

# Cost of Constructing a Metal Hoop High Tunnel

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Use of high tunnels by fruit, vegetable and cut flower growers is becoming increasingly popular in the U.S. as a low-cost method to extend their growing season. High tunnels are actually one type of season-extending technology or protected agriculture (e.g., row covers, low tunnels, high tunnels) and may be referred to by other names such as hoophouse, Quonset-style house or unheated greenhouse. This fact sheet will focus on cost issues related to the construction of a high tunnel using **metal** hoops. There are several excellent fact sheets<sup>2,3,6,7</sup> available that outline cost and construction methods for building a high tunnel using **PVC** hoops. Pennsylvania State University offers a for-cost high tunnel manual (<http://plasticulture.psu.edu/node/115>).

Regardless of the type of high tunnel you choose, there are a number of advantages and disadvantages in using high tunnels.<sup>4</sup> Advantages frequently cited include extended spring and fall growing seasons, wind and rain protection, reduced likelihood for disease problems on certain crops and potential for higher market value of crops and higher quality of harvested crops. Disadvantages include additional capital expense, disposal of polyethylene covering, additional requirement to monitor increased temperature inside tunnel and potential issue of snow loads.

In general, there are a number of site and engineering issues that must be considered before constructing a high tunnel.<sup>8</sup> Site issues include sunlight and wind exposure, access to

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**FIG. 1. Typical Quonset-style high tunnel design**

water and topography. Sunlight and wind issues may influence the orientation of your high tunnel. The overall dimensions and climatic requirements (e.g., snow loads) of your high tunnel will influence such issues as bow/hoop spacing and bow thickness.

High tunnels can be constructed from scratch (the focus of this fact sheet) using a pre-purchased kit or by hiring a company to build the high tunnel for you. In general, most commercial growers build their own high tunnels (i.e., bend their own pipe) or use their own labor to construct a high tunnel from a kit. Pipe benders range in price from \$150 to \$750, depending on features and size. In general high tunnel kits range from \$2.25 to \$5.00/ft<sup>2</sup>, depending on tunnel dimensions, features (e.g., rollup sides, doors), bow steel thickness and type of film. Many suppliers for high tunnel materials and kits are available.<sup>1,5</sup>

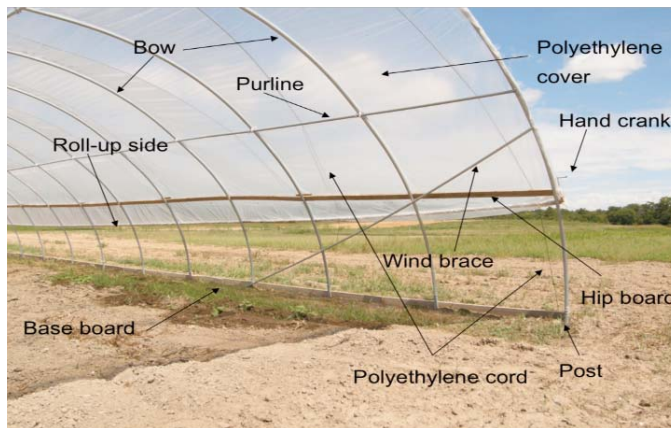


FIG. 2. Major components of a high tunnel

The following tables illustrate material and labor costs associated with constructing high tunnels of varying dimensions using **metal** hoops.

**Table 1. Material and labor associated with constructing 30' x 96' high tunnel using chain link tubing.**

| Item                                     | Unit Price <sup>Y</sup><br>(\$) | Quantity | Subtotal<br>(\$) | Note   | Labor<br>(Hr) |
|--|---------------------------------|----------|------------------|--|---------------|
| <b>Post/Anchor Legs</b>                  |                                 |          |                  |  | 2.5           |
| 1 7/8" x 3' x 18 gauge tubing (0.047")   | 5.25                            | 34       | 178.50           | 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 – 2" pipe end cap            | 13.95                           | 1        | 13.95            |  |               |
| Ratchet tie-down                         | 13.98                           | 10       | 139.80           | to anchor the tunnel structure, prevent wind damage  |               |
| <b>Bows</b>                              |                                 |          |                  |  | 6             |
| 1 5/8" x 11' x 18 gauge tubing           | 12.50                           | 68       | 850.00           | 6' apart   |               |
| 1 3/8" x 21' x 18 gauge tubing           | 17.00                           | 2        | 34.00            | bend and cut to 8" pieces to be inserted between 2 adjacent bow sections; need 4 Tek screws per piece; 51 pieces for 3/bow |               |
| Tek screw <sup>Z</sup>                   | 0.05                            | 204      | 10.20            |  |               |
| <b>Purlines</b>                          |                                 |          |                  |  | 6             |
| 1 3/8" x 21' x 0.047" 18 gauge tubing    | 17.00                           | 15       | 255.00           | 3 purlines, 5/purline  |               |
| Tek screw <sup>Z</sup>                   | 0.05                            | 24       | 1.20             | 2/connection   |               |
| Cross connectors for 1.66" x 1.315" pipe | 2.17                            | 51       | 110.67           | 3/bow  |               |
| <b>Cover</b>                             |                                 |          |                  |  | 9.5           |
| 8' aluminum wire lock base               | 5.54                            | 34       | 188.36           | 12/side x 2 sides + 5/end x 2 ends   |               |
| 4' wire spring lock                      | 1.23                            | 68       | 83.64            | to cover all lock base   |               |
| 48' x 150' poly 6-mil Tufflite IV        | 452.75                          | 1        | 452.75           |  |               |
| Tek screw <sup>Z</sup>                   | 0.05                            | 170      | 8.50             | 5/base to put it on wood   |               |

**Table 1. Material and labor associated with constructing 30' x 96' high tunnel using chain link tubing (cont.)**

| Item  | Unit Price <sup>Y</sup><br>(\$) | Quantity | Subtotal<br>(\$) | Note   | Labor<br>(Hr) |
|---|---------------------------------|----------|------------------|--|---------------|
| <b>Cover (cont.)</b>                            |                                 |          |                  |  | 9.5           |
| 2 x 4 x 12 treated lumber                       | 6.97                            | 19       | 132.43           | 96/12 per side,<br>1' connecting piece/2 x 4 |               |
| Wood screw, 64 needed                           | 5.07                            | 1-lb     | 5.07             | 8/connection                                 |               |
| Pipe strap for 1 5/8" tubing                    | 0.46                            | 34       | 15.64            | connect wood with bows                       |               |
| Polyester cord 1/8" x 1,000'                    | 26.47                           | 1        | 26.47            | 45' x17'                                     |               |
| <b>Roll-up sides</b>                            |                                 |          |                  |  | 4             |
| 2 x 6 x 12 treated lumber as base board         | 10.97                           | 19       | 208.43           | 96/12 per side,<br>1' connecting piece/2 x 6 |               |
| Wood screw, 64 needed                           | 5.07                            | 1-lb     | 5.07             | 8/connection                                 |               |
| Pipe strap for 1 5/8" tubing                    | 0.46                            | 34       | 15.64            | connect wood with bows                       |               |
| 1 3/8" x 21' x 0.047" 18 gauge tubing           | 17.00                           | 10       | 170.00           | 5/side; 2 sides                              |               |
| Tek screw <sup>Z</sup>                          | 0.05                            | 16       | 0.80             | connect tubing                               |               |
| Hand crank assembly 12"                         | 31.95                           | 2        | 63.90            |  |               |
| Curtain 6' x 96' with sealed seam               | 450.00                          | 1        | 450.00           | 200' long                                    |               |
| <b>Miscellaneous</b>                            |                                 |          |                  |  |               |
| WD-40   | 3.44                            | 1        | 3.44             | for easy installation of<br>bows in posts    |               |
| String  | 5.00                            | 1        | 5.00             | for post line-up                             |               |
| Flags   | 5.00                            | 1        | 5.00             | marking                                      |               |
| Spray paint                                     | 5.00                            | 1        | 5.00             | marking                                      |               |
| Drill bits of various sizes                     | 20.00                           | 1        | 20.00            | these will wear out                          |               |
| <b>Tunnel Subtotal</b>                          |                                 |          | <b>3,466.96</b>  |  | <b>28.5</b>   |
| <b>Windbraces</b>                               |                                 |          |                  |  | 1.5           |
| 1 3/8" x 21' x 18 gauge tubing                  | 17.00                           | 4        | 68.00            | 1/corner                                     |               |
| Tek screw <sup>Z</sup>                          | 0.05                            | 16       | 0.80             | 4 Tek/brace                                  |               |
| <b>Doors</b>                                    |                                 |          |                  |  | 4             |
| Poly  | 0                               |          | 0                | the extra from the top<br>cover              |               |
| 4 x 4 x 16 #2 treated lumber                    | 21.97                           | 4        | 87.88            |  |               |
| 4 x 4 x 12 #2 treated lumber                    | 17.97                           | 2        | 35.94            |  |               |
| 1 3/8" x 21' x 18 gauge tubing                  | 17.00                           | 2        | 34.00            | for roll up door                             |               |
| Hand crank assembly 12"                         | 31.95                           | 2        | 63.90            |  |               |
| <b>Subtotal for Windbraces and Doors</b>        |                                 |          | <b>290.52</b>    |  | <b>5.5</b>    |
| <b>Total</b>                                    |                                 |          | <b>3,757.48</b>  |  | <b>33.5</b>   |
| <b>Possible Additional Expense: Pipe Bender</b> |                                 |          |                  |  |               |
| M2030 bender (includes shipping)                | 750.00                          | 1        | 750.00           |  |               |

**Note:** Chain link tubing of smaller diameter (e.g., 1 3/8" instead of 1 5/8") could be used when constructing 20' (or less) wide high tunnels.

<sup>Y</sup>Prices as of fall 2009 from local and on-line sources

<sup>Z</sup>Tek screw: self-taping metal screw

**Table 2. Estimated material cost and labor to construct 30' wide high tunnel of different lengths.**

|                           | Length of High Tunnel     |             |             |             |             |
|---------------------------|---------------------------|-------------|-------------|-------------|-------------|
|                           | 36'                       | 54'         | 72'         | 96'         | 120'        |
|                           | <b>Material Cost (\$)</b> |             |             |             |             |
| 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> |
| <b>\$ per square foot</b> | <b>1.47</b>               | <b>1.38</b> | <b>1.34</b> | <b>1.30</b> | <b>1.28</b> |
|                           | <b>Labor (hour)</b>       |             |             |             |             |
| 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> |

## References

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