

EARTHQUAKES (PART SEVEN)

The New Madrid Seismic Zone, stretching from east central Arkansas to the southern tip of Illinois , is a major source of concern to the US Geological Survey and FEMA.

Their largest concern for this area is the disastrous effects of **Earthquake Soil Liquefaction** that will occur during a large quake. Liquefaction is transformation of loosely packed, saturated sand and/or silt into a fluid mass. Liquefaction is a temporary quicksand condition. The NMSZ, which includes parts of Tennessee , Kentucky , Missouri , Arkansas , Illinois , Indiana , and Mississippi , harbors a large liquefaction field.

Liquefaction is induced seismically by earthquake tremors that generate the pressures needed to separate grains of sand saturated with water, resulting in a viscous fluid mixture of water and suspended sand grains like that of a “cement slurry when freshly poured.” The only way that loose sand can have any strength is if the grains touch each other, supporting each other’s weight and any burdens coming from above, the sides, or below. Liquefaction disables grains from touching one another.

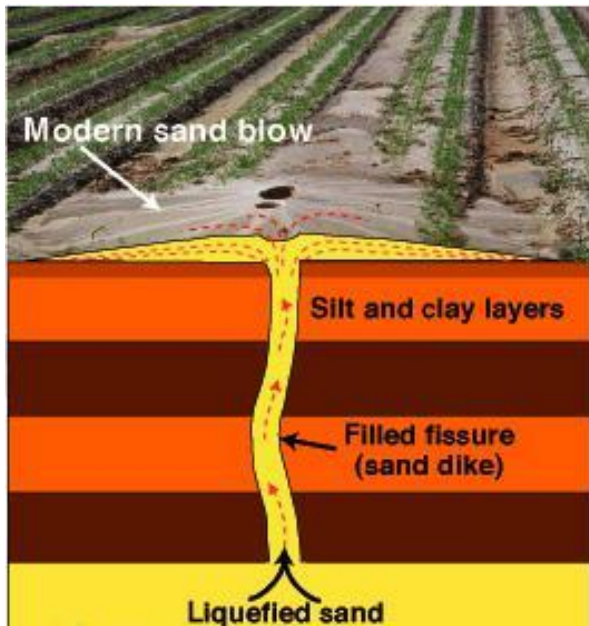
Thus, liquefaction is not a random geologic occurrence! The probability of its occurrence increases with the co-existence of the following three variables:

1. Young loose sand/soil, such as found in alluvial deposits—that is, sediment deposited by flowing water, as in a riverbed, flood plain, or delta.
2. A shallow ground water table (less than 50 feet).
3. The presence of active seismic faults.

These three variables exist in the New Madrid Fault Zone in the alluvial Mississippi Valley . The co-existence of the three variables in the Mississippi Valley is a concern because of two urban areas: Greater St. Louis Area in Missouri (population: 2,764,054 in 2004) and Greater Memphis Area in Tennessee (population: 1,230,303 in 2005). Unfortunately, many of the built environments of these two cities and many others in the New Madrid seismic Zone have not been built to withstand earthquake effects, including soil liquefaction.

The ubiquitous evidence of old and repetitive liquefactions throughout the New Madrid Seismic Zone strongly suggests that liquefaction will be a very big problem if it detonates some zinger earthquakes like it did in 1811-1812. Examples of old liquefaction include sand blow explosion craters, earthquake ponds, channel blowouts, simple sand boils, compound sand boils, sand dikes,

sand sills, lateral spread sags, sunk lands, and earthquake lakes.



The ground failure that resulted from liquefaction during the New Madrid earthquakes of 1811 and 1812 was severe. We're talking about vertical displacement of 3 to 6 feet and lateral displacement up to 33 feet. A recurrence of that type of event would have severe consequences for structures.

Seismically-induced liquefaction effects can be severe. The New Madrid Seismic Zone has demonstrated severe liquefaction effects in the past when it was relatively uninhabited. An earthquake in the zone today would likely cause liquefaction to recur as the three variables—alluvium, high water table, and seismicity—remain present today, as in the past. The population centers near the NMSZ are at risk for the effects of liquefaction.

Last week Gene, W5SXV, brought up the subject of the Richter Scale, so let's look at some interesting figures that Charles Richter developed in 1935 and are still used to this day to measure earthquakes strength.

The Richter scale is open ended and logarithmic which means there are no upper and lower limits to the scale, and that every time the magnitude goes up by one unit, the amount of energy this represents increase thirty times. The following are measurements of the Richter scale and the equivalent amount of TNT each represents:

RICHTER

TNT ENERGY

1. 1.0 6 ounces

2.	1.5	2 pounds
3.	2.0	13 pounds
4.	2.5	63 pounds
5.	3.0	397 pounds
6.	3.5	1000 pounds
7.	4.0	6 Tons, equal to a small atomic bomb.
8.	4.5	32 Tons
9.	5.0	199 Tons
10.	5.5	500 Tons
11.	6.0	6270 Tons
12.	6.5	31,550 Tons
13.	7.0	199,000 Tons
14.	7.5	1,000,000 Tons
15.	8.0	6,270,000 Tons

As you can see from these figures, earthquakes can produce and unleash a tremendous amount of energy that will produce waves of destruction in there paths.

There are now heavily populated areas in the New Madrid Fault Zone where studies show that the ground will fall away during a large earthquake changing elevations drastically. During the earthquakes of 1811 and 1812, Lake St. Francis, which is in the wildlife management area 600, located 15 miles southeast of Jonesboro in Craighead County , was formed. The lake is shown to be 40 miles long and one half mile wide. Two other lakes were also formed during this time, Lake Reelfoot , which encompasses 25,000 acres in the Northwest corner of Tennessee and Big Lake near Manila , Arkansas which is approximately 15 miles west of Blytheville , AR. The ground sank away and the elevations dropped at least twenty feet in these areas. The Mississippi embayment fall line

area, in which the New Madrid seismic zone is located, extends from Cairo , Ill south through northeastern Arkansas , western Kentucky , western Tennessee , and then westward to include the lowland area of southern Arkansas , eastern Oklahoma and northeast Texas .

FEMA: New Madrid earthquake preparedness is agency priority

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Preparing for a catastrophic earthquake along the New Madrid fault is a priority, FEMA officials said before a congressional field hearing on government readiness to handle natural disasters, and the "New Madrid Seismic Zone is at the top of the list," one section chief of the Federal Emergency Management Agency, said. "It's our primary objective."

There is "significant concerns" for the potential of a catastrophic earthquake equal in magnitude to those that struck parts of the Mississippi River Valley in 1811-1812, and again in 1895. A magnitude 7 earthquake would destroy more than 60 percent of buildings in St. Louis and Memphis , Tenn. , because most buildings predate building requirements aimed at resisting the shock. "A catastrophic earthquake in the Central United States along the New Madrid Seismic Zone could pose unprecedented problems and challenges," the FEMA Official said. FEMA officials are worried about how quickly they could enter the affected area because many roads, bridges, and approaches could not be expected to withstand a high-magnitude earthquake, "It will be a monumental challenge".

FEMA has been sharply criticized for its handling of the aftermath of Hurricane Katrina, and they would not say whether the Katrina criticism had prompted the agency's interest in the 50-mile-wide New Madrid fault zone, centered near the southeast Missouri town New Madrid, and stretches from Arkansas to Illinois . Instead, they are pointing to the potentially, wide-ranging impact on the nation's economy, estimated in the tens of billions of dollars should and when a large earthquake hits in the NMSZ.

A strong earthquake could disrupt the flow of commodities by underground pipeline, rail, barge and highway; halt the flow of food exports, fuel oil and coal outside the region; and block routes for emergency services.

A House subcommittee which oversees FEMA and emergency management, traveled to St. Louis to gauge how prepared local, state and federal governments would be in responding to a natural disaster, and avoid problems such as those that emerged with Katrina.

After that trip, that committee said they are leaning toward introducing legislation that would separate FEMA from the Homeland Security Department. That's in response to criticisms that FEMA's traditional role of dealing in natural disasters has gotten lost in Homeland Security's emphasis on fighting terrorism. "Response was slow and key decisions were made late," and "We can't afford to get it wrong again. Business as usual doesn't work in a catastrophic disaster."

Missouri emergency management said most federal emergency funds are tied to terrorism and not available for natural disasters. "That's been changing since Katrina," and "It's about time."