Leaning Broiler House Foundations: An Affordable Solution?

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Acknowledgements

- Georgia Farm Bureau Insurance

Poultry house failures

- Most poultry house structural failures are not caused by a single structural issue or weather event.
- Failures are typically caused by a combination of a weakened structure and a major weather event.
- Foundation problems are a key issue in many failures
- We can improve future foundations, but what do we do for existing problems?

1) Foundations

- The integrity of the foundation is critically important to the overall strength of a structure.
- The foundation should not be neglected because problems with foundations can cause problems throughout the entire structure.

Often what looks like a truss failure, is actually a foundation failure

Even when it is not the main cause...it is often a contributing factor
1) Foundations

- A foundation is only as strong as the soil underneath and around the foundation.
- The soil on which a foundation sits should be:
  - 1) well-drained
  - 2) free of organic matter
  - 3) have a uniform bearing capacity

If the soil beneath the foundation is substandard….

- The overall structural integrity of the building will be compromised.
- The soil must be able to carry the weight of the structure, equipment, and snow without significant compression.

When soil compression occurs…

- the structure moves…

To help insure overall house stability

- The minimum depth of a poultry house foundation should be 12 inches.
- The depth of the footing is measured from the surface of the ground to the bottom surface of the footing.

Soil around the foundation helps to support the soil underneath the foundation.

reducing the overall structural integrity of the poultry house.
A concrete stem wall is a house’s foundation

Concrete stem wall houses

- The stem wall is the foundation and therefore the bottom of the stem wall should be 12” below the surface of the soil.

A trench can help to insure proper foundation depth

Soil drainage around a foundation is very important

- Saturated soil has little strength to support a poultry house foundation in the vertical direction so a house will tend to settle over time.

Soil drainage around foundation is very important

- Saturated soil also has little strength to support a poultry house foundation in the horizontal directions.
The lack of horizontal foundational support...

Both of which can lead to failure when a load (snow/wind) is applied to the structure.

...can lead to rotation of the entire side wall or...

Drainage

- If the soil in the immediate vicinity of a poultry house is chronically saturated with water, foundations are prone to settling and rotation issues which can lead to a structural failure when loaded.

Foundations – exterior grading/erosion

- The bottom portion of a poultry house foundation must remain covered with soil.
Foundations – exterior grading/erosion

- The ground around a poultry house should slope away gradually (i.e., 1/12) to help direct water from the roof away from the foundation to prevent erosion.

- It is generally recommended that the horizontal distance from the edge of foundation to the face of any steep slope (i.e., 3/12+) be a minimum of five feet.

- Ground in the immediate vicinity of the foundation should be protected from scouring due to rain water flowing off the roof of the poultry house through the use of vegetative ground cover.
rocks/stone

Interior grading is equally important
- It is important that an interior foundation depth of 8” to 12” must be maintained in order to maintain proper vertical and lateral support.

Large rocks near steep slope to prevent erosion

Foundation – Interior grading
- Differences between interior and exterior grades can result in uneven loads being applied to the foundation possibly leading to foundation rotation.

Or gutters

Foundation - interior grading
- The foundation must be protected from damage from clean-out equipment or exposure of the foundation due to removal of soil from the floor.
Top of block wall foundation at interior grade

Rotational cracking

Minimal interior foundation depth of concrete stem wall

Foundation - rotation
- Rotation of the foundation wall is normally caused by poor soil conditions. In many cases this rotation is caused either by the poor underlying soil or by poor grading/erosion around the foundation.

Cracking in concrete stem wall

Based on observations the following criteria are suggested...

<table>
<thead>
<tr>
<th>Rotation of the foundation (degrees)</th>
<th>Suggestion</th>
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<tr>
<td>Less than 5 degrees</td>
<td>Not a major concern</td>
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Approximately 9 degrees of rotation

Severe block wall rotation

House damage by concrete block wall rotation

Keep in mind that concrete stem walls are tapered (typically 87 degrees)

Severe concrete block wall rotation

Solution for rotated foundation?
Solution for rotating foundations

Possible fix for rotating foundations

Possible fix for rotating foundations

Treated 4 x 4’s

Dumb mistake #1. Don’t put threaded rod near a large knot.

Possible fix for rotating foundations

Steel Struts
Steel Struts

“The Claw”

Measuring the stress

Final Design – 4 x 6’s

“The Claw”

Control Room
Measuring Progress

- Crack in Control Room went from 1.25” to 0.56”
- Top of Foundation moved average of 1”
- Some points moved 2”

Challenges

- Must move entire wall
- Jagged cracks in foundation provide resistance
- Frame has shifted and does not want to shift back
- Drilling holes in concrete is tough

Successes

- Successfully reversed much of the foundation rotation
- Stabilized the wall to prevent further rotation
- Cost effective solution

Questions?

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