



## Plunge and cage dipping

*Garry Levot, New South Wales Department of Primary Industries*

Sheep can be treated for lice infestations by immersion in pesticide solution. Dipping equipment may be in-ground or mobile plunge dips or immersion cage dips. Mobile plunge or cage dipping services are provided by contractors in many areas. To find dipping contractors in your district contact the Livestock Contractors' Association or look for advertisements in local papers or in telephone directories.

Irrespective of the apparatus used to dip sheep, it is essential for lice control that all sheep are wet to skin level at all sites on the head and body. Wool that is more open is easier to wet than tight, fine wool. Merino fleeces resist wetting, so it is important that dipping is done thoroughly and in accordance with label directions. This includes periodic checking of sheep for wetness, for example, by using a water-soluble marking pencil (e.g. Columbia 'Copperplate' Red Copying 2100) on the skin under, and on the back of the neck (see page 3 and 4 for details).

The dilution rate indicated on product labels must be used and nothing, other than a bacteriostat in some instances, should be mixed with registered products in a dip. Increasing the dip concentration or use of mixtures containing more than one dip product cannot counteract substandard application and should not be considered.

Immersion dipping is costly due to high labour and chemical costs. Dipping requires people to move sheep into, through and away from the dip and may include the hire of a contractor. Dipping costs include the construction of the dip, the water supply and the chemical used to charge the high volume of dip wash. Nevertheless, immersion dipping is the most thorough and robust means of treating sheep for lice infestations. However, to avoid infection through shearing cuts, sheep must be re-mustered for treatment a few weeks after shearing, with increased labour input.

At the end of dipping a large volume of spent dip solution containing chemical remains. Even if the dip will not be used again for several months, at some time it will need to be pumped out. Mobile operations need to pump out before they can move off-site. In preparation for dip disposal a bunded area with growing pasture should be prepared for this purpose. The bund is used to contain the dip wash within an identifiable area where it will soak in and where sunlight and soil bacteria will degrade the pesticide. Stock should not graze this area for at least 3 months unless a shorter or longer interval is indicated on the product label. It is unacceptable to allow spent dip wash to enter dams, ponds or any watercourse.

## Procedures and effects during dipping

### Charging (the dip)

The addition of product at the dilution rate indicated on the label at the beginning of dipping.

### Stripping

The selective uptake of pesticide from the dip solution at a faster rate than the removal of water. As a result, the chemical is removed faster than the dip wash, which gradually decreases in concentration as dipping proceeds.

### Constant replenishment

The 'constant' addition of fresh pesticide solution from supply tanks into the dip sump during dipping to maintain a constant volume (and concentration) of dip wash. Advantages of constant replenishment are less fluctuation in dip concentration and no interruption of dipping to replenish or reinforce the dip.



### Reinforcement

The regular addition of pesticide, but not water, to the dip. Reinforcement replaces the pesticide removed from the dip wash by stripping.

### Topping up (Replenishment)

The addition of water and pesticide to the dip to replace the dip wash taken out by the sheep. If product label directions say so, topping up should occur after reinforcement, every time the dip volume drops to no less than 75% full.

### Dipping out

The addition of product only (reinforcement) towards the end of dipping to minimise the amount of used dip wash for disposal. By reinforcing without topping up, dipping out allows the dip volume to drop to 50% full. To determine when to start dipping out, estimate the rate at which wash is being removed from the dip. Calculate how many sheep will take the dip to half its initial volume. Keep the dip at full volume until that number of sheep remain, then begin dipping out. Reinforce when the dip falls to 75% of its initial volume. Continue to dip out until the dip reaches half its initial volume then stop dipping and clean the dip. A dip must not fall below half of the initial level even when dipping out. The dip level should never be low enough to allow the sheep to walk in the dip.

## Dipping methods

### Plunge dipping

Plunge dips may be in-ground or mobile, straight, 'U'- or 'S'-shaped. A schematic diagram of an in-ground plunge dip appears in Appendix 1, at the end of this note. At least two people and good dogs are needed. One operator will act as forcer to persuade sheep into the dip and the other will dunk sheep during their swim.

To achieve effective wetting of sheep and ensure eradication of lice by plunge dipping, the swim length should be at least 9m. The sheep should be dunked twice, not including the 'splash' entry, to completely wet the head and neck, with a preference towards backward dunking. A large spray nozzle can be used to replace one dunk and would be advantageous in maintaining dip wash circulation.

Only sheep that are fit and in good condition should be plunge dipped. All sheep need to be able to complete the swim and walk up the inclined exit ramp. Heavily pregnant ewes, weaners or sheep in poor condition are more susceptible to stress and should be dipped early in the day. Pregnant ewes and sheep in poor condition may be unable to climb out of the dip. Lambs should be drafted from ewes to avoid being trampled or drowned in the dip. If sheep 'pile up' at the exit point, dipping becomes inefficient and sheep can drown unless prompt action is taken.

Avoid dipping sheep on very hot days or in wet or very windy conditions. The sheep may be chilled severely by winds and will not dry out quickly in wet conditions. Start early in the day and finish early enough to allow the sheep to dry before nightfall. Hot, tired sheep should be rested prior to dipping, as skin absorption of chemical and drinking of dip wash can result in losses due to poisoning. The sheep should be yarded overnight, prior to dipping, with access to water, but not feed, to allow them to empty out. This reduces contamination of the dip by sheep faeces.

Different sized sheep should be drafted off and dipped separately to prevent smothering and drowning. Young sheep are more susceptible to infections and should be dipped first when the dip wash is cleanest. Sheep heavily infested with grass seeds are more prone to infection. Draft off diseased sheep, such as any with dermo, pink eye or open abscesses. Do not dip any other sheep after these before cleaning out the dip.

Forcing pens and the race leading to the dip entry should have slatted or concrete floors to reduce organic matter (faeces, soil, plant matter etc.) contaminating the dip. Sheep do not enjoy swimming and remember the experience; previously plunge-dipped sheep may become reluctant to enter the dip



and may need to be encouraged into the dip. A range of design features can be used to improve sheep flow. The design of the lead up to the dip can incorporate a V-belt conveyor, hock bars, a curved lead up race and decoy sheep to attract the other sheep onto a dip slide entry after which it is too late for the sheep to choose an alternative path. Sheep may be delivered into the dip via a VE conveyer. This labour-saving device has the added advantage of positioning the forcer further from the dip splash zone.

Draining pens should be cleaned regularly to reduce the amount of organic matter carried into the dip. Sheep should not be held in the draining pens, but encouraged to return to their paddock as soon as possible to dry out. This will reduce the risk of mycotic dermatitis and subsequent flystrike.

Management of the dipping process in a calm and organised manner will ensure that sheep are not lost through drowning or by inhalation or ingestion of dip wash. Infection can be managed by ensuring skin is intact with sufficient healing time following shearing, yards are free of sharp projections, dogs are muzzled and sheep are free of grass seed infestations, as any hole in the skin can provide a site for bacterial infection from dip wash.

When using a plunge dip, particular attention should be paid to the following points:

- The dip must be pumped out and thoroughly cleaned and disinfected before use.
- All eligible sheep should be dipped after shearing cuts have healed, no earlier than 10–14 days (refer to product labels), preferably before 4 weeks, and not later than 6 weeks after shearing. Dipping off-shears is not recommended due to the high risk of infection in shearing cuts.
- The volume of the dip should be carefully calculated to ensure that the mixing rate is correct. Appendix 1 provides some advice on measuring the volume of a dip sump. It may be better to add water in batches from a 500 litre container or to use a water meter.
- A clear 'sight tube', dip stick or the dip sump should be calibrated by marking each 100 litres as it is added to aid in chemical dose rate calculations including when 'dipping out'. This measurement should only need to be done once, correctly, with permanent volume marks that cannot wash, wear, fade or peel off over time.
- When using chemical, the dip should be 'charged' at the correct rate according to the label directions. Accurately measure the correct amount of chemical and pre-mix this in a bucket of water. Most dipping chemicals are in a form that does not readily disperse if poured directly into a large volume of water. Pre-mixing will disperse it in a form that will mix more readily in the dip. Pour the pre-mix along the length of the dip and mix the dip thoroughly using a recirculating pump, paddle, shovel or rake before the first sheep are dipped. Do the same after any break of an hour or longer because the mixture may settle on standing.
- The dip concentration and volume must be maintained in line with label directions. 'Constant replenishment' or 'topping up' according to the label directions may be used. Topping up should be done when the volume drops by no more than 25% of the initial volume. If the product label has directions for 'reinforcement' this should be done before replenishment of the dip. Reinforcement provides a means of maintaining dip concentration while reducing the volume of dip for disposal when dipping out. Topping up should be done according to the specific instructions on the product label to maintain dip concentration. Example calculations are provided in Appendix 2.
- The head of each sheep should be pushed under twice with a downward and backward movement to open the fleece. Remember that the back of the neck is the hardest part to wet in plunge dipping.
- Sheep can be checked for complete wetting at skin level by using a water-soluble copying pencil or a scourable dye in the dip wash. To do this put on waterproof trousers and gloves,



and catch a few dipped sheep after they have had just sufficient time to drain. Open the fleece in the hard to reach areas such as in the neck folds, back of the neck etc. and apply the pencil to the skin. If the skin is wet, the pencil will leave an obvious coloured mark. However, if the skin is dry, it will not. The pencil tip must be dried in between uses. Sheep with areas of dry skin need to be dipped again and any remaining sheep should be dipped more thoroughly.

- The dip should not be allowed to become excessively dirty as infections (e.g. clostridial disease, 'cheesy gland' or mycotic dermatitis ['lumpy wool' or 'dermo']) and wool staining may occur. To avoid these, sheep vaccination programs need to be up to date. Moreover, the dip should be emptied and cleaned when one sheep has been dipped for every 2 litres of the dip's working volume (e.g. for a 10,000 litre dip after 5,000 sheep have been dipped irrespective of how many times topping up has occurred). To minimise the volume of spent dip solution for disposal follow the label directions for 'dipping out'. When dipping out, chemical but no water is added to the dip sump as directed on the label to maintain an effective concentration of chemical in the dip.
- If dip solution is held overnight, a suitable bacteriostat should be added beforehand to help prevent the build-up of bacteria in the dip. If mycotic dermatitis is a problem the addition of a bacteriostat such as zinc sulphate or chlorhexidine used as directed on product labels is recommended. A disinfectant can be used when cleaning out the empty dip. The sun is a very good bacteriostat, so allow it to dry the dip after cleaning.

### Immersion cage dipping

Cage dipping is an extremely efficient means of treating large numbers of sheep quickly. Most cage dips are operated by contractors, and a single operator with good dogs can dip several thousand sheep in a day. There are several sizes of cage dip currently in operation. 'Richards' design cage dips operated by 'Richards-trained' staff are able to use diazinon to dip sheep for lice. This is because of several unique design features that protect the operator from exposure to dip spray or splash. It is illegal to use diazinon in any other cage dip design or plunge or shower dips. However, there are effective, safer to use alternative products available.

During the dipping process sufficient sheep to fill the cage are persuaded to enter by the use of decoy sheep. The cage lid is lowered and the cage is then lowered into the dip sump below, until sheep in the cage are completely submerged. Operator procedures vary a little. Some will immerse the sheep such that their backs are covered by solution, then raise the cage, before again completely submerging the cage momentarily. Others will simply submerge the cage for about 10 seconds before raising the cage and releasing the sheep. Hydraulic operation of the dip requires a reliable power supply or a dedicated generator. In the event of power failure dips have a 'fail safe' release system to either raise the lid, release the dip solution, or both.

Cage dipping is physically less stressful on sheep than plunge dipping. The same sheep management and dip hygiene precautions needed for plunge dipping also apply to immersion cage dipping.

### Operator safety

Most dip chemicals are moderately toxic, particularly when concentrated.

- Strictly follow the safety direction on the label.
- Operators should wear overalls, waterproof gloves and boots, a washable hat and any other protective clothing as directed on the product label.
- Waterproof trousers or apron are recommended for those working on the dip.
- Be careful of dip splash as the sheep enter the dip or are dunked.
- Avoid standing in the exit area where sheep will shake and spray dip wash as they leave.



- Wash hands, arms and face with water after contact with pesticides and before eating or drinking.
- Change wet clothing as soon as possible.
- If the chemical is swallowed or contacts the eyes call the Poisons Information Centre (Phone 13 11 26).
- Refer to the LiceBoss [Products Tool](#) and the [Sheep lice treatments—Chemical group characteristics](#) and [Use of pesticides for controlling lice—occupational health and safety](#) LiceBoss Notes for information on sheep dip products.

[Click here to watch the video.](#)

**Plunge dipping video**

**Source: NSW DPI**

**Acknowledgement:** This note is based on the Industry and Investment NSW Fact Sheet 'Sheep plunge dip management' by Edward Joshua and includes information assembled by Mike Riley and Brian Horton.

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**Appendix 1: Recommended design for an in-ground plunge dip**

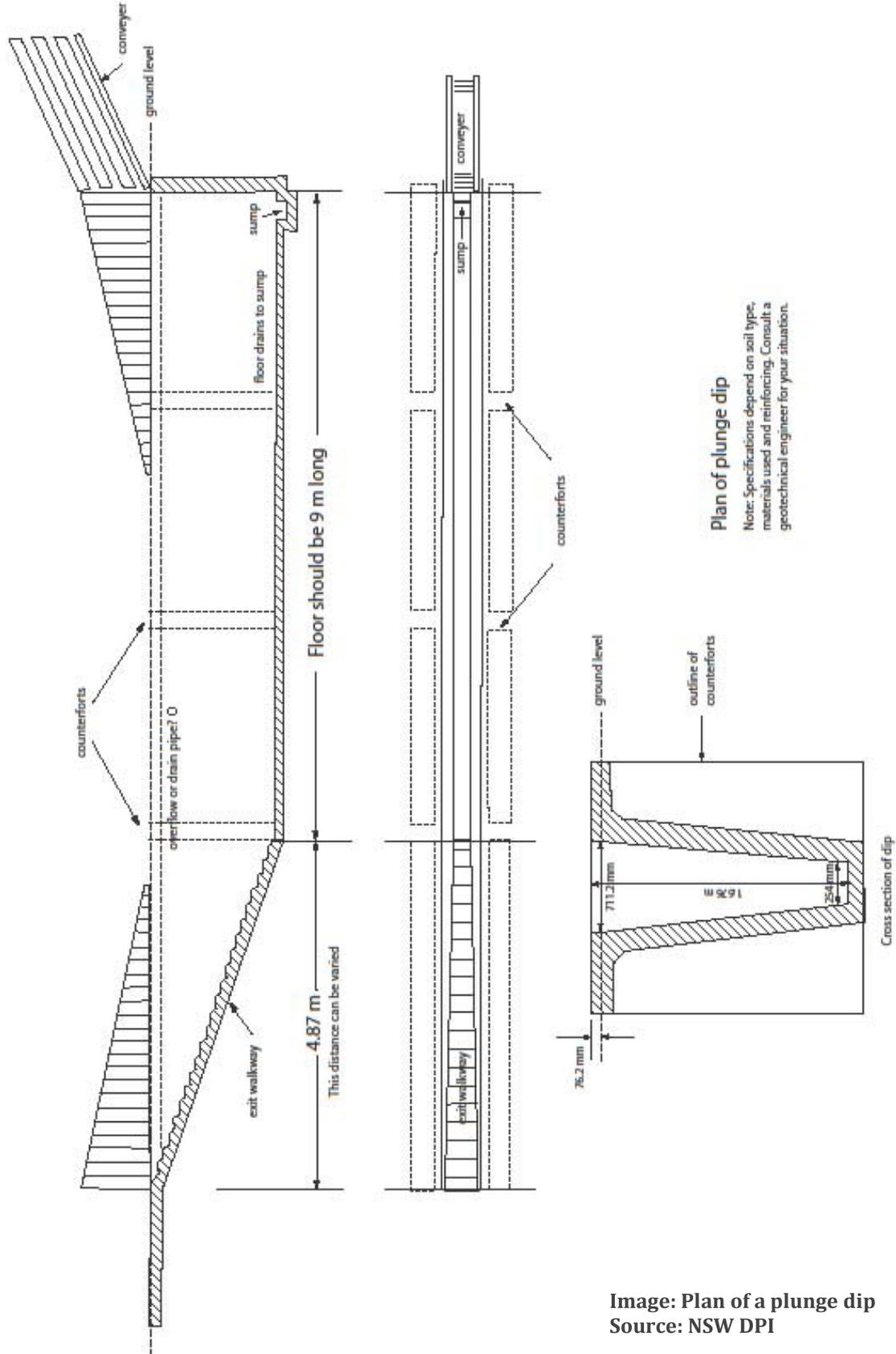
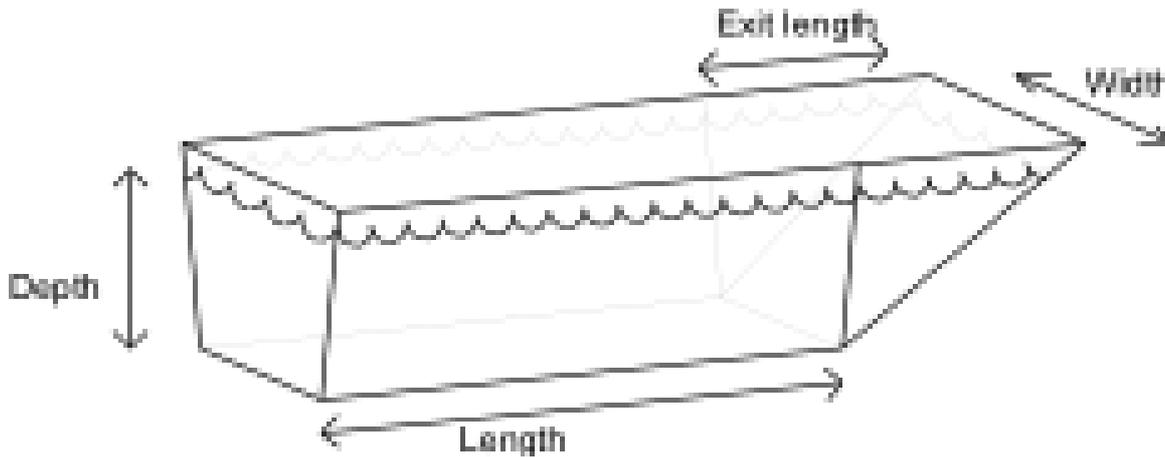


Image: Plan of a plunge dip  
 Source: NSW DPI



## Appendix 2: Calculating the capacity of your dip and tanks and the amount of chemical to be used

### Calculate the capacity of your dip



Take all measurements at the waterline in metres.

All volumes are in litres.

This method is an approximation and ignores sloping sides, for ease of calculation.

Volume of Main section	=	Length x Width x Depth of Main section x 1000
Volume of Exit section	=	Length x Width x Depth of Exit section x 500
Total Dip Volume in litres	=	Volume of Main section + Volume of Exit section

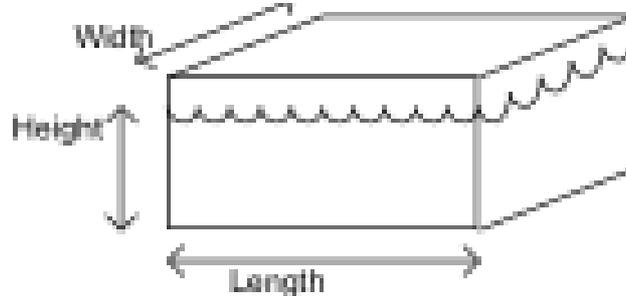
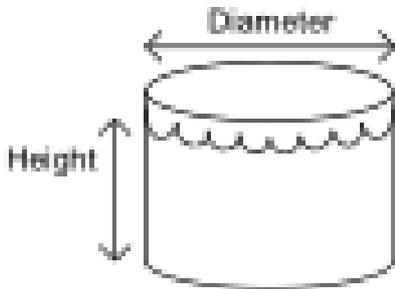
**Example:**

Length of Main section	8m
Depth of Main section	1.2m
Dip width	0.75m
Length of exit	2m

Volume of main section	= 9 x 0.75 x 1.2 x 1000	= 8,100 litres
Volume of exit	= 2 x 0.75 x 1.2 x 500	= 900 litres
Total volume of dip	= 8,100 + 900	= 9,000 litres



### Calculate the capacity of your tanks



Round tanks	Square tanks
<p>Volume = Diameter x Diameter x Height x 785</p> <p>Example:</p> <p>Diameter 2m</p> <p>Height 1.2m</p> <p>Volume = 2 x 2 x 1.2 x 785</p> <p>= 3,768 litres</p>	<p>Volume = Length x Width x Height x 1000</p> <p>Example:</p> <p>Length 1.8m</p> <p>Width 1.2m</p> <p>Height 1.1m</p> <p>Volume = 1.8 x 1.2 x 1.1 x 1000</p> <p>= 2,376 litres</p>

### Calculate the amount of chemical used

(note both millilitres and litres are used here)

Example: Dip volume: 9,000 litres, replenishment tank: 3,800 litres

For a chemical with

- an initial charge of 500 ml per 1000 litres
- reinforcement at 650 ml per 500 litres
- topping up at 250 ml per 500 litres
- constant replenishment at 1000 ml per 1000 litres

$$\begin{aligned}
 \text{Initial charge} &= \text{dip volume} \times \text{initial charge rate} \\
 &= 9000 \times 500 \div 1000 \\
 &= 4500 \text{ ml (4.5 litres) chemical in the dip.}
 \end{aligned}$$

Plus either a) or b):

a) Constant replenishment

$$\begin{aligned}
 &= \text{volume of tank} \times \text{replenishment rate} \\
 &= 3800 \times 1000 \div 1000 \\
 &= 3800 \text{ ml (3.8 litres) of chemical in the tank}
 \end{aligned}$$

Maintain the dip level by constant flow from the tank.

b) Periodic topping up

$$\begin{aligned}
 &= \text{volume of tank} \times \text{topping up rate} \\
 &= 3800 \times 250 \div 500 \\
 &= 1900 \text{ ml (1.9 litres) of chemical in the tank}
 \end{aligned}$$

When the level in the dip falls 500 litres, reinforce the dip with 650 ml chemical, then top up from the tank.