



UNIVERSITY OF ILLINOIS  
EXTENSION

Illinois Migrant Council

# PREPARING A NEW GENERATION OF ILLINOIS FRUIT AND VEGETABLE FARMERS

a USDA NIFA BEGINNING FARMER AND RANCHER  
DEVELOPMENT PROGRAM PROJECT  
GRANT # 2012-49400-19565

<http://www.newillinoisfarmers.org>





UNIVERSITY OF ILLINOIS  
EXTENSION

GROWING A NEW GENERATION  
OF ILLINOIS FRUIT AND VEGETABLE FARMERS

# HIGH TUNNEL CONSTRUCTION AND OPERATION

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Zack Grant and Shelby Henning

February 2015



# Hightunnels.org

- High tunnels are unheated, plastic-covered structures that provide an intermediate level of environmental protection and control compared to open field conditions and heated greenhouses

# University of MN

- A high tunnel, by definition, is a non-permanent structure that has no electrical service, no automated ventilation and no heating system.





# Common High Tunnel Crops in Illinois

- Tomato
- Pepper
- Cucumber
- Raspberry
- Strawberry
- Blackberry in northern IL
- Lettuce and other Greens



# Homemade







# Prefabricated



FieldPro gable



FieldPro gothic



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UNIVERSITY™

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#### 4-H Youth

Aquaculture-Catfish

Community-Government

Crops & Horticulture

Environmental Quality

Farm Management

Farm Safety

Forestry-Forest Products

Health-Home-Family

Insects-Plant Diseases-

Pesticides-Weeds

Lawns & Gardens

Leadership

Livestock

Poultry

Wildlife and Fisheries

## High Tunnel Crop Production Project

### Suppliers

Mention of the suppliers does not imply endorsement of this supplier over similar suppliers by Mississippi State University Extension Service.

High tunnels have been used in the Northeastern U.S. for season extension production for decades. There is increasing interest in high tunnel production of specialty crops in Mississippi. This publication provides a partial list of high tunnel suppliers, from whom producers interested in high tunnel production could potentially purchase kits, tools, and supplies to construct high tunnels. Mention of the suppliers does not imply endorsement of this supplier over similar suppliers by Mississippi State University Extension Service.

A.M. Leonard, Inc.

Phone: (800) 543-8955

Piqua, OH

<http://www.amleo.com>

-General farm and garden supplies, high tunnels, greenhouses

Agratech, Inc

2131 Piedmont Way

Pittsburg, CA 94565

Phone: (877) 432-3336

Phone: (925) 432-3399

### More High Tunnel Information:

- Home
- About Us
- Calendar
- News
- Suppliers
- Information
- Videos
- Publications
- China Trip



# Gothic



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# Quonset





# Gable



# Gutter Connect











# SITE SELECTION



# Subject to forces of nature: wind or snow damage













# Urban growers need to check local zoning ordinances and building laws

The screenshot shows a web browser window with the URL [urbanaindinois.us/permits](http://urbanaindinois.us/permits). The page is for the City of Urbana, specifically the 'BUSINESSES' section. The main heading is 'Building Safety Permit Application Forms'. Below this, there are links for 'Building Permit application and information' and 'Schedule of Fees'. A table lists various permit applications with their file names and sizes. A 'Print' button is also visible. The footer of the page mentions the last update date (Jan 03, 2014) and lists the author and contributors.

Building Safety Permit Application Forms

[Building Permit application and information](#)

[Schedule of Fees](#)

Type	File	Size
	<a href="#">Plumbing Permit Application</a>	22KB
	<a href="#">Sign Permit Application</a>	119KB
	<a href="#">Electrical Permit Application</a>	16KB
	<a href="#">Mechanical Permit Application</a>	24KB
	<a href="#">Miscellaneous Permit Application</a>	13KB

**Print**

Last updated on Jan 03, 2014 (Created on Apr 23, 2010) – Author: [Vivian Petrotte](#) – Contributors: [Sharon Humes](#), [Natalie Kenny Mar...](#)  
Filed under [Applications](#), [Building](#), [Electrical](#), [fence](#), [fireplace](#), [hvac](#), [Mechanical](#), [Permits](#), [Plumbing](#), [shed](#), [Community Development Services](#)





5801  
ay®  
IGHT

12/22/2009



# Pieces and Parts





Purlins

Bows

Hip Board and Wiggle  
Wire Extrusion

Ground Post

03/17/2010





03/22/2010







11/05/2010





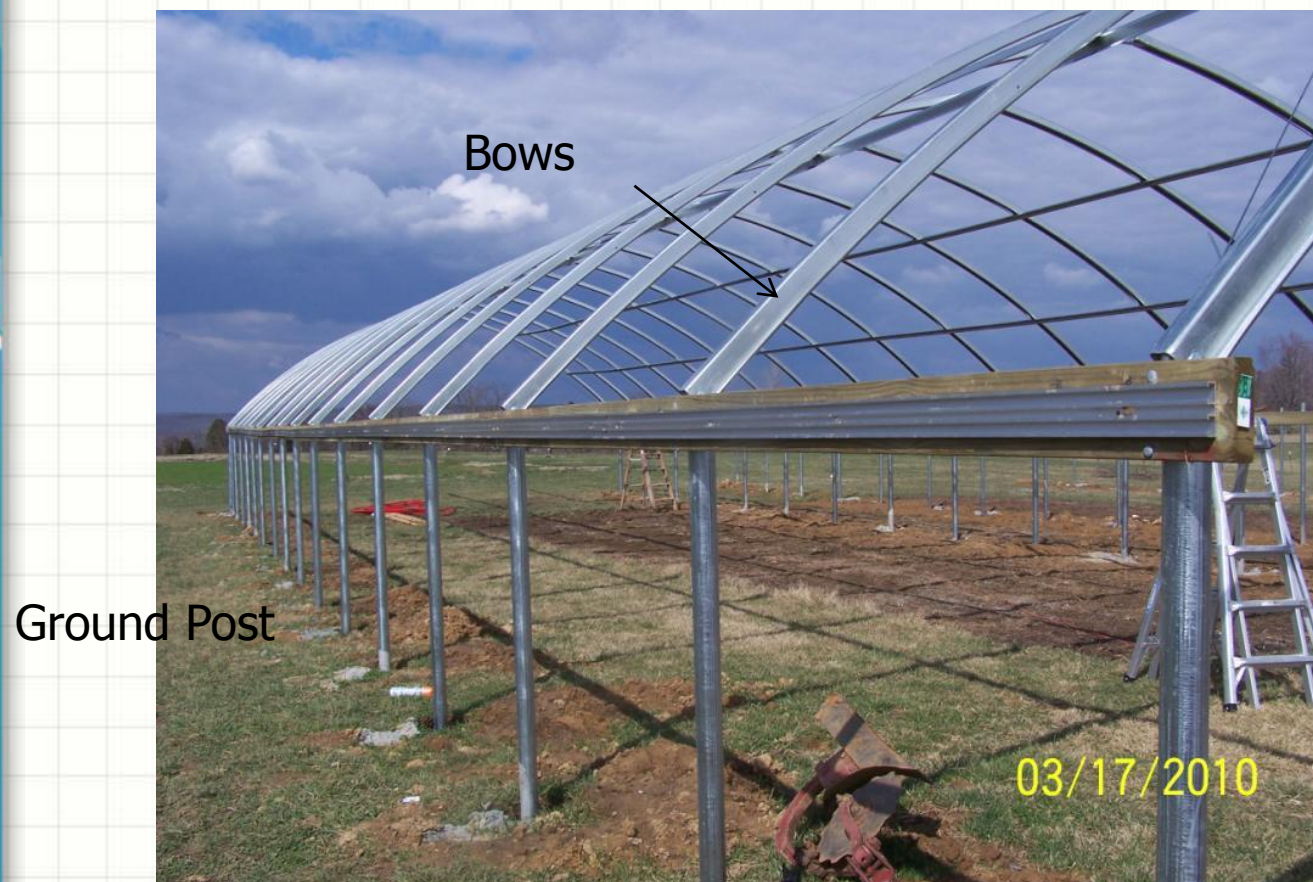








# Bow spacing usually 6' or 4'

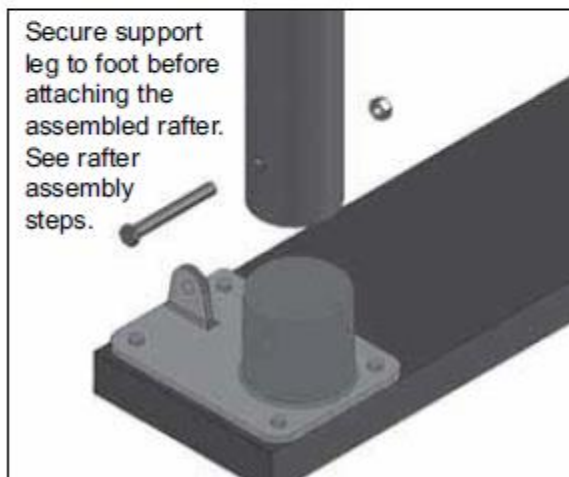
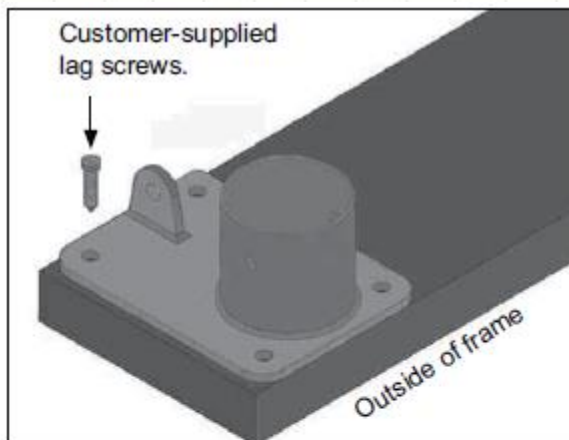


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# Anchoring



# Moveable





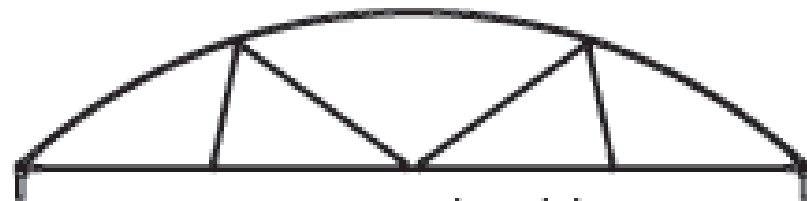
Open Bow — No Truss, Not Available in All Models & Sizes



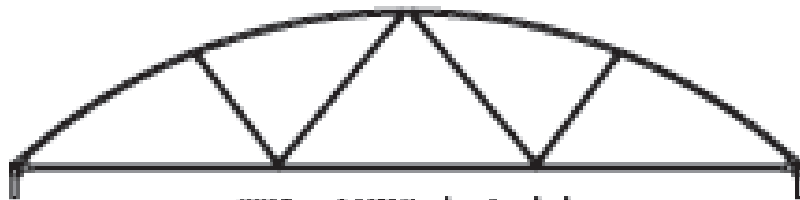
"H" Truss, 1.315" Members Standard



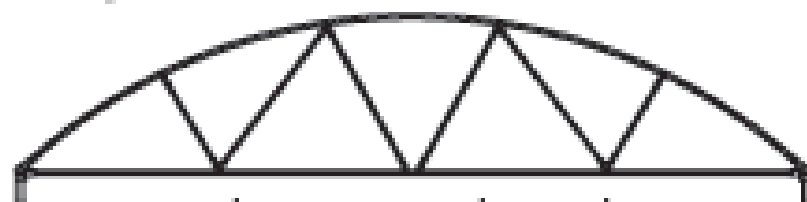
"Y" Truss, 1.315" Members Standard



"M" Truss, 1.315" Members Standard



"W" Truss, 1.315" Members Standard



"Triple Y" Truss, 1.61" Horizontal Bottom Member,  
1.315" Diagonal Braces Standard













03/09/2010







03/22/2010



















11/02/2010



# Glazing



# Poly

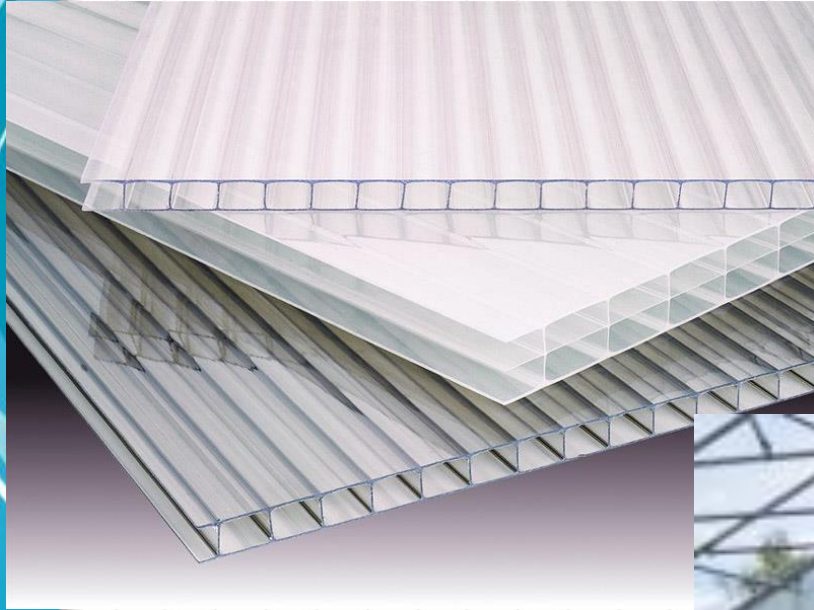


# Cloth or Fabric





# Polycarbonate



# Construction



Contact Us

Buy Now

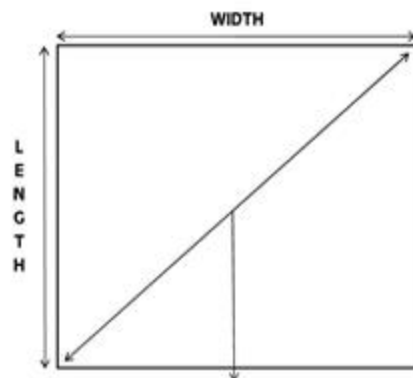
It's as easy as A, B, C!

A. Determine the *Width*

B. Determine the *Length*

C. Diagonal measurement is provided for you!

The Carpenter's Square Book has done the computation for you. No more looking for scrap paper to work out the Pythagorean Theorem to find the diagonal. Simply find the page that contains your measurements and within seconds you have the diagonal measurement needed to square your building project. The Carpenter's Square Book is also sized to go anywhere, pants pockets, shirt pockets, toolbox, glove compartment, where ever you need it, it'll fit.



DIAGONAL SQUARE MEASUREMENT

EXAMPLE

**WIDTH**

**LENGTH**

**DIAGONAL MEASUREMENT (CIRCLED ABOVE ON CHART)**

	40 FT	40 FT	40 FT	40 FT
	L	FT	IN	S
1	40	0	1	51
2	40	0	5	52
3	40	1	3	53
4	40	2	3	54
5	40	3	6	55
6	40	5	3	56
7	40	7	2	57
8	40	9	4	58
9	41	0	0	59
10	41	2	6	60
11	41	5	7	61
12	41	9	1	62
13	42	0	6	63
14	42	4	4	64
15	42	8	5	65
16	43	1	0	66
17	43	5	4	67
18	43	10	3	68
19	44	3	5	69
20	44	8	5	70
21	45	2	1	71
22	45	7	6	72
23	46	1	6	73
24	46	7	6	74
25	47	2	0	75
26	47	8	4	76
27	48	3	1	77
28	48	9	7	78
29	49	4	7	79
30	50	0	0	80
31	50	7	2	81
32	51	2	2	82
33	51	10	2	83
34	52	6	0	84
35	53	1	6	85
36	53	9	6	86
37	54	5	7	87
38	55	2	1	88
39	55	10	3	89
40	56	6	7	90
41	57	3	3	91
42	58	0	0	92
43	58	8	6	93
44	59	5	5	94
45	60	2	4	95
46	60	11	4	96
47	61	8	5	97
48	62	5	6	98
49	63	3	0	99
50	64	0	3	100
101	108	7	5	109
102	109	6	6	110
103	110	5	7	111
104	111	5	1	112
105	112	4	3	113
106	113	3	4	114
107	114	2	6	115
108	115	2	0	116
109	116	1	2	117
110	117	0	5	118
111	117	11	7	119
112	118	11	1	120
113	119	10	4	121
114	120	9	6	122
115	121	9	1	123
116	122	8	3	124
117	123	7	6	125
118	124	7	1	126
119	125	6	4	127
120	126	5	7	128
121	127	5	2	129
122	128	4	5	130
123	129	4	1	131
124	130	3	4	132
125	131	2	7	133
126	132	2	3	134
127	133	1	6	135
128	134	1	2	136
129	135	0	6	137
130	136	0	1	138
131	136	11	5	139
132	137	11	1	140
133	138	10	5	141
134	139	10	1	142
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138	143	8	1	146
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141	146	6	6	149
142	147	6	3	150
143	148	5	7	151
144	149	5	3	152
145	150	5	0	153
146	151	4	5	154
147	152	4	1	155
148	153	3	6	156
149	154	3	2	157
150	155	2	7	158
151	156	2	4	159
152	157	2	1	160
153	158	1	6	161
154	159	1	3	162
155	160	0	7	163
156	161	0	4	164
157	162	0	1	165
158	162	11	7	166
159	163	11	4	167
160	164	11	1	168
161	165	10	6	169
162	166	10	3	170
163	167	10	0	171
164	168	9	6	172
165	169	9	3	173
166	170	9	0	174
167	171	8	5	175
168	172	8	3	176
169	173	8	0	177
170	174	7	6	178
171	175	7	3	179
172	176	7	1	180
173	177	6	6	181
174	178	6	4	182
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185	189	3	2	193
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189	193	2	2	197
190	194	2	0	198
191	195	1	6	199
192	196	1	4	200
193	197	1	2	201
194	198	1	0	202
195	199	0	6	203
196	200	0	4	204
197	201	0	2	205
198	202	0	0	206
199	202	11	6	207
200	203	11	4	208







01/26/2010





# CONSTRUCTION



01/26/2010







01/26/2010







01/27/2010







01/27/2010







01/27/2010







01/27/2010







01/28/2010







01/26/2010







01/27/2010







03/01/2010









03/04/2010







03/04/2010





03/05/2010







03/05/2010







03/09/2010







03/18/2010





03/22/2010







03/19/2010





03/22/2010







03/22/2010



# Perimeter Drain







03/22/2010







04/02/2010







04/07/2010







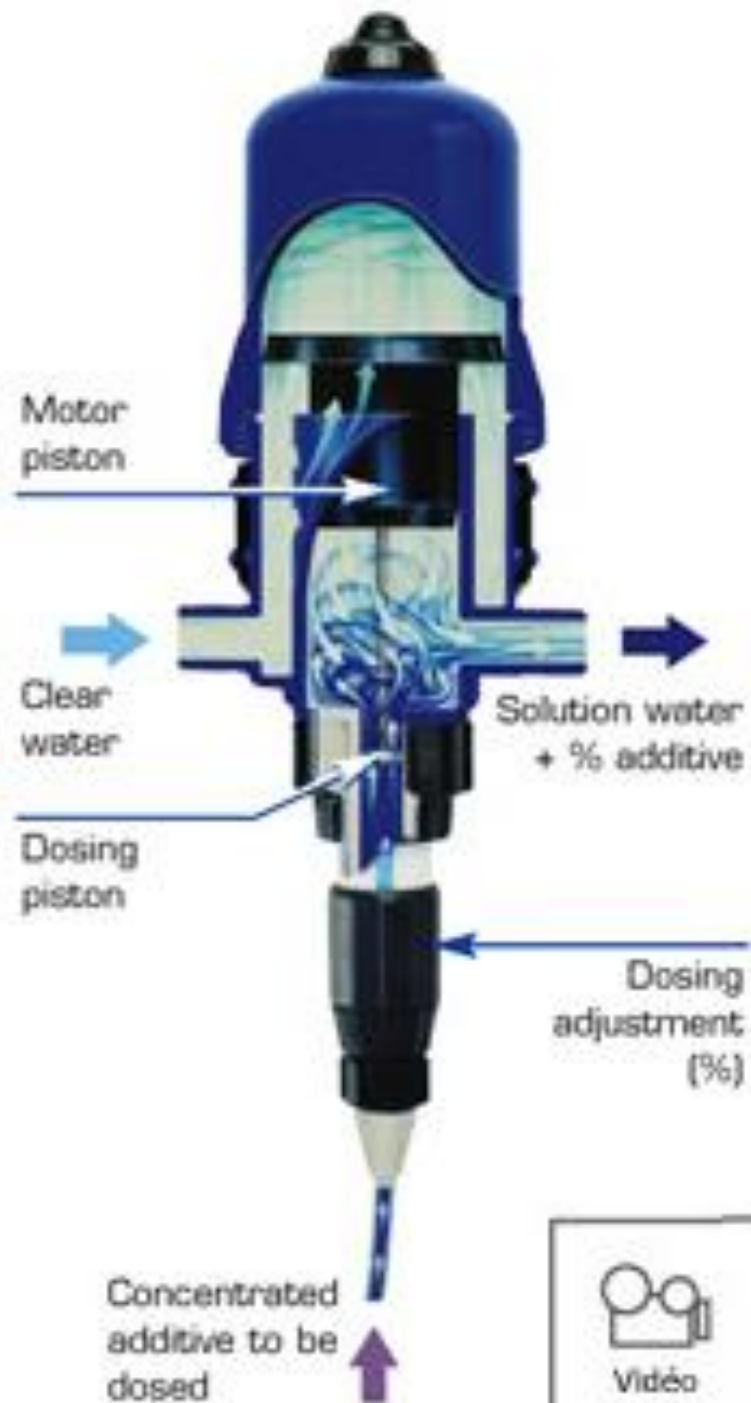
04/09/2010





# Fertility

- Cropping cycle often shorter so care with organic or slow release fertilizer
- High density should impact fertilizer recommendations ..... But how???
- Small raised beds require careful calculations and measurements
- Salt buildup can occur
- Normally split between preplant and fertigated







04/09/2004







04/09/2010











04/12/2010





# Spacing issue

- Tunnels are vital real estate
  - Tight spacing needed for high yields
  - Tighter spacing can increase insect and disease problems
- Tighter spacing may impact cultivar performance



Empire

Chocolate Ch

04/19/2010













# Training and Trellising

- The value of the space dictates careful consideration of training systems
- Cultivar selection may predicate the type of training system i.e. tomato
  - Determinate
  - Indeterminate



















06/02/2010







06/03/2010





# Pollination







05/08/2011







04/09/2004







09/28/2012





09/28/2012





# IRRIGATION



# Irrigation

- Likely used to deliver fertilizer
- High density and warm temperatures can result in relatively high demand particularly as crop is maturing....some growers will use twin tapes
- Needs to be MANAGED otherwise still may experience BER and cracking





# Ventilation & Circulation





# Shadecloth



# Hydroponic Production

- Plants grown without soil
- Allows production on sites with contaminated, poor or no soil.
- Soil pathogens not a factor
- Early yields
- Large yields
- Quality produce





21/05/2012







28/06/2012







# If you have questions ...

- University of Illinois Extension Local Food Systems and Small Farms team
  - <http://web.extension.illinois.edu/smallfarm/>
- USDA's Start2Farm site
  - <http://www.start2farm.gov/>