GRAIN TRADE AUSTRALIA

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Section 2 – BARLEY TRADING STANDARDS

2016/17 SEASON

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SECTION 1 INTRODUCTION

General

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

In order to provide a consistent message to both domestic industry and international buyers, 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 barley.

Considerations to the Standards

This section of the Manual relating to Barley 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 barley 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 barley 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 a specific varietal segregation 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) 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

Approved and recommended varieties to be grown and acceptable within each grade are listed within this document. The approval of each variety within a grade is determined by a group external to GTA.

Variety integrity and correct variety assessment is an integral part of the grain classification and Standards application process. GTA endorses the varietal classifications as listed in this Manual and encourages all industry to follow the approved varietal list as listed in this Manual where relevant.

Changes to varietal classifications may occur at any time during the season following the publication of this Manual. As these changes will not necessarily be included in this Manual industry should implement their own procedures for monitoring the varietal classification process.

Timing of Standards Development

The Standards outlined in this Manual are applicable for the entire season of 2016/17. Standards apply to grain assessed as per these Standards from 1 August 2016 to 31 July 2017.

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. The images in that document display the minimum and/or maximum coverage and attributes of the Defective Grain types as defined in these Standards.

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.

Barley

Barley includes grains of the species *Hordeum vulgare*.

Barley Not of the Current Season

To be accepted into malt grades the load presented of approved malting varieties must be grown in the current season. Barley Not of the Current Season may be received into any Feed grade.

Broken

Refers to barley that is mechanically damaged due to the harvesting or handling process with a quarter or more of the grain missing. This includes any mechanical damage to the germ.

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.

Covered Smut

Covered smut is caused by various fungi of *Ustilago spp*.

Loose Smut

Loose smut is the result of the fungus *Ustilago tritici* developing in the barley heads during the growing phase. The tolerance applies to the weight of all pieces of loose smut material (except kernels) in the half litre sample.

A nil tolerance applies to all smuts in kernels.

Chemicals not Approved for Barley

Refers to the following:

- Chemicals used on the growing crop in the State or Territory where the barley was grown in contravention of the label
- Chemicals used on stored barley in contravention of the label
- Chemicals not registered for use on barley
- Barley containing any artificial colouring, pickling compounds or marker dyes commonly used during crop spraying operations that have stained the barley
- Barley 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 2016/17" - see GTA website http://www.graintrade.org.au/nwpgp.

Cleaved

This defect occurs where the split of the kernel has penetrated through the husk and into the endosperm. This internal split may have arisen due to a number of causes, including:

Cleaved

Cleaved barley is generally caused by rainfall events or rapid changes in moisture when grain is maturing. This results in a split along the crease or a split down the back, front or side of the grain exposing the endosperm. Any visible cleaving is considered defective.

Hormone Damaged

Hormone Damaged barley grains are to be classified under the Cleaved heading. The grains affected are distinctly distorted, twisted and lack the traditional barley shape.

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 Cleaved.

Coloured Aleurone Layer

Refers to barley grains which have a coloured aleurone layer in the kernel. The colour is generally blue or black. Also includes black hulled varieties.

Contaminants

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

- Barley Not of the Current Season
- Cereal Ergot
- Cereal Smut
- Chemicals not Approved for Barley
- Chemicals in excess of the MRL
- Coloured Aleurone Layer
- Earth
- Foreign Grain (Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice)
- Foreign Material
- Foreign Seeds
- Insects – Large
- Insects – Small
- Loose Smut
- Objectionable Material
- Pickling Compounds or Artificial Colouring

- Ryegrass Ergot
- Sand
- Six row barley
- Snails
- Stones
- Stored Grain Insects and Pea Weevil – Live
- Varietal Purity
- Wild Oats / Wild Radish

Contaminants may be referred to as Foreign Material, see definition.

Dark Tipped

Dark tipped refers to staining caused by excess moisture and / or humidity or a stress related biochemical reaction towards the end of the growing period and into harvest. Often grains exhibit a distinct dark brown to black discolouration. This mainly occurs at the germ end of the grain however in severe cases it may progress to other parts of the grain. Dark tipping equal to or greater than 1 mm is classified as defective grain.

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 Dark Tipped.

Defective Grains

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

- Broken
- Cleaved
- Dark Tipped
- Dry Green or Sappy
- Field Fungi
- Frost Damaged
- Heat Damaged, Bin Burnt or Storage Mould
- Insect Damaged
- Shot
- Skinnings
- Sprouted

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

Dry Basis

Barley protein is measured as a percentage by weight on a Dry Moisture basis i.e. 0% moisture.

Dry Green or Sappy

Dry Green refers to green grains arising from harvesting of grain before it has matured. Dry Green grains are those whose surface is distinctively green. Dry Green grains are usually dry and hard.

Sappy grains are those that have been harvested before maturity. Sappy grains are generally soft when pressed. They may or may not be green. Any level of sappiness is classified as defective.

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 Dry Green or Sappy.

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*.

Cereal Ergot

Cereal ergot is *Claviceps purpurea* infection of any cereal kernels. A nil tolerance applies to any whole or pieces of affected kernels found in the sample.

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.

Falling Number

Falling Number is a grain quality test which measures the degree of weather damage in barley and is based on the unique ability of alpha amylase (an enzyme released during seed germination) to liquefy a starch gel. Strength of the enzyme is measured by Falling Number defined as the time in seconds required to stir plus the time it takes to allow the stirrer to fall a measured distance through a hot aqueous flour or meal gel undergoing liquefaction.

The Falling Number test is an alternative to the Rapid Visco Analyser (RVA).

Both the Falling Number and RVA results over-ride the visual assessment of Shot and/or Sprouted.

Feed Grade

Varieties to be accepted into the barley Feed Grade include:

- Those varieties not listed as a Malt or Food variety; and/or
- Malt or Food Varieties that do not meet the Malt or Food Grade specifications

Refer to Varietal Classification in Section 4 for more information.

Field Fungi

Field Fungi refers to individual kernels where the seed coat has the appearance of black spotting occurring anywhere on the grain. Coverage greater than approximately 10% of the grain surface is considered defective.

Grains that show approximately 10% or less of fungal growth are to be classified as sound.

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.

Food Grade

The Food Grade is a grade of barley as defined within these Standards. The Food Grade is applicable to the barley variety Hindmarsh only. Hindmarsh will only be classified into the Food grade if it meets all Malt Grade specifications.

Foreign Grain

Foreign Grain refers to wheat, cereal rye, triticale, cultivated oats and rice grains only, for which a separate tolerance applies. Other cereal grains, pulses and oilseeds are considered as Foreign Seeds.

Foreign Material

Any Foreign Material that is not already categorised specifically in other definitions within this Standard.

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)*
Poppy (Field) *(Papaver rhoeas)*
Poppy (Horned) *(Glaucium flavum)*
Jute *(Corchorus olitorius*)
Long Head Poppy *(Papaver dubium*)
Mexican Poppy *(Argemone mexicana*)
New Zealand Spinach *(Tetragonia tetragonoides)*
Parthenium Weed *(Parthenium hysterophorus*)
Saffron Thistle *(Carthamus lanatus)*
Wild Poppy *(Papaver hybridum)*

Type 2

Barley with Coloured Aleurone Layer (blue / black) (Malt grades only)
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)*
St. Johns Wort *(Hypericum perforatum)*
Starburr *(Acanthospermum hispidum*)

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*)
Thornapple *(Datura spp)*

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 3d

Double Gees / Spiny Emex / Three Cornered Jack *(Emex australis*)

Type 4

Bindweed (Field) *(Convolvulus arvensis*)
Cut-leaf mignonette seeds or pods *(Reseda lutea)*
Darnel (Drake Seed) *(Lolium temulentum*)
Hexham Scent/King Island Melilot *(Melilotus indicus)* acceptable only if free from taint odour
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)*
Paterson's Curse / Salvation Jane *(Echium plantagineum)*
Sesbania Pea *(Sesbania cannabina)*

Type 6

Colombus Grass *(Sorghum almum*)
Johnson Grass *(Sorghum halepense*)

Type 7a

Broad Bean (*Vicia faba*)
Chickpeas *(Cicer arietinum)*
Clover pods *(Tribolium spp)*
Corn (Maize)(*Zea mays*)
Cowpea *(Vigna unguiculata)*
Faba Beans *(Vicia faba*)
Lentils *(Lens culinaris*)
Lupin *(Lupinus spp*)
Medic Pods *(Medicago 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

6 row barley
Bindweed (Australian) *(Convolvulus erubescens)*

Bindweed (Black) *(Polygonum convolvulus*)
Brome Grass (*Bromus spp*)
Muskweed (*Myagrum perfoliatum*)
Onion weed (*Asphodelus fistulosis*)
Phalaris glumes (*Phalaris spp)*
Poverty weed (*Calocephalus sonderi*)
Ryegrass on stalk
Sheep weed (*Chondrilla juncea*)
Sorghum (Grain) *(Sorghum bicolor)*
Three horn bedstraw *(Galium tricornutum)*
Turnip Weed *(Rapistrum rugosum)*

Type 7b includes any other Foreign Seeds not specified in Types 1 - 7a, in Small Foreign Seeds or listed elsewhere within these Standards.

Other Categories

Other Foreign Seed categories exist, being:

Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice (referred to as Foreign Grain)
Wild Oats and Wild Radish Pods
Barley with Coloured Aleurone Layer (blue / black) (Feed grades only)

All Foreign Seed Pods not listed above such as those that are 5mm or less in diameter are included as Foreign Material, whether whole pods or part thereof.

Frost Damaged

Refers to grain damaged as a result of frost during the maturation phase. Frost Damaged barley grains appear pinched and sunken in on the back, usually on the awn half of the grain. In severe cases the kernel under the husk may appear orange.

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 Frost Damaged.

Germinative Capacity

This is a measure of the barley grains capability to germinate. It is usually measured in the laboratory to assess germination of potential late malt deliveries. Germinative Capacity is also referred to as viability.

The methods used are based on the following IOB (Institute of Brewing) Methods (January 2007):

- 1.5 Germinative Capacity of barley: Hydrogen Peroxide and Peeling Technique (RM, EM)
- 1.6 Germinative Capacity of Barley: Rapid Staining Method (EM)

Germinative Energy

Germinative Energy measures the germination of barley grains within a 72 hour period using a method of analysis based on the following IOB method (January 2007):

1.7 Germinative Energy of Barley (BRF Method) (EM)

Grade

Grade refers to the classification given to the barley load following sampling and full assessment according to these Standards. The Grade may be determined as a two stage process under specific conditions such as early or late deliveries, being:

- Initially at the delivery point
- Following further analysis of the retained sample in the laboratory

For barley there are three grade types:

- Malt Grade
- Food Grade
- Feed Grade

A malt variety will only be classified into a Malt grade if it meets all specifications for that particular Malt Grade.

Heat Damaged, Bin Burnt or Storage Mould

Heat Damaged, Bin Burnt

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.

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.

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, Bin Burnt or Storage Mould.

Hit and Miss

In relation to screen slots, refers to the sequence of slots on the screen when viewing along a row facing the direction of the slots. That is, the screen in made of a series of slots and "no slots" in sequence equidistant.

Insect Damaged

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

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 (*Desiantha spp*)	Aphids
Grasshoppers, Locusts	Minute Mould Beetle (*Corticaria spp*)
Ladybirds	Mites (*Acarina spp.*)

Large Insects	Small Insects
Pea Weevil (*Bruchus pisorum*) (dead only)	Stored Grain Insects (dead only)
Sitona Weevil (*Sitona spp*)	
Wood Bugs	

Tolerances apply to either Live or Dead whole Insects. Note for Live Pea Weevil and Live Stored Grain Insects, a nil tolerance applies – refer to Stored Grain Insects.

For all Insects pieces are included in Foreign Material.

Load

A load is a bulk unit tendered for delivery.

Loose Smut

Refer to Cereal Smut for definition.

Malt Grade

Malt Grade is a grade of barley as defined within these Standards. Malt grade barley is highly desired for the malting process which involves a controlled process where barley has been allowed to sprout for use chiefly in brewing and distilling.

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 https://www.legislation.gov.au/Details/F2016C00570

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.agriculture.gov.au/ag-farm-food/food/nrs/databases 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.agriculture.gov.au/ag-farm-food/food/nrs/plant-product-testing

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 barley, become a food safety issue of concern or has a commercially unacceptable odour. This includes but is not limited to the following:

Animal Material

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

Odour

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

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 as Foreign Material.

Tainting Agent

A Tainting agent is any contaminant that imparts a smell or taint to barley. 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.

Pea Weevil

Pea Weevil refers to all life stages 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

As Pea Weevils are commonly 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

Pickling Compounds are those chemicals added to grain as a seed treatment or as a seed dressing prior to sowing. This includes grains that may be affected by marker dye commonly used during crop spraying operations that has stained the barley. 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.

Protein

Proteins (amino acids arranged in a linear chain) form a large component part of grains. These structures are responsible for the quality expressions in end use products made from barley.

Rapid Visco Analyser (RVA)

RVA is a grain quality test which measures the degree of pre harvest germination of malting barley and is based on the ability of the enzymes alpha amylase and (1,3 and 1,4) beta glucanase to be able to liquefy a starch gel. The strength of enzyme activity and therefore the degree of germination is measured by the RVA as defined by the force required to stir an aqueous barley meal mixture over a defined time period.

The result of the RVA is a Stirring Number. The RVA is an alternative to the Falling Number test.

Both the RVA and Falling Number results over-ride the visual assessment of Shot and/or Sprouted.

Retention

Retention is the material retained above the 2.50mm screen after a sample of barley grain is subjected to the screening process.

Sand

A grain of sand is defined as a particle of unconsolidated (loose), rounded to angular rock fragment or mineral grain larger than 0.06mm that falls below the 2.2mm screen during the screening process. Smaller material is classified under Foreign Material. Material that is retained above the 2.2mm screen (includes material retained above the 2.5mm screen) is classified as Earth or Stones.

Screenings

See “Unmillable Material below the Screen”.

Shot

Barley grains exhibiting the following outward signs of having commenced germination are classified as Shot:

- Opening of the grain at the germ end; and/or
- The husk has a distinct pin hole at the germ end or has ‘tramlines’ where the husk has begun to lift on each side on the back of the grain at the germ end. Note that the tramlines must be on both sides.

The Falling Number or Rapid Visco Analyser result always over-rides the visual assessment of Shot.

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 Shot.

Six Row

Refers to barley varieties with six kernel rows in the head. It is generally recognised that two-row barley is best suited for malting and six-row barley is only suitable for Feed purposes.

Skinnings

Skinnings is usually caused by mechanical damage to the grain during harvesting. Skinnings may also be caused by over-handling of grain in storage or by specific weather conditions prior to harvest.

Skinnings is defined as damage to the protective husk of the barley.

Each grain exhibiting one of more of the following characteristics is assessed as a Skinned grain:

- Awn Skinning - Greater than a third of the husk from the awn end towards the centre of the grain has been removed.
- Germ Exposed - The husk is removed from the germ end of the grain or been damaged other than Shot or Sprouted or the germ itself has been removed.
- Pearled - The entire husk has been removed.
- Side Skinning - Part of the husk is missing from the side of the grain on the two-thirds of the grain closest to the germ end.
- Split Backs - The husk is split along the length of the centre ridge of the back of the grain.
- Split Skirt - The husk is split along the centre or side edges, on the back of the grain, at the germ end.
- Ventral Skinning - Part of the husk is missing from the ventral side of the grain on the two thirds closest to the germ end.

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 Skinnings.

Small Foreign Seeds

These are all small foreign seeds in the unmillable material fraction which have fallen below the 2.2mm screen during the screening process, except those specifically mentioned in the Foreign Seeds definition.

Smuts

See Cereal Smut. Refers to all smut types of all cereals. Includes Ball and Covered smut.

Snails

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

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

Smaller pieces of snail shell (less than half) are included as Foreign Material.

Sprouted

Sprouted grains are those with any visible evidence of the shoot or root system beginning to emerge from the germ.

Note that the Falling Number or RVA result always over-rides the visual assessment of Sprouted.

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 that is retained above the 2.2mm screen (includes material retained above the 2.5mm screen) during the screening process. Material falling through the 2.2mm screen is defined as Sand.

Note a maximum weight of 4.0g applies to the total weight of all Stones per 2.5L retained above the 2.2mm and 2.5mm screen.

Stored Grain Insects

These are insects which cause damage to stored grain. The tolerance applies to all life stages of the insect. These include:

Common Name	Scientific Name
Bean Weevil	*Acanthoscelides obtectus*
Flour mite	*Acarus siro*
Murky meal caterpillar	*Aglossa caprealis*
Foreign grain beetle	*Ahasverus advena*
Lesser mealworm	*Alphitobius diaperinus*
Pea and bean beetle – Southern cowpea weevil	*Callosobruchus chinensis*
Pea and Bean Weevil – Cowpea weevil	*Callosobruchus maculatus*
Cowpea weevil	*Callosobruchus phaseoli*
Dried fruit beetle	*Carpophilus dimidiatus*
Dried fruit beetle	*Carpophilus hemipterus*
Dried fruit beetle	*Carpophilus ligneus*
Dried fruit beetle	*Carpophilus obsoletus*
Rice Moth	*Corcyra cephalonica*
Flat Grain Beetle	*Cryptolestes spp*
White-shouldered house moth	*Endrosis sarcitrella*
Tropical Warehouse Moth	*Ephestia cautella*
Cacao moth/warehouse moth	*Ephestia elutella*
Mediterranean flour moth	*Ephestia kuehniella*
Broad-horned flour beetle	*Gnatocerus cornutus*
Tobacco beetle/cigarette beetle	*Lasioderma serricorne*
Long-headed flour beetle	*Latheticus oryzae*
Spider beetle black	*Mezium affine*
Spider beetle	*Mezium americanum*
Mottled grain moth	*Nemapogon granella*

Common Name	Scientific Name
Merchant grain beetle	*Oryzaephilus mercator*
Saw Tooth Grain Beetle	*Oryzaephilus surinamensis*
Small-eyed flour beetle	*Palorus ratzeburgi*
Depressed flour beetle	*Palorus subdepressus*
Indian Meal Moth	*Plodia interpunctella*
Psocids/Book lice	*Psocoptera sp*
White-marked spider beetle	*Ptinus fur*
Australian spider beetle	*Ptinus tectus*
Meal moth	*Pyralis farinalis*
Lesser Grain Borer	*Rhyzopertha dominica*
Granary Weevil	*Sitophilus granarius*
Rice Weevil	*Sitophilus oryzae*
Maize Weevil	*Sitophilus zeamais*
Angoumois Grain Moth	*Sitrotroga cerealella*
Yellow mealworm	*Tenebrio molitor*
Dark mealworm	*Tenebrio obscurus*
Cadelle	*Tenebroides mauritanicus*
Rust-red Flour Beetle	*Tribolium castaneum*
Confused Flour Beetle	*Tribolium confusum*
Warehouse Beetle	*Trogoderma variable*
Hairy fungus beetle	*Typhaea stercorea*

Note that a separate tolerance exists for live and dead 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

Test Weight

Test Weight is a measure of the density of grain.

Unmillable Material below the Screen (Screenings)

This is the total material passing through a 2.20mm screen after a sample of grain is subjected to the screening process. It includes Small Foreign Seeds.

Variety

This is the next lowest level taxonomic rank of a plant below that of the term “species”. Barley varieties fall into two distinct grades, being Malt or Feed.

Varietal Master List

This list designates whether the barley variety’s highest classification can be a Malt grade, Food grade or a Feed grade. The variety’s grade is not dependent on its geographical growing region. The barley classifications are generally based on the following grades:

Malt 1 Grade	Malt 2 Grade	Malt 3 Grade
Food Grade	Feed No. 1 Grade	Feed No. 2 Grade

Varietal Purity

It is recognised that a load may not be 100% of a specific variety and may be contaminated by the presence of another variety of barley.

Malting Barley is extremely sensitive to varietal admixtures. Different malting varieties cannot be binned together:

- All Malt grades are variety specific grades with a minimum varietal purity of 95%
- There are no varietal purity limits for Feed grades

Specific limits apply to the presence of six row and blue / black aleurone varieties in barley grades.

Visual Recognition Standards Guide

The Visual Recognition Standards Guide (VRSG) for Barley contains a range of photographs and illustrations to supplement the barley Standards as outlined in this booklet. The most recent VRSG for barley was released in August 2015.

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.

Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice

These cereal grains are often referred to as Foreign Grain and are assessed separately from Foreign Seeds.

Wild Oats, Wild Radish

Wild Oats and Wild Radish are assessed separately from Foreign Seeds.

SECTION 3 GRAIN QUALITY STANDARDS

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

To fully understand and accurately implement the barley Quality Standards, reference should be made to other relevant sections in this Barley 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.

Commodity: Barley		**Season: 2016/17**	
Grade: MALT 1		**Standard Reference No.: CSG 20**	
QUALITY PARAMETER	**SPECIFICATION**	**COMMENT**	
Varietal Purity Min (% by count)	95	All approved 2 row Malting varieties of the current season	
Moisture Max (%)	12.5		
Protein Min (%)	9.0	N X 6.25 @ 0% Moisture Basis	
Protein Max (%)	12.0		
Test Weight Min (kg/hl)	65.0		
Retention Min (% by weight)	70.0	All matter remaining above a 2.50mm slotted screen – 40 shakes in the direction of the slots	
Screenings Max (% by weight)	7.0	All matter passing through a 2.20mm slotted screen – 40 shakes in the direction of the slots	
Germinative Energy Min (%)	95	IOB 4ml Germinative Energy test	
Germinative Capacity Min (%)	98	IOB Germinative Capacity test (stain)	
Rapid Visco Analyser Min (units)	130	RVA units	
Falling Number Min (sec)	300	Falling Number result	
Defective Grains Max - (% by count, 100 grain sample, unless otherwise stated)			
Shot	Nil	Cleaved	1
Sprouted	Nil	Broken (% wt 100 gram sample)	2.0
Dark Tipped, of which;	10	Frost Damaged	5
Field Fungi	5	Dry Green or Sappy	1
Skinnings	15	Heat Damaged, Bin Burnt or Storage Mould (count per half litre)	1
Insect Damaged (count per half litre)	10		
Foreign Seed Contaminants Max - (count of seeds in total per half litre, unless otherwise stated)			
Foreign Grain	85	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice	
Variation	25	Wild Oats, Wild Radish	
Type 1 (individual seeds)	8	Colocynth, Jute, Long Head Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed, Saffron Thistle	
Type 2	Nil	Barley with Coloured Aleurone Layer (blue / black), Castor Oil Plant, Coriander, Crow Garlic/ Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds and pods, Ragweed, Rattlepods, Starburr, St. John's Wort	
Type 3a	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr, Thornapple	
Type 3b	4	Vetch (Tare), Vetch (Commercial)	
Type 3c	4 seeds / 1 pod	Heliotrope (Blue), Heliotrope (Common)	
Type 3d	1	Double Gees/Spiny Emex/Three Cornered Jack	
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Darnel (Drake Seed), Hexham Scent/Meliot (only acceptable if no tainting odour is present), Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle	
Type 5	40	Knapweed (Creeping/Russian), Sesbania Pea, Patterson's Curse/ Salvation Jane	
Type 6	Nil	Columbus Grass, Johnson Grass	
Type 7a	1	Chickpeas, Clover, Corn (Maize), Cowpea, Faba Beans, Lentils, Lupins, Peas (Field), Medic Pods, Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter including broad bean	
Type 7b	50	6 row barley, Bindweed (Australian), Bindweed (Black), Brome Grass, Musk Weed, Onion Weed, Phalaris Glumes, Poverty Weed, Ryegrass on stalk, Sheep Weed, Sorghum Grain, Three Horn Bedstraw, Turnip Weed and any other Foreign Seed not specified in Types 1-7(a) or in SFS	
Small Foreign Seeds (% by weight)	0.6	All Foreign Seeds not specified in Types 1-7(b) that fall below the 2.20mm screen during the Screenings process	
Other Contaminants Max - (count per half litre, unless otherwise stated)			
Foreign Material (% by weight)	1.0	Other than already specified	
Cereal Smut / Cereal Ergot	Nil	Includes Ball and Covered Smut, any Cereal Ergot	
Loose Smut (weight in grams)	0.1	Weight of all pieces per half litre	
Ryegrass Ergot (length in cm)	0.5	Length of all pieces present aligned end on end	
Pickling Compounds (entire load)	Nil	Pickled grain or artificial colouring	
Chemicals Not Approved for Barley (entire load)	Nil	Residues of any chemical compound not approved for barley, used in contravention of the labelled instructions or chemicals in excess of the MRL	
Stored Grain Insects & Pea Weevil – Live (entire load)	Nil	All life stages	
Insects – Large, Live or Dead	3	Includes Rutherglen bugs, ladybirds, grasshoppers/locusts, sitona weevils, wood bugs & pea weevil (dead only)	
Insects – Small, Live or Dead	10	Includes all species of aphid, mites & stored grain insects (dead only)	
Snails	2	Dead or alive	
Sand	50	Individual grains	
Earth	3	5mm max in diameter	
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones retained above the 2.2mm and 2.5mm screen per 2.5L	
Objectionable Material (entire load)	Nil	Presence of meat meal, blood meal, fish meal, poultry offal meal or other animal proteins. Sticks (>1cm in length & 0.5cm in diameter), stubble (>3cm in length & 1cm in diameter), glass, concrete, metal, animal excreta, animal carcasses, tainting agents or any other commercially unacceptable contaminant, odour or taste	

Commodity: Barley		**Season: 2016/17**	
Grade: MALT 2		**Standard Reference No.: CSG 21**	
QUALITY PARAMETER	**SPECIFICATION**	**COMMENT**	
Varietal Purity Min (% by count)	95	All approved 2 row Malting varieties of the current season	
Moisture Max (%)	12.5		
Protein Min (%)	9.0	N X 6.25 @ 0% Moisture Basis	
Protein Max (%)	12.0		
Test Weight Min (kg/hl)	65.0		
Retention Min (% by weight)	62.0	All matter remaining above a 2.50mm slotted screen – 40 shakes in the direction of the slots	
Screenings Max (% by weight)	10.0	All matter passing through a 2.20mm slotted screen – 40 shakes in the direction of the slots	
Germinative Energy Min (%)	95	IOB 4ml Germinative Energy test	
Germinative Capacity Min (%)	98	IOB Germinative Capacity (stain)	
Rapid Visco Analyser Min (units)	130	RVA units	
Falling Number Min (sec)	300	Falling Number result	
Defective Grains Max - (% by count, 100 grain sample, unless otherwise stated)			
Shot	Nil	Cleaved	1
Sprouted	Nil	Broken (% wt 100 gram sample)	2.0
Dark Tipped, of which;	10	Frost Damaged	5
Field Fungi	5	Dry Green or Sappy	1
Skinnings	15	Heat Damaged, Bin Burnt or Storage Mould (count per half litre)	1
Insect Damaged (count per half litre)	10		
Foreign Seed Contaminants Max - (count of seeds in total per half litre, unless otherwise stated)			
Foreign Grain	85	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice	
Variation	25	Wild Oats, Wild Radish	
Type 1 (individual seeds)	8	Colocynth, Jute, Long Head Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed, Saffron Thistle	
Type 2	Nil	Barley with Coloured Aleurone Layer (blue / black), Castor Oil Plant, Coriander, Crow Garlic/ Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds and pods, Ragweed, Rattlepods, Starburr, St. John's Wort	
Type 3a	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr, Thornapple	
Type 3b	4	Vetch (Tare), Vetch (Commercial)	
Type 3c	4 seeds / 1 pod	Heliotrope (Blue), Heliotrope (Common)	
Type 3d	1	Double Gees/Spiny Emex/Three Cornered Jack	
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Darnel (Drake Seed), Hexham Scent/Meliot (only acceptable if no tainting odour is present), Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle	
Type 5	40	Knapweed (Creeping/Russian), Sesbania Pea, Patterson's Curse/ Salvation Jane	
Type 6	Nil	Columbus Grass, Johnson Grass	
Type 7a	1	Chickpeas, Clover, Corn (Maize), Cowpea, Faba Beans, Lentils, Lupins, Peas (Field), Medic Pods, Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter including broad bean	
Type 7b	50	6 row barley, Bindweed (Australian), Bindweed (Black), Brome Grass, Musk Weed, Onion Weed, Phalaris Glumes, Poverty Weed, Ryegrass on stalk, Sheep Weed, Sorghum Grain, Three Horn Bedstraw, Turnip Weed and any other Foreign Seed not specified in Types 1-7(a) or in SFS	
Small Foreign Seeds (% by weight)	0.6	All Foreign Seeds not specified in Types 1-7(b) that fall below the 2.20mm screen during the Screenings process	
Other Contaminants Max - (count per half litre, unless otherwise stated)			
Foreign Material (% by weight)	1.0	Other than already specified	
Cereal Smut / Cereal Ergot	Nil	Includes Ball and Covered Smut, any Cereal Ergot	
Loose Smut (weight in grams)	0.1	Weight of all pieces per half litre	
Ryegrass Ergot (length in cm)	0.5	Length of all pieces present aligned end on end	
Pickling Compounds (entire load)	Nil	Pickled grain or artificial colouring	
Chemicals Not Approved for Barley (entire load)	Nil	Residues of any chemical compound not approved for barley, used in contravention of the labelled instructions or chemicals in excess of the MRL	
Stored Grain Insects & Pea Weevil – Live (entire load)	Nil	All life stages	
Insects – Large, Live or Dead	3	Includes Rutherglen bugs, ladybirds, grasshoppers/locusts, sitona weevils, wood bugs & pea weevil (dead only)	
Insects – Small, Live or Dead	10	Includes all species of aphid, mites & stored grain insects (dead only)	
Snails	2	Dead or alive	
Sand	50	Individual grains	
Earth	3	5mm max in diameter	
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones retained above the 2.2mm and 2.5mm screen per 2.5L	
Objectionable Material (entire load)	Nil	Presence of meat meal, blood meal, fish meal, poultry offal meal or other animal proteins. Sticks (>1cm in length & 0.5cm in diameter), stubble (>3cm in length & 1cm in diameter), glass, concrete, metal, animal excreta, animal carcasses, tainting agents or any other commercially unacceptable contaminant, odour or taste	

Commodity: Barley		**Season: 2016/17**	
Grade: MALT 3		**Standard Reference No.: CSG 22**	
QUALITY PARAMETER	**SPECIFICATION**	**COMMENT**	
Varietal Purity Min (% by count)	95	All approved 2 row Malting varieties of the current season	
Moisture Max (%)	12.5		
Protein Min (%)	9.0	N X 6.25 @ 0% Moisture Basis	
Protein Max (%)	12.8		
Test Weight Min (kg/hl)	65.0		
Retention Min (% by weight)	58.0	All matter remaining above a 2.50mm slotted screen – 40 shakes in the direction of the slots	
Screenings Max (% by weight)	NA	All matter passing through a 2.20mm slotted screen – 40 shakes in the direction of the slots	
Germinative Energy Min (%)	95	IOB 4ml Germinative Energy test	
Germinative Capacity Min (%)	98	IOB Germinative Capacity (stain)	
Rapid Visco Analyser Min (units)	130	RVA units	
Falling Number Min (sec)	300	Falling Number result	
Defective Grains Max - (% by count, 100 grain sample, unless otherwise stated)			
Shot	Nil	Cleaved	1
Sprouted	Nil	Broken (% wt 100 gram sample)	2.0
Dark Tipped, of which;	10	Frost Damaged	5
Field Fungi	5	Dry Green or Sappy	1
Skinnings	15	Heat Damaged, Bin Burnt or Storage Mould (count per half litre)	1
Insect Damaged (count per half litre)	10		
Foreign Seed Contaminants Max - (count of seeds in total per half litre, unless otherwise stated)			
Foreign Grain	85	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice	
Variation	25	Wild Oats, Wild Radish	
Type 1 (individual seeds)	8	Colocynth, Jute, Long Head Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed, Saffron Thistle	
Type 2	Nil	Barley with Coloured Aleurone Layer (blue / black), Castor Oil Plant, Coriander, Crow Garlic/ Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds and pods, Ragweed, Rattlepods, Starburr, St. John's Wort	
Type 3a	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr, Thornapple	
Type 3b	4	Vetch (Tare), Vetch (Commercial)	
Type 3c	4 seeds / 1 pod	Heliotrope (Blue), Heliotrope (Common)	
Type 3d	1	Double Gees/Spiny Emex/Three Cornered Jack	
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Darnel (Drake Seed), Hexham Scent/Meliot (only acceptable if no tainting odour is present), Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle	
Type 5	40	Knapweed (Creeping/Russian), Sesbania Pea, Patterson's Curse/ Salvation Jane	
Type 6	Nil	Columbus Grass, Johnson Grass	
Type 7a	1	Chickpeas, Clover, Corn (Maize), Cowpea, Faba Beans, Lentils, Lupins, Peas (Field), Medic Pods, Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter including broad bean	
Type 7b	50	6 row barley, Bindweed (Australian), Bindweed (Black), Brome Grass, Musk Weed, Onion Weed, Phalaris Glumes, Poverty Weed, Ryegrass on stalk, Sheep Weed, Sorghum Grain, Three Horn Bedstraw, Turnip Weed and any other Foreign Seed not specified in Types 1-7(a) or in SFS	
Small Foreign Seeds (% by weight)	0.6	All Foreign Seeds not specified in Types 1-7(b) that fall below the 2.20mm screen during the Screenings process	
Other Contaminants Max - (count per half litre, unless otherwise stated)			
Foreign Material (% by weight)	1.0	Other than already specified	
Cereal Smut / Cereal Ergot	Nil	Includes Ball and Covered Smut, any Cereal Ergot	
Loose Smut (weight in grams)	0.1	Weight of all pieces per half litre	
Ryegrass Ergot (length in cm)	0.5	Length of all pieces present aligned end on end	
Pickling Compounds (entire load)	Nil	Pickled grain or artificial colouring	
Chemicals Not Approved for Barley (entire load)	Nil	Residues of any chemical compound not approved for barley, used in contravention of the labelled instructions or chemicals in excess of the MRL	
Stored Grain Insects & Pea Weevil – Live (entire load)	Nil	All life stages	
Insects – Large, Live or Dead	3	Includes Rutherglen bugs, ladybirds, grasshoppers/locusts, sitona weevils, wood bugs & pea weevil (dead only)	
Insects – Small, Live or Dead	10	Includes all species of aphid, mites & stored grain insects (dead only)	
Snails	2	Dead or alive	
Sand	50	Individual grains	
Earth	3	5mm max in diameter	
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones retained above the 2.2mm and 2.5mm screen per 2.5L	
Objectionable Material (entire load)	Nil	Presence of meat meal, blood meal, fish meal, poultry offal meal or other animal proteins. Sticks (>1cm in length & 0.5cm in diameter), stubble (>3cm in length & 1cm in diameter), glass, concrete, metal, animal excreta, animal carcasses, tainting agents or any other commercially unacceptable contaminant, odour or taste	

Commodity: Barley		**Season: 2016/17**	
Grade: FEED 1		**Standard Reference No.: CSG 10**	
QUALITY PARAMETER	**SPECIFICATION**	**COMMENT**	
Varietal Purity Min (% by count)	NA	Includes any 2 Row or Feed variety and barley of any season	
Moisture Max (%)	12.5		
Protein Min (%)	NA	N X 6.25 @ 0% Moisture Basis	
Protein Max (%)	NA		
Test Weight Min (kg/hl)	62.5		
Retention Min (% by weight)	NA	All matter remaining above a 2.50mm slotted screen – 40 shakes in the direction of the slots	
Screenings Max (% by weight)	15.0	All matter passing through a 2.20mm slotted screen – 40 shakes in the direction of the slots	
Germinative Energy Min (%)	NA	IOB 4ml Germinative Energy test	
Germinative Capacity Min (%)	NA	IOB Germinative Capacity (stain)	
Rapid Visco Analyser Min (units)	NA	RVA units	
Falling Number Min (sec)	NA	Falling Number result	
Defective Grains Max - (% by count, 100 grain sample, unless otherwise stated)			
Shot	N/A	Cleaved	NA
Sprouted	Nil	Broken (% wt 100 gram sample)	5.0
Dark Tipped, of which;	NA	Frost Damaged	10
Field Fungi	NA	Dry Green or Sappy	NA
Skinnings	NA	Heat Damaged, Bin Burnt or Storage Mould (count per half litre)	1
Insect Damaged (count per half litre)	85		
Foreign Seed Contaminants Max - (count of seeds in total per half litre, unless otherwise stated)			
Foreign Grain	500	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice	
Variation	50	Wild Oats, Wild Radish	
Variation	100	Barley with Coloured Aleurone Layer (blue / black)	
Type 1 (individual seeds)	8	Colocynth, Jute, Long Head Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed, Saffron Thistle	
Type 2	Nil	Castor Oil Plant, Coriander, Crow Garlic/ Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds and pods, Ragweed, Rattlepods, Starburr, St. John's Wort	
Type 3a	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr, Thornapple	
Type 3b	4	Vetch (Tare), Vetch (Commercial)	
Type 3c	4 seeds / 1 pod	Heliotrope (Blue), Heliotrope (Common)	
Type 3d	1	Double Gees/Spiny Emex/Three Cornered Jack	
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Darnel (Drake Seed), Hexham Scent/Meliot (only acceptable if no tainting odour is present), Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle	
Type 5	40	Knapweed (Creeping/Russian), Sesbania Pea, Patterson's Curse/ Salvation Jane	
Type 6	40	Columbus Grass, Johnson Grass	
Type 7a	10	Chickpeas, Clover, Corn (Maize), Cowpea, Faba Beans, Lentils, Lupins, Peas (Field), Medic Pods, Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter including broad bean	
Type 7b	150	6 row barley, Bindweed (Australian), Bindweed (Black), Brome Grass, Musk Weed, Onion Weed, Phalaris Glumes, Poverty Weed, Ryegrass on stalk, Sheep Weed, Sorghum Grain, Three Horn Bedstraw, Turnip Weed and any other Foreign Seed not specified in Types 1-7(a) or in SFS	
Small Foreign Seeds (% by weight)	1.2	All Foreign Seeds not specified in Types 1-7(b) that fall below the 2.20mm screen during the Screenings process	
Other Contaminants Max - (count per half litre, unless otherwise stated)			
Foreign Material (% by weight)	1.0	Other than already specified	
Cereal Smut / Cereal Ergot	Nil	Includes Ball and Covered Smut, any Cereal Ergot	
Loose Smut (weight in grams)	0.1	Weight of all pieces per half litre	
Ryegrass Ergot (length in cm)	0.5	Length of all pieces present aligned end on end	
Pickling Compounds (entire load)	Nil	Pickled grain or artificial colouring	
Chemicals Not Approved for Barley (entire load)	Nil	Residues of any chemical compound not approved for barley, used in contravention of the labelled instructions or chemicals in excess of the MRL	
Stored Grain Insects & Pea Weevil – Live (entire load)	Nil	All life stages	
Insects – Large, Live or Dead	3	Includes Rutherglen bugs, ladybirds, grasshoppers/locusts, sitona weevils, wood bugs & pea weevil (dead only)	
Insects – Small, Live or Dead	10	Includes all species of aphid, mites & stored grain insects (dead only)	
Snails	2	Dead or alive	
Sand	50	Individual grains	
Earth	3	5mm max in diameter	
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones retained above the 2.2mm and 2.5mm screen per 2.5L	
Objectionable Material (entire load)	Nil	Presence of meat meal, blood meal, fish meal, poultry offal meal or other animal proteins. Sticks (>1cm in length & 0.5cm in diameter), stubble (>3cm in length & 1cm in diameter), glass, concrete, metal, animal excreta, animal carcasses, tainting agents or any other commercially unacceptable contaminant, odour or taste	

Commodity: Barley		**Season: 2016/17**	
Grade: FEED 2		**Standard Reference No.: CSG 11**	
QUALITY PARAMETER	**SPECIFICATION**	**COMMENT**	
Varietal Purity Min (% by count)	NA	Includes any 2 Row or Feed variety and barley of any season	
Moisture Max (%)	12.5		
Protein Min (%)	NA	N X 6.25 @ 0% Moisture Basis	
Protein Max (%)	NA		
Test Weight Min (kg/hl)	60.0		
Retention Min (% by weight)	NA	All matter remaining above a 2.50mm slotted screen – 40 shakes in the direction of the slots	
Screenings Max (% by weight)	25.0	All matter passing through a 2.20mm slotted screen – 40 shakes in the direction of the slots	
Germinative Energy Min (%)	NA	IOB 4ml Germinative Energy test	
Germinative Capacity Min (%)	NA	IOB Germinative Capacity (stain)	
Rapid Visco Analyser Min (units)	NA	RVA units	
Falling Number Min (sec)	NA	Falling Number result	
Defective Grains Max - (% by count, 100 grain sample, unless otherwise stated)			
Shot	N/A	Cleaved	NA
Sprouted	5	Broken (% wt 100 gram sample)	5.0
Dark Tipped, of which;	NA	Frost Damaged	10
Field Fungi	NA	Dry Green or Sappy	NA
Skinnings	NA	Heat Damaged, Bin Burnt or Storage Mould (count per half litre)	5
Insect Damaged (count per half litre)	85		
Foreign Seed Contaminants Max - (count of seeds in total per half litre, unless otherwise stated)			
Foreign Grain	1500	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice	
Variation	100	Wild Oats, Wild Radish	
Variation	100	Barley with Coloured Aleurone Layer (blue / black)	
Type 1 (individual seeds)	8	Colocynth, Jute, Long Head Poppy, Mexican Poppy, Field Poppy, Horned Poppy, Wild Poppy, New Zealand Spinach, Parthenium Weed, Saffron Thistle	
Type 2	Nil	Castor Oil Plant, Coriander, Crow Garlic/ Wild Garlic, Darling Pea, Opium Poppy, Peanut seeds and pods, Ragweed, Rattlepods, Starburr, St. John's Wort	
Type 3a	2	Bathurst Burr, Bellvine, Branched Broomrape, Bulls Head/Caltrop/Cats Head, Cape Tulip, Cottonseed, Dodder, Noogoora Burr, Thornapple	
Type 3b	10	Vetch (Tare), Vetch (Commercial)	
Type 3c	4 seeds / 1 pod	Heliotrope (Blue), Heliotrope (Common)	
Type 3d	1	Double Gees/Spiny Emex/Three Cornered Jack	
Type 4	20	Bindweed (Field), Cutleaf Mignonette seeds or pods, Darnel (Drake Seed), Hexham Scent/Meliot (only acceptable if no tainting odour is present), Hoary Cress, Mintweed, Nightshades, Paddy Melon, Skeleton Weed, Variegated Thistle	
Type 5	40	Knapweed (Creeping/Russian), Sesbania Pea, Patterson's Curse/ Salvation Jane	
Type 6	40	Columbus Grass, Johnson Grass	
Type 7a	20	Chickpeas, Clover, Corn (Maize), Cowpea, Faba Beans, Lentils, Lupins, Peas (Field), Medic Pods, Safflower, Soybean, Sunflower and any other seeds or pods greater than 5mm in diameter including broad bean	
Type 7b	300	6 row barley, Bindweed (Australian), Bindweed (Black), Brome Grass, Musk Weed, Onion Weed, Phalaris Glumes, Poverty Weed, Ryegrass on stalk, Sheep Weed, Sorghum Grain, Three Horn Bedstraw, Turnip Weed and any other Foreign Seed not specified in Types 1-7(a) or in SFS	
Small Foreign Seeds (% by weight)	2.0	All Foreign Seeds not specified in Types 1-7(b) that fall below the 2.20mm screen during the Screenings process	
Other Contaminants Max - (count per half litre, unless otherwise stated)			
Foreign Material (% by weight)	1.0	Other than already specified	
Cereal Smut / Cereal Ergot	Nil	Includes Ball and Covered Smut, any Cereal Ergot	
Loose Smut (weight in grams)	0.1	Weight of all pieces per half litre	
Ryegrass Ergot (length in cm)	0.5	Length of all pieces present aligned end on end	
Pickling Compounds (entire load)	Nil	Pickled grain or artificial colouring	
Chemicals Not Approved for Barley (entire load)	Nil	Residues of any chemical compound not approved for barley, used in contravention of the labelled instructions or chemicals in excess of the MRL	
Stored Grain Insects & Pea Weevil – Live (entire load)	Nil	All life stages	
Insects – Large, Live or Dead	3	Includes Rutherglen bugs, ladybirds, grasshoppers/locusts, sitona weevils, wood bugs & pea weevil (dead only)	
Insects – Small, Live or Dead	10	Includes all species of aphid, mites & stored grain insects (dead only)	
Snails	4	Dead or alive	
Sand	50	Individual grains	
Earth	3	5mm max in diameter	
Stones (g per 2.5L)	4.0	Maximum total weight of all Stones retained above the 2.2mm and 2.5mm screen per 2.5L	
Objectionable Material (entire load)	Nil	Presence of meat meal, blood meal, fish meal, poultry offal meal or other animal proteins. Sticks (>1cm in length & 0.5cm in diameter), stubble (>3cm in length & 1cm in diameter), glass, concrete, metal, animal excreta, animal carcasses, tainting agents or any other commercially unacceptable contaminant, odour or taste	

SECTION 4 VARIETAL CLASSIFICATION

Preferred Varieties

The Barley Australia Preferred Variety List is updated annually by Barley Australia as a guide to industry on market preferred varieties. Barley varieties on the Preferred Variety List are determined by marketing companies who are members of Barley Australia and reflect those malting varieties which, in their opinion, are sought by purchasers of Australian malting barley.

A new variety accreditation does not mean the variety will be a Preferred Variety until market demand is established:

- 'Domestic' is demand by domestic brewers for malting varieties.
- 'Export' is demand by export brewers for malting varieties.

The trade may purchase malting barleys for sale to domestic malthouses, or for export. Australian malthouses make malt for both domestic brewers and for export brewers.

It is recommended that growers of malting barley should contact their marketers of choice, storage company and consultant agronomists, prior to making any variety sowing decisions.

VARIETY	DOMESTIC DEMAND	EXPORT DEMAND
VICTORIA		
Baudin	-	Medium
Buloke	-	Medium
Commander	Medium	Medium
Gairdner	Medium	Medium
LaTrobe	-	Medium
Scope	-	Medium
Westminster	High	High
NEW SOUTH WALES		
Baudin	-	Medium
Buloke	-	Medium
Commander	High	Medium
Gairdner	Medium	Low
LaTrobe	-	High
Navigator	Low	-
Scope	-	Medium
Commander	Medium	Medium
QUEENSLAND		
Commander	Medium	Medium
Westminster	High	-

VARIETY	DOMESTIC DEMAND	EXPORT DEMAND
SOUTH AUSTRALIA		
Baudin	-	High
Buloke	Low	High
Commander	High	High
Gairdner	Low	Low
LaTrobe	Low	High
Navigator	Low	-
Scope	Low	High
Westminster	-	Medium
WESTERN AUSTRALIA		
Bass	Medium	High
Baudin	High	High
Buloke	-	Medium
Commander	-	Medium
Flinders	Low	Low
Gairdner	-	Medium
LaTrobe	Low	Medium
Scope	High	High

Accredited Varieties

The varieties listed below have been accredited by Barley Australia as malting barleys following established evaluation and testing procedures in association with the Malting and Brewing Industry Barley Technical Committee (MBIBTC) and Pilot Brewing Australia (PBA).

Australian barley growers are requested to consult the Barley Australia Preferred Varieties List to see varieties that are currently preferred by purchasers of Australian malting barley. Australian barley growers are also requested to contact their local consultants regarding information on varietal suitability to specific production regions.

Varieties marked in the Notes column as "Outclassed" as other varieties have better yield and many with superior malting characteristics. Whilst these Outclassed varieties remain as Accredited Malting Barleys, there is little demand or segregations provided for these varieties. It is the opinion of Barley Australia that these varieties are no longer marketable.

Where a load is delivered with a varietal mix that does not meet the minimum varietal purity of 95%, its maximum classification can only be Feed grade.

Note that varieties listed below may be governed by Plants Breeders Rights legislation:

A. MALT Barley Accredited Varieties 2016/17:

VARIETY	YEAR ACCREDITED	NOTES
Admiral	2014	
Arapiles	1994	Outclassed
Bass	2012	
Baudin	2003	
Buloke	2008	
Commander	2009	
Dhow	2002	Outclassed
Fairview	2011	
Fitzroy	2005	Outclassed
Flagship	2006	Outclassed
Flinders	2015	
Gairdner	1998	Outclassed
GrangeR	2013	
Grimmett	1982	Outclassed
Hamelin	2004	Outclassed
Henley*	2013	Does not meet receival standards due to blue aleurone
LaTrobe	2015	
Macquarie	2014	
Navigator	2012	
Schooner	1983	Outclassed
Scope CL	2013	
Sloop	1998	Outclassed
Stirling	1982	Outclassed
Tallon	1992	Outclassed
Vlamingh	2006	
Westminster	2013	
Wimmera	2014	

Note*:
1. Is known to produce a blue aleurone layer.

B. FOOD Grade Barley Accredited Varieties 2016/17:

Hindmarsh

C. FEED Barley Accredited Varieties 2016/17:

Barque	Binalong	Brindabella	Capstan
Chebec	Cowabbie	Dash	Doolup
Fathom	Fitzgerald	Fleet Australia	Grout
Hannon	Kaputar	Keel	Lockyer
Mackay	Maritime	Molloy	Mundah
O'Connor	Onslow	Oxford	Roe
Skiff	Tantangarra	Tilga	Torrens
Tulla	Urambie	Yagan	Yambla
Yarra			

Note:

1. FEED Accredited Varieties include any two row variety with a White Aleurone Layer

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

Barley is traded on the basis of quality tests conducted on lots of barley 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 Receival 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 Receival Agent's agreement with the buyer concerned if different from these Standards.
- Results should be entered on the Receival Agents sample receipt.

5.2.6 References

Sampling of Barley 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:

$$\% \text{ Moisture} = \frac{Wtp - (Wdry - Wdish)}{Wtp} \times 100$$

Where

Wtp is the weight of the test portion before oven drying
Wdry is the weight of the dish, lid and test portion after oven drying
Wdish 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 44-15.02.

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 – Barley – 0.
- Electronic balance – accuracy = 0.001g (or better)
- Aluminium dishes - these dishes must be kept clean and weigh 11.500 + 0.005g
- 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 approximately 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 +/- 0.010g from tare. Recheck weight of dish to ensure within 11.500 +/- 0.005g. Dishes must also be checked before and after the season to ensure they are correct.
- Weigh out accurately 10.000 +/- 0.001g 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 °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 minutes once the required temperature is reached. Usually for 130°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 44-15.02

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 Protein Assessment of Cereals – Dumas Reference Method

5.6.1 Definitions

This is the Dumas reference method used to determine the crude protein content of cereal grains. Samples are incinerated in an oxygen rich atmosphere to produce oxides of nitrogen which are catalytically reduced to molecular nitrogen. Interfering combustion products are removed by selective absorption. Nitrogen concentration is then measured by a thermal conductivity detector calibrated against a standard of known nitrogen content. Protein is then calculated from nitrogen content using a known factor for each product.

5.6.2 Scope

This method is applicable to all cereal grains.

5.6.3 Apparatus

- Combustion nitrogen analyser consisting of a furnace capable of maintaining minimum operating temperature of 950°C for pyrolysis of the sample in pure oxygen, an isolating system capable of isolating liberated nitrogen gas from other combustion products for subsequent measurement by thermal conductivity detector, a device for converting NO_x products to nitrogen or measuring NO_2, and a detector system capable of interpreting detector response as percent N.

- Grinder or mill that produces ground material with particle size ≤ 0.8mm and with minimal heat generation.

- Analytical balance accurate to at least 0.0005g.

5.6.4 Reagents

- Gases – carrier gas (usually helium), pure (99.9%) oxygen, compressed air (used to drive component parts of the analyser)

- Reference calibration standard – TRIS - high purity (hydroxymethyl) aminomethane or Nicotinic acid

5.6.5 Procedure

- Follow procedures to set up the analyser and operating gas systems as specified by the manufacturer. Perform the necessary adjustments for gas flows and pressures, combustion temperatures and times and start up equilibrium times to ensure optimal analysis conditions for the type of sample to be analysed.

- Calibrate the instrument by following the manufacturer's guidelines using the appropriate calibration standard. The calibration should be cross checked against a second high purity standard – Nicotinic Acid or EDTA. Blanks, as stipulated by the manufacturer, should be run prior to analysis to establish the baseline. These should include consideration of an atmospheric blanks factor or a sample blank similar to samples under test.

- Grind an amount of sample sufficient to represent the original material, and to perform a number of nitrogen determinations as required. Sample to be "as is".

- Weigh accurately to 0.001g an amount of ground sample, as recommended by the manufacturer, into the appropriate sample capsule and place the sample into the instrument for analysis.

- If presenting the sample to the instrument in a pellet form, adjustments may be required to burn temperatures, times and blanks to compensate for the absence of a sample capsule.

- Blank and standard control/check samples should be repeated periodically (as a guide every 10 samples) during each analytical run to monitor any drift. Standard drift corrections and recalculation of samples should be made after analysis if the drift exceeds specification.

- Calculation of nitrogen content is usually performed automatically by the instrument data processing system or associated software.

- Results should be expressed as percent (5) nitrogen to two decimal places. For conversion to protein content "as is" multiply barley nitrogen by 6.25%. Convert protein content to an 0% moisture basis for barley for the nitrogen/protein values where necessary. Report result to the nearest 0.1%.

- Analysis should be repeated if the difference between duplicate test results exceed the respective repeatability values (r) shown in the following table:

Grain	Mean % N	Repeatability		Reproducibility	
		r	RSD_r %	R	RSD_r %
Barley	1.85	0.06	1.22	0.11	2.09
Barley malt	1.49	0.04	0.99	0.08	1.97
Sorghum	1.47	0.05	1.15	0.07	1.69
Wheat durum	2.09	0.04	0.64	0.08	1.32
Wheat*	1.97	0.03	0.61	0.09	1.69
Wheat APH	2.54	0.03	0.46	0.08	1.15
Wheat flour	2.03	0.03	0.46	0.09	1.56

* Wheat other than the type specified in the above table

- Suitable fineness of grind gives a relative standard deviation (RSD) of ≤ 2.0% for ten successive determinations of nitrogen in ground test material. A larger RSD indicates the need for a finer grind or a larger analytical test weight, assuming that the instrument has been properly set up.

- For each batch the accuracy of the system is demonstrated by making ten successive determinations of nitrogen in nicotinic acid or tryptophan (different materials from calibration standard). Means of determinations must be ≤ ± 0.15 of respective theoretical values with standard deviation ≤ 0.15. Failure to achieve these values indicates the need for recalibration or optimisation of instrument settings.

- Accuracy checks should be carried out (1) On instrument installation and reinstallation following repairs and service; (2) When a new batch of working reference material is used; (3) After experiencing problems in instrument set up.

5.6.6 References

- Crude Protein Reference Method - AACC Method 46-30
- Dumas Total Nitrogen Determination – CCD Method 02-03, RACI
- Dumas Combustion – Total Nitrogen Determination (Reference Method) Annex A - National Measurement Institute Document M8
- Sweeney, R.A. (1989). JAOAC 72: 770
- 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

5.7 Protein Assessment of Cereals – NIR

5.7.1 Definition

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

5.7.2 Scope

This procedure is applicable to all cereal grains.

5.7.3 Reagents

Not applicable.

5.7.4 Apparatus

NIR instrument approved by the National Measurement Institute for use for trade purposes under the conditions stipulated in NMI V10 (Uniform Test Procedures for the Verification, Certification and In Service Inspection of Protein Instruments for Grain), and NMI M8 (Pattern Approval Specifications for Protein Measuring Instruments for Grain).

5.7.5 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 protein.

Report result to the nearest 0.1%.

5.7.6 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

5.8 Test Weight Assessment - Schopper Chondrometer Reference Method

5.8.1 Definitions

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

5.8.2 Scope

This method is applicable to all cereal grains.

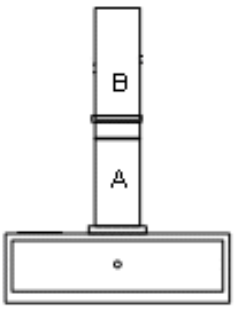
5.8.3 Apparatus

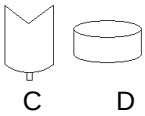
- 1L Schopper Calibrated Chondrometer
- 2 decimal place balance
- Plastic bowl

5.8.4 Reagents

Not applicable

5.8.5 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.

5.8.6 References

Test Weight Per Bushel - AACC Method 55-10

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

5.9 Test Weight Assessment – Franklin Mark 11 Chondrometer Reference Method

5.9.1 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.

5.9.2 Scope

This method is applicable to all cereal grains.

5.9.3 Apparatus

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

5.9.4 Reagents

Not applicable.

5.9.5 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.

5.9.6 References

Test Weight Per Bushel - AACC Method 55-10

ISO7971-2

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

5.10 Test Weight Assessment – Kern 222 Chondrometer Reference Method

5.10.1 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.

5.10.2 Scope

This method is applicable to all cereal grains.

5.10.3 Apparatus

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

5.10.4 Reagents

Not applicable

5.10.5 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.

5.10.6 References

ISO Method 7971-2

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

5.11 Unmillable Material Assessment (Screenings) – Reference Method

5.11.1 Definitions

This is the reference method used to determine the percentage by weight of Unmillable Material Below the Screen (Screenings), including Small Foreign Seeds.

5.11.2 Scope

This method is applicable to barley.

5.11.3 Apparatus

Agtator Shaking Device

Combination of two screens – top 2.50mm top screen and 2.20mm bottom screen with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.20mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.50mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 2.20mm slot width as assessed by an Engineers Pin Gauge is to be 2.20 mm ± 0.01 mm. Pin Gauge, being 2.21mm and 2.19, needs to have a valid Regulation 13 certificate.
- 2.50mm slot width as assessed by an Engineers Pin Gauge is to be 2.50 mm ± 0.01 mm. Pin Gauge, being 2.51mm and 2.49, 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

5.11.4 Reagents

Not applicable.

5.11.5 Procedure

- Obtain a certified half litre sample of grain. Sample to be “as is”.
- Place the barley screens on top of the Agtator platform with the slots aligned toward the front of the Agtator. Ensure the barley screen is clean, smooth, dry and free of grain residues in the slots.
- 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 screens and pan from the Agtator and detach the screens 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.

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

- Report all results to the nearest 0.1%.

5.11.6 References

Go - No go gauge with Regulation 13 certificate.

5.12 Retention – Reference Method

5.12.1 Definitions

This is the reference method used to determine grain retained above the 2.50mm screen, referred to as Retention.

5.12.2 Scope

This method is applicable to barley.

5.12.3 Apparatus

Agtator Shaking Device

Combination of two screens – top 2.50mm top screen and 2.20mm bottom screen with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.50mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.20mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 2.50mm slot width as assessed by an Engineers Pin Gauge is to be 2.50 mm ± 0.01 mm. Pin Gauge, being 2.51mm and 2.49, needs to have a valid Regulation 13 certificate.
- 2.20mm slot width as assessed by an Engineers Pin Gauge is to be 2.20 mm ± 0.01 mm. Pin Gauge, being 2.21mm and 2.19, 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

5.12.4 Reagents

Not applicable.

5.12.5 Procedure

- Obtain a certified half litre sample of grain. Sample to be “as is”.
- Place the barley screens on top of the Agtator platform with the slots aligned toward the front of the Agtator. Ensure the barley screen is clean, smooth, dry and free of grain residues in the slots.
- 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 screens and pan from the Agtator and detach the screens from the pan.
- Calculate Retention percentage - Weigh the grain remaining above the 2.50mm screen on an appropriate top pan balance and calculate the percentage as follows:

  $$\text{Retention by wt (\%)} = \frac{\text{Grain above the 2.50mm screen}}{\text{Total Weight}} \times 100$$

- Report all results to the nearest 0.1%.

5.12.6 References

Go - No go gauge with Regulation 13 certificate.

5.13 Falling Number – Reference Method

5.13.1 Definitions

This is the reference method for determination of Falling Number and is based on the unique ability of alpha amylase to liquefy a starch gel. Strength of the enzyme is measured by Falling Number defined as the time in seconds required to stir plus the time it takes to allow the stirrer to fall a measured distance through a hot aqueous gel undergoing liquefaction.

The Falling Number test is an alternative to the Rapid Visco Analyser (RVA).

Both the Falling Number and RVA results over-ride the visual assessment of Shot and/or Sprouted.

5.13.2 Scope

This method is applicable to barley.

5.13.3 Apparatus

Perten Falling Number apparatus, including standardised precision viscometer tubes with close tolerances, inside diameter ± 0.02mm outside diameter ± 0.3mm length ± 0.3mm.

Thermometer, calibrated in 0.1°C, and certified to ± 0.3°C.

Sample Mill. Must produce meal with particle size distribution as follows; <500µm, 0-10%; >210 but <500µm, 25-40%; <210µm, 75-50%. The recommended instrument is the Perten 3100 Mill with 0.8mm sieve.

Automatic Pipette should be capable of delivering 25 ± 0.3ml.

Analytical balance accurate to at least 0.01g

5.13.4 Reagents

Distilled water

5.13.5 Method

- Start the Falling Number instrument by following the manufacturer's instructions. Ensure the bath is filled with distilled water and the instrument has reached full operating temperature before being used.
- Grind a minimum 250g sample of whole grain using the designated mill. Sample to be "as is".
- Weigh 7.00 ± 0.05 g of meal into a dry falling number tube. There is no requirement to adjust the weight of meal based on the elevation where the test occurs or the moisture content of the barley.
- Add 25 ml of distilled water from the automatic dispenser. Insert a rubber stopper into the top of the tube and shake tube in an upright position 20-30 times (up and down) or more if necessary) until mixed. Make sure all flour is suspended by upending. Alternatively the unit may shake the tubes.

- Use the viscometer stirrer to scrape down the slurry coating the upper part of the tube, and scrape all slurry from the stopper.
- Place the tube and the viscometer stirrer into the water bath within 30 to 60 seconds after mixing. Start the Falling Number apparatus immediately afterward.
- At the conclusion of the test, record the time in seconds.
- Remove the tube and appropriately clean the stirrer, tube and stopper using cold water and brush. Distilled water may assist removal of all traces of the starch gel material. Clean the mill of all residues retained from the sample.
- Report the Falling Number value to the nearest second.

5.13.6 References

Falling Number Determination – AACC Method 56-81B

5.14 Rapid Visco Analyser – Reference Method

5.14.1 Definitions

This is the reference method for determination of Rapid Visco Analyser (RVA) units and is based on the unique ability of alpha amylase to liquefy a starch gel. Strength of the enzyme is measured by RVA units defined as the time in seconds required to stir plus the time it takes to allow the stirrer to fall a measured distance through a hot aqueous gel undergoing liquefaction.

The RVA test is an alternative to the Falling Number.

Both the RVA and Falling Number results over-ride the visual assessment of Shot and/or Sprouted.

5.14.2 Scope

This method is applicable to barley.

5.14.3 Apparatus

Rapid Visco™ Analyser apparatus, including one use RVA cups and paddles, as supplied by the manufacturer.

Sample Mill. Must produce meal with particle size distribution as follows; <500µm, 0-10%; >210 but <500µm, 25-40%; <210µm, 75-50%. The recommended instrument is the Perten 3100 Mill with 0.8mm sieve.

Automatic Pipette should be capable of delivering 25 ± 0.3ml.

Analytical balance accurate to at least 0.01g

5.14.4 Reagents

Distilled water

5.14.5 Method

- Start the RVA instrument by following the manufacturer's instructions. Ensure the instrument has reached full operating temperature before being used.
- Grind a minimum 300g sample of whole grain using the designated mill. Sample to be "as is".
- NOTE: the RVA will read "_ _ _" until it reaches the measuring temperature.
- Measure 25.0 +/- 0.1 ml water (distilled or deionised) from the dispensette into a new canister.
- Accurately weigh 4.00g (+/- 0.01g) of ground grain into a weighing vessel.
- Transfer the entire weighed sample onto the water surface in the canister (not the other way around). The sample should not be added to the water until just before the test occurs otherwise erroneous results may occur.

- Place the paddle into the canister and vigorously jog the blade through the sample up and down 10 times. Repeat the jogging action if any lumps remain on the water surface or adhere to the paddle.
- Place the paddle into the canister and firmly insert the paddle into the RVA paddle coupling on the instrument.
- NOTE: The paddle must be fully inserted into the coupling (firmly squeeze the front of the paddle against the back of the coupling) for proper functioning of the instrument.
- Make sure that the paddle turns freely in the canister and does not rub against the sides. If the paddle rubs it will give a higher than expected result.
- Initiate the measurement cycle by firmly depressing the blue motor tower of the instrument and immediately releasing it.
- On completion of the test, the tower will raise and the Stirring Number will be displayed at the front of the instrument. Record the Stirring number.
- NOTE: The instrument will display time in seconds for the duration of the three-minute test and then display the Stirring Number at the completion of the test.
- Remove the canister with the insulating glove or tongs and discard.
- CAUTION: the sample canister is hot at the end of the test.

5.14.6 References

American Association of Cereal Chemists Method – Weather Damage in grain: AACC 22-08, ICC 161 and Royal Australian Chemical Institute Methos - RACI 05-05

5.15 Germinative Energy – Reference Method

5.15.1 Definitions

This is the reference method for determination of the percentage of grains which can be expected to germinate fully if the sample is malted at the time of the test.

5.15.2 Scope

This method is applicable to barley.

5.15.3 Apparatus

Petri dishes, 90mm

Filter paper, white Whatman No.1, 85mm

Pipette 4 ml and 8 ml

Flat tray

Cellotape

Incubation chamber or germination cabinet (if available)

5.15.4 Reagents

Distilled water

5.15.5 Method

- Place two filter papers in the bottom of the petri dish and add precisely 4 ml of distilled water.
- Count 100 whole barley grains from the sample and place them on the paper so that each makes good contact.
- Cover the petri dish with its lid and ensure that loss of moisture is prevented by making a good seal using cellotape or other measure.
- Place the petri dish on a tray in a dark germination cabinet or incubator set at 19°C or on the surface of a bench under similar temperature and lighting conditions. It is important that the petri dish or any tray it sits on is flat.
- At intervals of 24 hours and 48 hours from the beginning of the test, remove corns.
- Count the remaining barley grains that have not chitted after 72 hours.
- % Germinative Energy is calculated using the following formula = (100 – remaining unchitted grains).
- Report the results as a % rounded to the nearest whole number.

5.15.6 References
IOB Methods of Analysis – 1.7 Germinative Energy of Barley (BRF Method) (EM) Issued January 1997.

5.16 Germinative Capacity Rapid Staining Method – Reference Method

5.16.1 Definitions

This is the reference method for determination of the percentage of living grains in a sample of barley using rapid staining.

5.16.2 Scope

This method is applicable to barley.

5.16.3 Apparatus

Scalpel or other apparatus for accurately sectioning grains longitudinally

Test tubes

Filter pump or source of air suction

Magnifying glass

5.16.4 Reagents

Distilled water

2,3,5-triphenyl tetrazolium chloride solution (10g/l). Follow the manufacturer's instructions on dilution. Store the solution in a dark bottle to exclude light.

5.16.5 Method

- Separate 100 barley grains. Exclude any foreign material and broken grains.
- Cut the grain longitudinally to bisect the embryo, discarding one set of half corns.
- Place the remaining half corns in a test tube and cover with the tetrazolium solution at room temperature.
- Evacuate the tube to below 200mm Hg for 3 to 4 minutes and re-introduce air to force the solution into the grains.
- Maintain the test tubes at 40°C for 30 minutes in a water bath.
- Drain the grains.
- Spread the grains on moist filter paper and examine using magnification.
- Classify the grains into:
    - Completely coloured which are healthy living germs (X)
    - These which are damaged but sufficiently intact to germinate – as a minimum the shoot and scutellum together with a little of the tissue between the shoot and root are stained (Y)
    - Unstained germs or those less stained than the minimum described in Y above

- Calculate the germinative capacity using the following formula:

  Germinative Capacity (%) = X +Y

- Report the results as a % rounded to the nearest whole number and state the method used in brackets e.g. GC = x% (stain)

5.16.6 References

IOB Methods of Analysis – 1.6 Germinative Capacity of Barley: Rapid Staining Method (EM) Issued January 1997.

5.17 Defective Grains Assessment – Reference Method

5.17.1 Definitions

This describes the method of assessment of deliveries of barley for the various types of defective grains described in these barley Standards. The various defective grain types and their assessment methods are described in this method as follows:

Count per 100 grains	Count per half litre	% by weight 100 grams
Shot*	Insect Damaged	Broken
Sprouted*	Heat Damaged, Bin Burnt or Storage Mould	
Dark Tipped		
Field Fungi		
Skinnings		
Cleaved		
Frost Damaged		
Dry Green or Sappy		

* For Shot and/or Sprouted grain, GTA Standards specify both a Rapid Visco Analyser (RVA) minimum and a Falling Number minimum. The RVA test is an alternative to the Falling Number. Both the RVA and Falling Number results over-ride the visual assessment of Shot and/or Sprouted. Refer to the Falling Number Reference Method or the Rapid Visco Analyser Reference Method, as applicable.

5.17.2 Scope

This method is applicable for all deliveries of barley.

5.17.3 Apparatus

- Visual Recognition Standards, with the following photographic standards being recognised by GTA:
    - Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2015, GTA

A 100 grain tray or mechanism capable of holding 100 grains

Analytical balance accurate to at least 0.1g

5.17.4 Reagents

Not applicable

5.17.5 Method

- Sample to be “as is”.
- For Defective grains with tolerances above zero, assessment is made on grain from the Grower Load Composite sample.

- 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 or during discharge into the receival hopper after assessment.

- Grain should be examined for defects under conditions of good lighting. Instruments of magnification may be used to assist the determination of the level of visually defective grains present in the sample.

- For those defects with a tolerance based on the count in a 100 grain sample, a small sub sample should be drawn from the Grower Load Composite sample and placed on the 100 grain tray. Surplus grain should be removed from the tray when all 100 holes have been filled. Count the number of grains for the defect in question.

- For those defects with a tolerance based on the number of grains in a half litre sample (Insect Damaged, Heat Damaged, Bin Burnt or Storage Mould), the entire half litre sample is to be assessed. Count the number of grains for the defect in question.

- For those defects with a tolerance based on % by weight in a 100 gram sample (Broken), a representative 100 gram sub sample should be drawn from the Grower Load Composite sample. Remove all Broken grain from the 100 gram sample and weigh.

- 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 presence and level of defective grains can be assessed with the assistance of the GTA Approved photographic standards (Visual Recognition Standards Guide) listed in Section 6 or Approved objective measurement instruments where appropriate (refer for example Falling Number or Rapid Visco Analyser Reference Methods in Section 5).

- Report results as follows:

  Percentage by count in 100 grains – nearest 1%
  Count per half litre – nearest whole number
  Percentage by wt in 100 grams – nearest 0.1%

5.17.6 References

Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2015, GTA.

5.18 Contaminants Assessment – Reference Method

5.18.1 Definitions

This describes the method of assessment of deliveries of barley for the various types of Contaminants described in these barley Standards. 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 Count	Weight in grams per half litre	Weight in grams per 2.5 litres	% by weight in half litre	Count per entire load
Ryegrass Ergot	All Weed Seed Types except 2 and 6*	Varietal Purity	Loose Smut	Stones (total above the 2.2mm & 2.5mm screen)	Small Foreign Seeds	Type 2 weed seeds
	Coloured Aleurone Layer*				Foreign Material	Type 6* weed seeds
	Insects Large – Live or Dead					Coloured Aleurone Layer*
	Insects Small – Live or Dead					Cereal Ergot
	Snails					Smut – Ball & Covered
	Sand					Stored Grain Insects and Pea Weevil - Live
	Earth					Objectionable Material
	Wild Oats / Wild Radish					Pickling Compounds or Artificial Colouring
	Wheat, Cereal Rye, Triticale, Cultivated Oats, Rice (Foreign Grain)					Chemicals not Approved for Barley or in excess of the MRL
	Six row barley					Foreign Seed Pods
						Barley Not of the Current Season

*Note – Type 6 weed seeds and Coloured Aleurone Layer are to be counted per half litre or per the entire load, depending on the grade

5.18.2 Scope

This method is applicable for all deliveries of barley.

5.18.3 Apparatus

Combination of two screens – top 2.50mm top screen and 2.20mm bottom screen with the following specifications:

- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.50mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 300mm diameter discs x 0.9mm stainless steel, perforated with 25.40mm x 2.20mm slots, hit and miss on ends with 4.77mm end bar and 2.0mm side bar.
- 2.50mm slot width as assessed by an Engineers Pin Gauge is to be 2.50 mm ± 0.01 mm. Pin Gauge, being 2.51mm and 2.49, needs to have a valid Regulation 13 certificate.
- 2.20mm slot width as assessed by an Engineers Pin Gauge is to be 2.20 mm ± 0.01 mm. Pin Gauge, being 2.21mm and 2.19, 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 2015, GTA
- Seed Impurities of Grain Identification Guide, 3rd Edition, GTA
- Insects of Stored Grain, A Pocket Reference, 2nd Edition, CSIRO

Mesh Screen (optional)

Ruler

5.18.4 Reagents

Not applicable.

5.18.5 Method

- Sample to be “as is”.
- For contaminants with tolerances above zero, assessment is made on the entire half litre sample on grain above and below the 2.50 mm and 2.20mm screens after the Unmillable Material assessment (Screenings) has been conducted.
- For nil tolerance contaminants, the tolerance (rejection of the load) will 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 of all screens and in the bottom pan 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 5.18.1.

- If any Stones are found above the 2.2mm and 2.5mm screen in the initial half litre sample, then a further four half litre samples should be taken. If the total weight of all Stones above the 2.2mm and 2.5mm screen found in the combined 2.5L sample is above 4.0g, the load 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 5.18.1.

- 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.

- Seed Pods are to be assessed as a count per half litre where greater than 5mm in diameter. Where seed pods are not listed in the Standards and are 5mm or less in diameter, they are to be measured as part of Foreign Material. Any seed pods detected must not be opened. Pods refers to whole pods or part thereof.

- 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 grain or Chemicals in Excess of the MRL, it is recommended that 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.

- Report results as follows:
  Count per half litre – nearest whole number
  Length in cm per half litre – nearest 0.1cm
  Percentage by wt per half litre – nearest 0.1%
  Percentage by count per half litre – nearest 1%
  Weight in grams per half litre – nearest 0.1g
  Weight in grams in 2.5 litres – nearest 0.1g

5.18.6 References

Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment – Issued August 2015, GTA.

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

Insects of Stored Grain, A Pocket Reference, 2nd Edition, CSIRO

Ute Guide Series, GRDC

5.19 Varietal Declaration Procedure

5.19.1 Definitions

This is the recommended procedure for determining the variety of the load presented for delivery.

5.19.2 Scope

This procedure is applicable to all barley deliveries.

5.19.3 Apparatus

Not applicable.

5.19.4 Reagents

Not applicable.

5.19.5 Method

For the purposes of the Receival Standards and delivery of grain, classification is dependent on the segregations available at the point of delivery and the highest grade classification available for that variety as per the Varietal Master List.

- Driver declares the variety(s) in the load tendered for delivery. It is recommended that the grower sign a Declaration Form and provide this to the driver for provision to the Receival Agent. This Declaration Form should at a minimum contain the grower details and the variety(s) of the load.

- 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.

- Note that depending on the varietal declaration and the procedures of the Receival Agent, a sample of the load may be taken and sent to a laboratory for assessment of the variety within the sample. In this instance sample is to be “as is”.

- Report the variety as per the following procedure using the applicable code as defined by the Receival Agent.

<u>Load is Declared as One Variety Only</u>

- Where the load is declared as being of the one variety only, review the applicable maximum grade classification of that variety as per the Varietal Master List.

- Based on the quality results, Grade the load and record the declared variety.

<u>Load is Declared as Multiple Varieties of the Same Grade Classification Status</u>

Malt (or Food) Varieties:

- Where the load is declared as being of more than the one variety, unless the Varietal Purity specifications of minimum 95% can be met, the load cannot be classified as a

Malt or Food grade. If the Varietal Purity specifications have been met for the Malt or Food Grade, it is recommended the Receival Agent implement some form of varietal purity testing.

- Based on the quality results, Grade the load and record the variety with the greatest percentage in the load (i.e., the variety that was nominated to meet the Varietal Purity specifications).

Feed Varieties:

- Where the load is declared as being of more than the one Feed variety, the load can only be classified as a Feed grade

- Based on the quality results, Grade the load and record the variety with the greatest percentage in the load

Load is Declared as Multiple Varieties of Different Grade Classification Status

- Where the load is declared as containing one or more of a Malt, Food and/or a Feed variety, the load can only be classified as a Malt or Food grade if the varietal purity minimum of 95% is met.

- Based on the quality results, Grade the load and record the variety with the greatest percentage in the load.

5.19.6 References

Varietal Master List

Declaration Form, if applicable

5.20 Screen Slot Size Compliance Procedure

5.20.1 Definitions

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

5.20.2 Scope

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

5.20.3 Apparatus

Engineers Pin Gauge, 2.19mm and 2.21mm, with a valid Regulation 13 certificate

Engineers Pin Gauge, 2.49mm and 2.51mm, with a valid Regulation 13 certificate

Checking template (if available)

Calibration Sticker

5.20.4 Reagents

Not applicable.

5.20.5 Method

- Compliance testing shall be undertaken by randomly selecting 74 slots and measuring using the above Gauges.
- Place screen or disc with the smooth surface up so that it sits horizontally.
- Examine the screen for any damage to the slots. If there is any damage affecting the accuracy of the slots or the screen immediately reject the screen.
- Ensure the screen is labelled with the correct slot/hole size, the commodity that is normally tested on the screen (barley) and the screen identification number.
- For screen accuracy, place relevant checking template (testing 74 slots) 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 barley, the barley gauges are 2.19 – 2.21 (2.20mm) and 2.49 – 2.51 (2.50mm).
- Hold the GO/NO GO GAUGE in the middle.
- Place an end of the GO/NO GO GAUGE on the middle of a slot which lines up with a slot on the template so that is perpendicular to the slot.
- Release the GO/NO GO GAUGE. Gauges are not to be pushed through slots.

- If the GREEN (GO) end does not go through then the slot fails. Record this event and move on to the next slot.
- If the GREEN (GO) end does go through then the slot size is greater than the nominated size of the GREEN end. Proceed to test the slot with the RED (NO GO) end as follows:
    - If the RED (NO GO) end does not go through then the slot size is less than the nominated size of the RED end and greater than the nominated size of the Green End, hence the slot is within the accepted range and passes.
    - If the RED (NO GO) end does go through then the slot fails. Record this event and move on to the next slot.
- Proceed to test all 74 slots, recording each failure.
- Repeat the above process for both screens i.e., the 2.50mm and 2.20mm screen.
- 0 to 25 slots 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)

5.20.6 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 barley.

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 barley. 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
Defective Grains				
Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment	Hardcopy booklet	GTA	n/a	Issued August 2015
Contaminants				
Visual Recognition Standards Guide for Grain Commodity Sampling and Assessment	Hardcopy booklet	GTA	n/a	Issued August 2015
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	2nd Edition	2007
Seed Impurities of Grain Identification Guide	Hardcopy booklet	GTA	3rd Edition	n/a