

Instructor Guide for Student Sensitization Sessions



GEOHAZARDS  **INTERNATIONAL**
A Nonprofit Working Toward Global Earthquake Safety

**Training Materials for
School Earthquake
Safety**

December 2008

PREFACE

Many parts of India face a high level of earthquake hazard. India has experienced many damaging earthquakes in the past, and earth scientists say that strong earthquakes will continue to strike the region for the foreseeable future. Sadly, earthquakes often have tragic consequences for school-children. In the October 2005 Kashmir-Kohistan earthquake, 17,000 children died when their school buildings collapsed. The May 2008 Wenchuan, China earthquake killed about 19,000 children in school collapses. Many of the catastrophic consequences of these earthquakes were preventable. Schools can be made safe from earthquake threats with community support, hard work, and dedication. A first step towards school earthquake safety is to educate teachers, school administrators, students, and parents about earthquake risks and how they can reduce the risks they face.

Purpose

You will use this set of training materials to conduct sensitization, or awareness generation, sessions for older students. The training materials include a presentation in Microsoft Powerpoint™ and this instructor guide. This instructor guide will take you through the presentation slide by slide and will identify important aspects you should highlight.

Audience

The main audience will be secondary or senior secondary students. Other audience members will include teachers, and possibly the headmaster and other administrators. When you make the arrangements for your presentation, always discuss the makeup of the audience so you can prepare appropriately.

Training Objectives

This instructor guide will help you effectively communicate information about earthquake basics, safety and preparedness. During the session, you should help the audience:

1. Understand why earthquake safety is important
 - a. Understand the basics of earthquake hazard in the Delhi region (i.e., what causes earthquakes, earthquakes can affect Gurgaon)
 - b. Understand what might happen to the school building and to its furnishings, equipment, and systems if a strong earthquake occurred
2. Understand how to reduce the damage and consequences caused by an earthquake
 - a. Recognize and understand, conceptually, how to anchor or relocate items than can fall, slide, or topple and cause injury or block exits

- b. Understand why the school will need to develop a school emergency preparedness plan and practice it with drills
 - c. Know what to do before, during, and after an earthquake
- 3. Understand how they can help make themselves, their families, and their school safer
 - a. Think about their role in the school's emergency preparedness plan
 - b. Talk to their family about making a family preparedness plan and anchoring falling hazards

Table of Contents

Preface	i
School Earthquake Safety	1
Earthquake Basics	1
Falling Hazards Mitigation	8
Lessons for Students	17
Family Preparedness	20
The Project.....	22

School Earthquake Safety



Learning about Earthquake Safety



GEOHAZARDS INTERNATIONAL
A Nonprofit Working Toward Global Earthquake Safety

Earthquake Basics



GEOHAZARDS INTERNATIONAL
A Nonprofit Working Toward Global Earthquake Safety

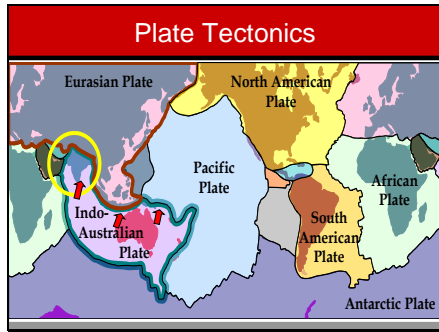
What's Covered in this Session

- What is an earthquake?
- What causes earthquakes in India?
- How do you measure an earthquake's strength?
- How likely it is that an earthquake will occur in Gurgaon?
- What might happen in schools in Gurgaon if an earthquake happened?

What is an earthquake?

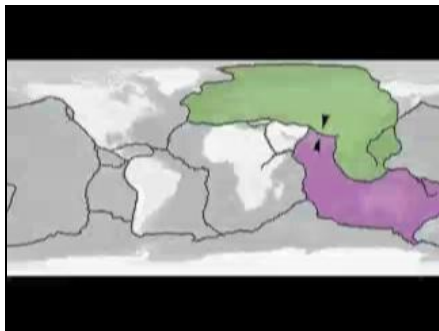
- An earthquake is the shaking, rolling or sudden shock of the earth's surface.
- Earthquakes are the Earth's natural means of releasing stress.

More than a million earthquakes rattle the world each year. Earthquakes can be felt over large areas although they usually last less than one minute. Earthquakes cannot be predicted.



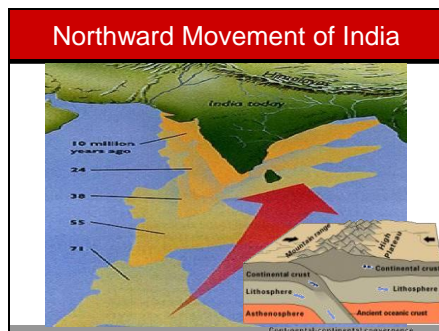
Explain that the earth is like an egg with a cracked shell with its outer crust made up of several pieces known as plates. There are 7 major plates and several minor ones. (Point out the Indian Plate here and show them that it is bordering the large Eurasian Plate.) These plates are constantly interacting with each other – some are sliding against each other, some are moving away from each other, while others are colliding/pushing against each other. Use your hands to demonstrate this movement. Also mention that the Indian Plate is pushing against the Eurasian Plate.

The next slide shows a video of what happens at a plate boundary.

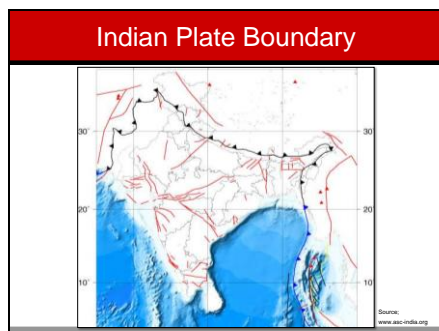


This slide shows the ‘action’ happening at the Indian Plate boundary. Explain how India was part of a large continent along with Australia, Africa, etc. near the South Pole and split away from it approximately 180 million years back and started moving North-North East. It collided with the large Eurasian Plate approximately 15 to 10 million years back. This push from the Indian Plate resulted in the formation of the Himalayas, which is among the youngest and the fastest growing mountain ranges in the world. This happened because the Indian Plate could not push away the

large Eurasian plate and went under this Plate in a process called subduction rising up the land on the other plate. This movement creates a lot of stress and when the rocks cannot withstand this pressure any longer, it gives way and this sudden movement is what we feel as an earthquake. When a large enough earthquake happens, pressure is released and it will take some time before stresses can build up again to cause the next earthquake. The Indian Plate continues to move and pressure continues to build up along the plate boundaries. When a large earthquake occurs some of this pressure is released. If not, the pressure builds up and the longer we have to wait, the stronger the earthquake will be. Have any of you felt a strong earthquake in Delhi? Is that a good thing?



When the video runs explain the movement of the Indian Plate and how there was the TETHYS SEA between Indian plate and the Eurasian plate and NO Himalayas, which were formed as a result of the collision.



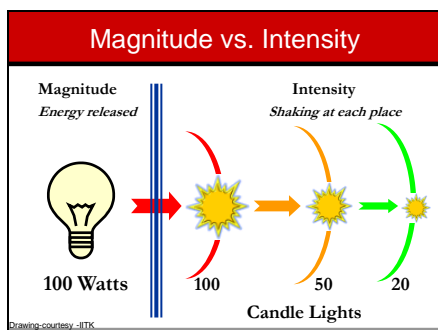
Explain how the country is actually in two plates. Ask which States are on the Eurasian Plate and which are **at** the boundary. Explain how the interaction between the plates causes a lot of stress in the rocks and when it becomes too much for the rocks, it breaks and this is what we feel as an earthquake. **IMPORTANT:** Mention here that when a big enough earthquake happens some pressure is released. So if we have not felt a **LARGE** earthquake in this plate

boundary, the pressure is building up and an earthquake can be expected.

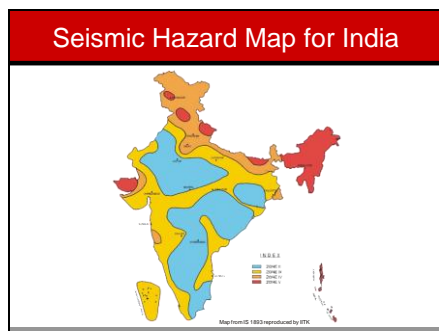
Indian Earthquakes					
Date	Event	Time	Magnitude	Max. Intensity	Deaths
16 June 1819	Cutch	11:00	8.3	IX	1,500
12 June 1897	Assam	16:25	8.7	XII	1,500
5 Feb. 1900	Coimbatore	03:11	6.0	VII	Nil
4 Apr. 1905	Kangra	06:10	8.0	X	19,000
15 Jan. 1934	Bihar-Nepal	14:13	8.3	X	11,000
15 Aug. 1950	Assam	19:39	8.6	X	1,530
21 Jul. 1956	Anjar	21:02	6.1	IX	113
10 Dec 1967	Koyna	04:30	6.5	VIII	200
23 Mar. 1970	Bharuch	20:56	5.2	VII	30
21 Aug. 1956	Bihar-Nepal	04:39	6.6	IX	1,004
20 Oct. 1991	Uttarkashi	02:53	6.4	IX	763
30 Sep. 1993	Killari (Latur)	03:33	6.2	VIII	7,925
22 May 1997	Jabalpur	04:22	6.0	VIII	38
29 Mar. 1999	Chamoli	00:35	6.6	VIII	63
26 Jan. 2001	Bhuj	08:46	7.7	X	13,805

Even though this gives a list of earthquakes – use this slide to ask whether the time of occurrence of an earthquake matters. When they all say that night time earthquakes are deadly, tell them about the percentage of children dying in daytime earthquakes is greater. Tell them about the 16,000 children who died out of a total of 75,000 people who died in the Muzzafarabad earthquake. India was lucky that schools were not in session on our side of the border at the time of the quake. Our schools collapsed, but we were lucky that the children and teachers were not in them.

Also, use this to ask about the two terms mentioned here – Magnitude and Intensity...and move on to next slide.



Explain Magnitude by comparing an earthquake to a 100W light bulb. Whether you are five meters away from the bulb or five hundred meters away, the bulb remains a 100 W bulb. That is what magnitude is – the energy released by the earthquake. But the intensity of light you get from the bulb varies if you are at 5m or 500m from the bulb. This is similar to the intensity of an earthquake which is a measure of how an earthquake is felt at a place.



Explain the Seismic zoning map of India. It has four zones from Zone II to Zone V. The zones are Low Risk (Zone II), Moderate Risk (Zone III), High Risk (Zone IV) and Maximum Risk (Zone V). You may also mention that these maps are based on the information we have as of now and this map could be revised. In fact the first zoning map was made in 1962, revised in 1966 and again in 1970. The 1970 map had 5 zones with a No Risk (Zone I) in addition to the other four zones as in the current version. Since the Latur earthquake happened in a place that was in the no risk zone, the map was revised and the No risk zone was merged with the low risk zone. Hence the current Seismic Zoning map (IS 1893:2002) divides the country in to four zones between Zone II and Zone V as mentioned above.



This shows the seismic zoning map of Haryana. Gurgaon- as you can see falls in the High Risk Zone IV. According to the map, Zone IV can be affected by earthquakes of intensity up to VIII.

Consequences of Earthquakes

Damaged Buildings

Poorly designed or built structures can collapse



Photos from National Information Service for Earthquake Engineering, UC Berkeley

What causes death and injuries in an earthquake? It is poorly built buildings and structures.

Consequences of Earthquakes

People Killed, Injured and Disabled



Consequences of Earthquakes



Shows the damage to a school building in the Gujarat earthquake of 2001. This is what can happen outside a building. But what happens inside a building? Let us see a short video (next slide).

Falling Hazards?



This is a short video from a television studio in Kobe during an earthquake in 1995. Most of the furniture here is on wheels, which may not be the case in our classrooms or homes. What can happen there if a similar shaking happens in our rooms?

Consequences of Earthquakes

Objects Inside Buildings Fall, Slide, or Topple

- People can be injured
- Valuable objects can be destroyed
- Records can be lost
- Undamaged buildings are not usable



People can be injured or trapped by falling objects. In the picture, the shelves are fixed to the ground, but the books have still fallen out.

More Examples of Damage



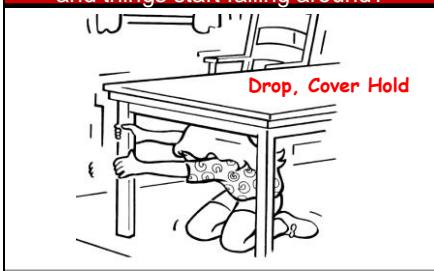
Someone could be trapped. Records/Books can be difficult to retrieve.

Summary

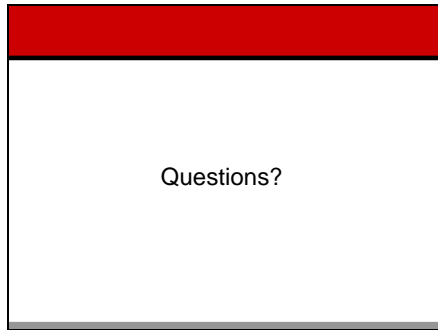
- India is pushing into China, which causes earthquakes
- Damaging earthquakes will continue to happen in India
- Earthquakes happen when faults break
- Gurgaon is located in the "High Damage Risk Zone" (Zone IV) on India's Seismic Hazard Map
- Damage to a building's contents can cause injuries and even deaths
- Duck Cover Hold
- You can prepare

This is a summary slide and after reading through the bullets, you come to the term Duck, Cover, Hold – this has not been used before. "What is that? If the earth starts shaking and objects start falling down, what will you do?"

What will you do if you are in a room and things start falling around?

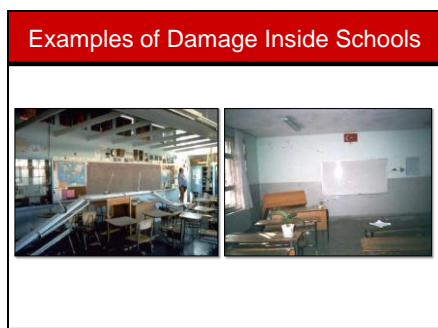


'Duck cover Hold' or 'Drop Cover Hold' is what you have to do during the shaking.



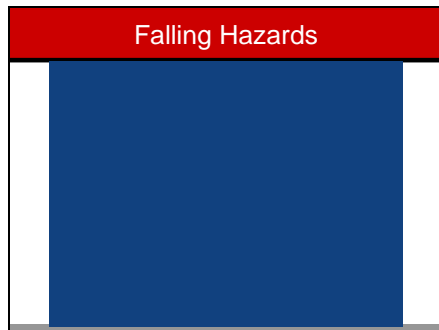
Ask:

- Do any of you sit near a tall cupboard in class?
- Does anyone in your house sleep right next to a large steel cupboard?
- What can happen if there is an earthquake?
- How many doors are there in this room?
- What if a cupboard falls against this door and traps us all inside here?



Left Picture. Lighting fell. Explain how tube lights don't just plop down. They swing on the wire. Not much fun to be under one of those.

Right Picture. Cupboard fell onto the teacher's desk. Relocation could be a simple solution. If the teacher is injured, the children will be traumatized.



What might be a hazard here?

- Look around this room and identify objects that could fall, slide, or topple over in an earthquake.
- Are there any?
- Are there many objects that can fall in other rooms?
- What could happen if these things fell, slid, or toppled over?
- Are there many such objects in your home?

Look around you with “earthquake eyes!”
Do all of you have earthquake eyes?



What are the hazards here?
Nothing much...except for the podium and chairs. Talk about exits here. Is there something outside the exits that can block it?

Note to presenter: For the next four slides, you can add photographs of the target school itself. Take them through the hunt and say “You have earthquake eyes after all!! Will you use them at home as well? Please do.”

What are the hazards here?



What are the hazards here? Responses should include:

- Things that could fall down and injure children.
- that could get damaged and will be difficult to replace.
- Glass.

What are the hazards here?



What are the hazards here? Responses should include:

- Thin concrete jallies that can break and fall.
- Rack can fall and cause injuries.
- Rack can also block way to exit.

Now, what might be a hazard here?



What we just did is called a hazard hunt

Here are some tips:

- Look at each room in the school with "Earthquake Eyes".
- Ask yourself "if a major earthquake hit right now, what could injure someone?"

Say that this is how you start mitigating falling hazards. You need to know what is wrong before you can fix it.

Items in Schools that Can be Hazards



- Storage Cabinets
- Display Cabinets
- Library Shelves
- Laboratory and Office Equipment
- Hazardous Materials and Chemicals
- Light Fixtures, Fans
- Large Windows
- Coolers and Air Conditioners
- Water Tanks

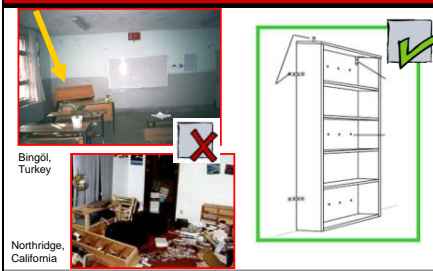
List of items that could be hazards in a school. "Are we missing something that could be a danger in your school?"

Three ways to mitigate falling hazards

- Relocate objects that can injure
- If relocation is not possible, secure these objects.
- For securing large or heavy objects, get help

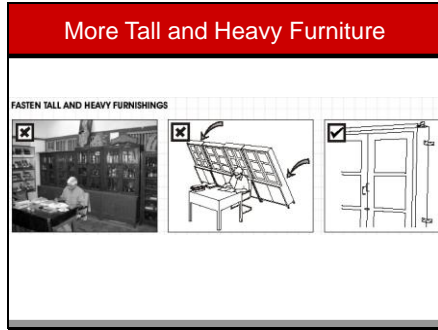
Relocate. For example, move the cupboard away from your bed. If you can't move it, then fix it to a wall using L clamps so that it doesn't slide, topple or fall.

Tall and Heavy Furniture

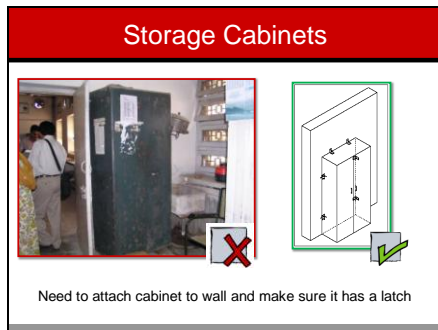


Pass around L clamps, etc.

INSTRUCTOR GUIDE | STUDENT SENSITIZATION



In most schools, principals sit with a lot of hazards behind them. These have to be fixed.



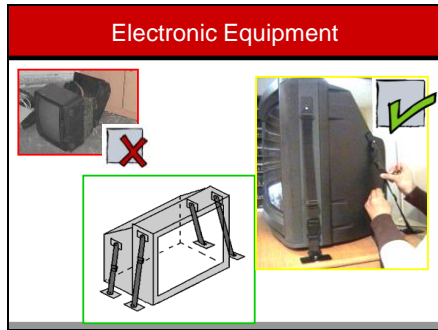
Tall cupboards can fall and injure someone. They can also slide and block our exit.



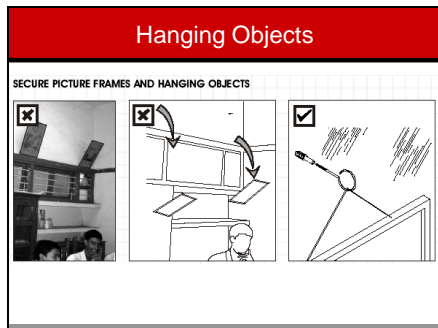
These are pictures of a library, a janitor's closet with cleaning supplies, and a records storage room. If these records contain examination results, mark sheets and other educational records, these fallen papers will be difficult to get in order. Hazardous materials must be secured from damage.



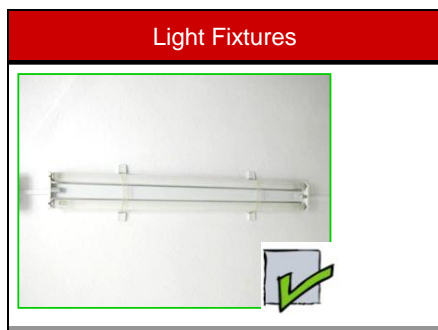
Shelves should be fastened, and the contents of these shelves should be kept from falling. Simple materials can be used to secure shelf contents.



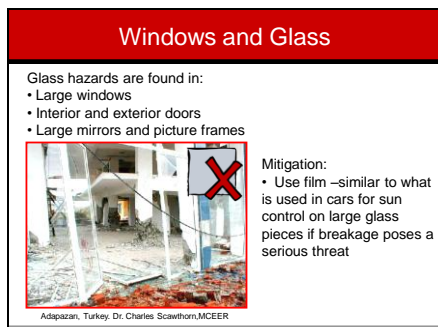
Here the danger is not only of injury, but also of causing economic losses.



Use hooks to hang pictures, rather than nails so that they do not slide off easily, cause injuries and scatter broken glass.




Tube bulbs are secured to the ceiling with plastic clips. Screws should be used to secure the clips to the ceiling rather than self-adhesive pads.





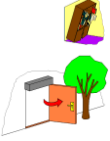
This can cause:

- Serious injury** if people cut themselves on flying shards or other jagged pieces
- Hindered access to exits** if broken glass is scattered on exits paths
- Burglary and vandalism** if buildings are left unsecured because of broken windows and glass doors



Exits

1. Keep items that may hinder evacuation away from exit doors.
2. Install door opening to outside.
3. Keep fire exits in an openable position.
4. Ensure that doors open easily.
5. Create wide exits.
6. Do not clog exit ways.



Objects placed near exits fall in an earthquake and hinder evacuation. Having an unrestricted exit path is especially important in these locations:

- Main exits of schools
- Main exits in large buildings
- Doors in spaces where crowds congregate (terminals, theatres, large shopping areas, and sports arenas)

Important actions (last ones are not indicated on slides, but should be mentioned):

- **Keep items that may hinder evacuation away from exit doors.** Hallway cabinets, standing rolled carpets, heavy items that can slide or topple, glass and ceramic objects, and shelf contents that may fall and hinder evacuation should be secured or removed from the vicinity of the exit.
- **Install outward opening doors.** Whenever possible exit doors should be installed so that they open outward. When large crowds are trying to exit or there is debris in the room, an outward opening door is usually easier to open. When people move towards inward opening doors to escape, they are in the way of the door and the door itself blocks the exit path.
- **Keep fire exits unlocked and install panic bars.** Emergency exit doors or fire doors should be kept unlocked whenever a building is occupied. This will ensure that faster evacuation can occur. When it is necessary to keep

these doors locked, panic bars can be installed. When pushed the panic bar opens the door from the inside, while remaining locked from the outside. Fire doors should also be regularly inspected and maintained.

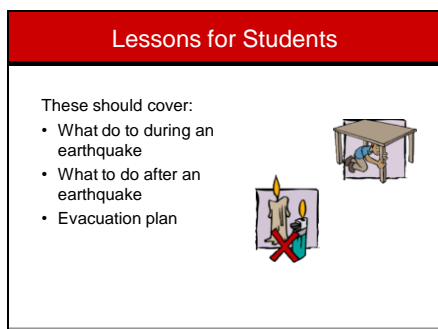
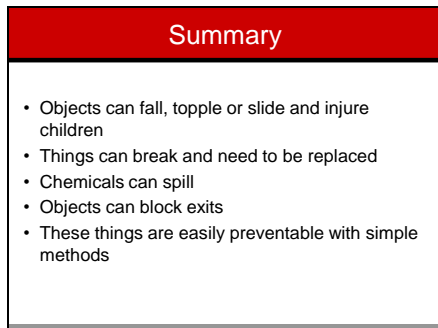
- **Ensure that doors open easily.** Doors that are hard to open or close due to sticky door jams or tight frames, may become even more difficult to open after an earthquake. These types of doors can be sanded down or re-hung so that they swing freely.
- **Create wide exits.** Whenever possible, exit paths should be wide enough for people to evacuate without being overcrowded. When exit paths are narrow, evacuation is slowed and people can be injured from bumping into one another.
- **Place strong levers near heavy exit doors and barred windows.** Exit doors made from heavy metal may be difficult to open after an earthquake if the building has shifted. A crowbar or sledge hammer that has been secured near the exit and is easily visible may be helpful when opening these doors during evacuation.
- **Install service entrances adjacent to revolving doors.** Service doors can be installed adjacent to revolving doors so that people can exit without overcrowding. These service doors should be wide, easily accessible, and remain

unlocked during the hours that the building is occupied.

- **Use a single secure door instead of an added security gate.** Apartment door security systems that have one door that opens inward and another security gate that opens outward can be hard to open in an emergency evacuation. These two door systems will be hard to exit if things have shifted or fallen in front of the doors either inside or outside. They also require having two sets of keys and opening two doors that may be jammed. Security gate systems can be replaced with one secure door to make evacuation easier and simpler.
- **Install back up systems for electric automatic doors and gates.** Because there may be power outages after an earthquake, electric automatic doors (photocell doors) or other doors that cannot be easily opened without electricity can be made safer by installing emergency battery operated door opening mechanisms. Alternatively, these doors can be installed with a mechanical manual override system for use during power outages. Manual override systems should be easily accessible and well marked.



Many schools and offices have old cupboards lining up the corridors. This takes away precious corridor space (corridors are part of your emergency exits) and these can topple over in an earthquake blocking our exits.



Why evacuate?

- Buildings can become dangerous because of damage
- There will be aftershocks
- People want to get out



What can happen in a school in an earthquake? Play the video. What would you do if there is an earthquake NOW? (Go round the room asking this question)



Duck, Cover, Hold (DCH). Why should we hold on to the table? Because during earthquake shaking, the table may move away.



Film on DCH showing a class drill.



In many classrooms, the table is too small for children to get under comfortably. If so, do protect your head using your school bag, a chair, etc.

During an Earthquake

- Students and teachers shout “earthquake”
- Move away from:
 - Cabinets, bookshelves
 - Windows, glass
- Duck, Cover and Hold On
- Protect head and neck
- Remain calm, do not run



Remember what the previous video showed. It is very important that **DURING** shaking, you should not run out. You should remain under a sturdy table. If you run out, there will be many things inside and outside a building that could fall on you and injure you.

After an Earthquake

- The teacher with the class monitor surveys room and identifies injuries
- Students leave the room together and follow the evacuation route to the designated safe area walking quickly, but safely.
- Student buddies help each other and injured or disabled students

After the shaking is over, the teacher will find out if any one is injured. Children will follow the evacuation route to the designated assembly point. Student buddies that have been previously identified will take care of each other and any children with disabilities.

After Evacuation

- Provide first aid for injured students
- Students remain in designated safe area
- Teacher locates missing students, Students inform teacher about the missing and absent students
- Students kept together until
 - Instructions are received that it is safe to return to the classroom, or
 - Students are released to a parent or guardian

At the assembly point, a roll call is made and the teacher ascertains that no one is missing. Students should stay together until instructions are received from the staff members.

Questions?

Family Preparedness

- Do a Home Hazard Hunt
- Make Family Preparedness Plan
- Put together a Family Emergency Kit

Home Hazard Hunt

- Look at each room in your home with "Earthquake Eyes" from the level of the shortest member of your family.
- Take some time and sit in each room and think "if a major earthquake hit right now, what would injure us". Then fix the hazard.
- To prevent injury and reduce damage, each room of your home should be carefully examined.
- This will be the starting point in the preparing your home

Take them through some rooms of the house.

•**Living rooms.** Ask them what hazards one normally finds in living rooms. (Tell them how dangerous TVs can be for little children).

•**Bedrooms.** We spend a lot of time in bedrooms, but this would be the place we will be caught in when there is a night time earthquake. So take special care for things that can fall on us and those that can block our exit.

•**Kitchens.** Kitchens are among the most hazardous rooms in the house – they contain a lot of glass, fire, cooking gas, etc. One needs to ensure safety here. Install mechanical latches on cupboards. Tie gas cylinders so that they don't fall down and start a gas leak. Make it a habit to turn off the gas cylinder at night.

Family preparedness planning..

- Take a few minutes with your family to discuss a home evacuation plan. Sketch a floor plan; walk through each room and discuss evacuation.
- Plan a second way to exit from each room or area, if possible.
- Prepare the Family Emergency Kit to sustain your family for 72 hours. Refurbish every 3 to 4 months.
- Make sure your neighbours do so too! (or else be prepared to share your kit with them)
- Know where your emergency kits are located.

Family preparedness planning..

- Mark where the "Main" switches or valves are located so that they can be turned off. Indicate the location of your family's emergency outdoor meeting place.
- [Get trained in First Aid](#)
- Do a preparedness drill (*everyone!*)

Family Emergency Kit

- Non-perishable food to last 72 hours
- Water (10 lit/ day/person)
- First aid kit + prescription medicine+ sanitary items
- Torch +spare batteries
- Radio + batteries
- Emergency cash
- List of emergency telephones
- Copies of valuable documents
- Spare eye glasses etc..

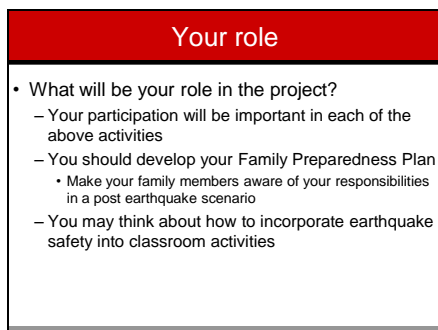
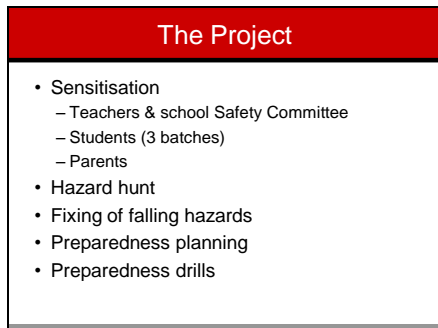
Family preparedness planning should involve all members of the family sitting together and discussing the scenario of an earthquake. If a damaging earthquake happens during the daytime, family members will be in different parts of the city. It is important that each person in the family discuss and decide on their roles and responsibilities in getting the family back together after such an event.

Main switches: electric to prevent sparks that could cause an explosion if there is a gas leak, water to prevent flooding from broken pipes, gas (if you have piped in gas) to prevent fires and explosions. Basic first aid is important because you can help yourselves and your neighbours if anyone has minor injuries. You can help ease the pressure on the hospitals and doctors by treating minor injuries yourself. Emphasize that everyone should participate in preparedness drills, especially the very old, very young, and disabled. These people will be the most vulnerable during and after a disaster.

Ask the questions:

- Can you imagine you or your family members queuing for relief?
- What is the earliest that you feel that relief will be distributed to everyone?

The most optimistic estimates are that it will take 72 hours. For your family to survive these 72 hours, it is important that you prepare a family emergency preparedness kit. A sample list of contents is given in the slide.



You should take part whole-heartedly in all activities in the school. You should also encourage your family members to develop a family preparedness plan. Inform them about the school preparedness plan.

