Greenhouse - Q and A

TIPS and ADVICE

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Ask the Experts

Question : What are some tips and recommendations and choices for roof venting ??

Part Two

Part Two

How much vent area do I require ???

The general recommendations are 15% to 20% of roof area. And remember, one should base it on the fact that there is no wind allowance.

To get into the nuts and bolts. Lets look at an example.

Say a grower is planning on building a 10 bay gutter connect project that is located near Fort Wayne, Indiana. The project is comprised of 30' long gutter houses each 240 feet long for a total area of 72000 sq. ft . and wishes to use only roofing vents for cooling.

Environmental Data for the site is 92 deg. F DB/73 deg. F wet bulb summer outdoor design-4 deg. F winter outdoor design, the project is located at 41 deg. F north latitude at a elevation of 381 feet above sea level.

The grower expects the inside temperature at crop level ever to exceed 10 deg. F more than the outdoor conditions. The max. solar load on the project is 15,445,000 BTU's on June at 12:00 PM and at this time the air temperature up at the vents is 40 deg. warmer than outdoor air. 1/2 of the total solar gain is offset with plant evaporation

Vent area by Rule of thumb = 72000 sq. feet X 0.20 = 14,400 sq. ft total or 1,440 sq. feet. per bay.

Let's see how the rule of thumb works out.

By ASHRAE standards.

Using Q=H/((60Cp * Ad * (Ti-To)), where Q = cfm air flow, H is total heat (BTU's/hour), Cp is the specific heat of air, and Ad is density of standard air.

= 7,722,500 / (60 * 0.075 * 0.245 * 10) = 700,453 CFM. We will use 700,000 CFM (CFM = cubic feet per minute) / (330 cubic meters / sec)

A check based on air flow rate of 1 AC/min = 72000 * 8 * 60 / 60 = 576,000 CFM

So ..... here we have it we need around ..... 700,000 CFM air flow. (Min.). We will not use the good old rule of thumb. Cause most modern greenhouses have higher side walls .

Now remember the flow equation back in part one .... the fun begins.

First ...

The grower wishes to build this structure with 1/2" per 12 feet slope along the gutter line for roof drainage. This creates a roof differential of 10 ". The vents have a range of movement of 24". This creates a max. height differential of 10/2 + 24 = 29" = 2.4 feet.

Using the equation from part one and redefined to find area:

Vent area A = Q / (C * sq. root h * (Ti-To/Ti)), where Q is air flow in CFM, C is constant = 14.6, Ti is indoor temperature, To is outdoor temperature, H is height difference between inlets and outlets and A is the area of inlets or outlets in sq. feet.)

A = 700,000 / (116 * sq. root (2.4 * (142-92)/142))

A= 6,564 sq. feet. (Total free area of inlets or outlets.) Or say 13,000 sq. feet total. (1/2 of area for intake / 1/2 the area for exhaust)

The grower concerned about the indoor ambient temperatures decides that they'd like to build in a bit of safety factor on the vent sizing. Who knows maybe in the future he may consider insect screening, which will limit the vent flow capabilities.

Well he could increase the size of the vents.

Add to low level vents or simply add more roof vent opening.

Or:

Consider this..... Instead of building the house with a 1/2" slope per 12 feet. Let's check out what slope of 1" per 12 feet will do, using the same conditions. After all, this wouldn't cost the grower anything.

A 1" per 12 foot drop will create a roof differential of 20 ". The vents have a range of movement of 24". This creates a max. height differential of 20/2 + 24 = 34" = 2.8 feet.
Using the equation from part one and redefined to find area:

Vent area A = Q / (C * sq. root h * (Ti-To/Ti)), where Q is air flow in CFM, C is constant = 116, Ti is indoor temperature, To is outdoor temperature, H is height difference between inlets and outlets and A is the area of inlets or outlets in sq. feet.)

Q = 14,400 ft. feet* (116 * sq. root 2.8 * (142-92)/142)) = 1,658,000 CFM

Notice: just by virtue of the increased elevational differences along the length of the gutter, a large increase on the vent air flow rating results.

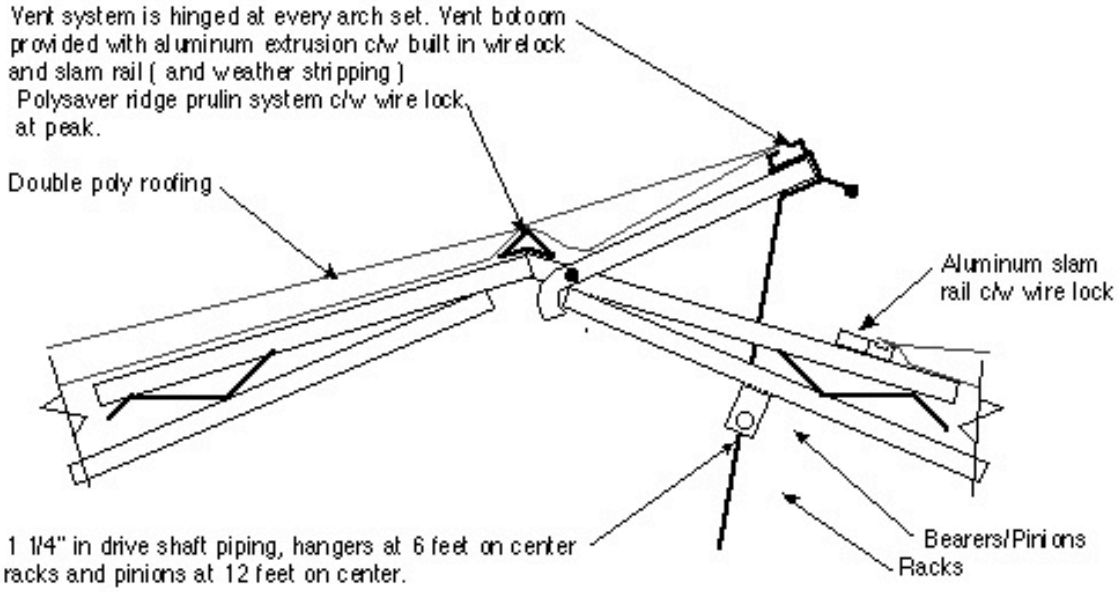
This would allow the grower to keep the house cooler or to add future insect screening in the future to the vent. (Insect screening drastically reduces air flow). Flow Constant C is reduced from 116 to 45. This would mean that if screening was added the vents could safely flow 643,420 CFM per sq. foot. (This is close but workable.)

The nice thing about this approach is that it won't cost the grower extra to make this decision when he constructs the greenhouse.

This approach is simply wise planning.

Common Venting Methods

Double Poly Roof Vent System



Vent in Open Position
Reinforced Arch Shown

Double poly ridge vent systems are provided in widths of three and four feet for the length of the house.

The vents are comprised of arch pivots placed at 6 feet on center (to match arch spacing), pivots and attachments, aluminum base rail c/w built in wire lock and flashing, aluminum slam rail c/w built inwire lock, corner windbracing, end arch pivot provide with end flashing for air seal air gable ends. Inflation jumper kits are provided to double poly vent inflation.

Motor operator (manual or automatic must be ordered separately.)

This vent is of similar configuation as our gutter vent with exception of vent wide and curvature on vent arms.

Reinforeced arches showen are for 21 foot, 24 foot and 27 1/2 foot models. The 30 foot model is similar with exception bottom cord of arch carries through right to reinforced ridge bracket. See arch profiles.

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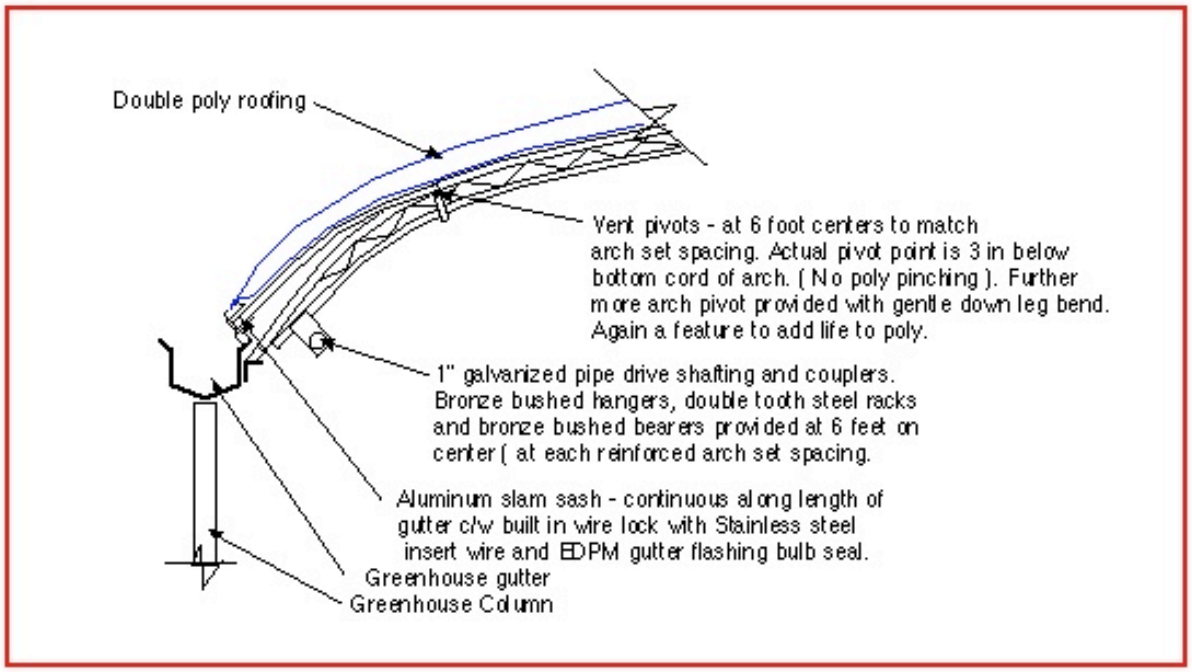
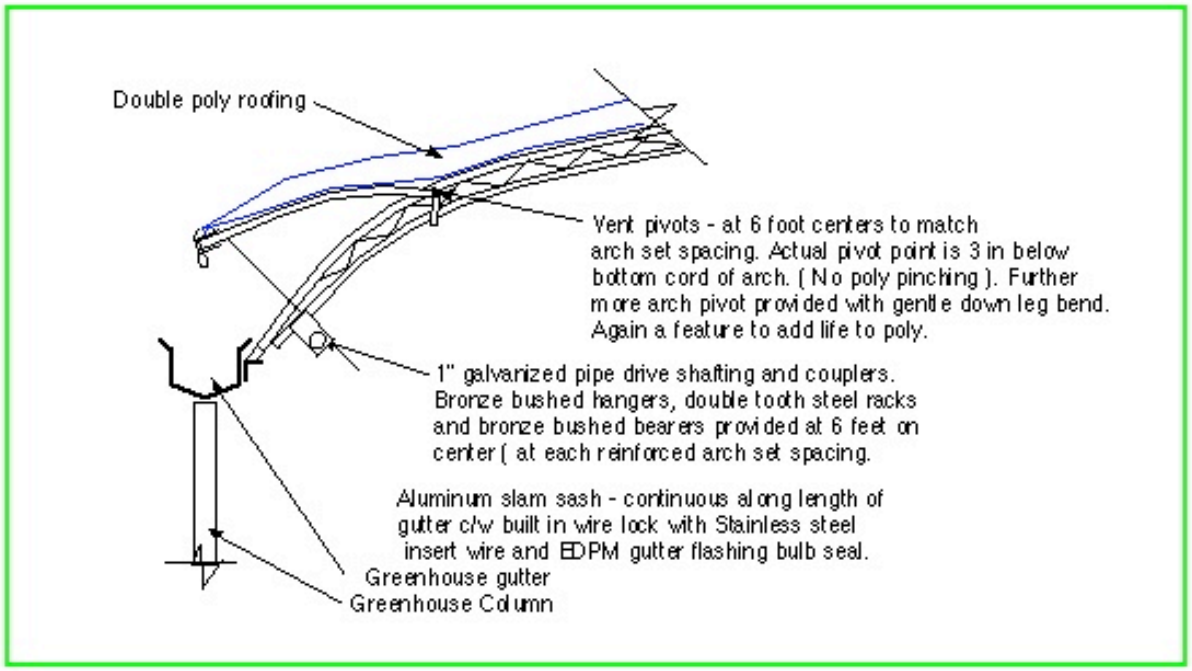
Double Poly Gutter Vent Systems



Vent In Closed Position



Vent In Open Position

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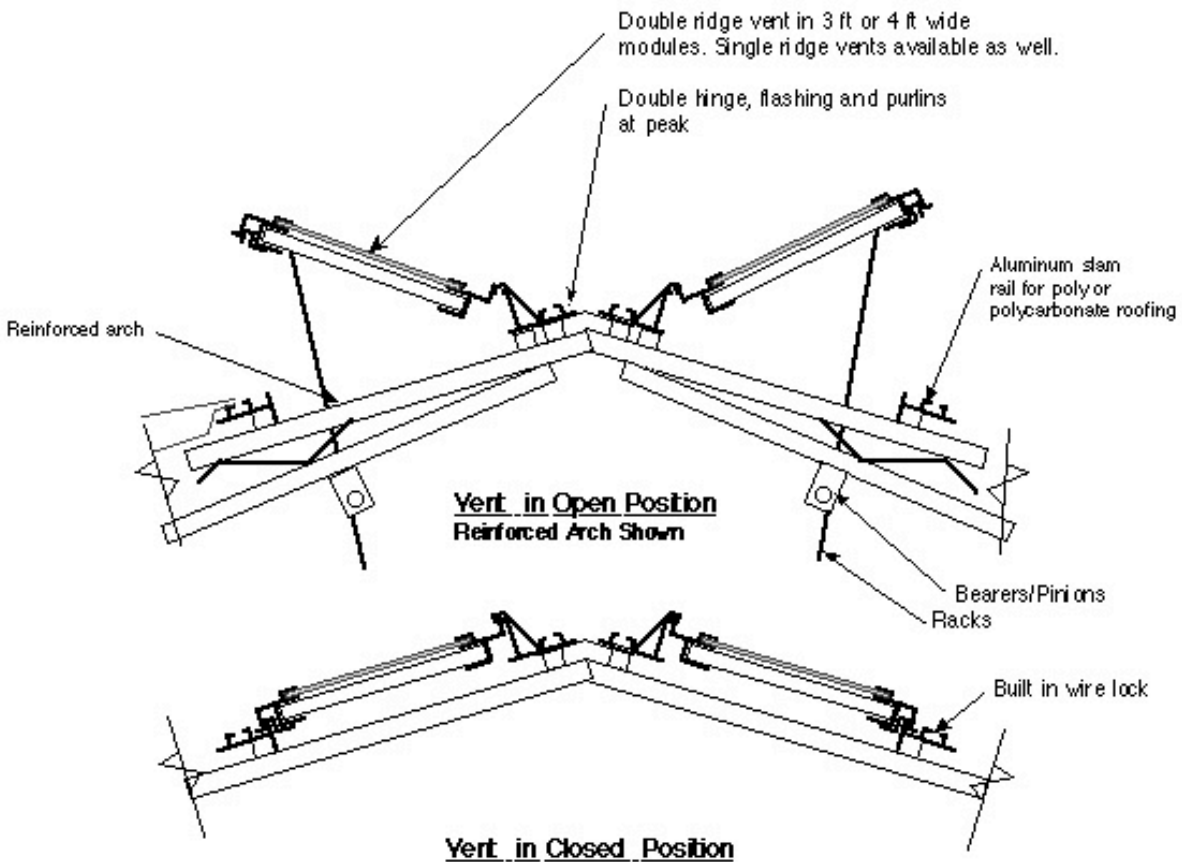
Ridge Vent Option



Ridge vents are available in modular lengths of 12 feet in 3 or 4 foot widths. They can be ordered in a single vents for double vents as shown above. Vent packages are comprised of aluminum continuous hinge, aluminum header and base frame, 1" square aluminum hortizontals placed at 2 feet on center, aluminum side shields and gaskets, 6 mm polycarbonate cladding, aluminum slam rail with built in drip, 1 1/4" galvanized pipe shafting, racks, pinions and bearers at 6 feet on center. Vents come assembled in 12 or 24 foot lengths to suit order.

On special order the vents came be ordered without polycarbonate and provided with double poly package.

The ridge vents can also be used on any of our freestanding greenhouse structures.

On poly clad greenhouses ridge vents usually run the full length of the building. In snow belt areas ask for our snow dam option. This will save the roof poly from ice sliding off vents and tearing the poly.

Our double ridge vent provides 8" flashing on roof. This flashing provides a walkway for those that poly the roof. A real time saver, when it comes time to pull poly.

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Consultants, Suppliers and Installer to the Commercial Greenhouse Industry