

Low Cost, Deployable

GeoShelters

For Humanitarian, Disaster Relief And Commercial Operations



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Standard Model GeoShelter: Exterior View



*Fiberboard Model
With Standard Entry
(with and without
translucent plastic panels)*

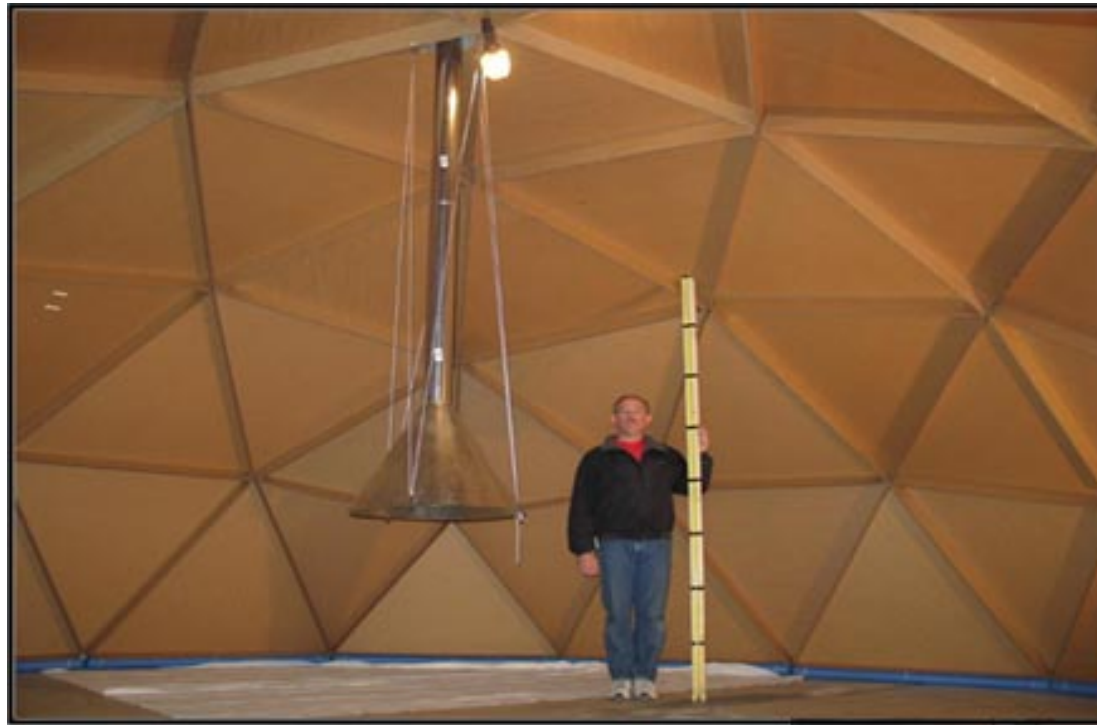


*Extruded Plastic Model
With Portal Entry (with
and without door)*



This shelter is the size of a two-car garage (452 sq. ft.), 20% the cost of an equivalent tent, with a lifespan of up to 5 years without maintenance.

Standard Model GeoShelter: Interior View



*Fiberboard Model
With Chimney*

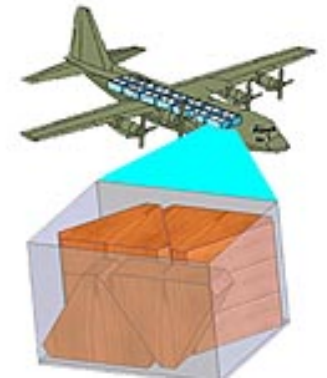
*Extruded Plastic Model
With Portal Entry*



GeoShelter can accommodate ten (45 sq. ft. each) to thirty (15 sq. ft. each) people.

Plastic GeoShelter: Key Features

- Standard Size:
 - 24 feet in diameter
 - 10 feet overall height
 - 452 square feet of floor space (size of a 2 car garage)
- Basic System (polypropylene plastic)
 - 6 millimeter white exterior shell
 - Three flapped openings and frames
 - 12" long stakes (45) and specialized rivets
 - Shipping box (8 on a C-130 463L pallet or 50 to 60 in a 40' shipping container)
- Properties:
 - Light weight
 - Hard exterior shell
 - Superior wind resistance
 - Interior stake down, no exterior ropes
 - No special skills or tools for assembly
 - Easy assembly or disassembly
 - Durable, resilient, long lasting
- Options:
 - Entry door and interconnecting portal, flooring, insulation, lighting, heating, skylights, ventilation.



6 mm standard size plastic models are tested, certified and ready for shipping today.

Other Key Features

Shell materials

- 6 millimeter polypropylene plastic
- 4 millimeter polypropylene plastic
- 6 millimeter water resistant fiberboard (in development)

Size

- **Standard:** 24 feet diameter (452 square feet floor area), 10 feet high
- **Pyramid:** 9.25 feet x 9.25 feet (87 square feet floor area), 7 feet high
- **Super** (in development): 40 feet diameter (1250 square feet floor area), 16.7 feet high

Weight

- **Standard:** 4mm plastic \approx 150 pounds, 6mm plastic \approx 300 pounds, 6mm fiberboard \approx 150 pounds
- **Pyramid:** \approx 70 pounds
- **Super :** \approx 600 pounds

Manufacturing Rates

- 6 mm plastic: 11,000 per month
- 4 mm plastic: 11,000 per month
- 6 mm fiberboard; 20,000 per week

Useful Life

- Plastic: 5 years without maintenance (life can be expanded by painting or other external applications like adobe)
- Fiberboard: 18 months (in testing)

Livability

- Standard model comfortably houses 6 people long-term and 20 short-term.

Assembly & Deployability

- Standard model: 3 hour assembly time by two people with standard tools
- Standard model 1 hour disassembly.
- Deployable: 60 in a shipping container

Safety Features

- Wind resistant (85 mph +)
- Fire, flame and smoke resistant
- No interior or exterior supports or ropes

Options

- Packages: floor, insulation, fireplace
- Entry portal with door or flap

6mm and 4mm standard model demonstration and test units are available.

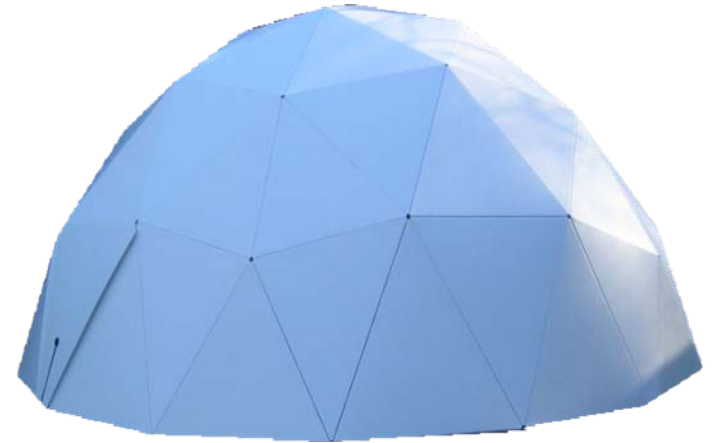
Wholesale Pricing



Fiberboard
(in development)
\$1495



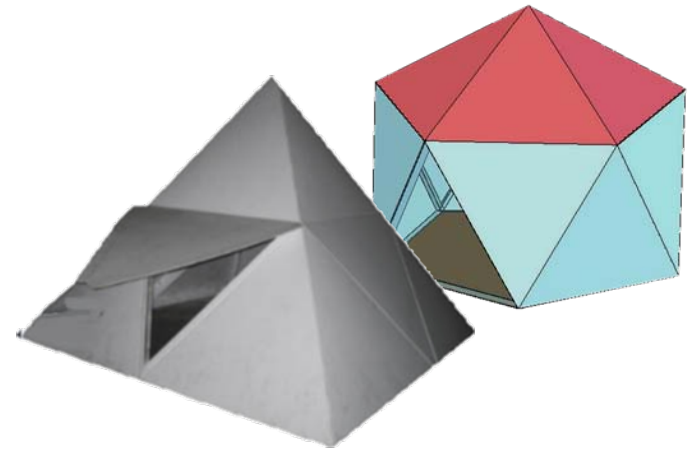
Extruded Plastic
4mm: **\$1995** *(not fully tested)*
6mm: **\$2995** *(tested & certified)*



Super Dome (6mm Plastic)
(in development)
≈\$6995

Options:

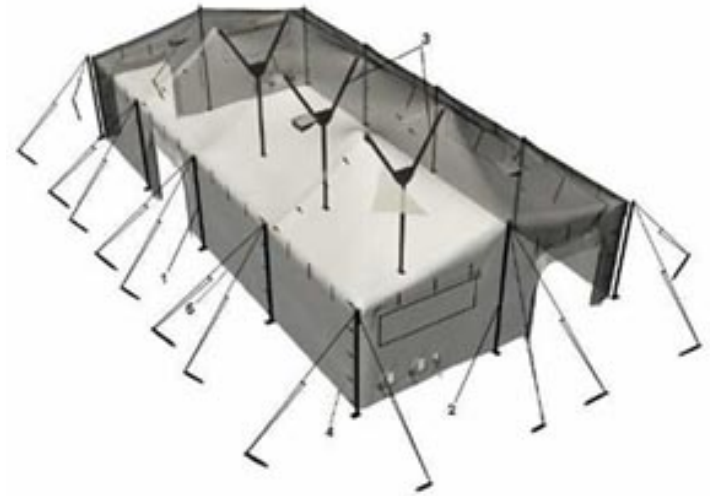
GeoShelter floor package	\$499
GeoShelter insulation package	\$399
GeoShelter fireplace package	\$249
GeoShelter vertical entry door	\$299
GeoShelter connecting or open entry portal	\$124
Pyramid floor package	\$149
Pyramid reusable bolt package	\$99
Pyramid insulation package	\$99



Pyramid/Pentahut
\$595 (6mm plastic)
\$150 (fiberboard)

GeoShelters Versus Tents

- Much lower cost
- Superior snow loads
- Superior wind resistance
- Superior insulation properties
- Superior air infiltration blockage
- Superior extended stay shelter
- No exterior ropes (safety)
- No exterior or interior bracing
- Immune to condensation
- No smell
- Lighter
- Warmer in the winter
- Faster production times-less stockpiles required
- Modern shape



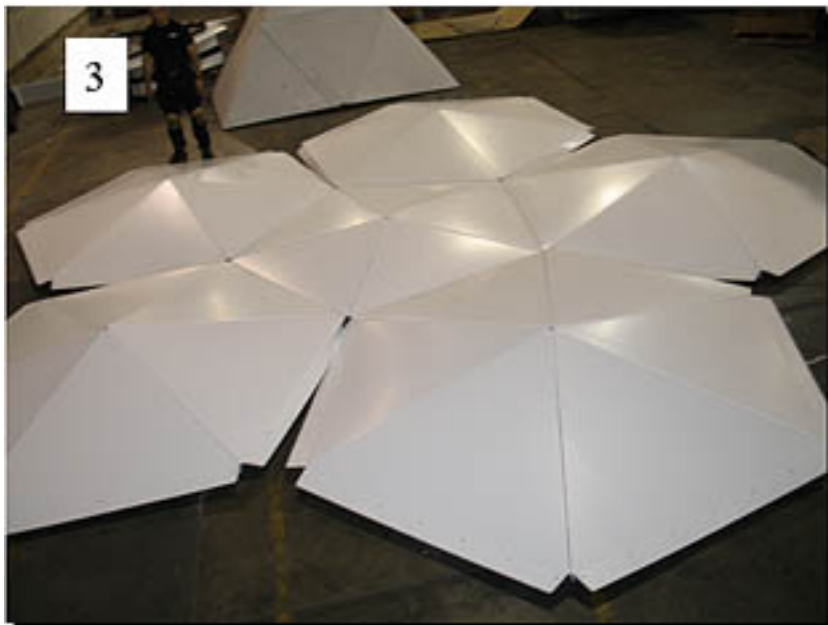
Tent Supports = Complex
Equivalent Tent Cost ≈ \$10,000 to \$15,000



GeoShelter Supports = None
GeoShelter Cost = \$1,495 to \$2,995

Plastic GeoShelters are lower cost, more durable and more attractive than tents.

Easy Assembly



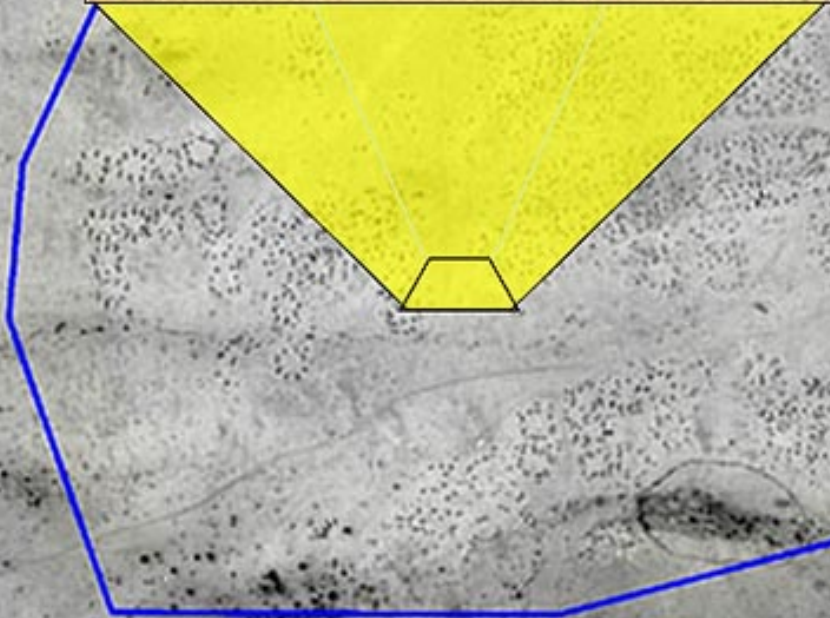
No special tools required. Several hours to assemble or disassemble.

Disaster Relief & Humanitarian Shelters

Most shelters are grass huts or thin plastic tarps draped over stick frames.



NGO AREA

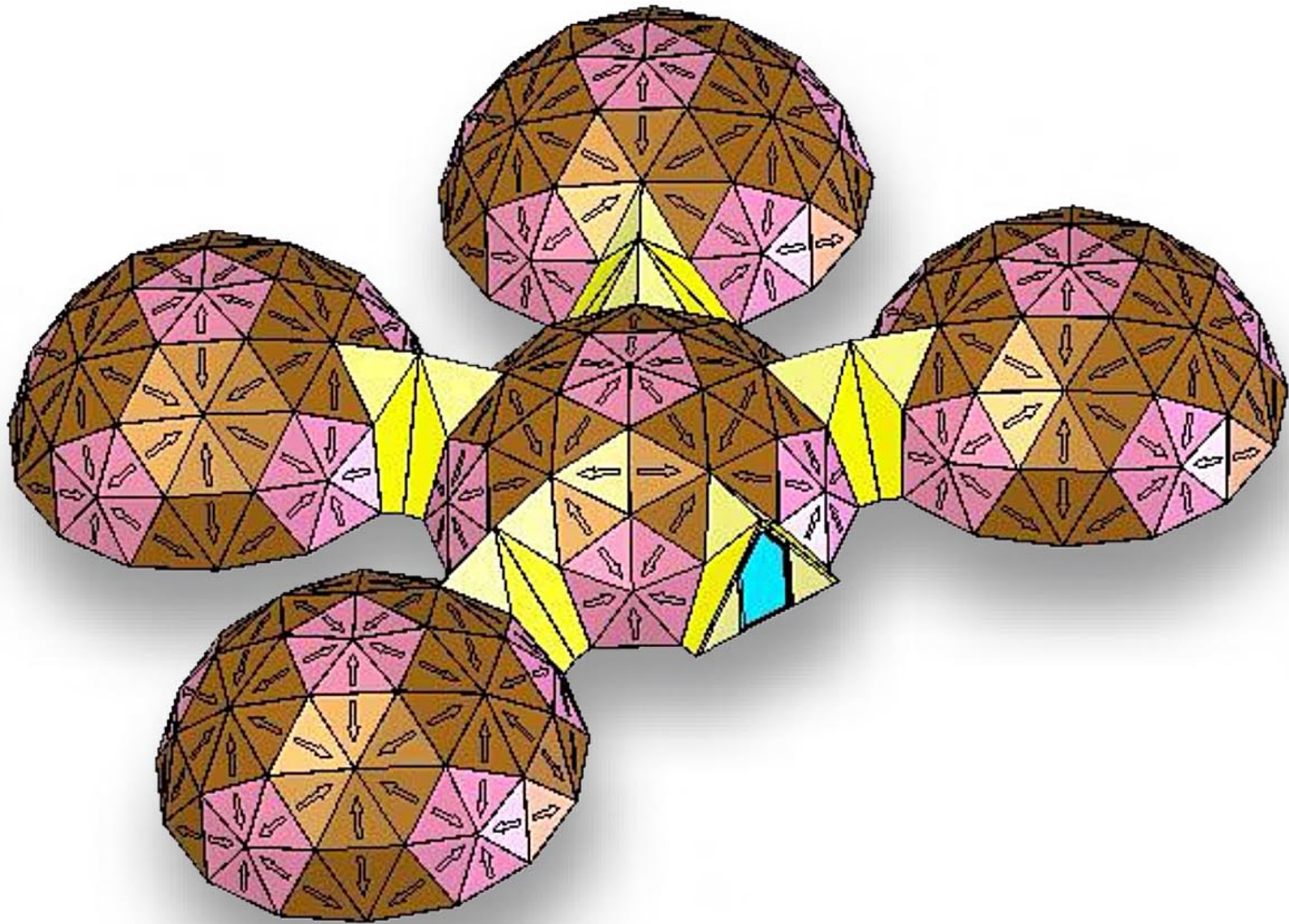


GeoShelter



Touloum Darfur Refugee Camp In Chad

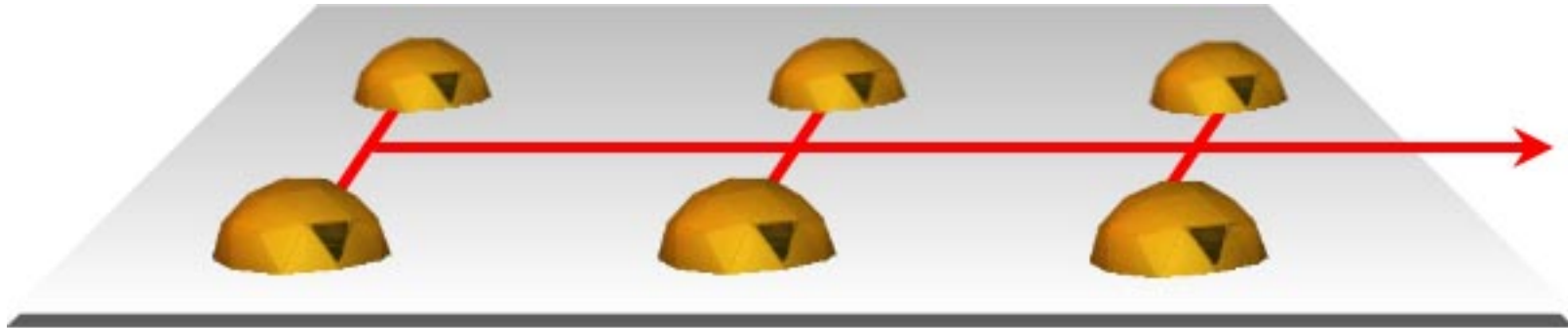
Five Dome Structure



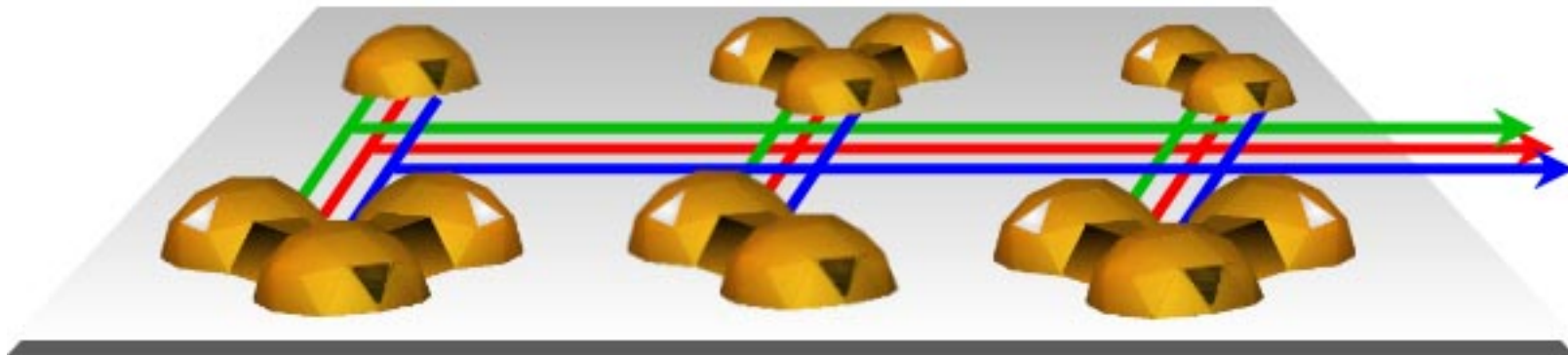
Five connected GeoShelters provide approximately 2300 square feet of living space.

Refugee GeoCity Concept

Phase I = Basic Shelters + Electricity



Phase II = Customized Shelters + Complete Utilities



- Shelters are modular and can be connected (a cluster of three provides 1350 square feet worth of living space).
- Shelters can be made semi-permanent by applying an adobe or gunnite overlay.

GeoShelters have a number of options to make the GeoShelter more livable over longer periods of time by creating a GeoCity with adequate utilities.

Commercial Applications

Greenhouses



6mm Polycarbonate
280 Square Feet
\$10,600 (typical retail)

Clear or Opaque Colors



6mm Polypropylene
452 Square Feet
\$2,995 (Wholesale)

GeoShelters have a wide range of commercial applications.

Military Applications & Hunting Lodges



- **Special order materials** of extruded colored Polypropylene plastic that can be color matched to clients needs such as camouflage or specialized printing.
- **Special order materials** of extruded Polypropylene plastic that can be IR adjusted to lower interior IR emissions or simulate IR (decoy) emissions for military applications.

GeoShelter can be manufactured in a wide range of colors: clear to camouflage.

Camping Models

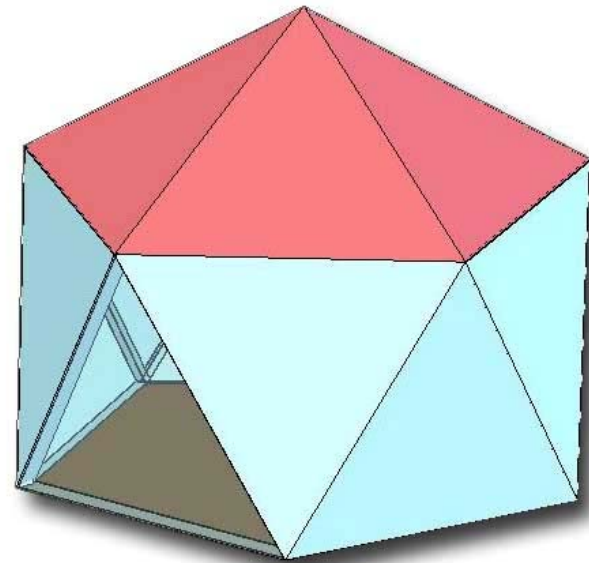
Pyramid Model

- Made from the same components as the standard GeoShelter
- Floor area is 87 sq. ft. (9'3"x9'3") and 6'7" in height
- Can accommodate 3 to 4 people with 30 minute set up times.
- Approximately 70 pounds in weight.



Pentahut Model (In Development)

- PentaHut that will meet the USAID requirements of 50 sq. foot per person.
- Floor area is 85 sq. ft and it is 7.5 ft tall at the peak.
- The edge between the roof and sidewalls is approximate 6' to the rim.



Camping models are ideal for short-term inexpensive activities or operations.

6mm Plastic GeoShelter Specifications & Certifications

6mm Plastic GeoShelter Parts List

Part Description	Part #	QTY	Part Description	Part #	QTY
GEO24100-3 (3 Flap Openings)			1D - DOOR KIT		
Staking Washer (6mm Plastic)	GEO24103-11	48	Staking Washer (6mm Plastic)	GEO24103-11	2
Door Flap (6mm Plastic)	GEO24105-11	3	Door Side-LH (6mm Plastic)	GEO24123-11	1
Pentagonal Panel (6mm Plastic) Small	GEO24106-11	30	Door Side-RH (6mm Plastic)	GEO24123-12	1
Hexagonal Panel (6mm Plastic) Big	GEO24107-11	42	Peak (6mm Plastic)	GEO24124-11	1
Door Frame (6mm Plastic)	GEO24108-11	3	Side Seal (6 mm Plastic)	GEO24125-11	2
Shipping Box (cardboard)	65"x 58"x 24"	1	Toe Plate (6 MM Plastic)	GEO24126-11	1
Tent Spike (3/8"dia x 3/4" head x12" lg)	12HGSPK	30	Door-LH (6mm Plastic)	GEO24127-11	1
Knob Male (Star 2.25"dia x 3/8-16 Stud)	59625K79	3	Shipping Box (cardboard)	???	1
Knob Female (2.25"dia x 3/8-16 internal)	59625K76	3	Tent Spike (3/8"dia x 3/4" head x12" lg)	12HGSPK	2
Cap Plugs	I - 1 5/16	31	Bolts (3/4" Long bolt) (Door/Vent Flaps)	32W37516075	7
2" Polyurethane Tape (120 yrd needed)	BT6160	3	Bolts (1/2" Short bolt)	32W37516050	87
			Tee Nuts (4 Prong Barrel Nut)	90975A031	94
3B Bolt Kit			Knob Male (Star 2.25"dia x 3/8-16 Stud)	59625K79	1
Bolts (3/4" Long bolt) (Door/Vent Flaps)	32W37516075	21	Knob Female (2.25"dia x 3/8-16 internal)	59625K76	1
Bolts (1/2" Short bolt)	32W37516050	759	1P - PORTAL KIT		
Tee Nuts (4 Prong Barrel Nut)	90975A031	780	Staking Washer (6mm Plastic)	GEO24103-11	2
			Portal Side-LH	GEO24120-11	1
3R Rivet Kit			Portal Side-RH	GEO24120-12	1
Ratchet Rivets (735 holes @ 2 per hole)	27QB7/16x.75	1770	Shipping Box (cardboard)	65"x 58"x 24"	1
			Tent Spike (3/8"dia x 3/4" head x12" lg)	12HGSPK	2

3 flap dome is the standard kit with portals and doors optional.

Specifications: Loads & Wind

- **Structural Test:** 30 Jun 07 on 24-foot diameter, 6 mm polypropylene GeoShelter
- **Snow loads:** ASCE 7-02 requires 10 pounds per square foot. Without any internal supports (such as poles), GeoShelter tested at 10.4 pounds per square foot. The failure mode of this structure was bifurcation buckling (shown) and was not catastrophic. The panels snapped back to original position with no damage.
- **Wind:** Nominal design 3-second gust wind speeds as specified in ASCE 7-02 for all areas of the United States is a minimum of 85 mph. For steady state winds, a 10.4 psf relates to 63 mph. Since actual wind loading is dynamic, it is likely the localized wind pressure will re-distribute to other areas of the dome before causing the bifurcation failure. With internal supports, wind resistance can be enhanced further.



GeoShelter should withstand hurricane category one (75-95 mph) force winds.

Specifications: Flame & Smoke Propagation

- **Flame Spread And Retardancy:** **Standard materials** of extruded Polypropylene plastic with additives that will meet Class B flame spread and retardancy requirements of NFPA 701 and ASTM-E662. **Special order materials** of extruded Polypropylene plastic with additives that will meet Class A flame spread and retardancy requirements of NFPA 701 and ASTM-E662.
 - **NFPA 701** is a vertical burn test designed to measure flame spread up a vertically-mounted sample.
 - **ASTM-E662** is a test to measure the amount of smoke given off by a burning material.

- **Flame Retardant:** 3 and 4 mm flame retardant sheet was tested according to ASTM E-84 to have a flame spread of < 25 and smoke developed index of < 450. Therefore, flame retardant sheet is classified as class A Interior Wall & Ceiling Finish according to National Fire Association Life Safety Code 101, Section 6-5.3.
 - **ASTM E-84** tests applies to products designed for use as building materials, and measures the surface flame spread on the substrate to be tested.

Class B certified GeoShelters are safer than many other shelters made of wood and similar materials. GeoShelters can be manufactured to Class A standards.

Actual Demolition Test

- In April 2007, an improperly secured 6mm 24-foot diameter, 6 mm polypropylene GeoShelter was uprooted by a “North Easter” with wind gusts exceeding 75 mph.
- The uprooted GeoShelter wrapped around a tree (shown) and was presumed destroyed.
- Three men pulled the GeoShelter from the tree and it snapped back with only minor damage to the vertical panels on entry portal. No visual damage was done to the dome panels.
- Engineering was accomplished on the ground staking requirements and improved stakes were engineered. For extreme or sandy soil conditions, an underground ground fastening system was devised.

Before



After (no major damage)

Geodesic structures are inherently strong and resilient without internal supports.

Ground Stakes

- **Standard Stake**

The standard stake is a 12" long x 3/8" diameter galvanized steel stake commonly used in concrete construction. Under the head is a 7/16" ID by 1-1/2" OD steel washer and a 4" plastic staking washer making up the assembly. There are 30 stakes used per dome, 2 per panel.

Standard Stake



High Wind Retainer Stake

- **High Wind Retainer Stake**

The Duckbill fastener model 40 is rated to 300# capacity in normal soils. It is driven in by using a special rod. The cable is then inserted thru a 4" plastic staking washer and a small steel washer. There are 30 per GeoShelter in place of the stakes for a total retaining force of 9000# in normal soil.

(http://www.allmetalssupply.com/earth_anchors.htm)



Proper staking is essential to GeoShelter stability especially in windy environments.