Looking across a fence at livestock resting in a pen, you may think you know just how they feel. They are breathing, eating and drinking, and walking around, right? But do we REALLY know how they feel by observing them from afar?

To really know what your livestock feel in their housing environment we have to get down and dirty and experience it for ourselves.

This activity booklet will guide you through evaluating your livestock's living space and also give you the chance to learn how they really feel!
I Need My Space

Raising livestock requires space. The amount of space each animal needs depends on the species. For example, cattle generally need more space than goats. The amount of space needed also depends on age and size. For example, a 150 lb pig will need more space than a 30 lb pig (see the chart to the right). Remember that your animals are growing so plan how much space they will need in the future to ensure you can provide enough. More space is always better!

<table>
<thead>
<tr>
<th>Stage of production</th>
<th>Square feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-30 lbs</td>
<td>1.7-2.5/pig</td>
</tr>
<tr>
<td>30-60 lbs</td>
<td>3-4/pig</td>
</tr>
<tr>
<td>60-100 lbs</td>
<td>5/pig</td>
</tr>
<tr>
<td>100-150 lbs</td>
<td>6/pig</td>
</tr>
<tr>
<td>150-Market</td>
<td>8/pig</td>
</tr>
</tbody>
</table>


Punch the Numbers

Pretend you have the shed pictured on the right that you would like to use to keep market pigs for a 4-H project. You want to know how many pigs you can house in this space. Use the dimensions and the formula to determine how many square feet it contains. Then calculate the maximum number of 120 lb pigs you can house given the information in the chart above.

Area in square feet: ______________

What is the maximum number of 120 lb pigs can you house? ______________

Check your answer on the next page.
Stepping on Toes

When animals become too crowded, they can not do the normal daily activities that keep them healthy. They spend more time standing up which can lead to tired, sore legs. It is more difficult for them to access food, which will reduce their growth rate and make them more susceptible to disease. In extreme situations of overcrowding, animals get pushed around and fall because they don’t have enough room to stabilize themselves. This leads to serious injuries and is an example of poor animal welfare.

Packed Pens

To experience what it feels like for livestock when they are crowded, find some friends or fellow 4-Hers to try this activity:

• Have everyone participating in the activity stand close together so there is only an inch or so between your bodies.
• Have one person then create a “fence” using tape on the floor in a square around the group of participants.
• Now have everyone stand outside the fence.
• Have one person:
  1) Enter the fence
  2) Walk around the entire border of the fence
  3) Sit down
  4) Crawl on hands and knees around the entire border of the fence
  5) Lie down
• Now add another person ask both people to perform the same tasks.
• Keep adding people until everyone is in the fence or until the activities can no longer be performed without someone getting stepped on or having to step out of the fence.
• Spend a few minutes talking about how it felt to have less and less space to do the activities and how it could affect your health and wellbeing.

Answer: 6 pigs (or fewer)
Walk it Off

There are different options for flooring in livestock housing, each with advantages and disadvantages. Important considerations when choosing a flooring surface include levelness, traction, ease of cleaning, and cushion. Sometimes the best option is to have multiple surfaces for different areas for activities such as feeding, resting, and exercise. Animal comfort has a large impact on health and productivity. Comfort is also an important part of meeting and exceeding animal welfare standards.

Look at All the Options

*Below is a list of flooring surfaces. List an advantage and disadvantage for each one.*

<table>
<thead>
<tr>
<th>Surface:</th>
<th>Advantage:</th>
<th>Disadvantage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dirt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plywood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber mats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood shavings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on dirt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on rubber mats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on wood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on dirt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on rubber mats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• on wood</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Make a Choice

Choose the surface you think would be the best for each housing area and list one reason that you chose it.

<table>
<thead>
<tr>
<th>Housing Area:</th>
<th>Surface:</th>
<th>Reason:</th>
</tr>
</thead>
<tbody>
<tr>
<td>At the feed bunk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise lot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor loafing area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alleyways</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Balancing Act

It is time to look inside the buildings and structures that your animals have to protect them from sun, wind, and precipitation. Shelters are necessary for most livestock species and should be designed to maintain a comfortable temperature and adequate ventilation. Because they are uniquely designed and built, there is much variation in ventilation throughout buildings and structures. Providing proper ventilation is a balancing act between being too stagnant and being too drafty.

The goal of providing proper ventilation is to replace stale air with fresh air. This provides oxygen to livestock, controls the temperature within the structure, and removes moisture, gases, dust, and airborne pathogens. Ventilation should not be so much that it feels drafty though. To improve ventilation within a structure, vents may be created in areas where there are “dead spots” (areas where there is no air movement) and solid material can be added to areas to reduce drafts. Mechanical ventilation such as automated fans and venting systems can be installed to ensure adequate airflow.
At Their Level

To assess ventilation in livestock housing, you can use your senses and a couple of simple tools. Remember that most animals spend their time close to the ground, so you need to get down to their level to assess ventilation where they live! This will give you a chance to see how your animals really feel in their housing environment.

Ventilation is a measure of how much air is exchanged through a space each minute. The rate of ventilation is measured in cubic feet per minute (CFM) and is reported per animal. The ventilation requirement depends on the outdoor temperature. The basic process that occurs with all successful ventilation systems is:

- Cool, dry air is drawn into the structure
- Heat and moisture are added to air
- Warm, wet air is expelled from the structure

The chart to the right is an example of the ventilation recommendations for calves in different outdoor conditions.

<table>
<thead>
<tr>
<th>Outdoor conditions</th>
<th>Ventilation recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Weather</td>
<td>20 ft³/animal/minute</td>
</tr>
<tr>
<td>Mild Weather</td>
<td>60 ft³/animal/minute</td>
</tr>
<tr>
<td>Hot Weather</td>
<td>130 ft³/animal/minute</td>
</tr>
</tbody>
</table>

Why you think the ventilation recommendations are different for the three outdoor conditions?

Spend some time in your animal’s housing environment assessing ventilation and getting to know how they really feel. Remember to get down to their level!

Record the temperature: __________________________________________________________

What does the air smell like?_______________________________________________________

Can you feel the air moving?_______________________________________________________

Can you see dust in the air?_______________________________________________________
Making a “Wind”icator

How do we know how much air is moving through a space? Air exchanges can be measured using a tool called an anemometer (an-nee-MOM-itur). Measuring indoor air movement requires a very sensitive device. However, we can measure the speed of outdoor air contributing to indoor air movement through vents and roof ridges by constructing a simple anemometer as shown here:

First, gather these supplies:
- Scissors
- 4 small paper drinking cups
- Marking pen
- 2 equal length strips of stiff, corrugated cardboard
- Ruler
- Stapler
- Push pin
- Sharpened pencil with eraser
- Modeling clay
- A watch that shows seconds

Next, follow these steps:
- Cut off the rolled edges of the paper cups to make them lighter
- Color the outside of one cup with the marking pen
- Cross the cardboard strips so they make a plus (+) sign and staple them together
- Staple the cups to the ends of the cardboard strips; make sure the cups all face the same direction as shown
- Take the ruler and pencil and draw lines from the outside corners where the cardboard strips come together to the opposite corners (see the dotted line on the diagram). Where the pencil lines cross will be the exact middle of the cross
- Push the push pin through the center of the cardboard (where the pencil lines cross) to attach the cardboard cross with the cups on it to the eraser point of the pencil. Blow on the cups to make sure the cardboard spins around freely on the pin
- Place the modeling clay on a surface outside, such as a porch railing, wooden fence rail, a wall or a rock. Stick the sharpened end of the pencil into the clay so it stands up straight

Using your watch, count the number of times the colored cup spins around in one minute to measure the wind speed in revolutions per minute. Placing this simple anemometer in various locations will show you how airspeed is affected by things like nearby buildings or the direction of the wind, which also affects the air exchange within your livestock housing structure.
Blowing Smoke

Now that we know how to measure the wind outside our livestock housing structure, how do we ensure adequate airflow within livestock housing structures without sensitive equipment? If only you could visualize the air moving or not moving within the structure ... well, you can by using a very light powder (such as talc powder or corn starch) in a small squeeze bottle!

Here you can see that the powder goes up in a straight stream and falls in a straight stream, indicating minimal air flow through the structure.

In contrast, here you can see the powder comes out in a straight stream but is then carried away by the air flow through this housing structure.

Now it is your turn: Try this in your livestock housing facility to look for drafty areas (where the powder blows away as it comes out of the bottle) and dead spaces (where the powder falls straight down to the ground without drifting to the side first).
Comfortable Quarters

Another aspect of livestock housing that should not be overlooked is providing suitable bedding material. Bedding serves as:

• a cushion for livestock when they are resting, creating less impact and compression on their joints and sensitive areas while lying down and getting up.
• an absorptive material to help keep moisture, urine, and feces away from the animal which will reduce pathogens.
• an insulator to reduce heat loss from animals, which helps them maintain a healthy body temperature.

First, gather these supplies:

• Various bedding materials
• Panty-hose legs (one for each type of material being tested)
• Scale
• Bucket of water
• Clothes pins
• Clothesline
• Tubs to catch water drips

Next, follow these steps:

• Place 2-3 lbs of intended bedding material into the panty-hose “bag”
• Weigh the bag and record the weight
• Place the bag in the bucket of water and leave immersed for 10 minutes
• Remove the bag from the water and hang on the clothesline above tubs until the bag stops dripping
• Reweigh the bag and record the new weight

Now Calculate the absorbency factor by using the following formula:

\[
\text{Absorbency Factor} = \frac{\text{weight after soaking} - \text{original weight}}{\text{original weight}}
\]

The greater the absorbency factor, the more absorbent the material!

<table>
<thead>
<tr>
<th>Material</th>
<th>Beginning Weight (lbs)</th>
<th>Ending Weight (lbs)</th>
<th>Absorbency Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>wheat straw</td>
<td>2.2</td>
<td>6.82</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Keep in mind however that absorbency is not the only factor that must be considered when choosing the best bedding material for your livestock. Less absorptive materials can be used for bedding, especially in combination with a more absorptive material. For example you can fist put down an more absorptive layer, which prevents mud and puddles, and then place a less absorptive layer on top, which will drain down and keep the moisture away from the animal’s body.
Providing an environment for 4-H livestock requires some thought and effort on your part as a 4-H Her. Part of the enjoyment of caring for livestock includes designing a place for them to live. Look at pictures of housing designs to help inspire you to create livestock housing that is not only good for your animal’s health and wellbeing, but also eye appealing and something that you can be proud of! See some of the examples below to spark your creativity. Also, add your own pictures or pictures from magazines to this page.

Add your pictures here!
To the Drawing Board!

Now it is your turn!
Use the space below to draw a livestock facility. Draw the facility that your livestock are currently being housed in, or use your imagination and draw what you think would be an ideal housing facility for your livestock.

Remember to include these key things:

- Housing dimensions
- Identification of covered and/or open areas
- Location of windows and vents
- Feed area location and dimensions
- Water location
- Bedding area
Improving Livestock Housing

Now that you know about livestock space requirements, proper footing, ventilation, bedding, and cleanliness, can you come up with five ways to improve your livestock housing facility to meet these needs?

If you have questions about your animal’s health or wellbeing, contact your 4-H leader, extension agent, or veterinarian.