



Department of
**AGRICULTURE
FISHERIES &
FORESTRY -
AUSTRALIA**



Hay Export Procedure 2000

(Incorporating The Hay Export Protocol 1996)

**Baled Hay Exports to Countries that Require AQIS
Certification.**

AQIS (Australian Quarantine and Inspection Service)
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1 Introduction

This procedure explains the procedures, for AQIS officers and clients, for sampling and inspection of baled hay for phytosanitary certification.

1.1 Phytosanitary certificate

When a phytosanitary certificate is required for baled hay or similar product (e.g. straw etc), exporters must present product that meets the importing country's requirements.

AQIS will only endorse fumigations on phytosanitary certificates when the importing country requests it and approved treatments have been; (i) supervised by AQIS officers; (ii) a registered fumigation company supplies certification; or (iii) fumigations are approved under CA arrangements.

1.2 Freedom (on inspection) from any live insects and soil

Untreated hay may contain a range of field pests, notably fungal feeders (such as *Typhaea* spp. i.e. fungus beetle etc) and stored-product pests.

International phytosanitary certificates state:

"...inspected according to appropriate procedures and are considered to be free from quarantine pests, and practically free from other injurious pests..."

In practice however, most importing countries apply a policy of **nil-tolerance of any live insects**: and, if one is found, the entire certification lot is rejected. AQIS officers and approved inspectors have to apply **the same** standard to phytosanitary inspections.

Since it is practically impossible for AQIS to inspect every particle of hay, for live insects, inspection inevitably involves a sampling process. **Exporters should be aware, therefore, that in issuing a phytosanitary certificate, AQIS makes no claim that an entire shipment is free of insects. Based on inspection of representative samples ("appropriate procedures") the shipment is considered to be "practically free" of live insects.**

1.3 Freedom from quarantine pests...

All inspected product must be inspected and found free of pests of quarantine concern to the importing country. Quarantine pests vary between each country. International phytosanitary certificate states:-

"...inspected according to appropriate procedures and are considered to be free from quarantine pests, and practically free from other injurious pests..."

NOTE: Rye-grass seeds (galls), infested with the nematode, *Anquina funesta*, which are in turn infected with *Clavibacter toxicus*, are associated with Annual Rye-grass Toxicity (ARGT), which has been reported in South Australia, Western Australia and, more recently, Victoria. Horses and cattle have died after eating toxic hay.

The Crops Division of the Department of Agriculture, Fisheries and Forestry (AFFA), in conjunction with industry, is developing a protocol for inspecting and testing stored hay for ARGT; and the State Departments of Agriculture can provide information on area freedom and ELISA testing, if formally requested by the importing country.

1.4 Absence of fumigants and other residues, harmful to health

OH&S principles apply to hay fumigated for export, to protect inspection personnel and workers, in Australia and overseas.

In January 1989 the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) established new standards to limit pesticide, heavy metal and aflatoxin residues in both domestic and imported animal feedstuffs (EICM 1989/15). MAFF conducts random sampling of imported feeds, and those found exceeding the limits are destroyed or re-exported. Other countries are likely to implement similar sampling of imports.

2 Approved Fumigation Standards (Effective Fumigation)

2.1 New Fumigation protocol developed in Western Australia

In Agriculture Western Australia, a research team comprising Dr F. De Lima, R Emery and P. Jackson, conducted extensive investigations of double-dumped hay fumigated in 40 ft containers, using Methyl bromide (CH₃Br), Phosphine (PH₃) and Carbon dioxide (CO₂), in more than 100 trials beginning in 1990. A final report of their results, is given in **Development of Exports of Oaten Hay to Japan** (Project No: DAW-28A – Principal Investigators R. Nussey and Dr C. P. F. De Lima) 1994. This report and earlier work by Jonathon Banks (CSIRO) forms the basis for AQIS standards for fumigating double-dumped hay.

Fumigation companies have the following options that comply with the new standards:

- (i) **AQIS Supervision of Treatment:** at the start of fumigation, at the second monitoring (where applicable) and at the end of the treatment.

(Note: AQIS will supervise fumigation treatments only under the following circumstances:

- (a) when the exporter requests AQIS supervision; and
- (b) when the fumigation (that is not done in accordance with AQIS fumigation standards) details are to appear on the phytosanitary certificate.

Note: No AQIS supervision is required where the exporter presents a commercial certificate that complies with the new fumigation standards (effective fumigation).

- (ii) **Compliance Agreement (CA) Arrangements:** the company is to provide a quality manual that meets the requirements of the Standards, and the companies' compliance with procedures will be audited by AQIS at the fee for service rate.

New AQIS Fumigation Standards for Hay

Since the WA Investigations specifically targeted hay, whereas the AQIS Standard in EICM 1995/2 did not, AQIS has decided to make the WA protocols, with modifications, the national standards for fumigating double-dumped hay, exported in 20 ft and 40 ft containers. These procedures may also form the basis of CA arrangements, as given in EICM 1995/2.

3 The New AQIS Fumigation Standards for Hay - incorporating the WA protocols

There are no mandatory requirement for treatments unless requested by the importing country, but fumigation is generally necessary to meet the importing countries requirement of **no live insects** in hay consignments.

AQIS does not specify any particular treatments. This is left to the discretion of commercial parties, for whom profitable trading depends upon effective fumigation. ***Exporters should note, however, that the effective fumigation, as given in 3.2 – 3.5 below, ATTRACTS A REDUCED RATE of sampling for inspection.***

Three fumigant gases, or mixtures of them, were tested in the WA investigations, namely Methyl Bromide (CH₃Br), Phosphine (PH₃) and Carbon Dioxide (CO₂). (Phosphume™, a mixture of 2% phosphine in carbon dioxide, and carbon dioxide itself, both proved to be effective alternative fumigants, but further work is required before either can be used on a regular basis.)

NOTE: - As methyl bromide is phased out in accordance with the Montreal agreement, other alternatives will replace methyl bromide in these standards.

Options for treatment are as follows:

- 3.1 No treatment;
- 3.2 Fumigation under sheets, prior to loading (CH₃Br, PH₃);
- 3.3 Fumigation inside well-sealed containers, without sheets (CH₃Br, PH₃);
- 3.4 Fumigation of product that has obtained, through monitoring, 200 gram contact hours with CH₃Br.
- 3.5 Fumigation inside containers, under sheets (CH₃Br, PH₃);
- 3.6 Fumigation in-transit (CO₂).

3.1 No treatment

This is not a practical option, though it has been attempted, usually without success. Insect pests are found in virtually every untreated consignment of hay and fumigation is the only realistic option. A hygiene test is to be conducted of the immediate inspection area, the packing shed and some bales as they come off the press.

NB: Inspectors are to inspect a minimum of 10 bales per container load of untreated hay. (Hay to be taken in a 'V' formation away from the door (i.e. sample bales to be taken from the second and third rows from the doors)).

Other options are available such as inspection during packing of the container, inspection in shed prior to packing provided that the integrity of the product is maintained and the shed has been inspected and there is no likelihood of cross infestation or contamination.

3.2 Fumigation under sheets prior to loading

Fumigations must comply with label directions for stock feed. A groundsheet is necessary, unless the hay bales are on an impervious surface (concrete or bitumen).

There is a risk of cross-infestation after fumigation, either during airing-off or while containers are being loaded. A closed shed or warehouse minimizes this risk, provided these premises are not infested with stored-product pests. ***Premises and surroundings where containers are fumigated in the open, should be inspected/tested for freedom from pests and contaminants before samples are inspected.***

3.3 Fumigation inside a well-sealed container (no sheets)

To ensure that containers are well sealed, pressure decay tests are necessary, prior to fumigation.

Evidence of this test having been conducted and passed must be presented to the inspecting officer before sampling and inspecting bales of hay.

3.3.1 Pressure Decay Test

- [a] Use a Dwyer Magnahelic® Differential Pressure Gauge, series 2000, 250 PaC, with piping specified and approved by the Department of Agriculture, or any other appropriate authority.
- [b] Introduce compressed air (industrial grade in G size cylinders or an air compressor capable of obtain this pressure in containers) into the container unit until the needle gauge registers a deflection of 250 Pascal (Pa), then turn off the gas.
- [c] If 250 Pa cannot be achieved, the container is deemed to have failed the pressure test and must be fumigated under gas-tight tarpaulins. *This is the first of two rejection tests.*
- [d] Gas leakage from the container is indicated by pressure decay, as shown on the gauge. Start the stopwatch when the needle drops to the 200 Pa mark.
- [e] Stop the watch when the needle drops to the 100 Pa mark.
- [f] The time taken is the pressure-test value, in seconds, for that container.
- [g] Pressure testing may be carried out on full or empty containers. For full containers, subtract two seconds from the registered time, to give the true value of the container.
- [h] Only containers achieving a pressure test decay time of greater than 5 seconds for methyl bromide, and greater than 10 seconds for phosphine, are deemed to have passed the pressure test, and are suitable for fumigation without tarpaulins. *This is the second of two rejection tests.*
- (i) Containers must be **fumigated on the same spot as they were tested**. Containers are not to be moved until fumigation is completed.

3.3.2 Fumigation of containers that meet the pressure-test

3.3.2.1 Methyl Bromide: tarpaulins, and an impervious ground surface, are not required for containers that exceed a pressure decay test value of 5 seconds.

The licensed operator applies CH₃Br in the standard way, through a heat exchanger unit. The pipe/tube delivering the fumigant must be placed approx. 600mm into the head/air space above the product. **This space must be a minimum of 20mm from the bottom of the roof ribs.**

If the head/air space is below 20mm, a perforated pipe (as explained in 3.5.1) must be inserted a minimum of half the length of the container. The fumigant must be introduced through this pipe along the top of the bales.

The pipe must have 4mm diameter holes, drilled at 100cm intervals, starting 200 cm from the door end of the container. It is introduced along the top of the bales, through the center of the container and is left in place throughout the fumigation. This ensures even distribution of the gas.

The recommended treatments for containers are as follows:

Gas-tightness of the Container	Dose	Exposure Period	Product Temperature
> 10 seconds	48 gm ³	12 hours	> 25°C
> 10 seconds	48 gm ³	24 hours	10 - 25°C
5 – 10 seconds	64 gm ³	12 hours	> 25°C
5 – 10 seconds	72 gm ³	24 hours	10 - 25°C

3.3.2.2 Phosphine: containers that hold pressure for more than 10 seconds, have passed the pressure test and may be fumigated without using tarpaulins.

Phosphine may be applied as aluminium phosphide. Ten sachets (34 gm each) are inserted into each 40-ft container using the PVC application pipe described for methyl bromide (see 3.5.1). Four sachets are distributed to the rear of the container, three to the middle, and three at the door end.

A weighted string is dropped down the pipe and sachets are attached to the end of the string. When the sachets are pushed into the container, the pipe can be pulled out immediately, leaving the sachets and the string. Used sachets are easily removed (and disposed of according to label directions) when the fumigation is finished.

Phosphine fumigation should not be attempted if the temperature is below 15°C. Above 15°C, fumigation should be continued for the following exposures:

Exposure Period	Product Temperature
7 days	> 25°C
10 days	15 –25°C

3.4 *Fumigation of product that has obtained, through monitoring, 200 gram contact hours with CH₃Br.*

3.4.1 CH₃Br introduction

The licensed operator applies CH₃Br in the standard way, through a heat exchanger unit. The pipe/tube delivering the fumigant must be placed approx. 600mm into the head/air space above the product. **This space must be a minimum of 20mm from the bottom of the roof ribs.**

3.4.2 Insufficient head/air space

If the head/air space is below 20mm, a perforated pipe (as explained in 3.3.2.1) must be inserted a minimum of half the length of the container. The fumigant must be introduced through this pipe along the top of the bales.

3.4.3 Monitoring of containers

Each container must be monitored to ascertain 200gram hours. Monitoring of this fumigation can be done from a monitoring pipe/tube inside the doors. Clients are to record (i) container number, (ii) amount of gas induced, (iii) time of introduction of gas (iv) gas retention results after ½ hour of induction, (v) gas retention results ½ hour before intended venting, (vi) time

fumigation completed (vii) number of gram hours exposed etc. (see Attachment 1 for sample of a monitoring sheet).

3.4.4 Monitoring documented

Documented evidence of the monitoring for each container (having been conducted and passed i.e. 200 gram hours reached) must be presented to the inspector before sampling and inspecting bales of hay. The monitoring records for individual containers may be attached to the fumigation certificate.

3.4.5 Topping up

Topping up with CH₃Br to a maximum of 72 grams per m³ total gas is allowed. If the 200gram hour is not reached in 24 hours, the container will have to be resealed and re-fumigated or fumigated using another approved method. If client elects not to re-fumigate then the container will be sampled as a container that has received no treatment.

3.5 Fumigation inside containers under sheets

3.5.1 Methyl Bromide (CH₃Br)

Containers that do not hold pressure for 5 seconds, are considered to have failed the pressure test and are to be fumigated under sheets.

The container must be placed on an impervious floor (eg: cement; concrete; bitumen or plastic sheet), with a minimum of 50cm edge around the container. Tarpaulins must be free of holes and made from heavy gauge plastic (greater than 1500 micron) or bitumen-canvas. The tarpulin must be roped; to secure the sides and so prevent any bellows action in high winds, which effectively pumps the gas out of the container. The edges of the tarpaulin, on the ground, need to be weighted down with 15cm diameter sand snakes (or equivalent e.g. sufficient sand to seal the edge) placed as close as possible to the container body.

A licensed operator applies CH₃Br in the standard way, through a heat exchange unit. The pipe delivering the fumigant is connected to a 40mm, open-ended PVC pipe of the same length as the container.

The pipe must have 4mm diameter holes, drilled at 100cm intervals, starting 200 cm from the door end of the container. It is introduced along the top of the bales, through the center of the container, and is left in place throughout the fumigation. This ensures even distribution of the gas.

3.5.2 Phosphine:

Containers that cannot hold pressure for at least 10 seconds, are considered to have failed the pressure-test and must be fumigated under tarpaulins. The tarpaulins are to be arranged as for methyl bromide in this section (3.5.1).

Phosphine to be applied as 3.3.2.2

3.6 Fumigation in-transit

In-transit fumigation is, in general, not approved in Australia, or en route to importing countries. The main OH&S concern is with phosphine preparations, but methyl bromide also poses problems, though carbon dioxide is of less concern.

Moreover, in-transit fumigations can be considered effective, only if several experimental container loads pass inspection at outturn – and not many exporters want to take this risk.

Irrespective, AQIS can **only** issue phytosanitary certificates on the basis of freedom from pests and diseases in an **INSPECTED** sample. Therefore, where countries require a phytosanitary certificate, in transit fumigation is not an option.

4 Container Inspection

Containers must be inspected prior to loading, to confirm that they are free of insects and other contaminants. Inspection options, as given in **EICM 1993/16**, are:

- (i) Traditional inspections by AQIS officers; and
- (ii) Compliance Agreement (CA) arrangements;

The inspection standards to be applied, are contained in **Inspection of Empty (Dry Box) Containers – Workshop Notes and Work Instructions**.

5 Sampling of Containers and Hay Bales for Inspection

Officers must verify that pre-loading inspection of all containers has taken place, by checking inspection stickers and documentation. Containers must also be examined for any structural damage that may have occurred since the empty-container inspection, either during loading, fumigation or transport.

5.1 Selecting Containers

To avoid bias in random sampling of hay containers, and to make trace-backs easier if they are rejected by the importing country, it is recommended that a **'consignment' or 'certification' lot**, be derived from the same **'fumigation lot'** (containers fumigated with the same fumigant in compliance with the above standard). While an entire fumigation lot may form a single **'inspection' lot** (containers physically presented for inspection at the same time) a fumigation lot may be divided into two or more certification lots.

Effectively fumigated containers, from which bales are to be inspected, are chosen at random. The sampling plan is as follows:

Number of Containers	Number of Containers
----------------------	----------------------

in the inspection lot	to be sampled
2 – 5	2
6 – 10	3
11 – 30	5
31 – 50	7
50 or more	10

5.2 Choosing Bales from the Sample Containers

It would be too time-consuming (and too costly) to unload each container in the inspection lot, in order to choose sample bales from the entire load. The only realistic option is to sample bales from the first layer at the door-end of the containers.

Untreated hay: at least ten (10) bales need to be unloaded for inspection. These bales are to be removed from the container in a 'V' formation away from the doors, accessing the second and third rows. Moreover, when hay has not been fumigated properly, using an approved method as required in 3.2 – 3.5, the consignment will be inspected as for **untreated** hay.

Treated hay: Where it is fumigated as required in 3.2 – 3.5, in accordance with registered label instructions, two (2) bales are sampled per container selected. This reduced inspection rate applies for both supervised (by AQIS) and unsupervised fumigations.

NOTE:

- (i) When bales are removed from the container, all visual surfaces should be inspected for live insects and other quarantinable material, such as soil, rodents etc. Officers are to observe Occupational Health and Safety (OH&S) standards at all times.
- (ii) All containers of hay that require a phytosanitary certificate are to have the doors opened and the residues on the floor, floor, door seals, door ledges and face (surface) of the bales sampled and inspected to determine them free of pests
- (iii) After removing the sample bales and inspecting all visible surfaces, container doors must be shut immediately to keep insects out.
- (iv) **If the sample bales are to be transported more than 50 metres, or if it is raining, the bales must be enclosed in a tarpaulin, or the like. Any residues gathered in the tarpaulin need to be inspected as part of the sample. If any live insect or other contaminant is found on the tarpaulin, the lot is rejected.**

6 Aeration of Sample Bales

Under occupational health and safety requirements, AQIS is obliged to ensure that staff members are not exposed to unsafe practices. Sample bales of hay, drawn immediately after fumigation of a container, have been found to contain unacceptable concentrations of fumigants (eg. methyl bromide, phosphine etc.).

Passive “de-gassing” of bale samples takes 2-3 hours, after the bale straps are cut. Clearly it is unacceptable for an officer to wait for 2-3 hours after sampling (time that needs to be charged), before inspections can be conducted. If officers aren’t satisfied, they can request the fumigator to test for the presence of fumigants in the bales, in the presence of the AQIS officer, prior to inspecting the hay. To avoid such delays, and to obviate the need for active de-gassing with compressors, it is acceptable for the exporter to:

- [a] select samples from given containers, under a co-regulation sampling agreement. Clients are to arrange this by contacting AQIS.
- [b] ensure that sample bales are correctly identified, secured and placed in a ventilated area free from cross infestation;
- [c] provide AQIS, in writing, with the time when aeration started; and
- [d] **ensure that all containers in the inspection lot remain on site until AQIS inspections are complete.** (AQIS permission may be granted to move containers as long as the containers whereabouts are known and they can be removed from the export chain and a co-regulation arrangements has been established to check the internal of the container for insects and contaminants).

Alternatively, Officers may accept a demonstration by a licensed fumigator, using an approved gas detection device that sample bales are free of gas and therefore safe to inspect.

7 Inspection of Hay Bales

7.1 Inspection area

Establishments shall provide an undercover area for conducting inspections. A room, a converted container (which may be portable and taken into the field), or a sealed-off area of a larger processing shed are all appropriate. The inspection surface must be a white bench or table, with adequate natural or artificial lighting (a minimum of 600 lux at the inspection surface, usually 3 fluorescent tubes 1.2 metres from the surface). (When conditions are suitable – no wind or rain – inspections may be conducted on a white sheet in the field.)

Before inspecting bale samples, Officers must first examine the inspection area and surrounds, to ensure that there is little risk of cross-infestation.

7.2 Inspection equipment

An Officer’s equipment should include:

Inspection Equipment	Reason for Equipment
Sieve	To help to separate out live insects and other foreign matter that may constitute grounds for rejection

Hand lens x 10 magnification	To magnify small objects
Specimen jars	To collect live insects, for protection prior to identification
Tweezers or small paint brush	To help collect specimen contaminants
Plastic bags and ties	For collecting larger contaminants

7.3 Inspection technique

Inspections should be conducted as follows,

(If using a room, the doors must be open, lights on and any fan off):

- (i) Cut the straps (if not already done) of the bale, split the “biscuits” (minimum of three per bale) and shake them out over the inspection bench/sieve;
- (ii) Examine closely, all residues on the bench top/top of sieve, using a magnifying glass where necessary;
- (iii) Brush the residues into the sieve (at least three- (3) sieve lots per bale, but more if necessary);
- (iv) Shake the sieve for at least thirty (30) seconds in total; and
- (v) Examine both the top section and lower tray for at least one minute for insects and contaminants.

The procedure is shown pictorially in *Inspection Standards for Hay Exports*.

7.4 Inspection criteria

The following table and preceding inspection protocol has been developed between AQIS and the hay industry, applicable to all importing country’s nil-tolerance of live insects and pests.

A Officers are to REJECT consignments when any of the following are detected:		
(i)	True to Description:	The description of the product be does not truly reflect (adequate and accurate) the product that is carried inside the container.
(ii)	Live Insects and Pests:	<p>This includes live insects in all stages of the life cycle – egg, larvae, pupae and adult.</p> <p>In particular, Officers should look for rodents, psocids (which feed on moulds and mildews found on damp hay) beetles (which may leave webbing or frass, a substance like sawdust) and bugs, which are sucking insects. Training programs for Officers will show how to identify various insects commonly found in hay.</p> <p>Note that: under normal phytosanitary inspections, consignments would not be rejected for such “hitch hikers” as spiders and mites (which are not classified as storage pests), but since the importing country is likely to reject for them, Officers should do the same.</p>
(iii)	Soil	<p>(a) clods weighing more than 30g; and</p> <p>(b) cumulative sand/soil on the bench top amounting to more than 30g.</p>
B Officers are NOT TO REJECT consignments but are to inform the exporter ASAP when any of the following are detected:		
(i)	Mallee Roots	Or other wood/timber, greater than 50 mm square.
(ii)	<i>Ergot infestation of ryegrass seed</i>	<i>Ergots are purple-black, horn-like fungal bodies, produced by the fungus Claviceps purpurea, which replace one or more grains in the heads of ryegrass and wheat. Ergots can be up to four times larger than normal grain and may contain toxins harmful to humans and animals.</i>
(iii)	Rocks	If more than 500g in one bale.
(iv)	Moisture	Moist hay is combustible, and therefore dangerous. Psocids also thrive in damp hay.
(v)	Other Miscellaneous contaminants	Sheep dung, rags, hessian bags, tools, etc.

7.4.1 Re-Inspection of rejected product:

Hay rejected for insect infestation may be re-presented for inspection. Exporters/agents are to supply the officer with details of treatment applied to the product. Re-inspection involves the same procedure as stated in Section 7 above.

8 Break-bulk, bale bundles for Japan

Japan has agreed to a protocol for handling bundles of double-dumped hay bales, sealed in polythene and strapped on wooden pallets. On arrival, Japanese officers will inspect such break-bulk bundles on the wharf, on the following basis:

- (i) Each pallet of hay is to be sealed completely with a polyethylene sheet;
- (ii) A quarantine certificate is to be issued for, and attached to, each inspection lot. Each lot needs to be labeled so that it is identified easily;
- (iii) If insects are detected in a lot, as a result of import inspection, the whole lot will be transferred immediately to a fumigation warehouse in the Japanese plant protection station. The entire polyethylene sheet will be removed for fumigation.

9 Future directions of the hay industry

When experimental testing of carbon dioxide fumigation is completed, the *Hay Export Protocol* may be altered accordingly.

Furthermore, industry is experimenting with triple and quadruple-dumped hay, which could affect fumigation efficacy, and AQIS may have to review its requirements when the experimental data becomes available.

Attachment A

MONITORING SHEET FOR FUMIGATION OF HAY FOR REDUCED SAMPLING RATE

EXPORTER:		PHYTOSANITARY CERTIFICATE NUMBER:		FUMIGATOR/AUTHORISED PERSON:
		COUNTRY OF DESTINATION:		

DATE GAS INTRODUCED:	CONTAINER NUMBER:	INDUCTION TIME:	AMOUNT OF GAS INTRODUCED	HEAD SPACE (MM)	LOCATION OF LINE:	20 MINUTES MONITOR: READING	2 ND MONITORING (IF APPLICABLE):	FINAL MONITOR:	TIME OF FINAL MONITOR:	TOTAL GRAM HOURS:
31/10/00	SCXU4567895	11.30 am	64g/m ³	25	Inside door	54g/m ³	N/A	16g/m ³	8.00 am	328

I, certify that the information furnished above is true and accurate
.....(Fumigator/approved company representative)