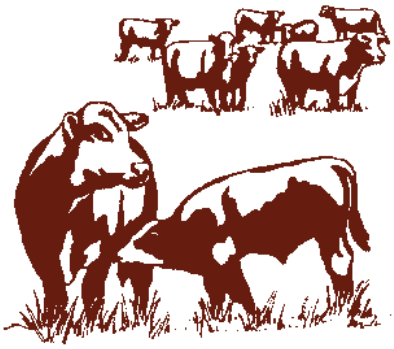
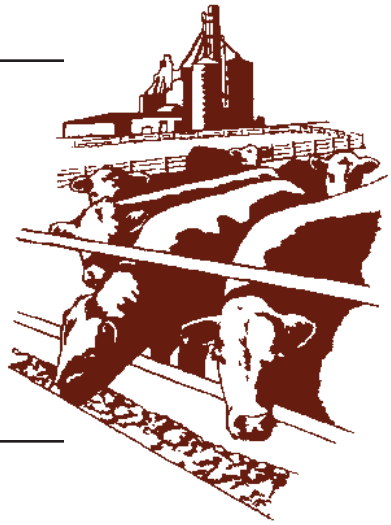


Beef Cattle Handbook



BCH-9004 Product of Extension Beef Cattle Resource Committee

Cattle Behaviour And Handling Facility Design For Feedlots

Temple Grandin, Assistant Professor Department of Animal Science Colorado State University

An understanding of cattle psychology combined with well designed facilities will reduce stress on both you and your cattle. Reducing stress is important because stress reduces the ability to fight disease and weight gain. It also increases weight loss, and damages rumen function. An animal's previous experiences will affect its stress reaction to handling. Cattle have long memories. Animals which have been handled roughly will be more stresses and difficult to handle in the future. Animals which are handled gently and have become accustomed to handling procedures will have very little stress when handled. The basic principle is to prevent cattle from becoming excited. Cattle can become excited in just a few seconds, but it takes 20 to 30 minutes for the heart rate to return to normal in severely agitated cattle.

There is an old saying "You can tell what kind of a stock man a person is by looking at the behavior of his cattle." In one feedlot survey, cattle from yards which had a reputation for rough handling were wilder and more difficult to handle at the packer. They also had more bruises. The degree of stress which will be induced by handling and restraint can vary from almost no stress in a tame show animal to very severe stress in a wild range cow. The degree of stress is determined by three major factors — 1) amount of contact with people, 2) quality of handling (rough vs. gentle) and 3) genetics. Frequent, gentle handling will reduce stress. Genetics is also an important factor. Some genetic lines of cattle are calmer and less wild than others. Cattle with an excitable temperament will take longer to respond positively to gentle handling that cattle with a calm temperament. Most cattle will become less stressed and settle down when they are handled gently. Although painful procedures cannot be avoided, a reduction of agitation and excitement will still reduce stress. Cattle remember painful restraint methods such as nose tongs. Handling will be easier in the future if you use a halter to hold the heads and keep electric prod usage to an absolute minimum.

Behavior Principles

Cattle have wide angle vision, they can see behind themselves without turning their heads. However, there is a small blind spot behind their rear (Figure 1). When a group of cattle move, the animals maintain visual contact with each other. This enables the herd to stay together. An animal following another animal will tend to stay in Positions A and B on Figure 1. Moving together as a herd helps protect cattle from predators. The strongest dominant animals will be in the middle of the herd and the subordinate, weaker animals will be on the outside. During feedlot handling, the wilder animals are often at the end of the bunch. Since cattle are a prey species they are ever vigilant and fear novelty. For example, cattle placed in feedlot pens may be fearful of cars passing by on the highway, but soon they learn to ignore them.

Understanding the flight zone is the key to easy, quiet handling. The flight zone is the cow's personal space. When you penetrate the flight zone the animals will move, and when you retreat from the flight zone the animals will stop moving. The size of the flight zone is determined by several factors, such as wildness or tameness, and the angle of the handler's approach. The flight zone will be larger when a handler approaches head on, and it will become smaller when the animal is

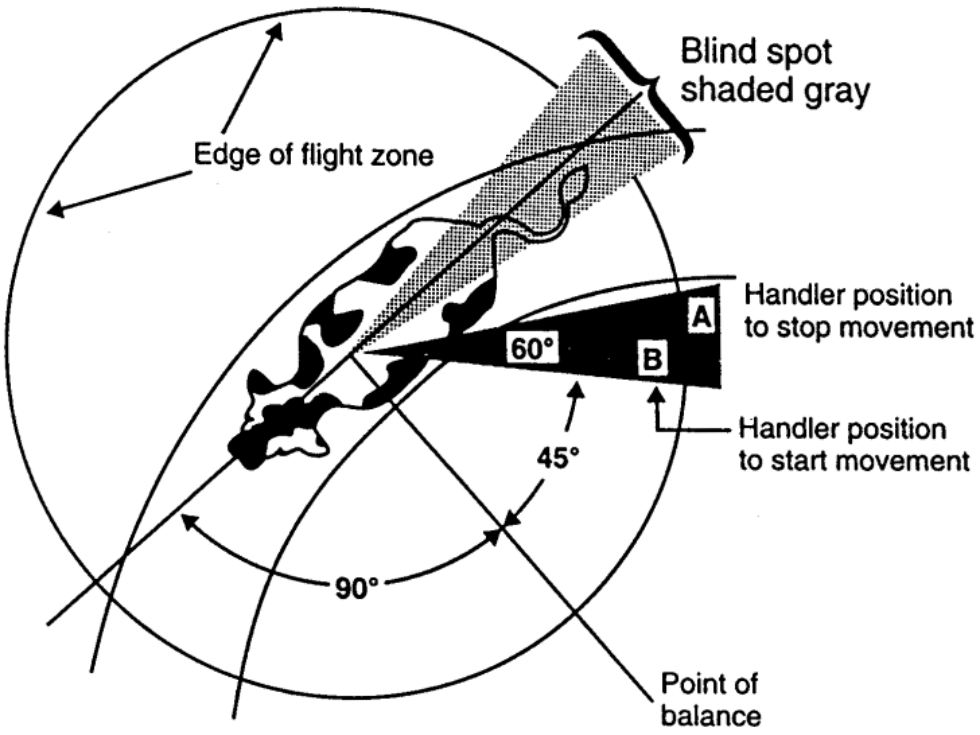


Figure 1. Flight Zone Diagram.

confined inside a single file chute. A barrier in between the handler and the cattle reduces the flight distance. A cow passing by you will have a smaller flight zone that a cow coming directly at you. If a cow becomes excited the flight zone will increase. Cattle can be easily moved by working on the edge of the flight zone (Figure 1). the handler must be close enough to the animal to make it move, but not so close as to cause it to panic and flee. If the cattle start moving too fast, you must back off and get our of the flight zone.

If cattle in a pen look at you, you need to approach and put pressure on the edge of the flight zone. To keep the animals moving you alternately enter and retreat from the flight zone. When an animal moves for you, you reward it by relieving pressure on her flight zone, but in a few seconds you will invade her flight zone again to keep it going.

When cattle are worked in an enclosed space such as an alley or crowd pen, great care must be taken to avoid deeply penetrating the flight zone. This can result in panic, jumped fences and cattle turning back on the handler. If cattle in an alley start to turn back you must back up and get out of the flight zone. When an animal rears up in a race, retreat from its flight zone; nine times our of ten, it will settle back down.

To move an animal forward you must be behind the point of balance shown on Figure 1. Moving in front of the point of balance at the shoulder will make the animal go backward. To start movement, approach just behind the point of balance and move back into Positions A and B. Avoid getting into the blind spot on pasture or in a large pen. Standing in the blind spot will cause the cattle to stop and turn and look at you. They want to know where you are at all times. In close quarters you may get kicked if you get in a cow's blind spot when cattle are being moved through a single file race.

Working In Crown Pens

When cattle are being handled in a confined area such as a crowding pen or sorting alley, handle small groups. Bring eight or ten cattle into a crowding pen, which leads to the single file race, instead of twenty. Overloading the crown pen is a common handling mistake. The animals need room to turn. A stick or whip with plastic streamers or a garbage bag tied on the end is useful for turning cattle in the crowd pen. Shake the streamers on the right side of the head to turn left and vice versa. Use the animal's natural following behavior to assist with filling races. Utilize the following behaviour: Wait until the single file to the squeeze is almost empty before refilling. Avoid the overuse of crowd gates. If the cattle are moving, do not shove the crowd gate up on them.

Problems with balking tend to come in bunches; when one animal balks, the tendency to balk seems to spread to the next animals in line. When an animal is being moved through a single-file chute, the animal must never be prodded until it has a place to go. Once it has balked, it will continue balking. The handler should wait until the tailgate on the squeeze chute is open before prodding the next animal. If the cattle become severely agitated due to excessive prodding, the agitation and frenzy can spread to the other cattle. Severely agitated cattle may secrete a "smell of fear" substance that can be detected by other cattle.

An animal left alone in the crowding pen after the other animals have entered the single-file chute, may attempt to jump the fence to rejoin its herdmates. A lone steer or cow may become agitated and charge the handler. A large portion of the serious handler injuries occur when a steer or cow, departed from its herdmates, refuses to walk up the single-file chute. When a lone animal refuses to move, the handler should release it from the crowding pen and bring it back with another group of cattle.

Vision And Facility Design

Cattle have poor depth perception when they are moving with their heads up. To see depth they have to stop and put their heads down. This is why they balk at shadows and strange objects on the ground. A single shadow that falls across a scale or loading chute can disrupt handling. The lead animal will often balk and refuse to cross the shadow. If you are having problems with animals balking at one place, a shadow is a likely cause. Balking can also be caused by a small bright spot formed by the sun's rays coming through a hole in a roof. Patching the hole will often solve the problem. Shades constructed from snow fence should not be used over working areas. The zebra stripe shadows can cause balking.

Draining grates in the middle of the floor will make cattle balk. A good drainage design is to slope the concrete floor in the squeeze chute area toward an open drainage ditch located outside the fences. The open drainage ditch outside the fences needs no cover and so it is easier to clean. Animals will also balk if they see a moving or flapping object. A coat flung over a chute fence or the shiny reflection off a car bumper will cause balking. Dairy cows that move through a facility every day will learn to walk over shadows and drains because they are no longer novel.However, a dairy cow will balk if she sees a strange piece of paper on the floor or a coat hung over a fence.

Cattle have a tendency to move toward the light. If you ever have to load livestock at night, it is strongly recommended that frosted lamps that do not glare in the animal's face be positioned inside of the truck. However, loading chutes and squeeze chutes should face either north or south; livestock will balk if they have to look directly into the sun. Sometimes it is difficult to persuade cattle to enter a roofed working area. Persuading the animals to enter a dark, single-file chute from an outdoor crowding pen in bright sunlight is often difficult. Cattle are more easily driven into a shaded area from an outdoor pen if they are first lined up in single file.

Many people make the mistake of placing the single-file chute and squeeze chute entirely inside a building and the crowding pen outside. Balking will be reduced if the single-file chute is extended 10 to 15 feet outside the building. The animals will enter more easily if they are lined up single file before they enter the dark building. The wall of the building should NEVER be placed at the junction between the single-file chute and the crowding.

Do Not Dead End Your Race

Livestock will balk if a race appears to be a dead end. Sliding and one-way gates in the single-file race must be constructed so that your animals can see through them, otherwise the animals will balk. This is especially important at the junction between the single-file race and the crowd pen. The sides of the single-file chute and the crowding pen should be solid. The crowding pen gate also should be solid so that animals cannot see through and turn back towards herdmates they just left. Palpation gates, however, should be solid so that cattle do not see a person standing in the chute.

When a curved race is used it must be laid out properly so that it does not appear to be a dead end. A cow standing in the crowd pen must be able to see a minimum of two body lengths up the chute. Cows will balk if the chute is bent too sharply at the junction between the crowd pen and the single-file chute. Figure 3 illustrates an efficient curved facility that is easy to lay out. It consist of three half circles laid out along a layout line. The radius points of all three half circles are in the layout line. A 16 (4.8m) ft. inside radius for the curved single-file chute is recommended. A 12 (3.5m) ft. radius is the absolute minimum unless a straight section is installed at the junction between the crowd pen and the chute.

Why A Curved Race Works

A curved, single-file race works better than a straight race for two reasons. First, it prevents the animal from seeing the truck, the squeeze chute, or people until it is almost in the truck or squeeze chute. Shields for handlers to hide behind and remote controlled gates can also be used to prevent cattle from seeing people up ahead. A curved chute also takes advantage of the animal's natural tendency to circle around the handler. When you enter a pen of cattle you have probably noticed that the animals will turn and face you, but maintain a safe distance. As you move through the pen, the animals will keep looking at you and circle around you as you move. A curved race takes advantage of this natural circling behavior.

A well-designed, curved single-file race has a catwalk for the handler to use along the inner radius. The handler should always work along the inner radius. The curved race forces the handler to stand at the best angle and lets the animals circle around him. The solid sides block our visual distractions except for the handler on the catwalk. The catwalk should run alongside of the race and NEVER be placed overhead. The distance form the catwalk platform to the top of the race fence should be 42 (100 cm) inches. This brings the top of the fence to belt- buckle height on the average person.

Layouts For Shipping, Receiving And Working

Figure 2 illustrates a layout for shipping, sorting and unloading trucks. Each diagonal pen holds one truck load. Placing the pens in an angle eliminates sharp 90 degree corners and facilitates cattle movement. The gates are longer than the width of the alley to eliminate sharp corners. Use 4.2m (12ft.) gates on a 3.5m wide alley and

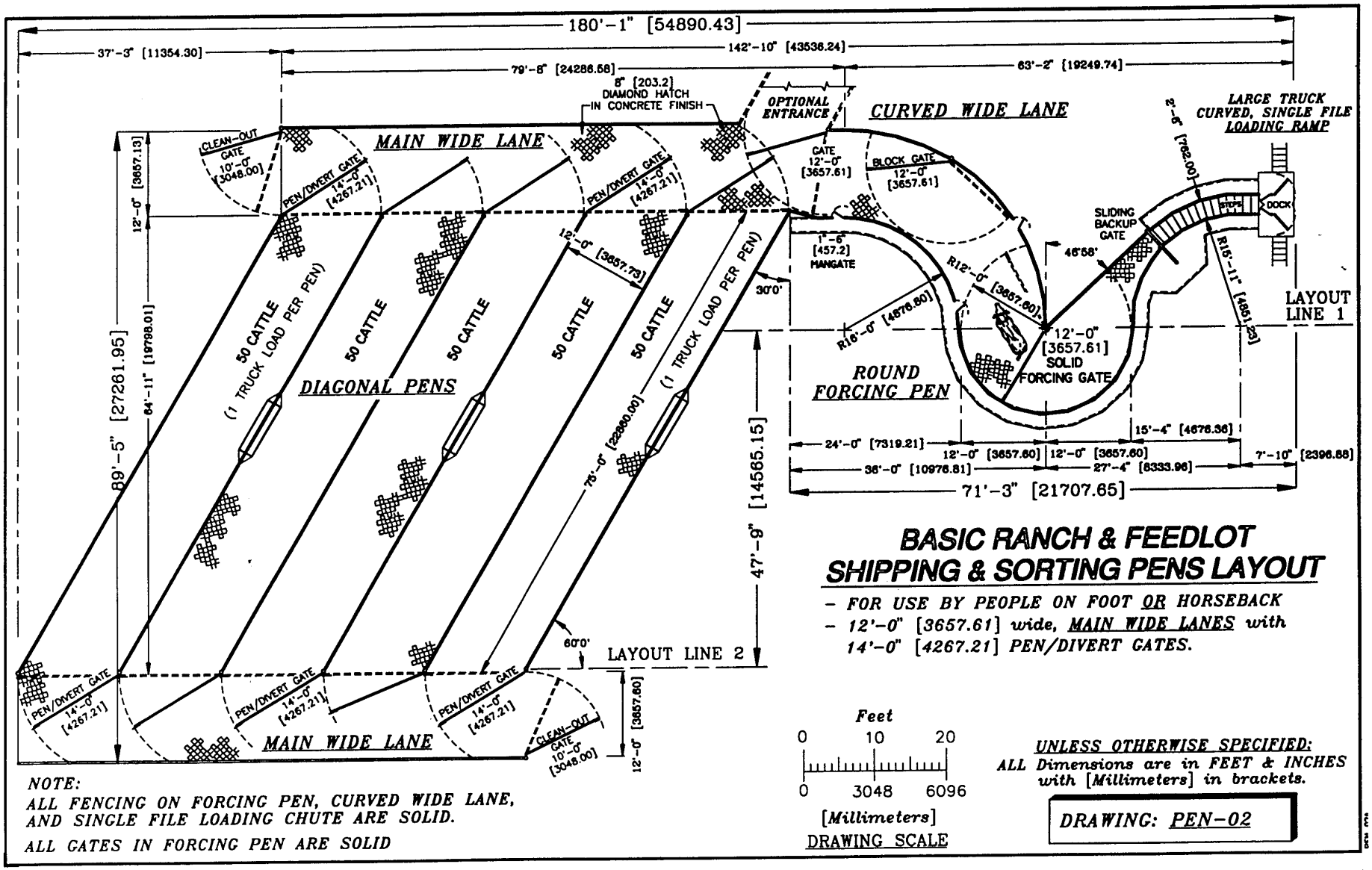


Figure 2. Layout for Shipping, Sorting, and Loading Trucks.

5m (16ft.) gates on a 4.2m wide alley. The loading ramp with the round crowd pen is easy to layout because the radius points are all located along a layout line. Figures 3 and 4 illustrate two different layouts for a cattle working (processing) area which has a curved singe-file race, round crowd pen and wide curved lane. The wide curved lane provides the advantage of easier filling of the round crowd pen. Cattle will move easily when a handler works along the inner radius. A whip with plastic ribbons tied to it works well for moving cattle along the wide curved lane and into the crowd pen.

The layouts in Figures 2,3, and 4 can be used as building blocks to form custom designed systems for a particular feedlot. Figure 4 is designed for a pre-fabricated working circle and Figure 3 can be easily built on the site using the layout lines. All the radius points are on the layout line. Three-way gate intersections make it easy to tie the layouts into existing alleys.

Loading Ramp Design

Loading ramps should be equipped with telescoping side panels and a self-aligning dock bumper. these devices will help prevent foot and leg injuries caused by an animal stepping down between the truck and the chute. The side panels will prevent animals from jumping out the gap between the chute and the truck.

A well designed loading ramp has a level landing at the top. This provides the animals with a level surface to walk on when they first get off the truck. The landing should be at least 5 ft. (1.5m) wide for cattle. Many animals are injured on ramps that are too steep. The slope of a permanently installed cattle ramp should not exceed 20°. On concrete ramps, stairsteps are recommended because they are easier for cattle to walk on when they become icy or worn. The recommended dimensions for stair steps are a 3 1/2 in. (10cm) rise and a 12 in. (30cm) to 18 in. (45cm) tread length.

Ramps for both loading and unloading cattle should have solid sides and a gradual curve. If the curve is too sharp, the ramp will look like a dead end when the animals are being unloaded. A curved single-file chute is most efficient for forcing cattle to enter a truck or a squeeze chute. A ramp used for loading and unloading cattle should have an inside radius of 12 ft. (3.5m) to 17 ft. (5m), the bigger radius is the best. A loading ramp for cattle should be 30 in. (76cm) wide and no wider. The largest bulls will fit through a 30 in. wide chute.

Restraint Principles

Cattle sometimes become severely agitated in a conventional squeeze chute. This is probably due to deep invasion of the animal's flight zone by the operator and other people that can be seen through the open barred sides. Stress could be reduced, and cattle will stay calmer, by replacing the open barred sides with solid drop down panels for access to the animal. People that handle buffalo and deer have used solid sides on squeeze chutes for many years. They also use a solid gate located about 3 ft. (1m) to 4 ft. (1.2m) in front of the headgate. This gate prevents the cattle from attempting to run through the headgate. Many cattle sustain shoulder and neck injuries when they hit the headgate too hard. Even though a gate in front of the headgate would slow down cattle handling, it would probably pay for itself by reducing injuries and weight gain losses due to shoulder and neck pain. One large Colorado feedlot reported that sickness was greatly reduced when they handled animals more gently in the squeeze chute. Bruises and neck injuries also secrete "stress" substances onto the animal's system.

Observations of cattle handling at slaughter plants indicates that squeeze chutes on ranches and feedlots need to be modified. Blocking the animal's vision has a great calming effect. I spent 35 hours operating a restraining device which is used for kosher slaughter. It consists of a box with completely solid sides and a small T shaped opening in the front for the animal's head. When an animal enters the box it can not see people. After it sticks its head through the front opening a metal shield prevents it from seeing people. A light over the head hole entices the animal to stick its head through. Most cattle walk in quietly and seldom attempt to lunge at the head opening. The cattle at this slaughter plant were calmer than cattle entering a conventional squeeze chute with open bar sides.

Since the animals did not attempt to run through the restrainer, squeeze pressure could be applied slowly instead of suddenly. Slow steady motion had a calming effect. Sudden jerky motion or sudden bumping of the animal with the apparatus caused agitation and excitement. When the animal's vision was blocked it would stand and allow its head and body to be positioned in the device. The cattle would seldom resist pressure from the apparatus if it was applied slowly and excessive pressure which would cause pain and discomfort was avoided. There is also the concept of optimum pressure. Sufficient pressure must be applied to make the animal "feel restrained" but excessive pressure which would cause pain must be avoided. Many people make the mistake of applying more pressure when an animal struggles. The animal will often stop struggling if the pressure is reduced slightly. Excess pressure must be slowly backed. A sudden release of the pressure will cause the animal to become excited.

Adjustment Of Squeeze Chutes

The use of a complete squeeze chute is strongly recommended for wild cattle that are not trained to head restraint. Restraint of the body will prevent the animal from fighting the headgate. On hydraulic chutes the pressure relief valve must be adjusted to prevent excessive squeeze pressure. Excessive pressure can cause severe injuries such as a ruptured diaphragm or broken bones. On most hydraulic chutes the proper setting 555 PSI. The operator should be trained to slow the animal down in the squeeze before it reaches the headgate. To prevent shoulder and neck injuries, animals should enter the chute at a walk.

To prevent choking in a headgate with curved stan-

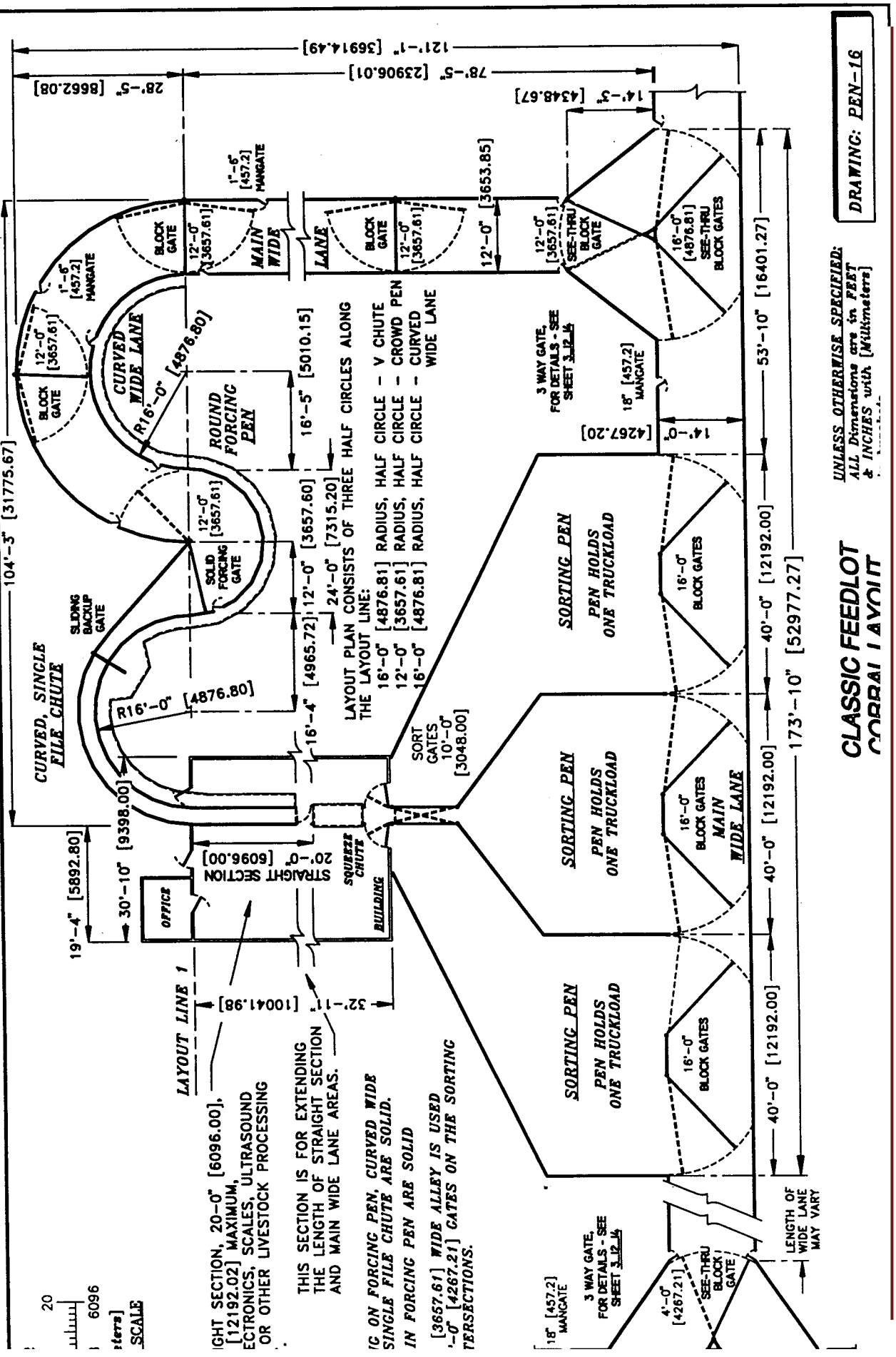
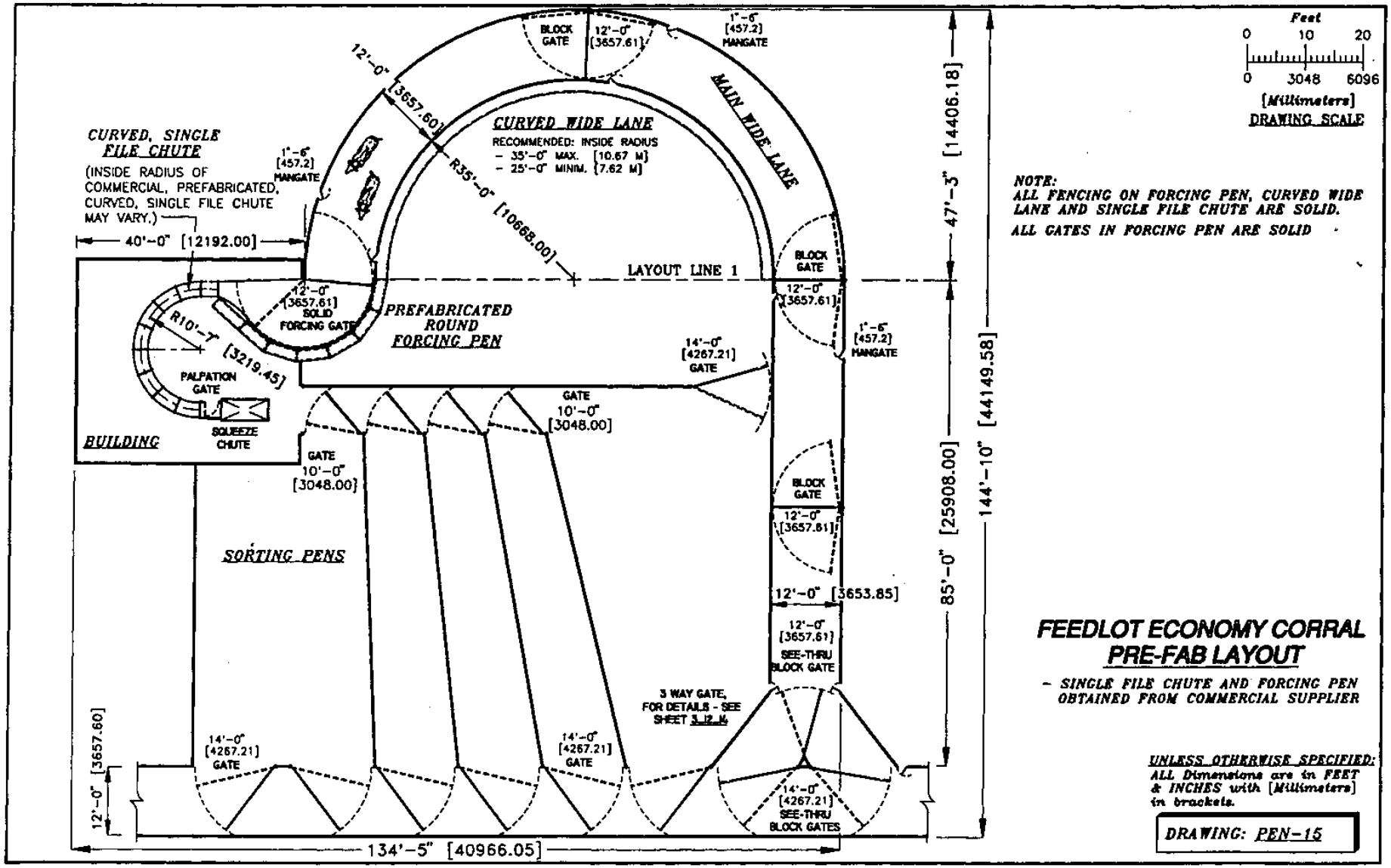


Figure 3. Layout for Shipping, Sorting, and Loading Trucks.


CURVED, SINGLE FILE CHUTE
(INSIDE RADIUS OF COMMERCIAL, PREFABRICATED, CURVED, SINGLE FILE CHUTE MAY VARY.)
40'-0" [12192.00]
1'-6" [457.2] MANGATE
CURVED WIDE LANE
RECOMMENDED: INSIDE RADIUS
- 35'-0" MAX. [10.67 M]
- 25'-0" MINM. [7.62 M]
R35'-0" [10668.00]
12'-0" [3657.60]
MAIN WIDE LANE
BLOCK GATE
12'-0" [3657.61]
LAYOUT LINE 1
12'-0" [3657.61] SOLID FORCING GATE
PREFABRICATED ROUND FORCING PEN
R10'-7" [3219.45]
PALPATION GATE
SQUEEZE CHUTE
BUILDING
14'-0" [4267.21] GATE
GATE 10'-0" [3048.00]
SORTING PENS
12'-0" [3653.85]
12'-0" [3657.61] SEE-THRU BLOCK GATE
3 WAY GATE, FOR DETAILS - SEE SHEET 3.12.M
14'-0" [4267.21] SEE-THRU BLOCK GATES
12'-0" [3657.60]
134'-5" [40966.05]
47'-3" [14406.18]
85'-0" [25908.00]
144'-10" [44149.58]
Feet
0 10 20
0 3048 6096
[Millimeters]
DRAWING SCALE
NOTE:
ALL FENCING ON FORCING PEN, CURVED WIDE LANE AND SINGLE FILE CHUTE ARE SOLID.
ALL GATES IN FORCING PEN ARE SOLID
FEEDLOT ECONOMY CORRAL
PRE-FAB LAYOUT
- SINGLE FILE CHUTE AND FORCING PEN OBTAINED FROM COMMERCIAL SUPPLIER
UNLESS OTHERWISE SPECIFIED:
ALL Dimensions are in FEET & INCHES with [Millimeters] in brackets.
DRAWING: PEN-15

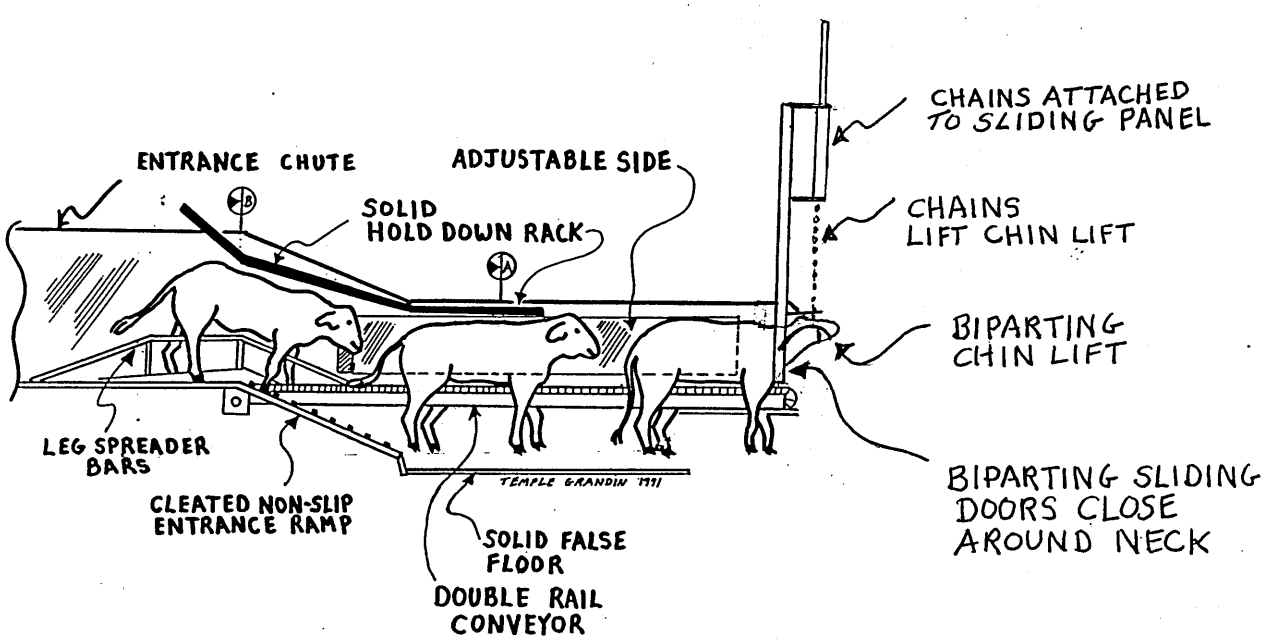


Figure 5. Conveyer Restrainor for Feedlot.

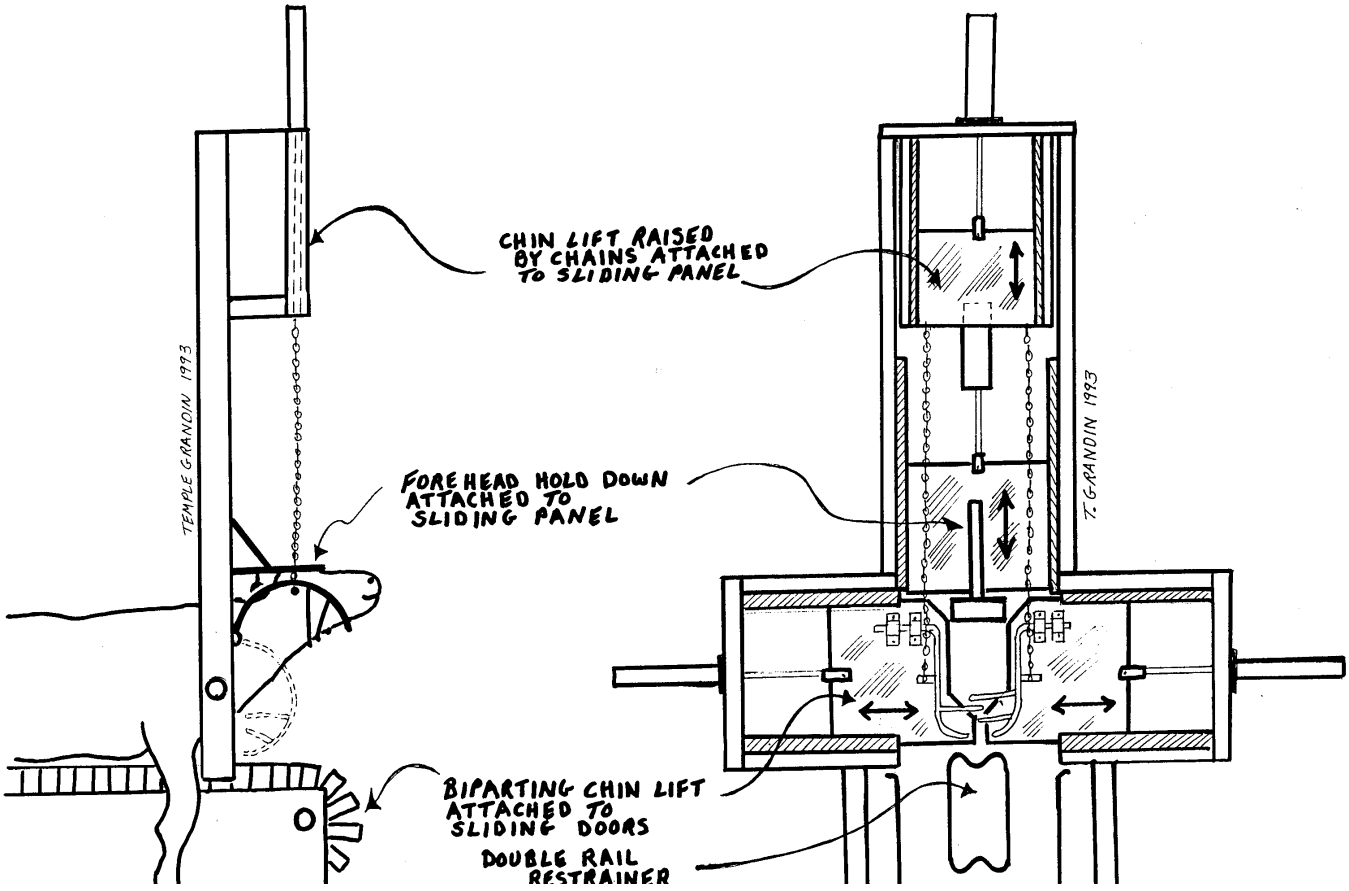


Figure 6. Head Gate for Use on a Conveyor Restrainer.

chion bars, the squeeze sides must be adjusted so that the V shape of the sides prevents the animal from lying down. Pressure exerted by the headgate on the carotid arteries can kill the animal. Some veterinarians prefer a chute which does not pinch the feet together at the bottom. If a squeeze chute with straight sides is used it must be equipped with a straight bar stanchion headgate to prevent choking. An animal can safely lie down in a straight bar stanchion. Care must be taken with self catching headgates. Cattle can by injured if

they run into the self catcher at a high speed. Selfcatchers should not be used with wild horned cattle. It is also essential to adjust the self catcher for the size of the cattle. Severe injuries can occur if a self catcher is adjusted too wide and the animal's shoulder pass part way through the closed gate.

Latches and ratchet locks must be kept well maintained to prevent accidents to people. If a ratchet device becomes worn, replace it immediately. Friction type latches must never be oiled. Oiling will destroy the ability of a friction latch to hold. On self catching headgates the mechanism must be kept maintained to prevent an animal from getting stuck part way through a closed gate.

Conveyor Restraint

Even under the best conditions, cattle are often injured when they hit the headgate on a conventional squeeze chute. This can result in bruised shoulders, spinal compression injuries and hematomas. In one survey, bruises occurred in five out of seven feedlots on 1.6 % to 7.8% of the cattle. Even though cattle appear to be normal, weight gain may be reduced because the animals have stiff necks or sore shoulders.

I estimate that the use of conveyorized, restraining equipment of the type used in large U.S. slaughter plants would quickly pay for itself at feedlots. This equipment would almost eliminate neck and shoulder injuries because the animals could be brought up to the headgate at a controlled speed to a head restraint device located on the other end of the conveyor (Figures 5 and 6). Another advantage would be improved animal welfare. Cattle would remain calmer because they are touching each other as they move through the system. The cattle straddle a moving conveyor in a race with solid sides.

Facility Construction Tips

Five foot (1.5m) high fences are usually sufficient for cattle such as Hereford and Angus. For Brahman cross and exotics a 5 1/2 ft. (1.6m) to 6 ft. (1.8m) fence is recommended. Solid fencing should be used in the crowding pen, single-file chute, and loading chute. If you budget permits, solid fencing should be used in the wide, curved lane. If solid fencing is too expensive, then a wide belly rail should be installed. This is especially important if the facility is constructed from sucker rod. An 18 in. (45cm) wide solid belly rail can also be installed on gates to prevent animals form hitting gates during sorting.

If a V-shaped race is built, it should be 16 (41cm) to 18 (45cm) in. wide at the bottom and 32 (81cm) to 36 (90cm) in. wide at the top. The top measurement is taken at the 5 ft. level. If the single-file chute has straight sides it should be 26 (66cm) in. wide for the cows and 18 (46cm) to 20 (51cm) in. wide for calves. When a funnel type crowding pen is built, make one side straight and the other side on a 30° angle. This design will prevent bunching and jamming. The crowding pen should be 10 (20cm) to 12 (3.5m) ft. wide. The recommended radius for a round crowd pen is 12 ft. (3.5m). Larger crowd pens are not recommended. The minimum radius is 10 ft. (3m). Recommended cattle alley dimensions are 10 ft. (3m) for people on foot, 12 ft. (3.5m) for people on foot and horses, and 14 ft. (4.2m) to 16 ft. (4.8m) for horses only.

To prevent animals from slipping in areas paved with concrete, the concrete should be scored with deep grooves. The grooves should be 1 in. (2.5cm) to 1 1/2 in. (3.8cm) in an 8 in. (20cm) diamond pattern. A diamond pattern should be used because it is easier to wash.

In areas with solid fence, small man-gates must be installed so that people can get away form charging cattle. The best type of man-gate is an 18 in. (46cm) wide, spring-loaded steel flap. The gate opens inward toward the cattle and is held shut be a spring. A person can quickly escape because there is no latch to fool with. The man-gates can be constructed form 10 gauge steel with a rim of 1/2 in. (1.3cm) rod.

Author:
Temple Grandin, Assistant Professor Department of Animal Science Colorado State University

This publication was prepared in cooperation with the Extension Beef Cattle Resource Committee and its member states and produced in an electronic format by the University of Wisconsin-Extension, Cooperative Extension. Issued in furtherance of Cooperative Extension work, ACTS of May 8 and June 30, 1914.

BCH-9004 Cattle Behaviour And Handling Facility Design For Feedlots