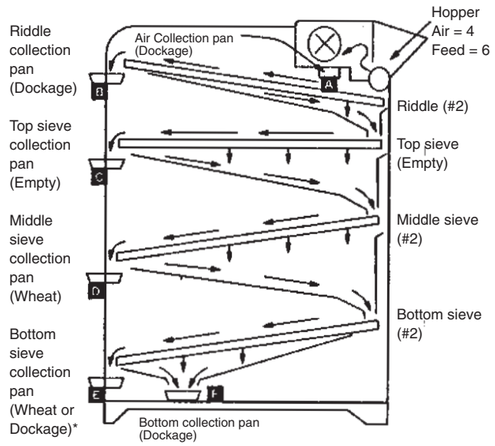

Figure 4. Set Up Procedure for Carter Day Dockage Tester Standard Procedure for HRW.

test weight, pour the entire dockage free sample through a funnel into a kettle until the grain overflows the kettle. Level off the kettle making three, full-length, zigzag motions with a stroker. Test weight is determined by weighing the filled kettle on either a special beam scale, an electronic scale programmed to convert gram weight to test weight, or a standard laboratory scale. If a standard scale is used, the gram weight must be converted to test weight per bushel (multiply the grams in a one quart kettle by .0705 to obtain the test weight in pounds per bushel).

Step 8 - Determination of Shrunken and Broken Kernels in Wheat Using Hand Sieves

Shrunken and broken kernels (S&B) affect the USDA Grade. If the sample is more than 3% S&B kernels, the USDA grade cannot be higher than USDA #2. Following is a procedure to determine the percent shrunken and broken kernels.

1. Divide out a representative dockage free portion of approximately 250 grams. Record the weight of the sample used.
2. Assemble an O64 by 3/8 slotted sieve on top of a bottom pan. The sieve should be held level in both hands directly in front of the body with the elbows close to the sides. The sieve should be held so that the grain will move lengthwise

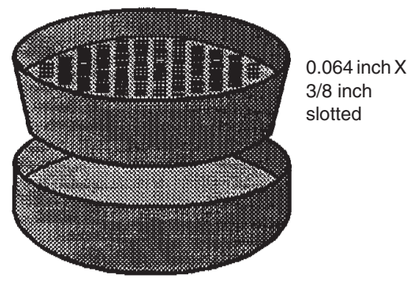

Figure 5. Standard Set Up Procedure for Determining SBK in HRW.

with the perforations. In a steady sieving motion, the sieve should be moved from right to left approximately 10 inches and returned from left to right 20 times (20 complete cycles).The material remaining in the slots should 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 is weighed to determine the percentage of shrunken and broken kernels. The percent SBK is determined by dividing the weight of the sieved shrunken and broken kernels by the total weight of the sample sieved.

Step 9 - Foreign Material and Damaged Kernels

All material other than wheat that remains in the sample after the removal of dockage and shrunken and broken kernels is foreign material. The percentage of foreign material is determined by handpicking a representative 30-gram dockage and S&B free portion. The most common types of kernel damage are black tip fungus, germ, frost, heat, mold, scab, sprout, and insect damaged. The percentage of damaged kernels is determined by handpicking a 15-gram dockage and S&B free portion.

Summary

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

OKLAHOMA COOPERATIVE EXTENSION SERVICE AGEC-223

Practical Wheat Sampling and Hand Sieving Procedures

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http://osufacts.okstate.edu

This publication provides practical procedures which can be used by producers, warehouse managers, and elevator managers for sampling and grading wheat. The procedures and portion sizes are based on the USDA Practical Procedures for Grain Handlers. The portions and hand-sieving methods presented in this fact sheet are not used by official grain inspectors licensed by the Federal Grain Inspection Service. Licensed graders must use larger portions and precision mechanical equipment that will provide the most accurate and most 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 should:

1. be obtained in accordance with recommended procedures
2. be of the prescribed size (at least 1,000 grams or approximately 1 1/4 quart)
3. be handled securely, protected from manipulation, substitution, and careless handling.

The following pages explain the proper way to do probe sampling. Some of this information was taken from: *Inspecting Grain-Practical Procedures for Grain Handlers,* Section 1, Sampling Grain.

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 grain 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

Hand 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 should be used. There are two types of hand probes: compartmented probes in which slots in the outer tube match compartments in the inner tube and open throat probes in which the inner tube is open. Open-throat probes tend to draw more of their sample from the top portion of the grain, while compartmented probes draw a representative sample from each layer. All official grain probes are compartmented probes 1-3/8 inches in diameter (outer tube).

Make sure the probe reaches the bottom of the carrier. A 5 or 6 feet probe will be sufficient for most farm trucks while hopper-bottom carriers may require a longer (6, 8 or 10 feet) probe.

Mechanical probe: There are two types of mechanical probes which are recommended for sampling stationary lots of grain in trucks, railcars, or other open-top carriers. The gravity-fill probe function is similar to compartmented hand probes except that after the compartment is filled it rotates to an inner tube where it is forced up by air. The core probe functions by forcing the sample up into the core as the probe is pushed down and then using air to transport the sample to the output point. A third type, the in-load suction probe which uses negative air pressure to suck the sample into the bottom of the probe, is not recommended since it tends to overestimate foreign material.

Sampling Canvas: Heavy canvas cloth or similar material can be used to display the sample from the compartmented probe. Other alternatives are a short section of rain gutter or a half section of pipe. The sampling canvas or other material should be 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.

Sampling Containers such as heavy cloth or canvas bags and metal buckets or plastic cans may be used to transport the sample to the inspection station. Sample containers should be free of all old grain, insects, and other waste material prior to use. Air-tight containers or bags lined with a polyethylene liner should be used to store grain to prevent loss of moisture and to protect the sample from adverse environmental conditions such as rain or humid weather.

General Procedures

Before sampling any carrier, record on your sample ticket the carrier's identification number. 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, the general rules are:

1. Insert the probe at a 10-degree angle from the vertical with the slots facing upward and completely closed. The 10-degree angle eases the resistance of the compacted grain against the probe while still allowing the probe to reach the bottom of the container. 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 load 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 jamming 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. 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 as 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 onto 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 should be composited and placed in a sample bag along with a completed sample ticket. If the examination of the probes indicates 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 allow fine material to be blown from the canvas.

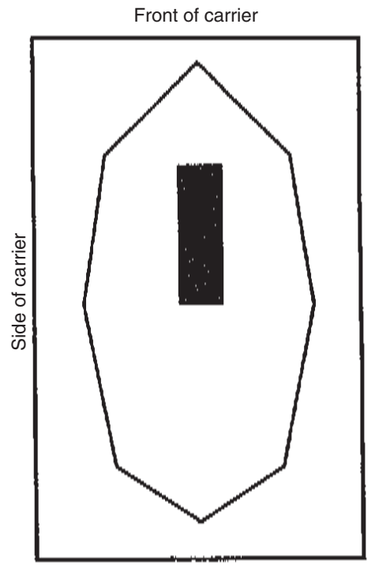
Where to Probe

Draw **at least two samples** from any truck or trailer that are 600 bushels or less. Larger lots of grain should be probed in three to five places. Recommended probe sites, which are shown in Figure 1, are anywhere in the carrier except the corners and the center of the load (which was directly underneath the loading spout). The probe sites should be varied between loads in a random manner. Elevators which routinely sample in the same location have found that bad grain seems to migrate to the areas in the load which are not sampled. Hopper-bottomed carriers should be probed in the center of each hopper (Figure 2).

Inspection Procedures

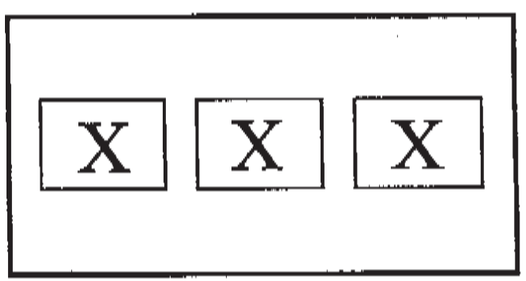
The process of inspecting wheat begins when the sample is drawn and follows a prescribed path:

1. Obtain a representative sample of approximately 1,000 grams.
2. Examine the sample for insect infestation, heating, or other harmful conditions.
3. Divide out a 250-gram portion (or the amount specified for your moisture meter) and determine the moisture content.
4. Recombine the 250-gram portion and test the entire sample for dockage.
5. Check for objectionable odor.
6. Determine the test weight.
7. Divide out a 250-gram sample and determine the percentage of shrunken and broken kernels (SBK).



* Draw at least two probe samples form any point in the shaded

Figure 1. Sampling Sites-Truck or Trailer.



* Draw probe samples from the points marked with an X.
Avoid prbing in the sprout-lines.

Figure 2. Sampling Sites-Hopper Bottomed Carriers.

8. Divide the sample into small portions for examination of foreign material (30 grams) and damaged kernels (15 grams).

Step 1 - Obtain a Representative Sample

Use the probing procedures described above or a tailgate sampler to obtain a representative sample of approximately 1,000 grams.

Step 2 - Insects, and Harmful Conditions

The presence of two or more live insects injurious to stored grain causes the grain to be designated "infested," but does not affect the numerical grade. Heating is a condition common to grain which is spoiling and also causes the grain to be designated "U.S. Sample grade." Be careful not to confuse heating with sound grain which is warm due to storage in bins, railcars or other containers during hot weather. Other harmful substances which can cause the grain to be considered U.S. Sample grade include: castor beans, crotalaria seeds, glass, stones, and unknown foreign substances such as rock salt, fertilizer, or "pink wheat."-

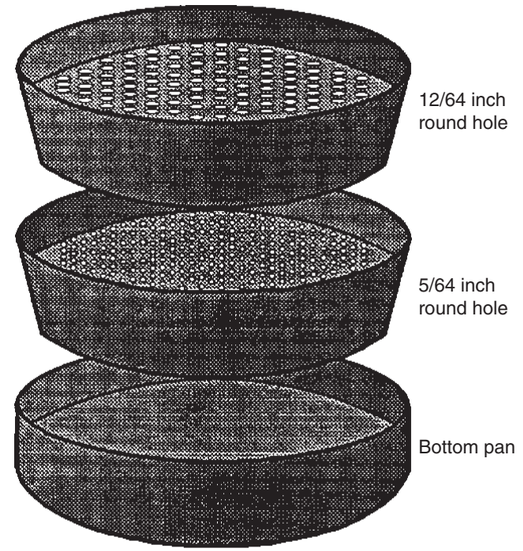
Step 3 - Moisture

Moisture is an essential measure of wheat storability and value and should be determined prior to removing dockage. Moisture can be determined with any device which has been tested and approved by the Oklahoma Department of Agriculture. Moisture meters should be certified once a season and maintained in adherence with the manufacturer's recommendation. Many moisture meters (such as the Montomco) require that a specific weight sample be used. The use of an inexact sample weight will result in an inaccurate measure of moisture content. In addition, some of the newer moisture meters also display an estimate of test weight. **This test-weight estimate cannot be legally used in determining grade** since it is based on a small sample size (often 100 grams or less) and is made before the dockage is removed.

Step 4 - Determination of Dockage in Wheat Using Hand Sieves

The entire sample (approximately 1,000 grams) should be used to determine the level of dockage. Wheat dockage is certified to the nearest tenth percent (0.1%, 0.2%, 0.3% etc.). Dockage is weed seeds, weed stems, chaff, straw, grain other than wheat, sand, dirt, and any other material other than wheat, which can be removed readily from wheat by use of appropriate sieves. Following are the guide lines for hand sieving to determine dockage. (Elevators that use a one pint test weight kettle may use a smaller portion (500 grams) to determine dockage, provided there is sufficient dockage-free wheat to overflow the kettle.)

1. Record the weight of the sample used (approximately 1,000 grams)
2. For sieving, assemble a 5/64 round-hole sieve on a bottom pan and then place a 12/64 round-hole sieve on top (Figure 3). Place approximately one-third of the sample at a time on top of sieve and shake vigorously until all of the wheat passes through the top sieve. Determine the percentage of dockage by combining and weighing all of the material which remained on top of the top sieve and



(Shake until all wheat goes through the top pan)

Figure 3. Standard Hand-Sieve Set Up for HRW.

which passed through the bottom sieve. The percentage is calculated by dividing the weight of the material on top of the top sieve and the material which passed through the bottom sieve by the total sample weight.

Step 5 - Determination of Dockage with a Mechanical Dockage Tester

1. Record the weight of sample used (approximately 1,000 grams).
2. Clean the dockage tester, insert the appropriate sieves and riddle, and make adjustments recommended by the manufacturer which give results comparable to FGIS standard equipment (Figure 4).
3. Turn on the tester and pour the sample into the hopper.
4. After the sample has cleared the last sieve, turn the tester off.
5. Remove and weigh the dockage (Figure 4).

Note: If the sample contains more than 0.5% chess or similar seeds it must be run using special chess procedures—refer to OSU Fact Sheet "Grading Cheaty Wheat."

Step 6 - Check for Objectionable Odors

Except for smut or garlic odors, wheat which has a musty, sour or commercially objectionable foreign odor (COFO) is "U.S. Sample grade." Use the entire sample to determine odor. Fumigant or insecticide odors are not considered COFO if they dissipate after aerating the sample for 4 hours.

Step 7 - Determining Test Weight

Test weight is a measure of the weight of grain required to fill a specific volume (pint, quart, or bushel). To determine