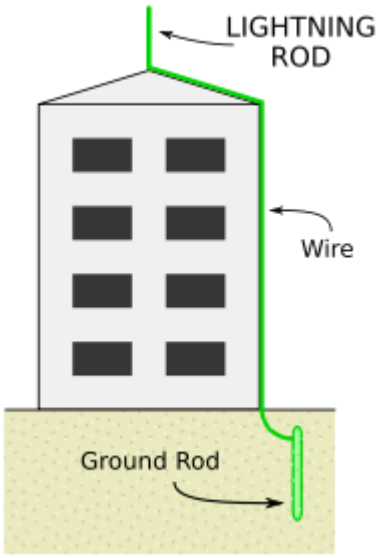
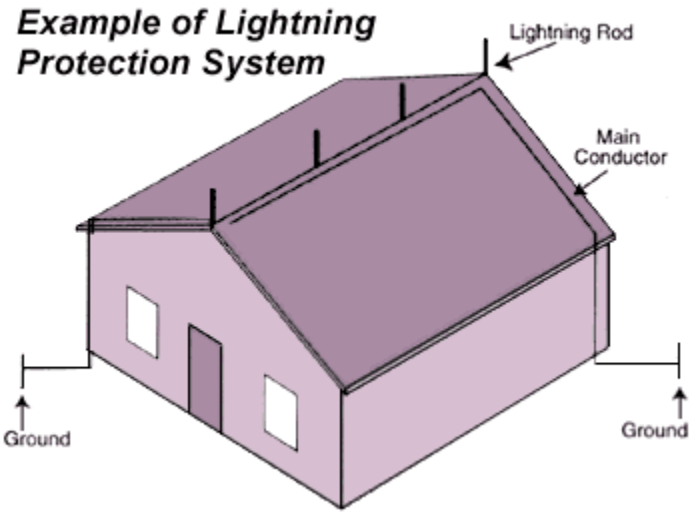
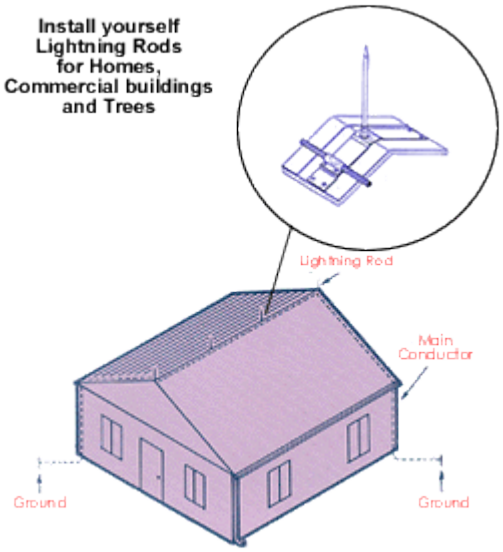
Sample Design Solutions to reduce the impact of weather-related hazards

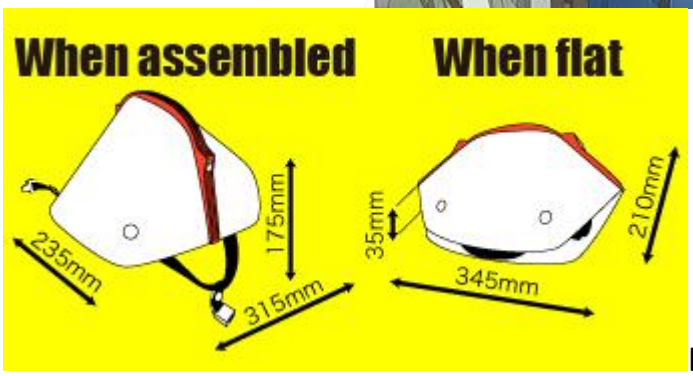
Lightning Rods for houses and buildings to prevent damage from lightning strikes.





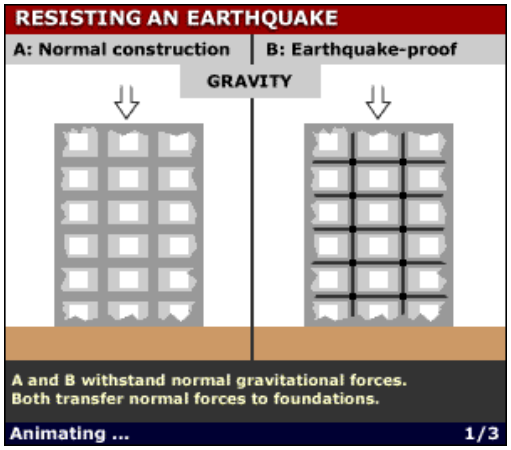


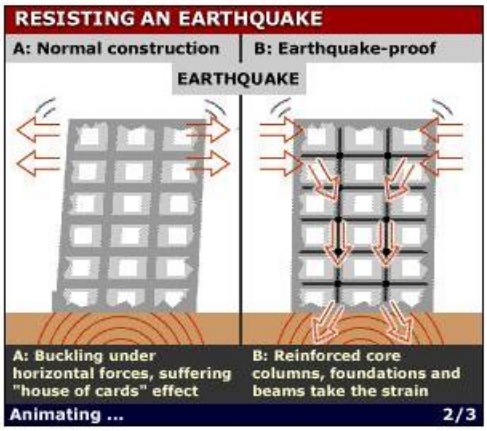
Helmets for protection from earthquakes and tornadoes

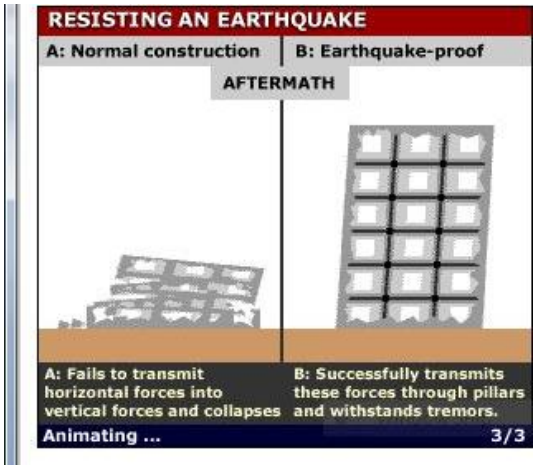


Earthquake Safety Helmets

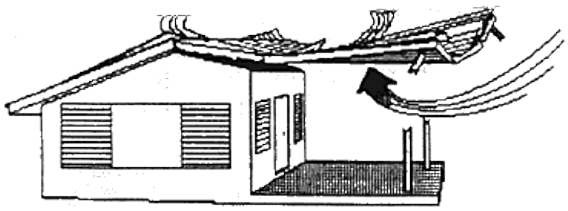
OSBE TORNADO

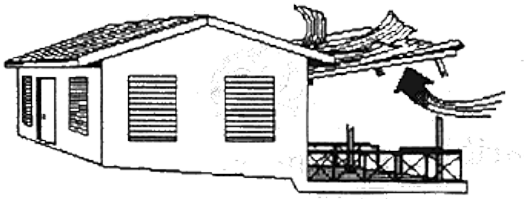






Reinforcing core columns, foundations, and beams in buildings to reduce damage from earthquakes

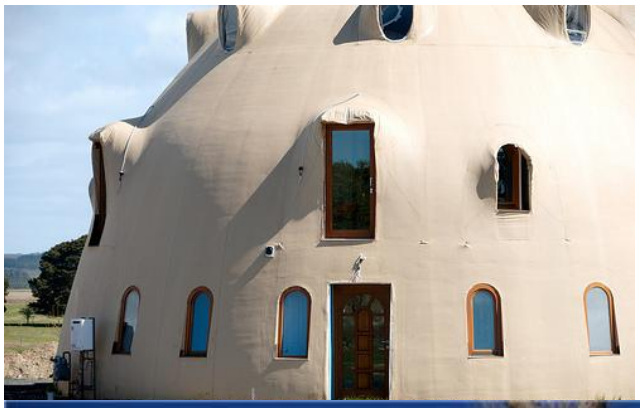




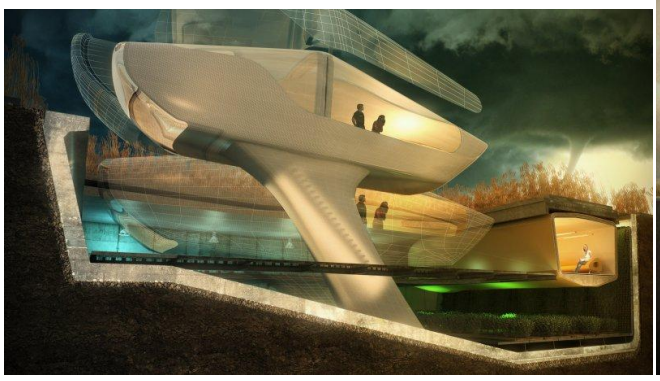
- Build verandahs and patios as **separate** structures rather than extensions of the main building.
- If they blow off, **the rest of the house** will not be damaged.

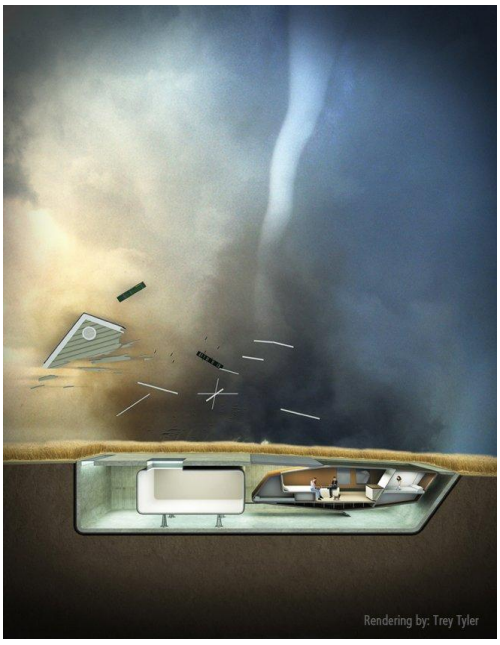
Will protect against:

- Earthquakes
- Hurricanes
- Tornadoes
- Fire Storms



Underground houses also protect against tornadoes





The original tornado-proof structure (seen here) had an irregular shape. The new design is a perfect square and sits flat on the ground. The house is lowered into the ground by a hydraulic arm.

Designs to reduce the impact of floods

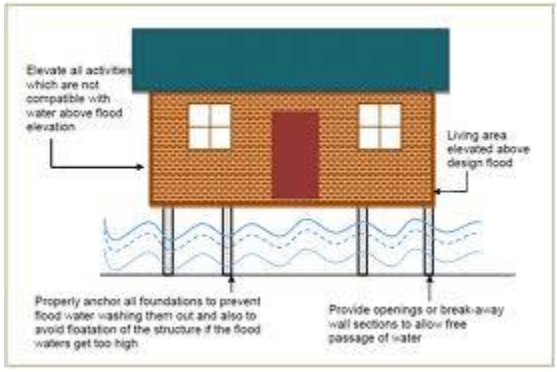


Figure 2: Wet proofing – measures to make the building more resilient to flooding

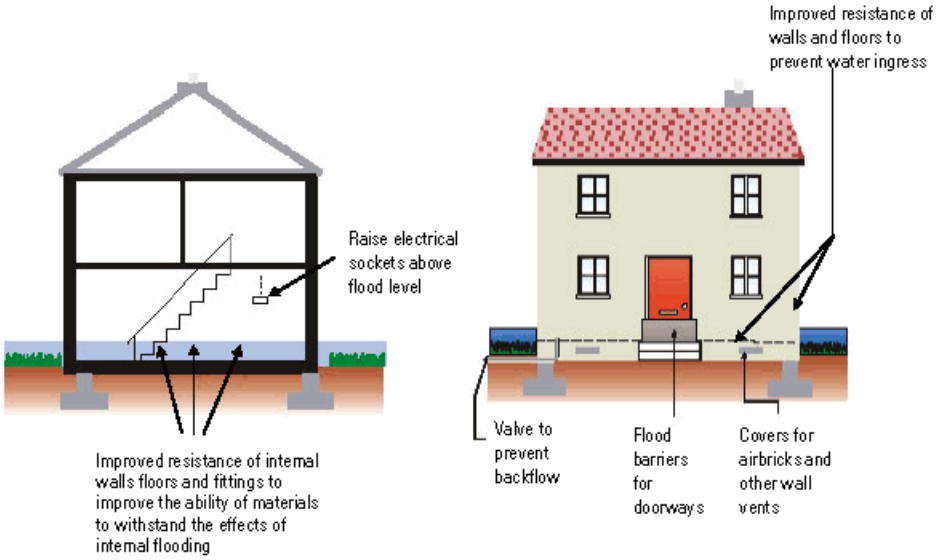
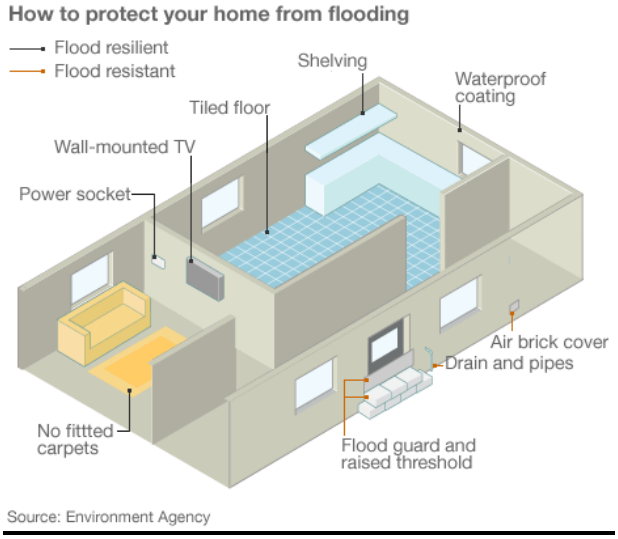


Figure 3: Dry proofing – measures to keep water out of building

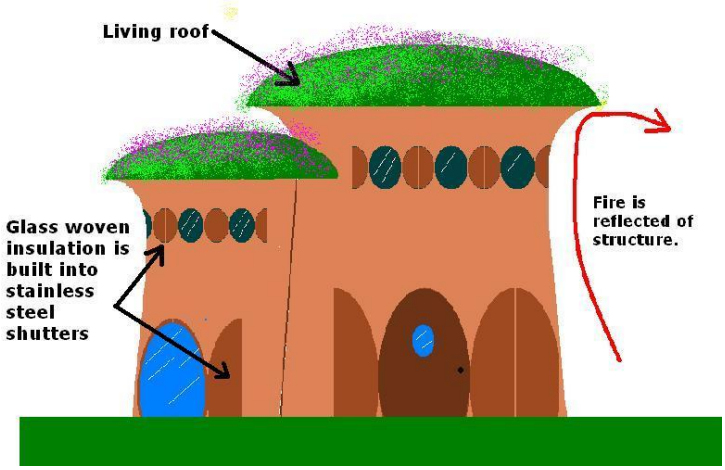


Source: Environment Agency

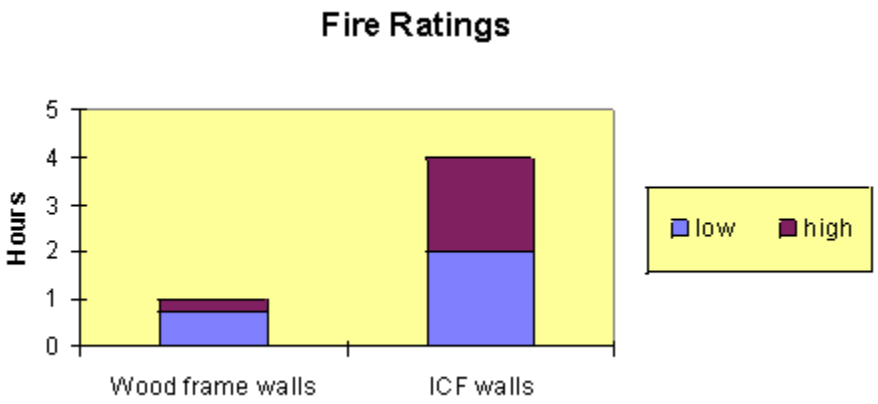
LIFTING HOUSES IS 100% FLOOD SOLUTION

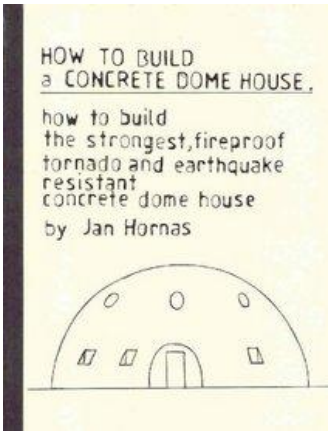
Using sand bags to prevent flooding

Fire-proofing by building with concrete and steel and innovative house designs



Insulated concrete forms combined with flame-resistant roofing and siding





Hurricane Proof HOMES

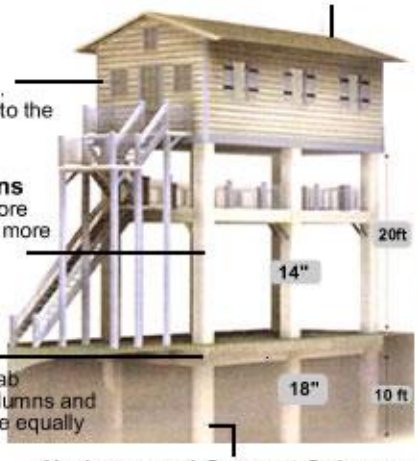
Audubon Village homes were built by Crown Team Texas

Roof
Secured to the house frame with metal straps, and shingles are attached with six inch nails

House Frame
every pieceof the wood is secured using metal straps. The entire structure is bolted to the concrete colums below

Concrete and Steel Columns
Reinforced concrete columns more than a foot square lift the house more than 25ft above the ground

Grade Beam
Reinforced concrete beams, 2ft thick and a 4inch concrete slab link the underground support columns and distribute the weight of the house equally



Underground Support Columns
Concrete and steel 18 inch support columns are 10ft into the ground

TEXASGULFCOASTONLINE

Hurricane Resistant Homes that withstood Hurricane IKE at its worst Gilchrist Texas

Anatomy of a High Wind & Hurricane Resistant Home

deltec HOMES
deltechomes.com
800.642.2508

All aspects of a Deltec home are ingeniously designed to work as a system, making it the smartest home you can build for high wind areas.

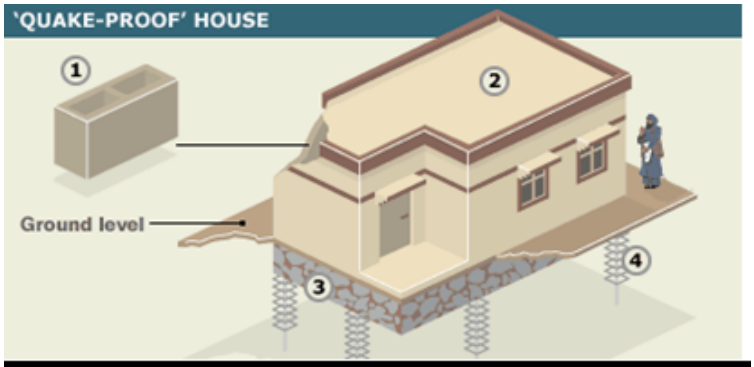
A. SHAPE
Aerodynamic circular building envelope works with nature, not against it
1. Wind can't build up enough pressure on any side to cause a structural failure
2. Reinforced clear span roof is at optimum pitch (6/12) for wind deflection and reduced lift
3. Circular structure transfers environmental loads most efficiently, with a high degree of redundancy providing extra resilience and performance during critical events

B. ENGINEERING
Creating a building envelope to resist high wind and provide safety to its occupants
4. Radial truss array in roof and floors work like spokes on a wheel
5. Potential energy from sustained winds is dispersed throughout the structure instead of building up in a single area

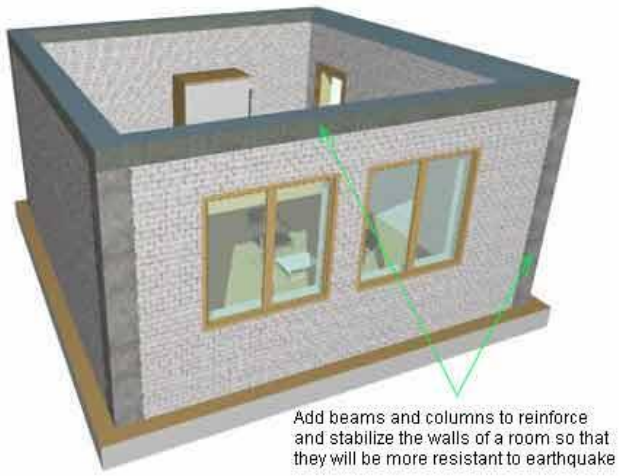
C. MATERIAL EXCELLENCE
Merging superior materials with a superior design results in a stronger and more durable structure
6. Machine rated 2400 psi framing lumber used in trusses and walls is twice as strong as typical framing material
7. Five Ply 5/8" plywood sheathing used instead of OSB on exterior walls, roof and floors strengthens the home and prevents flying debris from penetrating the structural envelope of the home
8. Reinforced windows with impact glass prevent wind and water from entering the home

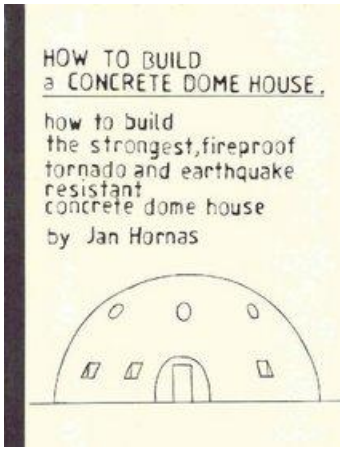
D. CONNECTIONS
Emphasis on maintaining continuous load paths and strong connections between the roof, exterior walls, floor systems and foundation
9. Oversized truss hangers keep roof system anchored to walls
10. Walls have multiple construction ties to the floor system for structural stability and to transfer shear forces
11. Continuous metal strapping from roof trusses to foundation helps maintain structural stability

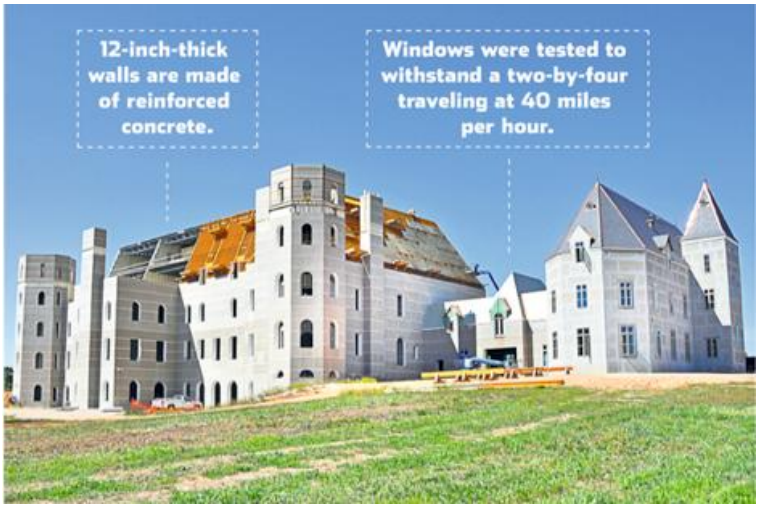
E. SUSTAINABILITY
Utilizing products and construction techniques that enhance livability in the event of a prolonged power outage
12. Solar water heater provides uninterrupted hot water
13. Enhanced insulation maintains a more balanced temperature inside the home
14. High wind rated reflective metal roofs helps reduce radiant heat gain in the home
15. Passive solar design helps heat and cool the building through appropriate shading and window placement



1. Hollow concrete brick designed to cause minimal damage
2. Reinforced cement concrete roof
3. Stone foundations made from rubble from destroyed houses
4. Reinforced steel corner pillars provide strength and flexibility




HOW TO BUILD
a CONCRETE DOME HOUSE.
how to build
the strongest, fireproof
tornado and earthquake
resistant
concrete dome house
by Jan Hornas


12-inch-thick walls are made of reinforced concrete.
Windows were tested to withstand a two-by-four traveling at 40 miles per hour.