Disaster Management

3. Typical Strategy for Pakistan

BY

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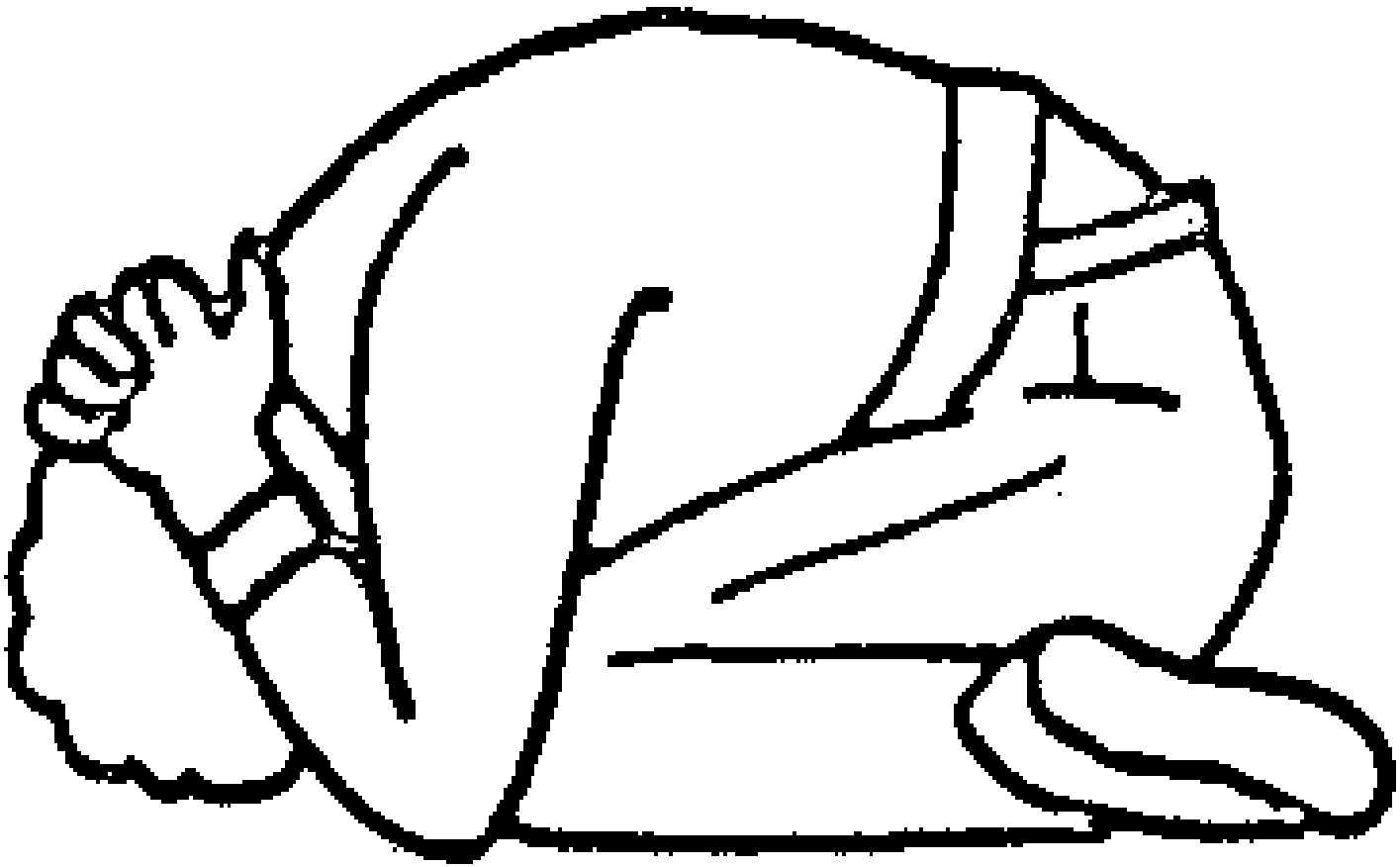
Beware of large openings in their ground floor exterior walls, big windows, patio doors, and garage doors

Faulty construction on sliding soil: root cause of death in earthquake-hit areas

Turkey 1999 earthquake: 34 killed in wood frame houses and 40,000 in masonry and concrete

Sticking out elements fall first

Drop and cover position



Buildings that performed better

- **A century and half a century old buildings in Murree, Muzafarabad and Balakot, including old barracks of British Army, with a canopy roof made of iron sheets, survived and resulted in less damages.**
- **New buildings using concrete slabs were erased to the ground and did not allow rescue teams to rescue trapped people inside buildings because concrete slabs were not only heavy to remove rather difficult to cut or break.**
- **Muzafarabad President House and Prime Minister House of similar construction have received serious damage.**

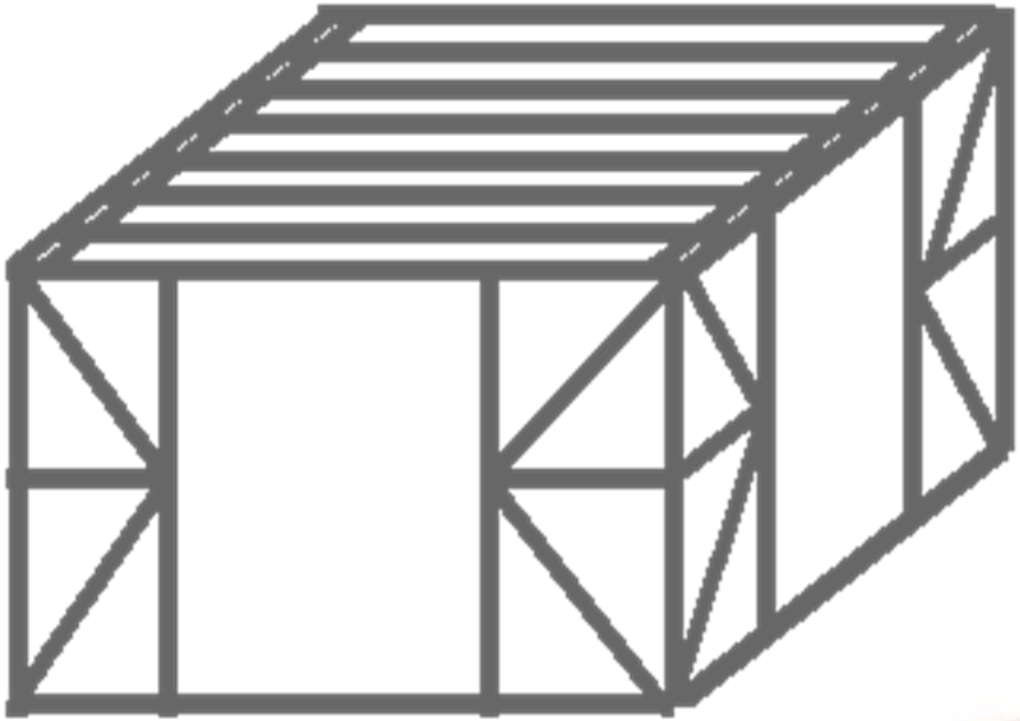
Buildings that performed better

- **Abbotabad can be taken as prime example to understand this issue. Abbotabad Cantonment, which was established during British Era, was constructed on Gothic style mostly with canopy rooftops using wooden pillars. These buildings have survived while new buildings with concrete slabs and no seismic frames have erased to ground.**
- **Mushroom like growth of buildings with structural design similar to plain areas played havoc.**

Loose masonry

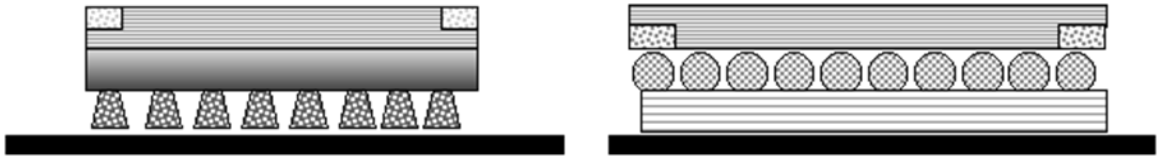
1990 Earthquake, Scale 6.0, *Masooleh*, Iran, Resulted Very Minor Damage

- **Most buildings, two to three storeyed, made in thick adobe and mud walls, were more than 100 years old.**
- **Wooden beams, columns and ring ties framed around the walls.**



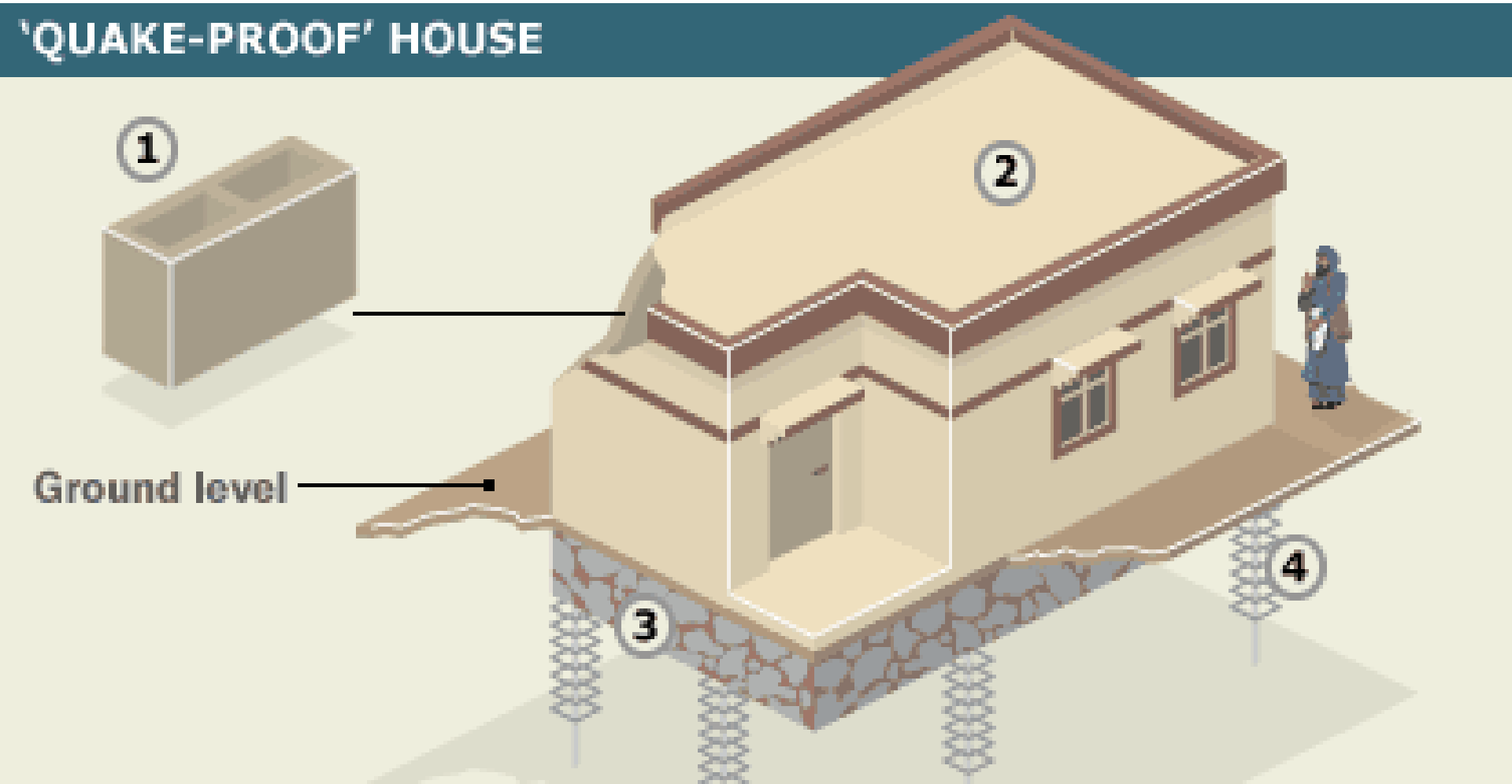
Masooleh

Many traditional buildings were constructed on base-isolated foundations, with layers of timber enabling rolling movement



A number of techniques can be used to make houses withstand earthquakes better:

1. Hollow block walls designed to cause minimal damage
2. Low weight articulated roofs
3. Stone foundations made from energy dissipating dry rubble
4. Timber or steel bracings and pillars providing flexibility



Features to be included in design: new construction or a retrofit

- • Special attention to potential weak ground floors.
- • A heavy foundation on stable ground.
- • Walls well tied to the foundation.
- • Lateral resistance in key walls
- • Proper nailing of wood to the studs.

Earthquake Proof Buildings

- **No building can be completely earthquake-proof, but good seismic design will minimize structural damage, and,**
- **Most importantly, safe evacuation of the occupants during an earthquake is a prime factor.**

HOW CAN WE REDUCE EARTHQUAKE LOSSES

- **(1) Understanding the nature and extent of the earthquake risk,**
- **(2) Taking actions to reduce the risks, and**
- **(3) Establishing policy to guide the development of effective risk-reduction programs**
- **(4) Practical steps on earthquake hazard mitigation and preparedness.**

Understanding Earthquake Risk

- **(1) Risk can be numerically defined as the probability of a hazardous event multiplied by the cost of damage that would result should the event happen.**

- **(2) Maps have to be drawn depicting expected levels of ground shaking, and distribution of physical development.**

Sociological factors

- **Sociological factors that should be considered in the determination of earthquake risk in include:**
- **the distribution of people,**
- **businesses and industries,**
- **financial institutions,**
- **important transportation routes**
- **permanent storage sites, and**
- **location of critical facilities: medical etc.**

Risk Reduction

- **Earthquake damage can be reduced by:**

- **(a) taking account of earthquake hazards in land-use decisions,**
- **(b) using appropriate engineering and construction design to reduce the hazard, and**
- **(c) involving communities in earthquake preparedness programs.**

Land-Use Decisions

- **local regulatory laws can encourage suitable types of land use.**
- **restricting development within easy control.**
- **Forming a National Earthquake Hazard Reduction Program**
- **Development and promotion of appropriate building codes**

Engineering and Architectural Design

- **Engineers have to develop methods to increase the resistance of land and structures to the damaging effects of strong ground shaking.**
- **Stabilization of landslide areas and compaction of soft-soil sites. Vibro-flotation is one method.**
- **Provide proper drains to keep fields dry.**
- **Use building shapes that do not localize large stresses**

Nonstructural hazards

- **Nonstructural hazards can be reduced in new or existing buildings by:**
- **Securely attaching ceiling panels, light fixtures, and shelving and by**
- **Installing special equipment, like safety glass and automatic gas shut-off valves.**
- **Strengthening older buildings**

Earthquake Preparedness Programs

(1) *Before an earthquake occurs*

- **This means planning:**
- **What to do to reduce earthquake risk,**
- **What emergency supplies should be on hand, and**
- **What steps to take during and after an earthquake to reduce loss of life**
- **Identifying earthquake hazards, earthquake drills, emergency supplies, and shelter management.**

Preparedness Exercises

- identifying areas that are safe from falling objects,
- practicing what to do during the shaking and
- What to do when the shaking stops, and
- obtaining essential emergency supplies like a first aid kit.
- Doing some preparations, like securing water and power.
- Securing heating arrangements.

Earthquake Preparedness Programs

(2) *During an earthquake*

- **Strong ground shaking often lasts only 30 to 60 seconds.**
- **Power failures may plunge a room into darkness.**
- **Find a nearby protected place to take shelter until the shaking stops. Take the drop and cover position.**
- **This should be taken under a sturdy desk or table, inside a doorway, along a wall entirely inside a building, or within the inside corner of a room.**
- **Take actions during an earthquake if one is inside a building, outside, or in a vehicle.**

Earthquake Preparedness Programs

(3) *During an earthquake*

- **prevent additional injury and loss of life**

  building should be evacuated because of the possibility of further damage

- **hazards like fire or gas leaks have to be looked into**

- **occupants should be accounted for medical assistance and food supplies**

What To Do During an Earthquake

Location	Action	Where	Hazards
Inside building	Drop and cover	Under sturdy desk Under sturdy table Along inside wall In doorway In corner	Window glass Overhead objects Objects on wheels Swinging doors Collapsing fireplaces Chimneys
Outside building	*Drop and cover* (if necessary)	Building entryway (inside, where not subject to material falling from outside walls) In clearing, away from wires other overhead dangers	Building facades Overhead wires Trees Steep slopes

What To Do During an Earthquake

Location	Action	Where	Hazards
Outdoors, in open	Stay in open areas	Away from falling objects	Rock fall, landslide
Bus or other vehicles	Bring bus to stop	Side of road	Overpasses
			Falling debris
Hold on to seat	Stay in bus		Underpasses Overhead Wires
In all locations	Protect oneself	Nearest place	Falling debris

1. Emergency response personnel are likely be handicapped by impaired communications.

2. Damaged and blocked transportation routes, damaged equipment, and injured personnel, are likely to be met.

3. Besides protecting personnel from injury, schools, hospitals, governments, and certain businesses need to be concerned about maintaining and continuing operations after an earthquake.

4. Nearly two-thirds of all businesses are expected to be non-functional.

What To Do After the Shaking Stops

Steps	Specific Actions	Concerns
Check for injuries	Administer emergency first aid	Move severely injured only if mandatory Be prepared for aftershocks
Evacuate	Leave cautiously	Put on shoes Avoid elevators Choose exits carefully Be prepared for aftershocks
Check for safety	Turn off utilities	Gas, water, electric lines may be broken
	Use flashlights no candles	Electric sparks or flame may ignite gas
	Account for building occupants	May need to do search and rescue
	Confine animal	Dog bites common after earthquake

What To Do After the Shaking Stops

Steps	Specific Actions	Concerns
Get information	Use portable or car radio	Are there nearby secondary hazards, like chemical spills, fire? Avoid sightseeing, unnecessary travel, or spreading rumors
Care for and comfort others	Reassure children, ill, handicapped and elderly	Need physical and emotional care Avoid leaving them alone More physical and emotional trauma than other individuals
Make shelter	Use large plastic garbage bags Use blankets	Existing structures may be unsafe Prevent hypothermia Locate food and water