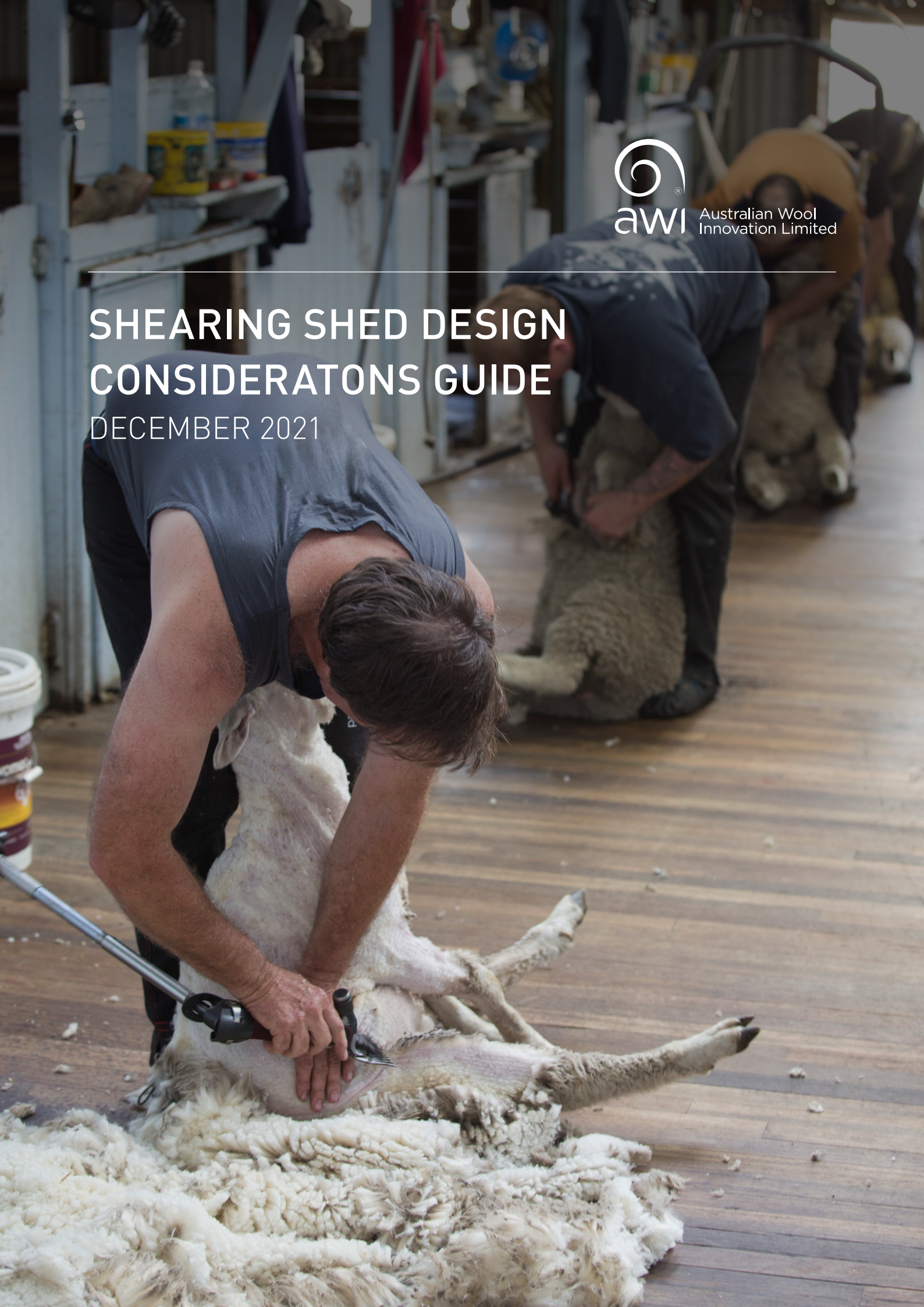


Australian Wool Innovation Limited

SHEARING SHED DESIGN CONSIDERATONS GUIDE

DECEMBER 2021

CONTENTS

GUIDE INTRODUCTION

This guide aims to outline some of the considerations that should be made when designing new or renovating shearing sheds.

Covering end to end of the shearing shed it is broken down into five topic guides; in-shed pens, shearing board, wool room, general design and construction and equipment.

This publication does have some specific considerations to help with decision making, however there are several additional AWI resources that have been developed and are more prescriptive in certain areas.

ADDITIONAL AWI RESOURCES

1. AWI SHEARING SHED DESIGN PROJECT:

AWI with a working group of woolgrowers and shed staff undertook an evaluation of shearing shed design and prototyped, trialled and developed an innovative shearing shed design that is freely available to industry. The design addresses worker safety and animal welfare, while also achieving improved shed efficiency and good wool quality outcomes.

Many sheds have now been built off this new shearing shed design across the country, with further information and the designs available at www.wool.com/sheddesign.

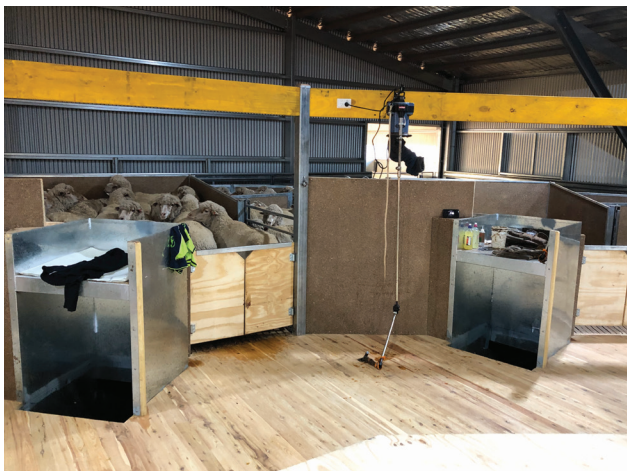


Figure 1: 'Arrow Park' shearing shed Dubbo NSW, the first shed built of the new AWI designs. Source: AWI.

2. SAFESHEDS, THE SHEARING SHED SAFETY PROGRAM

SafeSheds is an in-depth best practice guide and assessment resource which has been developed with input from right across the industry. SafeSheds is aimed at making the wool harvesting workplace safer for all.

SafeSheds has four sections:

1. Legal obligations of people involved in shearing
2. Guidance on how to assess and manage risks by using this assessment guide
3. Detailed best practice and assessment tools for all areas of shearing operations:
    - Module 1 – The shearing shed
    - Module 2 – Machinery and equipment
    - Module 3 – Amenities and facilities
    - Module 4 – Work practices
    - Module 5 – General working conditions

4) Assessment checklists:

- Full assessment
- Pre-shearing checklist
- Induction checklist
- Post shearing checklist

Go to www.wool.com/safe-sheds for more information, the assessment and checklist tools.

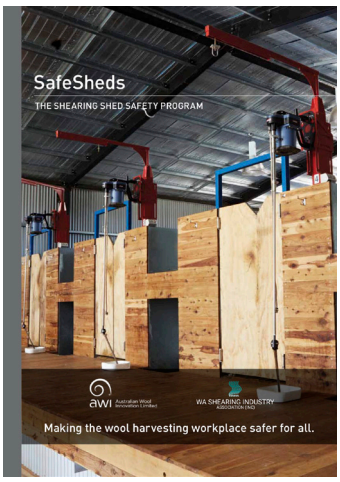


Figure 2: SafeSheds, The Shearing Shed Safety Program. Source: AWI.

3. RACE FED SHEARING MODULES

Automated delivery and manual catch race fed shearing modules - AWI is undertaking design, development and trial works for race fed shearing modules. Options for an automated sheep delivery onto the board and a manual race catch and are being explored, removing the catch and drag from the shearing process.

For more information on this project go to www.wool.com/racedeliveryunit.

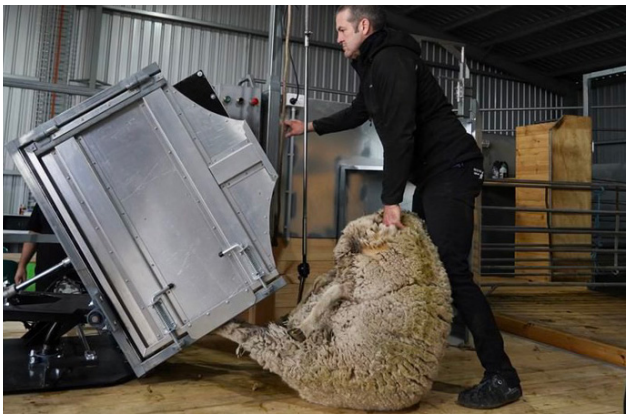


Figure 3: Modular race with and automated sheep delivery to eliminate the catch and drag. Source: AWI.

IN-SHED PENS

In conventional shearing sheds, a range of pens are required for various functions including holding, forcing and catching. Each should be designed to improve the efficiency and quality of work within the shearing shed.

ENTRANCE PEN

This pen is where sheep enter the shearing shed.

Allow enough room for sheep to enter the shed. A wide opening into the sheep area is much better than a narrow one to allow for rapid filling.

Sliding doors are often a good option for the entrance doorway. These should be 2500mm to 3000mm (2.5 to 3m) wide and hung on the outside of the shed and flashed over the top to provide weather proofing. Hanging doors on the outside of the shearing shed allows a gate to be fitted inside the shed.

Most shearing sheds are built off the ground to allow sheep to be held out of the weather under the shed wool room. The floor height of some sheds is sufficient to enable small machinery such as skid-steer or track loaders and people underneath to clean out faeces.

Sheds built off the ground have a ramp leading to the shed entrance. This ramp should be at least as wide as the entrance door 2500mm to 3000mm (2.5 to 3m) to allow for rapid filling of the shed area. The entrance ramp should have a maximum gradient of three to one. The ramp floor can be made from wood or concrete with sufficient grip so that sheep don't slip. Steel flooring is not recommended as it is noisy, more uncomfortable under foot for sheep and sheep's toes can get caught. The sides should be screened so that sheep cannot see out and become distracted.

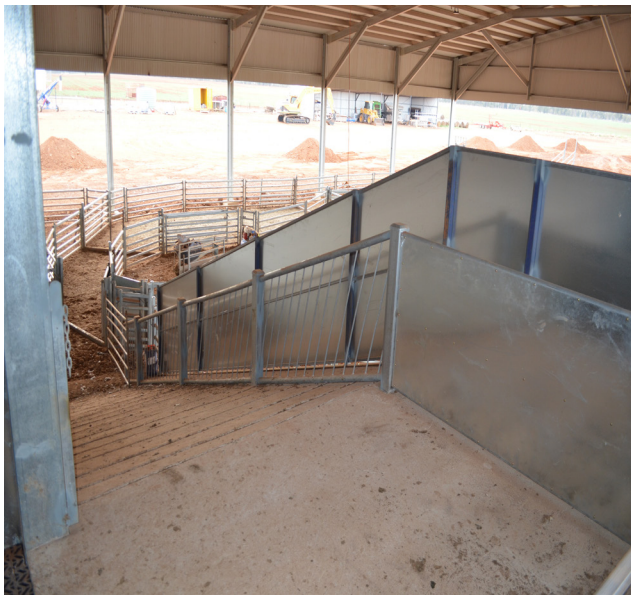


Figure 4: Shearing shed ramp with concrete flooring, walkway and screened sides. Source: AWI.

Consider additional ramp width for walkways up and down the ramp for safety, ease of access and ease of movement up and down while managing flow, ensure appropriate railing/sides for safety. Avoid light coming up from under the ramp and at the top of ramp at the point where sheep enter the shed. A skillion roof over the entrance door may help. Any gaps in the flooring should run perpendicular to the direction of sheep movement.

GENERAL PEN DESIGN AND LAYOUT

The penned area of a shearing shed typically consists of three types of pens: catching pens, forcing or filling pens and holding pens. These pens should be positioned to encourage the movement of sheep so the pens and the shed can be filled quickly and efficiently.

The total area needed to store sheep during shearing depends on the:

- number of stands
- month of shearing
- expected number of wet days.

Shed space on the grating and under the wool room should be big enough for at least one to 1.5 day's shearing without using catching pens. This may be extended to two days in the high rainfall areas. Machinery and hay sheds, or skillions can also be used as additional sheep holding areas.

In calculating the in-shed pen area needed for sheep storage, allow 2.7 full wool grown sheep per square metre.

Figure 5: Boarded off chute and additional storage. Source: AWI, SafeSheds, The Shearing Shed Safety program.

Pen areas throughout the shed should be in multiples of the catching pens. For example, if the catching pen holds about 20 full wool sheep, the fill pen should hold the same number, 20 sheep, and the holding pen twice that total number, or 40 sheep, so that together the three pens hold enough sheep for two average runs (approximately 80 sheep).

Understanding animal behaviour when designing and using facilities is essential. Pens should be designed to enable the shearer and shed hands to be in the best position when moving and handling stock, recognising the flight zone, field of vision and balance point of the sheep. Blinded panels can also help the flow of sheep, as sheep inquisitively look to move around corners and by reducing stress by not being able to see through the panel.

CATCHING PENS

The two main considerations in the design and construction of catching pens are the ease of penning up sheep and catching for the shearer. Penning up is easier if each catching pen holds a minimum of half a run which is about 18-20 full wool sheep or 6.5-7.5 square metres.

Shearers prefer to have individual catching pens and individual catching pen doors to avoid delays. Double catching pens shared between shearers create a longer drag, increase the curvature of the drag path and may need filling more often than single pens.

The width of the catching pen is limited by the distance between the stands and is generally about 2400mm (2.4m). The depth of the catching pen should minimise the number of steps the shearer has to take to catch a sheep. 2600mm to 2900mm (2.6m to 2.9m) is recommended. The distance to the back of the catching pen should never be more than 3005mm (3.05m).

The let-go chute should always be boarded off if in the catching pen area, at a lower height this can pose as a trip hazard and risk to shearers as they move backwards while dragging a sheep. When chutes going down into catching pens are boarded off, the top of the boarded off chute can be a good place for additional shearer storage to be created.

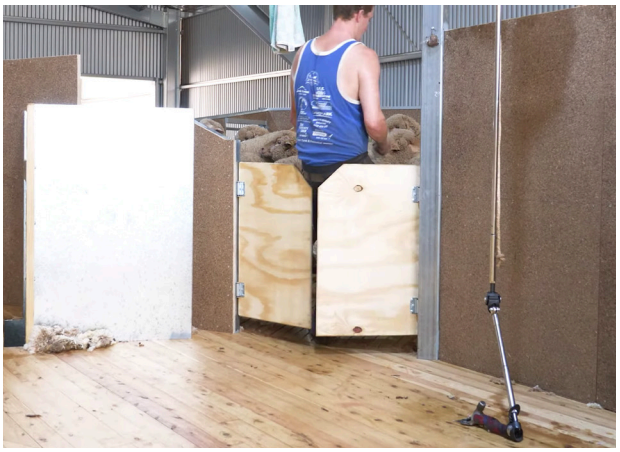


Figure 6: Low catching pen doors, below the shearers elbows on a front fill and sloped catching pen. Source: AWI.

Front and side-fill catching pens with floors that slope upwards away from the door at a gradient of approximately 0.65-0.97 in 10 improve worker efficiency. For example in a 2900mm (2.9m) deep pen this is 188mm to 280mm higher at the back of the pen than the front.

In these pens, sheep move up the slope away from the noise of the stand to comfortably face away from the door. This makes it easier for the shearer to catch, roll and drag each sheep down the slope, through the door and to the stand.

A height of 1500mm (1.5m) is recommended for the doors although lower doors can be effective, particularly where the catching pen is front filled and sloped up and away from the doors, encouraging sheep to accumulate facing away from the door. Where it is front/side fill, lower doors can be used it has the advantage of being lower than the shearer's elbows as they move through them. Doors should be light, self-closing and have double hinges to swing both ways.

Where higher doors are needed with difficult back fill pens, a third 'barn style' door may be an effective option. With two lower doors (below the shearers elbow) that are kept closed at all times to stop sheep escaping onto the board, with a third 'barn style' door that is swung on top, with it closed for filling and kept open while shearing.

The overall noise level and vibrations created from shearing is reduced if the doors and panels between catching pens and the shearing board are constructed of particle board, plywood or timber.

BACK-FILL CATCHING PENS

Traditionally, the forcing area has been located directly behind the catching pen, requiring the catching pen to be filled from the back. These are typically difficult to fill as the sheep are forced toward the noise of the shearing board. The pens cannot be topped up without the risk of losing sheep and the shearer cannot continue to catch sheep while the pen is being filled.

One way to improve the operation of back-fill catching pens is to install a counter-balanced lift/swing gate that replaces the entire back panel between the fill and catching pens although this does not necessarily address the issues identified above.

Back fill catching pens also prove difficult when adopting sloped catching pen timber slats for shearers to catch and drag down to the board, with sheep preferring to move uphill rather than downhill, therefore sheep will not fill as effectively.

Figure 7: Back fill catching pen, note the change in timber slat direction in the catching pen to help with drag. Source: AWI.

FRONT-FILL CATCHING PENS

In shearing sheds with a front-fill system, the fill pen is located next to rather than behind the catching pen and sheep typically move from the fill pen through a slide/swing or lift/swing gate in the front corner of the catching pen. Using this design, sheep fill from the front corner and move away from the noise on the shearing board. Sheep in the holding pen behind the fill and catching pens can also help draw sheep to the back of the catching pen and assist sheep flow. Side fill (filling midway or at the back side of the pen) variations of this design are adopted in some sheds.

If an existing catching pen is front fill but doesn't have sloped catching pen timber slats, this can be adotped. The small step up at the entrance gate into the catching pen will not be an issue (Figure 8).

The advantages of front-fill catching pens are that they:

- are quick, smooth-flowing systems for filling the catching pens
- can be easily topped up at any stage during a shearing run without the risk of sheep escaping and without requiring the shearer to stop catching
- suit curved or bent shearing board designs
- present the sheep with their backs to the shearer making them easier to catch.

Some disadvantages include:

- they can be difficult to design and install in existing conventional shearing sheds and are best suited to a curved shearing board
- shed width and construction cost may be increased because of the greater distance between shearing stands to allow for the fill pen.

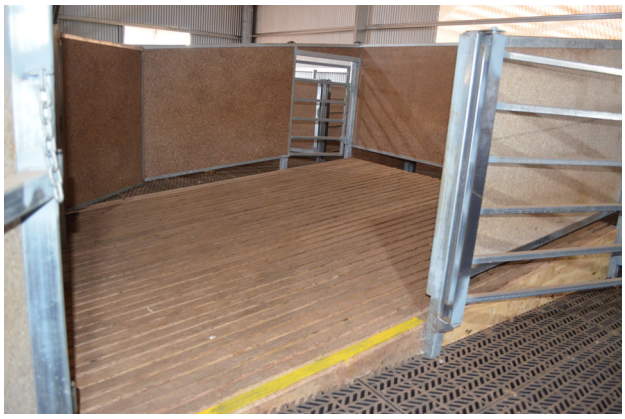


Figure 8: Plastic grating fill pen floor, slide/swing gate and front fill catching pen; sloped, timber slats parallel to drag, high visibility trip hazard paint. Source: AWI.

RACE-FILL CATCHING PENS

Race-fill catching pens generally incorporate a race which is usually 600mm (0.6m) wide and 1500mm (1.5m) long.

To fill the catching pen, the shed hand starts the sheep up the race from the filling pen and keeps the others following on.

The sheep move up the race and when they reach the end, they turn and move to the far back corner, drawing the others after them. Sheep can be moved into the catching pen at any time.

The advantages of race-fill catching pens include:

- they are suited to conventional straight shearing board designs with double catching pens
- older shearing sheds, including those with double catching pens, can be easily converted to race filling at little cost
- sheep are easily retained in catching pens during filling.

Some of the disadvantages include:

- the race reduces the working size of the catching pen
- increases the distance between stands if made wider for a larger catching pen
- if the filling race is also used as the return race there can be extra work or problems to avoid mixing of shorn and unshorn sheep

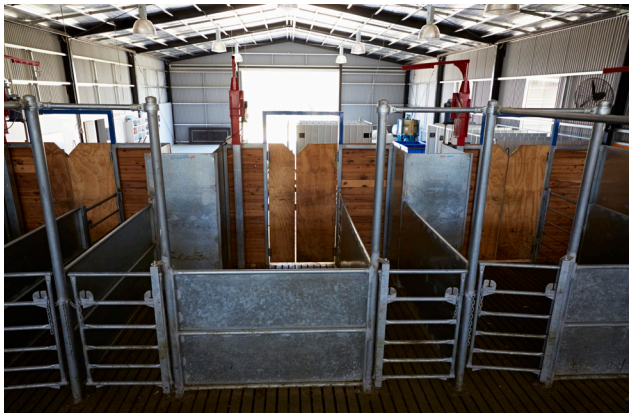


Figure 9: Example race-fill catching pen design, steel blind panels, variable doors (70:30) and boarded off chute. Source: AWI.

FORCING AND FILL PENS

Pens next to the catching pens are often called forcing or fill pens. Sheep are moved (or forced) from the forcing or fill pen into the catching pen. Forcing pens can also be used as sheep holding areas.

In older sheds, the forcing pen is often rectangular and sits behind the catching pens. This pen may also function as a back race. The forcing area has been modified in some modern shearing sheds and is beside the catching pens. These pens are known as fill pens and are used in conjunction with front-fill catching pens.

Forcing or fill pens should hold the same number of woolly sheep as the catching pen. Forcing or fill pens that are either too small or too large, cause extra work for shed hands due to poor sheep flow during penning up. If the fill pen is larger than the catching pen, the sheep that are left in the fill pen may try to escape, become distressed or distress sheep in adjacent pens.

Forcing pens are intended to make filling of catching pens quick and easy for shed hands. A well-designed forcing area aids the sheep flow within the shearing shed.

HOLDING PENS

Holding pens that each hold 40 full wool sheep are considered adequate, that is they are twice the size of the fill pen. If pens hold more than 100 full wool sheep there can be problems with sheep packing and overcrowding in corners, particularly with young sheep.

GRATING

Grating for the sheep handling areas has traditionally been made from timber slats although plastic grating is now becoming popular. Metal grating is not recommended as it is noisy, more uncomfortable for sheep to walk and stand on, and there is a greater risk of the sheep's toes catching.

Seasoned hardwood or pine slats measuring about 40mm x 30mm laid with 15mm gaps result in an effective, self-cleaning floor. These slats should be laid across (perpendicular to) the intended 'flow' or direction of movement of the sheep so the sheep see less light underneath the floor. This will make it easier to move the sheep through the shed. The exception to this is in the catching pen where it is recommended to always use timber slats and the grating runs parallel to the path of drag to minimise friction and the effort required to drag the sheep.
In sheds where the sheep handling area is close to ground level, the slats can be attached to sections of removable frames. These frames can be lifted out for cleaning.

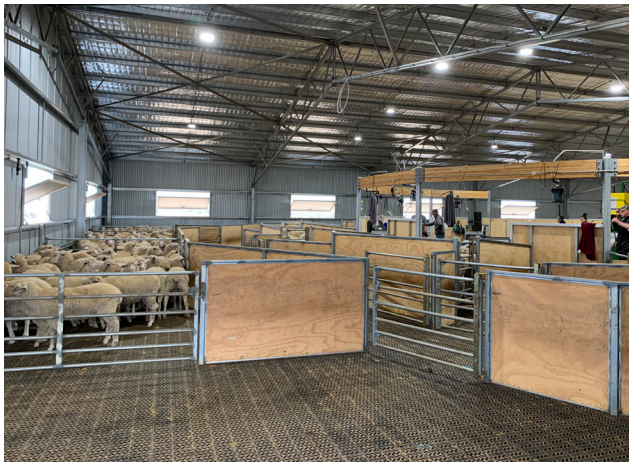


Figure 10: Plastic grating for holding and fill pens, it is deep and non-directional which is effective for sheep movement in any direction. Source: AWI.

Moulded plastic flooring is now readily available and presents an efficient alternative to timber slats. This can be laid quickly and easily without the need to consider light and directional flow to the same extent as is required with timber slats

COUNTING OUT PENS

Shearers and crutchers are paid on a per head basis, therefore it is essential to have an accurate count kept of the number of sheep shorn. This process has traditionally been facilitated using count-out pens.

The advantage of traditional count-out pens include:

- a direct count of shorn sheep is made from each stand
- the sheep shorn by each shearer can be inspected
- sheep are retained for any further treatment
- count-out can be completed at a convenient time
- each shearers sheep can be inspected.

If using count out pens, consider sizes large enough to allow for it to hold an average run worth of sheep. 12-15 square metres could roughly hold around 45 shorn sheep.

Some sheds do not have individual count out pens, shearers collect their own tallies and the total of the shorn mob is counted at the end of each run and compared with the shearers totals.

This system saves labour at the end of each run, however sheep shorn by each shearer cannot be inspected and sheep cannot immediately be held for further treatment, and it will require clear communications and an agreed plan for rectifying inconsistencies between tallies.

GATES

Gates used in shearing sheds need to be able to assist the flow of sheep in confined spaces and withstand considerable pressure. Several variations of standard gate design can be adopted. This primarily includes slide-swing and lift-swing designs.

SLIDE-SWING GATE

The slide-swing gate is designed to both slide and swing. The gate is mounted in a pivoting stirrup through which the gate can slide. The gate can also swing because the stirrup is pivoted.

The gate slides through its stirrup and along the fence. Then the gate is swung around behind the sheep, forcing or sweeping them through the gate opening. Slide-swing gates are usually fastened by a chain slide into a channel piece.

These gates eliminate the problem of opening gates into pens of sheep. They are simple to make and operate

LIFT-SWING GATE

The lift-swing gate is lifted up into the air and rotated over the backs of the sheep, lowered down level with the side of the pen and then operated like a conventional swing gate.

GUILLOTINE GATE

As the name suggests, a guillotine gate lifts vertically, usually with a counter-weight to regulate the movement.

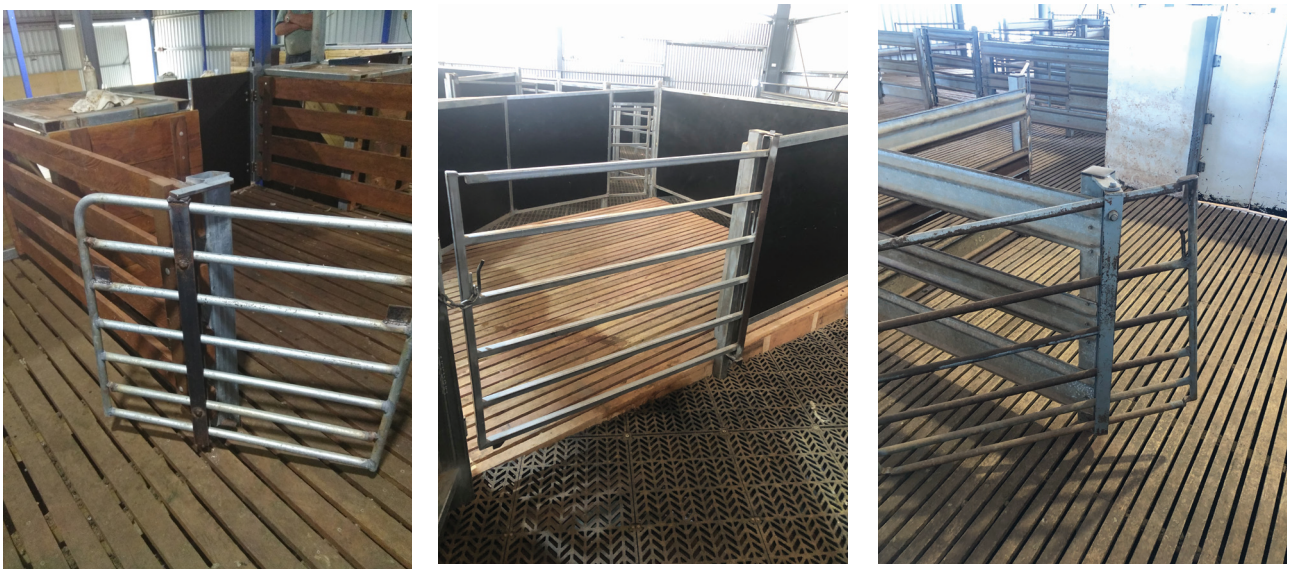
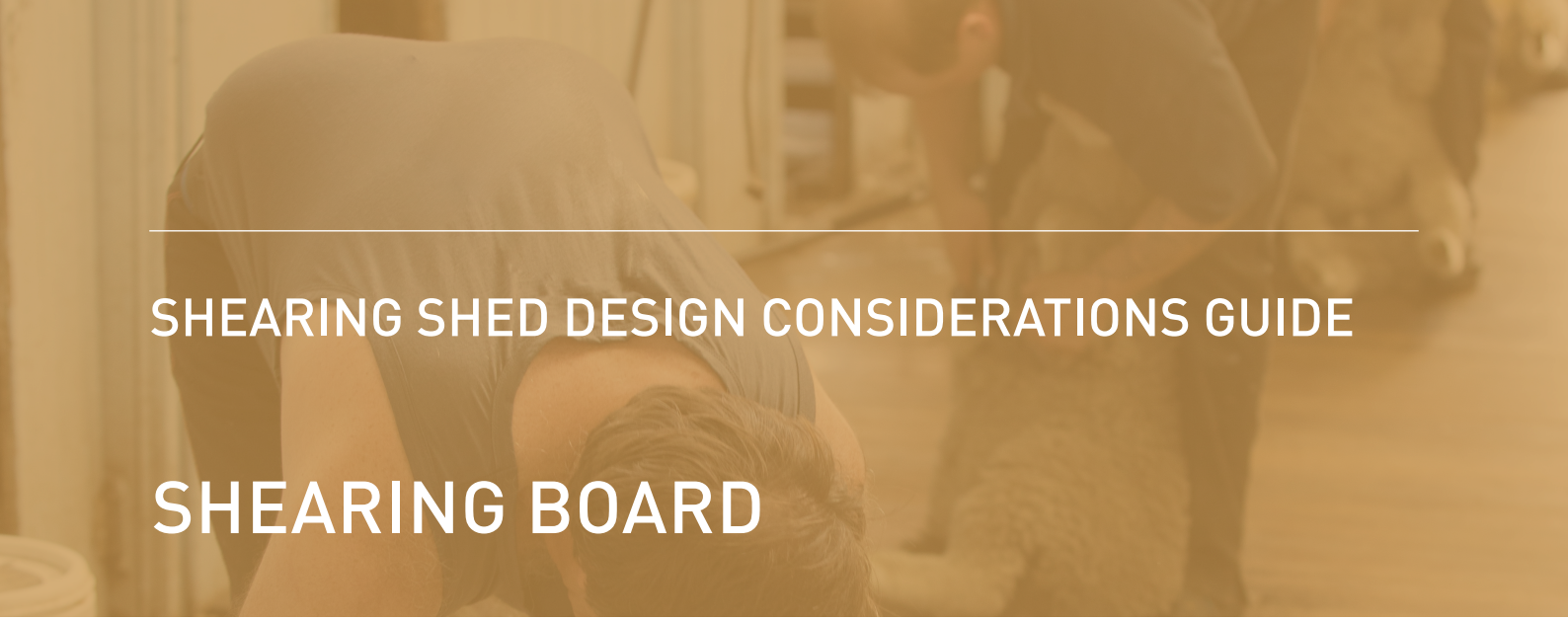


Figure 11: Example of slide-swing gates, when slid they can be sat in place with either end of the gate mounted in the stirrup towards the hinge. Source: AWI.



SHEARING BOARD

The shearing board is an area within the shearing shed where sheep are shorn. The board has five components:

- the stand (the shearer's workstation)
- the shearing machinery
- catching pen access
- shorn sheep let-go system
- a partition between the sheep pens and the stands.

BOARD DESIGN

The board design, whether raised or flat, should consider quality clip preparation and facilitate a good safe working relationship between shearers and wool handlers. This should include allowing fleeces, crutchings and contaminants to be effectively managed and removed from the board during the shearing process and between sheep.

FLAT OR RAISED SHEARING BOARD

There are pros and cons for both raised and flat shearing boards and this ultimately comes down to personal choice. Considerations for raised boards include:

- shed hands do not need to bend down to pick up the fleece
- some sheds have handrails along the board to reduce the risks working at heights, though this can also be an obstacle for shed hands to work around
    - high visibility paint can be used on raised boards and other edges to assist in mitigating risks working at heights or trip hazards
    - the raised board handrail can be hung from above removing any vertical rails presenting an obstacle for woolhandlers
- shed hands can use the raised board as a table when checking bellies for stained wool
- interference between shearers and shed hands is minimised
- the board can be quickly and easily cleared at crutching time
- storage room is available under shearing board for locks, bellies and other equipment
- shed hands cannot assist shearers with rams or difficult sheep
- shed hands can only access the fleece from one side against the leading edge of the raised board
- each shed hand will have different challenges with people of different heights, paddles can be a useful tool.

Considerations for working on a flat board:

- need to bend over to prepare and or retrieve fleeces
- only one surface to keep clean compared to two work areas with a raised board
- work health and safety risks associated with working on a raised surface are reduced when shearing on a flat board
- shed hands are not working at the same height as a moving animal and handpiece

- wool handlers have access around the fleece and shearer
- shed hands are more able to participate in the clip preparation on a flat board (removing locks and crutchings during the shearing process)
- shed hands can intervene quickly if there is an issue such as an escaped or difficult sheep.

Some contractors and woolgrowers communicate with shed staff and shearers asking for both sides of the crutch wool to be removed at the same time. This will assist in managing it on both a raised and particularly a flat board where a foot and paddle can be used to separate it.

In some raised board shearing sheds the wool room is at ground level.

Ground level wool rooms have two main disadvantages:

- under-floor sheep storage is lost
- classes are not on the same level as their wool bins/classed lines to assess their work and consistency
- bales may have to be lifted for loading onto trucks.

On the other hand, ground level wool rooms (usually with a concrete floor) can be used as a machinery parking or storage area when not being used during shearing. Although concrete flooring is preferred less by shed staff as it is a harder impact surface for them to work on. Some sheds with this design have rubber matting around the wool tables for skirting to reduce the surfaces impact in high traffic areas, although it is not ideal for sweeping and cleaning wool.

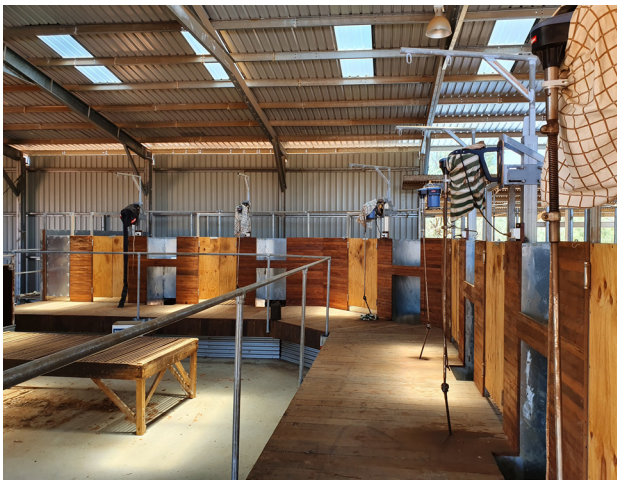


Figure 12: Raised 'L' shaped board and a flat 'U' shaped board. Source: AWI.

CURVED SHEARING BOARD

A curved board is recommended for the most efficient use of front-fill pens. It can be built as a flat board or as a raised shearing board.

The advantages of a curved shearing board include:

- reduced walking distances for shed hands
- allows for use of front-fill catching pens.

STAND DIMENSIONS

Several dimensions are important when building a shearing stand, the most important of which are the position of the down-tube in relation to the catching pen and let-go chute. The aim here is to minimise the work and stress involved in moving the sheep to and from the workstation.

Key considerations include reducing:

- the number of steps taken to catch the sheep and to drag it back to the stand
- the need to turn or twist while dragging sheep from the catching pen or moving sheep towards the let-go chute.

The distance between workstations or stands is also important. This should not be too small which can result in shearers and shed workers getting in the way of each other, nor too great meaning shed workers have to walk further between stands. The requirement for new shearing sheds and best practice distance between down tubes is at least 2100mm (2.1m).

At each stand there should be a shelf or recessed box for the shearer to place their oil can, cutter and combs etc. To minimise the impact of vibrations in the shed on shearers gear, rubber belt or timber-based storage help to look after their gear. If storage is on top of the chute, a raised leading edge/lip on this that will stop anything slipping off and falling into the chute can be useful.

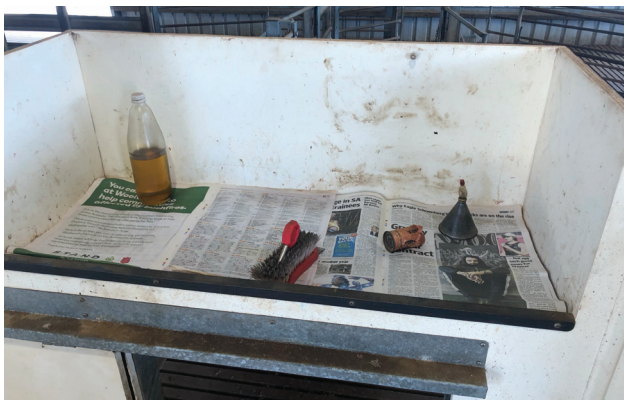


Figure 13: Raised leading edge/lip for storage to stop objects falling off. Source: AWI.

HARNESS MOUNT

Harness mounts can be placed above or next to overhead shearing plants. It is important that these can structurally hold the weight of the shearer in the harness, can pivot and swing as well as slide in and out along the overhead mounted arm as show in Figure 14 below.

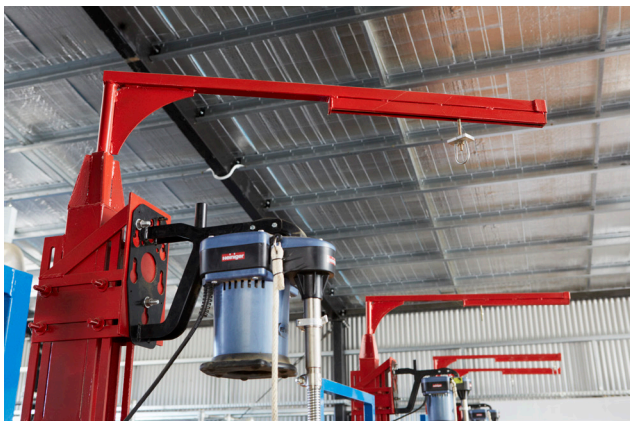


Figure 14: Harness mount pivoted to swing in any direction with the ability to slide in and out along the mounted arm. Source: AWI.

FLOORING

Tongue and groove timber flooring provides a suitable surface for shearing and wool handling. Timber flooring provides some cushioning as a surface, allows wool to be readily cleared away and allows the sheep to be moved and manipulated without sticking to the floor when being dragged from the catching pen to the shearing stand.

Timber is more comfortable to walk and stand on, and is quieter than other alternatives, such as concrete.

The board should be smooth for wool handling but not slippery for sure footing. The floor may be painted with a hard surface clear paint or sealer to prevent grease build up on the floor and make sweeping easier.

PARTITION BETWEEN THE BOARD AND SHEEP PENS

The partition between the board and the sheep pens should be at least 1500mm (1.5m) high to prevent sheep from seeing movement on the board and make penning up easier. Timber partitions between the pens and board are less noisy than metal. Boarded panels can also help with movement of sheep.

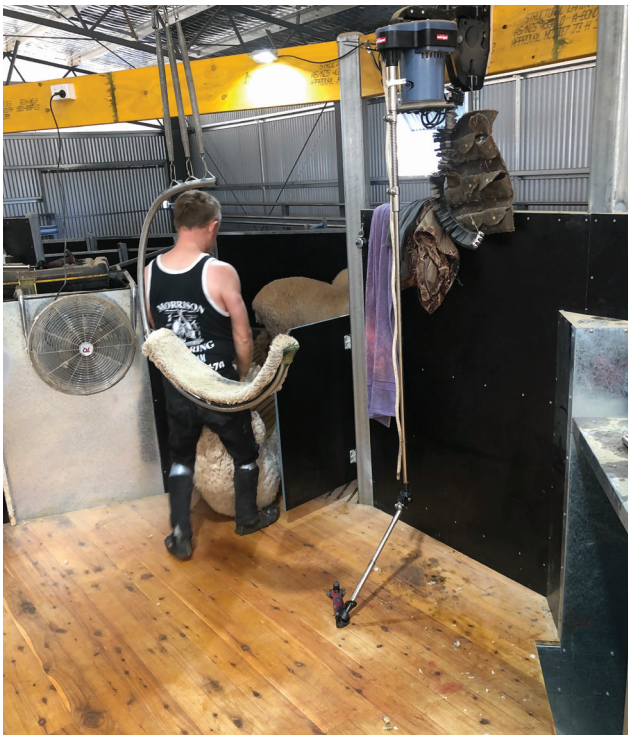


Figure 15: Low catching pen doors, board partition and straight drag from the middle of the catching pen. Source: AWI.

CATCHING PEN DOORS

Lower catching pen doors reduce the risk of shearer's hitting their elbows on the doors. Doors may be less than 1500mm (1.5m) high in front-fill pen configurations where the sheep run away from the doors when filling the catching pen. The gap between the floor and the bottom of the doors should be large enough to prevent sheep toes and the shearer's feet and heels from being caught but small enough not to encourage sheep to escape.

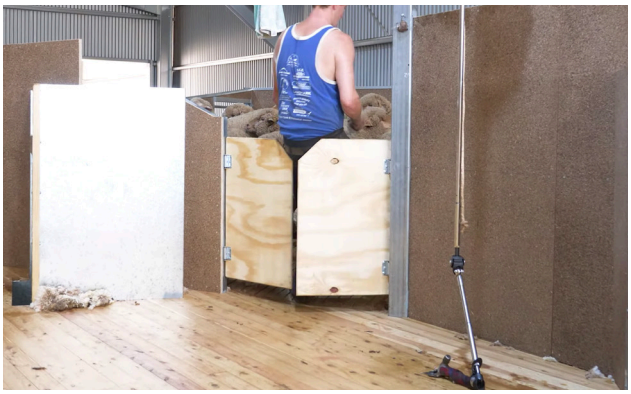


Figure 16: Low catching pen doors, below the shearers elbows, with a front fill, sloped catching pen. Source: AWI.

Where higher doors are needed with difficult back fill pens, a third 'barn style' door may be an effective option. That is too have two lower doors (below the shearers elbow) that are kept closed at all times to stop sheep escaping onto the board, with a third 'barn style' door that is swung on top, with it closed for filling and kept open while shearing.

The action or width of the catching pen doors, whether double, single or variable (60:40 or 70:30) should be optimised from a work health and safety perspective, as well as a worker efficiency perspective. Care should be taken to ensure these do not encroach upon the shearer's work station. For a right-hand shearing stand, the right-hand side catching pen door should not hit the downtube or handpiece when swung open, equally it should release early enough when dragging sheep out before reaching the shearing station. Variable 60:40 or 70:30 doors can be considered here. Self-closing, double action hinges allow the shearer to enter and exit unimpeded.

The doors should be constructed of light weight timber such as plywood. Timber doors are quieter and lighter. Sharp edges and catch points should be eliminated. Rounded corners are recommended.

LET-GO CHUTES AND RETURN RACES

The let-go system is the next most important consideration after the general design of the catching pen in terms of shearer safety and animal welfare.

CHUTES

Chutes are incorporated in the design of elevated shearing sheds and allow the sheep to be released to a count out pen below the shed. This design ensures that shorn sheep are immediately separated from woolly sheep, which is important for animal health, treatment and management, and take up less in shed/under cover storage than other let-go systems such as a return race. Compared to a return race, where count out pens are large enough to hold a runs worth of sheep it will also reduce the pressers time spent moving sheep for penning up as they are released below.

Aligning the chute entrance with the natural position of both the sheep and shearer at the end of the shearing process can help reduce the amount of turning and unnecessary exertion required to get the sheep into the chute. This will reduce risks to shearer safety and animal welfare.

Chutes that intrude or cut into the catching pen space can pose a significant risk to shearer safety as a trip hazard risk during the catching process. If the chute does intrude (Figure 2), it can be a boarded off with no sharp corners (Figure 5).

The chute should be approximately 600mm to 800mm wide to allow ample access and room for the sheep to be released down the chute with minimal resistance.

A recess into the board of 100mm to 200mm by the front edge of the chute can assist for an easier release of sheep into the chute.

A step down/vertical drop into the chute of approximately 100 to 300mm before an easing slope/decent will assist when releasing sheep into the chute. The chute should continue on an angle which encourages the forward movement of the sheep but not at a rate that may injure the sheep when it reaches the ground. The need for batons on the floor of the chute to slow the progress of the sheep should be avoided.

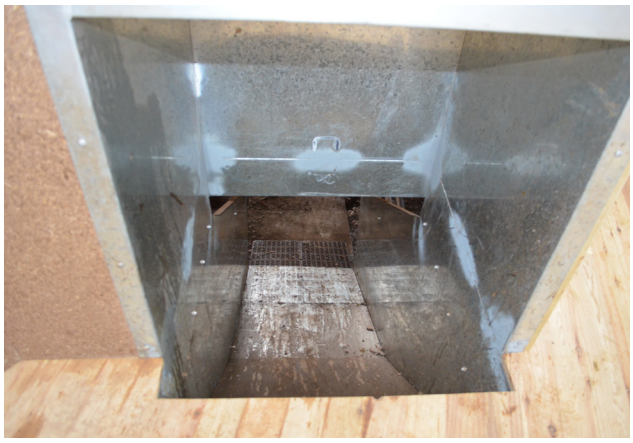


Figure 17: Wide, waist height, recessed chute and step down/vertical drop at the top of the entrance. Source: AWI.

It is recommended that the height of the chute be approximately waist height so shearers will always bump the top face of the chute with their bottom as the initial contact to prevent shearers getting too close should they step back towards a recessed chute. Consider 800mm or high enough for sheep to be released and the average shearers waist at the same time.

Chutes should be unobstructed where they meet the count-out pen. Consider installing a platform or landing pad at the bottom of the chute where it meets the count-out pen. This can help to soften the fall for sheep and to prevent soil erosion. Rubber matting or similar is recommended but not concrete as this can be too hard and abrasive.

RETURN RACES

In sheds with return races, shorn sheep are let-go back on to the grating, moving past woolly sheep.

Return races either run parallel to the filling race or catching pen, or are designed so that they can also be used as a filling race.

The advantages of return races are:

- shorn sheep readily enter the race and are not immediately exposed to the weather
- each shearer can assess their job quality of the shorn sheep
- shorn sheep can be held in the return race for further husbandry treatments.

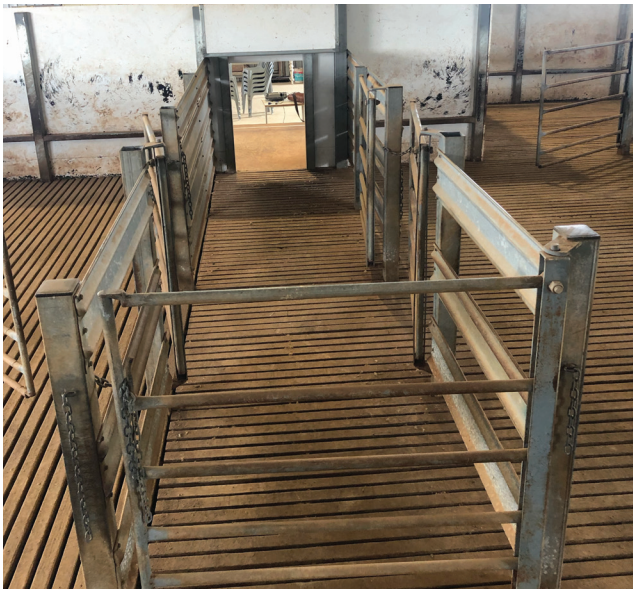


Figure 18: Return race for shorn sheep back onto the grating inside the shed. Source: AWI.

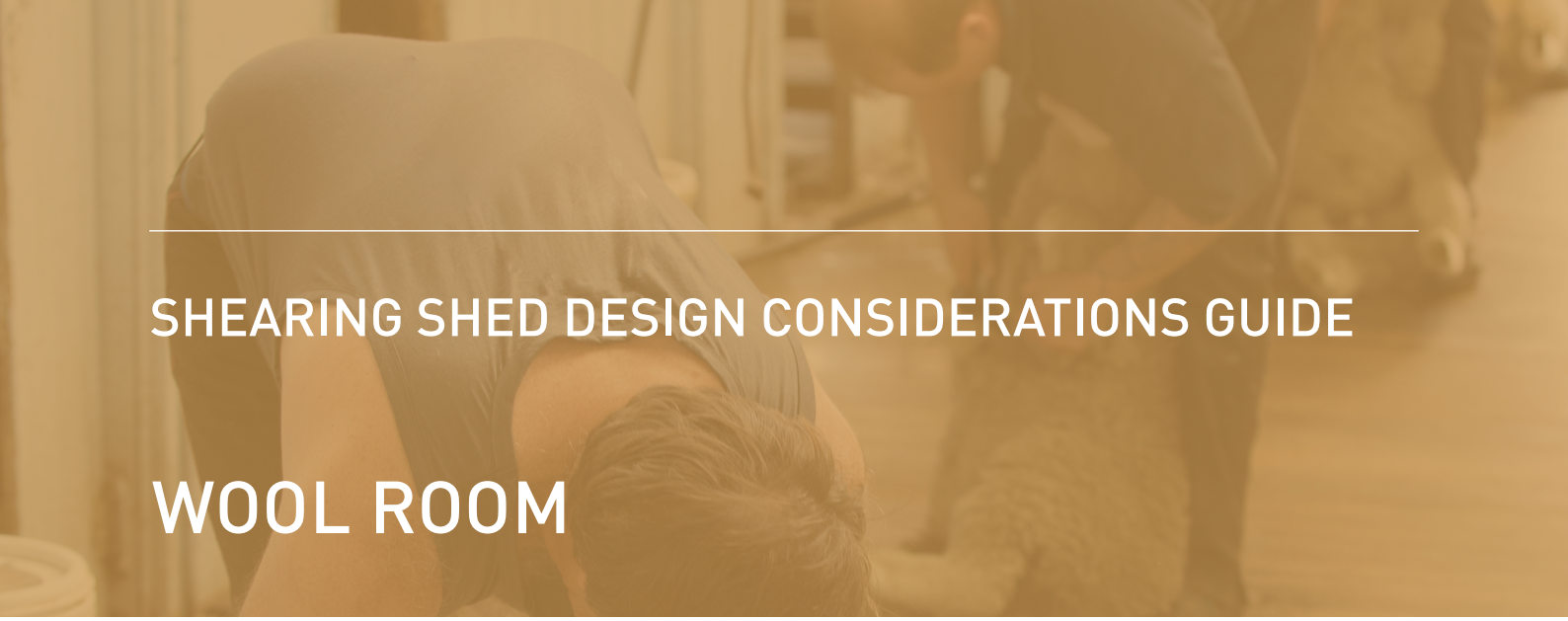
Some of the disadvantages include:

- shorn sheep, released from the return race, have to cross paths with woolly sheep before leaving the shed. This complicates sheep flow especially in large sheds.
- return races take up undercover grating/ shed space. They should be big enough to hold at least 20 shorn sheep or half an average run of sheep at shearing.
- catching pen design is limited. Front-fill catching pens are difficult to design with return races and the race reduces the working size of the catching pen.
- the distance between stands is greater (up to 3000mm plus apart)
- at crutching time the return races have to be emptied two or three times a run
- a cross race and an exit gate into the pen area are needed. These gates must be set up correctly before shorn sheep are let go or the catching pen is refilled.
- return races will also increase the pressers time spent moving sheep for penning up compared to if they are released below down a chute.

MACHINERY OPERATION

Independent electric overhead shearing units in a lot of cases have replaced shaft drive shearing equipment. These modern overhead units are a quiet, efficient and safer alternative to traditional alternatives.

The maker's specifications should be consulted before installing the shearing plant.



SHEARING SHED DESIGN CONSIDERATIONS GUIDE

WOOL ROOM

The wool room is the area in a shearing shed where wool handling occurs. While different processes may be followed, this usually includes:

- skirting
- classing
- storage in bins
- pressing into bales
- storage of bales.

There should be enough floor space in the wool room to allow for the placement of a wool table(s), wool bins and the wool press(s) to suit the design and throughput of the shed as well as unrestricted but not excessive movement of shed hands. Shed hands should not be required to walk further than necessary to move fleeces and maintain clean work areas. There should also be adequate floor space for the storage and organisation of bales.

Free span, portable construction makes the wool room less congested and more versatile. Wool rooms can be constructed at both ground level and above ground.

ABOVE GROUND WOOL ROOM

An above ground wool room can allow sheep to be stored under the floor. This can be particularly useful in high rainfall areas to ensure at least one day's shearing can be held undercover. An important consideration in such a design is the load-bearing capacity of the floor, particularly where wool presses may be moved and operated.

The flooring should be smooth but not slippery rather than abrasive so that wool can be moved and cleared away easily. As with the shearing board, this may be painted with a hard surface clear paint or sealer. The painted or sealed surface prevents grease build up on the floor and makes sweeping easier.

GROUND LEVEL WOOL ROOM

Raised board shearing sheds can have the wool room at ground level. Ground level wool rooms have two main disadvantages:

- under-floor sheep storage is lost
- bales may have to be lifted for loading onto trucks.

The floor of the wool room should be smooth to allow wool to be moved and cleared away easily. Some raised board shearing sheds have wool rooms with concrete floors. Concrete floors can be problematic in work areas as they can be uncomfortable to walk and stand on for long periods, noisy and wool can stick to them, but they can be used in wool storage area.

When not shearing or crutching, concreted areas can be used for storage of vehicles, equipment and other materials. Large access doors are an advantage when using the wool room for other purposes.

WOOL TABLES

Wool tables should be close to the shearers to reduce the distance shed hands need to walk. Wool presses can be close to the wool table so the fleeces of the main line can be put straight into the press rather than double handling through bins, further reducing walking distance and the need for rehandling fleeces.

More than one table may be used in shearing sheds with three or more stands. This nearly always leaves a clear table for the next shorn fleece, avoiding double handling.

Wool tables should be easily portable to allow greater flexibility in the wool room layout. Adjustable height wool tables enable wool handlers and classers of different heights to work more comfortably.

RECTANGULAR WOOL TABLES

Rectangular wool tables are typically used for skirting and classing. The table top has wooden slats or tubular steel rollers. These are spaced 50mm to 75mm apart; large enough for locks and second cuts to fall through.

Rectangle tables allow for fleeces to be spread out fully, given the longer length of the table, with enough space for a rolled fleece to sit at one end.

The advantage of rectangular wool tables is that they are long enough for a rolled fleece and thrown fleece to be on the table at the same time. These tables typically require two handlers who can skirt one side of the fleece simultaneously. The fleece will always land the same way (neck top and crutch bottom), this can be beneficial when skirting with two people, minimising the risk of missing skirtings between them if they always start at the crutch and each go one direction (a great benefit for learners to assist in always knowing where the other has started).

The disadvantage of rectangular wool tables is that they require two people for efficient operation, one on each side for skirting and wool rolling.

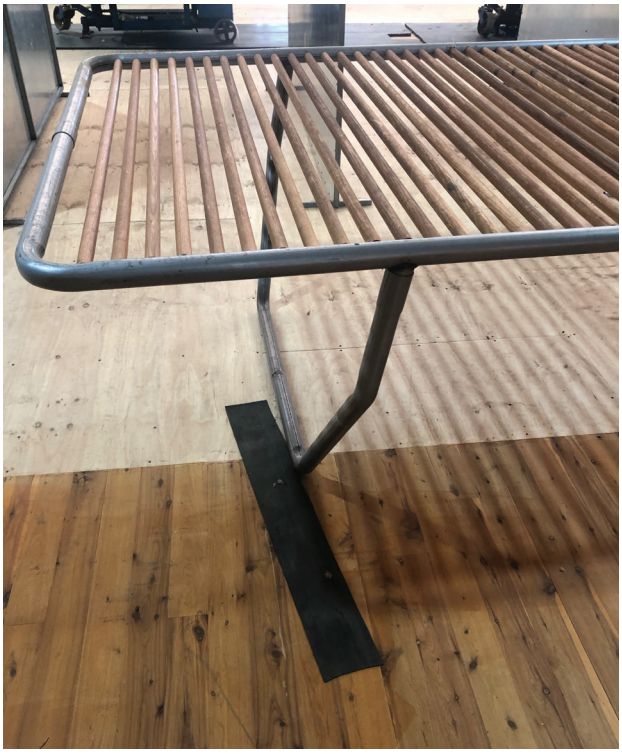


Figure 19: Rectangle wool table with a rubber mat which, goes under the leg stand to stop it shifting while in use. Source: AWI.

ROUND ROTATING WOOL TABLES

The top of a round table rotates on a central pivot. Tubular steep or PVC tubing is normally used for the table top and the spacings are far enough apart to allow locks and second cuts to fall through. Commercial round wool tables vary from 2100mm (2.1m) to 2230mm (2.23m) in diameter.

Throwing a fleece onto a round table requires a different technique from that used for a rectangular table because the width of the table does not allow for it to be fully spread out when thrown. The fleece should be thrown at a higher angle and less vigorously than for a rectangular table. As the fleece is skirted, the table rotates and the fleece is progressively rolled, ready for classing. The round table can be operated by one person.

Two round tables are an advantage in most shearing sheds. The shed worker can work each table alternately by standing in between them.

The advantages of a round table include:

- shed hands do not have to walk around the table
- one person can operate two tables
- the fleece can be thrown on to circular tables from any direction
- they are readily portable and take up less room in storage
- the height can be adjusted on some models.

The disadvantages include:

- a change in technique is required to throw the fleece correctly
- larger diameter tables may be required for big fleeces
- fleeces cannot be fully thrown which can reduce skirting efficiency
- rolled fleeces cannot be held on the table for classing
- if being used by two people to skirt it is harder to know where the other has started.

OVAL DOMED WOOL TABLES

These tables are an extension of the round table concept. It is claimed that the dome increases surface area and allows greater accessibility to the fleece.

The disadvantages include:

- fleeces cannot be thrown onto the oval table from any angle
- shed hands must move forwards and backwards as the table rotates.

WOOL BINS

Wool bins are used to store fleeces and oddments until they can be pressed into bales.

Traditional wool bins were permanent fixtures in the wool room. More modern sheds tend to use mobile or semipermanent bins which can be positioned according to clip preparation requirements or removed. This also allows the space to be used for other purposes when not being used for shearing and moved to allow a press to be moved closer to shearers if wool is going directly in from the board.

The bins are usually designed to hold at least 200kg or one pressed bale of loose wool. These are usually placed between wool tables and the press to be filled from the front and emptied from the back.

Enough wool bins should be available to allow for management of the main wool lines. If lines of wool are going straight into the press from the wool table, it is important to discuss this with the classer, classers can sometimes prefer to put lines of wool into the wool bins before they press so that they can review the consistency and accuracy of the job done.

Mobile wool bins can be used for pieces, bellies or locks. They should be strategically located so that wool can be easily moved to the wool press. Where the main fleece line is going straight into the press after classing, mobile bins may be useful for holding fleeces when the press is being used for other lines.

Figure 20: Portable, independent wool bin wall frames can be added and spaced out to the desired size and amount. Source: AWI.

WOOL PACK FRAMES

These can be conveniently placed near the wool table for storing pieces and locks, or near the shearing board for bellies and board locks.

The frames can be fixed to a wall, self-supporting or on wheels.

Wool pack frames should be located away from any overhead hazards that may pose a work health and safety risk should anyone climb into the pack to manually compact the wool.

GENERAL DESIGN AND CONSTRUCTION

MAIN SHED STRUCTURE

The frame of the shed can be constructed from timber or steel. Steel is resistant to termite and borer damage and, if steel roof trusses are used, a large open area can be created allowing greater flexibility for the layout of the pens, shearing board and wool room. The uniformity of steel also allows for significant building efficiencies.

Grated areas should still be constructed predominantly from timber (bearers and joists) as excrement is highly corrosive. Steel uprights should be protected from excrement at ground level to prevent corrosion.

The shed should be oriented to avoid glare and sharp shadows created by sunlight, as well as draughts from prevailing winds while still allowing the flexibility for air flow if required. Consideration should also be given to the layout of outside holding yards and facilities.

If the shed is above ground, consider continuing the external walls to the ground level to reduce the amount of light and wind draughts entering the shed from beneath the floor. This can be achieved by using batons which also allow for improved ventilation.

Figure 21: Wool room above in-shed storage, separate grinding area downstairs and the shed exterior complete to the ground. Source: AWI.

FLOORING

The floor of the entrance ramp can be made from wood, concrete or a suitable plastic product with sufficient grip so that sheep don't slip. It should also not be too steep (maximum gradient of three to one). Steel should be avoided as it creates noise, radiates heat, sheep toes can get caught and is an uncomfortable surface for sheep to walk on.

Grating for the sheep handling areas has traditionally been made from timber slats although plastic grating is now becoming popular.

Seasoned hardwood or pine slats measuring about 40mm x 30mm laid with 15mm gaps result in an effective, self-cleaning floor. These slats should be laid across (perpendicular to) the intended 'flow' or direction of movement of the sheep so the sheep see less light underneath the floor. This will make it easier to move the sheep through the shed. The exception to this is in the catching pens where the grating should be parallel to the path of drag to minimise resistance when dragging the sheep out of the pen.

In sheds where the sheep handling area is close to ground level, the flooring should be installed in removable frames which can be lifted out for cleaning.

Moulded plastic flooring (Figure 8 and Figure 10) is now readily available and presents an effective and efficient alternative to timber slats. This can be laid quickly and easily without the need to consider light and directional flow to the same extent as is required with slats.

Tongue and groove timber flooring provides a suitable surface for shearing and wool handling for the shearing board. Timber flooring provides some cushioning for the shearer,

equipment and sheep, allows wool to be readily cleared away, allows the sheep to be moved and manipulated without sticking to the floor and is quieter than other alternatives. The floor may be painted with a hard surface clear paint or sealer to prevent grease build up on the floor and make sweeping easier.

Timber floors are commonly used for above ground wool rooms. This flooring should be smooth rather than abrasive to allow wool to be moved and cleared away easily. As with the shearing board, this may be painted with a hard surface clear paint or sealer. The painted or sealed surface prevents grease build up on the floor and makes sweeping easier.

Concrete floors can be used for ground level wool rooms but should be avoided in wool handling areas as concrete can be uncomfortable to walk and stand on for long periods, is noisy and wool sticks to it. If concrete is used it should be as smooth as possible to allow wool to be moved and cleared away easily. When not shearing or crutching, this area can be used for storage of vehicles, equipment and other materials.

PENS

The panels between pens can be made from timber or steel. Timber, including rails, particle board and plywood, is useful in absorbing noise. A combination of blinded panels and timber or steel rail panels can be used to assist the flow of sheep around the shed. Blinded panels are effective in places to assist with sheep flow as the openings/exits will be around corners or through gates, additionally they are effective at reducing welfare risks with the nature of it being a 'blinded' panel. When designing pens consider the longevity of the materials to be used and where the pressure points may be.

The edges and corners of all rails should be rounded off to prevent injury.

Avoid protrusions or hazards in pens, particularly those caused by let-go chutes.

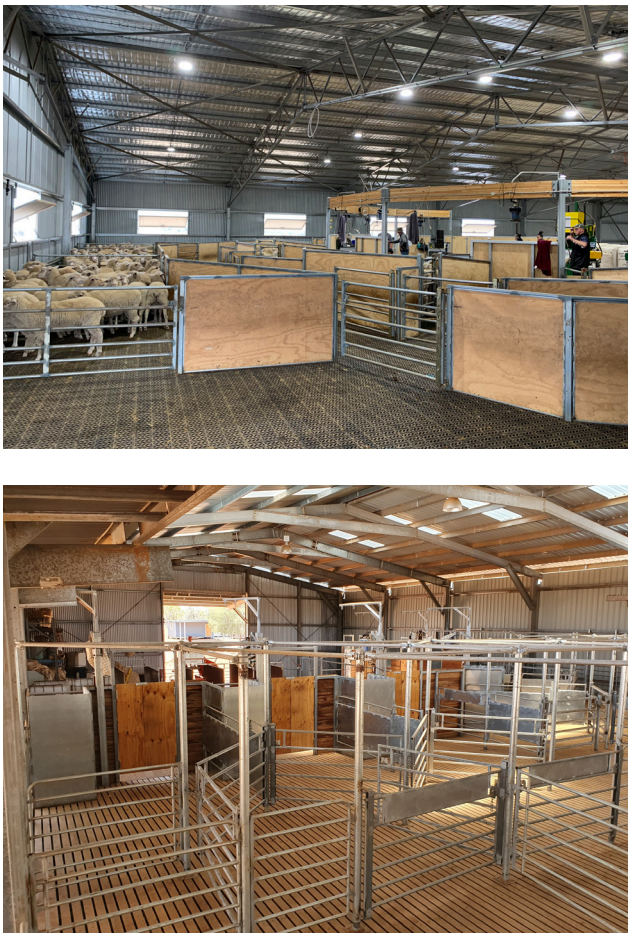


Figure 22: Timber blinded panel fencing and steel rail and blinded panel fencing. Source: AWI.

GATES

Gates can be made from timber or steel; however, timber gates are quieter and may require more maintenance over time. Steel lift/swing and slide/swing gates (Figure 11) provide a useful alternative to standard gates in confined spaces such as between the fill pen and the catching pen.

The edges and corners of gates should be rounded off to prevent injury.

Consider the action and the weight of the gate. If gates are too heavy, they can be difficult to lift, drag or swing. Gates can have numerous pinch points. These pinch points may be near the hinges or opening edge, particularly at the closing mechanisms.

Consider latches or chains that will make it as easy as possible for opening and closing.

PARTITION BETWEEN THE BOARD AND SHEEP PENS

The partition between the board and the sheep pens should be at least 1500mm (1.5m) high to minimise sheep from seeing movement on the board and make penning up easier. Timber partitions between the pens and board are less noisy and reduce vibrations.

CATCHING PEN DOORS

Lower catching pen doors reduce the risk of shearers hitting their elbows on the doors. Doors may be less than 1500mm (1.5m) high in front-fill pen configurations where the sheep run away from the doors when filling the catching pen but they need to be high enough to obstruct sheep. The gap between the floor and the bottom of the doors should be large enough to prevent sheep toes, and the shearer's feet and heels from being caught but small enough not to encourage sheep to escape.

Self-closing, double action hinges on catching pen doors have the advantage of allowing the shearer to enter and exit unimpeded. The style of door can vary from double to single or variable (60:40 or 70:30). Whichever is adopted, care should be taken to ensure they are able to release and swing closed before the shearer reaches their shearing station. The doors should not open in a manner that interferes with the handpiece and downtube.

The doors should be constructed of light weight timber. Timber doors are quieter, typically lighter and softer on impact. Sharp edges and catch points should be eliminated. Rounded corners are recommended.

LIGHTING

Lighting is an important consideration in shearing sheds. This can assist or hinder sheep flow and is important for both shearers and wool classers.

In the pens and sheep handling areas, including the let-go or chute area, lighting should be consistent, without hard lines or shadows which might interfere with the movement of sheep. Natural lighting is useful for lighting the whole shed, however at the wool table it is important to have a consistent lighting. Natural light can be harsh, inconsistent and change throughout and between days. This is best achieved through the strategic positioning of artificial, overhead 'white' light above wool handling and classing areas.

The shearer's workstation should also be well lit, lighting should be positioned above and or in front of the board to not cast shadows from overhead plant onto the shearing and wool handling areas. LED lighting provides a cost-effective solution in most situations.

Where natural light is used to supplement artificial light, this is best done using translucent rather than transparent sheeting in place of iron in the walls or roof which diffuses the light sufficiently to avoid hard light and sharp edges (Figure 23).

Figure 23: Artificial white lights centred over the wool room and table providing consistency for classing. Source: AWI.

Figure 24: Natural light from translucent wall sheeting. Source: AWI.

VENTILATION

The aim of good ventilation is to avoid noticeable draughts while at the same time dissipating heat generated in a shed full of sheep, common in humid weather and on cold nights. With the inconsistent nature of weather, flexibility to allow the elements in as appropriate while also being able to shut it out at other times is important.

Adequate ventilation reduces the formation of condensation on the roof which may drip onto sheep and wool and improves working conditions in the shed.

Ventilation can be provided in several ways:

- raised ridge capping along at least half the length of the ridge
- large wall shutters
- controlled ventilation blinds
- open, extended eves
- gable ventilation, including fixed metal louvres set high in gable ends
- ventilation below the grating although care should be taken to avoid allowing excessive light to come up through the floor.

Windows and doorways can provide additional ventilation but should not be relied on as the only source of air flow.

Fans may help circulate air in hot, still conditions. Fans should be positioned so that they do not directly blow air at or over shearers. Air conditioning may be a viable alternative under some circumstances.

PAINTING

Timber interiors are usually light in colour and do not require painting. Where painting is required, light colours which reflect light should be used as such colours can significantly brighten the working environment.

POWER SUPPLY

While professional opinion should be sought regarding the connection of power, adequate supply should be provided to ensure the operation of all stands, lighting and presses as well as other facilities that may be provided such as water pumps, air conditioning and fans.

A back up power supply such as a generator may also be appropriate if the shearing shed is isolated or prone to disruptions. To reduce noise and air pollution these are best placed outside and away from the shed.

Power points at each stand should be provided. Extension cords and power leads must not be used or left lying across the board or floors

AMENITIES

The following amenities should be provided at a minimum for shearers and other shed staff:

- hot and cold running water
- a shower or deep sink for washing that is separate to the food preparation sink
- both male and female toilets with adequate sanitary disposal facilities
- a simple food preparation area

- a fridge and stove/microwave
- table and chairs
- sufficient power points for staff to charge or operate equipment
- emergency information and contact details
- displayed address, direction and coordinates for the shearing shed location
- first aid kit.

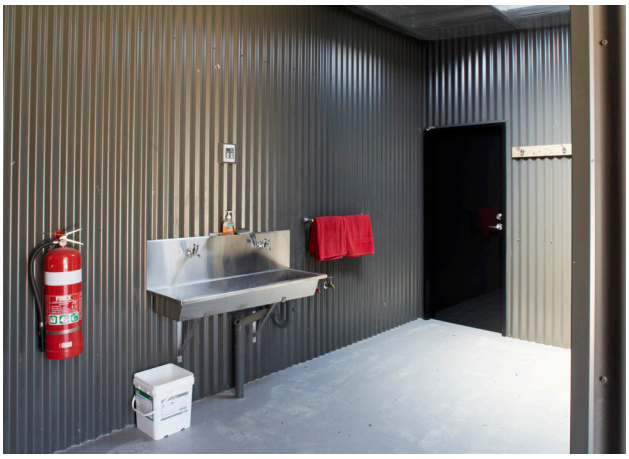


Figure 25: Separate washing area and fire extinguisher. Source: AWI.

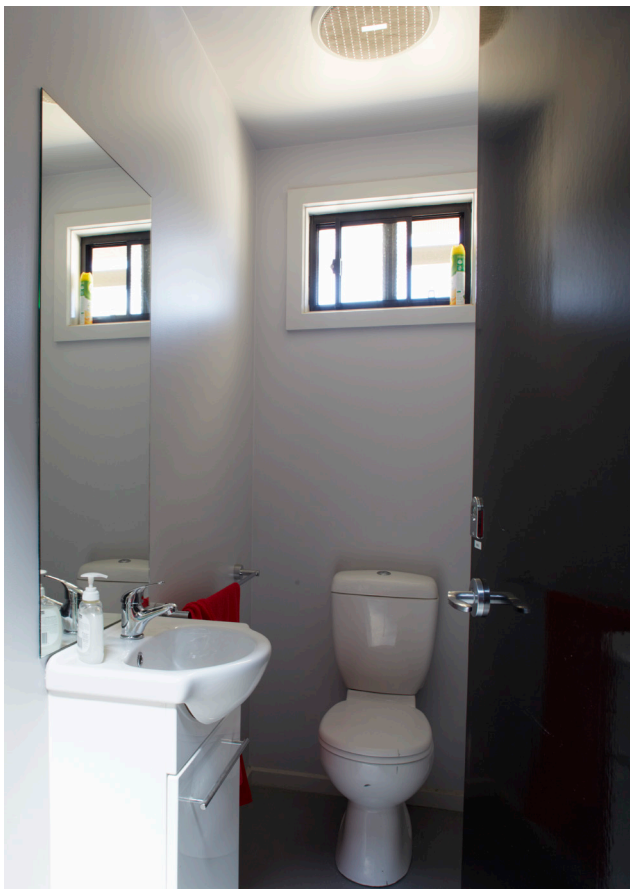


Figure 26: Male and female flushing toilets should be provided. Source: AWI.

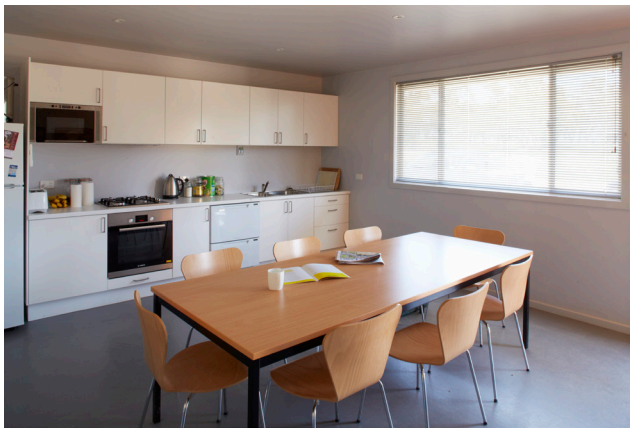


Figure 27: Clean kitchen area and table and chairs provided. Source: AWI.

EQUIPMENT

Consideration should be given to the equipment provided in a shearing shed and this must be maintained to ensure it is in good working order when it is required. What is required to be provided can change for woolgrowers hiring a contracting team and sourcing their own shed labour as 'cocky' runs.

SHEARING MACHINERY

Shearing sheds of the past included an array of power sources and transmission systems including stationary motors and shaft driven overhead units. These have largely been and where they can, should be replaced by modern electric overhead units. Modern shearing units are light-weight, quiet, efficient and incorporate automatic cut out safety features which significantly improve the safety of the working environment.

Shearers typically supply their own handpiece, combs and cutters.

GRINDERS

Grinders for sharpening cutters and combs used to be commonplace in shearing sheds although these are now typically owned and maintained by shearers or contractors.

Both double and single disc grinders are available. Double disc grinders save time because the discs don't have to be changed between grinding combs and cutters.

The grinder should run at between 2500 and 2600rpm.

Grinding should be done in a safe space away from other workstations.

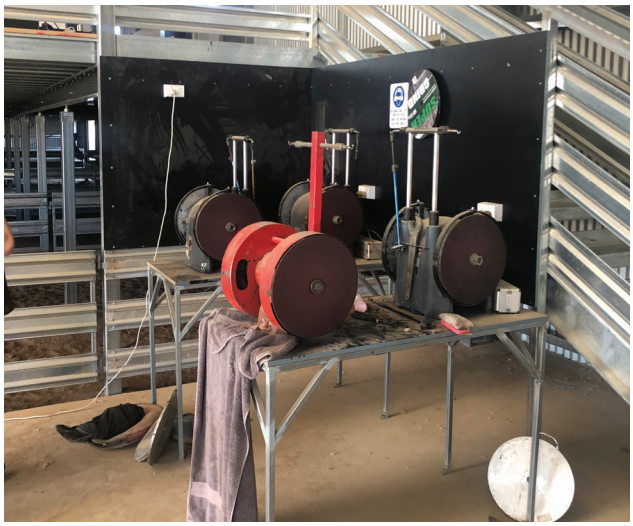


Figure 28: Separate grinding area away from the board and wool room. Source: AWI.

CLAMPS

A clamping plate is necessary for clamping the grinding paper to the disc when new papers are glued. Two are useful for storing and protecting the discs when not in use.

GRINDING PAPERS AND GLUE

Coarse emery paper (no. 40 grade) should be used on the comb disc and fine emery paper (no. 80 coarse) on the cutter disc.

An adequate supply of grinding paper glue should be kept on hand.

CORES

Spare long cores (or gut) and short cores should be available at shearing and crutching. Store spare cores by hanging them vertically. Never oil cores for storage.

LUBRICANTS

A light oil with viscosity of 30 (SAE30) and multi-purpose grease are needed for lubricating the shearing gear. Shearers will usually supply oil cans which are replenished from the shed supply. Typically, several litres and a cartridge and applicator of multi-purpose grease are appropriate.

WOOL PRESSES

Wool is compressed into a standardised pack to give a common shed bale size. When filled, the pack has a nominal dimension of 700mm x 700mm x 980mm. The maximum gross weight for wool bales of all descriptions is 204kg and the minimum is 120kg (with the exception of some speciality wool types). Packs are made from woven nylon and have a pack label attached to the top flap.

Electric and petrol-powered presses are available although care should be taken with the latter to ensure adequate ventilation for the exhaust fumes to disperse. Petrol motors can also be noisy and a better option may be to use an electric press with a generator outside the shearing shed with buffering to minimise noise.

When purchasing or hiring a press, it is important to ensure the press meets your specific needs and your shearing shed's capabilities. Considerations should include access to the shearing shed, power supply, appropriate safety features and throughput. Scales are now typically incorporated in the wool press.

Adequate wool bale fasteners and packs should be supplied by the woolgrower along with the wool press.

Wool presses are potentially dangerous if mis-used and strict attendance to safety guidance is required. Best to consider inducting those planning to operate the press prior to shearing commencing. Kill switches are a useful safety risk mitigation strategy.

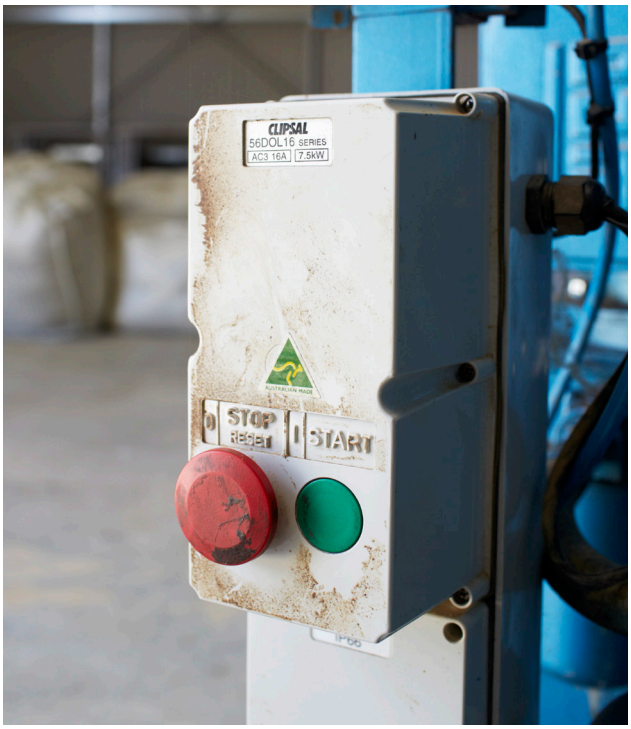


Figure 29: Wool press safety kill switch. Source: AWI.

BALE HANDLING

Bales must be moved from the wool press to a storage area and loaded on to transport. This is the responsibility of the woolgrower.

When designing a new shed, it is important to allow sufficient room to store enough bales so that the shed can still operate freely or make provision for bales to be moved to storage as required.

Bale handling equipment includes bale hooks and a trolley.

BRANDING

Branding should be done immediately by the wool classer after the pack is pressed to avoid misidentification of bales.

The required equipment (stencils, brushes) and materials (paints, markers) should be available for branding and the manufacturers' instructions should be followed.

For further information and standards visit the Australian Wool Exchange website http://www.awex.com.au/standards/.

WEIGHING

Bales should be weighed to ensure they are pressed within the established weight limits of 120kg to 204kg. Electric wool presses typically have inbuilt scales which should be calibrated before shearing to ensure they are accurate. Inbuilt scales eliminate the need for separate platform scales.

STORAGE

Bales are best stored on their butts (upright) in the shearing shed's wool room to minimise the need for lifting and double handling.

As a guide, 35 metres square is sufficient area to store 50 bales of wool in an upright position. A large bale storage area, built into the wool room, may add to the overall cost of a shearing shed but may also be designed to serve other purposes outside shearing time. Bales should be able to be transferred from the wool room to a truck tray efficiently and safely.

MAINTENANCE OF SHEARING EQUIPMENT

Shearing equipment should be checked, well maintained, and stored according to the manufacturer's instructions.

FIRST AID KIT

A first aid kit should be made available in the shearing shed whenever shearing or crutching is in progress.

Surgical needles and thread should also be available for stitching up badly cut sheep although most shearers will carry their own supplies.

SHEARING SHED SAFETY SIGNAGE

Shed safety signage kits should be in all shearing sheds, they are also available from AWI to order at the cost of production visit www.wool.com/safe-sheds.

REFERENCES

Australian Wool Corporation, Wool Harvesting Notes, 1980.

NSW Government, Department of Primary Industries, Shearing shed design – sheep storage and movement. www.dpi.nsw.gov.au/animals-and-livestock/sheep/yards-equipment/general-information/movement

Australian Wool Exchange (AWEX), standards and compliance. www.awex.com.au/standards/

WOOL.COM

 Australian Wool Innovation Ltd gratefully acknowledges the funds provided through woolgrower levies and the Australian government to support research, development and marketing of Australian wool. GD4394