

# *Poultry Engineering, Economics & Management*

## Newsletter of the National Poultry Technology Center, Auburn University

### ***Critical Information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management***

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## Can Your Trusses Be Trusted?

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Recent storm events caused serious damage on numerous poultry farms across the Southeastern U.S. From the snow storms early in the year to the infamous April 27th tornados that especially hit Alabama hard, this region's poultry structures have "weathered" more than their fair share of storms. A lot has been learned from these storm events. Both good and not so good aspects of poultry house construction have been brought to light. The industry has seen some houses take minimal damage in the face of heavy storm impact while some houses sustained substantial damage – up to total structural failure - from seemingly lighter storm activity. The obvious question to ask is "What exactly was learned from this?" The answer has two parts:

1. There is no way to totally remove all weather related risk from a poultry grow-out structure. There is no poultry structure that anyone can design or build, suitable and affordable for poultry production, that will withstand a direct hit from an EF-3 or greater tornado.
2. One can, however, remove a large portion of the risk by building to the International Building Code (IBC) design criteria and carefully monitoring the process to insure it is carried out properly. The IBC guidelines are based on weather data for specific regions over time. By building to IBC regional standards, growers can have a high degree of confidence that their poultry houses will be capable of standing up to the types of severe weather events accounted for under these guidelines.

We at the NPTC are keenly aware of the impact these facts will have on our region's, and the nation's, poultry industry. It is imperative for all stakeholders involved – grower, integrator, banker and insurer alike, to benefit from the lessons learned from the recent storm activity. In this newsletter, we will leave the question of future building standards for later discussion, focusing on the more immediately pressing question, "In light of these lessons learned, what should growers be doing now to protect their existing houses from the future storms that assuredly will come and may be even more severe?" We note that this applies to all poultry farms, not just those hit by the recent storms.



**The poultry house attic is a critically important part of the house and is the most often overlooked. In a worst case scenario, a single failure of a single truss member could eventually cause the total collapse of the house.**

**Growers should thoroughly inspect truss systems on a regular basis to spot weaknesses on their way to becoming disasters.**

**If repairs are needed or have recently been done, growers should make sure they are done properly, closely inspecting houses following repairs.**

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## Looking for potential problems? Good idea – Start in the attic

INSPECT THE ATTIC REGULARLY should be on every grower's house management priority list. This point cannot be overemphasized. More specifically, after any major wind or snow event, an attic inspection should be high on the list of priorities. The only way to avoid catastrophic events is close inspection and proper repair.

It is probable that poultry houses that sustained repairable damage from the recent storm events will have had repairs completed by now. Assuming that those repairs were made by reputable contractors under close supervision of the farm owner, those growers are back to "business as usual." However, for every grower out there who sustained damage, a strong word of caution is warranted – Make sure your repairs were made properly and will stand the test of time and future storms.

We encourage every grower to closely inspect his poultry houses after a repair has been made. Good craftsmanship stands out. Poor craftsmanship does as well. Unfortunately, the nature of a poultry house allows for some aspects of poor craftsmanship to be hidden from normal view. The first and easiest place that poor craftsmanship can be hidden is in the poultry house attic, which too often suffers from "out of sight, out of mind" neglect. The attic area is also where the most critical damage can be hidden from normal view.

In a worst case scenario, a single failure of a single truss member in the attic could eventually cause the total collapse of the poultry house. Unaddressed failure or weakness of one member will cause undue stress on the attached members and adjacent trusses, eventually leading to a much more widespread failure. In the photo on the front page, for example, failure in the bottom chord of one truss put excessive load on and caused failure of adjoining trusses in a kind of domino effect, almost literally "unzipping" the house..

### What causes minor failures that turn into major ones?

Storm events, including heavy snowfall, winds or rain, are a common cause of minor structural problems in the roof system, problems which may exist even if no major damage is visible from the outside. The other main cause is the normal aging and degradation of the wood structural members and the fasteners associated with them. When moisture from roof leaks or ceiling holes is introduced into the attic, this degradation process is accelerated.

Knowing what to look for is important. The galvanized metal nailing plates that hold the truss members together are a main area of concern and should be closely inspected. The increased stress they are put under during a wind or snow event can cause them to pull loose from the truss. Moisture from roof leaks or inside air leakage into the attic can cause corrosion on these truss plates and lessen their holding ability. If one of these nailing plates begins to pull out, the truss will deform so that it is no longer carrying its designed full load. This will cause increased stress load on the adjacent trusses, which can over time cause those trusses to fail – eventually leading to collapse.

That domino effect is why it is so important to spot and repair truss weaknesses or failures. The key is to make the right repair at the right time.

### Repair, or replace?

One must first decide if repair of the existing truss is possible or if truss replacement is needed. If multiple parts on any one truss have failed, then replacement of that truss is highly recommended. It is generally not recommended to scab a broken top or bottom chord without an engineer's inspection and recommendation to do so. When in doubt, opt for replacing the truss. Replacement can usually be accomplished by simply removing the metal roofing over the broken truss/trusses and moving a new truss into position beside or in place of the broken one.

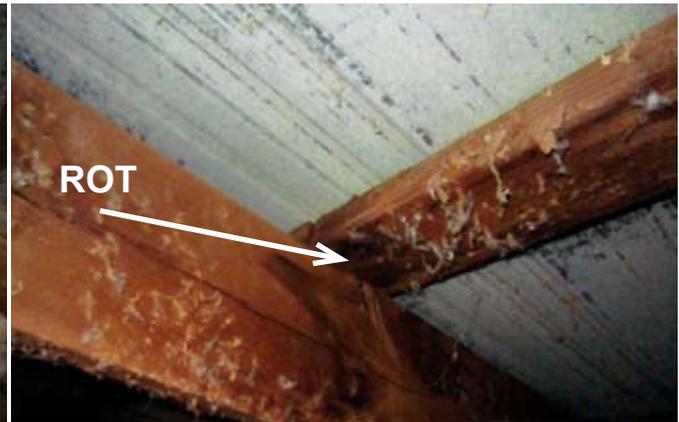
### Repair mistakes you don't want to make

It is important that any repair make the truss as strong, or stronger, than it was originally. An inferior repair will only delay the inevitable failure of the system. The truss must first be pulled back into a position that matches its original shape as closely as possible. Then any nailing plates that are loose must be plated over with plywood. The mistakes made most often with this repair are:

1. Plating the truss joint with lightweight plywood or OSB;
2. Using plywood pieces that are too small;
3. Plating only one side of the truss: and
4. Not using enough fasteners.



Photo above shows an acceptable truss repair in progress. The plate is 3/8-inch plywood of significant size being applied with numerous fasteners on each truss member. This repair will be complete when a matching plate is similarly applied to the other side.



Moisture is the enemy in a poultry house attic. Humid “bird air” like that leaking around the attic access panel in the left photo causes the metal nailing plates to corrode and wooden members to show early signs of rot. Roof leaks seen in the right hand photo can also cause truss members and purlins to rot.



The truss plates on these trusses are in the first stage of failure, beginning to pull out and allow the trusses to deform. Neither of these trusses showed any sign of a problem from the outside of the house. Only through close attic inspection can this be found. This may be the result of a storm event or normal aging.

Photo at right illustrates an inferior repair attempt. Notice the bottom chord of the truss on the left hand side down in the insulation. The 1/4-inch finish plywood plate, on one side, with a few nails, did not hold this truss together as the grower intended. This repair might have been successful if the plates had been 3/8-inch thick plywood, installed on both sides of the truss, and a sufficient number of fasteners installed.



Photo at left shows an acceptable plating repair of a truss whose center metal truss plates had come loose. Numerous screws were used instead of nails in the plywood plates. A matching plate on the other side makes this truss as strong or stronger than it was prior to the damage. However, these large plates do restrict attic access for future inspection.

## Making repairs you can trust

Applying plywood plating is a key repair strategy: use at least 3/8-inch plywood (not OSB) cut to at least two times the size of the metal nailing plate being repaired. A plate needs to be fastened on both sides of the truss with not less than six 1-1/4 inch 12d nails in each lumber member under it.

While it is generally not recommended to scab a broken top or bottom chord, broken interior web bracing members can be easily scabbed. Make sure such scabs are at least half the original member's length and fastened with at least six 16d nails on both sides of a break or crack.

Growers should also look at the lathe or purlins while in the attic. Check for rot, breaks or pulling up from the truss. While single instances of lathe failure usually are not much to worry about, multiple failures in the purlins can add to the stress on the truss system and contribute to a total failure. Such lathe failures can be symptomatic of larger roof failures. If multiple lathe issues are found, closer inspection of the remaining roof system is needed.

Once the attic has been thoroughly inspected, some inspection time on the roof is necessary. Check for loose nails and screws over the entire roof. Roofing nails and screws naturally back out over time. They can be easily replaced or repaired as needed. This type of backing out will usually be seen scattered in no particular place or order over the entire roof. However, if you observe a high percentage of nails or screws backed out in one particular area and other adjacent areas appear normal, then there may have been a weather event that caused some damage. Further inspection is needed in this case, particularly in the attic.

As has been mentioned, one of the main causes of roof system failures is roof leakage over time. One minor leak is nothing to get upset about, but multiple, persistent leaks in a confined area can lead to other damage in the future. If found and addressed quickly, repairs are typically minor in these cases.

## The Bottom Line

No poultry building will last forever. However, it is of utmost importance to the poultry grower operating in the current economy to maximize the usable life of his poultry house. The one factor most limiting this lifespan is maintenance and upkeep. The truss system in the attic is the most critical element contributing to the structural integrity of the roof and the house as a whole. The best weapon the grower has to fight this battle is constant vigilance.

Making it a habit to inspect the building – and especially the truss system in the attic – with “fresh eyes” from time to time can make growers aware of issues while they are small and repairable with the least amount of time and money.



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