


MODELING AN EARTHQUAKE IN YOUR CLASSROOM

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Problem

With the increase in seismic activity, we would like suggestions on how to construct new buildings to better survive a seismic event. We know that Illinois is not as active as other parts of the country, but we know there have been seismic events in the past and recently. Please help us take the proper amount of precaution based on the severity of the threat for our area.



**What do we know about this
problem?**

What do we need to know?

**Where do earthquakes take place
and what are their strengths?**

**[http://earthquake.usgs.gov/
earthquakes/map/](http://earthquake.usgs.gov/earthquakes/map/)**

Recent Illinois Earthquakes

- June 28, 2004: 4.2, 10 miles from Ottawa
- January 2, 2006: 3.6, 2 miles from Equality
- April 18, 2008: 5.2, 6 miles from Mt. Carmel
- February 10, 2010: 3.8, centered in Sycamore
- November 4, 2013: 3.2, 1 mile from Summit

Chicago Tribune 11-5-13

Suburban tremor not earthquake, officials say

By ANNEMARIE MANNION
Tribune reporter

People in the western suburbs who felt the earth move Monday weren't imagining it. But the cause remains a mystery.

The U.S. Geological Survey assigned the tremor that occurred about 12:35 p.m. near Countryside a preliminary magnitude of 3.7. Soon after, they downgraded the tremor to 3.2 and said it wasn't an earthquake, but likely was caused by work at a nearby quarry.

"Based on what they've looked at, we're pretty sure it's from a blast," said Paul Caruso, a geophysicist with the Survey.

The website Did You Feel It?, which is operated by the agency, reported that by midafternoon more than 700 people had contacted the site to say they had,

indeed, felt it. Police departments in Hinsdale, Elmhurst and elsewhere said residents called to report the tremor.

Harley Benz, a scientist with the Survey, said his agency looks at the seismic waves that travel through the earth and other factors to decide whether an incident is an earthquake or a human-made event.

An earthquake occurs much deeper beneath the earth's surface than Monday's event, he said.

Benz said the Survey always assumes that an event is an earthquake until its analysis shows them otherwise.

Survey officials also look at how close the event is to an area that has mining, quarrying or other industrial operations. It cannot pinpoint the source of Monday's tremor but said it occurred within

2 miles of McCook.

Joshua Robbins of Vulcan Materials said his company, at 5500 Joliet Road in McCook, was not responsible.

"Vulcan Materials did not blast today," Robbins said Monday.

A spokeswoman for nearby Hanson Material Service, 9101 W. 47th Street in McCook, declined to say if her company did any blasting Monday.

"I actually can't comment on that at this point," said the woman, who would identify herself only as Jennifer.

McCook police did not immediately return a call for comment.

Tribune reporters Dan Haar, Carlos Sadovi and Rosemary Regina Sobol contributed.

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ANTONIO PEREZ/TRIBUNE PHOTO

Karen Mulvihill said a water pipe burst in the basement of a La Grange home in which she was working after Monday's tremor.

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CHUCK BERMAN/TRIBUNE PHOTO

Blasting at a quarry in McCook was followed seconds later by a real tremor, the USGS now says.

More on that mystery tremor: It was real quake, experts say

By MATTHEW WALBERG

tered on their seismographs the A spokesman for Lehigh Han-

The earth definitely shook. But how? Why?

Monday's west suburban tremor remains a mystery

By MATTHEW WALBERG
AND WES VENTEICHER
Tribune reporters

When nature called just before 1 p.m. Monday, security guard John Harbacek was at a shipping yard and headed

measurement called Peak Particle Velocity (PPV) to record the velocity of the ground vibration.

According to Lehigh Hanson officials and the state Department of Natural Resources, the blast caused a PPV of 0.35 inches per second, well below the state-mandated limit of 1 inch per second. The subsequent tremor posted a PPV of 2.93 inches per second, more than eight

times that of the initial explosion.

"In fact, right next to us is the Vulcan (Materials Co.) quarry," said Lehigh Hanson spokesman Jeff Sieg. "Their seismographs didn't pick up our blast, but they did pick up the second event. That's why we've been so adamant that the tremor wasn't caused by our blast."

Devey hypothesized that perhaps some combination

of unknown factors made the small blast feel much larger than normal.

Sieg said the quarry is still operating, but blasting at the site was suspended until at least this week.

Meanwhile, the tremor continues to reverberate in the minds of local residents.

The village of La Grange fielded hundreds of calls last week. Officials told residents to document any damage and file claims with

Lehigh Hanson and the village.

La Grange resident Karen McDonnell said the blast was unusually strong, but the shock that followed shook chairs and knocked a piece of china from a cabinet to the floor.

"We get a lot of tremors from the blasts here, but it was obviously much more significant than that," she said. "Maybe the people at the quarry are able to learn

from it so it doesn't happen again."

Harbacek believes the blast was the source of the tremor.

But at least the porta-potty didn't tip over.


"Then I would have really been mad," he said.

Freelance reporter Joseph Ruzich contributed.

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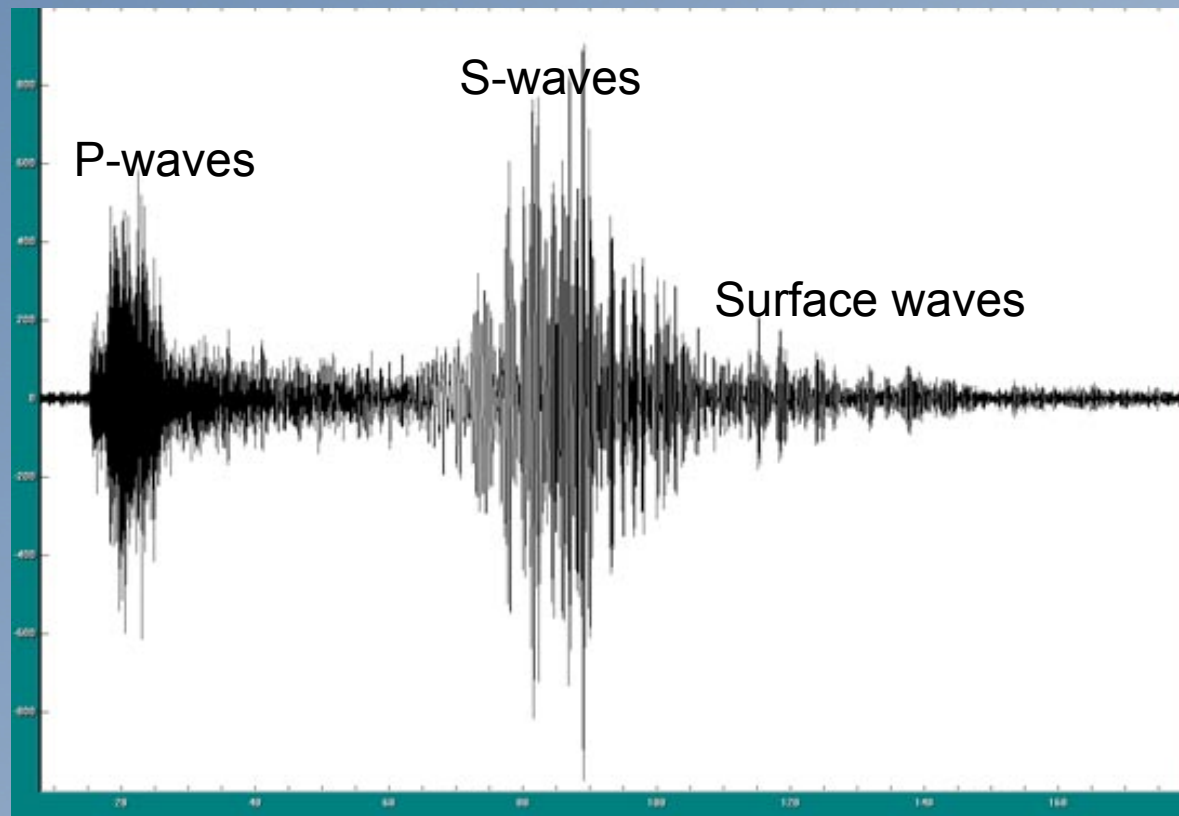


Different cause of an Earthquake

**How are earthquakes studied and
how do they cause damage?**

**[http://
www.sciencecourseware.org/
VirtualEarthquake/](http://www.sciencecourseware.org/VirtualEarthquake/)**

What are the waves caused by an earthquake?



Final Challenge

- Construct a building using only toothpicks and marshmallows
- Building must be at least 12" tall
- Building will be shaken for 1 minute
- Can construct own shake table to test using materials in aluminum tray

Science Curriculum:

- **MS-ESS2-2.** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- **MS-ESS3-2.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

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Science and Engineering Practices:

- Asking Questions and Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations and Designing Solutions
- Engaging in an Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

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Other Disciplines Covered:

- 6.EE 9: Represent and analyze quantitative relationships between dependent and independent variables
- 6.SP 2, 4,5: Develop understanding of statistical variability and summarize and describe distributions
- Mathematical Practices: Make sense of problems and persevere in solving them, construct arguments and critique the reasoning of others, use appropriate tools strategically, and attend to precision.
- 17.A.3b: Explain how to make and use geographic representations to provide and enhance spatial information including maps, graphs, charts, models, aerial photographs, satellite images.
- 17.C.3a: Explain how human activity is affected by geographic factors.

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