

# Grading table eggs

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Before selling table eggs it is important that they be evaluated for exterior and interior quality and any below standard eggs removed. USDA has specific standards for Grades AA, A, B or inedible/reject and these standards should be used whether eggs are officially graded by USDA inspectors or on-farm by producers. A complete description of the factors that affect egg graders can be found in the USDA Egg Grading Manual (available through [www.ams.usda.gov](http://www.ams.usda.gov) website).

Commercially eggs are graded simultaneously for exterior and interior quality but here these standards will be discussed separately. Exterior quality standards were developed to reduce the number of eggs with defects that detract from the egg's appearance or that would have a low probability of surviving the typical handling involved in getting eggs from the farm to market.

## EXTERIOR EGG QUALITY

The consumer wants a clean egg with an intact shell that looks appealing when it is fried or poached. While the appearance of the egg shell does not have an effect on the quality of its contents, the quality of the shell definitely affects consumer appeal.

Exterior quality evaluation is based on cleanliness, shape, shell texture and shell strength (see Table 1 on the next page). The exterior quality factors for Grades AA and A are the same.

### Cleanliness

Grade A eggs must be clean. They may show traces of processing oil which is sometimes used to preserve freshness.

### Stains

Eggs with stains can be Grade B or Dirty/Reject depending on the intensity of the stain, the type of stain, as well as the amount of shell covered by the stain.

- **Stain intensity** can be classified as slight, moderate or prominent (see Figures 1 and 2). As a rule of thumb, a slight stain is easily visible from one foot away but difficult to see from about three feet. A moderate stain is easily visible from three feet but difficult to see from about six feet. A prominent stain is easily visible from six feet or more.
- There are two **stain types**, localized and scattered. A localized stain is a single stain where all the stained areas are connected.

Figure 1. Examples of eggs with moderate localized stains

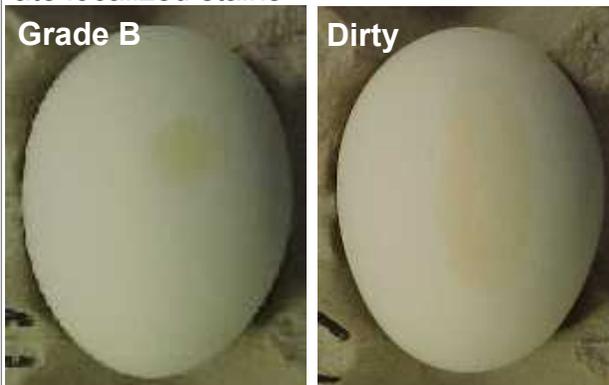


Figure 2. Examples of eggs with moderate, scattered stains

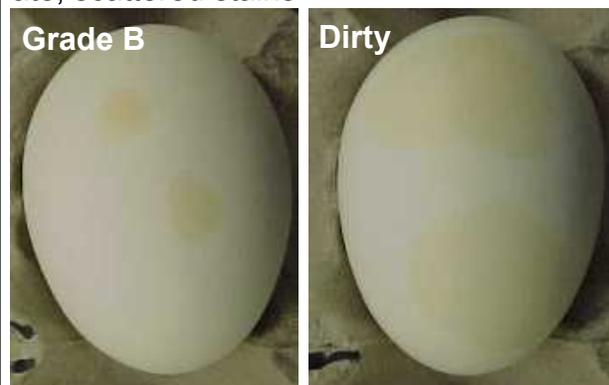


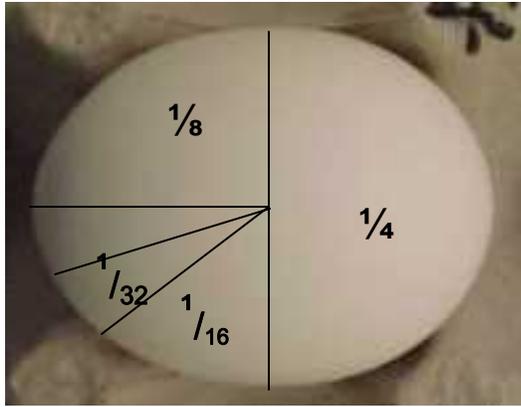
Table 1. Summary of standards for the exterior quality of table eggs

FACTOR	GRADE		
	AA or A	B	Dirty/Reject
Stain	Clean, but - May show small specks, stains or cage marks that do not detract from general clean appearance of the egg - May show traces of processing oil	Slight or moderate localized stains less than 1/32 <sup>nd</sup> of shell OR Slight or moderate scattered stains less than 1/16 <sup>th</sup> of shell	Prominent stains OR Slight or moderate stains covering more than 1/32 <sup>nd</sup> if localized and 1/16 <sup>th</sup> of the shell if scattered
Adhering dirt or foreign material	None	None	Adhering dirt or foreign material (1.0 mm in area or greater)
Egg shape	Approximately the usual egg shape	Unusually or decidedly misshapen	
Shell texture	May have rough areas and small calcium deposits that do not materially affect shape or strength	Extremely rough areas that may be faulty in soundness or strength. May have large calcium deposits.	
Ridges	Slight ridges that do not materially affect shape or strength	May have pronounced ridges	
Shell thickness	Free of thin spots	May have pronounced thin spots	
Body checks	Absence of body checks	May show pronounced body checks.	

Table 2. Summary of standards for the interior quality of table eggs

FACTOR	GRADE			
	AA	A	B	Inedible
Air cell	1/8 inch or less in depth	3/16 inch or less in depth	More than 3/16 inch in depth	Doesn't apply
White/albumen	Clear Firm	Clear May be reasonably firm	Clear May be weak and watery	Doesn't apply
Yolk	Outline slightly defined	Outline may be fairly well-defined	Outline clearly visible	Doesn't apply
Spots (Blood or meat)	None	None	Blood or meat spots aggregating not more than 1/8 inch in diameter	Blood or meat spots aggregating more than 1/8 inch in diameter

Figure 3. An egg marked to show 1/16th and 1/32nd of its shell surface



A scattered stain is two or more stained areas on the same egg.

- The **size** of the stained portions must be mentally added together and the total area of shell compared with the amount of stain allowed for a Grade B egg (see Figure 3 above). A Grade B egg can have a moderate localized stain covering less than 1/32<sup>nd</sup> of the shell. For scattered stains the limitation is 1/16<sup>th</sup> of the shell. If the stains are larger than those listed above, it is a Dirty/Reject egg.

### Adhering material

Eggs with adhering or foreign material larger than a speck (about 1.0 mm) are considered Dirty/Reject eggs. The adhering material can be anything from manure, a piece of shell, yolk or albumen (see Figure 4 below). It can also include a feather. Even though these things can be washed off, the eggs are categorized as Dirty until they are actually cleaned and the adhering material removed.

### Shape

There is a considerable range of egg shapes that could be considered 'approximately the usual egg shape' which would all be Grade As. Eggs that are too round or too long to fit in the egg carton are Grade B eggs downgraded because of their shape (see Figure 5). Grade B eggs downgraded for shape will also include those eggs that are clearly misshapen or that have definite flat areas. Any eggs that come in a strange shape are also Grade B (see Figure 5).

Figure 4. Photographs of different 'Dirty' eggs with adhering material

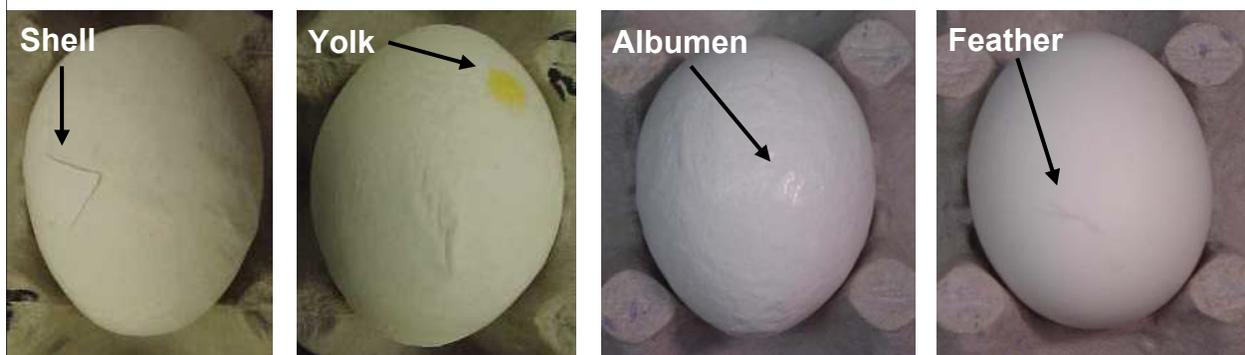


Figure 5. Photographs of Grade B eggs which are downgraded because of shape



Figure 6. Examples of Grade B eggs with calcium deposits.



Figure 7. Example of a Grade A egg with small calcium deposits.



Figure 8. Example of an egg downgraded because of ridges.



Figure 9. Example of a Grade B egg downgraded because of rough shell.



## Shell texture

Eggs with faulty texture are much weaker in shell strength and may be broken during distribution. It is primarily for this reason that these eggs are downgraded and do not normally appear in grocery stores.

Shells with large calcium deposits (greater than  $1/8^{\text{th}}$  of an inch in diameter) are Grade B (see Figure 6). Grade A eggs are allowed smaller calcium deposits (see Figure 7). A good rule of thumb is that if you were to pull your fingernail across a calcium deposit, and there would be a good size hole if it came off, it would be classified as Grade B. There is no standard for the number of calcium deposits. Therefore, eggs with small calcium deposits over the entire shell may be classified as Grade A if otherwise qualified (see Figure 7).

## Ridges

Ridges can result in weakened shells (see Figure 8 on the next page). Many eggs have small ridges and most of these should be classified as Grade A. Those eggs with large ridges, however, are Grade B.

A related condition is shell roughness, without distinct ridges (see Figure 9). It is common, however, to see both conditions on the same egg (see Figure 10).

## Body checks

Body checks are another type of faulty shell that results in downgrading of eggs. Body checks are eggs which were cracked when the shell was being formed in the hen's body and then partially calcified over, repairing the damage, before being laid.

Figure 10. Example of an egg with both distinct ridges as well as a rough shell.



Figure 12. Example of a body check egg with visible bulge in the shell.



Frequently an egg with a body check looks cracked, but it is actually still intact (see Figure 11). The shell does remain weak, however, so commercially these eggs are removed and not sold as table eggs. With some body check eggs the cracks are not as visible but they can be identified by the bulge in the shell shape (see Figure 12).

### Shell thickness

A shell should appear thick enough to withstand reasonable handling without breaking. Grade A eggs must have thick shells with no thin spots. Thin shells or thin spots would result in an egg being downgraded to a B. The egg in Figure 13 has a relatively large weak area. Eggs can also have small, weak shells in

Figure 11. Example of a body check egg showing visible cracks.



Figure 13. Example of a Grade B egg with a large thin spot in the shell

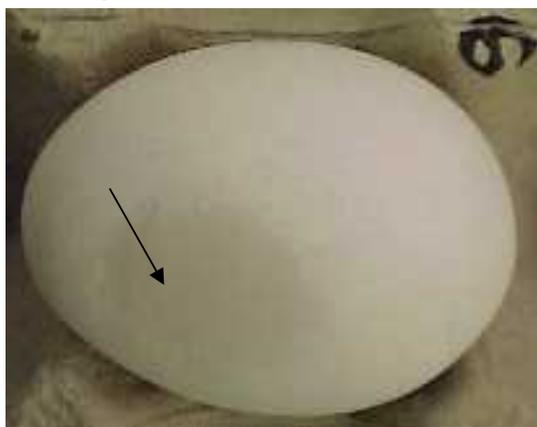
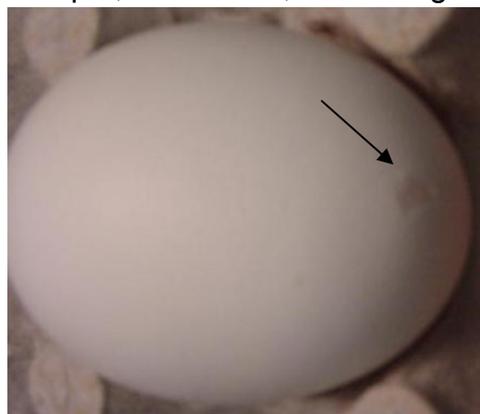
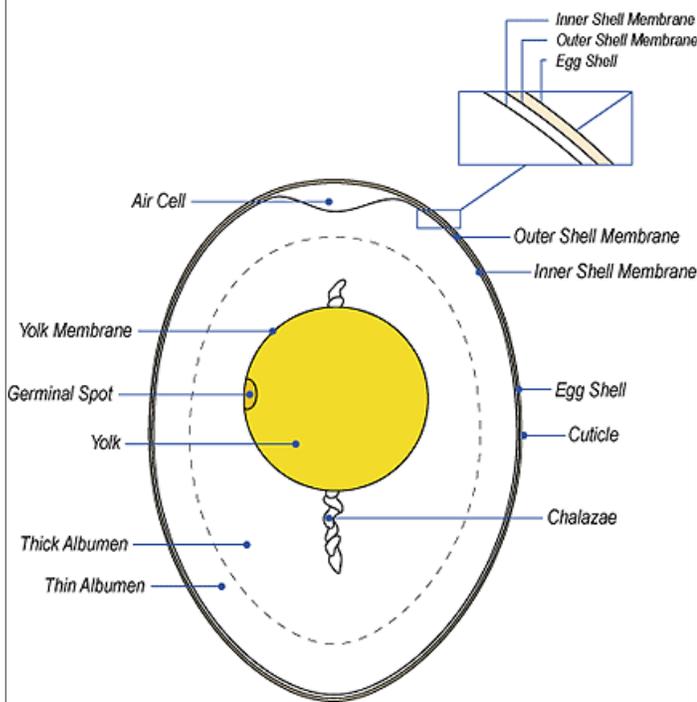


Figure 14. Example of a Grade B egg with a small thin spot, or 'window,' in the large end



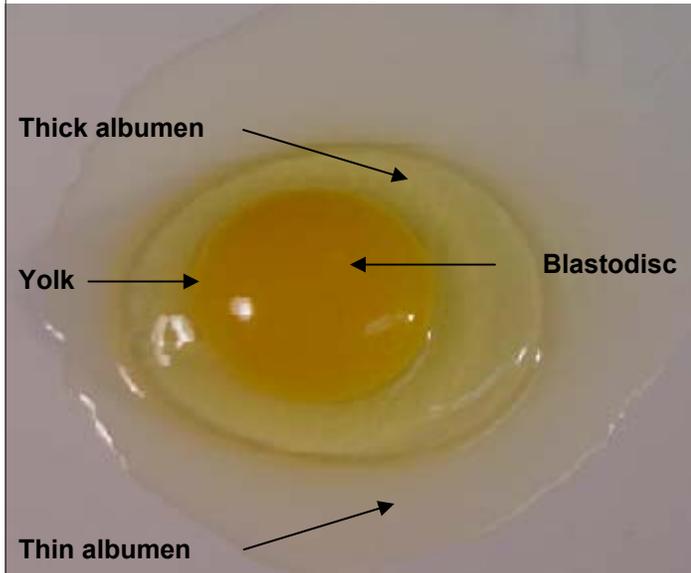
one area of an egg, such as the egg in Figure 14 which has a weak area (or 'window') in the shell at the large end. Both eggs would be Grade B.

Figure 15. The parts of an avian egg.



Source: Dr. Gary Ritchison, Eastern Kentucky University

Figure 16. Parts of an egg without its shell.



## INTERIOR EGG QUALITY

The grades based on interior egg quality are AA, A, B or inedible (see Table 2 on page 2). To evaluate the egg contents without breaking them out the shell, candling is used. To understand the criteria used in these evaluations it is important to have knowledge of the parts of an egg (see Figures 15 and 16).

The egg contents are surrounded by two membranes—an inner and outer shell membrane—

and, of course, the shell. When an egg is first laid these two membranes are closely attached on the inner lining of the shell.

The temperature of the contents of a freshly laid egg is slightly lower than that of the body temperature of the hen (105-107°F) but quickly warms to room temperature. As the egg contents cool they contract, separating the inner and outer shell membranes slightly, typically at the large end of the egg. This is referred to as the air cell.

As an egg ages it loses moisture and the contents contract even more, enlarging the air cell. Air cell size, therefore, is a good indication of egg quality and can be evaluated without breaking the egg open.

When an egg is broken open it is possible to see the parts making up the egg contents (see Figure 16). The yolk is in the center of the egg and is held in position by the chalazae located on the two poles of the yolk (difficult to see in the photo).

The yolk is surrounded by a layer of thick albumen and finally by the thin albumen. The blastodisc, which contains the genetic material of the female chicken, is located on the surface of the yolk.

As an egg ages the thick albumen breaks down reducing its height and volume. The amount of thin albumen is increased.

## Candling

Candling is done in a dark room with the candler light turned on. To candle an egg, hold it up to the candler with the large end against the light (see Figure 17 on the next page). It is best to hold the egg between your thumb and first two fingers. If you feel you may drop the egg, place your other hand underneath to catch any eggs that may drop.

With the egg at an slight angle, turn your wrist first one direct and then the other. This will cause the inside content of the egg to whirl. Repeat the procedure with the small end of the

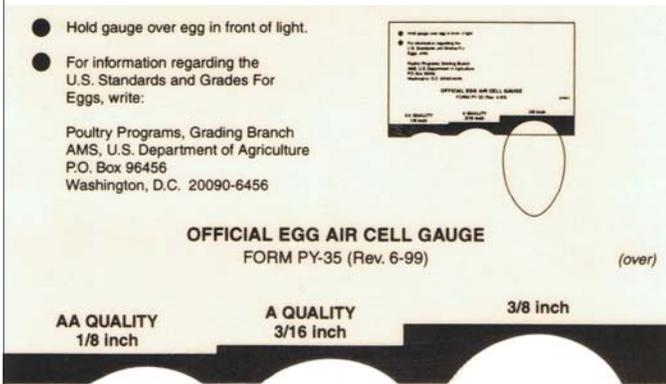
Figure 17. The use of a candler for determining egg grade based on internal egg quality.



Figure 18. An example of an egg with a blood spot being candled.



Figure 19. Official egg air cell gauge used in determination of the grade of an egg based on quality of interior contents.



egg against the light. This procedure will allow you to determine if a meat or blood spot is present (see Figure 18 for example of an egg with a blood spot). This will immediately make the egg a 'Reject' egg and no other evaluation is needed.

If no blood or meat spots are detected return the large end of the egg to the light and ob-

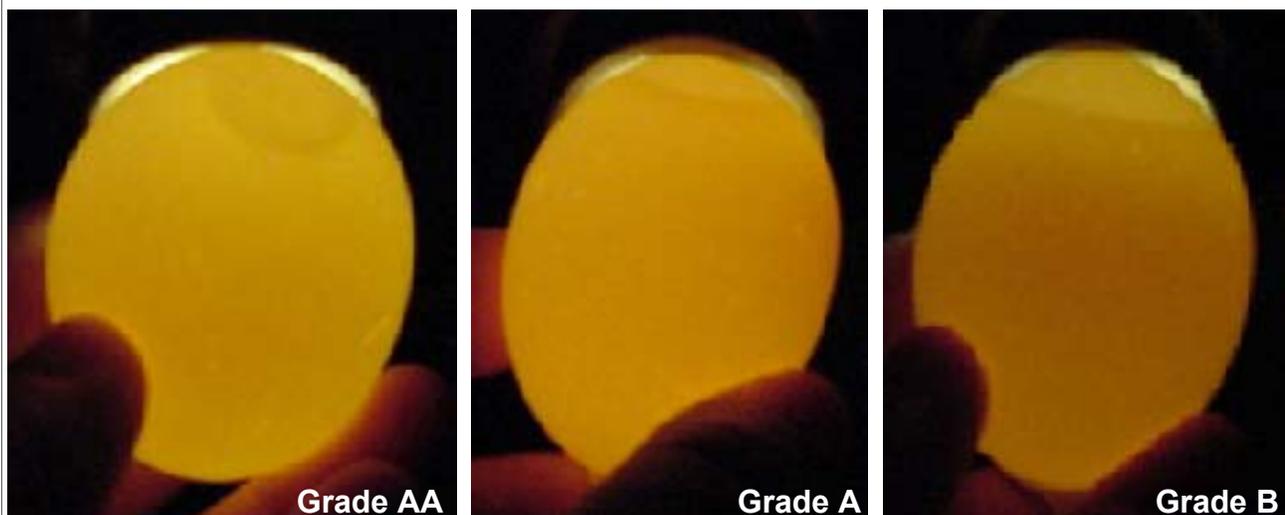
serve the size of the air cell (typically, but not always, found in the large end of the egg). The size of the air cell typically determines the grade as either AA, A, or B according to USDA standards (see Figure 19).

Eggs with air cells less than  $\frac{1}{8}$  inch deep are Grade AA. Eggs with an air cell greater than  $\frac{1}{8}$  inch but less than  $\frac{3}{16}$  inch are Grade A. Anything greater than  $\frac{3}{16}$  inch is a Grade B. Examples are shown in Figure 20 below.

As a rule of thumb, those eggs with an air cell smaller than the size of a dime are Grade AA and those larger than a dime but smaller than a nickel are Grade A. Anything larger than a nickel is a Grade B.

There is a third air cell depth indicator on the card, for an air cell depth of  $\frac{3}{8}$  inch. This is no longer used. In the past there was a fourth possible grade for eggs, Grade C. This grade no longer exists but the card has not been changed.

Figure 20. Examples of different air cell sizes as seen when candling eggs.



The yolk of a fresh, high quality egg will be surrounded by a rather dense layer of albumen/egg white. When the egg is twirled during candling, the yolk moves only slightly away from the center of the egg. As a result, the yolk outline is only slightly defined or partially visible. As the egg ages and interior quality deteriorates, the albumen becomes thinner and allows the yolk to move more freely. With Grade B eggs the yolk may come close to the shell, if it is not already stuck there. The yolk in Grade B eggs, therefore, becomes very visible when candled. It is important to distinguish between the yolk (with the weakened chalazae which are no longer keeping it in the center of the egg) and blood spots.

U.S Grade AA and A eggs are good for all purposes, but especially for frying or making deviled eggs where appearance is important. Grade B eggs are fine for general cooking and baking.

## EGG SIZES

U.S. egg sizes are defined by the weight of a dozen not on the weight of individual eggs. For example, the minimum weight for a carton of large eggs is 24 ounces. That does not mean each egg must weigh at least 24 ounces/12 eggs or 2 ounces. Many times producers will combine eggs of different sizes but making sure the total weight of the 12 eggs is at least 24 ounces.

Table 3. Minimum weights for different sizes of table eggs.

Size	Weight of a dozen eggs
Jumbo	30 ounces
Extra Large	27 ounces
Large	24 ounces
Medium	21 ounces
Small	18 ounces
Peewee	15 ounces