

## Building a 28mm Quonset Hut

By Binhan Lin

### Introduction and History

During WWI there was a demand for portable, sturdy structures for storage, barracks, medical and other facilities that could not be sheltered by tents. British Major Peter Norman Nissen began to experiment with various designs that utilized pre-made wooden frames and simple corrugated metal sheets to form a shelter. Inspired by the cylindrical drill-shed roof at Queen's University in Kingston Ontario, the basic shape of the Nissen hut was born. After much experimentation and critical assessment, Nissen patented his design in 1916 and the hut was put into production for the war. More than 100,000 were produced for Allied use.

The basic design of the Nissen hut is a set of semi-circular ribs, spaced 6 feet apart. The ribs form an arc with an eight-foot radius. Over the ribs and stringers are placed curved corrugated metal sheets, 2 feet 2 inches wide and ten feet tall. The sheets are overlapped sideways 2 corrugations, or about 2 inches and overlapped vertically about 6 inches, with the top piece covering the top of each of the sidepieces.

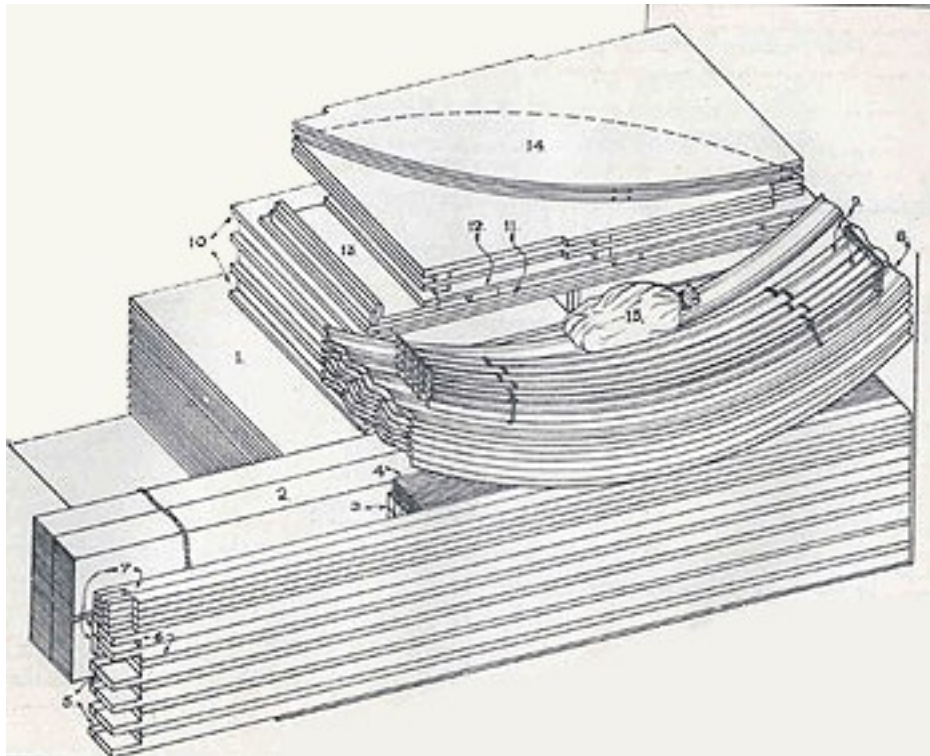
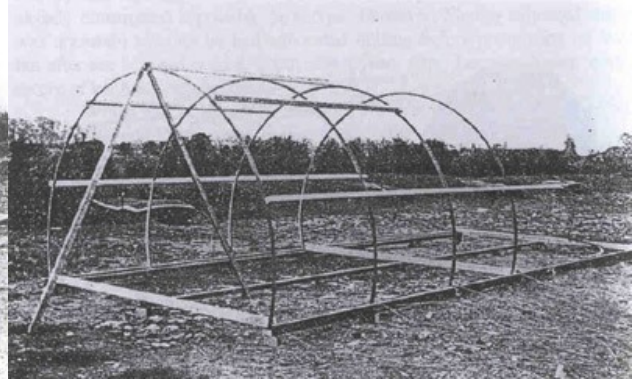
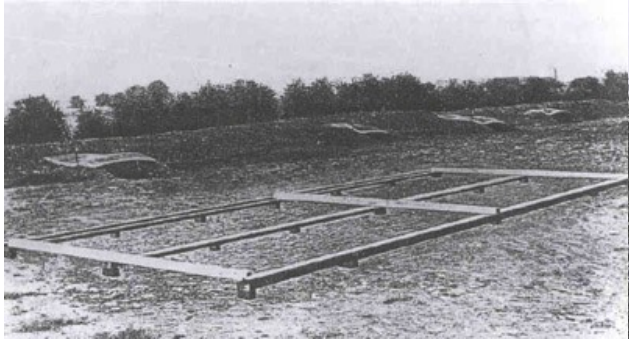
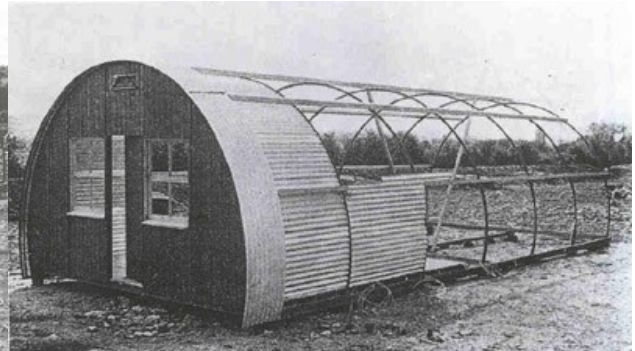


Figure 1. Diagram showing the compact packing of all the materials for a Nissen Hut. (Image from Nissens.co.uk)



Figures 2 and 3. Wooden bearers are laid on the ground and the steel ribs are set up. (Images from Nissens.co.uk)



Figures 4 and 5. Wooden flooring is installed, the inner corrugated lining (horizontal) added, then the end piece and outer corrugated skin (vertical) applied. (Images from Nissens.co.uk)

The Nissen hut was compact to transport and relatively simple to set up. Due to the modular nature of the building, construction of the parts was easily setup to be mass-produced.

By World War II, a US licensed a version of the Nissen hut, initially built at Quonset Point by the Davisville Naval Construction Battalion Center in Rhode Island, was being produced. Called the "Quonset Hut" the initial designs were nearly identical to the British Nissen Hut. The initial design was walled the T-Rib Quonset hut and differed from the British version in that the interior walls were made from Masonite® instead of corrugated metal. The remaining dimensions of 16' width and 20' or 36' length were retained. By 1941, approximately 8,200 had been produced.



Figures 6 and 7. Original T-rib Quonset and Redesigned Quonset Huts. (National Archives -RG 80-G-7443 and RG 342-FH-3b47102)

One major defect of the design was that the curved walls reduced the usable floor space as the area near the walls had a low headspace. To increase the usable area, the design was modified, by adding 4-foot vertical walls. In addition, the design of the frames was altered so that fewer pieces were needed for each support. The supports had only 2 sections instead of 3 and were changed in cross section shape from the previous "T" to an "I". The changes resulted in a reduction in weight of 35% and a cost reduction of 65% to produce. Approximately 25,000 were made.

In 1943, due to production demands, manufacturing was moved from Quonset Point to the Stran-Steel Division of the Great Lakes Steel Corporation. To simplify manufacturing, major changes were made in the design. The design reverted back to the semi-cylindrical shape of the original design and the footprint of the building was expanded to 20' wide and 48' long. Despite the increased size, changes in the design such as use of  $\frac{1}{2}$ " plywood instead of 1" wood boards for the floor and thinner metal for the siding produced a product that was even lighter and more compact for shipping. Other changes that decreased the shipping size was limiting the curved siding to only the roof sheets, with the side panels now being installed horizontally, which meant that they could be manufactured and installed flat. Over 120,000 Stran-Steel Quonset huts were produced in WWII.



Figure 8. Stran-Steel Quonset Huts. (National Archives, *RG 80-G-347017*)

### Model Design

This article will focus on building the Stran-Steel version of the Quonset Hut, although using these techniques, the earlier models of the Quonset or even the Nissen Hut could be made.

The Stran-Steel design is 20' wide, 40' long and 10' high. The cross section is a semi-circular arc with a radius of 10' feet. Since we are making a 28mm model, and assuming a 28mm scale equals 6 feet, the 20' x 40' base will scale down to 93mm x 187 mm (3.67" x 7.35"). Using basic geometry for arc length of half a circle ( $\pi * \text{radius}$  or  $3.14 * 10$  feet) the arc length is 31.4 feet. In scale, this equals 146 mm (5.77").

The foundation will then be a rectangle 93mm x 187mm in size, the curved top piece will be 146mm x 187mm and the two end pieces will be semi-circles with a radius of 46.5mm.

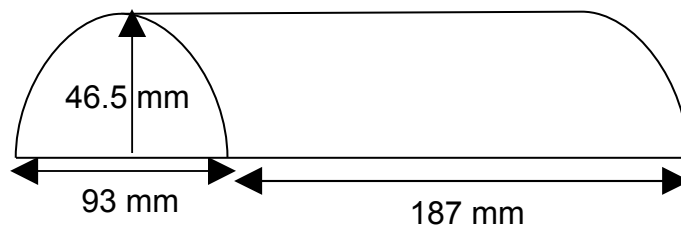


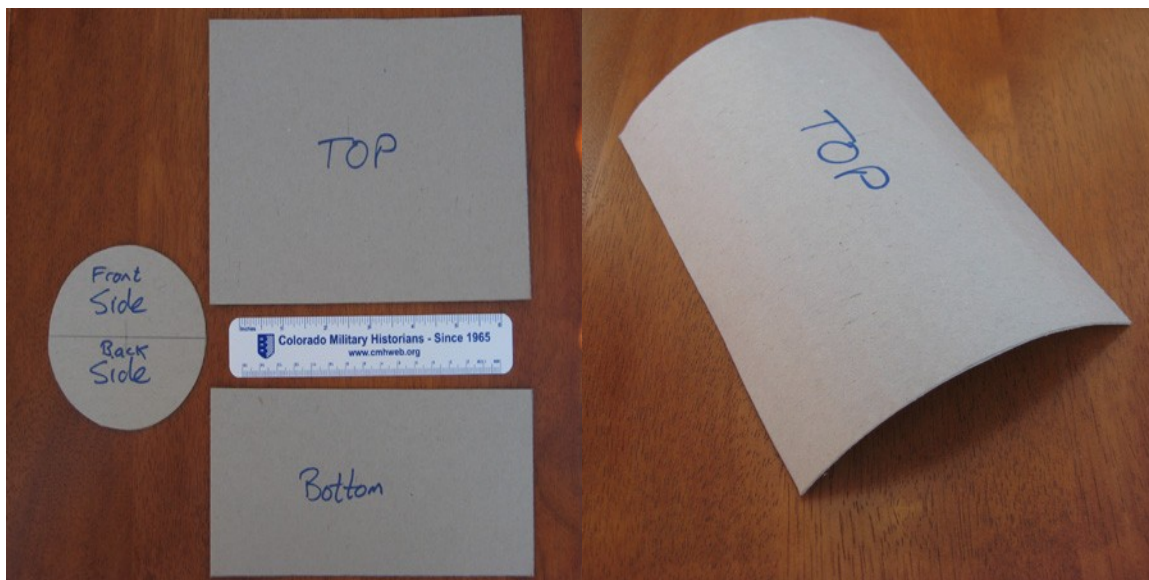
Figure 9. Dimensions of the model.

If you don't need to follow the specifications of an actual Quonset hut, then you can use any handy circular object to draw the ends of the hut – a coffee mug, tin can, package lid etc. and adjust the length and width to match. Alternatively use any handy half cylinder such as a cardboard tube cut in half to form the top of your hut.

### Materials and Model Construction

The primary materials for this project will be paper or cardboard of various types and glue to attach them. The foundation is made from thin cardboard or poster board, while the corrugated skinning is made from thin corrugated cardboard, commonly found as coffee cup holders from your local coffee shop. White or PVA glue is suitable as an adhesive, but I prefer using wood glue. My preference derives from two properties – wood glue provides a stronger bond, and second, wood glue is generally thicker and contains less water than most PVA or white glues which leads to less warping and wrinkling of paper products.

The foundation pieces are cut from thin cardboard; the end pieces are cut by using a compass to draw a full circle and then cutting the circle in half.

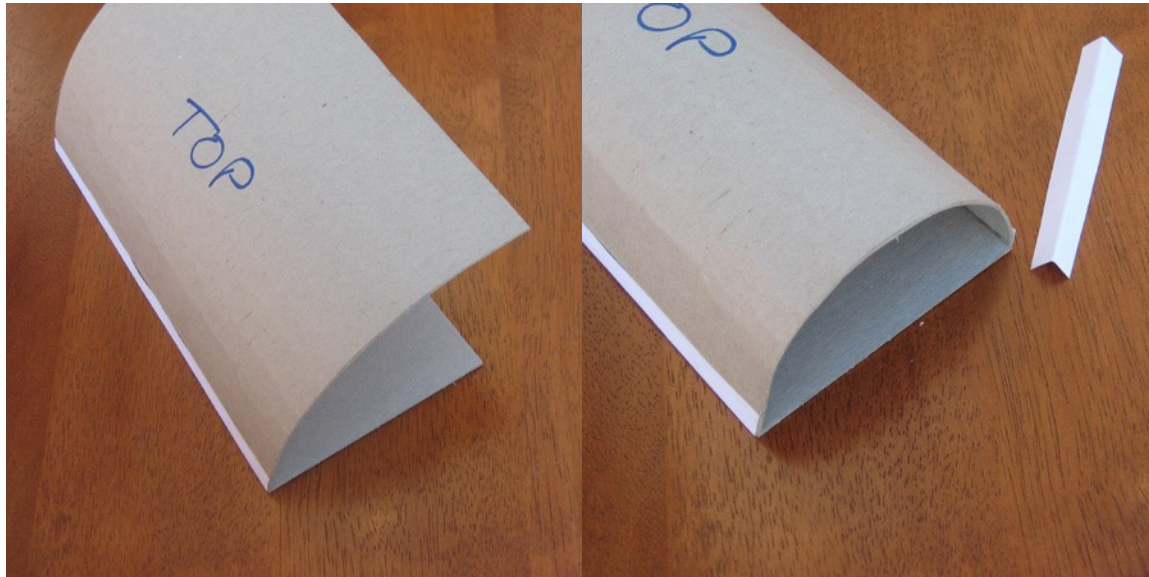


Figures 10 and 11. Foundation pieces cut from thin cardboard and the top piece after curving.

The top piece is curved by breaking down the cardboard by running it across a rounded edge of a table or countertop. Avoid using too sharp a corner as this might crease the cardboard. The top piece does not have to have the full semi-circle shape at this point, but take extra care to soften the areas that will become the bottom edges as these will need to flex more to take the proper shape when attached.

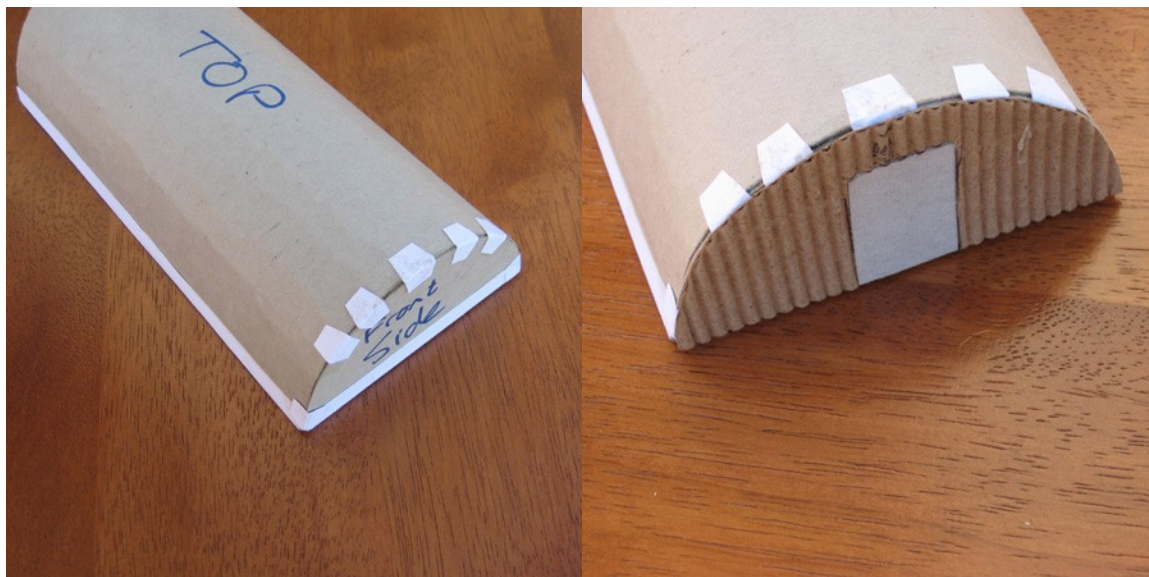
The top curved piece is then glued to the bottom piece using a strip of paper or light cardstock pre-creased into an angle (a sharp crease can be created by using a thin metal ruler to bend against). Attach one side of the top to the bottom and allow it to dry. For the second side, attach the paper strip to the bottom piece first and allow it to dry,

and then attach the top piece. If you do not allow the strip to dry on the bottom piece, it may slip out due to the outward pressure of attaching the top piece.



Figures 12 and 13. Attaching the curved top piece to the bottom piece.

After the top and bottom pieces are securely glued together, fit the end pieces on. This may take extra shaping of the ends of building to get the top to match the ends. Once the proper shape is achieved, attach the ends using strips of angled paper, short pieces around the curved portion.

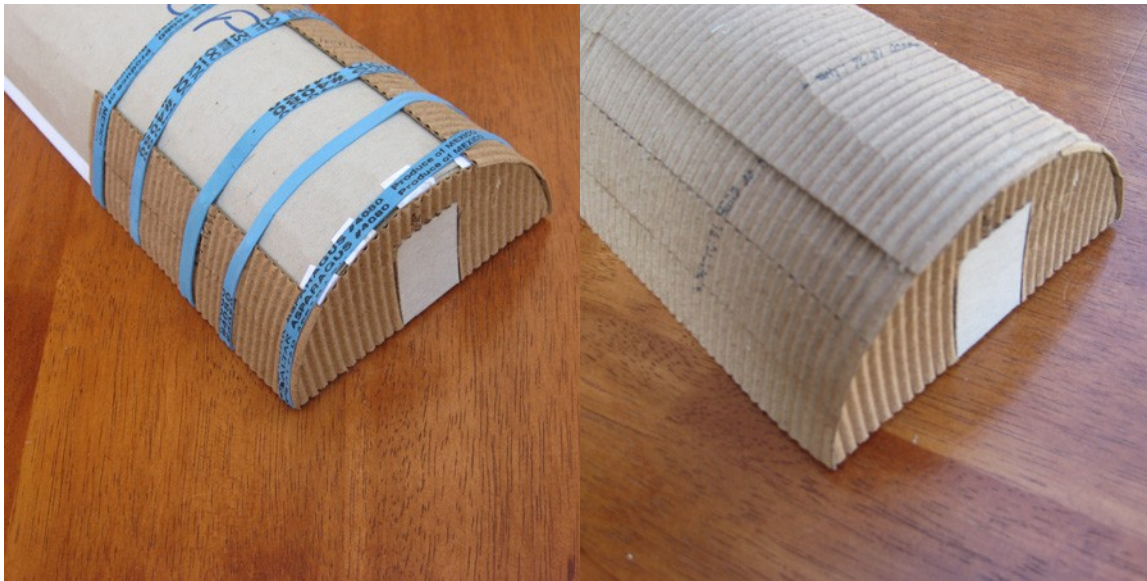


Figures 14 and 15. Attaching the ends of the foundation, corrugation and door.

After the foundation has dried, the outer skinning is applied. The corrugations should be vertical for all the pieces. The skinning can be added either in horizontal strips in the Stran-steel design or the tall vertical strips of the previous designs. Details such as

doors or windows can be added before the skinning and the skinning applied around them.

The skinning should be applied to the ends first, and then over the top. The top layer should slightly overlap the lower sections. I spaced the roof to overlap the ends by about one corrugation. Broad rubber bands can be used to hold the layers down while they dry. Do not use rubber bands that are too tight as they may crush the corrugations.



Figures 16 and 17. Application of the corrugations over the side and completed application of corrugations.

After all the skinning is applied, the Quonset hut is painted with a base color. Since most huts were made from galvanized steel, I used an aluminum color spray paint to provide the base color. The hut was then weathered using a rust/brown wash of Future/acrylic paint to dirty/rust it up slightly and then dry brushed with a dull aluminum color.

The door was detailed with additional strips of cardboard and painted to appear to be a metal paneled door. A handle was made from a short piece of steel wire bent into shape and glued into the door. The door and handle were weathered in a similar manner to the rest of the hut.

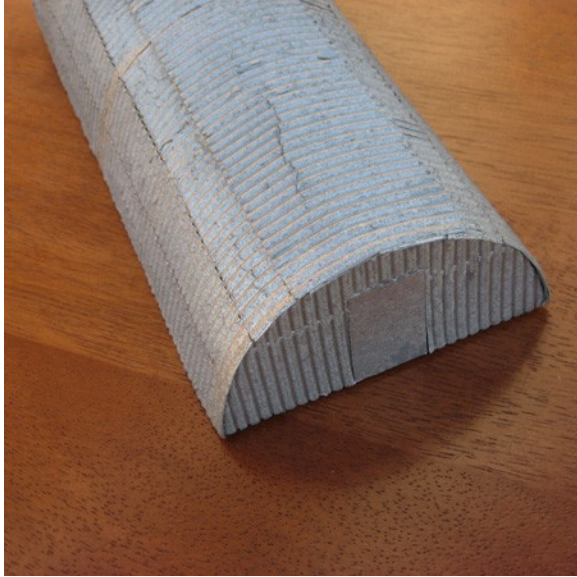
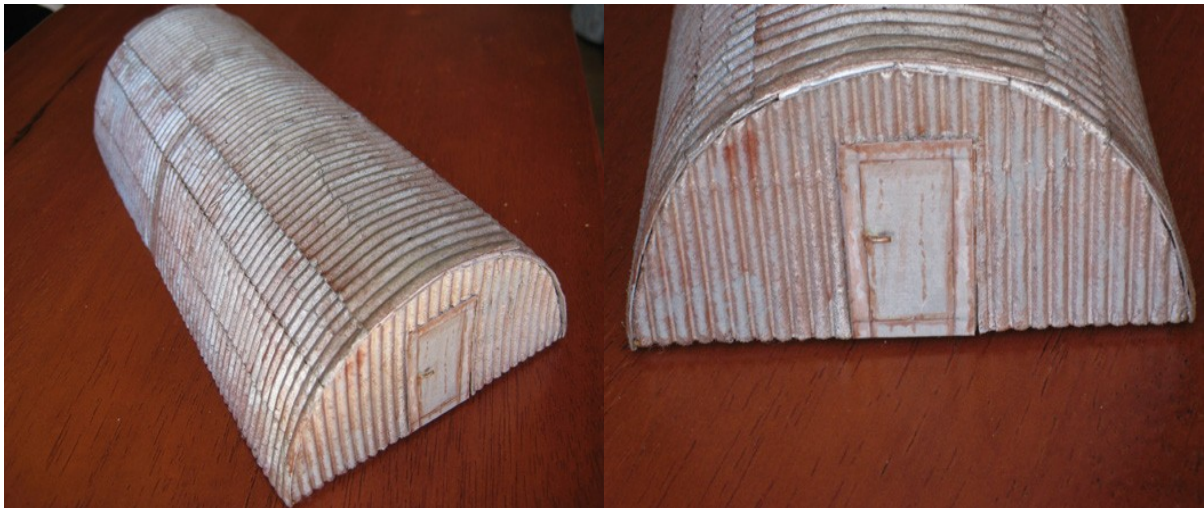


Figure 18. Quonset hut base painted with aluminum color.



Figures 19 and 20. Completed Quonset model after weathering and door detail.

## References

[www.quonsethuts.org](http://www.quonsethuts.org)

[www.nissens.co.uk](http://www.nissens.co.uk)