

High Tunnel System

Code 325

_____ Client _____ County

_____ Service Center _____ Date

West Virginia Job Sheet

March 2016



Definition

An enclosed polyethylene, polycarbonate, plastic, or fabric covered structure that is used to cover and protect crops from sun, wind, excessive rainfall, or cold to extend the growing season in an environmentally safe manner.

Purpose

Improve plant health and vigor.

Conditions Where Practice Applies

This practice applies to land capable of producing crops. This practice applies where sun and wind intensity may damage crops, or where an extension of the growing season is needed due to climate conditions.

This practice does not apply to crops not grown in the natural soil profile (i.e. tables/benches, portable pots, hydroponically, etc.).

Commercially available high tunnel structures are made in numerous widths and lengths and types (Quonset and Gothic). Ventilation is achieved by means of a combination of roll-up side vents, end vents, and occasionally roof vents. Generally, the end walls are framed-in to create a door and ventilation area. The high tunnel structure covers several crop rows which allow crop growth to full maturity, and is tall enough to allow spraying, cultivation and harvest to occur with the tunnel intact.

The larger the system, the more thermal mass is stored. A single layer of poly cover may provide one hardiness zone of protection, while a second row cover may provide a second zone of protection.

High tunnels are to be placed in sites with adequate drainage in full sun and, if possible, with protection from the wind. The orientation of the tunnel is dependent on the season and crops that will be grown. If improving plant quality during the main growing season is the goal, consider a North-South orientation.

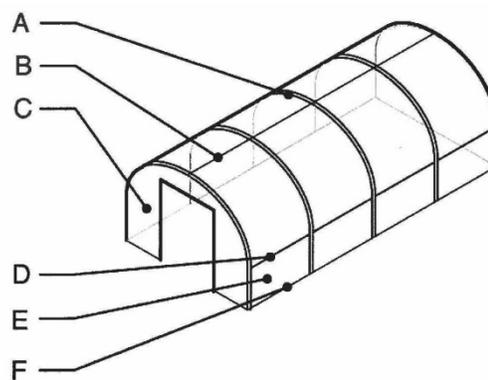
When the growing season is expected to extend into winter months, consider orienting the high tunnel along a more east to northeast or west or southwest axis.

Structures placed perpendicular to prevailing winds typically receive the most damage, so when strong seasonal winds are a concern, consider placing near a windbreak of trees, shrubs or fabricated material to moderate or redirect the wind (reference Windbreak / Shelterbelt Establishment (380)).

Criteria

- Plants in high tunnels rely on irrigation water. Applied either by hand, drip or sprinkler irrigation, etc. Therefore, it is essential to have a reliable water source (reference Irrigation System, Micro-irrigation 441 and associated practice standards).
- Supportive practices must be planned and installed as a condition for the installation of the high tunnel. Runoff water from the high tunnels or other nearby sources can cause erosion and ponding issues that may require the application of other conservation practices such as Diversion (362), Roof Runoff Structure (558), Underground Outlet (620), Grassed Waterway (412), Mulching (484) and/or Critical Area Treatment (342).
- The high tunnel structure must be planned, designed, and constructed from a manufactured kit in accordance with manufacturer's recommendations.
- High Tunnel structure width shall not exceed 30 feet and be at least 6 feet in height at the peak of the structure.
- High Tunnels shall be installed on level grade or the naturally occurring slopes not exceeding 5%.
- High Tunnels must be covered with at least 6 mil polyethylene greenhouse grade UV resistant film (4 year minimum lifespan).
- High Tunnels must be designed to withstand wind loads and equipped with appropriate wind bracing kits supplied by the tunnel manufactures.
- High Tunnels covers shall be removed or rolled up at the end of the growing season unless the structure is designed by the manufacturer to withstand expected snow loads.
- High Tunnels shall be a steel constructed frame.
- High Tunnels shall have a maximum four feet (4') rafter or bow spacing.
- High Tunnels shall have manufactured supplied heavy duty ground posts installed to a depth recommended by the manufacturer.

- High Tunnels shall have purlins connected by cross connectors to the bow, for added strength.
- High Tunnels shall have bows and ground posts that are at least:
 - 14 gage galvanized steel for tunnels $\geq 26'$ wide.
 - 14 gage galvanized steel for tunnels 15' to 26' wide.
 - 17 gage galvanized steel for tunnels $< 14'$ wide.
- High Tunnels shall have minimum 17 gage purlins (including ridge)
 - 5 for tunnels $\geq 26'$ wide.
 - 3 for tunnels 15' to 26' wide.
 - 1 for tunnels $< 14'$ wide.
- High Tunnels shall have corner end posts set in 8 inches of concrete or as recommended by the manufacturer, whichever is more stringent.
- Location based on the landowner's reasons and the decision documented.
- Typical terms associated with high tunnels are noted in the drawing below.



A.) Rib, Hoop, Arch, Bow
B.) Purlin , Ridgepole
C.) End Wall
D.) Hip Board
E.) Side Wall
F.) Baseboard

Consider

- Consider a minimum 6 ft. x 6 ft. opening on each endwall for increased ventilation and access (e.g. 2- 36 inch wide doors on each end or larger roll-up, sliding, or hinged doors).
- Consider the size of the equipment to be used in the tunnel when constructing the endwalls.
- Consider using a truss at least every other bow. For tunnels \geq 26 ft. wide consider using trusses with braces/cross-ties on every bow.
- Consider adding more purlins and/or wind bracing kits in windier areas.
- Consider the height of the sidewall as it relates to the height of the target crops (and personnel who will be working in the tunnel).
- Consider siting with adequate set back distance from hills, trees or buildings (minimum of 2 times height of obstruction) to avoid unnecessary shadows.
- Consider avoiding cutting and filling of soils whenever possible to achieve the desired slope limitation of five percent or less. Maintaining the natural soil profile in order to preserve the soil structure and encourage soil health is preferred.

References

WVU Extension Service: High Tunnels: High Tunnels in West Virginia (<http://anr.ext.wvu.edu/commercial-horticulture/high-tunnels>)

Cornell University High Tunnels (www.hort.cornell.edu/hightunnel)

Penn State Center for Plasticulture, High Tunnels (<http://plasticulture.cas.psu.edu/H-tunnels.html>)

HighTunnels.org Website (www.hightunnels.org)

"High Tunnel Production Manual for West Virginia"; Lewis Jett, Ph.D., Associate Professor and State Extension Specialist West Virginia University 2016.

High Tunnel System – Job Sheet

Producer _____ Farm # _____ Tract # _____

Assisted by _____ Field Office _____ Contract # _____

Materials List

High Tunnel Manufacturer _____ Model _____

Height (min. 6') _____ Width (max. 30') _____ Length _____

Supporting Practices Planned:

Critical Area Planting (342) -job sheet attached

Diversion (362)- plan attached

Grassed Waterway (412)- plan attached

Heavy Use Area Protection (561)

Irrigation Pipeline (430) – plan attached

Irrigation System, Microirrigation (441) - plan attached

Irrigation Water Management (449)

Roof Runoff System (558) - plan attached

Subsurface Drain (606) - plan attached

Underground Outlets (620) - plan attached

Other: _____

High Tunnel System Construction

- Call 811 West Virginia Miss Utility and have all above and underground utilities marked prior to construction.
- Check and adhere to local building codes, ordinances and laws prior to construction.
- Prepare site according to manufacturer's instructions.
- Locate away from structures that may cause snow drift, block ventilation or sunlight and from overhead branches or other obstacles.
- Lay out building location according to site plan, pay special attention to slope, surface runoff, grading (away from structure), orientation and windbreaks (as appropriate).
- Assemble high tunnel structure according to manufacturer's instructions and as specified in the job sheet.
- Install supporting practices as required, according to construction plans provided.

Seasonal High Tunnel System – Construction Checkout

Seasonal High Tunnel Structure – as-built measurements	
Length (ft)	Height in Center (ft)
Width (ft)	Structure Manufacturer:

Supporting Practices Installed

- Critical Area Planting (342) -job sheet
- Diversion (362)- plan attached
- Grassed Waterway (412)- plan attached
- Heavy Use Area Protection (561)
- Irrigation Pipeline (430)
- Irrigation System, Microirrigation (441)

- Irrigation Water Management (449)
- Roof Runoff System (558) –plan attached
- Subsurface Drain (606)- plan attached
- Underground Outlets (620)- plan attached
- Other:** _____

Planner Certification

This plan meets the requirements of West Virginia NRCS Conservation Practice Standard – *High Tunnel System (325)*.

Signature _____ Title _____ Date _____

Certification of Practice Completion

This practice has been completed according to NRCS plans and specifications. (Indicate in Practice Specifications if there were any changes to the planned practice and amount.)

Signature _____ Title _____ Date _____

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