

Preparing your Greenhouses for a Hurricane

A hurricane gets its energy from the condensation of the water vapor of the tropical atmosphere in West Africa or the Southern Gulf of Mexico into droplets. Once rotation is initiated due to instability in the atmosphere, the latent heat is released and creates a huge wind force and precipitation potential.

It takes over 8000 Btu to change a gallon of water into vapor. The cyclonic action of the eye of the storm carries the moisture up to great heights where the air is much cooler. This heat is released when the moisture condenses back to a liquid (rain). When you consider that some hurricanes have dumped over 30" of rainfall, you can see the huge amount of energy that is released.

Hurricanes develop almost every year. The period from July to October is the most active. Frequently these storms curve away from the east and west coast but almost every year one or more make landfall somewhere in the continental U.S.

The wind causes the most concern to the greenhouse industry. The minimum wind speed that is needed to classify a storm as a hurricane is 74 mph, but storms with winds of over 200 mph have been recorded.

Site exposure, height, shape and roof slope affect the wind load that a greenhouse can take without sustaining damage. Although most greenhouses are designed for a minimum 85 mph wind load, gusts can damage large sidewalls at even lower speed. I have seen both hoop houses and gutter-connected greenhouses that have been damaged by winds that were estimated to be only 60 mph. I also have pictures of both styles of greenhouses that were overturned by similar force winds.

Although we have no control over the force or direction of severe winds, here are a few tips to help minimize storm damage:

1. **Check the area for loose objects** – anything that can be picked up and hurled through the glazing should be secured or moved indoors. Boxes, flats, pieces of sheet metal or plywood can create a large hole that will allow the wind and rain in. Metal chimney (stovepipe) sections should be removed, braced or secured with sheet metal screws.
2. **Inspect for dry or weak tree limbs that could fall on the greenhouse.** Use common sense and safety equipment when working in trees.
3. **Close all openings including vents, louvers and doors.** You double the effective force of the wind when it is allowed inside the building. The wind on the outside puts a pressure or lifting force on the structure. The wind that gets inside tries to force the walls and roof off.

4. **Check all structural joints and bracing.**- Tighten the bolts on collar ties, truss supports, purlins and foundation brackets. It is surprising how many of these work loose over time. On hoop houses and gutter-connected greenhouses inspect diagonal bracing and tighten bolts or cable turnbuckles. This is important to prevent the greenhouse from racking end to end. If your greenhouse does not have bracing, install 2 x 4's, tubing or cables from eave to foundation. The bracing should be secured to each frame with bolts or clamps.
5. **Inspect glazing splices and barcaps** – Check that screws are in place and tight. There is considerable lifting force on large sheets of glass or plastic panel.

On poly houses there are several additional measure that can be taken

- **Increase the inflation pressure slightly** by opening the blower's intake valve. This will reduce rippling in the plastic. Be sure the plastic is attached securely and that any holes are taped.

Disconnect the arm to the motor on all ventilation-intake louvers and tape the shutters closed. Then turn on enough exhaust fans to create a vacuum in the greenhouse. This will suck the plastic tight against the frame. All doors should be securely closed.

Supplies to have on hand:

Several days' supply of fuel for your backup generator. Start the generator to see that it will operate properly. Take care not to back feed to the utility company power lines.

- Duct tape for tears in the plastic, broken glass, etc.
- Plywood and fasteners for doors and vents that may blow off.
- Flashlights and spare batteries
- Battery operated radio

Remember:

An 80 mph wind can produce a pressure of 16 pounds per square foot. For example, the 12' x 100' sidewall of a gutter-connected house would have to resist a 19,200-pound load.

An 80 mph wind blowing perpendicular to the side of a 28' x 100' greenhouse can create a lifting force of 220 pounds per square foot of length or 22,000 pounds overall. When you consider that the total weight of the greenhouse is about 6,000 pounds, each foundation post must have a withdrawal resistance of about 300 pounds.

Although we cannot presently harness the energy of a hurricane, we need to recognize the large forces that are generated. Preparation before a hurricane strikes can help to keep damage to a minimum.

John W. Bartok, Jr., Extension Professor Emeritus & Agricultural Engineer, Department of Natural Resources and the environment, University of Connecticut, Storrs CT - 2015