High Tunnel Construction Considerations

October 2008

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High tunnel production of early season vegetables is rapidly expanding in Iowa. By definition, a high tunnel is not a greenhouse (lacks heat and electrically controlled automatic ventilation); but like a greenhouse in that they are quonset or gothic shaped, constructed of bent metal pipe that are attached to metal posts that have been driven into the ground. They are covered with one layer of 6-mil greenhouse grade polyethylene. The ends of the tunnels are framed, usually in a way to allow a small tractor with tiller and plastic mulch layer to be used. Ventilation is provided by manually, or electric controller, rolling up the sides.

Construction of high tunnels is a 'do-it-yourself' type project with many innovative designs – from PVC at < $1.00/SF to >$3.00/SF for pipe frame depending on size, covering, end wall construction, etc. For a manual on step by step construction of a 17 X 36 tunnel consider the Penn State design. Go to: http://plasticulture.cas.psu.edu. Also, the American Society for Plasticulture has excellent written materials on high tunnels. Go to: http://www.plasticulture.org.

For a listing of suppliers, go to: http://www.hightunnels.org. Most of those listed are greenhouse suppliers, but a few have specific information on high tunnels or coldframes. Those that some Iowa growers have used include: Stuppy Greenhouse(Kansas City, KS www.stuppy.com), Atlas Greenhouse Systems (Alapaha, GA www.atlasgreenhouse.com), FarmTrek (Dyersville, IA www.GrowersSupply.com), Nolt's Midwest Produce Supplies (3160 140th St., Charles City, IA 50616, phone: 641-228-4496).
http://www.hoophouse.com/index.html - found on the web
The below comments refer to our ISU experience in assembling a 30 X 96 (12' height) and a 16 X 48 (8' height) tunnel at our research farms.

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Location is critical – in Iowa a windbreak is essential. Also, you want to locate the tunnel on excellent soils. Well-drained, and of high fertility.

Armstrong farm at Lewis Iowa. Results of 70 mph wind gust. Tunnel in a north-south orientation on a ridge top.

A good site is level, well-drained, fertility built up, sod destroyed, plowed, and windbreak to north.

An excellent site. Protected from the west and the north. Water available from a hydrant at the northwest corner.

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Drainage – slope away from tunnel walls to prevent rain and snow runoff from saturating soil inside tunnel. You might consider a 4-inch drain line under the rock to facilitate water removal.

Consider a tile line under the main tunnel area to prevent water logged roots of your crop.

Construction Tips - Cement in at least the corner posts. You may want to cement in every other one in high wind areas.

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In Iowa, we space posts every 4-foot, as opposed to the recommended 6-foot because of our wind loads.

An end wall should be constructed to allow a small garden tractor with tiller and mulch layer attachments to move as close to side walls as possible. If using a zippered end wall be sure to use the heaviest zipper possible. Light-weight ones tear out easily.

A rectangular opening with treated lumber.

Hinge to allow end to swing upright.

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Rebar used as spike to hold end wall in place.

Finished end wall on a 16 X 48 high tunnel. Consider a gothic structure rather than quonset for snow loads.

Sleeve used to hold overlapping plastic in place instead of 'flapping'

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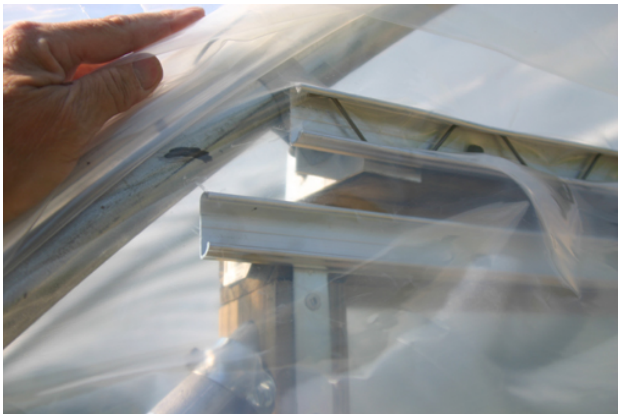
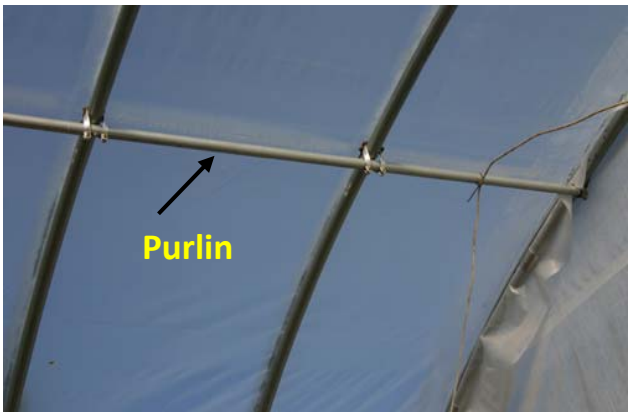


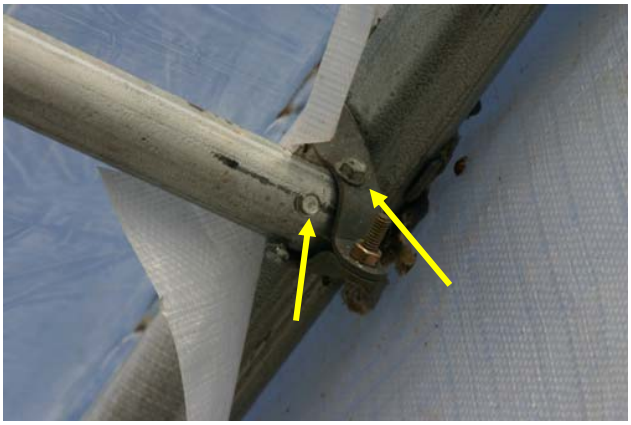
Potential plastic tear points

Other than duct tape, such as foam, could be used to protect plastic covering from tearing at stress points.



The purlins tend to move through the clamps creating a hole in the fiber end wall

Wind causes purlins to move through end wall.



Place additional screws in purlin and through clamp to prevent purlin movement.

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A hand crank can be used to raise and lower sides for ventilation. However, in early spring and late fall this operation may need to be performed several times a day. A controller and thermostat can add about $2,000 to the cost of a 30 X 96 tunnel, but temperature control is much more even.

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Early morning condensation on the inside of the plastic film may reduce the light transmission quality, but also can result in plant leaf surface becoming very wet. A fan or anti-fog film can prevent high nighttime moisture buildup.

Automatic vent (temperature resistor) can assist in ventilating heat during day.

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