Ceiling Lights, Suspended Ceilings and Hanging Fixtures

If they aren't well attached and supported, ceiling lights, suspended ceilings and hanging fixtures, such as chandeliers and ceiling fans, can fall in an earthquake and seriously injure those below. Here are some ways to protect our self:

1. Secure ceiling lights to supports using safety cables.

- Use a chain strap or a minimum 14-gauge wire to attach the light fixture to a nearby ceiling support. Locate the support visually or use a stud locator. Be sure to leave the safety cables slack; they should not support the weight of the lights under normal circumstances.
- If your ceiling light has a cover, keep it from falling during an earthquake by fastening it to the fixture itself or to the home's permanent structure.



- Pay special attention to your home's fluorescent lights. Installing plastic sleeves over the fluorescent light tubes will keep the glass from scattering if they break.

2. Use safety cables every few feet to attach suspended or false ceilings to the structure of your home.

- Use chain straps, plumber's strapping (metal strapping with holes) or heavy wire (minimum 14-gauge) to secure suspended or false ceilings.
- Use screws, bolts or other appropriate fasteners to attach the safety cables to both the suspended ceiling and the permanent structure.



- You can prevent the ceiling panels from flying upward by installing adjustable compression struts.

3. Make sure chandeliers, ceiling fans, other suspended fixtures and hanging plants are safely secured to the permanent structure.

- Connect all suspended items to strong supports with safety cables capable of supporting each item's entire weight. Each cable should remain slack and not support the item's weight under normal circumstances.

- Keep in mind that hanging items tend to sway easily. Make sure these objects will not collide with anything if they swing in an earthquake.

Windows and Doors

Your home's windows and glass doors may seem harmless enough. But in an earthquake, glass can break explosively, seriously injuring anyone nearby. One way to protect yourself and your family from broken glass is to apply safety film to windows and glass doors:



- Use a protective film (minimum thickness of 4 mils) on all types of glass, including tempered glass and annealed glass. You can buy it in rolls at your local hardware and home improvement stores, or contact the International Window Film Association for the nearest distributor. Be sure to install the film according to the manufacturer's instructions.
- As an alternative, consider professional installation.

Large Appliances

An earthquake can cause refrigerators, washing machines and other large appliances to slide or fall over. Heavy objects on wheels may roll if brakes or stops are not provided and locked. To secure these items:

1. Anchor large appliances to walls using safety cables or straps. The restraint should be located in the mid- to upper-portion of the appliance. Use the following method:

- Choose a screw-eye that is sized appropriately for the appliance. For example, use a 3/8-inch diameter screw-eye (or larger) for a refrigerator.
- For wood stud walls, use a stud locator to find the best wall location to install the screw-eye. For stone or masonry walls, place plastic anchors in the predrilled holes before you install the screw-eye.
- Connect coated wire cable to the screw-eye at one end and to a snap-hook fastener at the other end.
- Attach the cable to the appliance with the snap-hook fastener.

2. Replace rigid water or gas connections on large appliances with flexible connectors.

- Check to see if your local building codes allow you to use flexible connectors and whether a professional must install them.

3. Always lock the rollers of any large appliances or pieces of furniture.

Water Heaters

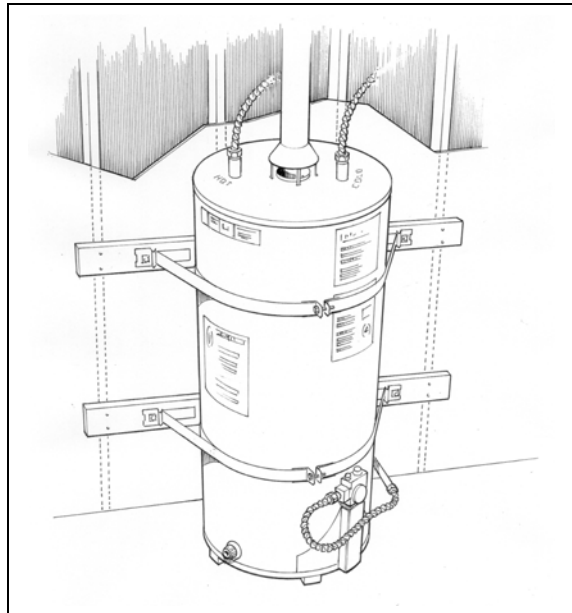
Water heaters can move or tip over in an earthquake and the broken water pipe can flood your home, destroying ceilings, floors, walls, and furniture, artwork and family photos. If your heater runs on flammable gas and the gas line breaks, the situation becomes far more serious.

Before you decide on a retrofit method, check with your local building department and make sure that it is approved for use in your area or goes beyond what is required by your local building code.



1. Secure water heaters (up to 50 gallons) to stud walls using the simple, generic method.

- You can anchor the water heater using items that are readily available from the local hardware store.
- To begin: fasten two 2 x 4 wood blocking strips to the nearby wall - one at a height within the upper one-third (1/3) of the water heater and the other within the lower one-third (1/3) of the water heater. The lower 2 x 4 should be at least four (4) inches above the water heater control. If you are working with a wood or metal stud wall, attach the blocking directly to the studs.
- Fasten heavy-duty shelving brackets to the wood blocking. These brackets should fit snugly against the water heater.
- Wrap plumber's strapping (metal strapping with holes) around the heater and secure it to the brackets.



2. Remember: Use flexible, not rigid, water and gas connectors.

3. Make certain all adult and teenage family members know where to locate the gas shutoff valve and how to operate it.

9.6 Things to do: Non structural preparedness

To avoid earthquake damages and loss of life

Step-1

- Fasten bookcases and cabinets to nearby walls;
- Install latches on cabinet doors and drawers;
- Secure electronic equipment, artwork and other breakable items to the tops of bookcases and cabinets;
- Anchor large appliances to nearby walls;
- Secure pictures and bulletin boards to walls;
- Attach safety cables to light fixtures, suspended ceilings and other hanging items;
- Apply safety film to windows and doors
- Secure water heater to nearby wall.

Step-2

- Reinforce cripple wall;
- Strengthen narrow walls on either side of garage opening;
- Anchor un-reinforced chimneys.

Step-3

- Add anchor bolts or steel plates to foundation;
- Secure post-and-pier foundation;
- Modify floor system;
- Strengthen wood-framed walls;
- Reinforce masonry walls;
- Retrofit roof system;
- Evaluate unique room additions.

9.7 Checklist

<p>How well will your home resist damage during a 3.0 earthquake? How about one that is a 6.0 or greater? Most homes typically will need some type of reinforcement to withstand a major earthquake. Here is a checklist that will help you focus on how to strengthen your home.</p>	<p>To answer some of these questions you may need to enter uncomfortable or small spaces. You may want to have an experienced inspector or professional engineer or architect check your home, instead. Whatever choice you make, take some time to do this before the next earthquake strikes.</p>
<p>Observation</p>	<p>Recommendation</p>
<p>Unsecured bookcases and cabinets</p> <p>Cabinet doors and drawers that swing open easily</p> <p>Electronic equipment and artwork that can topple</p> <p>Pictures and bulletin boards that can fall</p> <p>Hanging fixtures and suspended ceilings</p> <p>Large appliances that can tip over</p> <p>Unprotected windows and doors</p> <p>Water heater that can tip over</p> <p>Home not anchored to foundation</p> <p>Weak cripple wall</p> <p>Unsound post-and-pier foundation</p> <p>Weak floor system</p> <p>Inadequate walls</p> <p>Un-reinforced masonry</p> <p>Poor roof support</p> <p>Unsecured chimney</p> <p>Room over garage</p>	<p>Fasten to nearby walls</p> <p>Install latches</p> <p>Secure items to bookcases and cabinet</p> <p>Fasten securely to walls</p> <p>Attach safety cables</p> <p>Anchor to nearby walls</p> <p>Apply safety film</p> <p>Secure to nearby wall</p> <p>Add anchor bolts or steel plates</p> <p>Reinforce cripple wall</p> <p>Secure post-and-pier foundation</p> <p>Modify floor system</p> <p>Strengthen wood-framed walls</p> <p>Reinforce masonry walls</p> <p>Retrofit roof system</p> <p>Anchor un-reinforced chimney</p> <p>Strengthen the support</p>

9.8 Stay safe: Earthquake tips

When you feel an earthquake, duck under a desk or sturdy table. Stay away from windows, bookcases, file cabinets, heavy mirrors, hanging plants, and other heavy objects that could fall. Watch out for falling plaster and ceiling tiles. Stay under cover until the shaking stops. Hold onto your cover. If it moves, move with it. Here are some additional tips for specific locations.

If you're in a **HIGH-RISE BUILDING**, and you are not near a desk or table, move against an interior wall, and protect your head with your arms. Do not use the elevators. Do not be surprised if the alarm or sprinkler systems come on. Stay indoors, glass windows can dislodge during the quake and sail for hundreds of feet.

If you're **OUTDOORS**, move to a clear area, away from trees, signs, buildings, or electrical wires and poles.

If you're on a **SIDEWALK NEAR BUILDINGS**, duck into a doorway to protect yourself from falling bricks, glass, plaster, and other debris.

If you're **DRIVING**, pull over to the side of the road and stop. Avoid overpasses, power lines, and other hazards. Stay inside the vehicle until the shaking is over.

If you're in a **CROWDED STORE OR OTHER PUBLIC PLACE**, do not rush for exits. Move away from display shelves containing objects that could fall.

If you're in a **WHEELCHAIR**, stay in it. Move to cover, if possible, lock your wheels, and protect your head with your arms.

If you're in the **KITCHEN**, move away from the refrigerator, stove, and overhead cupboards. (Take time NOW to anchor appliances and install security latches on cupboard doors to reduce hazards.)

If you're in a **STADIUM OR THEATER**, stay in your seat and protect your head with your arms. Do not try to leave until the shaking is over. Then leave in a calm, orderly manner. Avoid rushing toward exits.

10. Religious leaders can play vital role in reducing suffering (before, during and after disaster)

The communities where Faith is an inseparable and most important part of everybody's lives, religious leaders play a significant role in educating and awareness building people. Also where communal worship in a specific place is the common practice, religious leaders would have invaluable access to the public. Considering their influence on the beliefs of the believers, they could be highly instrumental in passing the correct messages on earthquake safety and house-hold vulnerability reduction measures to the public, or to affect the improper attitude and practices among the communities. The religious leaders can:

- Advocate measures for community safety;
- Participate in poverty reduction, affordable housing, and economic development activities in your community;
- Take measures to safeguard your religious places;
- Educate community on earthquake preparedness;
- Advocate for programs for the most vulnerable and initiatives.
- Provide knowledge, information and create awareness among the communities about preparedness
- Link to public information;
- Encourage and motivate community to listen to public warnings and follow directions;
- Practice and support others in self-care;
- Work with other organizations to assess the needs of the community.
- Advocate to better allocate resources (i.e. financial donations) for long-term recovery efforts
- Share information on your community's needs
- Provide emotional/moral support and pastoral care for those affected

Prophet Muhammad (SAWS) said that "Whoever relieves a believer of some distress in this world, Allah will relieve him of some of his suffering on the Day of Judgment. Whoever makes things easier for one who is suffering hardships, Allah will make things easier for him in this world and in the hereafter."

In another hadith Prophet Muhammad (SAWS) commanded us to show mercy to distressed people. "Show mercy so that you may be shown mercy." And he (SAWS) also said, "Those who are merciful will be shown mercy by the Most Merciful. Have mercy on those who are on earth, and the One Who is in the heavens will show mercy on you."