

Disaster Lectures for IDEC in 2007

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Abstract

This article summarizes the outline of ‘Disaster Lectures for IDEC in 2007’ that contains the topics of Earthquakes, Tornadoes, Terrorists, Fires and Building Failures, Volcanoes, Hurricanes, Floods, Transport disasters and Miscellaneous. Four short video segments used in the lectures were recorded in CD-ROM that was distributed to students and donated to the IDEC Library as an original disk.

1. INTRODUCTION

Outline of the Disaster Lectures for IDEC, Hiroshima University in 2007, April-June was introduced in this article, which contains the topics of Earthquakes, Tornadoes, Terrorists, Fires and Building Failures, Volcanoes, Hurricanes, Floods, Transport, and Miscellaneous.

My definition of “Disasters” is unforeseen (surprise) mischance bringing with it destruction of life and/or property. It is a Catastrophe, a momentous tragic event. It is also inability to cope, beyond planning, prepared response, or capability to contain the destruction.

Four short video segments that produced some significant results, were presented in the class. Those are Enemy Wind in Oklahoma (10min), 1999 Tornado in Oklahoma (15min), May’s Fury (15min), and Little Rock, Arkansas (10min). The video images concerning (1) Kobe Earthquake investigation, (2) New York City on 9/11 (3) investigation after NYC911, and (4) Tornado in Oklahoma are recorded in a CD-ROM that anyone can refer at the IDEC Library.

2. EARTHQUAKES

- How to adsorb earthquake energy- ductility
- Safety by a solid object – not under it
- Cut off gas flow
- Stop trains

The four types of earthquake waves that travel from the epicenter in the earth are P waves, S waves, Raleigh waves, and Love waves. Of these, the Love waves are the fastest and can be used for an early warning so that trains can be stopped. A Seismograph is the instrument that detects the wave motion.

The video “The Day the Earth Shook” compares the earthquake damage of the Kobe, Japan earthquake, and the Northridge earthquake in California. My own experience and video of the examination of the Kobe damage to buildings are shown, especially the mystery of the single story collapse of 26 buildings. Fire in buildings is the greatest danger in an earthquake.

Tall buildings engineered under the current building code are apparently earthquake resistant. The vital new concept that improves the resistance is the ductility of the steel frames or the steel rebars in concrete frames. My laboratory research at the Portland Cement Association helped prove the value of that concept.

One thing we have learned recently concerning protection from falling ceilings is that we should no longer hide under a desk or other solid object. That object is likely to crush down but leave a space beside it that may provide protection. Similarly, doorways are now considered not a safe place from falling ceilings. The gas supply can now be cut off automatically to a building when a significant earthquake begins, saving the possibility of fire. In Japan the high speed trains are stopped when the first seismic wave comes.

3. TORNADOES

- Frame connections most important
- Safe rooms recommended
- Parent-child vortexes
- Flying debris
- Myths

Tornado resistance is vitally dependent on the strength of connections. Residential construction for one and two story wood buildings have three critical connections – bottom wood plate to concrete foundation, wood sheathing to the wood plates and studs, and the top plate to the roof structure. Anchor bolts into the concrete foundation, extensive nailing of the sheathing, and metal strap connections for the top plate to the roof satisfy these critical needs.

Safe rooms, including underground shelters, are recommended for all new home construction in “tornado alley”, and should be retrofit into existing houses.

Detailed research, fluid mechanics calculations, and observations have revealed that small fast spinning vortexes exist inside of the main vortex of a tornado. These small vortexes may be the reason for some of the fantastic performances of tornado wind – for example, moving people and other objects long distances along the tornado path.

The most dangerous aspect of tornado wind is the flying debris or “missiles” that are picked up and flung randomly in the air.

Recently, several myths concerning tornadoes have been disproved. For example, large cities are not exempt from destructive tornadoes, rivers do not change the track of the storm so that certain places are protected, and seeking shelter under highway over passes is not safe.

4. VOLCANOES

- Still unpredictable
- Effects on world climate
- Pacific Rim, Middle East, within plates

Volcano eruptions are still very unpredictable even though much study and research has been conducted. Significant earthquakes in the vicinity of the volcano are the best warning, but the detection of earthquakes may be too late to protect humans near the volcano.

The ash ejected into the atmosphere can have a significant effect of world climate. Most volcanoes are located at the junction of shifting continental plates, but the most active volcanoes are along the Pacific Ocean rim and in the Middle East. The video tape "In the Path of a Killer Volcano" was used to show the danger of the Italian volcanoes.

5. BOMBINGS

- More vigilance
- Design
- Home and foreign

Personal observation of damage from the Oklahoma City Federal Building and the World Trade Center Bombings was shown in video tape and discussed. Although these events are hard to anticipate, the public and the government agencies must be more vigilant to detect possible threats.

Buildings must be designed with the understanding that potential bombing hazards exist. For example, provisions for greater screening security and protecting the exterior of the building from truck bombs are the minimum.

Terrorist may come from the home country or from foreign countries. To improve surveillance we must lose some liberties, such as provisions of the Home Security Agency.

6. HURRICANES

- More predictable now
- El Niño
- Katrina

Hurricanes (cyclones, in Asia area) are much more predictable now than in the past. Satellites, search planes, and radar assist the meteorologists in plotting the path and predicting the intensity of hurricanes. But resistance from wind and flooding, as in the recent Katrina hurricane, is not advanced.

Even though repairs have been made to the concrete dikes or walls that attempt to keep the Mississippi River out of New Orleans, if another hurricane of similar intensity should hit this area, disaster will occur again, because the major part of the city is 8 feet below sea level.

Improving the prediction of hurricanes has benefited from the study of El Nino, the warming of ocean surface

water along the Equator.

7. FLOODS

- Usually predictable
- Except dam breaks

Floods along rivers and lakes are usually predictable. Government agencies have prepared 50 and 100 year flood plain maps. People should know from these maps the risk of building and planting crops in these flood plains. Risks can be covered with insurance, but it is always expensive, and many people prefer to assume the risk.

One town on the Missouri River has finally learned the flooding lesson after the town has been flooded approximately every 10 years. They have moved the whole town one mile to higher ground.

Some floods are not predictable, such as tsunamis, dam failures, or sudden unprecedented rainfalls. Tsunami warning systems in the Pacific, and soon to be installed in the Indian Ocean, can anticipate these floods to save lives, although structures may be destroyed.

8. TRANSPORT

- UA 232 in USA
- Tokyo poisonous gas
- Kyoto train crash

Transport disasters appear to be on the increase as travel, commerce, people, and vehicles increase. The remarkable flight and crash of United Airlines Flight 232 is reviewed.

The terrorist attack with poisonous gas on a Tokyo subway train is a disaster within the knowledge of members of this class. And the more recent train crash in Kyoto caused by excessive speed on a rail curve is familiar to these students.

Recent disasters of sinking of ferryboats have put the spotlight on the overloading of these craft. Of course, traveling the ocean when storms are predicted is usually the actual cause.

9. MISCELLANEOUS

- Are better weapons good?
- Are better communications good?
- Are people getting better?
- Insurance, Security, Lawyers

Miscellaneous types of disasters are noted. Virus infections, the world wide flu epidemic after WW I, famine, drought, and the most destructive disaster of all – WAR – are caused by humans and by nature. Did you know that the USA has been involved in 7 wars since WW II? Most of them were non-decisive such as Korea and Vietnam,

and now Iraq. The US tries to be the “Good Guy”, but it usually turns out that the conflict only makes more trouble. However, I do not believe that the USA will ever go back to the isolationist policy that occurred after WWI.

Russia and the USA continue to make bigger and better weapons, but why? And is the explosion of cell phones, email, and communications satellites making the world less tense, or more tense? Are people of this century any better or wiser than people 2000 years ago? Do insurance, security measures, and lawsuits help provide justice and peace, or only encourage inhuman behavior?

The study and research of natural and man-made disasters can alert bright young people to the future role they must play as leaders to bring these earth shaking events under some semblance of control. That is my mission and my hope.

10. Acknowledgments

I would like express my sincerely thanks to IDEC, Hiroshima University for giving me the last chance to teach a disaster lecture in Japan- my most favorite country.

I would also like express my thanks to students for attending my classes. The following pictures are the attendance at the last class and greetings from Oklahoma (with Nadia and my grandson, Dylan).



Photo 1: The attendance at the last class



Photo 2: Greetings from Oklahoma
(with Nadia and my grandson, Dylan)

A CD disk is attached on the back cover.