



Applied Poultry Engineering News

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Electrical Grounding for Broiler Houses

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Raising broilers is more challenging than ever before. Tunnel ventilation and electronic controllers are just two examples of new technology designed to help growers increase their control of the house environment and bird performance. More broiler houses are using expensive electrical equipment that can be destroyed or slowly damaged by voltage spikes. Proper electrical grounding forms the basis for a safe, efficient electrical system. Correct selection and installation of equipment will protect equipment and prevent human injury.

A grounding system provides an easy path for electrical current to return to its source. A grounding system should tie all non-current carrying conductors to earth ground (0 volts). The grounding system should present a minimum of resistance to current flow. For example, a corroded wire clamp attaching a ground wire to a ground rod might add 100 ohms or more resistance to a system.

Ground Rods

The purpose of a ground rod is to connect the grounding system to earth where current may be dissipated in moist soil. They should be at least 8 feet long, but a 10-foot rod is better. A longer ground rod will reach a soil with a higher moisture content. Moist soil carries current much better than drier soil. Placing a ground rod in moist soil is particularly important considering the drought conditions of recent years.

Ground rods should be either copper-clad or galvanized steel rods having a minimum diameter of 5/8" with a 3/4" diameter preferred. The larger the rod diameter, the lower it's resistance to current flow. The National Electric Code (NEC) mandates two ground rods unless you can show less than 25 ohms resistance with one rod.

Ground rods should be located close to the main breaker panel where they can contact moist soil. For broiler houses, this would likely be the drip line from the

roof or a low spot where water drains. If there is a creek bed or drainage area near the house, a ground wire may be run from the broiler house to a ground rod driven at this location.

It is important that there is only one grounding location where a rod or series of rods are connected by a ground wire. If there are independent ground rods there is an opportunity for a difference in ground potential between two rods. A ground rod dissipating current (from a lightning strike, for example) may cause current to travel through soil, enter an adjacent rod, and travel into that system to damage equipment.

To install the ground rod, first use a post-hole digger to dig a 6 to 8" deep hole. Drive the rod into the earth so that about 4" of rod remains above the bottom of the hole. A rod placed close to a house wall does not need to be driven below grade if it will not be damaged by lawnmowers or other devices. If it is impossible to drive the rod to the proper depth, it is acceptable to lay the rod horizontally, 2-1/2 feet below grade.

Ground Wire

The ground wire is a large copper wire that connects the main breaker panel bus to the ground rod. Typically, 6-gauge copper wire is sufficient. If the wire run is greater than 20 feet, 4-gauge wire should be used. The ground wire should be protected from damage from lawnmowers and vehicles. It should be buried (min. 6") for protection and enter the house as soon as possible. It is important that the wire not be cut; it should remain continuous.

Ground Clamps

Ground wires should not be merely wrapped around a ground rod. Ground clamps are used to attach a ground wire to a ground rod. The most common clamp is known as an acorn clamp. Make sure the ground clamps you select are rated for outdoor use. Do not use pipe clamps rated for inside water lines or hose clamps to attach the ground wire.



A typical ground rod, acorn clamp and ground wire installed above grade close to a house wall.

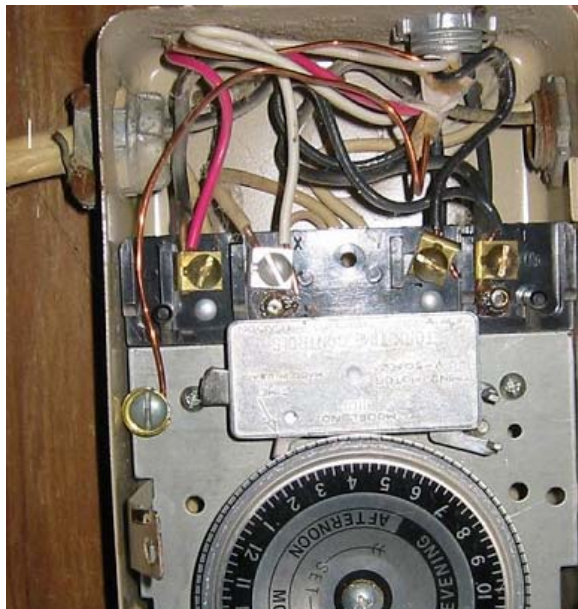
What Should Be Grounded?

Any equipment that is or could become energized, even accidentally, should be grounded. Current from lightning strikes objects in a random fashion. Accounts of lightning strikes reveal scenarios most of us could not predict.

Electric circuits in a broiler house should be wired with a 3-wire conductor consisting of hot, neutral and grounding wires. The grounding wire should be attached cleanly and securely to devices or systems to be grounded. The other end of the grounding wire should be attached to the ground bus on the main panel.

Metal conduit should not be used to carry a ground. The conduit itself needs grounding primarily because of loose fittings between sections of conduit. If metal water pipes are present, they should be grounded.

Receptacles in non-metallic receptacle boxes should have the ground wire attached to the ground screw on the receptacle. Only one wire is allowed under the ground screw on a receptacle to ensure proper connection to ground. If you have more than one wire feeding to the receptacle, these wires must be joined in a standard wire nut, then a single jumper wire connects the wire nut to the ground screw. For metal receptacle boxes, the box must be grounded. A ground wire should be added from the ground screw on the box to the wire nut. Jumpers known as “pigtailed” are available that have wire nuts and screws already attached.



Copper ground wire (left side) wrapped around ground screw inside an interval timer.

Ground screws on receptacle boxes should be painted green to indicate they are for grounding. Separate fasteners should be used for grounding and attachment of boxes.

Submersible pumps and metal well casings are required to be grounded. The grounding wire to the pump should be attached to the metal well casing which serves as a ground rod. If you have a non-metal casing such as PVC pipe, a 4-gauge copper ground wire should connect the pump to the ground rod or connected ground rods near the main panel.

It is also wise to have an electrician check for stray voltage from the grounding system to equipment and the poultry house structure.

Finally, remember that the purpose of any building or electrical code is to ensure basic human safety. It is wise to go beyond code in many situations to protect yourself, and your equipment and house investment.

The Newsletter Editor

This is the inaugural edition of Applied Poultry Engineering News. You may wonder who the editor of this newsletter is. Allow me to introduce myself; I am Gary Van Wicklen. I am a new member of the University of Delaware faculty. My title is Extension Poultry Production Engineer in the Dept. of Bioresources Engineering. I officially joined UD on September 1, 2002, but I spent a year at UD on a study leave from the University of Georgia, Dept. of Biological & Agricultural Engineering. At Georgia, I taught engineering students and did

research on poultry and swine housing for 21 years.

My office is located at the Research & Education Center on Rt. 9 between Laurel and Georgetown. Please feel free to visit with me. I can be reached at (302) 856-2585 x397. Although I am a UD employee, I am encouraged work with growers in Maryland and Virginia. I am fortunate to have a talented group of colleagues in industry and at the university to interact with who provide tremendous help for me. I interact with each of the four poultry companies on Delmarva as well as several equipment vendors. At the REC, I work with Bud Malone, Nick Gedamu and Stephen Collier. I also work with agricultural engineers located at the Newark campus: Dr. Norm Collins, Jr., Dr. Jim Glancey, and another recently hired faculty member, Dr. Eric Benson. We all have a common goal: improve the profitability of Delmarva's broiler industry!

Electronic Controller Workshops

Many growers on Delmarva have invested in electronic controllers for their broiler houses. These controllers have many features that can confuse the best of us! The University of Delaware is organizing instructional workshops to help growers learn more about their controllers. The initial workshops will start with the most basic instruction and will be suitable for anyone who has or is planning to get a controller. The workshops will be organized so that there will be:

- two students per controller,
- hands on learning,
- no more than 20 students/class,
- classes for specific controllers.

Personnel from controller manufacturers will be on site, but these workshops will not be a sales presentation. Our objective is for you to learn about and be comfortable operating your controller.

Please let us know of your interest in these workshops by calling Mrs. Jeanie Johnson at the REC, (302) 856-2585 x305.

Future Newsletters

The April edition of this newsletter will address the appropriate topic of evaporative cooling pad maintenance for broiler houses. To be sure you receive a copy, please send your email or mailing address to me at gww@udel.edu or to the Research & Education Center, 16684 County Seat Hwy, George/town 19947. Email is the quickest, surest way to receive the newsletter. We will mail paper copies of the newsletters to those that wish for a limited period. In the future, all newsletters will be stored on our poultry website currently under development.

Your Comments

Your comments regarding future topics for this newsletter, research topics for poultry engineering, or how this newsletter might be improved are appreciated. Please feel free to contact me through email at gww@udel.edu or by phone: 302-856-2585 x397.