Meat technology update

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Cattle handling design principles

Good animal handling is essential if one is to achieve meat of an ultimate pH of 5.7 or less, and prevent dark cutting meat and bruising.

In order to design efficient systems for handling animals at a meatworks one needs to understand how the animal perceives its environment. Acknowledgement is given to Dr Temple Grandin, Assistant Professor of Animal Science, Colorado State University, for preparation of material used in this newsletter.

Vision

Cattle and sheep have wide panoramic vision. Cattle can see 360 degrees because their eyes are located on the side of the head (Figure 1). However, depth perception is poor, and dark shadows may appear to be solid objects.

Races, forcing pens, and unloading ramps should have solid fences to prevent animals from seeing distractions outside the fence with their wide-angle vision. Moving objects outside the fence will frighten livestock. Animals will often baulk at a sudden change in fence construction or floor texture. Puddles, shadows, drains and bright spots will also impede animal movement. Poor depth perception may explain why livestock baulk at many things. Livestock can perceive depth when they are still and have their heads down but their ability to perceive depth while they are moving with their heads up may be poor. To see depth accurately the animal has to stop and put its head down.

Indoor handling facilities should have even, diffuse lighting that minimises shadows. Cattle and sheep have a tendency to move more easily from a dimly illuminated area to a more brightly illuminated area. At night or in enclosed facilities, lamps can be used to attract animals into races or knocking boxes. The lights should illuminate the floor and must not shine into the eyes of approaching animals.

Noise

Livestock have sensitive hearing and they are stressed by excessive noise. They are especially sensitive to high-frequency sound. In steel facilities, gate strike posts should have rubber stops to reduce noise and, in the stunning area, the shackle return should be designed to prevent clanging and banging. Air exhausts on pneumatically powered gates should be piped outside. If hydraulics are used to power gates or conveyors, the motor and pump should be located away from the animals and all hydraulic motors and plumbing should be designed to minimise noise; high-pitched sound from a hydraulic system is very disturbing to cattle. Cattle held overnight in a noisy yard close to the unloading ramp are more active and may show

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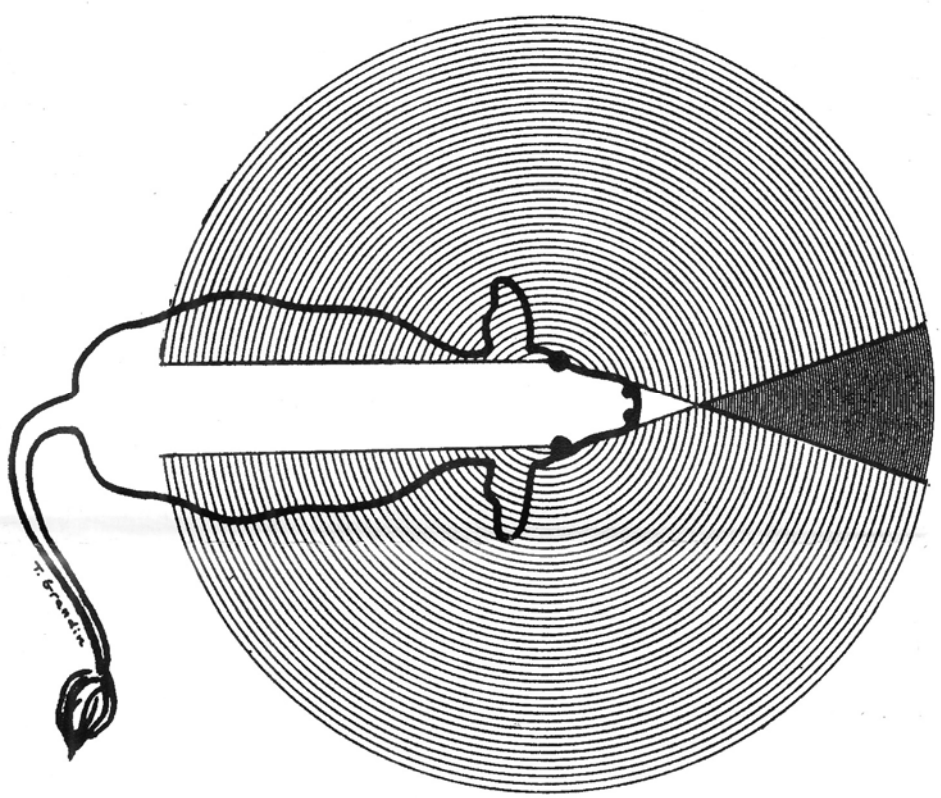
FIGURE 1: Cattle have panoramic vision. The area covered by the coarse concentric circles represents the animal's field of vision in which it has no depth perception. The small, shaded area in front of the animal's head represents its binocular field. It has depth perception in this 25-50° area.



more bruising compared to cattle in a quieter pen.

Layout

Cattle and sheep are herd animals and they will follow the leader, particularly around a curve. A group of animals will flow easily through a well-designed facility. The most efficient yard systems for cattle and sheep are constructed with curves and diagonals. Ninety-degree corners should be eliminated.

The designer of a handling system should imagine that a group of animals will flow through the system like a heavy liquid. The concept of flow is important. There should be no sharp corners to produce 'turbulence'.

In a race, cattle will more readily follow a curved path than a straight one. One of the principles of designing facilities for cattle handling is that the cattle need to see a way of escape, but not so much that they become distracted or frightened. The cattle can always see an opening as they walk down a curved race but they cannot see people or other activities (such as stunning pens) until they are almost upon them. On a long, straight single-file race cattle will baulk and bunch up at one end because they are afraid of all the commotion and noise at the other end.

Cattle will often baulk and refuse to move if they are persuaded to approach something that appears to be a dead end. Sliding gates, one-way gates and other doors in the single-file race should be made of expanded metal or closely spaced steel bars. This will enable the cattle to see through them. If a solid gate is closed across the entrance to the single-file race, the cattle will often refuse to approach it, because they cannot see an opening. However, stunning pens should have a solid entrance gate.

Since the unloading ramp is used to unload only, it should be wide and straight. This enables the cattle to see a clear path of escape. Curves are needed when cattle are being persuaded to enter something such as a truck or a meatworks.

Single-file races should never slope downward. Walking downhill is hard on cattle. The cattle will often baulk if they are forced to line up single file and wait in a single-file race that slopes downhill. The slope on the up-hill races should not exceed 15° for cattle.

However, long, narrow pens are recommended in stockyards and lairages for cattle and sheep. One advantage of long, narrow pens is more efficient animal movement: animals enter through one end and leave through the other. To eliminate 90° corners, the pens can be constructed at a 60-80° angle (Figure 2). Each pen gate should be longer than the width of the alley so that it opens at an angle to eliminate the sharp corner. Long, narrow pens maximise lineal fence length in relation to floor area and this may help reduce stress. Cattle prefer to lie along the fenceline.

With proper attention to detail, cattle handling systems work like well-oiled machines, while others bog down with cattle that constantly baulk and turn around. Below are a few practical tips why some cattle handling systems work better than others (see Figures 3 and 4).

Round forcing pens and curved, single-file chutes work better than straight ones but they must be laid out correctly. In addition to the reasons mentioned earlier, they also take advantage of the natural circling behaviour of cattle in that, as cattle go around a 180° turn, they think they are going back to where they came from. The layout of round forcing pens should be such that cattle make a 180° turn as they move through the forcing pen.

Figure 4 shows both the right and wrong layout for a curved race system. If the single-file race is bent too sharply where it joins the forcing pen the cattle may refuse to enter because it looks like a dead end. Cattle standing in the round forcing pen must be able to see a minimum of three body lengths up the single-file chute before the curve begins. The principle of a well-designed, curved, single-file chute is to show the animal that there is a place to go and then to take it around the curve.

FIGURE 2: Layout of unloading ramps, diagonal pens and curved race system for a cattle abattoir

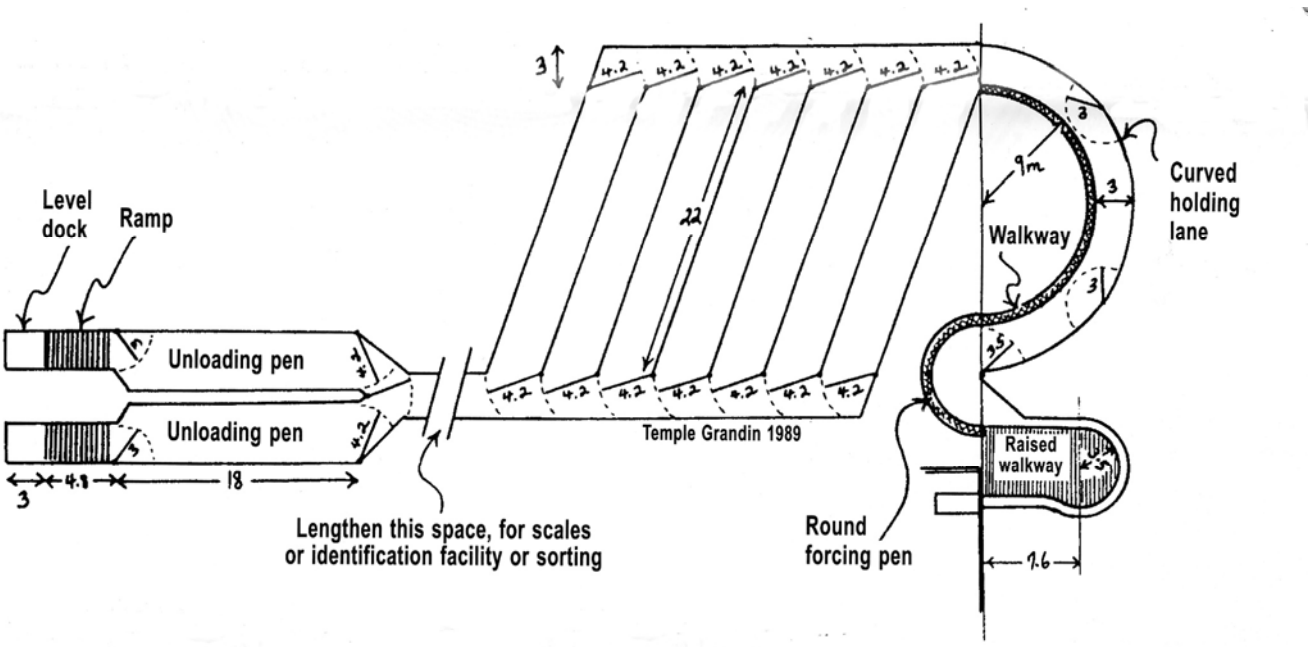
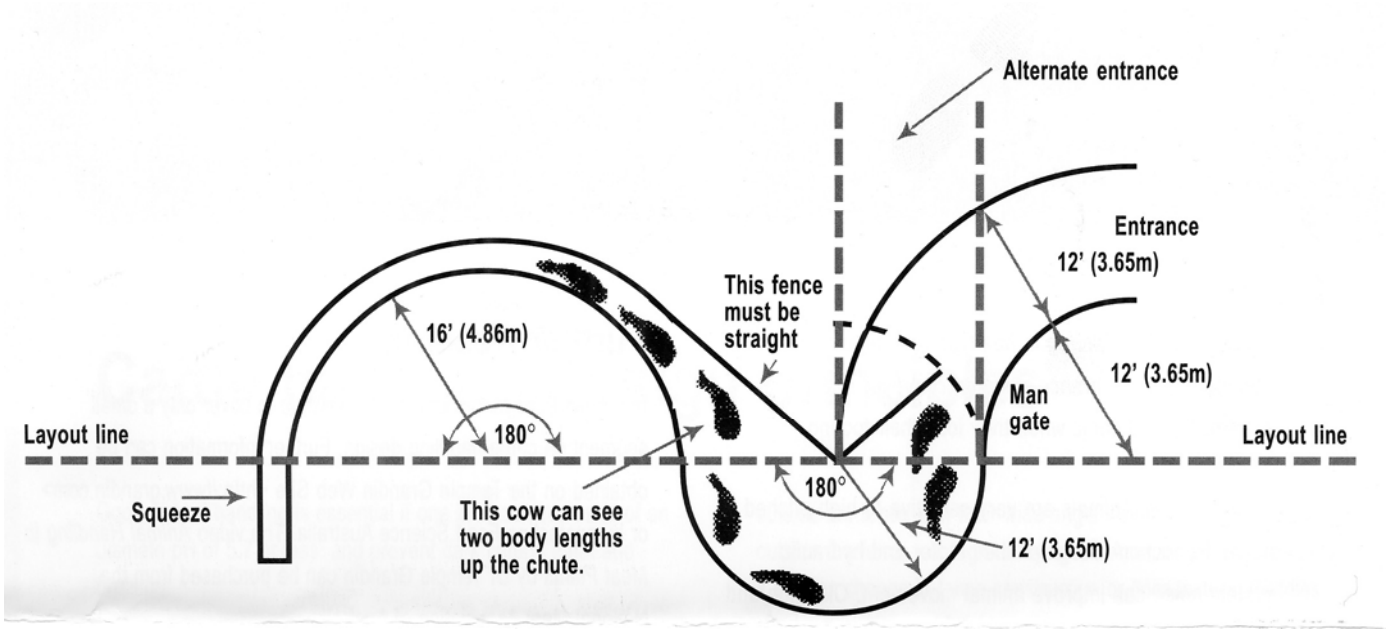


FIGURE 3: A well-designed round forcing pen takes advantage of the tendency of cattle to go back in the direction they came from.



Cattle often move more easily if the forcing pen and most of the single file chute is located outside the building. Cattle will often baulk if the wall of the building is placed at the junction between the forcing pen and the single-file chute. Either a building has to cover the entire forcing pen and single-file chute, or a minimum of two body lengths of single-file chute protruding outside the building has to be provided.

The forcing pen should never be built on a slope because the animals will pile up against the rear forcing pen gate. However, inclines to the stunner will work well but should be located in the single-file race.

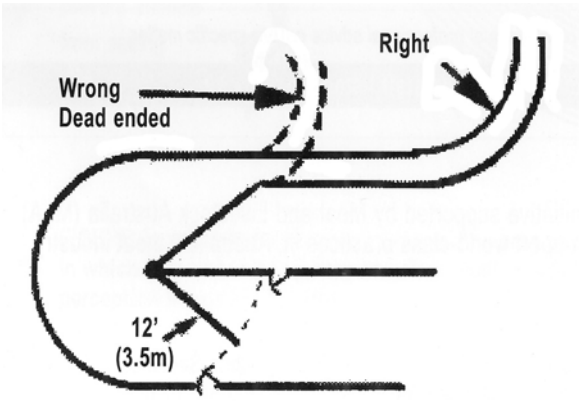


FIGURE 4: Right and wrong layout for cattle

Maintaining efficient cattle handling

Solutions to some common problems are as follows:

- *Remove distractions that cause baulking* – such as a chain hanging down in a race entrance, shadows, reflections off shiny metal, ventilation drafts blowing in the faces of approaching animals. Animals will baulk if either moving people or moving machinery are visible to them ahead. Install shields to prevent animals from seeing movement of people or objects ahead of them, particularly as they approach the restrainer or stunning box. Use solid fences in races, forcing pens and unloading ramps to prevent distractions. Ventilation drafts blowing down the chutes towards the animals may make it impossible to reduce electric prod use.

- *Provide adequate lighting.* Animals will not enter a dark place such as a knocking box or enter a place where direct glare from a light is blinding. To reduce baulking at the entrance of a restrainer, install a light above the entrance. The light should illuminate the entrance of the restrainer, but it must

not glare into the eyes of approaching animals. Lamps can also be used to encourage cattle to hold their heads up for stunning. Light coming up from under a conveyor restrainer should be blocked with a false floor to prevent animals from baulking at the 'visual cliff effect'. Animals may also baulk at shiny reflections off a piece of metal or sparkling water on the floor. Relocating a light will often eliminate the reflections.

- *Provide non-slip flooring in box-type restrainers and a non-slip cleated entrance ramp on conveyor restrainers.* Animals tend to panic when they lose their footing.

- *Reduce noise.* Animals are very sensitive to high-pitched noise. Reduction of high-pitched motor and hydraulic system noise can improve animal movement. Clanging and banging metal should be reduced and hissing air should be muffled.

- *Move small groups.* When cattle are being handled, the forcing pen and the staging areas that lead up to the forcing pen should never be more than three-quarters full. Half full is best. Do not push forcing pen gates tightly against the animals, as cattle need room to turn.

- *Use other driving aids.* Electric prods should be replaced as much as possible with other driving aids, such as plastic paddles or a stick with a flag on the end. The animals should move easily and handlers should not hit them. Cattle can often be moved along a chute when the handler walks back by them in the opposite direction of desired movement. Electric prods should never be applied to sensitive parts of the animal such as the muzzle, eyes, ears or anus, or on occasions when the animal has no room to go forward. If they are ever used, they should be long enough to touch the recalcitrant animal.

Further Reading

In a newsletter of this length it is possible to cover only a small segment on cattle-handling design. Further information can be obtained on the Temple Grandin Web Site <http://www.grandin.com> or by contacting Food Science Australia. The video *Animal Handling in Meat Plants* by Dr Temple Grandin can be purchased from the National Meat Association of Australia.

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Contact us for additional information

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