



# GRAIN TRADE AUSTRALIA

## Section 2 – MAIZE TRADING STANDARDS

### 2014/15 SEASON

#### TABLE OF CONTENTS

SECTION 1	INTRODUCTION.....	2
SECTION 2	DEFINITIONS .....	3
SECTION 3	GRAIN QUALITY STANDARDS.....	15
SECTION 4	VARIETAL CLASSIFICATION .....	19
SECTION 5	METHODS & PROCEDURES.....	20
5.1	Introduction .....	20
5.2	Sampling.....	21
5.3	Moisture Assessment of Cereals – Fan Forced Oven Reference Method .....	23
5.4	Moisture Assessment of Cereals – Brabender Oven Reference Method.....	25
5.5	Moisture Assessment of Cereals – NIR .....	27
5.6	Test Weight Assessment - Schopper Chondrometer Reference Method .....	28
5.7	Test Weight Assessment – Franklin Mark 11 Chondrometer Reference Method .....	30
5.8	Test Weight Assessment – Kern 222 Chondrometer Reference Method.....	32
5.9	Trash and Screenings Assessment – Reference Method .....	34
5.10	Defective Grains Assessment – Reference Method.....	36
5.11	Contaminants, Foreign Material and Total Admixture Assessment – Reference Method..	38
5.12	Screen Hole Size Compliance Procedure .....	41
SECTION 6	REFERENCE MATERIALS .....	43

# SECTION 1 INTRODUCTION

## General

Since 1999 Grain Trade Australia has on an annual basis reviewed, produced and published on behalf of industry Maize Trading Standards (Standards) through its Standards Committee (Committee).

In order to provide a consistent message to both domestic industry and international buyers, Grain Trade Australia (GTA) encourages input into development of these Standards. Additionally, we urge industry to use the Standards contained within this Manual as applicable when buying and trading Australian maize.

## Considerations to the Standards

This section of the Manual relating to maize has been produced following the annual review by GTA of Standards. There are various sections of this Manual relating to Standards and associated procedures and industry is encouraged to take account of all relevant sections when applying these Standards to maize bought and traded domestically or internationally.

The Grades referred to in this document are a combination of:

- Grades commonly introduced across the country on an annual basis and are generally the same in each State where maize is grown or traded
- Grades that may not be introduced every season or only introduced in a regional area. These grades may be created for various reasons including to meet the specific quality requirements of a customer, as specific varietal segregations or to deal with specific quality issues with harvested grain in a localised area

Industry should note the list of Grades in this Manual is not exhaustive.

## Variations to Standards

Whilst the information in this Manual is current at time of publication, you will need to monitor the GTA Member Updates, the GTA website ([www.graintrade.org.au](http://www.graintrade.org.au)) and other applicable information to ensure that you are aware of the changes to the Standards and the impact on your own trading arrangements.

## Varieties

Any commercially bred maize variety may be grown and be acceptable within each maize grade. There is no list of varieties available within this document.

## Timing of Standards Development

The Standards outlined in this Manual are applicable for the entire season of 2014/15. Standards apply to grain assessed as per these Standards from 1 August 2014 to 31 July 2015.

## SECTION 2 DEFINITIONS

The following Defect definitions are to be read in conjunction with the images displayed in the GTA Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment located on the GTA website at [www.graintrade.org.au](http://www.graintrade.org.au). The images in that document display the minimum and/or maximum coverage and attributes of the Defective Grain types as defined in these Standards.

### Aflatoxin

Aflatoxins are a group of chemicals produced by certain mould fungi. It includes four different aflatoxins (B1, B2, G1 and G2). All four are produced by *Aspergillus parasiticus*, whereas only B1 & B2 are produced by *Aspergillus flavus*.

These fungi may produce aflatoxin on corn kernels in the field or in storage. The tolerance refers to the total of all Aflatoxins including AFB1, AFB2, AFG1 and AFG2 in ppb.

### As Is

In terms of sample assessment, is the representative sample as taken from the load tendered for delivery without any interference to the sample. That is, there has been no cleaning or screening of the sample prior to analysis. The sample may also be referred to as a “dirty” sample.

### Bin Burnt

Refer to Heat Damaged.

### Broken

Broken maize refers to maize that is mechanically damaged due to the harvesting or handling process, with a quarter or more of the grain missing. It includes any mechanical damage to the germ.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Broken.

### Cereals

In the context of these Standards, cereals refer to wheat, barley, oats, cereal rye, triticale, sorghum, maize and rice.

### Cereal Smuts

Cereal Smuts include all smuts on all cereal grains. This includes but is not limited to:

#### Ball Smut

Are those infected by the spores of the fungus *Tilletia caries*. They have the appearance of pale, plump, slightly oversized grains. These grains are easily crushed between the fingers and contain a mass of black powder (spores) with a distinctive rotten egg smell. This may also be called Stinking Smut or Bunt.

#### Boil Smut

Boil smut, also called common smut, is caused by the fungus *Ustilago maydis*.

## Chemicals not Approved for Maize

Refers to the following:

- Chemicals used on the growing crop in the State or Territory where the maize was grown in contravention of the label
- Chemicals used on stored maize in contravention of the label
- Chemicals not registered for use on maize
- Maize containing any artificial colouring, pickling compound or marker dye commonly used during crop spraying operations that has stained the maize
- Maize treated with or contaminated by Carbaryl, Organochloride chemicals, or diatomaceous earth
- Chemical residues in excess of Australian Commonwealth, State or Territory legal limits (see Maximum Residue Limit and National Residue Survey)

For further information on this topic, refer to the document “Australian Grains Industry Post Harvest Chemical Usage Recommendations and Outturn Tolerances 2014/15” - see GTA website [www.graintrade.org.au](http://www.graintrade.org.au).

## Clean Seed Basis

For the purposes of assessment of various defective grains, clean seed includes all maize seed remaining above the screen following the Screening process.

## Coloured Grain

Refer to Pickling Compounds or Artificial Colouring.

## Contaminants

Contaminants are defined individually in these Standards and consist of the following:

- Aflatoxin
- Boil Smut
- Cereal Ergot
- Chemicals not Approved for Maize
- Chemicals in excess of the MRL
- Coloured Grain
- Earth
- Foreign Seeds
- Fumonisin
- Insects – Large
- Insects – Small
- Objectionable Material
- Odour
- Pickling Compounds or Artificial Colouring
- Ryegrass Ergot
- Sand
- Smuts
- Snails
- Stones
- Stored Grain Insects and Pea Weevil – Live

Contaminants may be referred to as Foreign Material, being all material other than whole or broken seeds of the maize being assessed.



## Damaged

Damaged grain refers to Dark Grain, Field Fungi, Heat Damaged or Bin Burnt, Insect Damaged and Sprouted.

## Dark Grain

Dark grains are those that exhibit an obvious dullness. The colour may change to dark brown/orange through to brown and black. Dark grain is included in the definition of Damaged.

## Dead or Mouldy

### Dead

Dead grains are those that have been affected by disease and appear greater than approximately 50% opaque. Grains that are equal to or less than approximately 50% opaque are considered normal grains.

### Mouldy

Mouldy grains appear discoloured and visibly affected by mould on the grain surface. The mould may develop during crop growth. The field mould may be difficult to distinguish from Storage Mould.

### Storage Mould

Storage Mould refers to kernels that have become affected by the development of fungi or bacteria due to an increase in grain moisture levels during storage. Affected grains appear discoloured and visibly affected by mould. Includes the commonly referred to term Rotted. Note that if any odour is detected a nil tolerance applies.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Dead or Mouldy.

## Defective Grains

Defective grains refer to maize that has been damaged to some degree, as outlined in these Standards. They include the following:

- Bin Burnt
- Broken
- Damaged
- Dark Grain
- Dead
- Field Fungi
- Fusarium Infection (Silk Cut & Starburst)
- Heat Damaged
- Insect Damaged
- Mouldy
- Pink Stained
- Sprouted
- Storage Mould
- Visibly Chewed grains (rodents)

An individual kernel may only have one defect, being the defect type with the tightest tolerance in the standard.

**Earth**

Earth is defined as a clod of dirt, being 5mm or less in diameter.

**Ergot**

Ergot is a purplish black fungal body, which contaminates cereal and ryegrass kernels when they are infected by the fungus *Claviceps purpurea*.

**Ryegrass Ergot**

Ryegrass ergot is *Claviceps purpurea* infection of ryegrass kernels. Tolerances are defined in terms of overall length in cm when pieces found in the sample are aligned end on end.

**Cereal Ergot**

Cereal ergot is *Claviceps purpurea* infection of any cereal kernels. Tolerances are defined in terms of the total number of pieces or whole affected kernels of any cereal found in the sample.

**Field Fungi**

Field Fungi refers to individual kernels where the seed coat is greater than approximately 50 percent discoloured. The visible discolouration of affected grains can vary from dark grey, brown to black in colour.

Grains that are approximately 50 percent or less discoloured are to be classified as Sound.

Field Fungi is included in the definition of Damaged.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Field Fungi.

**Float Index**

The Float Index is a useful guide to the density of maize. It is measured as the percentage of grains that float when placed in a solution.

**Foreign Material**

Refers to material other than whole or broken maize seed in the sample being assessed. Refer also to contaminants.

**Foreign Seeds**

Foreign Seeds are defined as seeds of any plant, other than the species of crop being tendered for delivery. Foreign Seeds are classified into two broad groups; those with specific tolerances listed in the Standards, and those without. The latter are termed "Small Foreign Seeds".

Seeds with specific tolerances have been categorised into several groups. These are:

**Type 1**

Colocynth (*Citrullus colocynthis*)  
 Double Gees / Spiny Emex / Three Cornered Jack (*Emex australis*)  
 Jute (*Corchorus olitorius*)  
 Long Head Poppy (*Papaver dubium*)  
 Mexican Poppy (*Argemone mexicana*)  
 Poppy (Field) (*Papaver rhoeas*)  
 Poppy (Horned) (*Glaucium flavum*)  
 Wild Poppy (*Papaver hybridum*)



Parthenium Weed (*Parthenium hysterophorus*)  
New Zealand Spinach (*Tetragonia tetragonoides*)

### **Type 2**

Castor Oil Plant (*Ricinus communis*)  
Coriander (*Coriandrum sativum*)  
Crow Garlic/Wild Garlic (*Allium vineale*)  
Darling Pea (*Swainsona spp*)  
Opium Poppy (*Papaver somniferum*)  
Peanut seeds and pods (*Arachis hypogaea*)  
Ragweed (*Ambrosia sp*)  
Rattlepods (*Crotalaria sp*)  
Starburr (*Acanthospermum hispidum*)  
St. Johns Wort (*Hypericum perforatum*)  
Thornapple / False Castor Oil (*Datura spp*)

### **Type 3a**

Bathurst Burr (*Xanthium spinosum*)  
Bellvine (*Ipomoea plebeia*)  
Branched Broomrape (*Orobanche ramosa*)  
Bulls Head / Caltrop / Cats Head (*Tribulus terrestris*)  
Cape Tulip (*Homeria spp*)  
Cottonseed (*Gossypium spp*)  
Dodder (*Cuscuta spp*)  
Noogoora Burr (*Xanthium pungens*)

### **Type 3b**

Vetch (Commercial) (*Vicia spp*)  
Vetch (Tare) (*Vicia sativa*)

### **Type 3c**

Heliotrope (Blue) (*Heliotropium amplexicaule*)  
Heliotrope (Common) (*Heliotropium europaeum*)

Note included in this Type are tolerances for seeds or pods

### **Type 4**

Bindweed (Field) (*Convolvulus arvensis*)  
Cutleaf Mignonette seeds or pods (*Reseda lutea*)  
Darnel (Drake Seed) (*Lolium temulentum*)  
Hexham Scent / King Island Melilot (*Melilotus indicus*) only acceptable if no tainting odour is present  
Hoary Cress (*Cardaria draba*)  
Mintweed (*Salvia reflexa*)  
Nightshades (*Solanum spp*)  
Paddy Melon (*Cucumis myriocarpus*)  
Skeleton Weed (*Chondrilla juncea*)  
Variegated Thistle (*Silybum marianum*)

### **Type 5**

Knapweed (Creeping/Russian) (*Acroptilon repens*)  
Sesbania Pea (*Sesbania cannabina*)  
Paterson's Curse / Salvation Jane (*Echium plantagineum*)

**Type 6**

Colombus Grass (*Sorghum almum*)  
 Johnson Grass (*Sorghum halepense*)  
 Saffron Thistle (*Carthamus lanatus*)

**Type 7a**

Broad Beans (*Vicia faba*)  
 Chickpeas (*Cicer arietinum*)  
 Cowpea (*Vigna unguiculata*)  
 Faba Beans (*Vicia faba*)  
 Lentils (*Lens culinaris*)  
 Lupin (*Lupinus spp*)  
 Peas (Field) (*Pisum sativum*)  
 Safflower (*Carthamus tinctorius*)  
 Soybean (*Glycine max*)  
 Sunflower (*Helianthus annuus*)  
 And any other seeds or pods greater than 5mm in diameter

**Type 7b**

Barley (2 row) (*Hordeum distichon*)  
 Barley (6 row) (*Hordeum vulgare*)  
 Bindweed (Australian) (*Convolvulus erubescens*)  
 Bindweed (Black) (*Polygonum convolvulus*)  
 Durum (*Triticum durum*)  
 Oats (Black or Wild) (*Avena fatua*)  
 Oats (Sand) (*Avena strigosa*)  
 Oats (Common) (*Avena sativa*)  
 Rice (*Oryza sativa*)  
 Rye (Cereal) (*Secale cereale*)  
 Sorghum (Grain) (*Sorghum bicolor*)  
 Triticale (*Triticosecale spp*)  
 Turnip Weed (*Rapistrum rugosum*)  
 Wheat (*Triticum spp*)

Type 7b includes any other Foreign Seeds not specified in Types 1 - 7a or elsewhere in Small Foreign Seeds.

**Fumonisin**

Fumonisin are a group of chemically related mycotoxins, the most common and most toxic called fumonisin B1 (FB1), with FB2 and FB3 common in lower concentrations. There are various *Fusarium spp* known to produce Fumonisin in maize in Australia. The tolerance refers to the total of all Fumonisin including FB1, FB2 and FB3 in ppm.

**Fusarium Infection****Silk Cut**

Easily identified where the pericarp is split and the starch appears to be popping out of the kernel.

**Starburst**

Best identified as spider web like streaks radiating down the kernel from the point of silk attachment. These streaks are corroded channels within the pericarp caused by fungal growth. Air in the channels breaks the transparency of the pericarp so the yellow aleurone beneath cannot be seen.





## Genetic Modification

Genetic modification (GM) refers to the use of modern biotechnology techniques to change the genes of a plant such as maize. In relation to Australian maize, all standards stipulate a tolerance of all varieties 99.8% free from genetic modification.

## Germination

The tolerance applies to the minimum number of grains in a sample that commence growth (refer also to Sprouted).

## Grade

Grade refers to the classification given to the load after it has been sampled and tested, and has been classified according to these Standards.

The following lists the more commonly used grades (note this is not a comprehensive list of grades):

Prime Feed	Prime Maize Feed No.1 and Feed No.2 Maize
---------------	--

The Grade into which a load is classified shall be determined by the various physical quality specifications detailed in these Standards.

## Heat Damaged

Heat damaged or bin burnt refers to those kernels that have become discoloured due to exposure to severe heat during storage or an incorrect artificial drying technique. Affected grains appear reddish brown, or in severe cases, blackened. Heat Damaged or Bin Burnt is included in the definition of Damaged. Refer also to Dark Grains.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Heat Damaged or Bin Burnt.

## Hybrid

A hybrid maize variety is defined as the product of a cross between two different varieties or parents of the same maize species.

## Insect Damaged

These are grains eaten in part by Stored Grain Insects and any field pests of grains including *Heliothis spp.* Any visible insect damage to the grain is classified as defective. Insect Damaged is included in the definition of Damaged.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Insect Damaged.

## Insects – Large and Small

These are insect contaminants of grain that do not cause damage to stored grains. There are separate tolerances for Large and Small Insects. They include but are not restricted to:

Large Insects	Small Insects
Desiantha Weevil ( <i>Desiantha spp</i> )	Aphids
Grasshoppers, Locusts	Minute Mould Beetle ( <i>Corticaria spp</i> )

Large Insects	Small Insects
Hairy Fungus Beetle ( <i>Typhaea stercorea</i> )	Mites ( <i>Acarina spp.</i> )
Ladybirds	Stored Grain Insects (dead only)
Pea Weevil ( <i>Bruchus pisorum</i> ) (dead only)	
Sitona Weevil ( <i>Sitona spp</i> )	
Wood Bugs	

Tolerances apply to either Live or Dead whole Insects for most species, however note for Live Pea Weevil and Live Stored Grain Insects, a nil tolerance applies – refer to the definition of Stored Grain Insects.

For all Insects, pieces are included in Foreign Material except for Gritting maize.

### Load

A load is a bulk unit tendered for delivery.

### Maize

Maize includes grains of the species *Zea mays*.

### Maximum Residue Limits

Maximum Residue Limits (MRLs) are the maximum amount of a chemical residue or its metabolite that is legally permitted on or in an agricultural commodity. The Australian Pesticides and Veterinary Medicines Authority (APVMA) sets MRLs. These MRLs are set at levels which are not likely to be exceeded if the agricultural or veterinary chemicals are used in accordance with approved label instructions and can be found on the ComLaw website at the following address <http://www.comlaw.gov.au/Details/F2014CO0821>.

Australian MRLs may differ significantly from those prescribed by foreign countries and the International Codex Alimentarius Commission. Consequently grain exporters must be aware of MRLs of importing countries and which countries accept Codex MRLs. Foreign country MRLs may be accessed directly from foreign government websites or the NRS grains database at <http://www.daff.gov.au/agriculture-food/nrs/nrs-australian-and-overseas-mrl-database>. Industry should always confirm the accuracy of these MRL listings through their own means.

### Moisture

This is the amount of water present in the sample as determined by the appropriate analytical method.

N/A

In these Standards means not applicable. That is, no minimum or maximum tolerance exists. The quality parameter may exist at unlimited levels in the sample.

### National Residue Survey

The National Residue Survey (NRS) gathers information and supplies chemical residue results on domestic and export grain commodities. The NRS results show Australian grain is of a high quality with respect to residues and contaminants. All grain exporters, container packers, bulk export terminal operators, Bulk Handling Companies and processors are encouraged to actively participate in the NRS grains residue monitoring program. Contravention of an overseas MRL may cause the rejection of cargoes resulting in severe financial cost being incurred and potentially jeopardising Australian grain into that market. Information about the NRS is located at <http://www.daff.gov.au/agriculture-food/nrs>.

## Nil

Nil in these Standards means a level of zero in a half litre sample representative of the entire load (or parcel of grain being assessed) and/or not detected in the load or in/on the delivery vessel at any stage of the receival process.

## Objectionable Material

Objectionable Material refers to objectionable foreign matter that may or may not be otherwise stated in these Standards which has the ability to degrade the hygiene of maize or become a food safety issue of concern. This includes but is not limited to the following:

### Animal Matter

This refers to meat meal, bone meal, poultry offal, meal or any other animal proteins or meals. Animal Material also includes carcasses, excreta, hair and any other animal parts of live or dead animals such as rats and mice.

### Stick

A Stick is defined as ligneous material greater than 1cm in length and 0.5cm in diameter. Note that crop stubble greater than 3cm in length and 1cm in diameter is defined as a Stick. Smaller material is included in Foreign Material.

### Tainting Agents

A Tainting Agent is any contaminant that imparts a smell or taint to maize. It includes but is not limited to plant parts and seeds of *Eucalyptus spp.*

### Water

The addition of water to grain prior to delivery is a prohibited practice.

### Other

This refers to any other commercially unacceptable contaminant such as animal excreta, glass, concrete, fertiliser or metal.

## Odour

A commercially unacceptable Odour is defined as a sour, musty or other objectionable odour emanating from the maize which is not natural or normally associated with maize. Odour may be caused by various means which may or may not be physically discernable in the sample being assessed.

## Pea Weevil

Pea Weevil refers to all life stages of insects of the species *Bruchus pisorum*.

Note that a separate tolerance applies to Live and Dead Pea Weevils:

Live

- A nil tolerance applies to all live Pea Weevils

Dead

- Dead Pea Weevil are included in the definition for Insects – Large
- Pieces of Pea Weevils are classified as Foreign Material except for Gritting maize



As Pea Weevils are commonly only found inside field pea seeds, it is recommended that a number of field peas present in a load of grain should be broken and assessed for the presence of this insect.

## **Pickling Compounds or Artificial Colouring**

### **Artificial Colouring**

This includes grain containing an artificial colouring agent. A common contaminant is marker dyes used during crop spraying operations that has stained the maize.

### **Pickling Compounds**

Pickling Compounds are those chemicals added to grain as a seed treatment or as a seed dressing prior to sowing. They are usually associated with a colouring agent.

Grains contaminated in this way may be identified by an unnatural surface colour and/or a colour that rubs off. Any grains that are artificially coloured regardless of intensity are defective.

### **Pink Stained**

This is a grain defect arising from infection by various fungi such as *Fusarium spp* which give the seed coat a distinct pink discolouration. The pink discolouration of these grains cannot be rubbed off from the grain surface (refer Pickling Compounds or Artificial Colouring).

### **Rodent Evidence**

Refer to Objectionable Material.

### **Sand**

A grain of Sand is defined as a particle of unconsolidated (loose), rounded to angular rock fragment or mineral grain between 0.06mm and 2.00mm in diameter. Smaller material is classified under Foreign Material. Larger material is classified as Earth or Stones.

### **Screenings**

This is the total material passing through a 4.75mm round hole screen after a sample of grain is subjected to the screening process. It includes Small Foreign Seeds.

### **Small Foreign Seeds**

These are all small foreign seeds in the screenings which have fallen below the screen during the screening process, except those specifically mentioned in the Foreign Seeds definition.

### **Snails**

This refers to whole or substantially whole (more than half) Snail shells, irrespective of size. These include but are not limited to:

- Common White Snail (*Ceruella virgata*)
- White Italian Snail (*Theba pisana*)
- Pointed Snail (*Cochlicella actua*)
- Small Pointed Snail (*Cochlicella abarbara*)
- Any other snail

Pieces of Snail Shell that are less than half an entire shell are classified under Foreign Material.

## Sprouted

Sprouted grains are those in which the covering of the germ is split and the shoot has broken through the seed coat. Grains that have had the germ knocked off or scalloped out due to header damage are not included. Sprouted is included in the definition of Damaged.

This definition is to be read in conjunction with the photo in the Visual Recognition Standards Guide which depicts the minimum affected standard for a grain to be classified as Sprouted.

## Standards

Standards means all the test parameters listed in this Manual. Loads presented for delivery or samples to be assessed under these Standards must be analysed for all the parameters listed in the Standards, unless otherwise specified in individual Storage and Handling Agreements.

## Stone

A Stone or gravel is defined as a lump or mass of hard consolidated mineral matter being greater than 2mm in length or diameter. Smaller material is defined as Sand.

Note a maximum weight of 4.0g applies to the total weight of all Stones per 2.5L greater than 2mm in length or diameter.

## Stored Grain Insects

These are insects which cause damage to stored grain. The tolerance applies to all life stages of the insect. Note that a separate tolerance exists for dead and live Stored Grain Insects.

### Live

- A nil tolerance applies to all live Stored Grain Insects

### Dead

- Dead Stored Grain Insects are included in the definition for Insects – Small
- Pieces of Stored Grain Insects are classified as Foreign Material except for Gritting maize

### Insects include:

- Angoumois Grain Moth (*Sitotroga cerealella*)
- Confused Flour Beetle (*Tribolium confusum*)
- Flat Grain Beetle (*Cryptolestes spp*)
- Granary Weevil (*Sitophilus granarius*)
- Indian Meal Moth (*Plodia interpunctella*)
- Lesser Grain Borer (*Rhyzopertha dominica*)
- Maize Weevil (*Sitophilus zeamais*)
- Psocids/Book lice (*Psocoptera sp*)
- Rice Weevil (*Sitophilus oryzae*)
- Rust-red Flour Beetle (*Tribolium castaneum*)
- Saw Tooth Grain Beetle (*Oryzaephilus surinamensis*)
- Tropical Warehouse Moth (*Ephestia cautella*)
- Warehouse Beetle (*Trogoderma variable*)



## **Test Weight**

Test Weight is a measure of the density of grain.

## **Total Admixture**

Total Admixture is the total of Foreign Material, Screenings and Trash in the sample. Note that separate tolerances also exist for these three quality parameters.

## **Trash**

This consists of chaff, backbone, seedpods and other light material which remains above the 4.75mm screen after a sample of grain is subjected to the screening process. It excludes contaminants for which tolerances have been stated in these Standards.

Chaff is defined as the protective material surrounding the mature seed prior to thrashing or harvesting. Backbone is the material to which seeds are attached to the plant stem.

## **Visual Recognition Standards Guide**

The Visual Recognition Standards Guide (VRSG) for Maize contains a range of photographs and illustrations to supplement the maize Standards as outlined in this booklet. The most recent VRSG for Maize was released in August 2014.

The Defective Grain definitions listed in this Standards Booklet are to be read in conjunction with the images displayed in the VRSG. The images in that document display the minimum and/or maximum coverage and attributes of the Defective Grain types as defined in these Standards.

## **SECTION 3 GRAIN QUALITY STANDARDS**

The following tables represent the grades of maize as defined in this Manual.

To fully understand and accurately implement the maize Standards, reference should be made to other relevant sections in this Manual, including:

- Definitions
- Varietal Master List
- Methods & Procedures
- Reference Materials such as the Visual Recognition Standards Guide

Other sections of the GTA Standards Manual should also be perused for general guidance on activities associated with implementation of these Standards.

As stated previously, the following Standards are applicable at the time of publishing of this Manual. Variations and new Grades may exist and industry is encouraged to keep updated with changes via reviewing the GTA website and other relevant industry information sources.

<b>Commodity: PRIME MAIZE</b>		<b>Standard Reference No. CSG-41</b>
<b>Effective: 1 October 2014</b>		<b>Season: 2014/15</b>
<b>PARAMETER</b>	<b>SPECIFICATION</b>	<b>COMMENT / VARIATION</b>
Description	n/a	Hybrids 99.8% free from genetic modification
Moisture Max (%)	14.0	
Test Weight Min (kg/hl)	72.0	
Total Admixture Max (% by wt)	5.0	Total of Foreign Material, Screenings and Trash
Foreign Material Max (% by wt)	3.0	All matter other than maize
Screenings Max (% by wt)	2.0	All matter passing through a 4.75mm round hole screen – 40 shakes
Trash Max (% by wt)	2.0	Chaff and other Trash retained above a 4.75mm round hole screen following the Screenings process
<b>DEFECTIVE GRAINS Max (% by weight, 200 gram sample, unless otherwise stated)</b>		
Broken	8.0	Includes damage to the germ
Damaged	3.0	Includes Dark Grain, Field Fungi, Heat Damaged, Insect Damaged and Sprouted
Dead or Mouldy	3.0	Includes Storage Mould. Dead are those that have been affected by disease and appear > approximately 50% opaque.
Pink Stained (entire load)	Nil	Various <i>Fusarium sp.</i> and other fungi that cause pink staining
<b>FOREIGN SEED CONTAMINANTS Max (count of seeds in total per half litre unless otherwise stated)</b>		
Type 1 (individual seeds)	8	Colocynth, Double Gee/Spiny Emex/Three Cornered Jack, Jute, Long Headed Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed (Qld only)
Type 2	Nil	Castor Oil Plant, Coriander, Crow Garlic/Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds or pods, Ragweed, Rattlepods, Starburr, St. John's Wort, Thornapple/False Castor Oil
Type 3 (a)	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Catrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr
Type 3 (b)	4	Vetch (Blue/Tare), Vetch (Commercial)
Type 3 (c)	8	Heliotrope (Blue), Heliotrope (Common)
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Damel, Hexham Scent (Hexham Scent is only acceptable if no tainting odour is present) or King Island Melilot, Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle
Type 5	40	Knapweed (Creeping/Russian), Patterson's Curse/Salvation Jane, Sesbania pea
Type 6	10	Saffron Thistle, Johnson Grass, Columbus Grass
Type 7 (a)	10	Broad Beans, Chickpeas, Cowpea, Faba Beans, Lentils, Lupin, Peas (Field), Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter
Type 7 (b)	10	Barley, Bindweed (Australian), Bindweed (Black), Wheat, Durum, Oats (Black), Oats (Sand), Oats (Wild), Oats (Common), Rice, Rye (Cereal), Sorghum (Forage), Sorghum (Grain), Triticale, Turnip Weed and any other weed seeds not specified in Types 1-7(a) or SFS
Small Foreign Seeds (% by wt)	0.5	All foreign seeds not specified in Types 1-7(b) that fall below the 4.75mm screen during the Screenings process
<b>OTHER CONTAMINANTS Max (count per half litre, unless otherwise stated)</b>		
Smut – Boil (% by weight)	1.0	Smut caused by <i>Ustilago maydis</i>
Smut – All Others (entire load)	Nil	Includes Ball Smut, Gall Smut and all Smut other than Boil Smut
Ergot – Ryegrass (length in cm)	0.5	Length of all pieces present aligned end on end
Ergot – Cereal (entire load)	Nil	Whole or pieces of Cereal Ergot
Aflatoxin – Total ppb	15	Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2)
Fumonisin – Total ppm	4ppm	Total Fumonisin including (FB1 + FB2 + FB3)
Stored Grain insects & Pea Weevils – Live (entire load)	Nil	All life stages
Insects – Large	3	Dead or alive
Insects – Small	10	Dead or alive
Snails	2	Dead or alive
Earth	3	Pieces of Earth, maximum 5mm in diameter each
Sand	20	Individual grains of sand
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones per 2.5L
Objectionable Material (entire load)	Nil	Sticks, glass, concrete, or any other commercially unacceptable contaminant, smell or taste
Pickling Compounds and Coloured Grain (entire load)	Nil	Pickled grain, dyed grain
Odour (entire load)	Nil	Grain which has any commercially objectionable foreign odour due to tainting agents or improper storage causing odour
Chemicals Not Approved for Maize (entire load)	Nil	Residues of any chemical compound not approved for Maize, used in contravention of the labelled instructions or chemicals in excess of the MRL



<b>Commodity: FEED No.1 MAIZE</b>		<b>Standard Reference No. CSG-42</b>
<b>Effective: 1 October 2014</b>		<b>Season: 2014/15</b>
<b>PARAMETER</b>	<b>SPECIFICATION</b>	<b>COMMENT / VARIATION</b>
Description	n/a	Hybrids 99.8% free from genetic modification
Moisture Max (%)	14.0	
Test Weight Min (kg/hl)	70.0	
Total Admixture Max (% by wt)	8.0	Total of Foreign Material, Screenings and Trash
Foreign Material Max (% by wt)	5.0	All matter other than maize
Screenings Max (% by wt)	5.0	All matter passing through a 4.75mm round hole screen – 40 shakes
Trash Max (% by wt)	4.0	Chaff and other Trash retained above a 4.75mm round hole screen following the Screenings process
<b>DEFECTIVE GRAINS Max</b> (% by weight, 200 gram sample, unless otherwise stated)		
Broken	10.0	Includes damage to the germ
Damaged	5.0	Includes Dark Grain, Field Fungi, Heat Damaged, Insect Damaged and Sprouted
Dead or Mouldy	5.0	Includes Storage Mould. Dead are those that have been affected by disease and appear > approximately 50% opaque.
Pink Stained (entire load)	Nil	Various <i>Fusarium</i> sp. and other fungi that cause pink staining
<b>FOREIGN SEED CONTAMINANTS Max</b> (count of seeds in total per half litre unless otherwise stated)		
Type 1 (individual seeds)	8	Colocynth, Double Gee/Spiny Emex/Three Cornered Jack, Jute, Long Headed Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed (Qld only)
Type 2	Nil	Castor Oil Plant, Coriander, Crow Garlic/Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds or pods, Ragweed, Rattlepods, Starburr, St. John's Wort, Thornapple/False Castor Oil
Type 3 (a)	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr
Type 3 (b)	4	Vetch (Blue/Tare), Vetch (Commercial)
Type 3 (c)	8	Heliotrope (Blue), Heliotrope (Common)
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Damel, Hexham Scent (Hexham Scent is only acceptable if no tainting odour is present) or King Island Melilot, Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle
Type 5	40	Knapweed (Creeping/Russian), Patterson's Curse/Salvation Jane, Sesbania pea
Type 6	10	Saffron Thistle, Johnson Grass, Columbus Grass
Type 7 (a)	50	Broad Beans, Chickpeas, Cowpea, Faba Beans, Lentils, Lupin, Peas (Field), Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter
Type 7 (b)	50	Barley, Bindweed (Australian), Bindweed (Black), Wheat, Durum, Oats (Black), Oats (Sand), Oats (Wild), Oats (Common), Rice, Rye (Cereal), Sorghum (Forage), Sorghum (Grain), Triticale, Turnip Weed and any other weed seeds not specified in Types 1-7(a) or SFS
Small Foreign Seeds (% by wt)	1.6	All foreign seeds not specified in Types 1-7(b) that fall below the 4.75mm screen during the Screenings process
<b>OTHER CONTAMINANTS Max</b> (count per half litre, unless otherwise stated)		
Smut – Boil (% by weight)	3.0	Smut caused by <i>Ustilago maydis</i>
Smut – All Others (entire load)	Nil	Includes Ball Smut, Gall Smut and all Smut other than Boil Smut
Ergot – Ryegrass (length in cm)	0.5	Length of all pieces present aligned end on end
Ergot – Cereal (entire load)	Nil	Whole or pieces of Cereal Ergot
Aflatoxin - Total ppb	20	Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2)
Fumonisin – Total ppm	10	Total Fumonison including (FB1 + FB2 + FB3)
Stored Grain insects & Pea Weevils – Live (entire load)	Nil	All life stages
Insects – Large	3	Dead or alive
Insects – Small	10	Dead or alive
Snails	2	Dead or alive
Earth	3	Pieces of Earth, maximum 5mm in diameter each
Sand	50	Individual grains of sand
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones per 2.5L
Objectionable Material (entire load)	Nil	Sticks, glass, concrete, or any other commercially unacceptable contaminant, smell or taste
Pickling Compounds & Coloured Grain (entire load)	Nil	Pickled grain, dyed grain
Odour (entire load)	Nil	Grain which has any commercially objectionable foreign odour due to tainting agents or improper storage causing odour
Chemicals Not Approved for Maize (entire load)	Nil	Residues of any chemical compound not approved for Maize, used in contravention of the labelled instructions or chemicals in excess of the MRL

<b>Commodity: FEED No.2 MAIZE</b>		<b>Standard Reference No. CSG-43</b>
<b>Effective: 1 October 2014</b>		<b>Season: 2014/15</b>
<b>PARAMETER</b>	<b>SPECIFICATION</b>	<b>COMMENT / VARIATION</b>
Description	n/a	Hybrids 99.8% free from genetic modification
Moisture Max (%)	14.0	
Test Weight Min (kg/hl)	67.0	
Total Admixture Max (% by wt)	8.0	Total of Foreign Material, Screenings and Trash
Foreign Material Max (% by wt)	5.0	All matter other than maize
Screenings Max (% by wt)	5.0	All matter passing through a 4.75mm round hole screen – 40 shakes
Trash Max (% by wt)	4.0	Chaff and other Trash retained above a 4.75mm round hole screen following the Screenings process
<b>DEFECTIVE GRAINS Max (% by weight, 200 gram sample, unless otherwise stated)</b>		
Broken	10.0	Includes damage to the germ
Damaged	5.0	Includes Dark Grain, Field Fungi, Heat Damaged, Insect Damaged and Sprouted
Dead or Mouldy	7.0	Includes Storage Mould. Dead are those that have been affected by disease and appear > approximately 50% opaque.
Pink Stained (entire load)	Nil	Various <i>Fusarium sp.</i> and other fungi that cause pink staining
<b>FOREIGN SEED CONTAMINANTS Max (count of seeds in total per half litre unless otherwise stated)</b>		
Type 1 (individual seeds)	8	Colocynth, Double Gee/Spiny Emex/Three Cornered Jack, Jute, Long Headed Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed (Qld only)
Type 2	Nil	Castor Oil Plant, Coriander, Crow Garlic/Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds or pods, Ragweed, Rattlepods, Starburr, St. John's Wort, Thornapple/False Castor Oil
Type 3 (a)	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr
Type 3 (b)	4	Vetch (Blue/Tare), Vetch (Commercial)
Type 3 (c)	8	Heliotrope (Blue), Heliotrope (Common)
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Damel, Hexham Scent (Hexham Scent is only acceptable if no tainting odour is present) or King Island Melilot, Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle
Type 5	40	Knapweed (Creeping/Russian), Patterson's Curse/Salvation Jane, Sesbania pea
Type 6	10	Saffron Thistle, Johnson Grass, Columbus Grass
Type 7 (a)	50	Chickpeas, Cowpea, Faba Beans, Lentils, Lupin, Peas (Field), Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter
Type 7 (b)	100	Barley, Bindweed (Australian), Bindweed (Black), Wheat, Durum, Oats (Black), Oats (Sand), Oats (Wild), Oats (Common), Rice, Rye (Cereal), Sorghum (Forage), Sorghum (Grain), Triticale, Turnip Weed and any other weed seeds not specified in Types 1-7(a) or SFS
Small Foreign Seeds (% by wt)	1.6	All foreign seeds not specified in Types 1-7(b) that fall below the 4.75mm screen during the Screenings process
<b>OTHER CONTAMINANTS Max (count per half litre, unless otherwise stated)</b>		
Smut – Boil (% by weight)	5.0	Smut caused by <i>Ustilago maydis</i>
Smut – All Others (entire load)	Nil	Includes Ball Smut, Gall Smut and all Smut except Boil Smut
Ergot – Ryegrass (length in cm)	0.5	Length of all pieces present aligned end on end
Ergot – Cereal (entire load)	Nil	Whole or pieces of Cereal Ergot
Aflatoxin - Total ppb	80	Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2)
Aflatoxin B1- ppb	20	Aflatoxin B1 only
Fumonisin – Total ppm	40	Total Fumonisin including (FB1 + FB2 + FB3)
Stored Grain insects & Pea Weevils – Live (entire load)	Nil	All life stages
Insects – Large	3	Dead or alive
Insects – Small	10	Dead or alive
Snails	2	Dead or alive
Earth	3	Pieces of Earth, maximum 5mm in diameter each
Sand	50	Individual grains of sand
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones per 2.5L
Objectionable Material (entire load)	Nil	Sticks, glass, concrete, or any other commercially unacceptable contaminant, smell or taste
Pickling Compounds & Coloured Grain (entire load)	Nil	Pickled grain, dyed grain
Odour (entire load)	Nil	Grain which has any commercially objectionable foreign odour due to tainting agents or improper storage causing odour
Chemicals Not Approved for Maize (entire load)	Nil	Residues of any chemical compound not approved for Maize, used in contravention of the labelled instructions or chemicals in excess of the MRL

## **SECTION 4 VARIETAL CLASSIFICATION**

A number of varieties are able to be used for multiple purposes, including for:

- Starch
- Processing
- Feed
- Silage

Varietal Restrictions are only applicable according to processors specifications or contract terms.

## **SECTION 5 METHODS & PROCEDURES**

### **5.1 Introduction**

The following section details methods and procedures to be used for the assessment of various quality parameters as outlined in this Manual.

The methods outlined are either Reference Methods or Field Assessment Methods. Field Assessment Methods are included as a guide to industry where Reference Methods may not be able to be implemented. Note that Field Assessment Methods must equate to the Reference Method for the applicable test method.

In all instances of disputes, test results produced by trade-certified equipment take precedence over non-trade certified equipment and methods. Where the dispute involves only non trade-certified equipment or test methods, the reference method takes precedence over the field assessment method.

Depending on the test to be conducted, variations may exist due to equipment used.

Procedures outlined are a guide for industry. Industry is free to develop their own Operational Procedures for each test and activity based on their own circumstances. At all times industry use of apparatus outlined in this Standard must comply with the manufacturers' recommendations for occupational health and safety and training.

## 5.2 Sampling

### 5.2.1 Definitions

This is the standard procedure used to draw a sample of the commodity from a bulk unit tendered for delivery to enable tests to be conducted on the commodity for the purposes of determining its quality.

- A primary sample is an individual probed sample taken from the lot presented for sampling
- A composite sample is the combined primary samples taken from the lot to be sampled, and is representative of the entire lot
- A sub sample is the sample taken from the mixed composite sample for the purposes of conducting quality tests, and is representative of the entire lot

### 5.2.2 Scope

Maize is traded on the basis of quality tests conducted on lots of maize presented for sale or delivery to end users. Obtaining representative samples is critical to ensuring test results reflect the true quality of these lots.

This procedure is applicable to all cereal grains, pulses and oilseeds.

### 5.2.3 Apparatus

- Manual sampling probe (double tube compartment probe, one inside the other, equipped with spiralled ports that open sequentially from bottom to top).
- Vacuum or pneumatic probe (an alternative to the manual sampling probe and consisting of a hand held or remotely controlled probe which retrieves grain through the use of a vacuum or other air movement system).
- Mixing bucket (including other associated equipment such as mini-auger suitable for mixing sample, optional).
- Sample dividing apparatus (optional).

### 5.2.4 Reagents

Not Applicable.

### 5.2.5 Procedure

#### Sample Collection guidelines for collecting a representative sample

- The surface of the grain should be fully exposed prior to sampling to allow for effective visual inspection. At this point, the load should be scanned for any defects or contaminants.
- The probe to be used should be of a sufficient length in order to obtain a sample from as close as possible to the bottom of truck.

- A primary sample must be drawn for assessment by thrusting the sampling probe as vertically and as deep as possible into the load.
- At least one probe must be taken from the front, middle and rear of each bulk unit.
- If more than one unit is delivered, samples must be drawn from each bulk unit as described above.
- If the bulk units are of visibly different quality, or if required at the Receiving Agents discretion, different samples and grade classification may be undertaken for each separate bulk unit.
- If the declared varietal composition or paddock where the grain was grown is different for each unit tendered for delivery, or more than one variety is commingled in each delivery unit, then a separate assessment of each unit must be conducted.
- Each primary (probed) sample must consist of at least one litre of grain.
- A composite sample from each load tendered for delivery shall consist of the following minimum quantities and number of probes:

Load Size	Sample Size (minimum)
10 tonnes or less	3 litres
Over 10 tonnes up to 20 tonnes	4 litres
Over 20 tonnes up to 30 tonnes	5 litres
Over 30 tonnes up to 40 tonnes	6 litres
Over 40 tonnes up to 50 tonnes	7 litres
Over 50 tonnes up to 60 tonnes	8 litres
Over 60 tonnes up to 70 tonnes	9 litres
Over 70 tonnes up to 80 tonnes	10 litres

Note – in the above table the sample size reflects the number of probe samples. For example, 4 litres equates to 4 probe samples.

#### Sample Mixing

- The primary samples in each probe must be collected together and thoroughly mixed in a suitable container using a mechanical device where appropriate, to form the composite sample.
- Sub samples should be drawn from the composite sample either by hand or through the use of a suitable sample dividing apparatus.

#### Sample Analysis

- The sub sample should then be analysed for all of the quality parameters specified in these Standards or in the Receiving Agent's agreement with the buyer concerned if different from these Standards.
- Results should be entered on the Receiving Agents sample receipt.

#### 5.2.6 References

Sampling of Wheat and other Grains - AACC Method 64-70A

### 5.3 Moisture Assessment of Cereals – Fan Forced Oven Reference Method

#### 5.3.1 Definitions

This is the fan forced reference method specified in National Measurement Institute legislation to be used to determine the moisture content of grain samples as loss in weight when subjected to heating.

#### 5.3.2 Scope

This is applicable to all cereals when being tested for moisture content under laboratory conditions.

#### 5.3.3 Apparatus

- Laboratory Mill
- Forced Draft Oven capable of being maintained at 130°C +/- 1°C
- Aluminium moisture dishes, 50 – 55 by 15 – 20mm with tight fitting covers
- Desiccator
- Electronic balance capable of weighing up to 100g to 4 decimal places

#### 5.3.4 Reagents

Not applicable

#### 5.3.5 Procedure

- Grind a 30-40g whole grain sample in a suitable mill (Perten 3303, Tecator, Cemotec or similar). Sample to be “as is”.
- Mix thoroughly and transfer 2 to 3g portions to each of 2 or more tared moisture dishes
- Cover and weight the dishes immediately
- Subtract tare weights and record weight of sample
- Clean mill between samples
- Uncover the dishes and place them in pre heated oven (130°C) and place covers under the dishes. Evenly distribute the dishes within the oven
- Close oven door and allow temperature to stabilise and then heat for exactly 60 minutes
- Remove the dishes, quickly replace the lids and place in the desiccator
- Weigh the dishes after they reach room temperature
- Determine loss in weight as moisture as per the following equation:

$$\% \text{ Moisture} = \frac{W_{tp} - (W_{dry} - W_{dish})}{W_{tp}} \times 100$$

Where

W<sub>tp</sub> is the weight of the test portion before oven drying

W<sub>dry</sub> is the weight of the dish, lid and test portion after oven drying

W<sub>dish</sub> is the weight of the empty oven moisture dish and lid

Report result to the nearest 0.1%.

If duplicates differ by more than 0.2%, repeat the determination, otherwise, report the average of the duplicates.

#### 5.3.6 References

- Moisture – Air Oven Methods – AACC Method 44-15A
- NMI M 8 Pattern Approval Specifications for Protein Measuring Instruments for Grain
- NMI V10 Uniform Test Procedures for the Verification, Certification and In Service Inspection of Protein Instruments for Grain



## 5.4 Moisture Assessment of Cereals – Brabender Oven Reference Method

### 5.4.1 Definitions

This is the Brabender Oven reference method used to determine the moisture content of grain samples as loss in weight when subjected to heating.

### 5.4.2 Scope

This is applicable to all cereals when being tested for moisture content.

### 5.4.3 Apparatus

- Mill - A low moisture loss mill must be used as significant levels of heat can be generated. The mill of choice is the Falling Number 3303 mill (a Wiley - using a 20 mesh screen). The Falling Number Mill 3303 is used with the setting – Wheat – 0.
- Electronic balance – accuracy = 0.001g (or better)
- Aluminium dishes - these dishes must be kept clean and weigh  $11.500 \pm 0.005\text{g}$
- Vial with well sealing screw to lid. Currently a small yellow top polyethylene container with polypropylene lid is used. Samples must be prepared and used within 24hrs.

### 5.4.4 Reagents

Not Applicable

### 5.4.5 Procedure

- Grind approx 50g of sample in accordance with relevant mill manual. Mix sample well and replace into original sample vial tightly sealing the lid. Sample must be prepared and used on the same day or prepared on the evening before.
- Make sure the dishes are clean and are resting on a clean surface (wipe with tissue). Tare the first dish and also subsequent dishes used but note the weight before taring if weight varies from 11.500 or tare varies by  $\pm 0.010\text{g}$  from tare. Recheck weight of dish to ensure within  $11.500 \pm 0.005\text{g}$ . Dishes must also be checked before and after the season to ensure they are correct.
- Weigh out accurately  $10.000 \pm 0.001\text{g}$  of the ground sample into an Aluminium dish. Then shake dish to obtain an even layer of sample.
- Take the weighed samples and place into the oven which has been previously switched on and heated to  $130^\circ\text{C}$ . Place the dishes in the oven noting the number of the dish and its position number (1 through 9). There are ten positions in the oven (the tenth place is taken up by an empty dish for calibration purposes).
- When the oven has been loaded note the time or set a countdown timer to 60 mins once the required temperature is reached. Usually for  $130^\circ\text{C}$  the oven takes 10 - 15 minutes to reach the required temperature.
- When one hour has elapsed, standardise the instrument by selecting the empty dish and placing 9g in weights in the small platform between the 3 prongs on the balance and

adjust the scale to 10.0 with the standard swinging freely. Moisture can then be read off for each sample in turn.

- Read the samples in the dishes consecutively recording results in the relevant worksheet.

NOTE:

- When switching the oven on make sure that the Brabender oven is level (use bubble level).
- All results are a direct reading of % w/w water.
- The minimum heating time must be adhered to (1 hour) but heating over the hour will not affect the results (up to 2 hours).
- If only a few grams of sample are available see the manufacturers hand book for the technique to be adopted.
- The weight of Aluminium dishes is to be checked at 6 monthly intervals to ensure they are within 11.500 +/-0.005g. If they are underweight they are to be discarded and replacements purchased. Do not add weight to the dish i.e. solder etc as this will breakdown over time or fall off. If they are overweight they may be cleaned with warm water and neutral detergent. Under no circumstances use abrasive or corrosive chemicals as this will lead to the dish being underweight.

#### 5.4.6 References

- Moisture – Air Oven Methods – AACC Method 44-15A
- NMI M 8 Pattern Approval Specifications for Protein Measuring Instruments for Grain
- NMI V10 Uniform Test Procedures for the Verification, Certification and In Service Inspection of Protein Instruments for Grain

## **5.5 Moisture Assessment of Cereals – NIR**

### 5.5.1 Definitions

This describes the NIR method for determination of moisture in cereal grains.

### 5.5.2 Scope

This procedure is applicable to all cereal grains.

### 5.5.3 Reagents

Not applicable.

### 5.5.4 Apparatus

NIR instrument approved for use for trade purposes under the conditions currently being developed by the National Measurement Institute.

### 5.5.5 Method

Sample to be “as is”.

Individual manufacturer instructions and procedures should be followed for operation and maintenance of NIR instruments used to determine grain moisture.

Report result to the nearest 0.1%.

### 5.5.6 References

- NMI M 8 Pattern Approval Specifications for Protein Measuring Instruments for Grain
- NMI V10 Uniform Test Procedures for the Verification, Certification and In Service Inspection of Protein Instruments for Grain

## 5.6 Test Weight Assessment - Schopper Chondrometer Reference Method

### 5.6.1 Definitions

The Schopper Chondrometer is used for the measurement of Grain Density (Density is also known as “Bushel Weight”, “Test Weight” or “Hectolitre Weight”).

### 5.6.2 Scope

This method is applicable to all cereal grains.

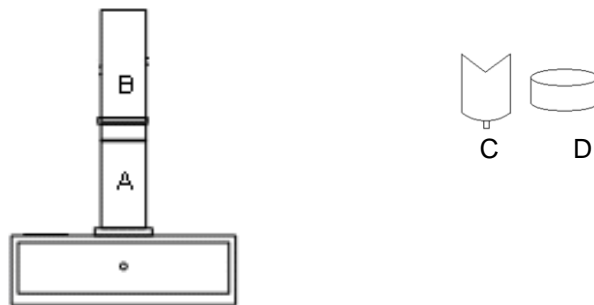
### 5.6.3 Apparatus

- 1L Schopper Calibrated Chondrometer
- 2 decimal place balance
- Plastic bowl

### 5.6.4 Reagents

Not applicable

### 5.6.5 Procedure



- Secure bottom half of cylinder A to base plate on the chondrometer box.
- Ensure the sliding divider C is in the slot on cylinder A.
- Place weight D on top of sliding divider.
- Secure top half of cylinder B to the bottom half A.
- Ensure the slider is closed and pour grain in the cylinder at a constant rate until full to the top.
- Pull the sliding divider out and the weight will move down, drawing the grain down with it (you will hear it moving down).
- Once the weight D is at the bottom, replace the sliding divider back in the slot.

- Carefully tip the cylinder upside down and tip out all the grain remaining above the divider. Make sure to catch the weight D as it drops down.
- Place a plastic container on the electric balance and tare to read zero.
- Remove the blade from the chondrometer and tip the measured litre of grain into the plastic container and weigh.
- The weight is in grams and needs to be multiplied by 0.1 (divided by 10) to obtain a density in kg/hl.
- Always undertake analysis in duplicate and average results.
- Report the result to one (1) decimal place.

#### 5.6.6 References

Test Weight Per Bushel - AACC Method 55-10

National Measurement Institute General Certificate of Approval No 4/10/0

## 5.7 Test Weight Assessment – Franklin Mark 11 Chondrometer Reference Method

### 5.7.1 Definitions

This is the Franklin Mark 11 Chondrometer reference method to determine the density of cereal grains (otherwise known as the Test Weight) expressed as kilograms per hectolitre.

### 5.7.2 Scope

This method is applicable to all cereal grains.

### 5.7.3 Apparatus

- Franklin Mark II Drop Weight Trade Certified chondrometer
- Pre filling Cup

### 5.7.4 Reagents

Not applicable.

### 5.7.5 Procedure

- Assemble the instrument together and place the calibration weight onto the top of the measuring cylinder.
- Place the measuring cylinder with weight on the hook at the end of the measuring beam.
- Calibrate the instrument by moving the sliding weight to the position corresponding to 40kg/hl on the measuring beam. The beam should balance equidistantly between the top and bottom of the square space at the other end of the beam.
- If the beam is not balanced, turn the calibration screw at the other end of the beam until the correct setting is achieved.
- Remove the calibration weight. The instrument is then calibrated.
- Insert the cutter bar into the bottom measuring cylinder, and place the drop weight on top of the cutter bar.
- Fit the top filling cylinder onto the measuring cylinder.
- Fill the pre filling cup with grain. Sample to be “as is”.
- Steadily pour the grain from the pre filling cup with one hand into the top filling cylinder until it is full whilst holding both cylinders together.
- Withdraw the cutter bar in a single swift motion.
- Re-insert the cutter in the slit and push it through the grain with a single firm stroke.
- Remove the top filling cylinder from the measuring cylinder and discard the grain remaining above the cutter, while holding the cutter in place.

- Remove the cutter and suspend the measuring container from the measuring beam of the chondrometer.
- Adjust the sliding weight on the beam until the instrument is balanced.
- Read the test weight of the graduated balance beam at the point indicated by the sliding weight and record the result in kilograms per hectolitre.
- Report the result to one (1) decimal place.

#### 5.7.6 References

Test Weight Per Bushel - AACC Method 55-10

ISO7971-2

National Measurement Institute General Certificate of Approval No 4/10/0

## 5.8 Test Weight Assessment – Kern 222 Chondrometer Reference Method

### 5.8.1 Definitions

This is the Kern 222 Trade Certified Chondrometer reference method to determine the density of cereal grains (otherwise known as the test weight) expressed as kilograms per hectolitre.

### 5.8.2 Scope

This method is applicable to all cereal grains.

### 5.8.3 Apparatus

- Kern 222 Trade Certified Chondrometer with valid Regulation 13 certificate.
- Electronic balance 0.01g resolution.

### 5.8.4 Reagents

Not applicable

### 5.8.5 Procedure

- Assemble the measuring container with the grain cutter inserted in the slit. Place the brass piston on top of the cutter blade. Connect the filling hopper securely on the top of the measuring container.
- Fill the pre-filling cup with grain. Grain sample to be “as is”.
- Empty the pre-filling cup out onto a large sample tray and manually remove any foreign material e.g. whiteheads, straw, barley, lupins, sticks stones etc.
- Pour the remaining grain from the sample tray back into the pre-filling cup. Ensure that the pre filler cup is filled up to or above the internal filling line/groove.
- Steadily pour the grain from the pre-filling cup into the filling hopper until the filling hopper is full.
- Grasp the measuring container firmly with one hand and with the other hand withdraw the cutter in a single swift motion.
- Re-insert the grain cutter in the slit and push it through the grain with a single firm stroke.
- Remove the filling hopper from the measuring container and discard the grain remaining above the cutter, while holding the cutter in place.
- Remove the cutter and return the base bucket to an upright position and then withdraw the cutter.
- Place the Steel Bowl onto the balance and press the T (Tare) button, ensure Zeros are displayed.
- Pour the grain from the bucket into the steel bowl.



- The weight in grams will appear on the display of the balance. This figure is referred to as the weight in grams per litre.
- All numerical results are to be written down to two decimal places.

#### 5.8.6 References

ISO Method 7971-2

National Measurement Institute General Certificate of Approval No 4/10/0

## 5.9 Trash and Screenings Assessment – Reference Method

### 5.9.1 Definitions

This is the reference method used to determine the percentage by weight of Trash and Screenings, including Small Foreign Seeds.

### 5.9.2 Scope

This method is applicable to maize.

### 5.9.3 Apparatus

Agtator Shaking Device

Maize Screen 4.75mm with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel perforated with 4.75mm round holes. Need a centre to centre measurement? The perforations of each row shall be staggered in relation to the adjacent row.
- Hole width as assessed by an Engineers Pin Gauge is to be 4.75mm  $\pm$  0.01 mm. Pin Gauge, being 4.76mm and 4.74, needs to have a valid Regulation 13 certificate.
- Compliance testing shall be undertaken by randomly selecting 74 holes and measuring using the above Gauge. 0 to 25 slots is an acceptable failure rate. Refer to separate procedure.

Analytical balance accurate to at least 0.01g

### 5.9.4 Reagents

Not applicable.

### 5.9.5 Procedure

#### Screenings, Small Foreign Seeds & Trash

- Obtain a certified half litre sample of grain. Sample to be “as is”.
- Place the maize screen on top of the Agtator platform. Ensure the maize screen is clean, smooth, dry and free of grain residues in the holes.
- Ensure the Agtator is set to perform 40 to and fro movements over a period of approximately 68 seconds.
- Pour the half litre of grain in one movement onto the screen surface. No additional movement or spreading of the sample over the screen is to occur.
- Turn on the Agtator and allow it to run until the 40 movements have been completed.
- Gently remove the screen and pan from the Agtator and detach the screen from the pan.



- Calculate Screenings percentage - Weigh the contents of the pan on an appropriate top pan balance and calculate the percentage as follows:

$$\text{Screenings by wt (\%)} = \frac{\text{Screenings Weight}}{\text{Total Weight}} \times 100$$

- Calculate Small Foreign Seeds percentage - Separate any Small Foreign Seeds (SFS) as listed in the Definitions Section of these Standards from the Screenings fraction and weigh these separately.

$$\text{SFS by wt (\%)} = \frac{\text{SFS Weight}}{\text{Total Weight}} \times 100$$

- Calculate Trash percentage - Separate any Trash above the screen (chaff, backbone, other Foreign Seed Pods not otherwise listed whether whole or in pieces and other light material) and weigh separately.

$$\text{Trash (\%)} = \frac{\text{Trash Weight}}{\text{Total Weight}} \times 100$$

- Report all results to the nearest 0.1%.

#### 5.9.6 References

No go gauge with Regulation 13 certificate.

## 5.10 Defective Grains Assessment – Reference Method

### 5.10.1 Definitions

This describes the method of assessment of deliveries of maize for the various types of defective grains described in these maize Standards. These are defined as:

<b>% by Weight 200 grams</b>	<b>Count per entire load</b>
Broken	All Smuts except Boil Smut
Damaged	Pink Stained
Dark Grain	
Dead	
Field Fungi	
Heat Damaged	
Insect Damaged	
Mouldy	
Sprouted	

### 5.10.2 Scope

This method is applicable for all deliveries of maize.

### 5.10.3 Apparatus

Maize Screen 4.75mm with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel perforated with 4.75mm round holes. Need a centre to centre measurement? The perforations of each row shall be staggered in relation to the adjacent row.
- Hole width as assessed by an Engineers Pin Gauge is to be 4.75mm  $\pm$  0.01 mm. Pin Gauge, being 4.76mm and 4.74, needs to have a valid Regulation 13 certificate.
- Compliance testing shall be undertaken by randomly selecting 74 holes and measuring using the above Gauge. 0 to 25 slots is an acceptable failure rate. Refer to separate procedure.

Analytical balance accurate to at least 0.01g

Magnification Lamp and/or Light box

Visual Recognition Standards, with the following photographic standards being recognised by GTA:

- Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2014, GTA

### 5.10.4 Reagents

Not applicable

### 5.10.5 Method

- Sample to be “as is”.
- Instruments of magnification and a Light Box may be used to assist the determination of the level of visually defective grains present in the sample.
- Each grain should be examined to determine if it is classified as defective. An individual kernel may only have one defect, being the defect type with the tightest tolerance in the standard.
- The defective grains percentage can be assessed with the assistance of the GTA Approved photographic standards (Visual Recognition Standards Guide) or Approved objective measurement instruments where appropriate.
- For nil tolerance defects, the tolerance (rejection of the load) can apply if the defect is detected at any stage of the delivery or testing process, including in the truckload before sampling, in the probe sample, in the half litre sample, in the 200 gram sample or during discharge into the receival hopper after assessment.
- For Defective grains with tolerances above zero, assessment is made on a 200 gram sample obtained from grain remaining above the 4.75 mm screen after the Screenings assessment has been conducted.
- Following sieving, the grain remaining on the top screen should be examined under conditions of good lighting for a period of at least 30 seconds but no more than 60 seconds. If defective grains are found, the level of defect shall be determined using a 200 gram sample.
- If defective grains which have a tolerance based on % in a 200 gram sample are detected, a 200 gram sub sample should be drawn from across the top of the screen. Remove each defective grain type from the 200 gram sample and weigh.
- Where a separate defect sub-category exists, for example Damaged, all defects within that category are to be weighed together.
- Report all applicable results to the nearest 0.1% as the weight in a 200 gram sample.

### 5.10.6 References

Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2014, GTA

### 5.11 Contaminants, Foreign Material and Total Admixture Assessment – Reference Method

#### 5.11.1 Definitions

This describes the method of assessment of deliveries of maize for the various types of Contaminants described in these maize Standards. This includes Foreign Material, various Contaminants and Total Admixture. The various contaminant types and their assessment methods are described in this method as follows:

Length in cm per half litre	Count per half litre	% by weight in half litre	Count per entire load
Ryegrass Ergot	All Weed Seeds except Type 2, includes Foreign Seed Pods where specified	Foreign Material	Cereal Ergot
	Earth	Small Foreign Seeds	Chemicals Not Approved for Maize or in Excess of the MRL
<b>Weight in grams per 2.5 litres</b>	Insects Large – Live or Dead	Total Admixture*	Objectionable Material
Stones	Insects Small – Live or Dead	Trash*	Odour
	Sand		Pickling Compounds or Artificial Colouring
	Snails		Smut (all except Boil Smut)
<b>PPB</b>	<b>PPM</b>		Stored Grain Insects and Pea Weevil - Live
Aflatoxin	Fumonisin		Type 2 weed seeds

\* May or may not include a contaminant

#### 5.11.2 Scope

This method is applicable for all deliveries of maize.

#### 5.11.3 Apparatus

Maize Screen 4.75mm with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel, perforated with 4.75mm round holes. Need a centre to centre measurement? The perforations of each row shall be staggered in relation to the adjacent row.
- Hole width as assessed by an Engineers Pin Gauge is to be 4.75mm ± 0.01 mm. Pin Gauge, being 4.76mm and 4.74mm, needs to have a valid Regulation 13 certificate.
- Compliance testing shall be undertaken by randomly selecting 74 slots and measuring using the above Gauge. 0 to 25 slots is an acceptable failure rate. Refer to separate procedure.

Analytical balance accurate to at least 0.01g

Visual Recognition Standards, with the following photographic standards being recognised by GTA:

- Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2014, GTA
- Seed Impurities of Grain Identification Guide, 3rd Edition, GTA
- Insects of Stored Grain, A Pocket Reference, 2<sup>nd</sup> Edition, CSIRO

Mesh Screen (optional)

Ruler

#### 5.11.4 Reagents

Not applicable.

#### 5.11.5 Method

- Sample to be “as is”.
- For contaminants with tolerances above zero, assessment is made on the half litre sample on grain above and below the 4.75mm screen after the Screenings assessment has been conducted.
- For nil tolerance contaminants, the tolerance (rejection of the load) may apply if the contaminant is detected at any stage of the delivery or testing process, including in the truckload before sampling, in the probe sample, in the half litre sample or during discharge into the receival hopper after assessment.
- Following sieving, the grain remaining on the top and in the bottom screen should be examined under conditions of good lighting. There is no time restriction for this assessment. If contaminants are found, they shall be removed by hand and assessed in accordance with the tolerance prescribed in these Standards under 5.11.1.
- If any Stones are found in the initial half litre sample, then a further four half litre samples should be taken. If the total weight of all Stones found in the combined 2.5L sample is above 4.0g, the sample is to be rejected.
- Seed contaminants are to be assessed using the appropriate visual assessment method and in accordance with the tolerance prescribed in these Standards under 5.11.1. Note that for Type 1 weed seeds, tolerances apply to individual seeds whereas for all other Types listed, tolerances are the total of all seeds in each Type.
- Small Foreign Seeds (SFS) are assessed in the bottom tray (catchpan). These may need to be physically removed from all non-SFS material in the bottom tray. Alternatively, to assist in separating SFS from non-SFS material in the bottom tray, a mesh screen may be used. Place the sample over the mesh screen over a white tray and gently shake. SFS tend to remain on top of the mesh screen. Physical hand separation of SFS may still be required using this method.
- Note that any seed pods detected must not be opened. Whole pods or part thereof are classified as Trash unless tolerances are specified in Foreign Seeds.

- Where depicted, other contaminants should be assessed using the GTA Approved photographic standards. Where reference material is not available, other contaminants should be assessed by reference to the Definitions of those parameters.
- For assessment of Pickling Compounds, Chemicals not Approved for Maize or Chemicals in Excess of the MRL, it is recommended all deliveries are accompanied by a signed declaration referring to its chemical status. Where the receiving agent believes that the visual appearance and/or odour of grain suggests that it has been treated with a non approved chemical, it is recommended the grain is not received until the representative “as received” sample has been tested by an approved independent laboratory and the presence or absence of non approved chemicals ascertained.
- For assessment of Aflatoxin and Fumonisin, a representative sample from the Grower Load Composite sample may need to be taken and sent to a laboratory for subsequent analysis.
- Report results as follows:

Count per half litre – nearest whole number  
 Length in cm per half litre – nearest 0.1cm  
 Percentage by wt in half litre – nearest 0.1%  
 Weight in grams in 2.5 litres – nearest 0.1g  
 PPB (parts per billion) – nearest whole number  
 PPM (parts per million) – nearest whole number

#### 5.11.6 References

Grain Quality Visual Recognition Standards – Australian Grains Centre, Co-operative Bulk Handling Ltd, October 2004

Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2014, GTA

Seed Impurities of Grain Identification Guide, 3rd Edition, GTA

Insects of Stored Grain, A Pocket Reference, 2<sup>nd</sup> Edition, CSIRO

Ute Guide Series, GRDC



## 5.12 Screen Hole Size Compliance Procedure

### 5.12.1 Definition

This is the recommended procedure for determining whether the screen hole size complies with the Standard and relevant legislation.

### 5.12.2 Scope

This procedure is applicable to all maize deliveries and screens used for assessment purposes.

### 5.12.3 Apparatus

Engineers Pin Gauge, 4.76mm and 4.74mm, with a valid Regulation 13 certificate

Checking template (if available)

Calibration Sticker

### 5.12.4 Reagents

Not applicable.

### 5.12.5 Method

- Compliance testing shall be undertaken by randomly selecting 74 holes and measuring using the above Gauge.
- Place screen or disc with the smooth surface up so that it sits horizontally.
- Examine the screen for any damage to the holes. If there is any damage affecting the accuracy of the holes or the screen immediately reject the screen.
- Ensure the screen is labelled with the correct hole size, the commodity that is normally tested on the screen (maize) and the screen identification number.
- For screen accuracy, place relevant checking template (testing 74 holes) centred as much as possible (use the handle as a guide) on top of screen and rotate so that all the holes line up. For discs place the disc on top of relevant checking template, rotate disc until all the holes line up then clamp with bulldog clips.
- Select the appropriate GO/NO GO GAUGE for the screen/disk to be tested i.e., for maize, the maize gauge 4.74mm – 4.76mm.
- Hold the GO/NO GO GAUGE in the middle.
- Place an end of the GO/NO GO GAUGE vertically over the hole on the template.
- Release the GO/NO GO GAUGE. Gauges are not to be pushed through holes.
  - If the GREEN (GO) end does not go through then the hole fails. Record this event and move on to the next hole.

- If the GREEN (GO) end does go through then the hole size is greater than the nominated size of the GREEN end. Proceed to test the hole with the RED (NO GO) end as follows:
  - If the RED (NO GO) end does not go through then the hole size is less than the nominated size of the RED end and greater than the nominated size of the Green End, hence the hole is within the accepted range and passes.
  - If the RED (NO GO) end does go through then the hole fails. Record this event and move on to the next hole.
- Proceed to test all 74 holes, recording each failure.
- 0 to 25 holes is an acceptable failure rate.
- If the screen meets the tolerances:
  - Record results on the equipment record
  - Affix the relevant calibration sticker to the side of the sieve (not the catch pan)

#### 5.12.6 References

Not applicable.

## SECTION 6 REFERENCE MATERIALS

At the time of publishing this Manual, the following photographic Reference Material referred to in this Manual is considered by GTA to be suitable as an aid to classification of maize.

Industry should be aware that all such material is controlled by the author of that material and appropriate copies of that material can be obtained from the author.

The method of printing, copying, storing, using or otherwise obtaining such Reference Material may impact on the appearance of its content. This may impact on the classification of maize. Industry should note the method of publication of the material by the author and other relevant information such as version number to ensure they have the appropriate version.

Name of Material	Material Type	Author	Version Number	Applicable Dates
<b>Defective Grains</b>				
Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment	Hardcopy booklet	GTA	n/a	Issued August 2014
Grain Quality Visual Recognition Standards	Hardcopy single sheets per defect type	Australian Grains Centre, Co-operative Bulk Handling Ltd	October 2004	n/a
<b>Contaminants</b>				
Grain Quality Winter Grain Crops: The Ute Guide	Hardcopy booklet	GRDC	n/a	n/a
Weeds: The Ute Guide	Hardcopy booklet	GRDC	Various editions	n/a
Insects of Stored Grain, A Pocket Reference	Hardcopy booklet	CSIRO	2 <sup>nd</sup> Edition	2007
Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment	Hardcopy booklet	GTA	n/a	Issued August 2014
Seed Impurities of Grain Identification Guide	Hardcopy booklet	GTA	3 <sup>rd</sup> Edition	n/a