

## Emergency Relief Tent for WorldWide Shelters

### Design Parameters

- 150 Sq Ft shelter capable of withstanding 50mph winds.
- No metallic structural elements to prevent pilferage.
- \$500 US or less total delivered cost.
- Air drop-able.
- Set-up simple enough for anyone with minimal visual instructions.

### Solutions

- Geodesic Dome tent for inherent strength.
- Pultruded fiberglass struts for strength, durability and cost savings.
- Patent pending hub design allows the use of single strut length throughout the tent.
- Hubs are pre-attached to tent body, and the 31 identical struts snap into the hubs until the tent is fully erected making it virtually impossible to assemble the tent incorrectly. Oh, and did I mention it sets up in 20 minutes with 2 people.

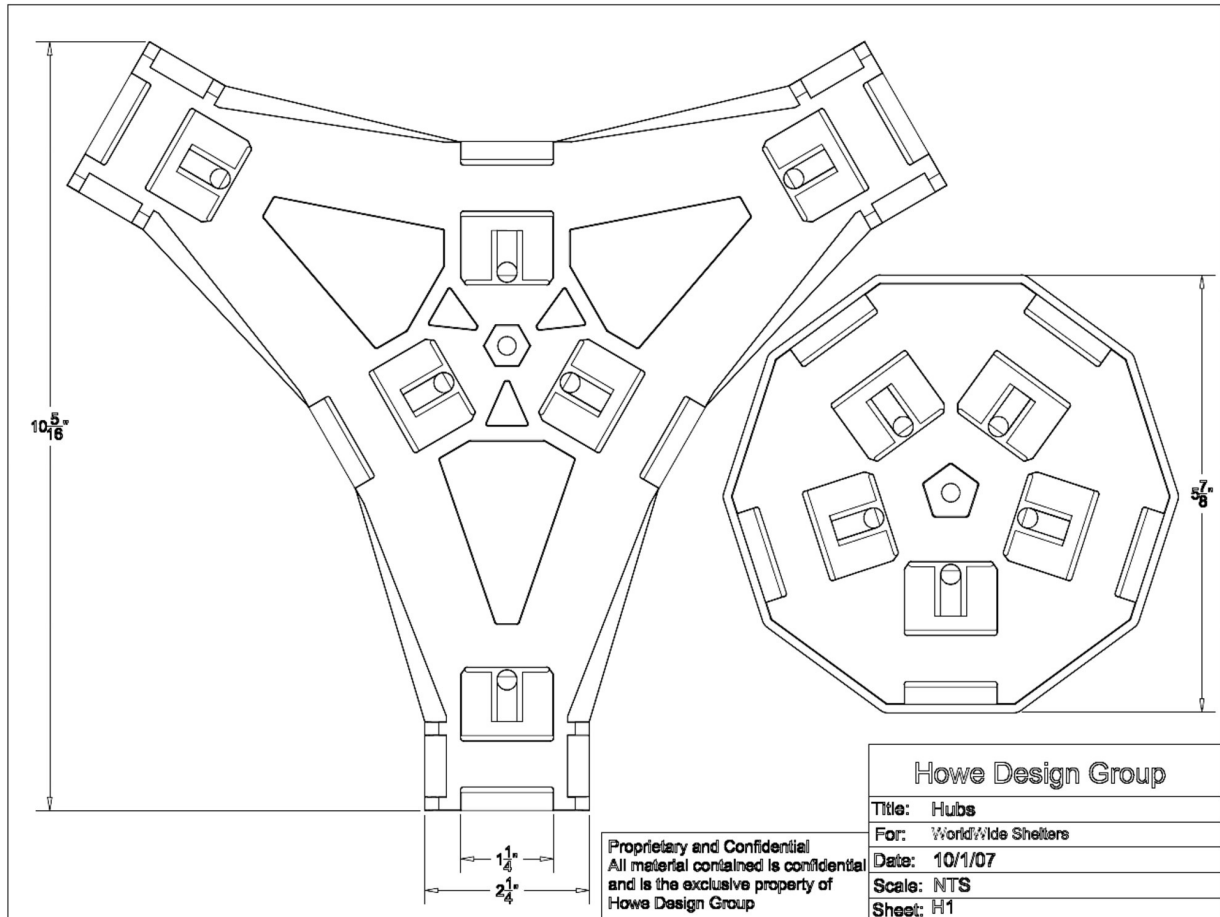


Inner Tent

# Hubs

Patent pending

Injection molding of the hubs was chosen for ease of manufacture and the ability to incorporate additional functions such as snap in retainers for struts. The mold is a simple straight-pull mold for speed, simplicity and cost of production.



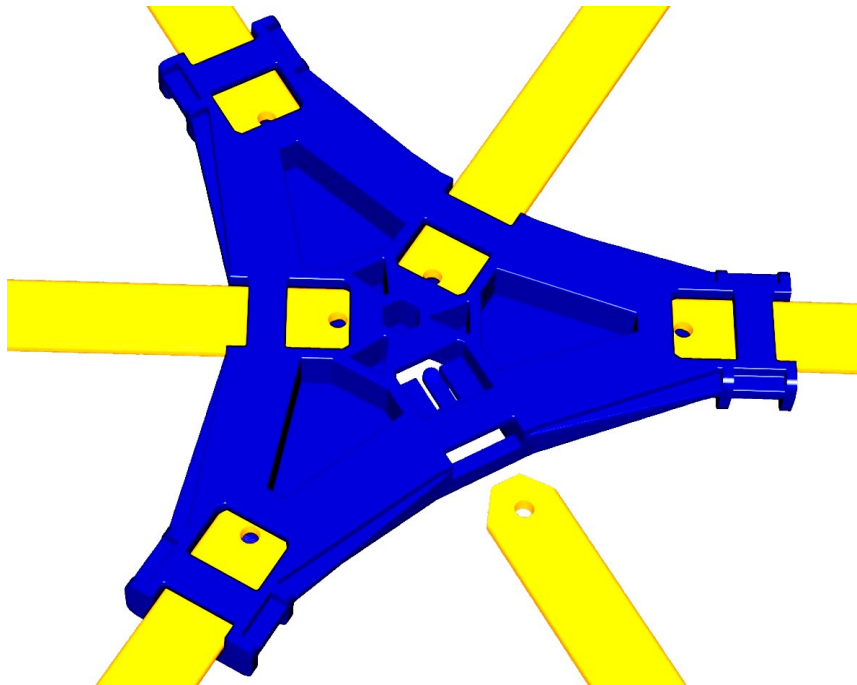
## Design Drawing

The main tri-lobal hubs are offset from the center for three of the six strut attachment points in order to compensate for the differing lengths required by the underlying Geodesic geometry. The resulting geometry allows for the use of a single length of strut so as to radically simplify set up. You simply insert struts until the tent is up.

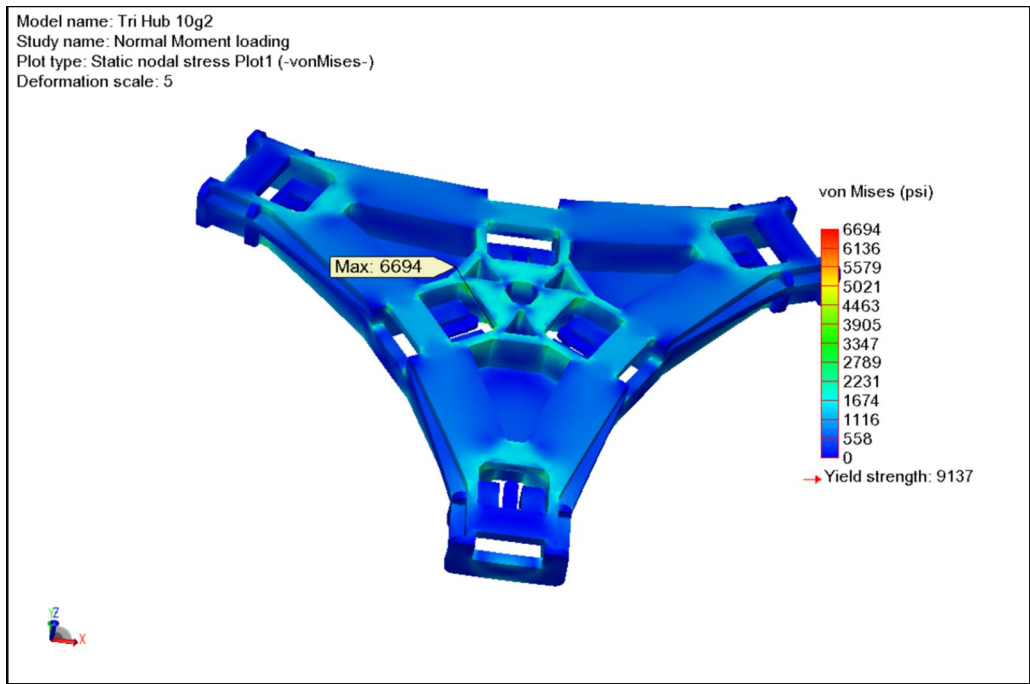
Hubs were initially modeled using AutoCAD and AutoSolids software. They were then exported to Solid Works Cosmos stress analysis software for testing by CFA Design. The resulting modifications were then incorporated into final solid models, and prototypes molded for further testing. The resulting hubs are incredibly strong and perform flawlessly in a broad range of conditions.

Hubs

Patent pending



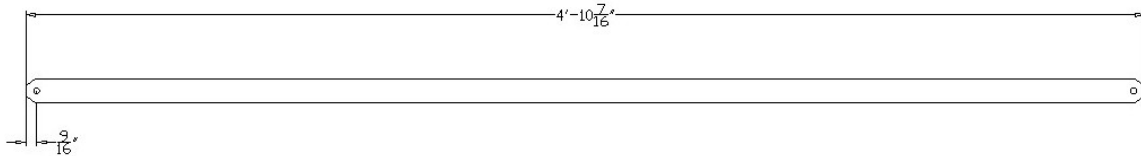
AutoCAD Solid Model



Cosmos Stress Analysis

## Struts

The struts are fiberglass pultrusions that are extruded with the glass fibers under tension to create a pre-tensioned structural component of extreme strength and durability while avoiding the temptation to pilfer associated with aluminum poles. The post-extrusion processing is simply cutting to length and drilling the retaining hole at each end.



Strut

## Tent



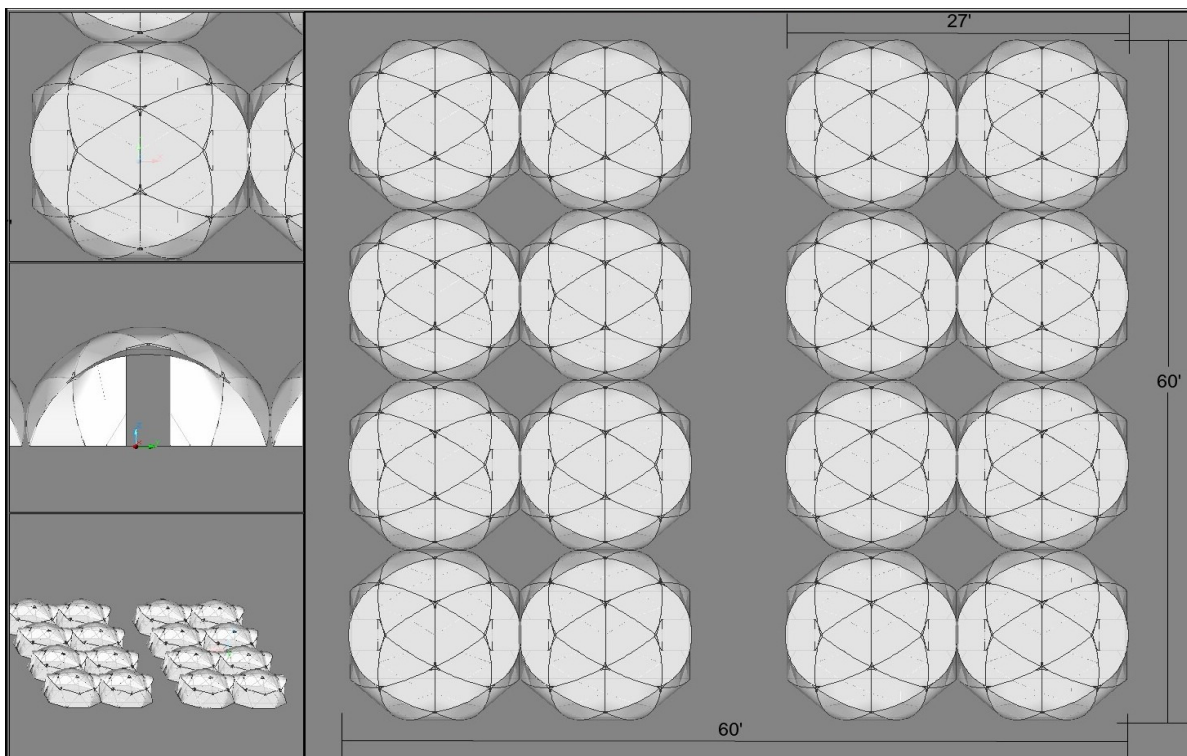
Tent with Flysheet

The tent is a 2-layer construction with the inner tent made from breathable polyester and the outer layer from waterproof polyester. The polyester is resistant to rot and UV thereby extending both the storage life and the field life of the tent. The double layer also adds to the strength of the structure as the inner tent forms a chord across the base of each strut while the outer flysheet spreads the loading uniformly over the length of the struts.

## Tent

Geodesic geometry was chosen for several reasons including the inherent strength from triangulating the surface of a sphere into approximately equilateral triangles. The resulting dome shape is also extremely efficient as a portable enclosure because a sphere has the least surface area per enclosed volume of any geometry, and therefore the lowest weight. Also, due to this efficiency of surface area to volume a dome shaped tent is the best for heat retention.

Structurally the geodesic geometry is also optimal as the regularity of its structure distributes loads applied from any direction with equal strength. This is true whether considering variable direction wind loads or vertical snow loads.



Concept Drawing (showing clustering)

The freestanding nature of geodesic tents obviates the need for the guylines that typically clutter the area around a standard tent. This allows for an efficient use of the space around a Geodesic tent and permits close clustering of tents in areas where flat space is limited. Also unlike conventional tents anchoring is not critical for the stability of the tent, and is really only necessary to prevent the tent blowing away.

## Specifications

Floor area – 14.3m sq (154 sq ft)  
Width – 4.01m (13 ft 2 in)  
Length – 4.19m (13 ft 9 in)  
Height – 2.1m (6 ft 10 in)  
Weight – 38.6kg (85 lb)  
Package – 152cm x 22cm x 22cm  
(60 in x 10 in x 10 in)



## Collaborators

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