Guide to treating sea containers with deltamethrin

Version 1.0

General

Deltamethrin is the only insecticide provisionally approved as a treatment for sea containers for import to Australia. As deltamethrin, is a provisional measure, it is strongly encouraged that methyl bromide or heat be used to treat sea containers wherever possible.

How to use this document

This guideline provides information to assist in the preparation and application of deltamethrin products to sea containers and should be read in conjunction with the Insecticide Treatment Methodology and the treatment schedule. Information provided in this document is for guidance only, all treatment requirements are captured in the Insecticide Treatment Methodology and relevant treatment schedule.

Contents

1   Prior to treatment

1.1   **Target of the treatment**

Refer to section 1.1 of the Insecticide spray treatment methodology.

The treatment must be applied to the:

- internal and external underside of the sea container floor
- the internal and external lower portion of the three sea container walls up to 1 m
- the internal and external lower portion of the doors up to 1m
- the door seals of the sea container

1.2   **Target suitability**

Refer to section 1.2 of the Insecticide spray treatment methodology.

The internal and external surfaces of the sea container must be cleaned prior to treatment. The surfaces must be pressure washed to ensure they are free from dirt and debris.

It is recommended that the container is vacuumed prior to pressure washing to remove any gross contamination (e.g plant material, dirt) as this will improve the efficacy of the treatment.

High pressure water must be applied directly into all cracks, joints, and crevasses. For a sea container, this means mounting on a container stand and applying high pressure water to the target locations the corner post plates (1), the forklift pockets (2) and the cross members (3) (Figure 1). For containers with gooseneck tunnels (Figure 2), cleaning must also focus on the gooseneck tunnel (4).

The surfaces of the container must be completely dry before deltamethrin is applied.

Figure 1: Schematic diagram of sea container floor (underside) with corresponding cleaning points as indicated (points 1, 2 and 3).
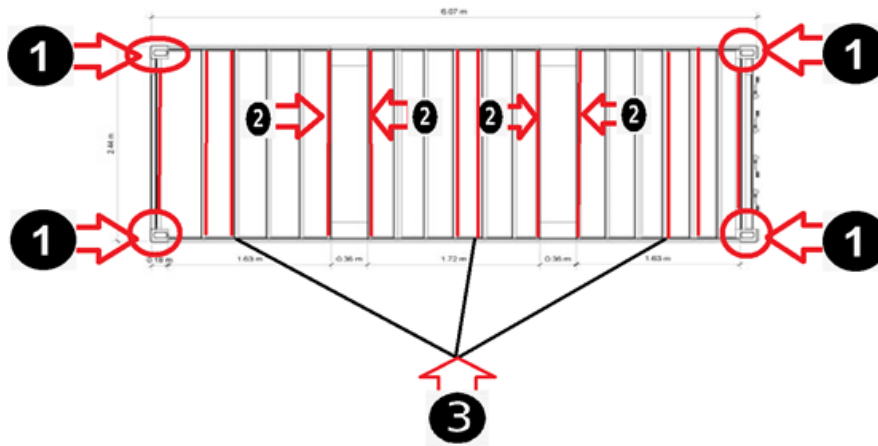

Figure 2: Schematic diagram of sea container floor (underside) with gooseneck tunnel (image courtesy of https://www.researchgate.net/publication/305483415_Strength_Analysis_of_Shipping_Container_Floor_with_Gooseneck_Tunnel_under_Heavy_Cargo_Load)
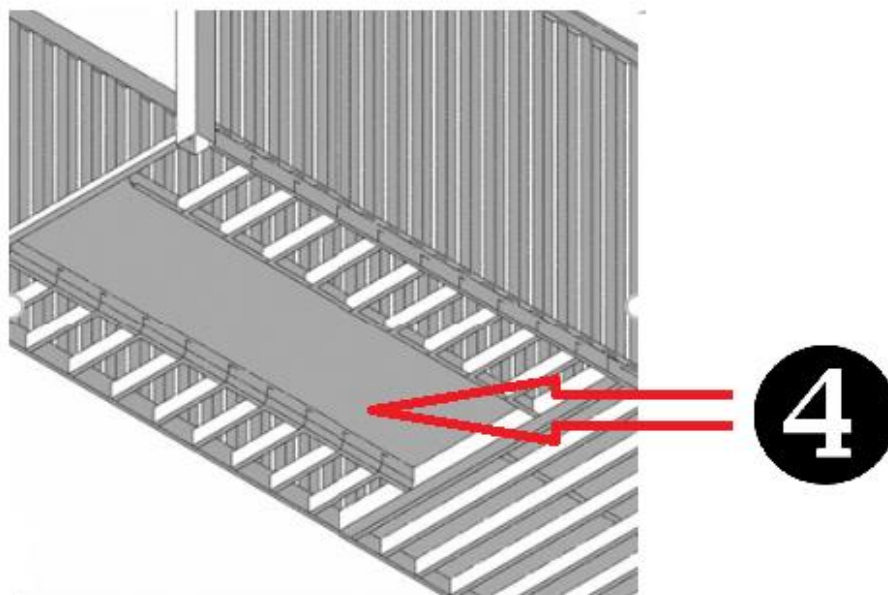
2 Safety

Refer to section 2 of the Insecticide spray treatment methodology and follow label directions. All label requirements for safety must be followed, including wearing appropriate Personal

Protective Equipment (PPE). Persons preparing and handling insecticide concentrate and dilute solution should wear protective clothing, such as coveralls (or overalls and hat), chemical resistant gloves (butyl rubber, neoprene, nitrile rubber), chemical resistant footwear, suitable eye protection, and a dust/mist filtering respirator (MSHA/NIOSH approved Number Prefix TC-21C) or a NIOSH approved respirator with any N, R, P, or HE filter.

3   Calculating the dose

Refer to section 3 of the Insecticide spray treatment methodology.

3.1   Treatment schedule

A suspension concentrate formulation of deltamethrin, with a concentration of 0.03% or above, must be applied as a 1 litre spray (1000 mL) solution per 20m^2, applied as a coarse spray of 350 to 400 microns.

The formulation type must be a suspension concentrate, as this has greater residual activity; and must have a structural use pattern.

3.2   Calculating the total target surface area

The total surface area of the sea container required to be treated must be calculated prior to treatment. For a sea container the area must be calculated for each target and the total determined. The formula is:

> **Total Target Surface Area of sea container (m^2) = area of internal floor (m^2) + area of external floor (m^2) + area of internal lower portion of walls up to 1m (m^2) + area of external lower portion of walls up to 1m (m^2) + area of internal lower portion of doors up to 1m (m^2) + area of external lower portion of doors up to 1m (m^2) + area of door seals (m^2) + allowances for all ridges cracks, joints and crevasses**

Allowances must be made for all ridges, cracks, joints, and crevasses when determining the surface area. This means that total surface area needs to account for the corner post plates (1), the forklift pockets (2) and the cross members (3) (Figure 1); and for containers with gooseneck tunnels (Figure 2), allowance must be made for the gooseneck tunnel (4).

Example calculation for the total target surface area

Sea containers subject to measures to address the risk of khapra beetle include 20'ft and 40'ft general-purpose six-sided sea containers.

For a general purpose 20'ft container, the total target area is approximately 71.67 m^2 (Table 1); and for a general purpose 40'ft container, the total target area is approximately 125.58 m^2 (Table 2).

Table 1—Calculations for total target area of a six-sided 20'ft sea container (m^2**)**

Target	Length (m)	Width (m)	Area (length x width) (m2)
Internal floor	5.90	2.35	13.87
External floor	6.06	2.44	14.79
Internal walls (up to 1m)	2.35 5.9 5.9	1.0 1.0 1.0	2.35 5.9 5.9
External walls (up to 1m)	6.06 2.44 6.06	1.0 1.0 1.0	6.06 2.44 6.06
Internal doors (up to 1m)	2.35	1.0	2.35
External doors (up to 1m)	2.44	1.0	2.44
Door seals x 2	2.35 2.35 2.35 2.35	0.5 0.5 0.5 0.5	1.18 1.18 1.18 1.18
Total target area	66.87		

Table 2—Calculations for total target area of a six-sided 40'ft sea container (m^2**)**

Target	Length (m)	Width (m)	Area (length x width) (m^2)
Internal floor	12.04	2.35	28.29
External floor	12.19	2.44	29.74
Internal walls (up to 1m)	2.35 12.04 12.04	1.0 1.0 1.0	2.35 12.04 12.04
External walls (up to 1m)	12.19 2.44 12.19	1.0 1.0 1.0	12.19 2.44 12.19
Internal doors (up to 1m)	2.35	1.0	2.35
External doors (up to 1m)	2.44	1.0	2.44
Door seals x 2	2.35 2.35 2.35 2.35	0.5 0.5 0.5 0.5	1.18 1.18 1.18 1.18
Total target area	120.79		

3.3   Dose calculation

The volume of concentrate used must be calculated by dividing the required spray concentration (0.03%) by the concentration of active constituent in the product, and then multiplying by the volume of spray solution required. The formula is:

Volume of concentrate required (mL) = spray solution concentration required (%) / concentration of active constituent in product (%) x volume of spray solution required (mL)

Where the concentration of active constituent in product is expressed in g/L, this must first be converted to a percentage by dividing by 10. The formula for this is:

Concentration of active constituent in product (%) = concentration of active constituent in product (g/L) / 10

Example calculations for the dose of concentrate required

Two example calculations are provided below for:

- Cislin 25 Professional Insecticide (APVMA No. 62147).
- Suspend Polyzone (EPA Reg No. 432-1514 (USA registration))

Details are summarised in Table 3.

For Cislin 25 Professional Insecticide (APVMA No. 62147), the active constituent of the product is expressed as 25g/L deltamethrin.

Note: as this is expressed in g/L, it must first be converted to a percentage before the volume of concentrate required can be calculated:

1. **Concentration of active constituent in product (%) = 25/10 = 2.5%**
2. **Volume of concentrate required (mL) = (0.03/2.5) x 1000 = 12 mL**

For Suspend Polyzone, the active constituent of the product is expressed as 4.75% deltamethrin.

Note: as the concentration of active constituent is already expressed as a percentage, there is no need to convert g/L to a percentage.

1. **Volume of concentrate required (mL) = (0.03/4.75) x 1000 = 6.3 mL**

Table 3—Example deltamethrin products and dosage for sea containers

Product name	Product formulation	Spray solution concentration required	Concentration of active constituent in product (g/L)	Concentration of active constituent in product (%)	Volume of concentrate required per L of spray solution	Application method and comments
Cislin 25 Professional Insecticide (APVMA No. 62147)	Suspension Concentrate	0.03%	25 g/L	2.5%	12 mL	Apply 1 L of spray solution per 20 m² (for application to non-porous surfaces). Apply with a mechanical sprayer capable of producing a <u>coarse</u> (350-400 μm) spray.
Suspend Polyzone (EPA Reg No. 432-1514 (USA registration))	Suspension Concentrate	0.03%	47.5g/L	4.75%	6.3 mL	Apply 1 L of spray solution per 20 m² (for application to non-porous surfaces). Apply with a mechanical sprayer capable of producing a <u>coarse</u> (350-400 μm) spray.

Example calculations for determining the total concentrate required for the total target area

The total amount of spray solution (L) to be applied is dependent on the total target surface area. To avoid underdosing the sea container, and to allow for the additional surface area associated with the features of the external underside of the sea container (e.g forklift pockets, gooseneck tunnels) and cracks, crevices and voids it is recommended that approximately 10% additional spray be prepared per container. For a 20'ft sea container the total area (including the additional 10%) is approximately 80 m², coverage should be achieved by using approximately 4 L of deltamethrin spray solution; and for a 40'ft sea container the total area (including the additional 10%) is approximately 140 m², coverage should be achieved by using approximately 7 L of deltamethrin spray solution (Table 4).

Table 4—Example deltamethrin products and dosage for sea containers

Product name	Total target surface area	Rate	Spray solution required	Rate product per L water	Total concentrate required in the spray solution
Cislin 25 Professional Insecticide (APVMA No. 62147)	80 m^2 (1 x 20' container)	1 L spray solution per 20 m^2	4 L	12 mL	48 mL
Cislin 25 Professional Insecticide (APVMA No. 62147)	140 m^2 (1 x 40' container)	1 L spray solution per 20 m^2	7 L	12 mL	84 mL
Suspend Polyzone (EPA Reg No. 432-1514 (USA registration))	80 m^2 (1 x 20' container)	1 L spray solution per 20 m^2	4 L	6.3 mL	25.2 mL
Suspend Polyzone (EPA Reg No. 432-1514 (USA registration))	140 m^2 (1 x 40' container)	1 L spray solution per 20 m^2	7 L	6.3 mL	44.1 mL

4 Conducting the treatment

Refer to section 5 of the Insecticide spray treatment methodology.

4.1 Equipment

The equipment to be used to conduct the treatment must be a mechanical sprayer and must be capable of producing a coarse spray (350-400 μm).

4.2 Calibration

The mechanical sprayer must be calibrated within the 7 days prior to undertaking the deltamethrin treatment by the same person that is conducting the treatment. The sprayer must be calibrated to provide a rate of 1 L/20 m^2.

The best way to calibrate the sprayer for treating sea containers is to:

1. using only water, spray either a 20'ft or 40'ft container as per normal treatment process and record the time taken.
2. spray water into a graduated measuring cylinder and measure the volume of water at the elapsed time (recorded at step 1.)

The volume recorded should equate to 1 L/20 m^2. If not, the speed of application may need to be adjusted; or the nozzle tip may need to be replaced if it is damaged. If the nozzle is replaced, the new nozzle must be capable of producing a coarse spray.

Complete the calibration record as included in the Insecticide spray treatment methodology.

Example calibration calculations

Two example calculations are provided below to demonstrate the process of calibration:

An area of 20 m² is sprayed with water to the point of run-off and it takes 2 minutes to spray. A graduated measuring cylinder is then filled with spray for a period of 2 minutes and the volume of water is measured as 1 L.

Volume of water (L)/area sprayed (m²) = 1 L/20 m²

An area of 20 m² is sprayed with water to the point of run-off and it takes 2 minutes to spray. A graduated measuring cylinder is then filled with spray for a period of 2 minutes and the volume of water is measures as 2 L.

Volume of water (L)/area sprayed (m²) = 2 L/20 m²

The volume needs to be halved, so adjust the rate of application or change the nozzle tip to achieve the required rate of application.

4.3   Applying the treatment

Mix the deltamethrin spray solution using the rate determined, either according to the label directions (where available) or fill the tank with half the required volume of water then the required volume of concentrate followed by the remaining water. Agitate the solution to ensure it is thoroughly mixed.

The deltamethrin spray solution must be applied to the sea container target surfaces to the point of run-off at the rate of 1 L/20 m².

To avoid spraying past the point of runoff, best practice is to apply the insecticide in two passes:

1) Apply half of the required volume of the deltamethrin spray solution and spray this to all target surfaces focusing on saturating the cracks, crevices, ridges, underfloor areas (as indicated in Figures 1&2) and door seals and applying a lighter film on the walls, allow this to dry. Ensure that the spray solution is agitated throughout the spraying process.

2) Apply the second half of the required volume of the deltamethrin spray solution and spray onto all target surfaces. Ensure that the spray solution is agitated throughout the spraying process.

4.4   Post treatment

Keep the sea container dry for 3 hours after spraying. If it rains within that period, the treatment will need to be applied again.

Complete the Record of Insecticide Treatment and Treatment Certificate as included in the Insecticide Spray Treatment Methodology.