

Current Report

Cooperative Extension Service • Division of Agriculture • Oklahoma State University

WHEAT SAMPLING AND HAND SIEVING PROCEDURES

Kim Anderson
Extension Economist

To obtain a representative grade of grain in a bin, truck, rail car, barge, or ship, proper sampling and sieving procedures must be followed. Official grades are determined through proper probing procedures and the use of a dockage machine. The hand sieving methods presented in this Current Report are not used by official grain inspectors licensed by the Federal Grain Inspection Service. Licensed graders must use precision mechanical equipment that will provide the most accurate and more uniform results.

REPRESENTATIVE SAMPLE

Obtaining a representative grain sample is an essential part of grain inspection. Without a representative sample, the final grade will not reflect the true grade or value of the grain.

In order for a sample to be considered representative, it must:

1. Be obtained in accordance with recommended procedures,
2. Be of the prescribed size (approximately 2-1/2 quarts but not less than 2 quarts in size), and
3. Be handled securely, protected from manipulation, substitution, and careless handling.

Representative samples may be drawn from truck lots and car lots by either probe, pelican, Ellis cup, woodside sampler, or diverter-type mechanical sampler. In case of export cargo (shiplot or bargelot) shipments, samples must be obtained by diverter-type mechanical samplers.

The following pages explain the proper way to do probe sampling. This information was taken from Federal Grain Inspection Handbook I, Chapter 3, Grain Sampling.

Probe Sampling

A large percentage of grain, as it travels from the farm to the final consumer, is at one time or

another sampled with a probe. Probe sampling is the only approved method for obtaining samples from stationary lots. If probe sampling is performed correctly, the samples drawn will consistently be representative.

The Equipment

Before learning the sampling procedure, the sampler should become familiar with the equipment he will use in carrying out his duties.

A. Probe. This standard piece of equipment, sometimes referred to as a trier, is constructed of brass or aluminum. Probes come in various sizes with standard lengths of 5, 6, 8, 10 and 12 feet. The type of carrier dictates which probe length shall be used. Probes consist of two tubes, one inside the other. All official grain probes are 1-3/8 inches in diameter (outer tube). The inner tube is divided into compartments. The outer tube has slots which match the compartment openings of the inner tube. When the tubes are aligned, grain may enter into or be extracted from the compartments in the probe.

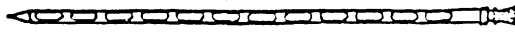
The following lengths of double-tube compartmented grain probes are approved for use by official inspection personnel for sampling lots of bulk grain:

Container	Length of Trier	Number of Compartments
Barges and Bay Boats	12-ft	20
Hopper Cars	10-ft	20
Boxcars	6-ft	12
Trucks	5 or 6-ft	11 or 12
Hopper-Bottom Trucks	6, 8, 10-ft	12, 16 or 20

Other containers - Use grain probes that will reach the bottom of the container.

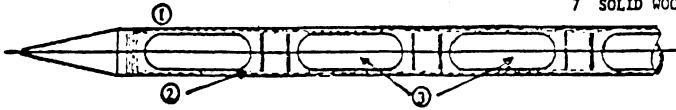
Whenever the bottom of a container is not reached by all probes, the special statement, "Top _____ feet sampled. Bottom not sampled," shall be shown on the sample ticket. The number of feet shown in the

Grain Probes

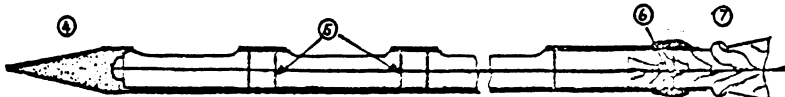


STANDARD SIX FOOT PROBE (TRIER)

- 1 OUTER TUBE
- 2 INNER TUBE
- 3 COMPARTMENTS
- 4 POINT
- 5 PARTITIONS
- 6 LOCKING PIN
- 7 SOLID WOOD HANDLE



VIEW SHOWING COMPARTMENT OPENINGS



statement shall correspond to the estimated average depth of all probes which did not reach the bottom of the carrier.

Example: A sampler is unable to reach the bottom of a hopper car compartment after inserting the probe to its full 10-foot depth. The bottom of the next compartment is not reached after the probe is inserted 8 feet. In the last compartment, the probe reaches the bottom after being inserted 9 feet.

Since the bottom of the container was not reached in all probes, the statement, "Top 9 feet sampled. Bottom not sampled," shall be shown on the sample ticket. The average of the two probes that did not reach the bottom (8 and 10 feet) is 9 feet.

Noncompartmented grain probes or open-ended probes shall not be used by official inspection personnel to sample bulk lots of grain for official inspection under the United States Grain Standards Act. Studies have proven that noncompartmented grain probes do not obtain representative samples.

B. Sampling Canvas.

This piece of equipment shall be constructed of heavy canvas cloth or similar material. Always use a sampling canvas(s) that is at least 6 inches longer than the probe used to draw the sample. This size is necessary so that the grain from the entire length of each probe will not spill off the ends of the canvas. Sampling canvases must always be kept clean, dry, and free of holes.

Half sections of pipe, similar to rain gutters, may be used instead of sampling canvases.

C. Sampling bags.

Bags shall be made from heavy cloth or canvas, have a draw string closure, and be large enough to contain up to 4 quarts of grain. Sample bags shall be free of all old grain, insects, and other waste material prior to use. It is also recommended that the

bags be lined with a polyethylene liner to prevent loss of moisture and to protect the sample from adverse environmental conditions, such as rain or humid weather.

Containers such as metal buckets or plastic cans may be used in lieu of sampling bags, provided the containers are clean and dry.

General Procedures

Before sampling any carrier, record on your sample ticket the carrier's identification number. Then, break the seals that secure the hatches or doors that are to be opened. Record the broken seal numbers on the sample ticket. Open the door(s) and enter the carrier. The applicant for inspection shall be responsible for removing the tarp from trucks and trailers, opening roll-top barges, and trimming (leveling) the grain in the carrier.

After entering the carrier, visually examine the whole lot of grain. Take a handful of grain from several locations and check it for odor. Record any unusual conditions on your sample ticket. Next, spread your canvas and check to see that the probe and canvas are clean and dry. You are now ready to start sampling.

There are several ways to insert the probe into the grain. Regardless of which technique you use, these general rules shall be followed:

1. Insert the probe at a 10 degree angle from the vertical, with the slots facing upward and completely closed. A 10 degree angle is used to obtain a cross-section of grain, while placing the end of the probe as close to the bottom of the carrier as possible. As the grain becomes more compacted, greater force is needed to reach the bottom of the carrier. The 10 degree angle eases the resistance of the compacted grain against the probe. The slots must be kept closed until the probe is inserted as far as it will go. Otherwise, a disproportionate amount of grain from the top of the lot will fall into the probe compartments as it is being inserted.

When sampling grain which contains sand or grit, insert the probe with the slots downward to avoid freezing it. After the probe is inserted, turn the slots upward before opening.

2. After the probe is fully inserted, (with the slots facing upward) open the slots and move the probe up and down quickly in two, short motions. When sampling grains, like oats and barley, additional up-and-down movement may be necessary to fill the probe. Close the slots completely, grasp the probe by the outer tube, and withdraw it from the grain. Do not pull the probe by the wooden handle. This can result in the inner tube being pulled out of the outer tube. When this occurs, the probe must be emptied, reassembled, cleaned, and the area probed again.

3. Empty the probe on the canvas and compare the grain from each depth of the probe for uniformity of kind, condition, and infestation. Also, compare the probe to others drawn from the same lot. If all probes and portions of probes are uniform with one another, they shall be composited and placed in a sample bag along with a completed sample ticket. If the examination of the probes indicate that the lot of grain is made up of distinctly different parts in regard to condition (such as musty, sour, commercially objectionable foreign odor, or heating grain), the sampler must then draw a sample from each of the different parts, in addition to the sample that represents the carrier as a whole.

4. When transferring the grain from the canvas to the sampling bag, take care not to spill any portion of the sample or allow fine material to be blown from the canvas.

5. Close all hatches or doors and replace all broken seals with new seals, unless directed by the applicant for inspection to do otherwise. Record on the sample ticket the code number of all seals applied. If the applicant directs that the doors not be closed or seals not applied, note this on the sample ticket.

6. After placing the grain and the completed sample ticket into the sample bag, tighten the drawstrings at the top of the bag so that it is closed securely. Carefully remove the bag from the carrier so that none of the sample is lost or spilled. Do not drop the sample to the ground.

Flat-bottom Trucks or Trailers

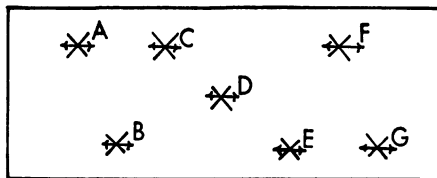
This section applies to trucks or trailers containing grain more than 4-feet deep or 8 filled probe compartments of grain. In Figure 1, the letters identify the probing sights, the X shows the probing location and the arrow indicates the direction of the 10 degree probing angle.

Probe site A - Probe the grain approximately 2 feet from the front and side.

Probe site B - On the side opposite probe site A, probe the grain approximately halfway between the front and center of the carrier, 2 feet from the side.

Probe site C - On the same side as probe site A, probe the grain approximately three-fourths of the distance between the front and center of the truck, 2 feet from the side.

Probe site D - Probe the grain in the center of the carrier.



Probe site E - On the side opposite probe site C, probe the grain approximately three-fourths of the distance between the back and the center, 2 feet from the side.

Probe site F - On the side opposite probe site E, probe the grain approximately halfway between the back and center, 2 feet from the side.

Probe site G - On the same side as probe site E, probe the grain approximately 2 feet from the back and side of the carrier.

Partially Filled Trucks or Trailers

This section applies to trucks or trailers containing grain less than 4-feet deep or fewer than 8 filled probe compartments of grain. In Figure 2, the letters identify the probing sights, the X shows the probing location and the arrow indicates the direction of the 10 degree probing angle.

Probe site A - Probe the grain approximately 2 feet from the front and side.

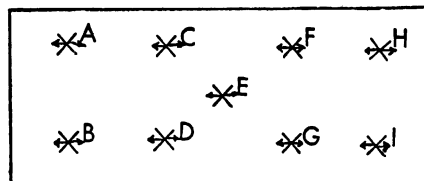
Probe site B - Probe the grain as specified for probe site A, but on the opposite side.

Probe site C - On the same side as probe site A, probe the grain approximately three-fourths of the distance between the front and center of the carrier, 2 feet from the side.

Probe site D - Probe the grain as specified for probe site C, but on the opposite side.

Probe site E - Probe the grain in the center of the carrier.

Probe sites F, G, H, and I - Probe the grain 4 additional times in the remaining portion of the carrier in the same manner as described for probe sites A, B, C, and D.



DETERMINATION OF DOCKAGE IN WHEAT USING HAND SIEVES

Because price discounts are applied to wheat with dockage above .5 percent and then in wholes and halves (i.e. .5%, 1%, 1.5%, etc.), it is important to

curately determine the dockage. Dockage is weed
eds, weed stems, chaff, straw, grain other than
eat, sand, dirt, and any other material other than
eat, which can be removed readily from wheat by use
appropriate sieves. Following are the guide lines
r hand sieving to determine dockage.

Divide out a representative portion of wheat
ranging in size from 1-1/8 to 1-1/4 quarts or
approximately 1000 grams. Record the weight of
sample used.

For sieving, assemble a 5/64 round-hole sieve on a
bottom pan and then place a 12/64 round-hole sieve
on top of the 5/64 sieve.

Sieving only about 1/4 of the sample at a time, the
wheat should be shaken vigorously for the material
to pass through the sieve.

After the complete sample has been sieved, the
material remaining on top of the 12/64 round-hole
sieve and the material that passed through the 5/64
round-hole sieve would be combined. This material
would be weighed to determine the percentage of
dockage in the sample. The percentage is
calculated by dividing the weight of the material
that passed through the sieves by the total sample
weight.

DETERMINATION OF SHRUNKEN AND BROKEN KERNELS IN WHEAT USING HAND SIEVES

Shrunken and broken kernels affect the USDA Grade.
If the sample is more than three percent shrunken and
broken kernels, the USDA grade can not be higher than
USDA # 2. Following is a procedure to determine the
percent shrunken and broken kernels.

1. The determination for shrunken and broken kernels
shall be made on a representative portion of

approximately 250 grams that is dockage free.
Record the weight of the sample used.

2. The portion to be sieved shall be placed on a sieve
having perforation 0.064 - inch wide by 3/8 inch
long and shall be sieved in the following manner:

The sieve shall be held level in both hands
directly in front of the body with the elbows
close to the sides. The sieve shall be held so
that the grain will move lengthwise with the
perforations. In a steady sieving motion, the
sieve shall be moved from right to left
approximately 10 inches, and returned from left to
right to complete one operation. The completed
operation shall be repeated 30 times. The
material remaining in the perforations shall be
returned to the wheat which remained on top of the
sieve.

3. The material passing through the 0.064 x 3/8 inch
sieve shall be weighed to determine the percentage
of shrunken and broken kernels.

The percent shrunken and broken is determined by
dividing the weight of the sieved shrunken and broken
kernels by the the total weight of the sample sieved.

SUMMARY

It is important that grain handlers concentrate in
determining the correct grade. Profit margins are too
small to loose money because improper grade
determination. The procedures presented in this
Current Report are not designed to produce Official
grades. The procedures should produce relatively
accurate estimates of dockage, foreign material,
damaged kernels and other factors effecting grades and
the value of the grain.