

# Housing Report Blast: Afghanistan

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Recent seismic events in Afghanistan have resulted in significant human casualties and extensive structural damage. On 22 June 2022, a magnitude 5.94 earthquake struck south-eastern Afghanistan, resulting in over 1,500 deaths and more than 3,500 injuries in eastern Afghanistan and western Pakistan. This event caused substantial destruction to residential infrastructure and left approximately 362,000 individuals in urgent need of humanitarian assistance (Ansari et al., 2023; Kast et al., 2024). In October 2023, a sequence of four earthquakes of magnitude MW 6.2–6.3 devastated Herat Province in western Afghanistan, leading to more than 2,000 fatalities and the collapse of numerous buildings, as reported by the United Nations (Fu et al., 2025). On 31 August 2025, a magnitude 6.0 earthquake severely impacted eastern Afghanistan, particularly the provinces of Kunar, Laghman, Nangarhar, and Nuristan, destroying 8,000 buildings and causing up to 2,800 fatalities (UN University Institute for Water, Environment and Health, 2025). Although these recent earthquakes were moderate in magnitude, they caused significant building damage and a high number of fatalities. Most fatalities resulted from the collapse of traditional-style buildings lacking earthquake-resistant features. Understanding the housing types and traditional construction practices in Afghanistan is essential for assessing future seismic risks and developing effective preventive strategies. This report provides a brief summary of the traditional housing types in Afghanistan that failed during these earthquakes.

## Common Housing Typologies in Afghanistan

Approximately 93% of houses in Afghanistan are non-engineered structures constructed from mud, mud-bricks (sun-dried bricks), and stones. These buildings are predominantly found in rural and semi-urban areas (UN-HABITAT, 2006). The construction methods vary by wall materials and roof types. According to UNCRD (2003), the principal types of residential buildings in Afghanistan include:

1. Mud houses (adobe) with roofs constructed from wooden logs.
2. Mud-brick walls (with mud mortar) combined with timber roofs, utilising either wooden logs or sawn timber.
3. Stone walls (random rubble stone masonry with mud mortar) paired with wooden roofs.
4. Brick walls, either sun-dried or burned, with dome roofs, are commonly called Pooshesh in Afghanistan.
5. Walls constructed from mud, burned bricks, or stone, with roofs made of concrete or steel girders.
6. Modern building with reinforced concrete frames or confined masonry structures that are built in urban areas.

Figures 1–4 illustrate typical housing construction systems in Afghanistan. The selection of wall materials and roof types largely depends on the household's economic conditions.

### *Typical Wall Systems*

Generally, wall foundations are excavated to a depth of approximately 30–50 cm. In some cases, stone masonry or rubble stone is used for the foundation, while the walls are constructed using mud, adobe (mud bricks), rubble stone, or fired bricks. Fig. 1 shows a typical mud house constructed with earthen walls supported by a rubble stone foundation, which helps improve stability and resistance against

ground moisture (Sultani, 2016). Fig. 2 illustrates a mud-brick (adobe) wall, one of the most widely used wall systems due to the availability of local soil and low construction costs. Fig. 3 presents a burned brick wall supported by a stone masonry foundation. This type of construction generally provides greater durability and strength than traditional mud-based systems. Fig. 4 shows a rubble stone wall combined with wooden logs in the structural system, where timber elements help support roof loads.



Fig. 1: Mud House with rubble stone foundation (Sultani, 2016).



Fig. 2: Mud brick wall (achro.org)



Fig. 3: Burned Brick wall with Stone masonry foundation (achro.org).



Fig. 4: Rubble stone wall with wooden logs (Photo source: solidarites.org)

### Typical Roof Systems

Figures 5a-c present three prevalent roof systems found in traditional Afghan houses. These systems are typically constructed with locally sourced materials and straightforward building methods.

#### *Vault Roof (Pooshesh) (Fig. 5a)*

The *Pooshesh* vault is a traditional masonry structure constructed over substantial load-bearing walls. It generally spans 3.0 meters between walls, each measuring approximately 0.60 meters in thickness. The vault shell, typically 0.20 meters thick, is built from mud bricks or rubble masonry bonded with mud mortar. This system relies on masonry's compressive strength and transfers structural loads to the supporting walls through arch action.

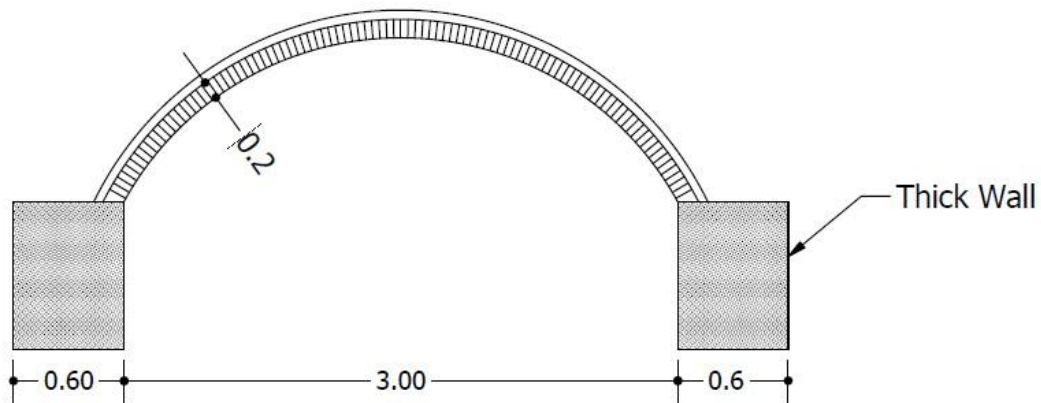
#### *Wooden Roof System (Fig. 5b)*

The wooden roof system comprises timber logs positioned horizontally across the supporting walls. These logs typically have diameters ranging from 15 to 20 centimetres and are spaced 0.75 to 1.00 meters apart. Woven mats are placed above the logs to support layers of soil or clay, which provide waterproofing and thermal insulation. The assembly is finished with a protective plaster of mud and straw, known locally as *kahgel*. This roofing method is prevalent in areas with readily available timber and is widely used in rural housing.

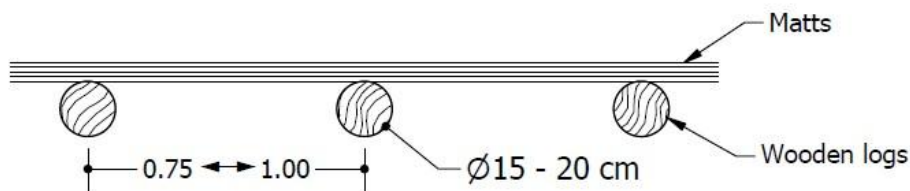
*Garder-e-Pooshesh (Shallow Vaults) Roof System (Fig. 5c)*

The *Garder-e-Pooshesh* system is a hybrid roofing method that integrates steel or reinforced concrete girders with shallow masonry vaults. The girders are generally spaced 0.90 meters apart, with shallow vaults constructed between them to a depth of approximately 0.22 meters. These vaults, typically made of brick or masonry, transfer loads to the girders, which subsequently convey them to the supporting walls. Steel girders are typically available as I-sections, whereas concrete girders are commonly supplied as precast beams from local markets. Mud mortar is typically used for Pooshesh vaults and mud-brick masonry, while lime mortar or cement mortar is commonly used in shallow vault roof systems.

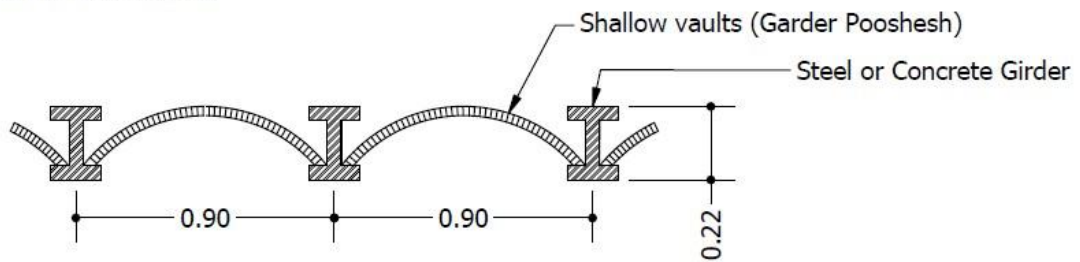
**a) Vault (Pooshesh)**



**b) Wooden Roof**



**c) Garder E Pooshesh**



All dimensions are in meters unless otherwise stated.

Fig. 5: Various roof types used in Afghanistan

## Earthquake Performance of Common Housing Typologies in Afghanistan

Vernacular buildings in Afghanistan are highly vulnerable to earthquakes due to inadequate construction methods and insufficient lateral resistance mechanisms. These non-engineered structures are typically built by local masons using traditional wall and roof systems composed of locally sourced materials. Reconnaissance reports confirm that recent seismic events have highlighted the buildings' susceptibility to earthquake-induced damage. The primary cause of structural failure is the collapse of the roof system, which often forces the supporting walls apart at their bases. This failure is attributed to improperly anchored and inadequately supported roof joists or timbers. Additionally, improper roof maintenance contributes to structural weaknesses. Roofs are frequently repaired before winter by applying extra layers of clay to enhance waterproofing and thermal comfort, which makes them heavy, which is a disadvantage in earthquakes due to their larger inertia forces. (Kast et al., 2024). In some cases, Floor and roof joists lacking adequate bearing may slide off their supports, causing the collapse of the floor and roof. According to Ansari et al. (2026), the main factors contributing to structural damage in vernacular houses include poor construction quality, absence of engineering design, and reliance on traditional rural building practices. The lack of connections among walls, roofs, and foundations leads to shear failure (shear cracks starting at the corners of openings), out-of-plane collapse, and progressive collapse of the entire structure. These issues are exacerbated on steep slopes, where houses suffer greater damage than those on flat terrain. The Figures 6a-h illustrate the extent of damage from the recent earthquake in Afghanistan and the failure mechanisms associated with different wall and roof typologies used in vernacular buildings.

## World Housing Encyclopaedia and Housing Reports

Earthquakes in Afghanistan have shown that many homes are vulnerable to damage. Most houses, whether in cities or rural areas, are built with traditional methods and local materials. Common types include adobe (mud-brick), rubble stone, and fired-brick masonry, often paired with timber-log roofs, earthen roofs, or masonry vaults such as *Pooshesh* and *Garder-e-Pooshesh*. These homes are usually built without engineering input or attention to earthquake safety. Because of weak wall connections, heavy roofs, poor mortar, and a lack of structural reinforcement, many of these homes are at high risk during earthquakes.

Learning how these traditional homes respond to earthquakes is key to better risk assessment and safer building methods. The World Housing Encyclopedia (WHE) is a project that helps by documenting common housing types from many countries and examining how they perform during earthquakes. WHE reports provide detailed information on building materials, design features, social and economic factors, construction methods, and damage observed in past earthquakes. These reports help assess vulnerability, model risk, and develop ways to strengthen buildings.

The World Housing Encyclopedia was started in 2000 by the Earthquake Engineering Research Institute (EERI) and the International Association of Earthquake Engineering (IAEE). It is a global resource on housing in earthquake-prone areas. In addition to housing reports, it provides technical guides and educational materials to improve earthquake-resistant construction. Recording details about traditional Afghan homes through projects like this is an important way to understand their weaknesses and find practical ways to make homes safer and stronger.

The WHE housing reports were developed and reviewed by volunteer engineers and architects from around the world. If you are interested in writing or contributing to a housing report, please reach out to us at [whe@eeri.org](mailto:whe@eeri.org).



a) Diagonal cracking in an adobe masonry wall caused by lateral stresses and weak roof-wall connections in a traditional timber log roof system during the 2023 Herat earthquake.



b) Vertical crack that separates the in-plane and out-of-plane walls at the corner, which also extends to the vault roof during the 2023 Herat earthquake.



c) The mud wall and wooden roof collapsed during the 31 August 2025 earthquake in eastern Afghanistan<sup>1</sup>.



d) Partial damage to the thick vault roof made of mud bricks during the 2023 Herat earthquake<sup>2</sup>.



e) Dry stone walls collapsed in the 31 August 2025 earthquake in Kunar Province, eastern Afghanistan<sup>3</sup>.



f) Arch ceiling damage caused by the 7 October 2023 earthquake in Herat Province, Afghanistan<sup>4</sup>.



g) Collapse of a house with steel roof girders in Herat Province following the October 2023 earthquake<sup>5</sup>.



h) Destroyed houses in mountainous terrain after the August 2025 earthquake in eastern Afghanistan<sup>6</sup>.

Fig. 6: Structural damage to the vernacular buildings in Afghanistan during recent earthquakes.

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