

# *The Poultry Engineering, Economics & Management* NEWSLETTER

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

Auburn University, in cooperation with the U.S. Poultry & Egg Association

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## Feature article

# Why Go to Wider Poultry Housing?

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Poultry growers face a somewhat different set of production and economic circumstances than most other agricultural producers. The main difference is that the bulk of the poultry grower's investment lies in the poultry structures and related equipment, and not in the underlying land and machinery, such as would be the case with most row-crop or livestock farmers. Further, the poultry house and its equipment play a major role in determining what kind of flock performance the grower will be able to achieve. Since the poultry grower's flock to flock revenue depends to a great extent on how his production efficiency directly compares with other growers, his housing and related equipment play a major role in determining how profitable his operation is. For this reason, poultry producers, and indeed all parties involved, including the grower, integrated company, insurer and lender, should have a strong interest in carefully evaluating all aspects of poultry housing.

The goal of achieving economies of size and scale has for more than 50 years been the key driving force in creating the modern poultry farm, as well as integrator complexes, processing facilities, and distribution systems. Benefits of achieving these economies have been gained across the industry, including both growers and integrated companies who encouraged their growers in the direction of larger poultry structures. The history of the industry shows that growers who, for a given number of birds to be grown, have constructed fewer but larger poultry buildings, have come out ahead. When done with due regard to all factors involved, the larger building generally results in lower production costs per square foot.

With the widespread acceptance and use of tunnel ventilation, optimal house length in the U.S. broiler industry has settled in at around 500 feet. And, since poultry houses are much longer than they are wide, per-foot increases in width give much greater increases in production area than does increasing length. So, in order to achieve fewer larger buildings, increases in width are being closely studied and tried out. While most modern broiler houses are around 40 to 42 feet wide, we are now seeing houses built in widths up to 60 feet and more. In some other countries, even wider houses have been built. Whether wider houses will actually prove more efficient will depend on a number of factors, including how well the house accommodates the equipment needed to satisfy bird needs, engineering and construction considerations, heating, ventilation and management requirements, and the cost of the building itself.

Some of the earliest commercial poultry houses were no more than coops about this size. Who could have believed then what poultry houses would look like today? The trend certainly has been to larger and larger houses. This photo taken near Auburn, Alabama, in 1925.



## **House Size and Equipment Comparison**

Building costs are only part of the total costs of owning and operating a poultry farm. Other cost factors include the number and size of buildings, site preparation costs, access, load-out, and other graveled road costs, and the cost of electrical, gas, and water services.

To illustrate how these factors are interrelated and how they affect the overall costs of building and operating a poultry farm, let's compare two farms, each with 120,000 square feet of total production area. One farm has six 20,000 square foot houses and the other farm has four 30,000 square foot houses. On the farm with six houses it will be necessary to grade six pads, and there will be six electrical, water, and gas service systems. There will also be six buildings and six sets of feeder and watering systems, as well as six sets of feed tanks. Also, grading and gravel will be required for access roads and load-out pads for all six houses. There will be six electronic controllers with corresponding sensors, six sets of tunnel fans, six inlet vent machines, and six evaporative cooling systems. Conversely, on the farm with four larger houses there will only be four sets of the same equipment.

The key fact is that many of the items mentioned above will not necessarily be proportionately larger (or even larger at all), especially with respect to cost. This is one of the principal reasons why there is so much interest in larger (wider) poultry houses today.

## **Management Considerations**

From a grower's standpoint, a second set of factors that should be considered with respect to the number of poultry buildings is the ongoing operational component. It is simply more efficient on an ongoing basis to manage fewer larger buildings than many smaller buildings, even though the number of birds and square footage are the same. The list of efficiencies associated with managing fewer larger buildings can be quite extensive. A few examples are picking up daily mortalities, tightening fan belts, adjusting vent box cables and strings, servicing curtain drops, servicing evaporative cooling systems, maintaining load-out and other graveled areas, keeping grass mowed and rodent free perimeters, litter clean out, and housekeeping operations. Efficiencies will also accrue to the integrated company in the areas of chick delivery, feed delivery, service technician routing, automated catch and live haul, just to name a few.

## **Engineering and Construction Considerations**

It is important for growers, lenders, insurers and integrated companies to all understand that as wider structures are adopted, utilizing various combinations of wood and metal construction technologies, more rigorous engineering and construction standards must be adopted and implemented.

With wider structures, especially with the clear span requirement, the structure must be specifically engineered for the geographical region, based on soil, wind, and weather conditions. In years past, many people have required a certified professional engineer's design on poultry house trusses, with little or no engineering consideration of details such as how the trusses would be connected to the wall, what style of knee brace might be needed, how many lateral and X braces might be needed in the roof, how well the wall is connected to the foundation, or the ability of the soil type at the specific site where the buildings were to be built to handle the building's loads. Some of the poultry structures that have failed in the U.S. during snow or wind storms have had professionally engineered trusses. The point is that not only the truss but the building itself should be designed by an engineer.

Furthermore, if a good set of plans is developed and these plans are not properly followed during the construction process, the building may still have problems. Cutting corners on material quality, foundations, post embedment depths, bracing, methods of connecting walls to trusses, etc. could well result in possible early failure or inadequate performance of the structure.

## **Heating and Ventilation Considerations**

Another important consideration in wider buildings is being sure the building is equipped with a properly designed and installed ventilation system. Tunnel ventilation and evaporative cooling systems must be designed to cope not only with the increased width of the house, but the larger heat output of the much larger flock. Similarly, wintertime heating and ventilation must be redesigned for the wider house. Because of the increased width of the house, more or larger capacity air inlet boxes are needed, and these boxes must be designed to put enough velocity on the incoming air to throw it to the center of the



When buildings get wider, the number of tunnel fans and the amount of evaporative cooling pad must increase to handle the volume of air necessary for good ventilation. This clear-span 66 x 500 ft building utilizes all-steel construction technology for trusses and walls.



This wide building utilizes poured curb foundations and tubular steel structure.



This 80-foot wide tunnel ventilated house in Australia has five feed lines. Note the number, size and location of the sidewall inlets for cool weather ventilation.



This 60 x 500 foot wood truss building under construction will be ready for birds within the next few weeks. Because good airflow is essential, note that all fans, both tunnel and sidewall, are slantwall cone fans with high airflow ratings.

house for good air mixing and air quality. In a 60-foot wide house, this “air throw” requirement is half again as much as is required in a 40-foot house. Improperly sized inlets, inlets of the wrong style or type, or poor workmanship in the house with regard to tightness will make for problems when ventilating wider structures. However, there are plenty of wider houses in production today in the U.S. that are well ventilated and producing good results.

### Optimization of Equipment to Meet Bird Needs

Feed and water systems are particularly sensitive to the width of a house. For example, to optimize feed pan densities, a rule of thumb accepted by many in the industry is that having 65 to 75 birds per pan results in the most efficient live production, and that having feed pan densities above or below this range will cause production performance problems. On the basis of this rule of thumb, it works out for a 500 foot long house that 20 to 22 feet of width would be required to optimize each feed line to 65-75 birds per pan, assuming normal stocking rates. On this basis, the optimum widths of broiler houses would be 20 to 22 feet, 40 to 44 feet, and 60 to 66 feet. If from a feed pan density standpoint an odd sized house called for only 2.5 feed lines to get 65-75 birds per pan, three feed lines would have to be installed, more feeding equipment than is needed. While houses of various sizes have been built and operated successfully, careful attention should be given in wide house design to matching equipment installations to bird needs to achieve maximum production efficiency.

### The Bottom Line

In general, the concept of wider poultry housing as a way to lower production costs is sound. And properly designed and built wide poultry houses are working well in many locations in the U.S. and throughout the world. However, any individual decisions on going to a wider house must be all about doing your homework with your individual data on cost optimization and cash flow, including all costs of the operation (site preparation, installation costs of utility services, road grading and gravel work, etc.). The most telling comparisons will be in terms of total costs per unit of production space, usually on a dollars per square foot basis. And then to be sure the new house can be properly designed and built. The importance of proper planning cannot be over stated.

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The Poultry Engineering, Economics and Management newsletter provides up-to-date information on topics of interest to poultry production personnel, focusing on most effective and efficient uses of modern technology and equipment, with a special emphasis on economic implications. The Newsletter is published six times a year, or as needed to address emerging or special issues. Contact: Jim Donald, Extension Biosystems Engineering, 228 Corley Bldg., Auburn University, AL 36849-5626, (334) 844-4181, fax (334)-844-3548, jimdonald@aces.edu. Published by:

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