



Australian Grain Industry – Code of Practice Technical Guideline Document

No. 5 STATIC GRAIN SAMPLING – ROAD TRUCK

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Grain Trade Australia

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Technical Guideline Document

No. 5 Static Grain Sampling – Road Truck

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For more information contact Grain Trade Australia

www.graintrade.org.au

Phone: 02 9235 2155

Email: admin@graintrade.org.au

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1. Application

For the static sampling of a truckload of grain, for the purpose of assessment according to grain standards. This Technical Guideline Document does not cover the sampling of moving grain or the sampling of grain storages.

2. Discussion on Sampling

2.1 What is Sampling?

Sampling may be defined as obtaining a representative sample of the grain held in any particular truck. Typically the sample is subsequently analysed to determine the quality of the grain.

2.2 National Measurement Institute Regulatory Controls

There are no regulatory controls on sampling applied by the National Measurement Institute (NMI). Nevertheless, as sampling has an impact on other aspects of grain quality assessment that falls within NMI regulations, the NMI will continue to keep a watching brief on sampling protocols implemented by industry and may provide input where required.

2.3 Industry Standards

The method of sampling as outlined below is the same for all cereal commodities. It is listed in each cereal commodity GTA Trading Standard. Therefore, the sampling method forms part of the Standard for that applicable commodity. For other commodity types (e.g., pulses, oilseeds) those standards also refer to and require the same sampling guidelines to be applied, although the level of detail may differ.

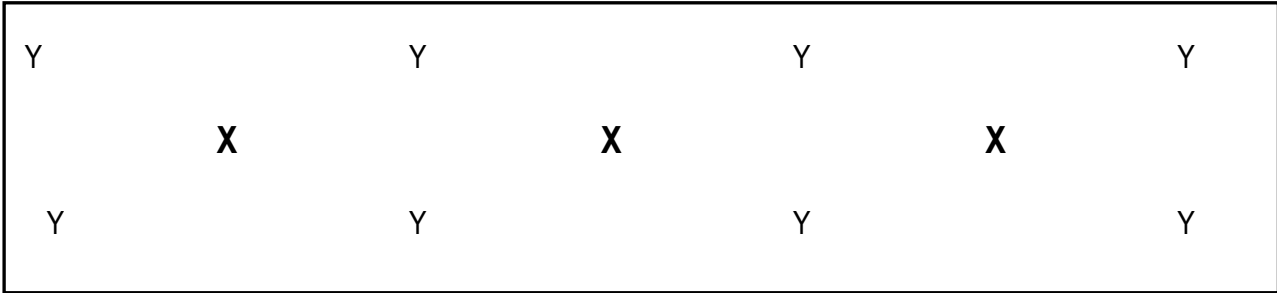
The key to having dependable and representative samples, is sampling often and then thoroughly mixing and/or dividing down the composite sample, so that a suitable size sample is available for assessment.

2.4 Sampling Locations and Number of Probes

The reference method used by the Australian grain industry for sampling of a grain truck is outlined in the Trading Standards Booklet for each cereal commodity, as produced by Grain Trade Australia (GTA).

The sample is taken by use of a probe that takes the same amount of grain at each point and throughout the entire depth of the grain in the truck. The locations of these probes as recommended by industry are depicted in diagram 1 below:

Diagram 1: Probe Location in Single Delivery Unit



- X** = primary location of probe for any sized truck, with a minimum of 3 probes per load
- Y** = placement of probe for truck sizes requiring above the minimum of 3 probes per load. Probes are placed systematically throughout the load

Following the full probing pattern as depicted in diagram 1 will not always be physically possible. In these instances, it is recommended that probes are to be taken evenly spread out along the length of the unit as close to the centre as possible. For practical purposes, the probe may be inserted into the grain (on one side of the truck) at an angle in order to obtain a grain sample at depth on the other side of the truck.

The following minimum sampling guidelines apply in Australia as per GTA Trading Standards:

- Ensure that at least 3 litres (L) of grain is collected from each truck unit tendered for delivery.
- The number of probes depends on the quantity of grain tendered for delivery, with larger loads requiring a greater number of probes as outlined in diagram 2 below

Diagram 2: Number of Probes based on tonnage in Load

| | |
|--|------------------|
| 10 tonnes or less | 3 L / 3 probes |
| Over 10 tonnes and up to 20 tonnes | 4 L / 4 probes |
| Over 20 tonnes and up to 30 tonnes | 5 L / 5 probes |
| Over 30 tonnes and up to 40 tonnes | 6 L / 6 probes |
| Over 40 tonnes and up to 50 tonnes | 7 L / 7 probes |
| Over 50 tonnes and up to 60 tonnes | 8 L / 8 probes |
| Over 60 tonnes and up to 70 tonnes | 9 L / 9 probes |
| Over 70 tonnes and up to 80 tonnes | 10 L / 10 probes |

Note that legal weight restrictions will apply to the tonnage permitted in individual truck units.

The amount of grain obtained each time the probe is inserted into the grain will depend on the method used and type of probe. This may alter the quantity obtained from that outlined above.

As outlined in diagram 1, the probes are to be placed systematically into the load into the general areas as indicated. In undertaking this approach:

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- The probing should avoid unrepresentative areas of the load that do not appear to be uniform throughout the load such as an area containing high chaff levels. For example, if the probe was placed into this area, the sample obtained would contain levels of chaff that are not reflective of the overall average of the load.

Each truck unit tendered for delivery is to be probed separately:

- If the grain in each truck unit is of the same quality, then the samples may be combined and only one assessment should be made for the entire load. This is the most common method of sampling a truck with more than one unit. Variations to this policy may exist for some grain types.
- If on inspection the vehicle has more than one unit with grain that appears to be of a different quality, then an individual assessment should be made for each unit. This also applies where it is requested by the deliverer of the grain that each unit be separately assessed. Therefore, a separate sampling and assessment process is to apply for each truck unit.

2.5 Sampling Equipment

There is a range of sampling equipment used by industry to obtain a representative sample. Industry is free to use any sampling equipment provided it generates a representative sample of the truckload of grain.

The most common probes in Australia are manual, vacuum or pneumatic sampling devices.

2.5.1 Manual Probe

The manual probe spear is made of aluminium or steel and has two tubes:

- The inner tube is divided into compartments
- The outer tube has slots that match the compartment openings of the inner tube

Probes come in various lengths, generally 1.5m, 1.8m or 2m. Depending on the probe length and sampling platform height, these shorter probes may not reach the bottom of large trucks.

When the tubes are aligned, grain enters the compartments of the probe.

The probe compartments should open sequentially from the bottom to the top so that grain enters the tube from the bottom first (if it opened from the top first, grain from the top of the load would enter the probe and fill it. No grain from the bottom of the load would be collected). Some older manual probes open all slots at the one time and sequentially from the top, it is recommended that these probes not be used.



The basic operation is as follows:

- Ensure the probe is clean and empty.
- Close the slots on the probe.
- Insert the probe vertically into the grain to its full depth.
- Hold the outer probe compartment and open the inner tube.
- After the probe fills (visually hear grain flow ceases) fully close the probe.
- Remove the probe from the load and upend the probe over a clean plastic bucket. The grain will flow from the open end of the probe into the bucket.

2.5.2 Vacuum Probe

A vacuum probe is an air assisted sampling instrument. The probe is hollow. The probe is connected to the sample collection device by a flexible hose through which the grain flows. Grain flows into the probe and into a collection device located on the sample stand or in/near the sampling and testing location. The flexible hose allows the probe to be moved to enable the probing to occur over the entire area of the truck, generally without moving the truck.

Vacuum sampling devices are varied in their design. The two main criteria required for proper use are:

- The suction is of sufficient strength to draw the sample of grain from the bottom of the probe into the sample collection device without altering the grain composition.
- The probe is sufficiently robust and long to be inserted to the bottom of the load.

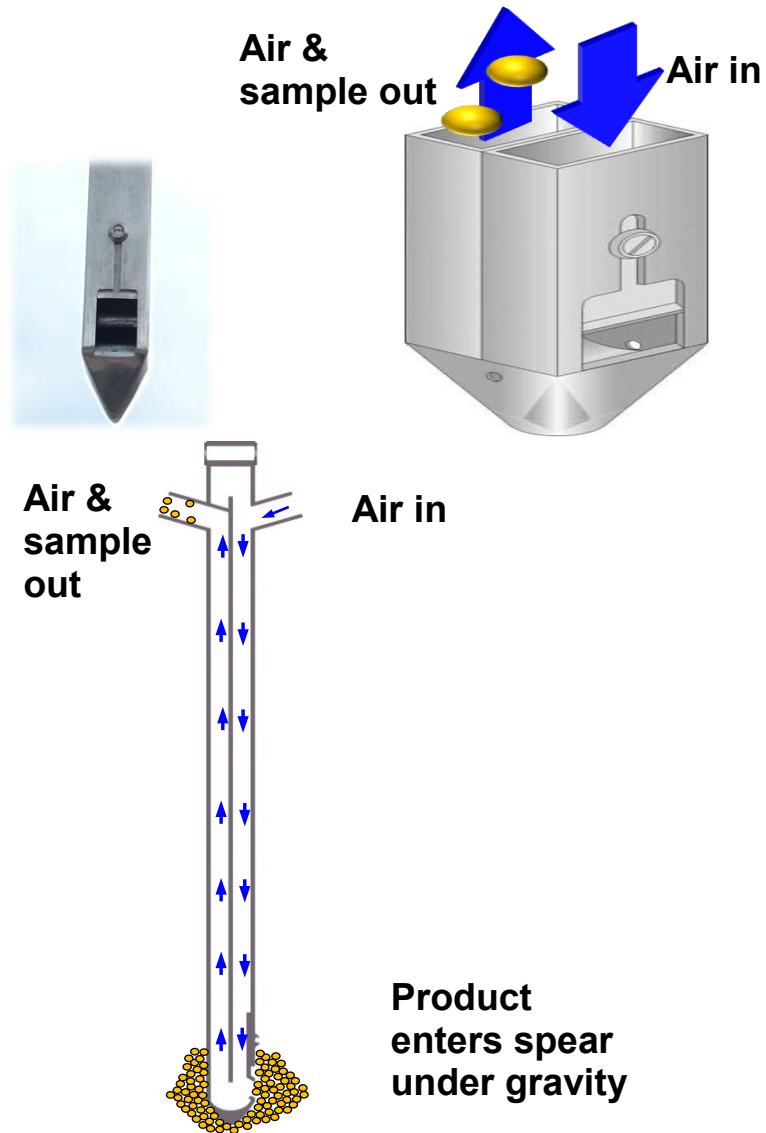


The basic operation is as follows, noting that depending on the type of unit, the following procedure may vary slightly:

- Ensure the probe and flexible hose is empty of grain before turning on the vacuum unit and inserting the probe in the load.
- The probe should be inserted into the load and removed from the load in one smooth action.
- Insert the probe into the top 30cm of the load.
- Place hand over the hole in the top of the probe to create suction.
- Insert probe into grain keeping your hand over the exposed hole.
- Push the probe into the load at a constant rate until it reaches the bottom.
- Upon reaching the bottom of the load, immediately remove your hand from the hole to prevent suction removing an excessive amount of grain from the bottom of the load compared to other locations throughout the grain bulk.
- Only operate the probe when pushing the probe into the load i.e., grain should not be taken from the load when withdrawing the probe from the load.
- Remove the probe from the load and wait until all grain has exited from the probe and flexible hose and has entered the sample collection device. Placing your hand over the hole, or straightening the flexible hose, may assist in removing any remaining material in the probe or hose.
- Depending on the probe type and the technique of the sampler, the probe should be in the grain no more than 4-5 seconds when inserting the probe into the load and the same when removing the probe from the load. Do not keep the probe on the bottom of the load.
- Ensure no material remains in the probe or flexible hose before turning off the unit.

2.5.3 Pneumatic Probe

These types of grain probe are generally recognised as the easiest method to take a sample from any sized truck unit. They may be pneumatically or hydraulically operated. There are various types available, with many operating with some form of telescopic arm that can extend or retract the core sampling tube. They are often able to be turned horizontally and raised or lowered vertically, enabling access to the truck without requiring the truck to be repositioned.



The basic operation is as follows, recognising various models may differ:

- Some form of remote control operates the sample probe.
- The core tube is forced vertically downward into the load. As this occurs, due to the downwards pressure grain enters the probe.
- Grain is pushed upwards into the inner chamber of the core tube as the probe is pushed downwards into the grain.
- Grain is moved to the receiving chamber for collection.
- The size of sample taken depends on the model. Once set, this is consistent each time the probe is inserted into the load.
- These units operate on the principle that only the grain that is forced into the core sample tube is taken as the sample.
- Given most units operate mechanically, the probe inserted into the truck takes a sample through the entire depth of the load i.e., to the bottom of the truck.

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2.6 Overseas Comparisons

2.6.1 International Sampling Methods and Equipment

There are a range of international standards relevant to the sampling and testing of grain. Several of these outline specific sampling processes for “static grain bulks”, as per truckloads sampled according to this Technical Guideline Document. These include:

- ISO/TC 34 Standards: ISO 542, ISO 5500, ISO 6497;
- ISO 6644, ISO 7002, ISO 13690;
- ISO/DIS 24333;
- [ISO/TC 69: ISO 2859 family, ISO 3951 family];
- Codex Sampling Standard;
- National country documents e.g., USDA GIPSA, Canadian Grain Commission;
- Independent Inspection and Surveyor methods; and
- Trade contracts e.g., GAFTA.

While differing, the majority include some common principles of sampling. For example, in ISO 24333:2009(E) Cereals, pulses and milled products – Sampling of Static Batches, it states:

- Samples should be as representative as possible from the lots from which they are taken.
- As the composition of a lot is seldom uniform, a sufficient number of increments shall be taken and carefully mixed, thus giving a bulk sample from which, the laboratory samples are obtained.
- The lot should be sampled over its entire depth.

Many include principles that are outlined in Australian standards. For example:

- “Where grain samples are required to be taken from wagons or vehicles at loading, the increment samples shall be taken by spear from not less than 3 sampling points from each wagon or vehicle.”
- “Mechanical sampling devices can be used if the principle of sampling according to which they function does not create any segregation at the probe tube intake and do not cause damage to the grains.”
- The Codex General Guidelines on Sampling (GGS) provides guidance on sampling and sets out sampling plans intended for use by Codex commodity committees or, if applicable, by governments in case of international trade disputes.
- The General Standard for Contaminants and Toxins in Food and Feed (GSCTF, Codex Standard 193) lists the maximum levels and associated sampling plans of contaminants and natural toxicants in food and feed.
- The Codex Commodity Standards Procedural Manual sets out a number of procedures for the development of conformity assessment provisions in commodity standards. There are a wide range of provisions for conformity assessment. Some standards do not mention sampling plans, some refer to general guidance on sampling plans, some refer to specific sampling plans and some specify a sampling plan and acceptance procedure in the standard itself.

Research into improved sampling methods, including sampling equipment continues internationally. For example, issues being considered by the Codex Committee on Methods of Analysis and Sampling include:

- Sampling variability;
- Sub-sampling methods and variability;
- Considerations on measurement uncertainty;
- Contractual obligations;
- Consideration of preventive measures in exporting countries to ensure exported foods meet requirements;
- The possible implications of those measures for the design of sampling and testing procedures at the point of import; and
- Reducing the probability of a subsequent dispute occurring through pre-market procedures.

Further, there are a number of principles outlined in those various international standards to be considered in any review leading to a potential change to sampling and testing processes. These include:

- “Risk management decisions should be commensurate to the assessed risk and should take into account the economic consequences and feasibility of risk management options. Risks due to conditions during storage and transport should be considered by all business operators in the food distribution chain. In order to achieve this there should be an understanding of the impacts of sampling and testing options on all affected parties.”
- “Risk management itself should be a continuing process that takes into account all newly generated information, including scientific information, in the evaluation and review of risk management decisions based on sampling and testing.”
- “The sampling and testing procedure applied should be appropriate to the commodity or lot to be sampled and tested, fit for intended purposes and applied consistently”.
- Practical considerations must be taken into account. “The choice of a sampling and testing procedure should take account of practical matters such as cost and timeliness of the assessment and access to lots, provided that consumers’ risk is not significantly compromised.”
- Review procedures are required. “Sampling plans and test methods should be reviewed periodically to ensure they take account new science and information.”

2.6.2 Competitor Sampling Methods and Equipment

The need for appropriate sampling is recognised by many overseas countries that compete with Australia for grain export markets.

CANADA

The following information is obtained courtesy from the Canadian Grain Commission website, not cited verbatim:

- The key to having dependable and representative samples is sampling often and thoroughly mixing and dividing down the selected sample. Equipment used at a grain handling facility usually copes with variable quality by taking multiple samples or by using a sampling process that takes samples at regular intervals.

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- Automatic mechanical sampling systems used for inward receipt of grain at licensed terminal elevators is outlined in the Sampling Systems Handbook and Approval Guide produced by the Canadian Grain Commission (CGC).
- A grain handling facility mandated or requesting CGC inspection services must install CGC-approved automatic sampling equipment to sample grain in the facility. There are a range of written procedures and protocols to follow to ensure the equipment is “operating as intended”.
- In general, the CGC will give approval only to automatic sampling systems that extract a complete and proportional cross-section of the grain stream (both height and width), proportionally reduce the sample size, and deliver the sample to the inspection area. Samplers of this type are commonly referred to as cross-stream diverter-type samplers.
- Samplers that are considered by the CGC to be in use “seasonally” will be evaluated prior to commencement of the season.
- Each company shall establish, document, implement and maintain a Grain Sampling System Manual.
- Manual sampling of the grain stream may occur.
- A Boerner-type divider is the only divider approved for use by the CGC.
- As some of the requirements and stipulations stated may not be appropriate or necessary in all situations, official agency staff may develop local quality control procedures.

Thus the Canadian system relies to a large extent on sampling from the grain stream for bulk grain. Note that small static parcels (greater than 100kg) can be probed using officially recognised double sleeved triers, procedures etc.

USA

The following information is obtained courtesy from the United States Department of Agriculture website, not cited verbatim:

- The United States Department of Agriculture Federal Grain Inspection Service Program Handbook on Grain Sampling outlines the policies and procedures for sampling grain in accordance with the regulations under the United States Grain Standards Act.
- Obtaining a representative sample from a lot of grain is an important and essential part of the grain inspection process. If the sample is not representative, the inspector's final grade will not reflect the true grade of the lot. For a sample to be considered representative it must be obtained by official personnel using official procedures and FGIS approved equipment.
- The depth of the carrier or container dictates the length of probe that is used to draw the sample. Probes to be used are specified. Whenever the bottom of a carrier/container is not reached by all probes, show the special statement "Top X feet sampled. Bottom X feet not sampled."
- The carrier may be entered for the purposes of sampling.
- The in-load suction probe has a tendency to overestimate foreign material and should not be used for trade.
- Non-compartmented grain probes and open-ended grain probes are not approved for official sample-lot inspections but may be used for official commercial inspection.
- For each type of carrier, there is an established sampling pattern also based on the amount of grain held (over or under 4ft deep) and whether the truck floor is flat or coned.
- Probe-type mechanical samplers are only approved for sampling trucks.
- Diverter-type (D/T) mechanical samplers are used to sample moving grain, and may be mounted in grain spouts, at the end of belts, or at the head of elevator legs.

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- Manual sampling of the grain stream may occur.
- As some of the requirements and stipulations stated may not be appropriate or necessary in all situations, official agency staff may develop local quality control procedures.
- The major components of any mechanical system must be of a model and type approved by the FGIS.
- For mechanical truck probes, the model and type of probe-type mechanical sampler must be approved by FGIS. Only 2 are approved, being gravity filled and core probes. In-load suction probes are not approved as “they draw air through the load of grain and vacuum excessive amounts of fine foreign material into the sample”.

2.6.3 Comparisons with Australian Sampling Systems

A general comparison and general reasons why the Australian system (in relation to sampling only) differs from those applying in some overseas countries is outlined in table 1 below. Note the list is not prioritised and the issues are not listed in any specific order. The importance placed on each item listed varies over time and based on the specific commercial arrangement applying in the industry sector.

In addition, statements made are generalisations only, based on interpretation and are not necessarily official policy of overseas Governments or bodies.

Table 1: Factors influencing Australian Sampling Methods and Procedures

| Factor | Australia |
|--|---|
| Regulated Standards | <ol style="list-style-type: none"> 1. Industry voluntary standards are based on commercial requirements of the marketplace. 2. Generally, industry applies common standards. |
| Regulated Sampling Method | <ol style="list-style-type: none"> 1. The market or Government regulator does not stipulate which method is to be used to obtain a representative sample. 2. Method was designed many years ago based on research and is still essentially the same today. |
| Regulated Equipment | <ol style="list-style-type: none"> 1. The market does not stipulate which equipment is to be used to obtain a representative sample. 2. Historically there are many smaller receival sites, thus not requiring or is it commercially viable to install costly mechanical systems. 3. Equipment used has satisfactorily met market requirements and the industry need of managing “quality in versus quality out”. |
| Storage Site Design, Operation and Control | <ol style="list-style-type: none"> 1. Major reliance on receival of harvested grain into country elevators, with a need for rapid receival but at the same time to be accurate and appropriate for the individual storage site. 2. Commercial operations apply throughout the supply chain with no government oversight. Regulations apply only on export. 3. On outturn to bulk export terminals the opportunity then arises to blend that grain. On export regulated sampling processes are employed for the purposes of quarantine. Those same sampling protocols are used for grain quality assessment under commercial arrangements. 4. Mandatory approved Sampling Manual and auditing of systems are not required however elements are being phased in under the Code of Practice. 5. As listed under 2.6.1, there are many principles and documents relating to sampling to be considered. To include all provisions in determining a revised sampling system that covers standards, commercial contracts, testing and certification etc. is complex. Thus, industry has chosen to “keep it simple”. |

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| Factor | Australia |
|---|---|
| Accuracy, repeatability, reliability etc. | <ol style="list-style-type: none"> 1. To date the systems employed in Australia have served the industry well. 2. Practical, economic and industry peer consensus view considerations are taken into account when selecting equipment to be used. 3. There is an understanding that if sampling is not done correctly as per industry standards, grain quality assessment may be compromised leading to contractual issues on outturn. |
| Regulated Dispute situations | <ol style="list-style-type: none"> 1. Industry developed dispute resolution process, either formally through GTA contracts or via discussion between the two commercial parties. |

2.6.4 Developments in Australian Sampling Systems

Despite the current system having a satisfactory history of operating effectively, industry is rapidly undergoing a process of review and continuous improvement in relation to sampling and testing methods. This is being undertaken for a number of reasons, only partly in response to those systems in use overseas.

Potential future improvements and changes already underway are outlined below:

Manual Systems

- There are virtually no manual probes now used commercially, although some do exist.

Vacuum and pneumatic Systems

- It is recognised that vacuum and pneumatic systems are operationally more flexible and appropriate to high throughput receival sites and are being introduced as required.
- Such systems are also being introduced for Workplace Health and Safety reasons at some locations.
- These systems enable sampling to the bottom of large trucks, often travelling large distances prior to tendering the load. Subsequent compaction of the load creates difficulty in using hand-held or vacuum probes. This is exacerbated for large pulse commodities such as faba beans. Thus systems are changing as required.

Industry Responsibility & Continuous Review

- An industry Code of Practice has been developed to outline acceptable sampling and testing practices. Elements of that Code include but are not limited to the following, recognising the level of sophistication and accuracy will vary by organisation, location used, purpose of use and commodity being assessed:
 - Only equipment suited to its intended purpose is to be used;
 - Staff training;
 - Documented procedures for equipment use and sampling and testing procedures are outlined in the company Sampling Manual or the Operating Procedures;
 - Equipment checked and audited on a regular basis;
 - Industry committed to continually evaluate and improve processes and systems; and
 - The preference is for the use of automated versus manual probes.
- The change to mechanical systems is not market driven, as to date there has been no evidence of a failure to correctly identify the quality of grain received. That is, the quality of grain outturned (domestic or export market, bulk, container or road truck/rail wagon) has generally been as expected based on receival sampling and testing. This policy was emphasised by industry to several grains exporting countries during the recent revision of ISO 24333 "In developing ISO 24333, industry needs revised ISO

methods that conform to current practices, noting that current practice(s) have not been identified as deficient”.

- Through membership on a Grain Quality Measurement Committee, industry works closely with Government (National Measurement Institute) on all aspects related to sampling and testing of grain for the purposes of trade. Industry is assisting the Government in its endeavours to achieve international standards for relevant equipment involved in the classification of grain.
- Through members of the Grain, Plant Products Export Industry Consultative Committee, industry is reviewing applicable sampling systems used at the point of export. Consultation with the Australian Government involves input into development of appropriate sampling regimes for export grain parcels where static sampling is required.

Research into Sampling Systems

- Australian Standards are revised based on Australian requirements and taking into account any relevant overseas systems or regulations.
- The results of studies on the effects of different types of probes, the number of samples and how the probe is inserted into a load of grain (angle etc.) have influenced the development of current and will influence future changes to standards. Many studies have been done and the outcomes are variable. For example, in one study on corn and soybeans:
 - “The hand probe overestimated the Foreign Material content”.
 - “Different models of mechanical probes provided different results and those were significantly different than hand held probes”.
 - “In all corn tests and in all soybeans tests except one, vacuum probes overestimated FM content”.
- Prior Australian research led to the development of the existing sampling protocols. It is recognised that work was conducted many years ago, however it is still cited in documents such as the NMI M8 as noted under point 2.3. That prior research identified that inappropriate sampling techniques, including incorrect use of the vacuum probe, would lead to a non-representative sample being taken from the load tendered for delivery.
- Studies indicate variability among probe types. The variability in mechanical probes is shown by choice of equipment when industry has introduced those systems to replace existing probe systems (verbal communication).
- As outlined, vacuum probes are difficult to use for some commodities and in some circumstances cannot reach the bottom of the load. Thus obtaining a representative sample is not possible. In these circumstances industry uses other sampling methods to identify any issues with grain in the load (e.g., tailgate sampling during discharge).
- To undertake a major upgrade in sampling systems is an expensive exercise. For this to occur at a rate faster than current adoption, further research would be required that indicates the current systems used are not appropriate. Nevertheless, approaches have been made for further research into sampling systems used in Australia to be undertaken to evaluate:
 - The capacity of vacuum probes to deliver a representative sample.
 - The need for repeatability of results.

As there has not been any data provided on the financial loss to the industry of inappropriate sampling systems, this research to date has not been considered a high priority compared with other industry issues being undertaken.

2.7 What Errors Can Occur During Sampling

There are many errors that may occur when using equipment to obtain a representative sample. Each error may have a significant impact on the ability to accurately determine the quality of the grain in the truckload tendered for delivery. Potential errors when sampling with a potential impact on the outcome obtained are outlined below.

2.7.1 General Errors – all Probe Types

The following outlines issues that may apply to one or more sampling methods, with the impact varying based on the sampling method:

- Insufficient number of samples taken for the composite sample to be considered representative of the load;
- Insufficient size of sample taken for accurate assessment of the load or for all quality tests to be conducted;
- Entire truckload of grain not exposed to sampling process resulting in sample not being representative of the load;
- Truck parked too far from sample stand resulting in samples unable to be taken from the required area of the load;
- Sample stand too low resulting in sample not being taken from lower areas of the load;
- Sample stand too high meaning full access to the load cannot be achieved;
- Lesser number of samples taken for the tonnage delivered, resulting in sample not being representative;
- Probe is deliberately inserted into areas of high contamination or poor quality, that is not reflective of the entire parcel quality;
- Probe used cannot reach the bottom of the load, increasing the potential for not sampling poor quality grain that may be present on the bottom of the load;
- Probe is not inserted in a vertical position into the load but at an extreme angle, meaning parts of the load are not sampled;
- Sample probe not placed in recommended areas of the load, leading to non-representative sample being obtained;
- Incorrect sample size per probe taken, if lower amount, risk of mis-classification;
- Probe not clean, leading to contamination of subsequent sample obtained from truck;
- Sampling equipment (hoses, collection chamber etc.) not clean, leading to contamination of subsequent sample obtained from truck or inability to obtain required volume of sample;
- Sampling hose interior surface not smooth (i.e., corrugated), leading to potential contamination with material remaining from prior load;
- Sample obtained from probing the truck not adequately mixed prior to assessment;
- Excessive amount of sample obtained from probing the truck creating difficulty in adequately mixing prior to assessment;
- Sample stand and truck to be sampled not physically located or placed in required position in order for safe sampling to occur or for the probe to be properly inserted in the required positions (e.g., truck too far from sample stand);
- Sample collection chamber or container collecting probe samples not adequately cleaned and thus contaminated from prior load;
- Surface of load not visually observed during sampling, resulting in non-detection of prohibited nil tolerance material that may not “fit/be collected” into the probe type being used;

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- Settlement of fine particles during transit of load and failure to ensure probe is inserted the full depth of the load due to this material being compacted; and
- Deliberate tampering or layering of load or general unevenness of grain during loading may not be detected if the entire depth of the load is not sampled.

2.7.2 Manual Probe Errors

- Probe not of sufficient length to reach the bottom of the truck;
- Different types of probes e.g., tapered versus non-tapered;
- Probe physically cannot be inserted into the entire depth of the load due to compaction of the load or physical contamination with a large amount of finer material in the lower part of the load;
- Probe inserted into the grain in the open position, resulting in sample obtained from top portion of the load only;
- Probe not closed prior to removal from load, resulting in sample lost from the probe;
- Probe cleaned by oil, resulting in contamination from the foreign material from the load onto the probe and difficulty in using the probe;
- Probe rusted from water ingress, resulting in difficulty in using;
- Due to operational difficulties of using the manual probe (i.e., Workplace Health & Safety rules preventing the samplers from leaving the sampling platform), probe cannot be inserted into the entire depth of the load; and
- Probe cannot be inserted in all required areas of the truck (i.e., other than in the immediate vicinity at the edge closest to the sample stand).

2.7.3 Vacuum Probe Errors

- Probe not sufficiently robust to withstand being inserted vertically into the truck to the bottom of the load (i.e., probe is bent, made of plastic, bottom opening hole damaged);
- Probe blocked with material from a prior load, leading to reduced suction and inability to obtain a representative sample from entire depth of the load;
- Vacuum hose attached to the probe blocked with material from a prior load (caused by kinking, not operating probe motor until all material is removed before re-inserting probe, hose interior surface is corrugated and not smooth), leading to reduced suction and an inability to obtain a representative sample from the entire depth of the load;
- Vacuum hose has holes in it, reducing the suction and ability to obtain a sample from the entire depth of the load;
- Vacuum probe motor not sufficiently powered to obtain a sample from the entire depth of the load;
- Vacuum probe excessively powered, resulting in collection of an excessive quantity of lighter foreign material when used incorrectly;
- Vacuum probe motor filter not regularly cleaned, reducing suction;
- Probe suction not commenced until probe inserted a long way into load, leading to failure to sample the top part of the load;
- Probe not inserted in a smooth manner throughout the load, resulting in inequitable collection of grain at different points in the load where the probe movement “halts or slows”;
- Probe inserted too slow through the load, resulting in excessive sample collected;
- Probe inserted too rapidly, resulting in insufficient sample collected; and

No.5 Static Grain Sampling – Road Truck

- Probe suction continues while probe is located at the bottom of the load, resulting in excessive amount of material collected from that area in comparison to other areas of the load.
- If suction is too high, too great a quantity of sample is obtained and the potential exists to draw loose dust and smaller material in the load. This would create a non-representative sample.
- If suction is too low, grain cannot be drawn through the probe and into the sample collection device.
- Due to operational difficulties of using the vacuum probe (i.e., Workplace Health & Safety rules preventing the samplers from leaving the sampling platform), probe cannot be inserted into the entire depth of the load.

2.7.4 Pneumatic Probe Errors

- Probe bottom is not stoppered or does not have an automatic “stop valve”, resulting in the probe going through the floor of truck or being damaged on the bottom of the truck;
- Probe is inserted into the load in exactly the same location each time, potentially leading to trucks being “doctored” with grain where probe is not inserted;
- Probe sensors not working correctly, resulting in the probe not being inserted in the entire depth of the load; and
- Incorrect air flow resulting in sufficient sample not being obtained for each probe

2.8 Impact of Incorrect Method/Equipment & Potential Actions to Take to Rectify

There may be significant consequences arising from the incorrect sampling of a load. To minimise the occurrence of such events, or the impact, a range of measures as outlined in this Technical Guideline Document can be undertaken. Other measures can also be taken as outlined below.

When using any sampling apparatus and method, industry is strongly encouraged to:

- Set-up equipment based on manufacturer recommendations;
- Document the procedure to be done, including routine maintenance and cleaning;
- If possible, certify the equipment a minimum of once a year (e.g., it is operating as per manufacturers specifications and intended purpose);
- Regularly monitor the condition of all equipment ensuring it is operating correctly, at an adequate standard, is clean and contaminant free;
- Damaged equipment should be inspected prior to commencement of use and repaired where required;
- Operate the equipment exactly the same each time it is used for the purposes of sampling;
- Follow industry sampling protocols; and
- When upgrading or purchasing new sampling equipment, only purchase equipment suited to the “sample stand set-up”.
- Ensure all staff are adequately trained in the use of equipment and that training is ongoing to ensure staff are deemed competent at all times (e.g., annual refresher training); and
- Have a documented dispute assessment procedure that outlines the processes to be followed when a result obtained from assessing a representative sample is disputed.