

Haiti's Buildings Weren't Fit To Withstand Quakes

by CHRISTOPHER JOYCE



(Top) M_Eriksson via flickr; (bottom) Jorge Cruz/AP
The National Palace in Port-au-Prince, Haiti's presidential residence, before and after Tuesday's earthquake.

January 14, 2010

text size A A A

Haiti's magnitude 7.0 earthquake struck a country whose buildings were barely built to engineering standards and were hopelessly fragile in the grip of such a strong quake.

That's the assessment of Pierre Fouche, an earthquake engineer from Haiti — in fact, the country's only earthquake engineer, to his knowledge.

Fouche says when he was studying engineering in Haiti his professors told him that at least one building there would survive an earthquake — the presidential residence known as the National Palace.

The palace now lies in ruins.

Constructing Disaster

Fouche is now getting his doctorate in earthquake engineering at the University of Buffalo. He says his family has survived Tuesday's quake, but he's

saddened by the fact that so many who didn't were killed because buildings in Haiti are so poorly constructed.

"Many people are doing whatever they want; they can build whatever they want," Fouche says. "One of the biggest problems too is that in the country we do not even have a national building code, which is very sad."

Fouche says people with money can build reinforced concrete buildings with steel rods to strengthen walls and floors. But he says even these may not meet engineering standards to support a load vertically, and they definitely cannot handle the side-to-side forces of an earthquake.

Visions of Chaos After The Quake



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With thousands missing and the death toll climbing, dazed survivors wander amid the ruins of Port-au-Prince two days after the devastating earthquake. (Juan Barreto/AFP/Getty Images)

"The earthquake, it's much more of a type of lateral loading, [and] for lateral loading you need special construction, but in many cases they are not designed, not even for current daily loading."

But many people in Haiti live and work in unreinforced buildings — brick, block or concrete. He says some of these buildings use stacked bricks instead of solid vertical columns to support ceilings.

Widespread Collapse

Earthquakes put enormous stress on rigid buildings. Andre Filiatraut, who directs the earthquake engineering center at the University of Buffalo, explains what happens to a masonry or concrete wall that's perpendicular to the [motion of the quake](#): "The wall just kind of explodes. Imagine that I hit a wall with my fist; I'm going to create a hole there, and imagine [that] the shaking in that direction will create even a bigger hole and the wall collapses and the slab falls down." The slab being the wall or ceiling.



Enlarge

Lisandro Suero/AFP/Getty Images

A destroyed building seen in Port-au-Prince after Tuesday's magnitude 7.0 earthquake. The quake toppled buildings, many of which weren't built to withstand tremors of that magnitude.

Filiatraut says televised images of Port-au-Prince suggest this kind of collapse was widespread.

"The video showed complete dust over the entire city. Apparently that dust lasted quite a long time, 10, 15 minutes or so, and that seems to indicate these types of buildings, concrete buildings, pancaking, creating a lot of dust."

Several big aftershocks followed the earthquake. Fouche says that makes the surviving buildings very dangerous. "Once you have the aftershock," he says, "it's like you are shaking a building that is already damaged, so this is quite likely to bring those buildings down."

After The Quake, Threat Of Landslides Looms

There's another threat to buildings and people in Haiti as well — quake-induced landslides. Haiti has very few trees left; it's one of the most deforested nations in the hemisphere.

Mark Ashton, a professor at the Yale School of Forestry who has studied the Caribbean, says that without woody plants, water doesn't soak deeply into the soil. That causes erosion and unstable slopes. "You can get rain-soaked soil, very fragile, without any rooting system, and you get very sudden movements — landslides."

Ashton says Haiti is a country with lots of steep slopes that are vulnerable to landslides. Besides the threat to people below, they could cover roads and slow down rescue and relief efforts.

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j k (wamu_jen) wrote:

I wish this article was a more rigorous scientific analysis of construction methods and

Recent First

earthquake damage, a good science editor should have been able to better direct the tone. Load-bearing masonry construction (i.e. brick or stone and mortar) does sustain the most damage under earthquake forces, but sadly it seems Port-Au-Prince did not have the resources to make steel or reinforced concrete construction a priority. Given the rarity of their major earthquakes and the other pressing needs of such a poor country, that investment would have been difficult to justify. In fact New York City would fare differently, given the amount of steel and reinforced concrete used (generally withstands earthquake forces better) and the many areas with firm bedrock soil conditions. In terms of resource allocation based on natural disaster probability I would guess that stiffening the earthquake resistance requirements for NYC building codes would not be the best use of resources, but a study of flood control and infrastructure strategies could be timely given recent events. FEMA (surprisingly) has many free online publications regarding earthquake design which are well written, and I would recommend them if anyone has further interest.

Thursday, January 14, 2010 3:02:13 PM

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david bockoven (davy_B) wrote:

Deborah:

That is the kind of unjustified confidence which destroys people from time to time. Remember Pompeii?

NYC indeed has a traceable record of substantial earthquakes. It's just that they're only at a frequency of every couple hundred years or so. Since the last major one was before the modern metropolis, its history hasn't been much recorded (there have been minor ones recently). Since the last one was that long ago, and since they come at the frequency they do, how soon do you think the next one might get here? Bad stuff doesn't just happen to unprepared people in other places.

Early one morning in Philadelphia about 20 years ago, I was lying in my futon bed when I felt a little shaking, prolonged oddly. Being from California, I thought it felt like an earthquake. Being in Phillie, I thought it must have been a very heavy truck going by on the street. Later that day, I learned there had been a very major earthquake in Northern Quebec, Canada. Would you have thought that was on a fault? Would you think it would shake so far away? I wouldn't have. I figured there were no fault lines.

Earthquakes may happen just about anywhere. NYC may get a category 5 hurricane, too.

Thursday, January 14, 2010 2:10:11 PM

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david bockoven (davy_B) wrote:

If I had been there, I'd likely have chosen to be in one of those buildings. There but for grace go some of us, eh?

Thursday, January 14, 2010 1:56:41 PM

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VC Ponsardin (vcponsardin1) wrote:

NYC has indeed suffered earthquakes within the last 200 years--same geological timeframe as Haiti. So don't be too confident that NYC would fare any better if a 7.0 magnitude quake struck tomorrow.

Thursday, January 14, 2010 11:48:57 AM

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Rebecca Hansbrough (spidergirl24) wrote:

Deborah-I don't disagree with you. As I said in my previous statement: "There's a different between meeting accepted building codes and being earthquake-protected." Some of San Francisco's were reduced to rubble even though they were built to code. They were not retrofitted to withstand higher earthquake forces. Haiti last suffered an 8.1 earthquake in 1946. 64 years later, the country suffered another earthquake. The northern Bay Area just had one last week. NYC does have a fault line that starts and runs along 125th street-a minor one. It is not immune. The odds of a major earthquake hitting the city might be long but one could occur. Your point: "Building codes should reflect the historic geological and meteorological data for that area, not be uniform throughout the known world." I agree with you. Fault lines exist in many locations we are not aware of. All it takes is one well-placed, violent event to bring down even the most solidly built structures. Many cities are including earthquake reinforced standards in their building codes despite the dearth of actual geological experience.

Thursday, January 14, 2010 11:17:49 AM

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Deborah Lepper (D_Lepp) wrote:

One of the stories this morning mentioned that there is no uniform building code in Haiti. NYC is not near a fault line, so it does not make sense to have codes include earthquake protection. Haiti, however, is near a fault, although one that has been relatively quiet in the recent centuries. Yes, many buildings throughout the developed world would not withstand an earthquake, as most are not near the edges of tectonic plates and so would expect no movement. Building codes should reflect the historic geological and meteorological data for that area, not be uniform throughout the known world.

Thursday, January 14, 2010 10:02:30 AM

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Ronald Hamann (unanimous) wrote:

Picture Test

Thursday, January 14, 2010 9:50:02 AM

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Rebecca Hansbrough (spidergirl24) wrote:

Guess what Christopher Joyce? There are a lot of buildings currently in the US that wouldn't withstand a 7.0 magnitude earthquake. You remember the damage wreaked by '89 Loma Prieta earthquake? Many of the structures built at the time certainly seemed up to code but when the Marina landfill surface underwent liquefaction, the Cypress interstate collapsed because construction elements could not sustain the force and buildings were not retrofitted with expansion joints, many of them did not survive the disastrous forces. There's more to an earthquake story than a meeting a building code. If a well-placed earthquake hit NYC, how much damage do you think such an event would produce? How many buildings would end up as rubble? There's a different between meeting accepted building codes and being earthquake-protected.

Thursday, January 14, 2010 9:36:54 AM

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Bill Lewis (dufus2) wrote:

Ya think?

Thursday, January 14, 2010 7:04:22 AM

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