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Sealing Concrete Foundation Air Leaks

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The Problem

A serious problem with many concrete stemwall and chainwall foundation poultry houses is air leakage at the top of the concrete curb. This allows unwanted air to directly enter the poultry house at bird level. This problem is typically caused in one of two ways. The first is inadequate sealing of the bottom wall plate to the concrete during construction. The second is the destruction of foam-type foundation seals by darkling beetles.

The two pictures at the top of Page 3 show a poultry house side wall at the foundation. The picture on the left was taken during a smoke test. The smoke shows outside air leaking into the house. The picture on the right shows exterior light shining between the surfaces of the concrete wall foundation and the bottom lumber plate of the side wall. The cause of the leak was damage to the foam sill sealer, originally installed between these two surfaces during construction, by darkling beetles over just a short period of time. The problem is that this air leak is likely to be 800 to 1,200 feet long. Leaks like this worsen the condensation problem on the concrete foundation in cold weather, cause litter moisture problems along the sidewall, allow cold-air drafts on the birds and increase heating system run times during winter. Leaks like this also allow outside air to bypass the attic inlets, sidewall or ceiling inlets, and tunnel inlets. It is a serious uncontrolled air leak which allows unconditioned and uncontrolled air to enter the house, and it needs to be repaired.

This particular problem exists in most houses that were constructed with concrete foundations. In the past, a foam sill sealer was used extensively to seal this void during new construction. Many house builders have now stopped using foam sill sealer and are using a variety of caulking materials to seal this void during new construction. But the problem still exists in houses that were constructed with the

Voids like this at the top of a concrete stemwall are fairly common in poultry houses built with foam sill sealers that have been destroyed by darkling beetles. Running around the entire perimeter of the house, the air-leak can easily be equivalent to leaving a man door wide open. Just walking around in the house, you can't see a crack like this. A closer inspection might show you where all those dollars have been going.

foam sill sealer. The gap or void between these two surfaces commonly ranges from 1/8 to 1/2 inch and changes as the building expands and contracts with temperature changes. So whatever we use to seal this void really needs to be resistant to darkling beetles, lend itself to being injected into a crack, and be flexible enough to stretch, yet maintain a good seal.

A Potential Solution

One product that we have recently tested to seal this void is made by BASF Building Systems and is called Sonneborn-Sonolastic NP. It is a polyurethane expansion joint sealant (equivalent products and brands may be suitable). This product comes in either a 10-ounce tube (NP1) for use with a common caulking gun or a 1.5 gallon pail (NP 2) that must be mixed on site prior to use and requires a commercial grade siphon type caulking gun. This product is made specifically for sealing expansion joints in commercial and industrial buildings, so it is made to withstand harsh weather conditions and maintain its flexibility. More information about this product and similar products may be found online at http://www.buildingsystems.basf.com/documents/np1_tdg.PDF.

We injected the void in a problem stemwall poultry house along the entire perimeter of the house foundation. One 10-ounce tube of sealer on average sealed 18 linear feet of the void around the foundation. This particular stemwall house required sixty 10-ounce tubes of sealer and approximately 5 man hours to complete the job. This included cleaning the void and applying the sealer around the entire perimeter of the house. The thermal images on the bottom of page 3 show that the sealant did, in fact, stop the air leaking into the house by totally sealing the void between the concrete and lumber plate.

Preparation and Installation

Before installing the sealer the void must be free of moisture, shavings, and darkling beetles to ensure that a consistent sealing and adhesion to the concrete and lumber are made possible. We recommend using a kitchen broom and a high velocity blower (leaf blower) to clean the void and prepare it for sealing. It is not recommended that any sealer be applied to the void if moisture is present on the concrete foundation or lumber seal plate. It is not recommended that excessive static pressures be placed on the house immediately after installing the sealer or before the sealer is allowed to cure.

The picture in the middle left of page 3 shows a grower injecting expansion joint sealant into the void between the concrete stemwall foundation and the bottom plate of the lumber wall. The picture on the middle right shows the void in the wall completely filled with the expansion joint sealer, thus achieving an air-tight seal between the two materials.

The bottom two pictures are thermal images that were taken before and after treatment of the stemwall foundation with expansion joint sealer.

The thermal image on the left shows the concrete foundation of a poultry house with cold outside air leaking into the building through the void between the concrete foundation and the bottom lumber plate. The black shading on the picture indicates cold air and the dark blue shades indicate the cold, moisture-laden concrete foundation. The labels show that the temperature difference between the top of the concrete wall where cold air is leaking in and the litter approximately 18 inches away from the wall is 16.5 degrees F.

The thermal image on the right is the same shot as the previous thermal image, but made after the void between the concrete foundation and the lumber wall was sealed with the expansion joint sealer. Notice that there is no air leaking into the building at the void as in the previous picture. The temperature in the building was higher in the picture on the right (+5 degrees F) due to the radiant heaters running in preparation for chick placement. However, with the air leak totally sealed, the temperature difference between the litter and the concrete/lumber plate joint where the void was reduced by more than 50%, to only 7 degrees F, an improvement of nearly 10 degrees.

The result, in addition to preventing cold outside air from chilling chicks, is that condensation along the stem wall is drastically reduced.

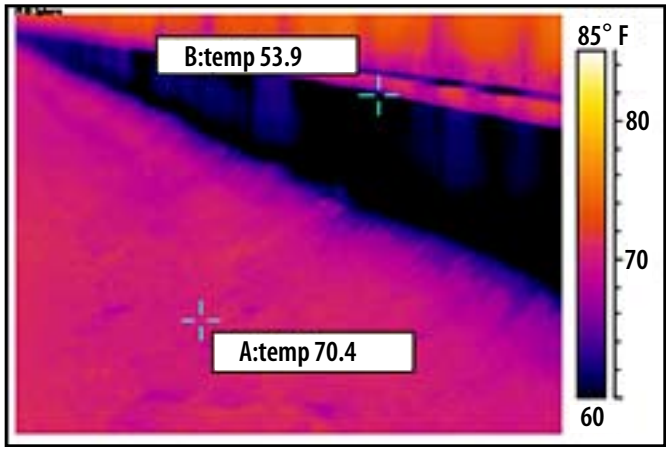
Regardless of house age, every poultry house should be checked for air leaks periodically to ensure the building envelope is intact and sealed. This can be done by conducting a static pressure test on

Solid wall house smoke test shows air leak between top of concrete foundation and lumber plate, probably caused by darkling beetle damage.

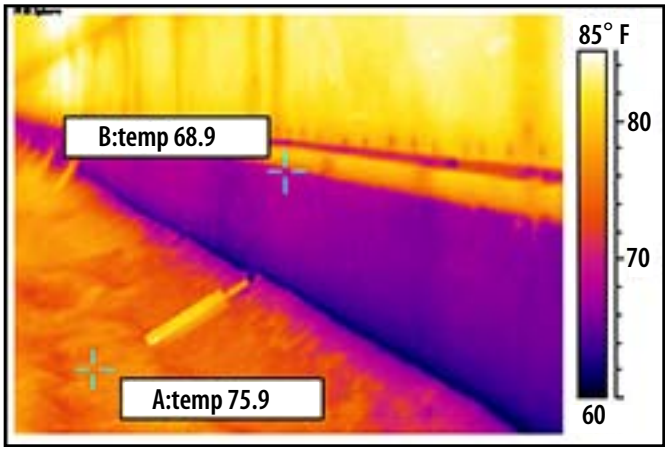
See-through void above foundation of solid wall house may extend around the entire house, an air leak easily equivalent to a wide-open man door.

Grower injects foundation sealant using an ordinary caulking gun. Voids must be thoroughly cleaned before applying sealant.

Freshly sealed void should be allowed adequate time to seal per label directions before applying static pressure.



Before sealing foundation air leak, thermal image shows a 16.5-degree F temperature difference between floor litter and the top of the concrete stem wall. The black shading indicates cold air coming into the house, and the dark blue shades indicate the cold, misture-laden concrete foundation.



After sealing foundation void, thermal image shows no air leaking into the house and litter about 5.5 degrees F warmer, with only a 7-degree temperature difference between floor litter and the top of the concrete stem wall. This is a temperature improvement of nearly 10 degrees.

the house. This means all vents shut, doors closed, fan shutters down, and all curtains tightened. Turn on 1 cfm of fan power for each square foot of house area. This means that for a 40 x 500 foot house (20,000 square feet), one 48-inch fan rated at approximately 20,000 cfm at 0.05 static pressure should be used. If you have a 54 x 500 foot house (27,000 square feet), you should use one 54-inch fan rated at approximately 27,000 cfm at 0.05 static pressure (or one 48-inch and one 36-inch fan) for the test.

The static pressure placed on the house should be very close to the same each time you check it and recorded somewhere for reference as the house gets older. If you cannot coordinate fan cfm's to house area exactly, remember which fan you used and make sure you repeat the same procedure each time the static pressure is checked. If the house tests more than 2-3 points in static pressure lower than the previous pressure test, this indicates a loss of house tightness and is definitely worth looking into.

Voids in the building around door frames, electrical and plumbing entrances through the wall, end wall or man door frames, around sidewall and inlet curtains, and anywhere else uncontrolled air leaks into the building envelope must be sealed to eliminate outside air infiltration into the building. These air leaks are typically a little more difficult to seal because they are typically much larger and inconsistent voids. Leaks like these may require some carpentry work and additional caulking or higher density spray foam rigs to seal the void permanently.

The Bottom Line

It is hard to put an exact dollar value on bird environment improvements, but cold air on baby chicks will definitely slow chick development, affect consumption of starter feed, and adversely affect litter conditions and paw quality. Additionally, sealing reduces gas consumption in cooler weather and promotes temperature uniformity in both hot and cold conditions. The product we tested can be obtained in bulk for between $4 and $5 per tube, making the total cost of properly sealing a house less than $300. The value of the resulting fuel savings and performance improvements will more than offset the treatment cost.

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