WOOL
HARVESTING
NOTE

No: 1.10

DECEMBER 1981

GATES

A gate is a movable panel which forms part of an enclosing barrier, and which facilitates the movement of personnel, goods, vehicles or livestock into or out of the enclosed area.

The enclosed area may be a paddock, yard, driveway, pen, race or laneway. While the gate must prevent transfer from one side of the enclosing barrier to the other when it is closed, its chief function is to allow transfer to occur at appropriate times. It therefore operates as a valve which can be opened and closed under controlled conditions.

FUNCTIONAL REQUIREMENTS

As far as sheep yards are concerned, the following functional requirements apply to gates. They must:

- be capable of single-handed manual operation (once the gate latch has been released);
- be of adequate height and strength to confine sheep when in the closed position;
- be of such length or width that, when open, the transfer of sheep or personnel is achieved without undue restriction or congestion at the gate opening;
- have a mode of operation which stimulates transfer, and enables it to take place with a minimum of time and effort;
- be of such a design that the opening and closing operation involves a swept area which is an acceptable fraction of the total enclosed area, the swept area being that area normally on the ground or floor over which the gate moves as it is opened and closed and which is therefore not available for sheep holding;
- be constructed in a manner which ensures long life under normal conditions of use, and requires a minimum of maintenance to remain in a satisfactory working state.

In some situations there will need to be a compromise between two or more of these requirements. In other situations, the particular application of the gate will make one or more of the requirements of overriding importance.

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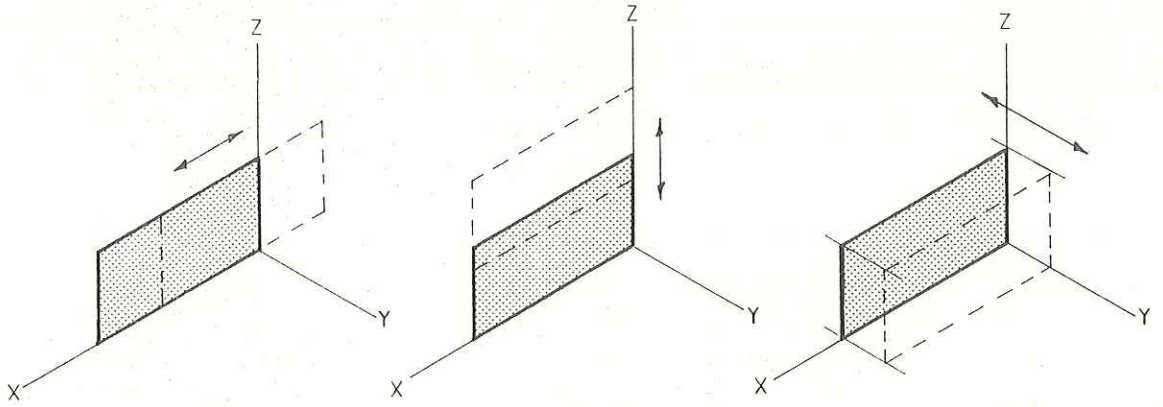
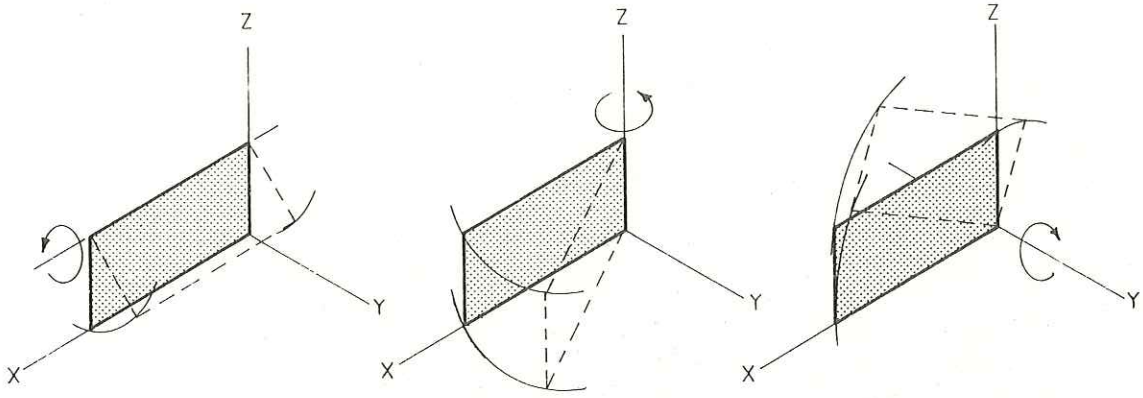
MOVEMENT PATTERNS

A gate is usually a rectangular flat surface contained in a vertical plane. Such surfaces have six degrees of freedom, or six independent ways of movement when referred to the three common reference axes. The six degrees of freedom are illustrated in the following diagrams, and the reference axes (which are at right angles to each other) are labelled X, Y and Z in each case.



1. Movement from side to side.
2. Movement up and down.
3. Movement fore and aft.



4. Rotation about a horizontal edge.
5. Rotation about a vertical edge.
6. Rotation about a corner.

Diagram 1. The six independent movements for a gate.

In practical applications, several of these degrees of freedom are used either singly or in combination as illustrated in Photos 1 to 9.

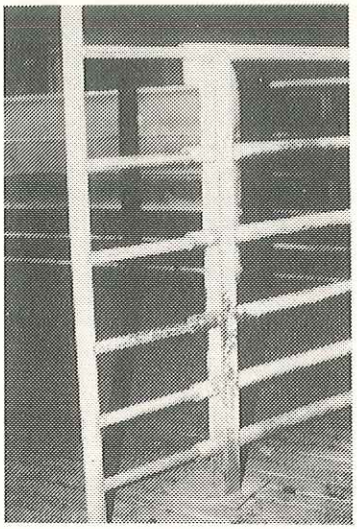


Photo 1. Sliding gate. Corresponds to Diagram 1.1.

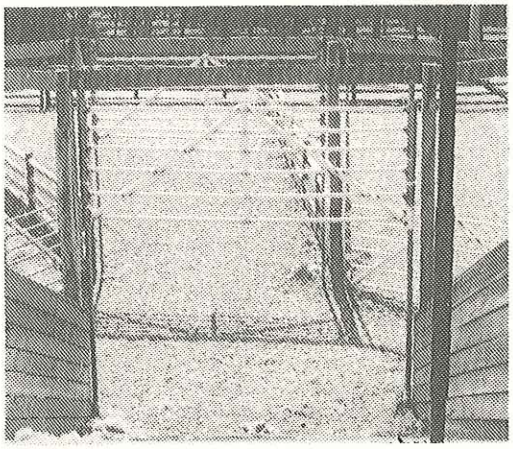


Photo 2. Vertical lift gate. Corresponds to Diagram 1.2.

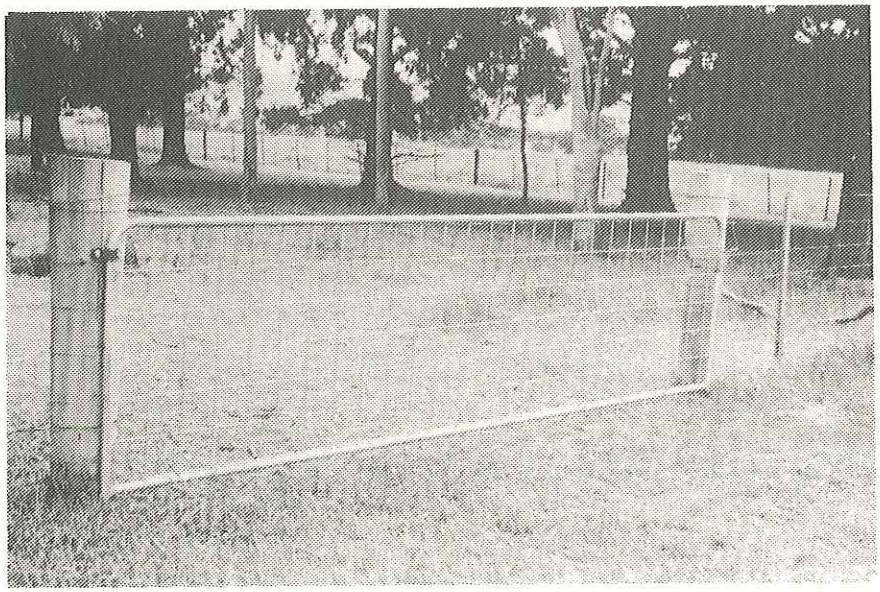
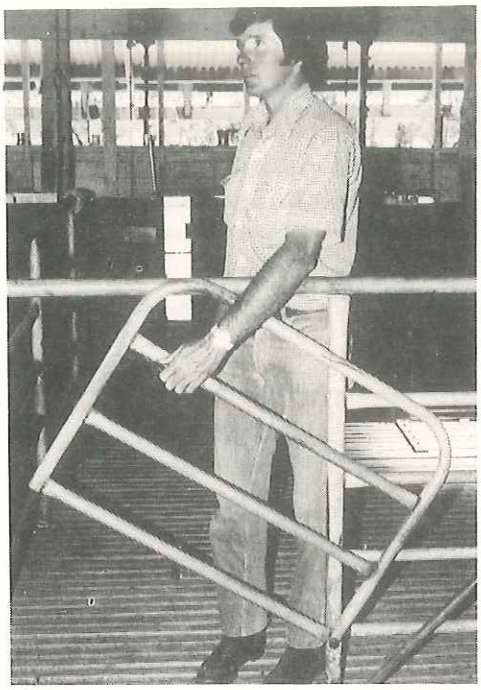


Photo 3. Common swing gate. Corresponds to Diagram 1.5.

Photo 4. Tumble gate. Corresponds to Diagram 1.6.



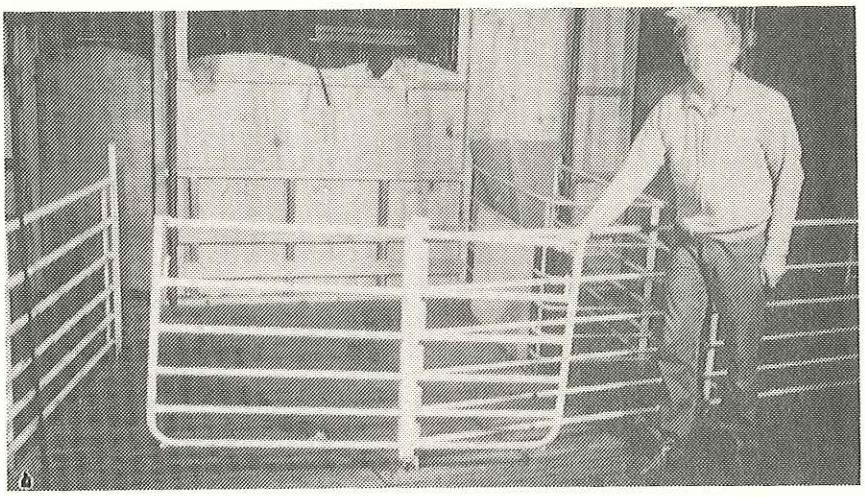


Photo 5. Slide swing gate. Combination of Diagram 1.1 and 1.5.

Photo 6. Lift swing gate. Combination of Diagram 1.2 and 1.5.

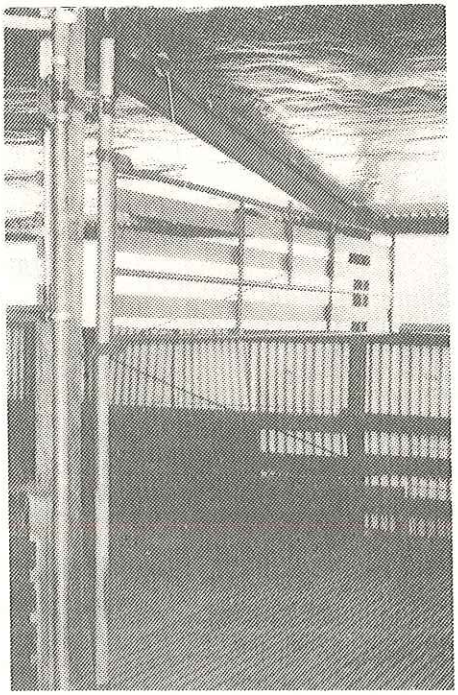


Photo 7. Tip swing gate. Combination of Diagram 1.5 and 1.6.

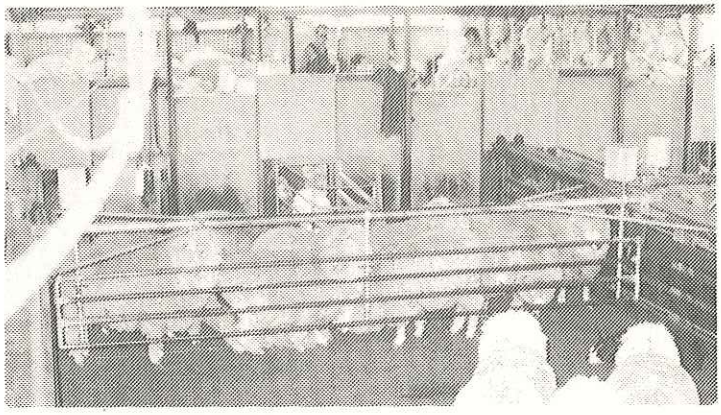


Photo 8. Mechanised backing gate. Combination of Diagram 1.3 and 1.4.

Photo 9. Race crutching gate. Combination of Diagram 1.3 and 1.5.

Diagram 2 represents the relationship between the six independent movements or degrees of freedom, and the various gates known to exist at this time. Some of these gates have been developed for specific applications while others are in common use.

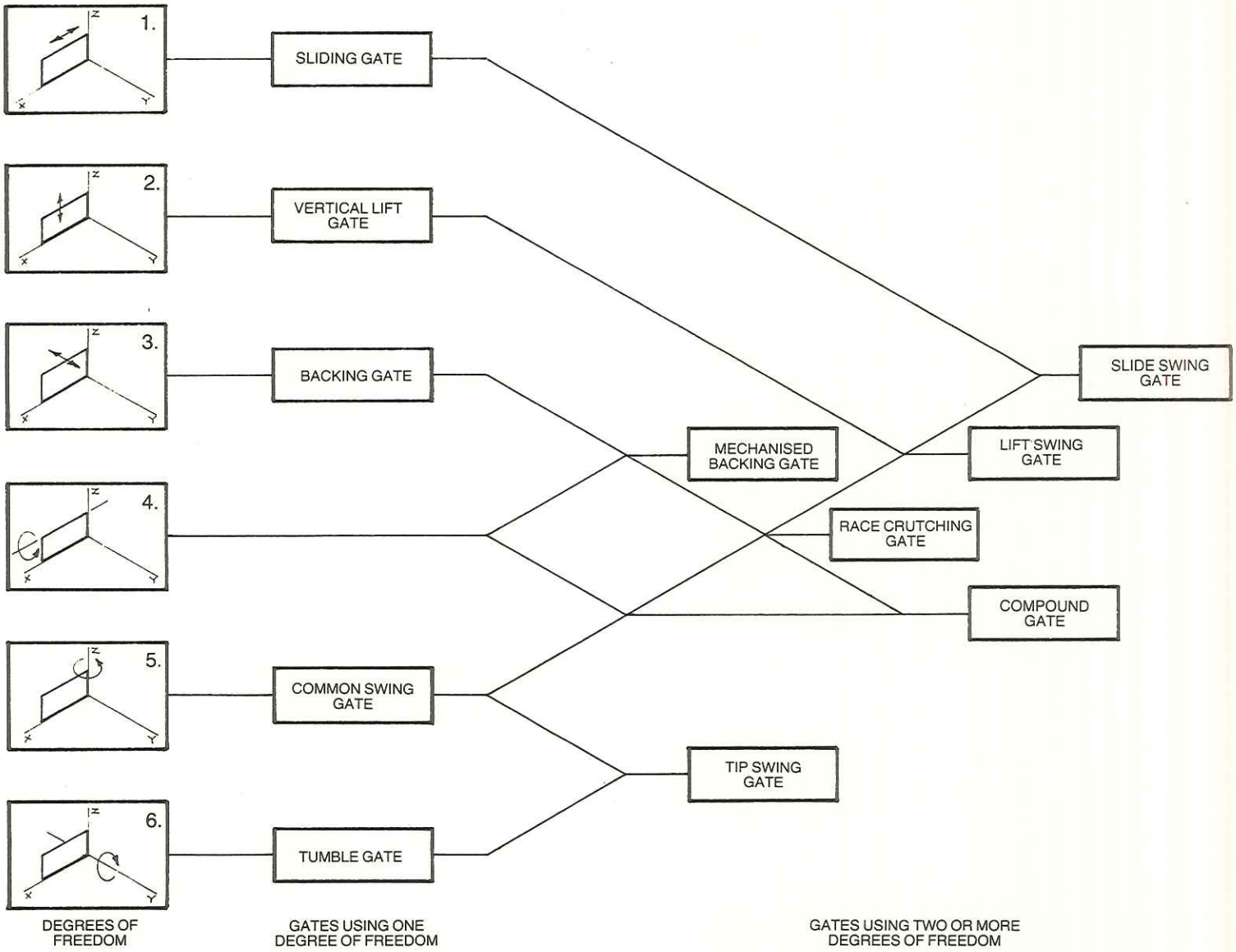


Diagram 2. Known gates and their relationship to the degrees of freedom.

There are other combinations of the degrees of freedom which are possible, but they have not found any useful application at this stage. New sheep handling procedures, or the application of electronic controls for the operation of gates, may lead to other movement patterns being developed.

FRAME CONSTRUCTION

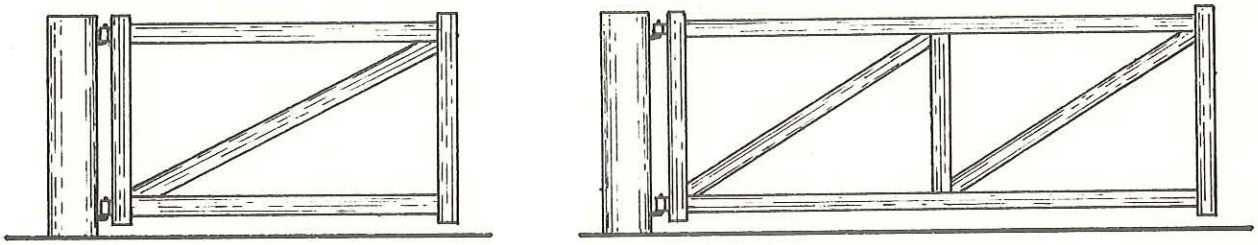
For acceptable gate performance, there are three important elements to consider. These are:

- the gate frame,
- the connection of the frame to the post or support,
- the gate catch.

This Note deals with the gate frame, and Wool Harvesting Notes No: 1.111 and No: 1.112 deal with gate catches.

The frame may be made from timber or steel. Both types can be manufactured in the farm workshop, while steel gates can be purchased from numerous suppliers. Steel gates are more popular because of the simplicity of manufacture (based on welded joints), their durability, minimum call for maintenance, higher strength to mass ratio, and ready availability. Commercial gates are supplied complete with hinge fittings and catch, and are usually the common swing type. However, some manufacturers produce a range of slide swing and lift swing gates for use in shearing sheds, and will make yard gates to order.

A timber frame must be made from durable timber to resist deterioration from exposure to weather. The corners must be square, and the completed frame free of twisting, with strong joints as would be obtained by using bolts. Protruding bolt ends must be cut off neatly to eliminate projections which could cause injury to operators or sheep.



(a) Usual method.

(b) Method for wide gates.

Diagram 3. Bracing of timber framed gates.

The gate frame must be adequately braced to prevent sag at the outer edges. The diagonal brace should run from the bottom corner at the hinge end of the gate to the top corner at the outer end. The brace must be neatly fitted into the corners in such a way as to withstand the compressive force developed in it when the frame tends to sag. The effectiveness of the brace depends on the angle it makes with the horizontal. The larger this angle the more effective the brace, and Diagram 3 shows that, for sheep yard gates wider than about 3600 mm, it is better to provide two braces.

Steel frames are generally made from galvanised pipe, although black (ungalvanised) pipe and rectangular hollow section (RHS) are alternatives. A length of pipe is first bent into an inverted U-shape with the aid of a pipe bender. Another straight length of pipe is then added to complete the frame. Common practice is to pinch or close the ends of such members to help produce a better welded joint as indicated in Diagram 4. The frame of narrow gates may be made from 20NB pipe, while for larger gates 25NB pipe would be more suitable. Further details of pipe and tube suitable for gates is given in Wool Harvesting Note No: 1.092.

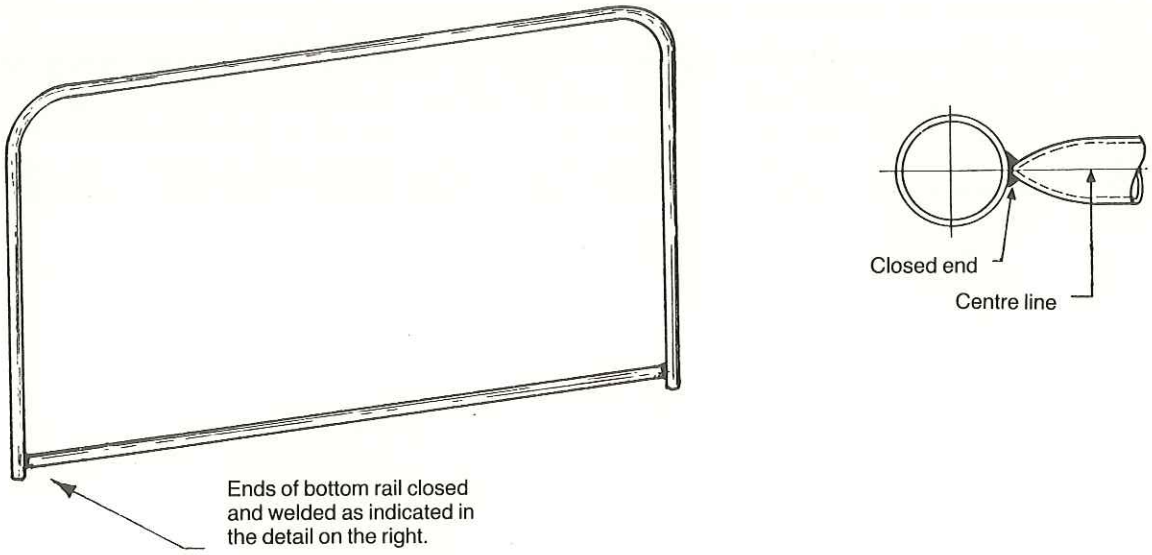


Diagram 4. Pipe frame with welded joints.

The corners must be square, and the frame free of twisting. This latter condition is indicated when the frame lies flat on the workshop floor without any corner being raised. For the sizes of gate usually found in sheep yards, there is no need to add a diagonal brace as with the timber frames. The material used to complete the gate provides adequate restraint to hold the frame in shape. However, for some gates covered with pre-fabricated fencing to make them stockproof, other frame members are added to increase rigidity as illustrated in Photo 10.

GATE INFILLS

There are various ways of making the gate frame stockproof.

These include the use of:

- timber rails,
- galvanised pipe rails,
- welded mesh,
- chain wire mesh,
- prefabricated fencing,
- galvanised steel sheets.

Typical spacing of rails is given in Diagram 5.

Gates using these materials are illustrated in Photos 10 to 16.

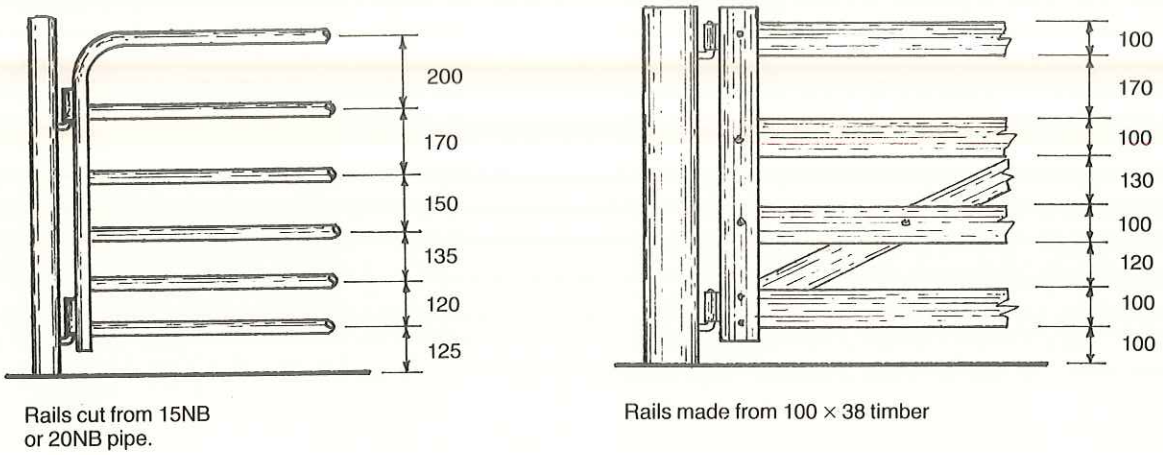


Diagram 5. Typical spacing of rails for gates. The dimensions are in millimetres.

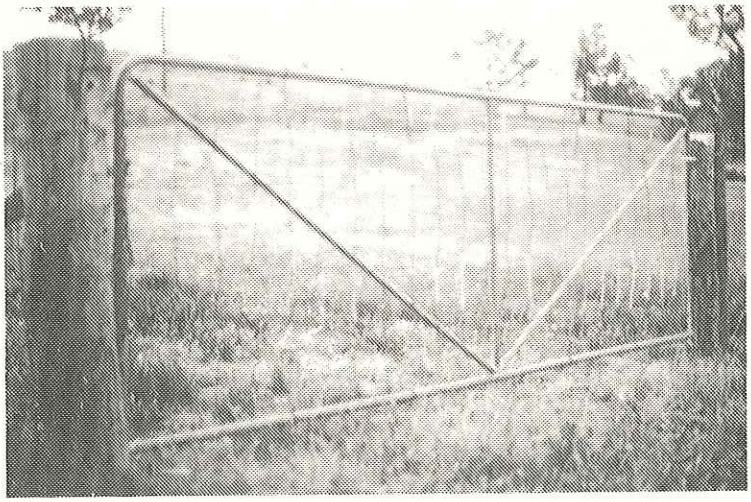


Photo 10. Gate covered with prefabricated fencing.

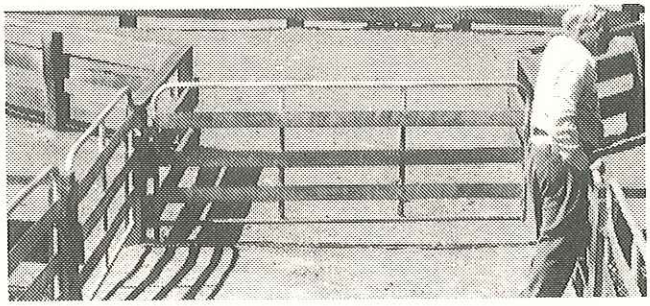


Photo 11. Steel pipe gate frame with timber rails.

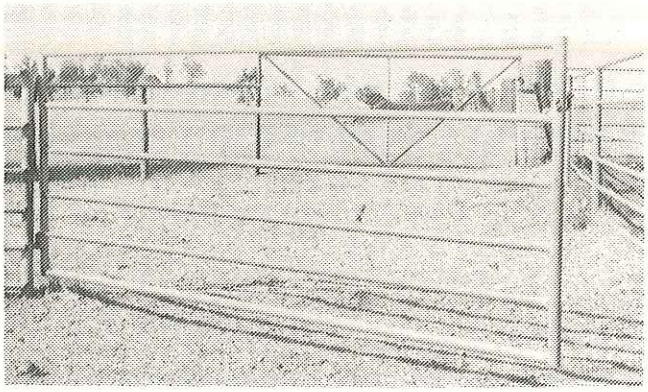


Photo 12. Steel pipe frame and rails.

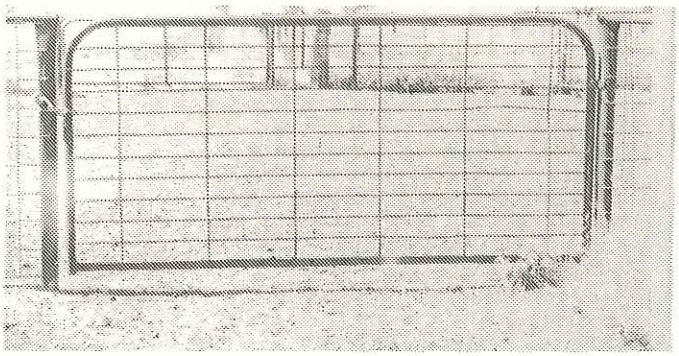


Photo 13. Gate with welded mesh infill.

Photo 14. Gate frame covered with chain wire mesh.

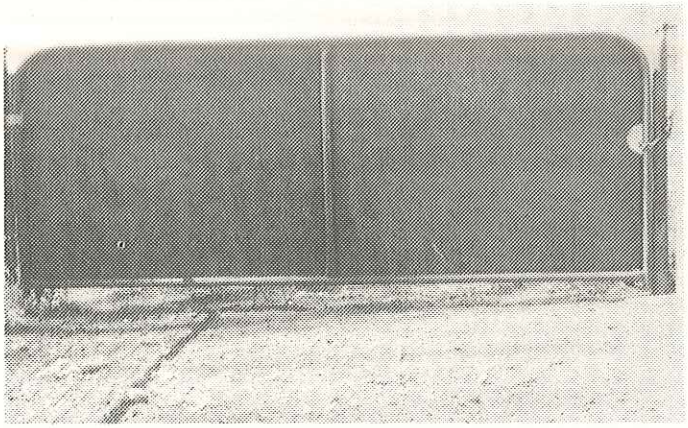


Photo 15. Sheeted gate with steel pipe frame and galvanised sheet infill.

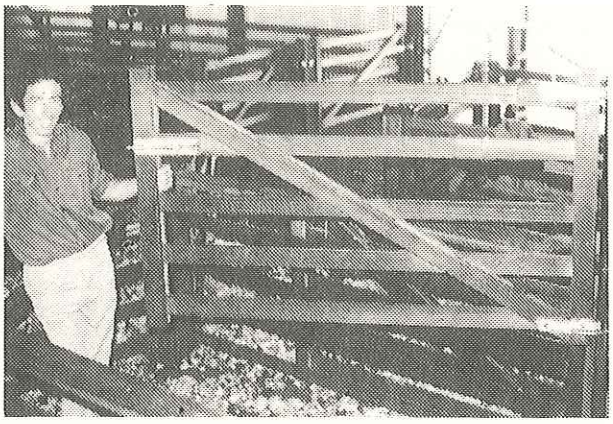


Photo 16. A lift swing gate with timber frame and rails.

Notice that with gates using rails, mesh or fencing, the sheep are able to see beyond the gate, and their vision is only partially obstructed. Gates covered with steel sheet provide a complete visual barrier. This has an influence on the behaviour of the sheep in confined areas.

Visual contact may encourage the sheep to move in required directions. On the other hand, gates providing only a small visual barrier may encourage restless sheep to charge on the basis that it is the most likely means of escape. This may result in damage to both sheep and gate. A larger visual barrier, such as that offered by timber rails, appears to reduce this type of behaviour. Sheeted gates, which prevent the sheep seeing anything beyond the gate, may be useful in screening operators, confining the vision of the sheep to some specified direction, or preventing the sheep from seeing objects which may deter movement in a required direction.

CLASSIFICATION OF GATES

Gates have commonly been classified according to their:

- application,
- method of operation,
- type of construction.

Under type of application, there are general yard gates, pen gates, drafting gates, block gates, and personnel access gates.

Method of operation includes common swing, sliding, vertical lift, lift swing and slide swing gates.

Type of construction covers timber or steel frame together with the various infills outlined in the previous section.

This classification can be represented diagrammatically as shown in Diagram 6. The table indicates common uses and types of gates and can be used in a variety of ways.

For example, starting with the lift swing gate panel in the second column, the lines to the right from this panel indicate that such gates can be of either wooden or steel construction, and the line to the left shows that such gates are generally confined to interior pens. Similarly, starting with personnel access gates in the first column, the lines from this panel show that they operate as common swing gates or sliding gates, and are made from timber or steel with a variety of infills.

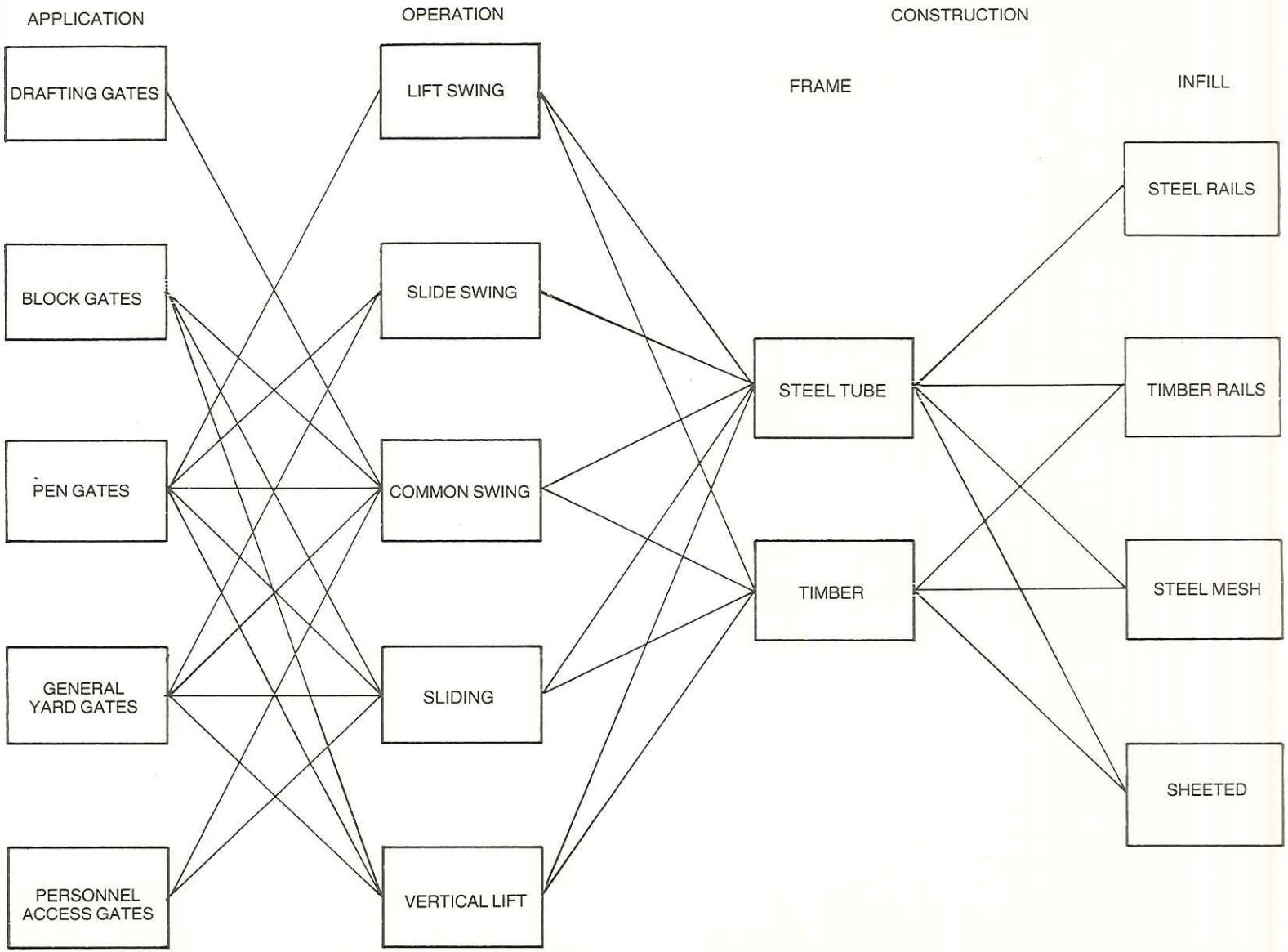


Diagram 6. Classification of commonly used gates.