



FEEDLOT DESIGN AND CONSTRUCTION

24. Buildings over processing facilities

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Portal frame pitched roof structure over the crush area only.



Steel and timber roof over crush, race and handler working area only.



Steel frame structure over crush with half-sheeted walls. Sharp contrast between dark shadows and bright sunlit areas could make cattle baulk.

Introduction

Locating a livestock handling facility inside a building, or covering part of the handling facility, improves the environment for both cattle and handlers who can work during inclement weather in a timely and low stress manner.

The most important work places to cover are the race and crush area. Electronic or electrical equipment may need to be housed in a dedicated, relatively clean area.

Design objectives

Buildings for livestock handling should be designed and constructed to

- Provide protection from the weather.
- Cover the area over the crush and preferably the entire curved race area.
- Have functional space for livestock handling processes.
- Maximise cattle flow and minimise baulking of cattle.
- Provide a safe, well-lit and ventilated working environment.
- Be able to be cleaned and hosed easily.
- Provide storage of equipment and veterinary chemicals.
- Provide storage of electrical equipment associated with operations.
- Comply with respective state building codes and relevant Australian Standards.

Mandatory requirements

Compliance with

- Australian Animal Standards and Guidelines for Cattle (DAFF, 2013)
- National Guidelines for Beef Cattle Feedlots in Australia (MLA, 2012a)
- National Beef Cattle Feedlot Environmental Code of Practice (MLA, 2012b)
- NFAS standards (AUS-MEAT, 2014).

The building elements, such as concrete footings, floor slabs and steel structures, shall achieve the structural provisions of the Building Code of Australia (BCA) and local building regulations and be designed in accordance with the relevant Australian standards.

Design choices

A functional structure need not be elaborate or overly expensive. Suitable designs will vary according to: the number of animals to be processed, operations to be performed and when they are to be performed; space restrictions; local weather; personal preferences; and budgets. The structure covering the processing facility should be determined during the planning and design phase of the project.

Types

The size of building can vary from one that covers the crush only to one that covers the entire processing area, including forcing pens, curved races, crushes and the draft area. Typically, small structures are free standing with a skillion or pitched roof and no walls. Larger facilities may be similar to a more commercial building, with walls, offices, staff amenities and storage facilities.

Section 40 – Machinery Workshops illustrates structural design elements of buildings that may be used as covers for processing facilities.

Structural design

The structural design criteria for various elements of a processing facility building are similar to other structural elements around the feedlot, such as steel structures in machinery workshops (see *Section 40 – Machinery workshop*), concrete footings, foundations and floor slabs in grain commodity storage areas (see *Section 28 – Feed preparation and commodity storage* and *Section 31 – Commodity storage*) and vehicles (see *Section 42 – Vehicle washdown* and *Section 41 – Cattle wash*).

Environment

Sun and heat

Solar radiation and heat are a major reason for protecting workers and cattle during processing.

Ventilation through roof vents is needed to prevent heat buildup in walled buildings. Skylights or clear roof sheeting will enhance natural lighting during the day, but can allow direct radiation.

Walls and roofing can create shadows that may baulk the animals (see *Section 21 – Livestock handling*) in the early morning or late afternoon. Sun angles can be calculated at both ends of the day during summer and winter to assess invasive bright light or shadows cast from structures. *Section 16 – Shade* provides more information about calculating shadow cast.

Rain

Protection from rain helps prevent interruptions during processing. Rain from roofing should be collected with guttering and directed away from the facility into the standard feedlot drainage system. Roof run-off is likely to be contaminated with manure dust and is not suitable for drinking.

Without gutters, water running off the roof into the flow of animals can cause cattle to baulk and create an unpleasant working environment if it flows through the processing area.

Wind

The direction of the prevailing wind will determine which walls should be clad and the orientation of the building. One or more walls can be left unsheeted for ventilation and to reduce costs. Air flow is important to maintain building ventilation, but wind will drive dust and rain and generate a chill factor in colder climates.



Steel frame building over entire processing area. One third of the shed is fully enclosed for storage and two side walls are half-sheeted from the top for protection against rain and wind. The north-facing wall is not sheeted.



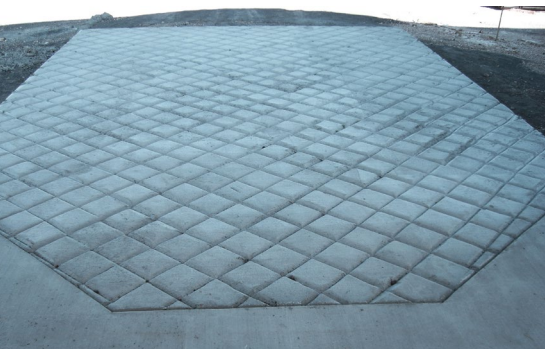
Steel frame building over the entire processing area. It is partially enclosed for protection against rain and wind, with a roof vent for ventilation.



Steel frame building over entire processing area. Lighting is provided with clear roof sheets and artificial lamps.



Stamped concrete with square pattern aligned along direction of flow. The lack of grooves on left where cattle turn is not ideal.



Stamped concrete with continuous square pattern orientated at 45° to cattle flow.



Stamped concrete with herringbone pattern.

Flooring

The floor level of the processing facility needs to be higher than the surrounding area to allow drainage of cleaning water out of the building.

Flooring within the processing facility should be non-slip, easy for cattle to walk on and not cause a hollow noise. The surface on which the animals walk has the greatest influence on any possible injuries. Worker-only areas do not need the same traction requirements as the cattle areas.

Any combination of materials can be used in the construction, with the choice depending on local availability of materials and type of flooring required.

Floors that receive heavy pressure from stock – such as gateways, forcing pens, races and the cattle crush – are generally constructed from concrete. But there is an increasing trend to using soft flooring options.

Concrete

Well designed concrete surfaces can provide a comfortable, clean environment, provided the correct falls allow good drainage during cleaning. But concrete floors can develop potential trouble areas over time, including the following issues

- Broken, cracked, eroded or otherwise damaged surfaces can lead to foot problems, such as sole bruising, or be responsible for small wounds that can allow infection to enter the foot.
- Poorly designed or constructed concrete surfaces may not provide sufficient grip for cattle. New concrete should be well compacted to minimise wear during its lifetime.
- Worn concrete can be particularly smooth and slippery and can lead to sole bruising and foot and leg injuries.
- Poorly constructed and damaged floor areas generate pot holes and dips in which manure collects, they are difficult to clean and could be a source of infectious illness.

There is little industry consensus regarding the most appropriate dimensions, orientation and configuration of grooves or patterns installed in concrete to create a slip resistant floor.

Theoretically, a floor that provides confident footing should have

- Parallel grooves spaced 40mm apart
- Grooves with a maximum width of 10mm
- Grooves across the animal's path of direction
- A regular pattern of hexagons with sides of 45mm in length.

Patterns in concrete can be created by grooving or stamping in green concrete, or cutting after initial curing takes place.

Grooves in green concrete

Bullfloating is a standard task that is performed after screeding when constructing concrete slabs-on-grade. Groove moulds are simply added on a bull float from plywood or wood strips. Bullfloating grooving is suitable for small areas and produces grooves without sharp or rough edges or exposed aggregates.

Diamond and hexagonal patterns can be created in green concrete using a metal stamp. Typically the stamp is fabricated from metal cut and welded together and with a handle, allowing it to be pushed into and removed from the concrete surface.

Stamping is sensitive to concrete moisture conditions. Concrete that is too wet will tend to stick to the stamp, causing undesirable rough edges and a 'sloppy' finish. Concrete that is too dry will bulge up in the inner space between each member used to form the pattern.

Cut grooves in cured concrete

New concrete floors can be grooved after initial curing and older concrete floors can be re-grooved as needed. Cutting grooves in hardened concrete eliminates the need for contractor experience in grooving wet concrete and the timeliness of stamping and bull floating.

Soft flooring

Soft flooring is becoming more common as feedlots seek to improve cattle welfare and minimise slipping and hoof/limb injury. The quietness of soft flooring also reduces cattle stress and assists with cattle handling.

The most common form is rubberised, high friction soft flooring that is available in mats or rubber belt form.

Rubber belting is usually reclaimed from the mining industry, where it is typically used as conveyor belting. But widths are usually limited to about 1800mm. Reclaimed rubber belting might have different levels of hardness and wear.

Rubber belting can be cut into various widths and lengths to meet particular needs. Belting should be fastened down with slightly counter-sunk, corrosion resistant fasteners embedded in the concrete. Grooving, or a pattern of holes, in the belt material is essential - as urine and manure make non-grooved belting slippery. Typically, holes of about 40mm in diameter are punched along the entire length of belting.

Suspended mesh

Woven wire mesh suspended over a concrete floor can provide a non-slip surface, with manure and urine falling through the mesh and simplifying cleaning processes.

Mesh flooring can be suspended at various heights above the floor. Typically the mesh is attached to the top of aluminium stirrups of about 100mm in height, but it must be well supported to prevent bending. This type of flooring is more common in abattoirs, where it helps to keep animals relatively clean.

Cattle wash down and drainage

A pressurised water washdown is the most effective for cleaning animals that are ready for dispatch to the abattoir and for cleaning the building floor.

Water pressure and volume need to be balanced. High pressure, low volume water will splatter solids, but a low pressure, high volume system may not move the solids. Hose length will determine how many hoses are required and the location of the reel or connection.



Rubber belt soft flooring with 40 mm holes punched in the rubber for non-slip effect.



Suspended woven-mesh floor. The mesh is securely attached to the top of aluminium stirrups.

Hose reels prevent safety hazards caused from hoses lying on the ground. However, as fire hose reel assemblies may not deliver enough volume of water, they would need to be designed to suit specific feedlot purposes.

Washdown water has to be directed to the feedlot drainage system (see *Section 10 – Pen and drainage systems*) and, as it contains manure, it must be directed to a sediment trap (see *Section 11 – Sedimentation removal systems*). Open drains are preferred, as they are more easily maintained than underground pipes. Any underground pipe must have a good slope and preferably no junctions or bends to restrict flow.

Staff amenities

Extra amenities may be needed in those feedlots where the processing facility is located some distance from the main office, or where cattle handling staff are more numerous. In larger facilities, the amenities can be part of - or inside - the processing area building.

The key design considerations include

- Are toilets or change rooms required?
- What will be required (e.g. hand washing and showers)?
- Will some separate personal hygiene facilities be needed for male and female staff?
- Will the facility be used as a meal room and, if so, will air conditioning and a mini-kitchen be required?
- Will it be used as an office to house computers and require a data/network connection and phone?
- Will it be used to house veterinary supplies, including medicines and vaccines?

Quick tips

- Plan a building for, or structure over, the processing facility during the design phase of the project.
- The crush area and race need the most protection from weather.
- The building or structure needs to be functional, but not elaborate or overly expensive.
- The type of building required will depend on the number of animals to be processed, operations to be performed, when they are to be performed, space restrictions, personal preferences and budget.
- Water off the roof should be directed away from the building and into the pen drainage system.
- Water off the roof will be contaminated with manure dust and unsuitable for human consumption.
- Consider shadows cast by buildings or bright light intrusions during layout and design to prevent cattle baulking.
- The most appropriate dimensions, orientation and configuration of patterns to create a slip-resistant concrete floor are not 'fixed in concrete'.
- Direct washdown water from the facility to the feedlot drainage system via a sediment trap.

Further reading

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