



GROWER 101

Structure Basics, Part I: Helpful Hints on Glazing

If you're thinking of adding some new structures this winter, this, the first in a three-part series provided by NGMA, will get you started in the right direction.



By National Greenhouse Manufacturer's Association

What is greenhouse film?

Greenhouse film is generally ultraviolet-protected polyethylene (similar to sandwich bags) with a thickness from 2-8 mm in the United States.

What are the three different categories of glazing?

Type I: Thin films, generally from 2-8 mm (0.002-0.008 inch), normally double-layered and air-inflated. Examples: Polyethylene, EVA (ethylene vinyl acetate), polyvinyl chloride and polyvinyl fluoride .

Type II: Flexible plastics such as fiberglass-reinforced plastic (FRP), acrylic and polycarbonate panels, and the "ladder profile" type structured materials such as polycarbonate, acrylics and laminar composites of both.

Type III: Rigid materials. Glass, including annealed, tempered and laminated forms of float, sheet and rolled (patterned) glass.

What is polycarbonate?

A clear, impact-resistant, thermoplastic polyester of carbonic acid produced from dehydrated polyhedral penols.

What is polyethylene?

There are two major types with different chain structures: the stiffer, stronger, linear material — high-density or low-pressure — and the more flexible, lower-melting, branched polyethylene, known as low-density or high-pressure polyethylene.

What is acrylic?

Acrylic is a clear, weatherable thermoplastic generally polymerized from methyl methacrylate monomers.

What is polyurethane used in?

Polyurethane is used in foams, fibers, elastomers, sheeting and coatings.

What is the "U" factor? What does "U" value mean?

The measurement of time rate of heat flow per unit area under steady conditions from the medium on the warm side of the barrier to the medium on the cold side. The values used to identify the amount of heat passing through one square foot of material for each F-degree difference between indoor and outdoor temperatures. It is expressed in BTU/hr/sq. ft. per temperature difference.

What does PAR mean?

PAR is abbreviated for photosynthetically active radiation, which is the visible portion of the spectrum from 400-700 nanometers (a measurement of light) and is regarded by many horticulturalists as being critical for proper plant growth and development.

What are infrared and ultraviolet?

Infrared is light on the long-wave end of the spectrum. Invisible to the human eye, it is where the heat is found. Near infrared is around 780 nm and far infrared is 25,000-1,000,000 nm. Ultraviolet (UV) is the invisible radiation below the lower end of the visible spectrum. It initiates some chemical reactions, causes plant bleaching, causes sunburn to humans and degrades most plastics.

What is near infrared transmission?

Near infrared energy is the thermal solar radiation that adds to the heating of the greenhouse yet has less energy than far red. This infrared transmission from 700-2,500 nm is measured by procedures specified in ASTM E-903. ASTM is the Association of Standards and Test Methods.

What is medium/far infrared transmission?

Far infrared energy is the energy reproduced by the mass inside a greenhouse. Transmission rate of far infrared energy through a greenhouse covering affects the heat retention capability of a greenhouse. Five to 20 microns is the range of importance and 7-14 microns is the most critical area of that range as measured by procedures specified in ASTM E-903 modified.

What is total solar radiation?

Solar radiation is applicable to all glazing types. It includes the entire available energy in the near infrared waveband and is useful in calculating total energy gain in a greenhouse so heating and cooling requirements can be calculated.

How is solar/light transmission measured?

Solar/PAR values of controls and weather samples are measured by ASTM guidelines to determine the percentage of light transmission loss for a given period of time.

What are UV absorbers?

A chemical compound with the ability to selectively absorb UV radiation. When incorporated into plastics, it reduces the degrading effects of ultraviolet energy.

What does NGMA recommend for comparing potential plant growth?

The NGMA recommends that glazing manufacturers test and report the PAR data derived from a uniform test procedure that reports transmission between 400-700 nm and below.

What is the best covering material for my greenhouse?

How are flexible plastics tested for strength?

Flexible plastics, like those used on greenhouses, are tested for strength and control using Association of Standards and Test Methods (ASTM) guidelines. The plastics are tested for tensile strength, flexural strength, flexural modulus, impact resistance, hail resistance and impact resistance.

What is the best covering material for my greenhouse?

It really depends on location, climate, type of crop, time of year you grow, number of square feet to be covered and budget.

When is poly film the right choice for covering a greenhouse?

Poly film is the least expensive covering and has the advantage of additives that can reduce heat, light intensity and condensation. Light transmission varies but is generally a few percentage points less than glass. Replacement averages around 4-6 years.

Should I cover my greenhouse with polycarbonate?

Polycarbonate has the advantage of being less expensive than glass, has an approximate life of 20 years and is hail-resistant. Disadvantages are possible loss of light transmission over time;

however, today's clear polycarbonates should not yellow for over 10 years and offer around 85-percent light transmission.

When is glass a good choice?

Glass has the advantages of high-light transmission (approximately 92 percent when clean) and durability and the disadvantages of being the most expensive and shattering in a strong hail storm.

Why is anti-drip important, and does it last?

Anti-drip reduces incidence of moisture-dependent diseases and damage to delicate crops. It ensures high light quality during the critical, early morning hours. Today, polycarbonate anti-drip systems can last as long as 10 years and films up to four years, depending on moisture demands.


Can a product be made to withstand hail?

Yes, some polycarbonates are made to withstand hail. While initially more expensive, in areas with a high probability for hail, it can be worth the extra investment.

Is there a covering made that will reduce heat in the greenhouse?

Yes, one poly film can actually reduce the heat in the greenhouse. Utilizing film additives, heat is actually reflected away from the greenhouse. Simple light diffusion results in averaging leaf temperatures, which helps plants withstand heat.

Are there any government regulations regarding greenhouse coverings?

Yes, OSHA governs the installation of greenhouse coverings, and building permits may be required depending on local zoning and codes. 

For additional information on new greenhouse structures or equipment, check out www.ngma.org or call the National Greenhouse Manufacturer's Association at (800) 792-NGMA.