Swine Housing in Cover-All Buildings

Written by: Jim Albinger, May 28, 2002

This document is intended to inform and explain how the "deep bedding" system for raising hogs performs and reacts to varying climatic conditions using a Cover-All® building. Years of continuous research data has been compiled to help Cover-All® give their swine production customers the necessary tools to maximize productivity in this type swine housing structure.

A Cover-All® building can be used for all phases of pork production. The largest use is still for finishing. Breeding and gestating are also excellent in this environment. Farrowing can be done in this type building, but for the purpose of this data we will focus on finishing, breeding and gestating.

Research on the performance of a Cover-All® building started in Lytton, IA in March of 1995 with a 30' x 72' SAS silver/black cover. This unit housed 180 head of finishers at a market weight of 250–280 pounds. Weaned pigs have been placed in this deep bedding environment as small as 18-22 pounds in the colder mid-west U.S. months and they have prospered and thrived very well. For the purposes of these tests, the average weight of pigs placed into the buildings was 35-50 pounds.

Swine Housing Requirements

The formulas for figuring all mature swine housing square foot requirements is as follows:

- Finished weight market pigs 12 sq. ft. / head
- Gestating gilt 25 sq. ft. / head
- Gestating 2nd parity (or older) sow 30 sq. ft. / head

Total area includes feeders, waterers and concrete pad.

Examples: Finishers

- 30' x 60' = 1800 ÷ 12 = 150 head
- 30' x 72' = 2160 ÷ 12 = 180 head
- 30' x 84' = 2520 ÷ 12 = 210 head (normal 200 head building)
- 40' x 60' = 2400 ÷ 12 = 200 head
- 50' x 80' = 4000 ÷ 12 = 333 head
- 62' x 100' = 6200 ÷ 12 = 516 head (normal 500 head building)

Remember: Larger is better – smaller is harmful. Keep 12 square feet per pig minimum in your design. Later in this document, you will see by tests that less than 12 square feet per animal will cut into production and make less money for the producer.

Basic finisher layout – floor plan: (See Illustrations A - D)

Size of the bedding area
The entire building except the feeder and waterer area.

Waterer and feeder positioning
You need only enough space for the pigs to stand and eat and drink. If too much concrete is exposed the pigs can sleep on it and thus mess on it as well. 16 feet into the building is more than enough for feed and water. (See Illustration E)

Waterer
Six drink stations (holes) is a minimum. Water is the cheapest feed we have and water depravation is a common mistake. The maximum is 40 head per drinker hole.

Feeders for finishers
One 12-hole feeder per 100 head or 1 drop feeder (4 to 16 bu.) per 60 head is required if an automatic feeding system is used. A wet/dry feeder can be used but if freezing is a problem but they are not recommended.

Concrete pad layout
A cross-section with 6 inches per 10 foot of slope - water line position on illustration. Approximately 16 feet into the building is adequate.

Dimensions of concrete pad "floating pad" for waterer
Level and only large enough to hold the fountain.

Deep Bedding Material
For swine production in a fabric building, we must maintain a minimum depth of organic bedding of 12 inches at all times. (See Illustration E)

This bedding material needs to be organic to promote bio-degrading or composting of the bedding pack. The less expensive this material can be, the more money the producer will keep at the end of the production cycle. In Iowa, corn stalks, oat straw and soybean straw are most commonly used. Soybean straw is preferred as it is the most absorbent and produces a clean sheen on the pigs in the building. Wheat straw, newspaper, sawdust, etc. make good bedding as well. It's whatever the producer can get as inexpensively as possible. The only material on the research farm that did not work well was grass hay as it has a solid, hard stem that would mat and not absorb enough moisture thus creating a mess for the pigs as well as the producer to clean out the building.

When partially composted bedding comes out of a building after the pigs are removed, it is black in color, quite solid (holds together well) and is easily picked up with a front-end loader or skid-loader. A straight blade bucket will be sufficient and grapple hooks and large teeth on buckets are a waste of time and money. The bedding breaks up and is very manageable to break apart and remove.

You do not get as much volume out of a building after a "turn" (cycle) of finishers as you put into the building. It will take about 25 - six foot diameter round bales of straw or stalks to bed one complete turn of pigs in a 30' by 84' or 40' by 60' (200 head) building. The amount of decomposed material removed is only about 1/2 to 1/3 the amount put into the building for that group in volume, but the mass is the same but more concentrated. The nitrogen level of this composted material runs about 19% and is ready to spread onto the fields for a very rich fertilizer. Decomposed bedding with manure is a far more readily available form of nitrogen than spreading raw manure on the soil.

At the research farm, we are consistently able to get 3 "turns" of pigs through a Cover-All® building in a one-year time period. That is much faster than a modern total slat, double curtain finisher which only averages 2.5 "turns" in one year. Herd health is much easier to maintain also because the building is in an "all in – all out" situation thus eliminating the heavy pathogen load with each group of pigs. What that group sheds for germs and diseases is removed and started over fresh with the next group.

In a conventional finisher, the "all in – all out" procedure is nearly impossible to attain as we cannot completely empty, clean and disinfect as the pigs are usually in a continuous cycle through the facility. In a Cover-All® finisher we can, however achieve a true "all in – all out" situation for the pigs. The depth of the bedding pack is critical. Bedding is continually added during the finishing process. The producer needs to maintain a 12 inch depth of material at all times. As the moist "dunging" areas grow in size, more bedding needs to be added to speed the composting process and dry the area. Bedding can be added from either end of the building, as there are large doors at each end. It is easier to "drop" larger bales in from the bedding end but we do not recommend opening the bedding end gates. The height of the bedding pack will grow and the pressure against that gate will be too great to shut if opened mid-cycle. A large loader, that can reach into the building is best or bring in bedding from the other end with a skid loader between to feeders over the concrete onto the pack. A small ramp is then recommended to aid in getting on and off the bedding from the cement pad into the bedding area.

This brings us to the basic premise of "deep bedding". In this environment, bedding is added throughout the finishing cycle of a group of "feeder to finish" pigs. The bedding is completely removed when the group of pigs is moved to market. All the diseases and pathogens shed by this group alone are completely removed. This is a pure "all in – all out" situation. Dirt floors are scraped clean and sweet barn lime can be added once a year for soil neutralization and creating a visual barrier to know when to stop removing bedding. The soil and composted bedding look the same so the white line gives you a visual place to stop cleaning.

We do not use cement as we need the warmth of the earth in winter months as our "heat bank" to draw from. The warmth of the earth below the building in the dirt floor acts as a radiator to transmit the heat built up in the warmer months into the bedding pack. Without that heat, as in the cold from a cement floor, we concentrate moisture and cause it to not move up through the bedding and evaporate but pool on the cold concrete floor.

It is critical that the bedding pack biodegrades and creates internal heat (an exothermic reaction). In cold weather, the heat rising from that pack warms the pigs at about 110°F to 140°F resulting in the pigs laying on the bedding - not the pig next to them. This also results in almost no rectal prolapsed problems in cold weather from "piling". The transferal of heat to the cold air above in the building is rapid with the huge ambient temperature difference causing the heat to rise and warm the pig.

In hot weather, the same bedding temperature will not rise nearly as fast as the ambient temperature. The ambient temperature is nearly the same causing the heat to rise slowly through the bedding. Warm air rises, bonding with the moisture in the bedding. This process is called evaporation. Evaporation is a cooling process resulting in nothing needing to be done differently from cold to hot weather.

The moisture is always traveling up from the bedding carrying pathogens and odors with it putting the "bad stuff" at the top of the building. With the Cover-All® building's high ceiling, we have a huge dilution factor with the large volume of air in the top of the building. Odors are less and the "bug load" is diminished as well.

Air Circulation
We now need to get the air out of the building. By facing the Cover-All® building in line with the prevailing wind and keeping the ends always open at the top in cold weather and wide open in moderate and hot conditions, we are forcing a "flow-through" ventilation situation. If we keep the sides open at the top of the wall between it and the cover, we cause the fresh air to be drawn up and into the building.

This whole process works on the principle of a paint spray gun. When we put an air-line on a paint sprayer we are forcing a low volume of air at high-speed through a very small, restricted space. When that air passes through that narrow opening and is then released into a bigger space it creates a vacuum called a "venturi". This vacuum is what pulls the paint from the can on the sprayer and atomizes it with the air and projects it out of the tip of the spray gun.

This same process works as we push air through the building at higher speeds by facing it into the prevailing winds. We create that same type "venturi" by allowing air to come up into the sides of the building between the cover and the wall. We then restrict it down to a narrow opening at the top of a 2' high air diverter board along the top of the wall inside the building. (See Illustration F & G). The air moves up through the opening gaining speed. The cold air falls causing the pigs to urinate and defecate in that center area thus setting up a "dunning pattern". The hot air rises and carries the evaporating air from the moist bedding pack and moves the foul air up to the ceiling and out of the building at the top at each end. It's diluted and cleaner smelling. This air dilution factor is what gives a Cover-All® a tremendous advantage with herd health. Respiratory problems are virtually non-existent, and ammonia build-up is very low contributing to lower levels of conjunctivitis of the eyes and pathogen intake into the lungs.

Herd Health

Herd health is always better in a Cover-All® building. The earth floor and the soft bedding eliminate problems with heavy animals, such as sows that develop sore feet and lameness from constantly standing on concrete. Slipping injuries are nonexistent as well. All new pigs introduced to the building need to be wormed before entering the facility. Internal parasite build-up in finishing is also not a problem as we are taking the "micro-environment" or bedding pack out and discarding it. It is then replaced with a new, clean pack with no worm build-up or pathogen load in it. A pristine environment is now ready to raise the next group of pigs. Remember; it is critical to realize that if a disease is brought into the building with a group of pigs, the deep bedding will help their health but not cure problems that pre-exist. If healthy pigs are brought in, healthy pigs will likely be brought out at the end of the finishing cycle. Health management is still very critical to efficient production. Slaughter checks at various packing facilities show wonderful health in the pigs from a Cover-All® as far as respiratory problems and worm infestation in the lungs and internal organs.

Cover-All® buildings can be placed in very close proximity to each other (side by side) and not carry pathogens from one building to another. (See Images H) No fans are required with this natural ventilation situation. This air will move exactly the same, because of the venturi effect, even on a hot still day, thus cooling the animals and limiting the stress without electricity costs to the producer. This alone is a huge cost savings.

Introducing Pigs to Bedding

Introducing new pigs (30 – 50 pounds) to bedding can be a very traumatic experience to the animal. Most infant pigs are used to raised, wire decks or concrete flooring. Bedding is really strange to them and they will be afraid of it. Allowing the pigs to enter a deep bedding building must include "locking" them on to the bedding pack for 4 – 6 hours when entering the first time. This will allow them to explore the bedding and learn that it is really safe and fun to play in. At the end of that period they will have run through it and established a dunning pattern as the cold air hits them. Pigs will not mess where they eat or sleep unless stressed or crowded. The gating can then be removed, allowing them to eat and drink and "return" to the bedding.

As digging or "rooting" areas appear, just put soiled bedding in those areas with a fork and the pigs will move on to new areas to explore. This rooting stops as they get used to the building and new bedding is added. Bedding needs to be added to wet areas and to "low" bedding areas. If a sleeping area is dry and full of bedding, do not add any more to it. Adding bedding for general maintenance use will be more frequent in the winter (every 5 – 7 days) and not so often in the warm months (every 10 days to two weeks).

Solution for Sorting

The last thing to discuss about layout is the solution for sorting. If you refer back to the floor plan illustration, you can see that there are three separate pens made by swing gates and permanent posts. The bedding and feeding areas are separated by gates and a scale or sort area is placed into one corner or side area. The outside open pen is made only for holding. We never let the pigs out on this pad except to move them to market. Fences and gates are used there as well to aid in loading and can be left to the design of the producer. A 30 foot by 12 foot outside pad will hold approximately 30 – 36 "fats" for market.

The small swing gates are used to run the visually "fat" pigs through a scale area. If no scale is used it still gives the producer a way to sort and hold "market ready" pigs outside through a small door to the pad and "not quite ready to go" sorted pigs in the feeding area. This eliminates the need to re-weigh them until the sorting process is done on the feeding area. One person can sort off 36 head by themselves in about 30 – 45 minutes and with a helper that time can be much less. The outside pad is good to have with one building as well as with multiple structures in a straight row running across the front for loading and holding. This pad works well for feed delivery if it is 12 feet or wider. If it is just used for sorting and holding and the feed is delivered over the pad from outside that area, 12 feet is the maximum to reach the feeders inside the building.

Genetics

The genetics most commonly used in a Cover-All® facility is very much the same as in a conventional building. The fact is very simple: If you put a fatter genetic type pig into the building, you'll get a heavier back-fat animal finished at the end and likewise, if you put a lean type pig in you'll get a leaner pig finished. The biggest question that producers have about genetic types used in our facility is "what type pig should I raise/buy to put into a Cover-All?" The answer – the more lean is best.

At the Iowa research farm, the common genetics used are PIC type high-gain, lean genetics. Most producers will be familiar with this usually "white" genetic line. The usual back fat at slaughter runs about .65" to .75". This is consistent with modern confinements, which use this type almost exclusively. The old misconception is that we raise fatter pigs in a "hoop" building. That is absolutely not true! In tests over the last seven years, pigs going to market of this type coming out of a Cover-All® finisher have been very lean with good feed efficiencies, rates of gain and the bottom line, COST PER POUND OF GAIN. That's what goes to the bank! If you can produce a pig at the same cost per pound in a Cover-All® at a faster rate with a lot less building investment, that's the name of the game.

"Kill sheets" show that these facts are consistent and dispute the old claims of over-fat pigs. One fact is true, though, in an open environment of 12 square feet per animal the raised activity level in our buildings will increase intake. They will eat more, as their energy level is higher. Feed intake is 10% - 15% higher in deep bedding structures. Feed intake is always up thus creating the need to watch the feed rations.

Research Trials

The research at the Iowa facility has proven that the increase in feed intake needs to be addressed if the producer is working with the same corn-soy diet as in a modern confinement with less space for the pig, thus a lower activity level. In other words, the ration is "hotter" in a modern tight spaced confinement. Several trials were run where 5% of the corn was taken away from the corn-soy diet. This lowered the calorie intake per pound of feed. We replaced it with fiber. Many types can be substituted such as wheat-mids, beet pulp, soybean hulls, and oats. Oats were used as it was the least expensive to obtain. The results were dramatic! A cheaper feed was produced at the same rate of gain and feed efficiency with the same days to market as the hotter more expensive ration with less increase in back-fat. The 5% replacement of corn with fiber is still used in all rations at the research facility with each turn of pigs at all steps in the ration.

Probably the most dramatic research trial was that of crowding the pig's living space. Two buildings of the same size (30' x 72') placed side by side were filled at a different pig density. The same feed rations, genetics and bedding were used and all animals were put in on the same day. One building housed 180 head (12 sq. ft. per pig) and the other 200 head (10.8 sq. ft. per pig). The results showed a dramatic reason why "not" to crowd the pig's living space. The building which had the 12 sq. ft. per pig had a much greater feed efficiency, a better rate of gain and approximately two weeks earlier to market as a group.

The biggest and most unexpected result came in the decrease in "death-loss". High-gain, lean genetics often carry what is commonly referred to as the "stress gene". This high-strung animal will die if put under stress late in its growing life and will commonly die unexpectedly of hemorrhagic bowl or a form of over eating resulting in the lining of the large intestine bleeding and thus bleeding to death internally. The pigs in the 180 head building (12 sq. ft. per pig) had less than a 1% death loss for the group and the 200 head building (10.8 sq. ft. per pig) had a +5% death loss. Not only would the revenue be lost but also the wasted feed and bedding material required for the pigs that are lost. Stress in pork production is constantly a huge problem if not managed efficiently and this 12 sq. ft. per pig environment is a great way to raise pork with minimum stress levels.

Gestation Buildings

Another type facility to be noted is that of a gestation building. Breeding and gestation is probably one of the best uses of a Cover-All® building. The environment of 25 sq. ft. per gilt and 30 sq. ft. per sow is ideal. Earlier maturity of young females, better conception rates with less re-breeds, less leg and foot problems and overall general sow conditioning are just some of the advantages seen with this type facility. The use of split-day feeding, limit feeding, and hand feeding are all easily accomplished. Please refer to the diagrams of gestation layout for reference.

Cover-All® Building Swine Research has data from many years of trials in all sizes and widths of building from 22' wide to 62' wide. All work very efficiently with minimal management. The labor to run the building is actually less per man hour as it is a pure all in – all out facility where bedding is only added and not removed until the end of the cycle. Herd health is second to none. Cover-All® will supply more in-depth answers to your questions about production in our buildings and produce more finite details on rations and closeout data if necessary.

Interior Atmosphere

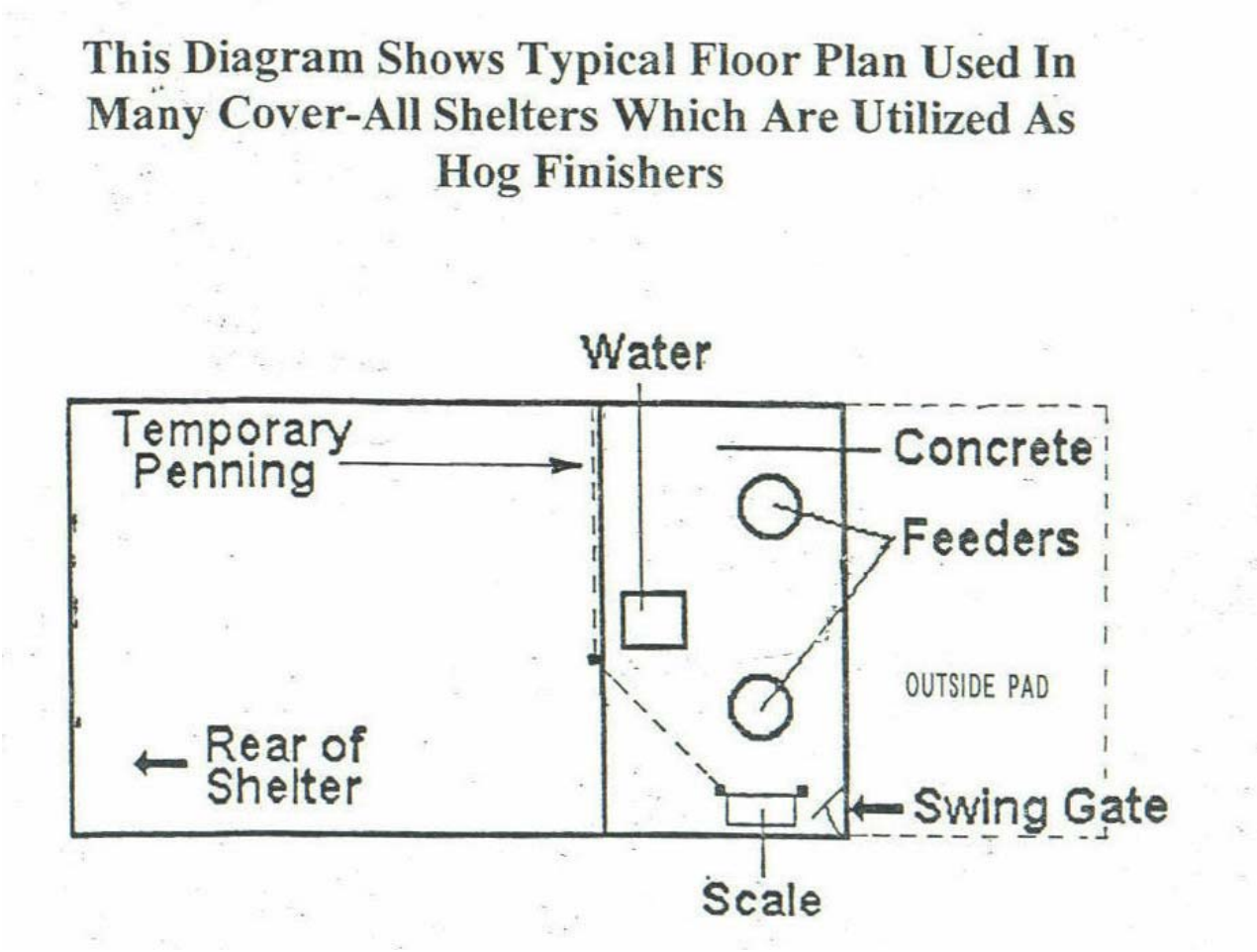
The light atmosphere in a white Cover-All® building is fantastic. White reflects the summer heat and gives a bright atmosphere to raise animals. In breeding and gestating, the natural light results in better lactation, conception rates and earlier estrus in all ages of sows and gilts. All of this is "free" light. Utility costs to run the facility on the research farm are just pennies per day to pump water. No lights, fans or heaters are needed and this factor alone is a huge savings to the producer.

We have made several claims in this report that show how a Cover-All® building performs for swine production. The structures on the research farm have provided excellent livestock housing. The Cover-All's design for strength is superior to all other "hoop" structures of its type which is evidenced by its over-all condition since their continued use was introduced in 1994.

Jim Albinger
Cover-All Building Systems, Inc.

Illustrations:

A)



B)

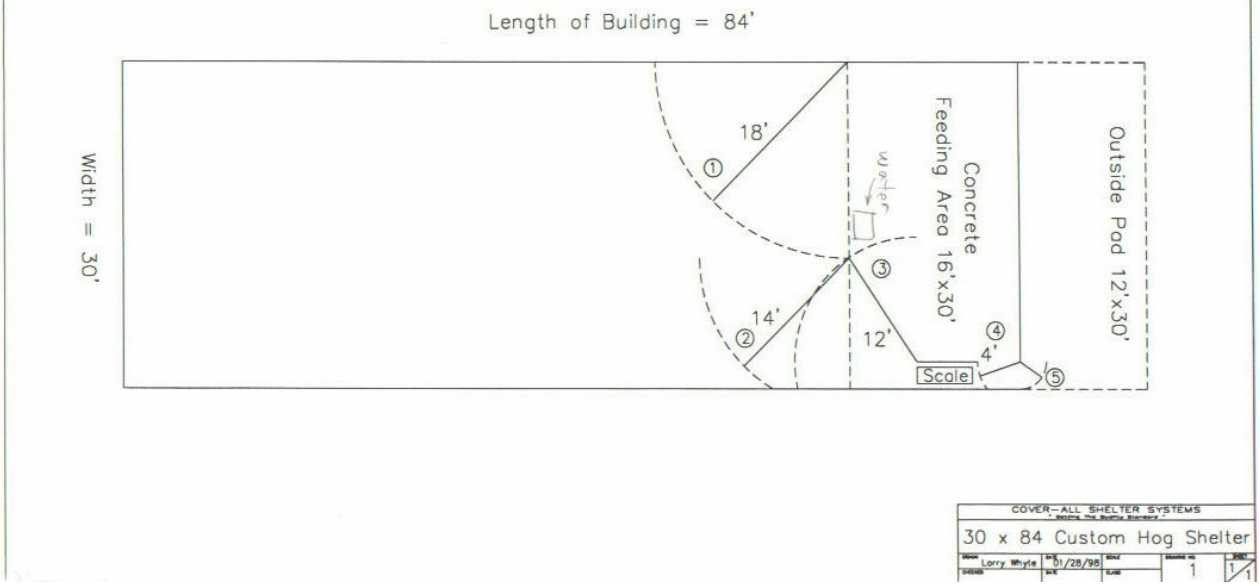
Close gate # 1 (18' hog) when starting to sort (hinge gate off wall)

Swing gate # 2 (14' hog) when sorting into scale open to bedding or closed to unit when trapping pig in scale area. (Carried in for sorting)

Gate # 3 is closed or left in building when sorting – stays in that position while sorting (12' hog)

Gate # 4 (4' hog) is opened to let pigs out onto conctete (outside pad) for sorted facts or opened into inside concrete pad for pigs not quite heavy enough to take to market but do not want to sort again.

Gate # 5 walk door (26" – 28") closes building to outside from scale runway. (Usually only pony wall light.)

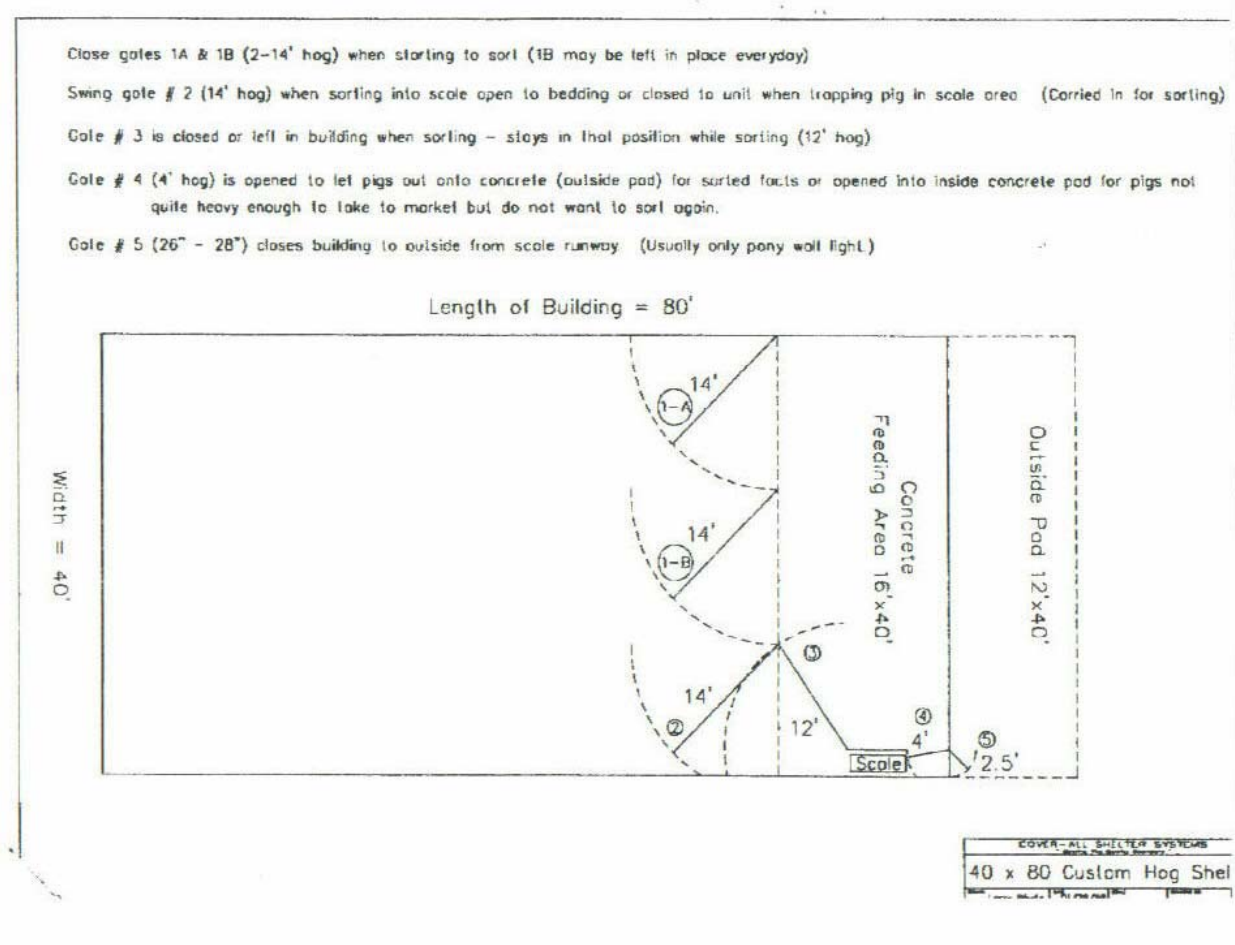


COVER–ALL SHELTER SYSTEMS

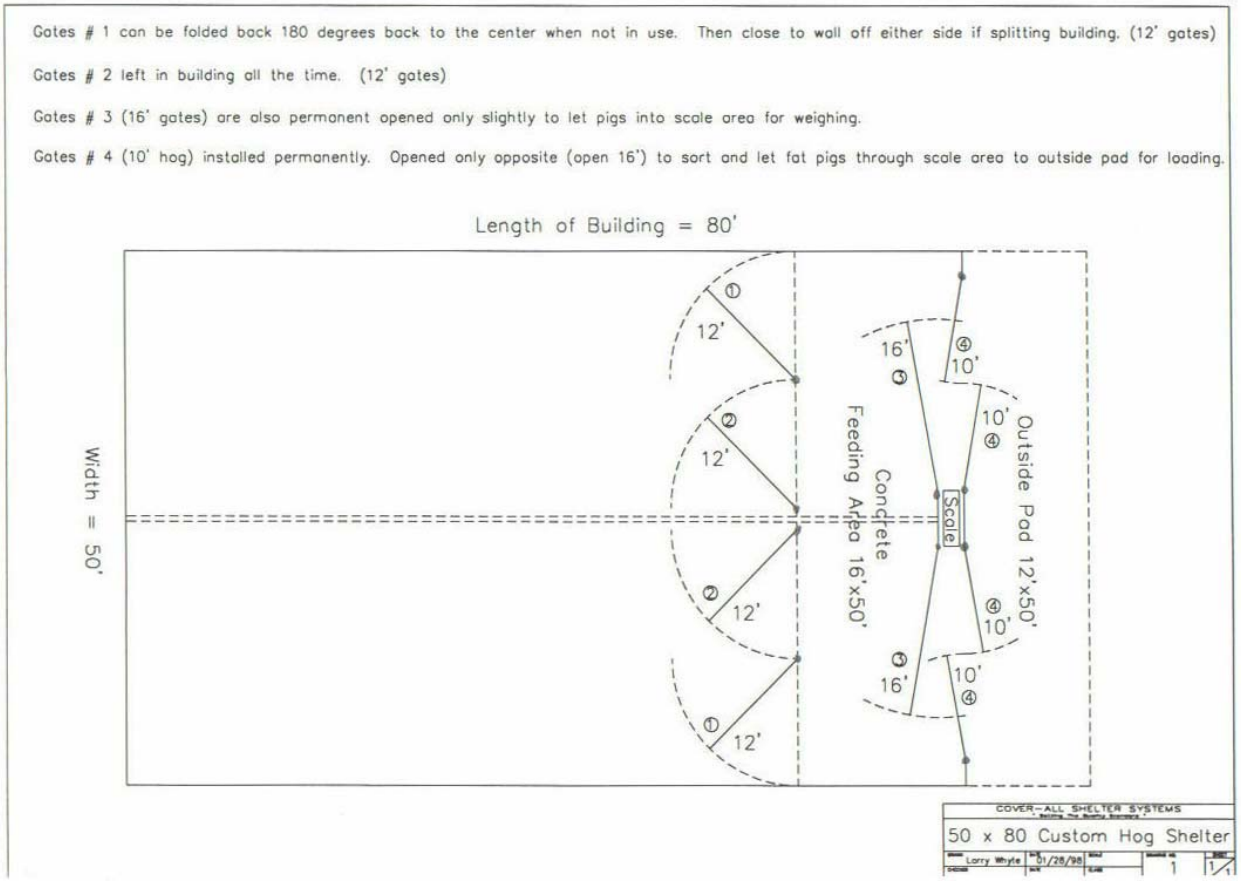
30 x 84 Custom Hog Shelter

Larry Whyte | 01/28/98 | 1 | 1/1

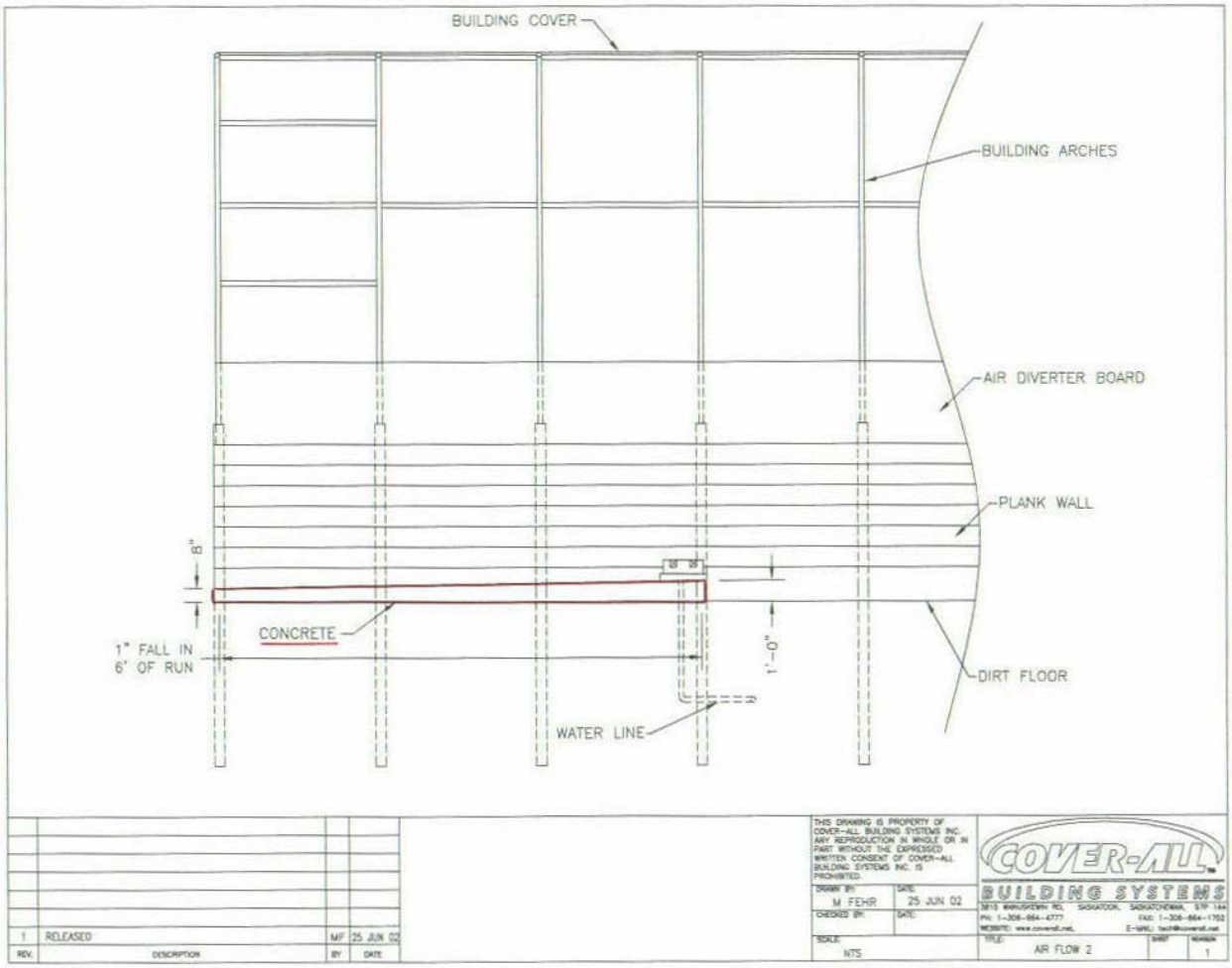
C)


Close gates 1A & 1B (2-14' hog) when starting to sort (1B may be left in place everyday)
Swing gate # 2 (14' hog) when sorting into scale open to bedding or closed to unit when trapping pig in scale area (Carried in for sorting)
Gate # 3 is closed or left in building when sorting - stays in that position while sorting (12' hog)
Gate # 4 (4' hog) is opened to let pigs out onto concrete (outside pad) for sorted facts or opened into inside concrete pad for pigs not quite heavy enough to take to market but do not want to sort again.
Gate # 5 (26" - 28") closes building to outside from scale runway (Usually only pony wall light)
Length of Building = 80'
Width = 40'
14'
1-A
14'
1-B
14'
2
3
12'
4
4'
5
2.5'
Concrete Feeding Area 16'x40'
Outside Pad 12'x40'
Scale
COVER-ALL SHELTER SYSTEMS
40 x 80 Custom Hog Shel

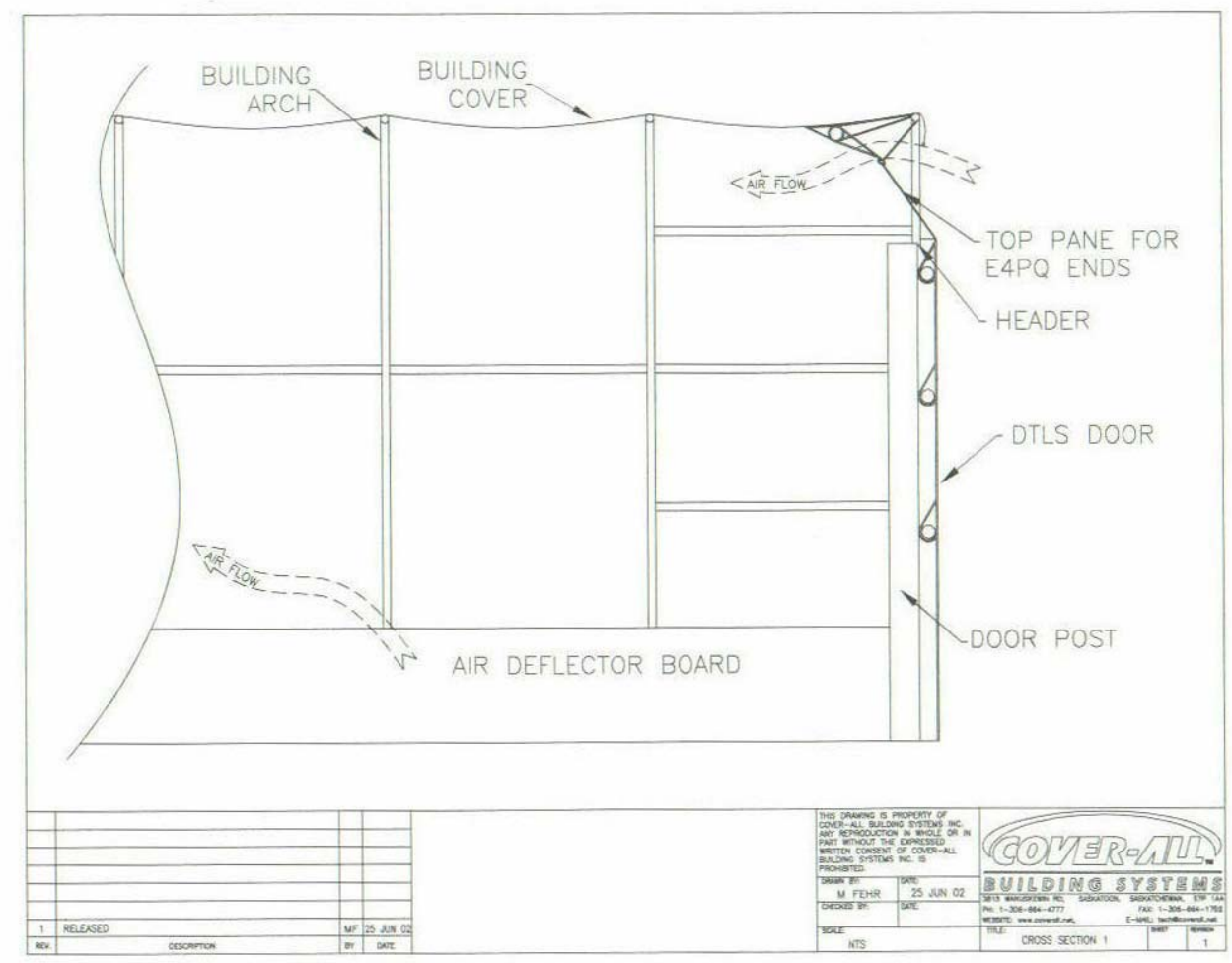
D)


Gates # 1 can be folded back 180 degrees back to the center when not in use. Then close to wall off either side if splitting building. (12' gates)
Gates # 2 left in building all the time. (12' gates)
Gates # 3 (16' gates) are also permanent opened only slightly to let pigs into scale area for weighing.
Gates # 4 (10' hog) installed permanently. Opened only opposite (open 16') to sort and let fat pigs through scale area to outside pad for loading.
Length of Building = 80'
Width = 50'
12'
16'
10'
Concrete Feeding Area 16'x50'
Scale
Outside Pad 12'x50'
COVER-ALL SHELTER SYSTEMS
50 x 80 Custom Hog Shelter
Larry Whyte
01/28/98

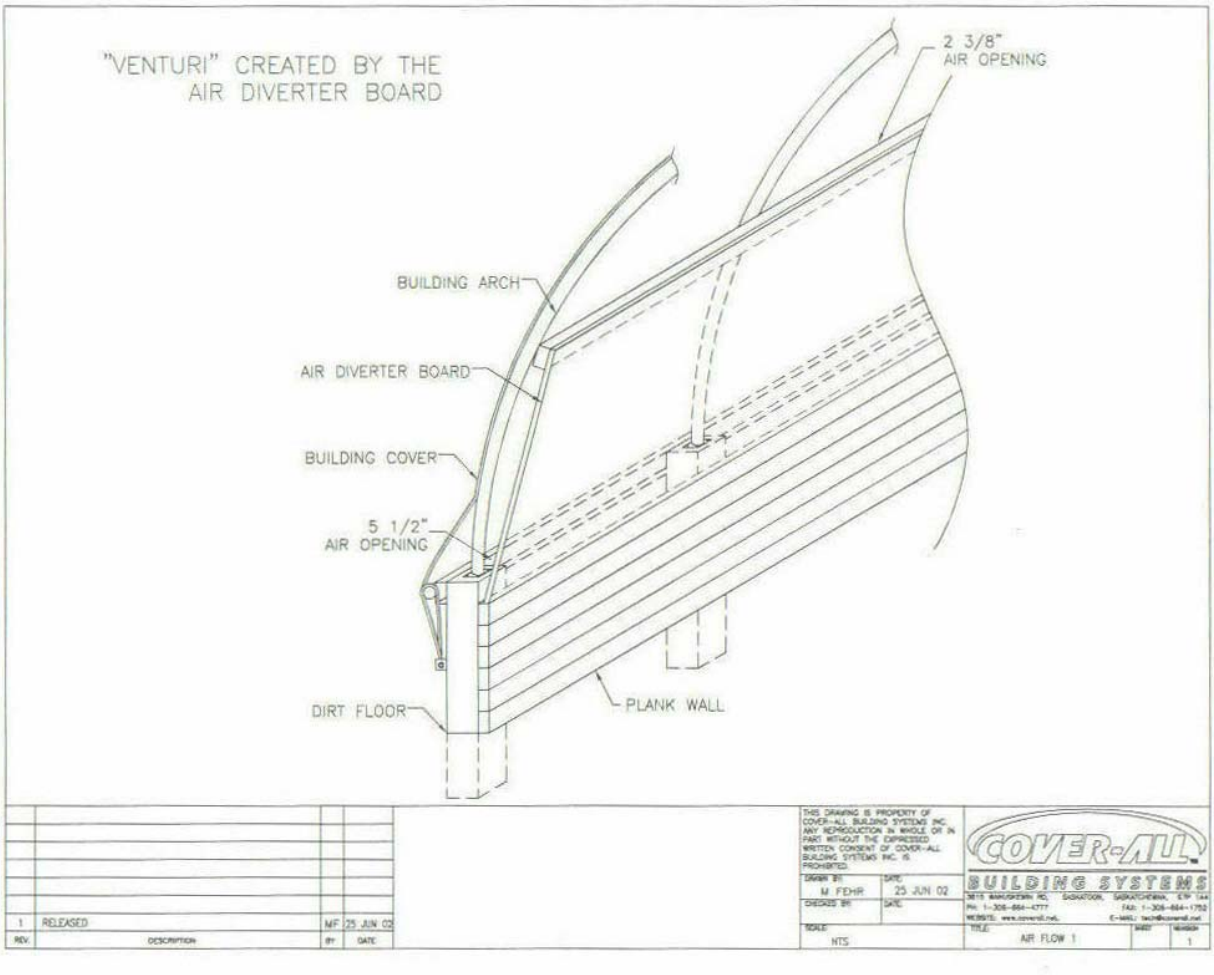
E)


BUILDING COVER
BUILDING ARCHES
AIR DIVERTER BOARD
PLANK WALL
8"
CONCRETE
1" FALL IN
6' OF RUN
1'-0"
DIRT FLOOR
WATER LINE
THIS DRAWING IS PROPERTY OF COVER-ALL BUILDING SYSTEMS INC. ANY REPRODUCTION IN WHOLE OR IN PART WITHOUT THE EXPRESSED WRITTEN CONSENT OF COVER-ALL BUILDING SYSTEMS INC. IS PROHIBITED.
DRAWN BY: M FEHR
DATE: 25 JUN 02
CHECKED BY:
DATE:
SCALE: NTS
COVER-ALL
BUILDING SYSTEMS
TITLE: AIR FLOW 2
1 RELEASED MF 25 JUN 02
REV. DESCRIPTION BY DATE

F)


BUILDING ARCH
BUILDING COVER
AIR FLOW
TOP PANE FOR E4PQ ENDS
HEADER
DTLS DOOR
AIR FLOW
DOOR POST
AIR DEFLECTOR BOARD
1 RELEASED MF 25 JUN 02
REV. DESCRIPTION BY DATE
THIS DRAWING IS PROPERTY OF COVER-ALL BUILDING SYSTEMS INC. ANY REPRODUCTION IN WHOLE OR IN PART WITHOUT THE EXPRESSED WRITTEN CONSENT OF COVER-ALL BUILDING SYSTEMS INC. IS PROHIBITED.
DRAWN BY: M FEHR DATE: 25 JUN 02
CHECKED BY: DATE:
SCALE: NTS
COVER-ALL BUILDING SYSTEMS
TITLE: CROSS SECTION 1
SHEET
REVISION 1

G)


"VENTURI" CREATED BY THE
AIR DIVERTER BOARD
2 3/8"
AIR OPENING
BUILDING ARCH
AIR DIVERTER BOARD
BUILDING COVER
5 1/2"
AIR OPENING
DIRT FLOOR
PLANK WALL
1
RELEASED
MF
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DESCRIPTION
BY
DATE
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DRAWN BY:
M FEHR
DATE:
25 JUN 02
CHECKED BY:
DATE:
SCALE:
NTS
COVER-ALL
BUILDING SYSTEMS
TITLE:
AIR FLOW 1
SHEET
1

H)