

Guidelines for Safer House Construction Design

1. Unsupported Masonry

1 Unsupported masonry

BAD DESIGN Unsupported masonry such as gable walls and pillars. Wall is at risk to collapse during earthquakes and high winds. Unsupported masonry is liable to movement and collapse.

BETTER DESIGN Timber trusses can be used to support masonry walls, making them safer. This applies to external and internal masonry walls. Diagonal bracing strengthens the whole building, helping to prevent movement and collapse.

BEST DESIGN A hipped roof is best as there is no longer the requirement for gable support. It also reduces the surface area for wind load.

2. Roof Pitch

2 Roof Pitch

BAD DESIGN A shallow pitch roof is more likely to uplift during high winds. Winds uplift the roof.

BETTER DESIGN A roof pitch of approximately 20-30 degrees is going to be more resistant to uplift in strong winds than a shallower pitch.

BEST DESIGN The safest design to prevent uplift from winds is a roof pitch of 30-40 degrees, with hipped ends.

3. Window and door openings and position

3 Openings

BAD DESIGN Window opening is too wide. Maximum window width = 1200mm. Openings are too close to building corners. Openings exceed 50% of the total wall area. This makes the wall unsafe. The building is likely to collapse during earthquakes if openings are too large and close to corners.

BETTER DESIGN A better design is when all openings are 1200mm wide maximum. All windows are 600mm from corners. Doors are 900mm from corners.

BEST DESIGN Ideally, the best and safest design is when the door is positioned in the centre of the building.

4. Building Shape

4 Shape

BAD DESIGN Long, thin, rectangular shapes and complex shapes have inherent weaknesses, and are at risk during earthquakes.

BETTER DESIGN A better solution for the same shape, is to divide the building into units. Each unit has a space between, allowing for movement during earthquakes.

BEST DESIGN Maximum length = $W \times 3$. A proportional rectangle and square are the best shapes for buildings.

5. Unsupported long, rectangular buildings

5 Longer buildings

BAD DESIGN Longer rectangular buildings are weaker and subject to outward movement of the walls in an earthquake. Longer rectangular buildings will collapse during an earthquake, as they have no internal support.

BEST DESIGN Longer rectangular buildings can be created by providing additional support using the internal wall. There needs to be sufficient connection between internal and external walls.

6. Pillars and posts to support covered areas

6 Pillars and posts

BAD DESIGN A structure using heavyweight pillars and posts is more likely to collapse during an earthquake. The covered area is connected to the house, so when an earthquake occurs it damages the whole house.

BETTER DESIGN It is better to design a covered area as a separate element from the building, and the pillars fixed to the foundations to prevent uplift. Pillars should be lightweight.

BEST DESIGN During an earthquake there will be less potential for the covered area to create damage to the whole building. Ideally, the best design is to have no pillars and posts. This will help prevent further damage during an earthquake and high winds.