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INDUSTRY STANDARD FOR PACKING OF GRAIN IN CONTAINERS

INFORMATION FOR SHIPPING COMPANIES AND PACKERS OF CONTAINERS

The use of Containers for the carriage of bulk commodities is effective and a popular method of exporting grain products from Australia. To facilitate this supply chain the gain industry relies on exporters to ensure that all staff are appropriately trained. It is the responsibility of the exporter and the packer to ensure that all Occupational Workplace Health & Safety (OWHS) precautions are taken when packing gain into containers as improper packing (absence of proper blocking, bracing and securing) may cause serious injury to personnel when the units are handled and transported. Further, cargo must be stowed and secured to ensure that it is presented in a condition that enables efficient and safe discharging at the destination.

A number of people in the supply chain rely on the exporter and the packer to ensure that the load is safe for handling and transport:

- Crew members of the ship
- Stevedores and terminal staff at the ports of loading and discharge
- Road and rail users
- Regulatory authorities, who may wish to inspect the contents
- Unpackers of the unit

Improper packing can cause distortion and compromise the containers integrity resulting in 'bulging' of the unit and spillage of contents through container doors. Grain spilt on board ships can pose significant problem for the ship's bilge system, necessitating a difficult and costly clean up. Distorted containers can also cause serious damage to a ship's container cell guides and delays in cargo operations. It is the responsibility of the exporter and the packer to ensure that the container to be packed is suitable for the carriage of the grain and the cargo is packed in a manner adequate to withstand the risks of carriage.

The Merchant shall indemnify the shipping company against all claims, losses, damages, fines and expenses arising or resulting from insufficiency of or defective condition of packing or marking, which results in any loss or damage to the cargo, the container, other cargo in the vicinity and damage to the vessel.

This standard has been developed to identify and minimise the incidents which have led to the damage of containers packed with grain. It also summarises the main legalisation requirements for certifying containers used in the export of grain and the use of container liners.

Container Weight

The transport of containers has inherent risks which correlate with increasing weight. Chain of Responsibility legislation mandates that the packer must ensure that the loaded container does not exceed the container's gross weight capacity or safety approval rating. Therefore it is essential accurate weight assessments are calculated to ensure that the amount of grain loaded is within container specifications. This will safeguard container integrity and prevent failure of container floors and doors. Legislation also requires that Container Weight Declarations accompany all containers.

To calculate the amount of grain to load in a container, the bulk density for that cargo is required to determine the volume of the container which can be utilised. The average bulk density of different grains ranges between 50 – 100 kg/100L.

Grain	**Average Bulk Density** (kg/hectolitre)
Barley	65
Oats	50
Wheat	75
Lupins	78

http://www.agric.wa.gov.au/PC_91888.html?s=1001

The following formula demonstrates the relationship between bulk density and container carry capacity:

$$\textbf{Maximum grain bulk density} = \frac{\text{maximum cargo weight (container rating – tare)}}{\text{maximum volume of container}}$$

For example, a typical **20ft** container with a ***rating of 30*** tonne, ***tare of 2.4*** tonne and ***volume of 33m³ (330 hectolitres)*** will be able to be fully loaded with grains of a bulk density up to **83.6 kg/ 100 L**.

Note: sufficient headroom above the cargo allowing for the withdrawal of sub-samples to be drawn with a probe in a minimum of five places is a mandated requirement.

The trend towards utilising 40ft containers for exporting grain increases the availability of container capacity for this market. When utilising a 40ft container to transport grain it is important to ensure that load limits are not exceeded. A number of methods can be applied to ensure accurate load weights; one approached is outlined in the following example.

When loading a 40ft container positioned on level ground, the following formula can be used to convert the amount of grain to be loaded to a height measurement inside the container.

$$\textbf{Height of grain inside container} = \frac{\text{Grain weight (Gross container - Tare) (kg)}}{\text{Floor Area (m) } \mathbf{X} \text{ Grain Bulk Density (kg/m}^3\text{)}}$$

For example, to load a **40ft** container to a gross weight of ***30 tonnes*** with a grain of bulk density 60 kg/100L (***600kg/m³),*** given that the tare of the container is ***4.0 tonne*** and the internal floor area in ***27.80 m²***, the height to fill to inside the container would be **1.56 m**.

Installation of a False Bulkhead

A false bulkhead is a removable vertical frame installed at the inside of the container doors. The bulkhead provides safe access to the container and supports the stowed grain independently of the doors. Materials used in bulkheads are plywood, various types of fibre board and MDF. The actual thickness of the bulkhead should be adequate to withstand the rigours of carriage by all forms of transport during its journey from origin to destination. It cannot be overemphasised that the LHS door must be secured properly to reduce the movement of grain during transport as this has led to a number of instances of leakage. Though the 'half or one door' model has been used, it provides no significant weight-bearing benefit.


Fig 1


Fig 2


Fig 3

Figures 1, 2, & 3 showing leakage of grain through the door

For packing and transport of grain it is recommended that a 'FULL or TWO DOOR' bulkhead is secured independently and not supported by the doors.


Fig 4


Fig 5

Labelling of Containers

It is recommended that containers are appropriately labelled to make all those involved in the transport chain aware of the risk when opening the doors. It is recommended that labelling notes:

a) The commodity held within the container is of a bulk nature
b) A bulkhead has been utilised.

Sealing the LHS Door

As a means to ensure that both container doors are properly and correctly closed, it is recommended that a supplementary container seal is affixed to the closed LHS door prior to commencement of grain loading. This practice will ensure that the LHS door is properly closed and secured, confirming the packer has met their duty of care. This can be done using a strip or bolt seal. It must be noted that sealing the LHS door in this manner is in addition to the existing requirement for a seal on the RHS door.

Current Loading Practices

There are four main methods used for packing grain in containers. There appears to be no association between the particular packing method and the geographical area.

Method 1 (Horizontal Load)

This method of loading is highly recommended as the OWHS risks and potential for damage to the container unit are minimised. There is also less chance of grain 'leakage', notwithstanding any container impact.

Container preparation – A false bulkhead is secured across the door opening and the LHS door is closed and sealed.

Loading – This method for packing involves having the container in an upright position and feeding the grain into the unit using of a conveyor belt or funnel shoot. The packer must ensure that the weight is evenly distributed over the entire surface area of the container.

Overall process takes between 10 - 25 minutes.

Fig 6

Figure 6 showing loading in progress

Fig 7

Fig 8

Fig 9

Figures 7, 8 & 9 showing loaded containers

Method 2 (Tilt Load)

Container preparation – A false bulkhead is secured across the door opening and the LHS door is closed and sealed.

Loading – This method for packing involves tilting the container to a 45° angle with the grain loaded and distributed through an overhead funnel. On completion, the container is returned to upright position. It is critical that every precaution is taken to ensure that there is no undue force on the front wall. It is possible that the front wall load may exceed 0.4 x payload during loading.

Overall process takes between 7 – 10 minutes.

This can be an alternative to method 1 above. The packer must ensure that the weight is evenly distributed over the entire surface area of the container.

Fig 10

Fig 11

Fig 12

Fig 10 – Grain silo used in 'tilt load' process
Fig 11 – Container being elevated for loading using tilt load
Fig 12 – Feeding of grain into container in tilt load position

Fig 13

Fig 14

Fig 13 – As above using conveyor belt for loading
Fig 14 – Container in position for tilt load

Method 3 (Vertical Load)

Container preparation – A false bulkhead is secured across the door opening and the LHS door is closed and sealed.

Loading – This method for packing involves inverting the container to an upright position with the grain loaded and distributed through an overhead funnel. On completion, the container is returned to an upright position. The packer must ensure that the weight is evenly distributed along the whole surface area of the container.

Overall process takes between 7 – 10 minutes.

Fig 15

Fig 16

Fig 15 – Container in position for vertical load
Fig 16 – Feeding of grain into container in vertical load position

Vertical loading can place excessive strain upon the front wall of the container and is likely to cause damage to it unless the front wall is sufficiently supported during loading. The 'inverter' on which the container is placed for positioning before loading should be fitted a secondary 'ram plate' to support the front container wall while being loaded.

If vertical loading is used it is strongly recommended that a false bulkhead is used in the packing process.

Method 4 (Roll Load)

The Roll Load method for packing involves turning the container onto its LHS. The closed LHS door subsequently takes the role of the false bulkhead while grain is loaded into the unit via a conveyor belt or funnel shoot. This method places an unnecessary strain upon the LHS wall and is likely to cause considerable damage to the unit. Although it is believed that this practice is used in Australia no packers have confirmed they have used this method onsite.

It is the strong recommendation that the roll load, <u>MUST NOT</u> be used to pack grain containers.

Certification of Containers

The Department of Agriculture, Forestry and Fisheries (DAFF), through the Australian Quarantine and Inspection Service (AQIS), regulates the export of prescribed products of which grain is one. AQIS inspection procedures are designed to make sure containers meet legislative requirements, and that Australia's reputation as a producer and exporter of clean, pest and disease free products is maintained. AQIS certifies that all grain exports conform to domestic export legislation and meet the importing country phytosanitary requirements. An important component of the export certification process is an inspection of the container which the grain is to be transported in.

The requirements for the inspection of dry containers are set out in the ***Export Control (Plants and Plant Products) Orders 2011***. There are two levels for container inspections referred to as Level 1 and Level 2. Consumable plant products, such as grain, are subject to the higher level of inspection, Level 2. For this certification an authorised officer must inspect the container to ensure it is free from:

• Live insects in residues or on the structure of the container, inside or out;
• Live rodents or evidence of rodents harbouring behind linings
• Any residue infestible by insects
• Structural damage such that insects could enter after loading
• Non-infestible material, odour, water, rodent carcasses or rodent droppings.

Non-infestible materials refer to any material not capable of infestation by pests including plastic beads, flaking paint off walls, oil residues off the floor, loose rust on walls, wet paint on walls.

Use of Liners

One option for shippers wishing to ensure that their cargo is satisfactorily packed and protected is the use of full or partial disposable liners. In some cases, these liners are an economical and acceptable alternative to carrying out maintenance such as; painting, floor sanding or stain treatment. It must be borne in mind that some consignees in importing countries are opposed to the use of any Liners as disposal becomes costly and may not be an environmentally sound practice.

Over time various interested parties have made requests to AQIS to permit the use of Liners as a method of upgrading a General purpose Container (GC) to a Food Quality Container (FC) i.e. installing a liner in a Level 1 certified container will facilitate its certification as Level 2. DAFF's Industry Advice Notice G2010/11 (Annex 1) outlines the conditions by which this upgrading of containers by installing liners is acceptable:

- *An AQIS authorised officer must inspect and pass empty container units.*
- *The use of a liner may be used to overcome superficial problems such as flaky paint, light rust, light transferable stains but **not** odours or infestible residues such as plant material or soil.*

Note: Installing a liner before the container has been inspected will require it to be removed, resulting in lost productivity. If a liner is installed to overcome the problem of flaky paint, when it is discharged at the destination, care must be taken to ensure that any flaky paint present does not contaminate the grain.

Acceptable lining materials include:

- Composite water resistant paper
- Polyethylene film
- Cardboard, Plywood and unbroken Particle Board.
- Foils

It is important to note that when the commodity is in direct contact with the lining, the lining must comply with Australian Standards AS 2070 and AS 2171 - 1992.

The following pictures provide examples of containers which should be acceptable for carriage of grain without taking any further remedial action in the preparation of the container.


Fig 17


Fig 18


Fig 19

Fig 17, 18, 19 - Interior panels gauged, non-transferable rusty stains.


Fig 20


Fig 21


Fig 22

Fig 20 - Interior panels gauged, non-transferable rusty stains.
Fig 21 - Floor and wall marked with, non-transferable rust and oil stains.
Fig 22 - Burnt paint non-transferable.


Fig 23


Fig 24


Fig 25

Fig 25 - Wall with non-transferable stains.
Fig 26 - Floor and wall marked with, non-transferable rust and oil stains.
Fig 27- NOT ACCEPTABLE - Splinters and debris – remove debris, sand down rough edges and make surface smooth.

For further pictures presenting acceptable standards please refer to the ‘Standards for Food Quality Shipping Containers’ published by Shipping Australia Limited. This guide is endorsed by AQIS and is available at the SAL website.

ANNEX 1

30 July 2010

INDUSTRY ADVICE NOTICE NO. G2010/11
Container liners and empty container inspection

This Industry Advice Notice (IAN) provides additional information to previous IAN 1999/8 'Container liners and empty container inspection' in accordance with schedule 5, part 2 of the Export Control (Plants and Plant Products) Orders 2005.

Background
As a result of a shortage of export quality shipping containers in 1999, and at the request of industry, AQIS assessed the use of two types of liners to upgrade containers. At the time, the program released IAN 1999/8, which allowed for the use two types of board liners. This IAN provides information for the use of additional types of liners as outlined below.

Conditions
Conditions for the use of pre-fabricated liners remain and are:

- An AQIS authorised officer must inspect and pass empty container units.
- The use of a liner may be used to overcome superficial problems such as flaky paint, light rust, light transferable stains but **not** odours or infestible residues such as plant material or soil.

Liners can be considered suitable if correctly installed. Shipping containers will need to be inspected by an AQIS approved officer prior to the liner being installed, and monitored by the exporter during loading to ensure the liner effectively negates against non-infestible residues and materials as well as defects such as stains, rust and flaking paint. Liners that are installed and complete prior to loading can be used for both bagged products and suitable bulk grain products, however progressively assembled boards will only be considered suitable for bagged products only. In the case of woven bladder liners, they may be installed at the time of inspection and the container sealed and loaded at a later date with bulk commodities. Please note that woven liners have a limited capacity to prevent transfer of moisture, hence they may be considered an effective barrier for light oil stains only.

Importing country requirements vary and AQIS advises exporters to seek advice from the importing country on any conditions or requirements they have for the use of container liners prior to export.

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