Barley
CLASSIFICATION PROCEDURES

The following classification procedure is to be used for the receipt of all Malting and Feed Barley grades.

1. Ask the grower or carrier for the Variety of Barley to fill in the transaction. Varieties that can be accepted into the Malting Barley Grades are listed on the Barley variety chart. If the variety is not listed as a malt variety it can only be accepted into Feed Barley grades.

   **MALTING BARLEY IS EXTREMELY SENSITIVE TO VARIETAL ADMIXTURES – DIFFERENT MALTING VARIETIES CANNOT BE BINNED TOGETHER.**

2. Sample the load presented for delivery according to the Receival Sampling procedure to produce a representative Grower Load Composite (GLC) sample. Ensure the GLC is thoroughly mixed. Observe the load for the presence of Nil Tolerance Contaminants.

3. **Check for the presence of Nil Tolerance Contaminants at all stages of the following classification procedure.**

4. From the GLC sample take an approx. 800 gram subsample to be tested for Moisture and Protein content using the Infratec wholegrain instrument. Ensure the machine is set to the correct calibration and record the results.

5. If the moisture result meets specification continue with classification, otherwise the load is to be temporarily declined.

6. Fill the litre measure using the barley pouring device.

7. Determine the Test Weight using the litre measure and balance.

8. The Retention and Screenings assessment is based on two screens - 2.2mm gap screen plus 2.5mm top screen. Pour the litre sample onto the top Agtator screen and press the start button.

9. Using the procedure in the Equipment & Procedures section, place the grain remaining above the 2.5mm screen into the litre measure and and determine the % Retention using the balance. Empty the litre measure ready for the next test.

10. Inspect the bottom tray for presence of Field Insects or Grain Insects.

11. Place the contents that passed through the 2.2mm screen into the litre measure and determine the % Screenings using the balance.

12. Inspect above and below the screens and the bottom tray for Foreign Seeds. Record the seed types using the categories listed later in this chapter. This is mandatory when the load is to be downgraded.

13. Look for Small Foreign Seeds in the bottom tray. To separate small foreign seeds (ryegrass, canola, turnip) from chaff and small barley, pass the sample through the mesh screen (colander) over a white tray. Slightly blowing on the fine screenings can help separate seeds from chaff. Some seeds may still need hand separating.

14. Examine the litre sample for Foreign Grains. Count the number of foreign grains (wheat, triticale, rye and oats) in the sample. If the number of foreign grains is large refer to the foreign grain definition highlighted later in this section and follow the alternative method.

15. Count all Snails in the litre sample.

16. Fill the 100-corn tray from the GLC. Spend up to 2 minutes with a Maggy Lamp and examine the tray for Defective Grains as listed below:

   • Broken
   • Dark Tipped
   • Dry Green or Sappy
   • Field Fungi
   • Frost Damaged

   • Heat Damaged, Bin Burnt or Storage Mould Affected
   • Insect Damaged
   • Shot or Sprouted
   • Skinnings
   • Split or Cleaved

17. If necessary a further 3 minutes (total 5 minutes) be used to further examine any problem defects.

18. Confirm declared Variety and Varietal Admixture.

19. Examine a 20 gram sample from the GLC for Broken or Cracked Grains. If present, separate all broken or cracked grains from the sample and weigh. Multiply the weight by 5 to determine the % by weight.

20. Examine a 1 litre sample for Stones.

21. Test for any other parameters on the Barley Receival Standards chart, not already covered, as required.

22. Confirm declared Variety and Varietal Admixture.

23. Take an appropriate amount of sample from the GLC sample to add to the 500MT Running Bulk Sample required for each Barley grade.

24. If using manual weighnotes, enter all required field onto the weighnote and derive the grade using the Receival Standards.

25. If using the computer grain system, enter all required fields into the computer the computer and select from the list of acceptable grades. The computer can derive a list of the acceptable pay and bin grades, in order of rank. However it is important to remember that this is only an aid for the classifier and does not absolve the classifier from the responsibility of classifying the load.

26. All mandatory tests shall be included on the transaction with the Test Code from the Barley receival Charts.

Weed Seed Types to be included where the load has been downgraded due to weed seeds.
DEFINITIONS

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 and includes any mechanical damage to the germ. May also be referred to as Cracked and Broken.

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

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

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

- **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

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
• 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 light to 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.

**Defective Grains**

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

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

An individual kernel may have more than one defect.

**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 or those grains when cut show an intense green colour in the cross-section. 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.

**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 not listed as Malt or Malt Varieties that do not meet the Malt Grade specifications are only acceptable into the barley Feed Grade. Refer Varietal Classification in Section 4 for more information.

Field Fungi
Field Fungi refers to individual kernels affected by the fungus *Cladosporium spp*. *Cladosporium spp.* gives the grain the appearance of black spotting occurring anywhere on the grain. Coverage greater than 1/8th of the grain surface is considered defective.

The fungus usually occurs during periods of high moisture or high humidity towards the end of the growing period into harvest.

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 rhoes*)
- Poppy (Horned) (*Glacium 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)
- Branched Broomrape (*Orobanche ramosa*)
- 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*)
- 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 (*Calocephalus sonderi*)
Phalaris glumes (*Phalaris spp*) Poverty weed (*Calocephalus sonderi*)
Rye grass 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:
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.

**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.

**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):

**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 two grade types:

- Malt Grade
- Feed Grade

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

**Heat Damaged, Bin Burnt or Storage Mould Affected**

**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 Affected**

Storage Mould Affected 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.

The above defective grains may become damaged to the extent that they may be referred to as Rotted. Rotted grains are included in the definition for Heat Damaged, Bin Burnt or Storage Mould Affected. Rotted grains are those that have become severely affected by the development of fungi or bacteria due to high moisture conditions. Individual grains appear distinctly discoloured by mould and may be swollen and soft. Affected grains may feel spongy under pressure and/or emit a mouldy odour.

**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 pests of grains. Grains may have a hole (commonly referred to as bored) or have a chewed appearance on any part of the grain.

**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:

<table>
<thead>
<tr>
<th>Large Insects</th>
<th>Small Insects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desiantha Weevil (<em>Desiantha</em> spp)</td>
<td>Aphids</td>
</tr>
<tr>
<td>Grasshoppers, Locusts</td>
<td>Minute Mould Beetle (<em>Corticaria</em> spp)</td>
</tr>
<tr>
<td>Hairy Fungus Beetle (<em>Typhaea stercorea</em>)</td>
<td>Mites (<em>Acarina</em> spp.)</td>
</tr>
<tr>
<td>Ladybirds</td>
<td>Stored Grain Insects (dead only)</td>
</tr>
<tr>
<td>Pea Weevil (<em>Bruchus pisorum</em>) (dead only)</td>
<td></td>
</tr>
<tr>
<td>Sitona Weevil (<em>Sitona</em> spp)</td>
<td></td>
</tr>
</tbody>
</table>
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.

**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.

**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. The definition may be varied by the Storage and Handling Agreement.

**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 discernable 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.*

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

- **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**

Pickling compounds are those chemicals added to grain as a seed treatment or as a seed dressing prior to sowing. They are usually associated with a colouring agent. Grains contaminated in this way may be identified by an unnatural surface colour and/or colour that rubs off.

Pickling Compounds include but are not limited to fenaminosulf, triadimenol, carboxin, flutriafol, bitertanol and any other fungicide added to the grain as a seed treatment.

**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 between 0.06mm and 2.00mm in diameter. Smaller material is classified under Foreign Material. Larger material is classified as Earth or Stones.

**Screenings**

See “Unmillable Material below the Screen”.

**Shot or Sprouted**

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

- Bursting of the grain at the germ end
- 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

Sprouted grains are those with any visible evidence of the shoot or root system beginning to emerge. Note that the Falling Number or RVA result always over-rides the visual assessment of Shot or Sprouted.

**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, in the two thirds of the grain closest to the germ end.

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 or Back Skinning - Part of the husk is missing from the side or the back 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.

Small Foreign Seeds
These are all small foreign seeds in the unmillable material fraction which have fallen below the 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.

Split or 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:

Split or Cleaved
Split or Cleaved barley is generally caused by rainfall events or rapid changes in moisture when grain is maturing. At this growth stage the grain may also be developing colour and is most susceptible to splitting. When grain begins to mature during hot dry periods, waxes begin to form on the outside of the grain and the husk begins to harden. The inside of the grain often begins to dry out but may still remain doughy. A sudden drop in temperature at this stage causes the husk and skin to harden further. Rain that falls after this event can be absorbed by the plant, and some will enter the grain causing a split along the crease. Alternatively the grain can burst at the husk which causes a split down the back, front or sides of the grain exposing the endosperm.

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

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.

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

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

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 or a Feed grade. The variety’s grade is not dependent on its geographical growing region.

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.

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.

MORPHOLOGICAL FEATURES

Kernel Shape (Twisted Grain)
This is a feature readily visible to the unaided eye.

SIX ROW BARLEY - has three rows on each side of the central stem called the rachis. The central rows can grow without problem, but the other four rows have to twist to fit in the cramped space. Therefore, on average, two-thirds of the grain will be twisted. Examples of six-row barley include Cape and Beecher.

TWO ROW BARLEY - the outer two rows on each side do not grow and only the even inner rows on each side develop, giving a sample with no twisted grains.

Aleurone Layer Colour
The aleurone layer is directly under the husk of the grain and is easily seen on skinned grains or when the husk has been peeled off. All current two-row varieties in Australia have a white aleurone layer. Some varieties overseas have a purple or black aleurone layer. Cape and Corvette are old Australian varieties with blue aleurone layers.
Rachilla Hair Length (Long V Short (Fuzzy))

It is important to note that the rachilla hairs are the most distinguishing feature and not the rachilla itself.

This feature generally needs the aid of jeweller’s eye loop with 5x or 10x magnification for recognition.

The rachilla is part of the barley flower, which remains on the grain. It does not seem to serve any purpose. It lies along the crease or hollow in the front of the grain, attached to the base or germ end and extending about one-third to one-half the grain length. It is generally thin and covered by one of two types of hair. Either it is densely coated with short fuzzy hairs or it has long glistening silky hairs. While the fuzzy haired type is always lushly covered, the long haired type can either be well covered or else have only a few hairs on it with the almost smooth rachilla easily seen.

As an aid to examining the rachilla hair type, it is useful to lift the rachilla out of the furrow of the grain. This can be done by tilting back the base of the germ end of the grain with the thumbnail. The rachilla can then be observed against a dark coloured surface so that the hairs are more easily seen. If the hairs are visible to the naked eye they are almost certainly of the long type.

Lemma Base Shape (Creased V Depressed)

This feature generally needs the aid of jeweller’s eye loop with 5x or 10x magnification for easier recognition.

The lemma is the skin on the back of the grain, which continues up into the awn. This is the opposite to the side of the grain to the crease and the rachilla. At the base of the lemma, the grain of some varieties will have a crease running across it, whilst other varieties will not have a crease.

Specific Variety Characteristics

In examining all barley features it is worth looking at more than one grain. Often the rachilla can be knocked out during the harvesting and sometimes the base of the lemma is broken off as well.

The features previously described enable varieties to be separated into a number of groups. Further separation into separate varieties can be more difficult and is usually not necessary at the silo.

Short Hair Rachilla and Depressed Lemma Base

Barque:
27. Similar to Galleon but slightly larger, plumper and brighter.
28. Tends to retain awns.

Capstan:
29. Exhibits short-medium length rachilla with short hair and depressed lemma base.

Chebec:
30. Similar to Schooner but an all round creamier colour.
31. Ribs running down centre of back and edges more pronounced than Schooner.
32. Smaller percentage of wrinkles evident.

Forrest:
33. Generally larger in size than Schooner.
34. Easily distinguished by purple - brown stripes prominent on ribs down the centre and edges of the back of the grain (however not all grains exhibit this effect).
35. Grains have a medium length rachilla with short hairs.

Gairdner:
36. Long grains but thinner than Schooner and Sloop.
37. Grains have a long stiff rachilla almost half the length of the grain.
38. Usually grown in higher rainfall areas.
39. There may also be 3 distinct veins visible on the back of the grain.

Galleon:
40. Usually longer and thinner than Schooner and has a brighter creamier colour.
41. Tends to retain more awn especially if reaped in cooler conditions.
42. When viewed side on, some grains display a slight downwards hook to the germ end.

Schooner:
43. Medium to average size.
44. Mellow colour tending to greyish underneath. Wrinkles evident mostly on top.
45. May have greyish colour lemma nerves.
46. Short-medium rachilla length with short hairs.

Sloop:
47. Slightly plumper than Schooner, off white to yellow in colour and more angular than Schooner.

Sloop SA:
Sloop VIC:
48. Tends to be more like Chebec than Schooner.
49. There is very little awn retention.

**Short Rachilla Hair and Creased Lemma Base**

**Weelah:**
50. Distinct crease evident at the lemma base.
51. Medium to large grain.
52. Can be chaffy with grains attached in groups to the rachis.
53. Has a medium length rachilla.

**Long Rachilla Hair and Depressed Lemma Base**

**Arapiles:**
54. Plump, medium size creamy coloured grain.
55. Shape can be quite distinctive.
56. Rachilla hairs are long and bushy.
57. Grown in Wimmera and Central Districts of Victoria.

**Baudin:**
58. Bred as replacement for Gairdner.
59. Has a slightly larger grain size than Gairdner.

**Clipper:**
60. Small to medium sized grains.
61. Mainly white in colour.
62. Medium-long rachilla length with long silky hairs that are dense at the rachilla base.
63. Grains have some wrinkling.

**Dhow:**
64. Tends to be plumper than Gairdner and has a soft, loose husk.
65. Dhow has short - medium length rachilla.

**Franklin:**
66. Predominantly small grain size – is typically classified using smaller screen size.
67. Off white to yellow colour.
68. Almost half of the length of grain is heavily wrinkled both top and bottom.
69. Rachilla lies close in crease.
70. Grown only in areas with higher rainfall.

**Keel:**
71. Plump grains with low screenings.

**Lofty Nijo:**
72. Plump grains with bushy rachilla.

**Maritime:**
73. Short-medium rachilla length with long hairs.

**Skiff:**
74. Small to medium size grain and under normal conditions is quite plump.
75. Caramel like colour and generally shows considerable husk and backbone in load.
76. Has a bushy rachilla and is very wrinkled.

**Tallon:**
77. Similar in most respects to Franklin, especially the wrinkles, but generally lighter in colour.

**Yagan:**
78. Large long angular grains, white to yellow in colour.
79. Rachilla hair long and bushy.

**Six Row Varieties**

**Beecher:**
80. Long thin grain, white colour with long rachilla hair.
81. Approximately two thirds of the grains are twisted.

**Cape:**
82. Grain exhibits a blue coloured aleurone, short rachilla hair and creased lemma base.
Two thirds of the grains are twisted.

### Summary of major grain characteristics

<table>
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<th>VARIETY</th>
<th>RACHILLA HAIR</th>
<th>LEMMA BASE</th>
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<td>Arapiles</td>
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