



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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Procedure - Destruction of birds using carbon dioxide gas (CO₂) in the shed

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REVISION HISTORY

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		Section	Details
1	4 Mar 04		
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1. Application / Scope

- The procedure is best applied to broiler sheds or similar where the birds are at or near to ground level. Use for layers in cages is subject to factors such as shed construction.
- The humane destruction of birds, in as short a time as practical, is a key objective for the LDCC. The objective is to render birds unconscious within 1 minute and dead within 3-5 minutes.
- The use of CO₂ gas to kill birds can be carried out by inexperienced operators with low level supervision by a person with experience in the method.
- The rate of kill may be limited by environmental conditions and availability of resources eg CO₂ vaporiser, bulk gas CO₂.
- Destruction of the birds in situ in the shed should be used where possible because it:
 - Enhances the health & safety of personnel by reducing the potential exposure to dust, and other potentially infected material because live birds are not individually handled;
 - Enhances the welfare of the birds by reducing or eliminating the need to handle large numbers of live birds;
 - Enhances biosecurity because of the reduced likelihood of dust etc being dispersed by catching operations;
 - Provides the opportunity for disposal by composting in the shed, and
 - Should be more cost effective than methods involving the individual catching of large numbers of birds.
- The method should be adaptable for controlled environment sheds. It may require some adaptation for layer sheds.
- Consideration should be given to composting the carcasses in the shed after destruction. This will require the addition of a carbon source and appropriate management to ensure the composting process is completed satisfactorily. Refer to the Composting SOP.

2. Abbreviations / Definitions

3. Resources / Equipment

On a per-team or site basis the following resources should be deployed:

- “Danger/do not operate” tags for isolated equipment (in accordance with the Pre Ops inspection SOP)
- Sufficient length of 2-2.5m wide 150+micron (min) plastic (colour other than clear is recommended)
- 20x rolls duct tape & something to cut it eg Stanley knife
- Electrical ties/teflon ties
- Step ladder(s)
- Machinery to hold roll of plastic and unroll simultaneously (machine will need to be able to go around outside of shed)
- Alternative to machine – smaller rolls of plastic on light duty pipe poles (where access is difficult)
- “ISO” bulk container (not baffled) for CO₂ gas, and tanker (baffled for transport) to maintain supply to “ISO” unit. Typical ISO unit has 20 tonne capacity.
- Vaporiser (“heats” gas for delivery). Trained operator to be provided with each bulk supply unit.
- Manifold & hoses to deliver gas to shed

- Timber battens eg 150 x25 or 38mm rough sawn, nail guns(s), industrial stapler, nails/clouts etc to support application of plastic to shed
- Weights eg sand bags or timber to hold plastic at high spots down to ground level
- Warning signs for shed(s) and property re CO₂ in use
- Barrier/Danger tape
- CO₂ monitors/alarms
- Candles – long life (short in height & burn for >4hrs) & cigarette lighter(s) – an alternative for detection of CO₂
- PPE for personnel erecting plastic etc – as for Personal Decontamination and AI OHS SOPs – respirators (2 strap), goggles, gloves, shoes, suitable shirt/shorts/overalls, head protection if working in area with low head clearance
- 8-12 personnel to prepare shed & erect plastic.
- Min 2 breathing apparatus qualified & accredited personnel & their equipment including capacity to refill air cylinders
- Additional personnel to collect & load dead birds if removed from shed.
- First Aid Officer, preferably with Advanced Resuscitation Certificate, first aid kit and Oxy Viva or equivalent.
- Waste skip or similar for wastes such as plastic.
- Optional
 - Weather reading equipment eg Kestrel meter (temperature & wind)
 - Portable lighting may be necessary when operating between sunset and sunrise.

NOTE: ISO unit & vaporiser can be trailer mounted to enable easy transport. Vaporiser can be angled to encourage condensation to run off.

4. Warnings

This operation has a number of potential OH&S risks. Training in each step must be provided to inexperienced operators before commencing the task. Therefore it is desirable to appoint a site Safety Officer for the duration of the task. A first aider must be available.

- Risk assessment – must be carried out prior to staff being engaged on the property taking into account electrical installations, standing & moving equipment, surface work area.
- CO₂ – this is very toxic (see MSDS). Personnel must not be allowed to inhale the gas in above normal concentrations ie enter shed post gassing and prior to the all clear being given for CO₂. Personnel operating in areas where CO₂ may be in large concentrations should wear a CO₂ monitor. If there is any suspicion of a person being affected by the gas, the first aider must be requested to attend.
- Manual handling – lifting of rolls of plastic, timber etc should be undertaken correctly and with mechanical support.
- Slips, trips and falls – the nature of the work area is likely to be uneven, changing surfaces etc. Personnel should be encouraged to work within their limits and suitable breaks taken. Personnel should be matched to the tasks at hand.
- Cuts & scratches – the operating environment will present many edges, sharps, etc that have the potential to inflict injury. Potential hazards should be either removed, &/or protected (covered) &/or marked with a hazard warning eg hazard tape. Where the risk of injury cannot be minimised an alternative approach should be sought eg removal of a wall.
- Electrical installations – farms typically have a wide standard of electrical installations. A check must be made to ensure the work area is safe for personnel. It may be necessary to isolate the supply to the work area during the task.

- Eye injuries – the flapping of wings, rapid movement of hands, etc all present the possibility of foreign matter in eyes including dust particles etc. Eye protection should be worn by all personnel.
- Mechanical assistance – where machinery such as a forklift, crane truck or similar are involved, it is essential all personnel are aware of the requirements when working around such machinery. Only accredited/approved personnel are to operate the equipment.
- Operating environment in and around commercial sheds can be a fairly hostile working environment eg high temperature +/- high humidity, ammonia, dust. Working in darkness may exacerbate hazards and consideration should be given to using lighting towers.
- Emotional well being – personnel will be affected differently by the experience. It is possible some personnel will be unable to be involved/complete this task. Careful selection of personnel is essential. It is essential all personnel are provided with the opportunity to access appropriate support.

5. Procedure

5.1 Shed preparation

- Preparation of sheds must not commence until it has been confirmed sufficient bulk gas is available to complete the task.
- Weather – the procedure is best carried out in cool still conditions (temperature <15-20C wind speed <5-10kph) to assist in the containment of the gas in the shed. It is important to ascertain the forecast weather for the destruction period, including preparation time. Where the weather conditions at the time are unsuitable further advice should be sought from the IPOPs Coordinator and/or IPOPs Manager.
- The weather, age of the birds and the time between shed preparation and filling of the shed with CO₂ has the potential to affect animal welfare. For older birds, eg >21-28 days, during hot weather >30C, the closure of the shed may lead to heat stress unless adequate measures are taken. Advice should be sought if these conditions are exceeded to determine the time period between closure of the shed & gas injection.
- Prior to and/or whilst wrapping the shed, a minimum number of suitably dressed personnel should enter the shed and isolate any necessary services eg electricity, water, feed.
 - Drinking and feed systems should be raised to their maximum height.
 - CO₂ warning device &/or candles should be placed to show the gas levels (1 metre above bird height). These should be put in place by these personnel.
 - Any records in the shed must be removed to a secure location. These should be treated as infected.
- For controlled environment sheds the air supply should be shut down when the gas is ready for injection into the sheds. If the air supply is to be shut down after most of the shed is wrapped, care should be taken not to cover the air supply and/or exhaust until the air delivery system is shut down.
- Close the shed as much as possible using normal procedures eg raise blinds.
- The shed must be wrapped in plastic from ground level to about 2-2.5m above the lower edge of the shed (broiler shed). The shed does not need to be airtight – rather it should be well wrapped without any obvious & large openings. The final wrap may be a mix of mechanical application—eg down sides—and hand done eg around the ends. The bottom edge of the plastic should be weighted down as needed to restrict gas escape.

The duct tape is primarily for joining sheets and closing around any obvious penetrations, rather than to close up every opening.

There is no need to cover any openings above the height of the plastic.

- Whilst the shed is being wrapped, position gas delivery hose(s) ready for delivery. Delivery in the shed should be 1m above the floor.
- Warning signs must be suitably posted on the shed and access ways to the shed(s)

NOTE: CO₂ is a heavy gas & will flow through openings to the lowest point.

NOTE: For electronically controlled environment sheds, wrapping should not be necessary, but an inspection of the shed should be undertaken to confirm there are no obvious holes where gas may leak out.

4.2 Gas Injection

- Gas injection must only commence when:
 - The current and predicted weather for the duration of the task is within the above limits
 - Team Leader/Site Supervisor is satisfied the shed is adequately wrapped
 - All personnel are outside the shed
 - All personnel including owner/staff and contractors are present & accounted for
 - Suitably qualified breathing apparatus personnel are in attendance
 - Confirmation there is adequate CO₂ gas to complete the task once it is started.
- Gas injection should:
 - Aim to fill the shed in 30-60 mins
 - Deliver the gas so there is minimal noise i.e. no noise that would cause the birds to pack up
 - Deliver the gas above the birds eg 1m above the birds so that it flows down to the floor & across it.
- The injection time must be noted so that the minimum time is completed.
- Start-up of the gas flow is important. The delivery valve(s) should be closed, the vaporiser open, and then rapidly $\frac{3}{4}$ open the valve from the tank to the vaporiser. Should a line freeze, dismantling may be required to clear it.
- Once the injection time is completed, actions necessary to confirm the gas has reached the desired level should be taken eg check audible alarms and candles.
- The shed should be left closed for at least 2 hours. The birds can then be inspected by personnel in breathing apparatus to confirm all birds are dead. Where small numbers of birds are still alive (<100) these can be killed by an alternative method eg neck dislocation.
- Ventilate the shed eg remove plastic & raise blinds for at least 4 hrs (to allow gas to escape from the feathers of the birds). Sensor readings must be checked for clearance of CO₂ prior to any person entering the shed. Breathing apparatus personnel must standby until it is established the shed is clear of CO₂.
- Leakage from the shed can be monitored with a portable CO₂ monitor.
- Plastic can be either re-used on site or, subject to the disinfection requirements, re-used on another site, or disposed off as prescribed.

- Shut down of the CO₂ should be done carefully. The tank to the vaporiser must be closed while the delivery valve is open so pressure is released.

NOTE: Failure to shut down correctly may result in personal injury and/or damage to the vaporiser.

- Cage layers will need to be removed promptly to avoid the complications of removing birds with rigor mortis from the cages. The loading & transport of birds should be in accordance with the relevant SOPs.

6. References

- Pre Ops inspection SOP
- Personal decontamination SOP
- Entry/exit IP/DCPSP SOP
- AUSVETPLAN Destruction 4.7

7. Appendices