Non-Engineered Construction and its Earthquake Damage

Yuji Ishiyama
Professor Emeritus
Hokkaido University

Un-reinforced brick masonry (Java, Indonesia)

Damage to brick masonry, most of them have no reinforcement.

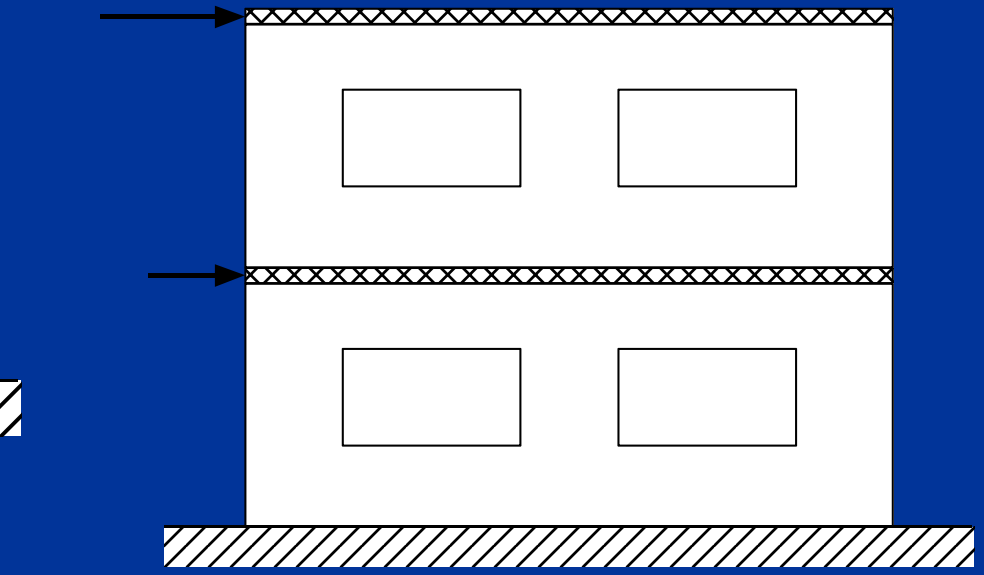
2006 Central Java, Indonesia EQ

Wooden houses have better performance against EQ’s.

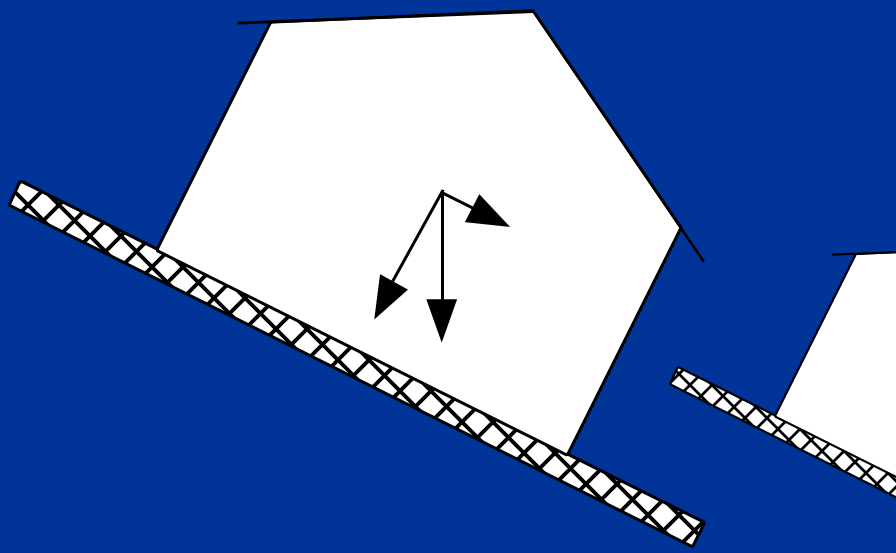
Roof sheathing board is not used.

Hydraulic jacks applying lateral forces

Tilting table (Indonesia)



Hydraulic jacks where there are floor diaphragms



Lateral component of gravity forces acts as EQ forces

Reinforced concrete frame with unreinforced brick infill walls

Unreinforced masonry infill walls are used in many countries.

Brick infill wall in Egypt

Damage to Adobe (sundried mud block) construction (1996 Nazca, Peru EQ)

Damage to Adobe (2001 Atico, Peru EQ)

Damage to Tapial construction (1990 Peru EQ)

Tapial is cast-in-place mud construction (1990 Peru EQ)

Damage to Japanese wooden houses (1995 Kobe EQ)

Narrow boards nailed to frame cannot resist lateral forces (1995 Kobe EQ)

Braces are effective to resist lateral forces (1995 Kobe EQ)

Connections of braces and frames should be sound (1995 Kobe EQ)