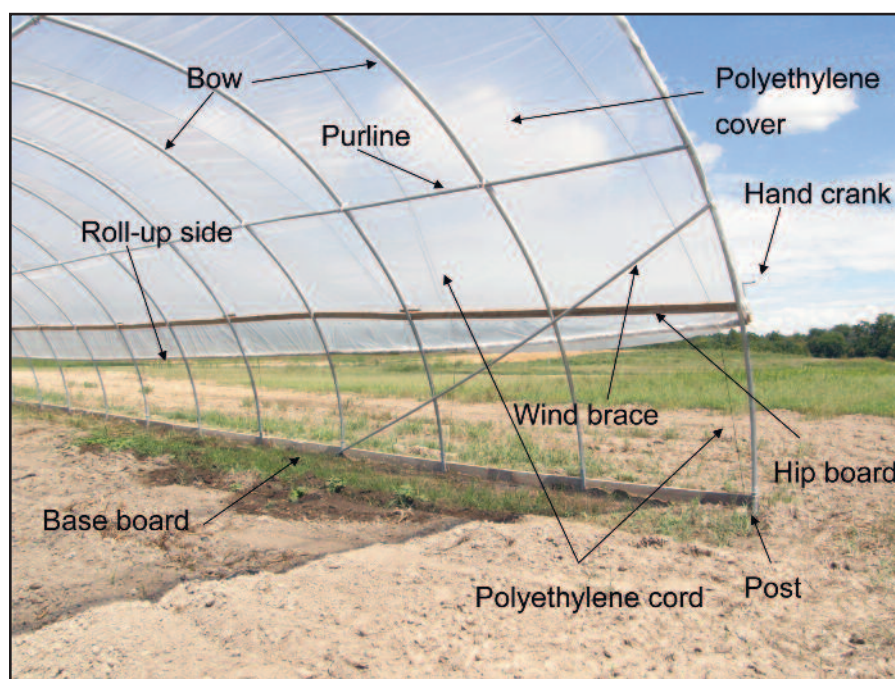


# Metal Quonset High Tunnel Construction Costs

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High tunnels are becoming increasingly popular in the United States among fruit, vegetable, and cut-flower growers as a low-cost method to protect crops and extend the growing season. High tunnels are known by other names such as hoop-houses, Quonset™-style houses, and unheated greenhouses.

This publication focuses on cost issues related to the construction of a high tunnel using metal hoops (chain-link tubing). See the references list for several excellent fact sheets that outline cost and construction methods for building a high tunnel using PVC hoops. Pennsylvania State University offers a high tunnel manual at <http://plasticulture.psu.edu/node/115>.



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Regardless of the type you choose (single- or multi-bay, Quonset or with straight side walls), there are a number of advantages and disadvantages of using high tunnels. Advantages frequently cited include these:

- extended spring and fall growing seasons
- wind and rain protection
- potential for reduced disease problems on certain crops
- potential for higher market value of crops
- potential for higher-quality harvested crops

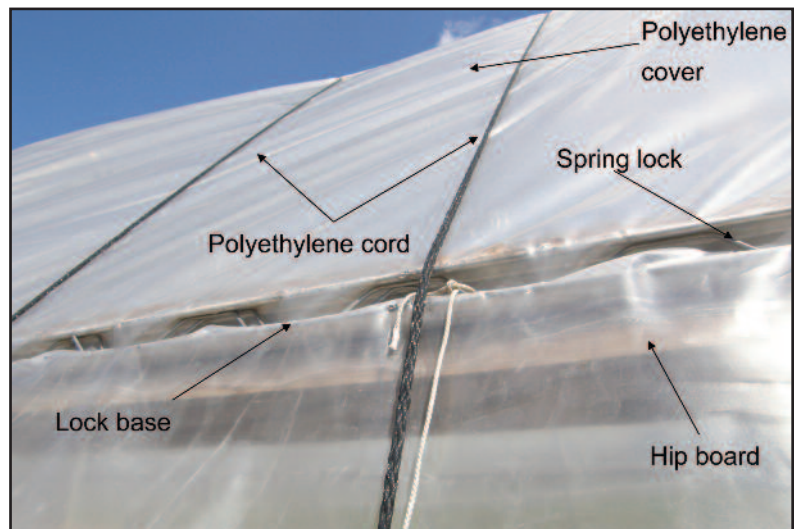
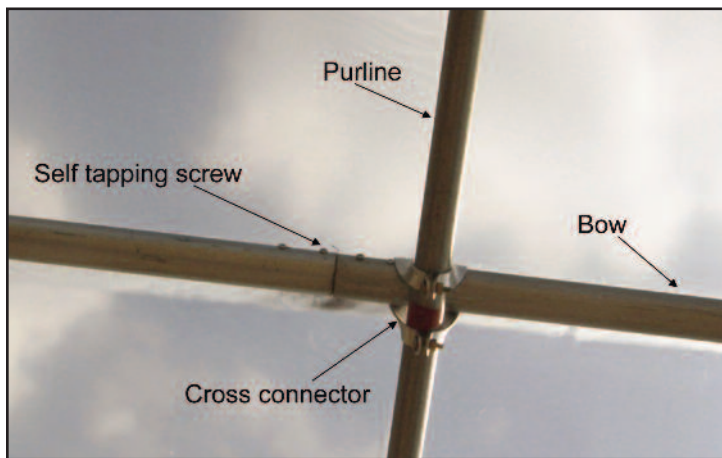
Disadvantages include these:

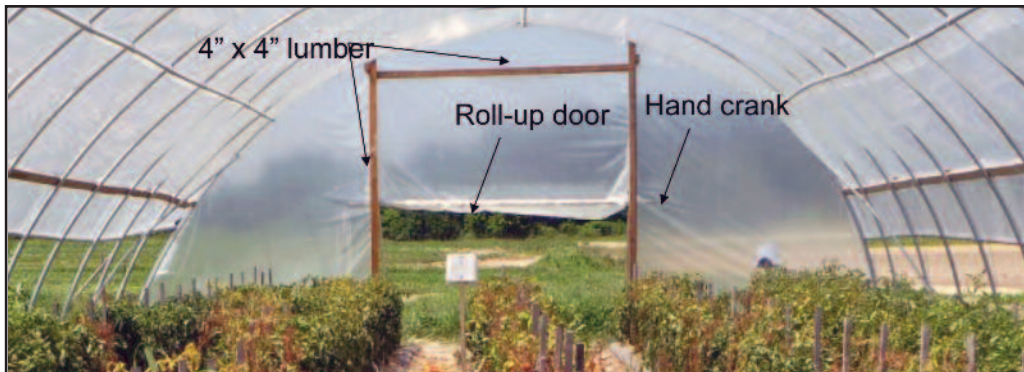
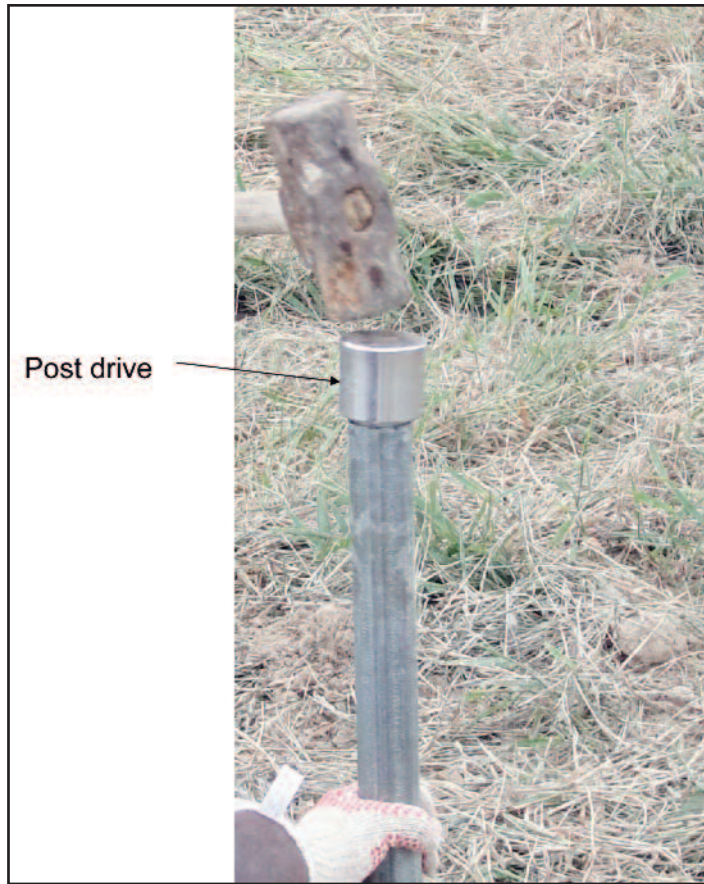
- significant capital expense
- logistics and expense of disposal of polyethylene covering
- required monitoring and management of high tunnel temperatures and ventilation
- potential for damage from wind, snow, and ice loads.

In general, there are a number of site and engineering issues that must be considered before constructing a high tunnel. Site issues include sunlight and wind exposure, access to water, and topography. Sunlight and wind issues may influence the orientation of your high tunnel. The overall dimensions and climatic requirements of your high tunnel will influence such issues as bow/hoop spacing and bow pipe size and thickness (gauge).

There are three options for construction: (1) some suppliers will also build tunnels for you; (2) contract with a third party to construct all or part of the tunnel, or (3) build the tunnels completely using your own crew. Most commercial growers build their own high tunnels or use their own labor to construct high tunnels from a kit. Pipe benders for making your own hoops range in price from \$150 to \$750, depending on features and size. Generally, high tunnel kits range from \$2.25 to \$5 per square foot, depending on tunnel dimensions, features (rollup sides, doors), bow steel thickness, and type of film. There are many suppliers for high tunnel materials and kits.

**Tables 1 and 2** illustrate material and labor costs associated with constructing high tunnels of varying dimensions using metal hoops.





**Table 1. Material and labor associated with constructing a 30-by-96-foot high tunnel\* using chain-link tubing.**

| Item   | Unit price (\$) | Quantity | Subtotal (\$) | Note  | Labor (hr) |
|--|-----------------|----------|---------------|---|------------|
| <b>Post/anchor legs</b>                          |                 |          |               |   | <b>2.5</b> |
| 1 $\frac{7}{8}$ -inch x 3-foot 18-gauge tubing   | 5.25            | 34       | 178.5         | 2/bow for 17 bows   |            |
| Carriage bolts                                   | 0.15            | 34       | 5.10          | 2/bow for 17 bows   |            |
| Nuts   | 0.10            | 34       | 3.40          | 2/bow for 17 bows   |            |
| Post driver, 1.9-inch pipe                       | 13.95           | 1        | 13.95         | To insert in post when hammering into the ground  |            |
| Ratchet tie-down                                 | 13.98           | 10       | 139.8         | To anchor the tunnel structure; prevent wind damage   |            |
| <b>Bows</b>                                      |                 |          |               |   | <b>6</b>   |
| 1 $\frac{3}{8}$ -inch x 11-foot 18-gauge tubing  | 12.5            | 68       | 850           | 6 feet apart  |            |
| 1 $\frac{3}{8}$ -inch x 21-foot 18-gauge tubing  | 17              | 2        | 34            | Bend and cut to 8-inch pieces to be inserted between 2 adjacent bow sections; need 4 self-tapping screws per piece; 51 pieces for 3/bow |            |
| Self-tapping screws                              | 0.05            | 204      | 10.2          |   |            |
| <b>Purlin</b>                                    |                 |          |               |   | <b>6</b>   |
| 1 $\frac{3}{8}$ -inch x 21-foot 18-gauge tubing  | 17              | 15       | 255           | 3 purlines, 5/purline   |            |
| Self-tapping screws                              | 0.05            | 24       | 1.2           | 2/connection  |            |
| Cross connectors for 1.66-inch x 1.315-inch pipe | 2.17            | 51       | 110.67        | 3/bow   |            |
| <b>Cover</b>                                     |                 |          |               |   | <b>9.5</b> |
| 8-foot aluminum wire lock base                   | 5.54            | 34       | 188.36        | 12/side x 2 sides + 5/end x 2 ends  |            |
| 4-foot wire spring lock                          | 1.23            | 68       | 83.64         | To cover all lock base  |            |
| 48-foot x 150-foot poly 6 mil Tufflite IV        | 452.75          | 1        | 452.75        |   |            |
| Self-tapping screws                              | 0.05            | 170      | 8.5           | 5/base to put it on wood  |            |
| 2x4x12 treated lumber for hip board              | 6.97            | 19       | 132.43        | 96/12 per side, 1-foot connecting piece/2x4   |            |
| Wood screws (64 needed)                          | 5.07            | 1        | 5.07          | 8/connection  |            |
| Pipe strap for 1 $\frac{3}{8}$ -inch tubing      | 0.46            | 34       | 15.64         | To connect wood with bows   |            |
| Polyester cord $\frac{1}{8}$ inch x 1000 feet    | 26.47           | 1        | 26.47         | To secure cover   |            |

|  |       |    |                |  |
|--|-------|----|----------------|--|
| <b>Roll-up sides</b>                               |       |    |                | <b>4</b>                                       |
| 2x6x12 treated lumber<br>as base board             | 10.97 | 19 | 208.43         | 96/12 per side,<br>1-foot connecting piece/2x6 |
| Wood screws (64 needed)                            | 5.07  | 1  | 5.07           | 8/connection                                   |
| Pipe strap for<br>1 $\frac{3}{8}$ -inch tubing     | 0.46  | 34 | 15.64          | To connect wood with bows                      |
| 1 $\frac{3}{8}$ -inch x 21-foot<br>18-gauge tubing | 17    | 10 | 170            | 5/side; 2 sides                                |
| Self-tapping screws                                | 0.05  | 16 | 0.8            | To connect tubing                              |
| Hand crank assembly<br>12-inch                     | 31.95 | 2  | 63.9           |  |
| Curtain 6-by-96 feet<br>with sealed seam           | 450   | 1  | 450            | 200 feet long                                  |
| <b>Miscellaneous</b>                               |       |    |                |  |
| WD 40  | 3.44  | 1  | 3.44           | For easy installation of bows in posts         |
| String   | 5     | 1  | 5              | For post line-up                               |
| Flags  | 5     | 1  | 5              | Marking  |
| Spray Paint  | 5     | 1  | 5              | Marking  |
| Drill bits of various sizes                        | 20    | 1  | 20             |  |
| <b>Subtotal for tunnel</b>                         |       |    | <b>3466.96</b> | <b>28.5</b>                                    |
| <b>Windbraces</b>                                  |       |    |                | <b>1.5</b>                                     |
| 1 $\frac{3}{8}$ -inch x 21-foot<br>18-gauge tubing | 17    | 4  | 68             | 1/corner                                       |
| Self-tapping screws                                | 0.05  | 16 | 0.8<br>0       | 4 Tex/brace                                    |
| <b>Doors</b>                                       |       |    |                | <b>4</b>                                       |
| Poly   | 0     |    | 0              | The extra from the top cover                   |
| 4x4x16 #2 treated lumber                           | 21.97 | 4  | 87.88          |  |
| 4x4x12 #2 treated lumber                           | 17.97 | 2  | 35.94          |  |
| 1 $\frac{3}{8}$ -inch x 21-foot<br>18-gauge tubing | 17    | 2  | 34             | For roll-up door                               |
| Hand crank assembly 12-inch                        | 31.95 | 2  | 63.9           |  |
| <b>Subtotal for windbraces and doors</b>           |       |    | <b>290.52</b>  | <b>5.5</b>                                     |
| <b>Total</b>                                       |       |    | <b>3757.48</b> | <b>33.5</b>                                    |
| <b>Pipe bender</b>                                 |       |    |                |  |
| M2030 bender<br>(including shipping)               | 750   | 1  | 750            |  |

Note: Chain-link tubing of smaller diameter (for example, 1 $\frac{3}{8}$ -inch instead of 1 $\frac{1}{2}$ -inch) could be used when constructing 20-foot-wide (or less) high tunnels.  
\*Quonset-style house with 6-foot bow spacing, three purlins, and a single layer of 6 mil polyethylene covering.

**Table 2. Estimated material and labor costs to construct 30-foot-wide high tunnels of different lengths.**

|                   | Length of high tunnel (ft) |             |             |             |             |
|-------------------|----------------------------|-------------|-------------|-------------|-------------|
|                   | 36                         | 54          | 72          | 96          | 120         |
|                   | Material cost (\$)         |             |             |             |             |
| Tunnel            | 1300                       | 1950        | 2600        | 3467        | 4334        |
| Doors; windbraces | 291                        | 291         | 291         | 291         | 291         |
| <b>Subtotal</b>   | <b>1591</b>                | <b>2241</b> | <b>2891</b> | <b>3757</b> | <b>4624</b> |
| \$ per sq. ft     | 1.47                       | 1.38        | 1.34        | 1.30        | 1.28        |
|                   | Labor (hr)                 |             |             |             |             |
| Tunnel            | 19.0                       | 21.5        | 24.5        | 28.0        | 31.5        |
| Doors; windbraces | 5.5                        | 5.5         | 5.5         | 5.5         | 5.5         |
| <b>Subtotal</b>   | <b>24.5</b>                | <b>27.0</b> | <b>30.0</b> | <b>33.5</b> | <b>37.0</b> |

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