

Reloading for Accuracy

Clean Case in a Tumbler

Cleaning the case will protect both the rifle chamber and reloading dies from galling from sand or other abrasives that may be left on an unclean case. Case cleaning also allows for smoother feeding in the rifle chamber and resizing dies. Cleaning the cases will prevent excessive corrosion, especially where the neck meets the shoulder. After cleaning a case, be sure to remove all of the cleaning media especially from the inside of the case, making especially sure to check the primer hole.

Eject Primer

Use a universal depriming die to remove the primer without resizing the case. This step can also be done before the cleaning process for good condition cases allowing the cleaning media to then clean the primer pocket after primer removal.

Inspect Case for Damage

Now that the case is clean and the primer ejected, it will be easier to notice any neck cracks, head separation, or other damage. Over several reloadings, a cases brass may fatigue causing risk of failure. Before reusing a case, check it for the following signs to determine if it needs to be retired:

- Case Head Separation
- Neck or Shoulder Splitting
- Primer Pocket Loose
- Primer Pin Hole in primer
- Overlapping metal rising up from primer pin indent (Sign of overpressure. Case is reusable at lower pressure)

Any cases with one or more of the above symptoms should be discarded.

Neck Annealing (when previously setup full length sizing die no longer pushes the shoulder back 0.002" due to brass spring back)

If you anneal necks set the case in about a 1/2 inch of water and just turn the neck dull red. The water keeps the base from annealing. Case neck splitting can often be reduced by periodically annealing the neck.

Lube Case

A case can easily get stuck or damaged in a die unless first lubricated. Spray on case lube is preferred due to its ease of application, but a lube pad can be used with the non spray on case lubricants.

Full Length Resize Case (Sizing bushing needed = neck thickness * 2 + caliber - 0.002")

Full length sizing or preferably body sizing and then neck sizing should be used rather than just neck sizing alone. If a case is only neck sized, than each time the case is used its headspace will change, causing pressure and alignment changes from the previous use. After a few firings, the shoulder will have moved to a point to require full length sizing anyway. If full length sizing is used at each reloading, than the shoulder is only pushed back a small amount each time. If neck only resizing is used several times until bolt manipulation becomes difficult, then finally all the shoulder sizing has to be done with one pass through the sizer die, and the brass is worked much harder.

A headspace gauge, or preferably the exact measured headspace from your rifle or fired round should be used for setting up the resizing die. If the sizing die does not push back the shoulder enough, bolt manipulation will become difficult, or worst case, the round will not seat in the chamber. If the sizing die pushes back the shoulder too far, the round can tilt in the chamber due to the pressure of the ejector spring, as the chamber to shoulder gap is too loose to hold the bullet in line with the bore. Wilson makes excellent headspace gauges but it is best to use your rifle to setup headspace. If you will be making a round to use in multiple rifles, the same technique can be used by just using the dimensions of the rifle with the tightest headspace.

Find a few cases that will not allow the bolt to close, or only close with a lot of resistance. Start with the resizing die setup very high in the press so it will not resize the case. Slowly (say 90 degrees rotation once close) lower the sizing die until the case is sized just enough to allow smooth closing of the bolt with no or very light felt resistance. Since you are adjusting in 90 degree increments, when finding the right spot on the first piece of brass, you may have gone up to 90 degrees too far. Back the die off 90 degrees and then fine tune the adjustment by rotating back down in 15 degree (or so) increments until the bolt closing feel is perfect. This is the proper position of the full length resizing die but you are not done yet.

Since the case has been through the resizing die several times as you crept up to the ideal headspace, the brass is not springing back as much as a case being resized in a single pass. Try a few more cases to ensure they size correctly in a single pass through the die. You may have to tighten the die just a little more to make up for the brass spring back. Once you get the same feel with a new piece of brass, lock the resize ring. With this setting, you should be pushing the shoulder back only about 0.001" - 0.002".

Add the bullet diameter to double the neck thickness and subtract .002" for bolt action, or .003 for semi-auto rifles. This will ensure that the case neck is resized as little as possible, yet still hold the bullet with adequate pressure. Only use competition quality full length sizing dies of the bushing type to do this operation. Redding for 7/8-14 reloading presses, or Wilson for hand dies. This will alleviate brass stress during the reloading process and ensure the case is more self centering in the chamber. This step requires that all cases have had the necks turned down to the same thickness.

Debur Flash Hole (once only)

When a case is first stamped out at the factory, a bur will frequently remain within the case at the inside edge of the primer hole. This bur can cause the primer flash to spread out differently from case to case. By eliminating this bur, primer flash spread can be made more consistent from case to case. The Primer Pocket Deburring Tool requires that all cases have previously been trimmed to the same length as the tool uses the case neck to stop the tool from progressing deeper into the case. Instead, it is recommended that you use a tool like RCBS makes that does not use the case mouth as a stop allowing this step to be done before trimming.

It also never hurts to use a second tool to chamfer the primer flash hole from the head side of the case to allow easier entry of the flash from the primer ignition into the case.

Uniform Primer Pocket / Clean Primer Pocket

Cleaning out the carbon buildup within the primer hole will square the pocket edges and guarantee that all primers seat to the same depth. This ensures that the firing pin will strike the primer at the same time in its stroke, and with the same pressure. Doing this step after the last cleaning, lets the tumbler help clean out the primer pocket, and also gives you a chance to ensure no tumbler media is blocking the flash hole.

Trim Case Length (.223Rem=1.750, .308Win=2.005", 300WM=2.610")

As the powder within a case explodes, the case is superheated and under tremendous pressure. This pressure causes the case to stretch outwards in all directions. The bolt face will prevent the case from expanding in its direction, as will the chamber walls prevent all but a minimum expansion in their direction. However there is no resistance to the case expanding toward the muzzle. Because of this expansion, there will come a time when the case will have stretched to a point where the neck will come in contact with the lands, damaging them in the process. For consistency, all cases should be trimmed down to the exact same length and re-trimmed every reloading. It is best to do this step after resizing, as the resizing process will lengthen the case as it is removed from the die.

If using the Wilson trimmer, it is best to do this step while the case is still lubed, making removal from the case holder easier.

Chamfer Inner\Outer Neck (only after trimming)

Chamfering the inner and outer neck removes burs created during the trimming process, and will help to ensure that the bullet will seat squarely and easily within the case. Don't get carried away with this step.

Turn the Outside Case Neck (optional - once only)

Most brass should have the neck turned down to minimize variance from case to case and allow consistent bullet seating crimp pressure. Due to less than perfect machining tolerances, the thickness around the circumference of the case neck differs. Trimming the entire case neck to the thickness of the thinnest part will ensure that the bullet is being held with the same pressure on all sides. This equal pressure will help the bullet to release from the case squarely in line with the bore. The case will also be turned to the same thickness as the remaining cases helping the neck resizing die to place the same neck pressure on each loaded bullet. A neck turning tool requires that each case have the same trimmed length, as the tool uses the case neck length to stop the cutter.

Trimming the case neck is only needed once for the life of the case. Normally, the case trimming process is done after resizing because the sizing process lengthens the case. If you will be turning the case neck, then the trimming process needs to be done first as the neck turning tools require a uniform case length to function properly.

Remove Lube with Tumbler

Remove the lube on the case from the resizing and turning operations by running them back through the vibration tumbler for 1 hour or so. After cleaning a case, be sure to remove all of the cleaning media especially from the inside of the case, making especially sure to check the primer hole.

Segregate Cases by Weight

Heavier cases have thicker walls that will expand at a slower rate than cases of a lesser weight. By grouping cases of the same weight, you will help ensure that those cases will expand similarly to one another, increasing accuracy through consistency. Any cases on the far outside upper or lower weight ranges should be discarded. Do not weight the cases until after the trimming process. Under no circumstances are you to ever use cases from two different companies in the same group. Manufacturing process differ from company to company far more than is apparent from a visual inspection of the cases.

Segregate Bullets by Weight

Heavier bullets will leave the barrel at a lower velocity, with more internal pressures than that of a lighter bullet. Heavier bullets will hold their velocity longer (all else being equal), and expand differently under the heat created by the explosion of the powder. By shooting bullets of the same weight, you can help to reduce these differences. Under no circumstances are you to ever use bullets from two different companies in the same group. Manufacturing process differ from company to company far more than is apparent from a visual inspection of the bullets.

Prime Case

When placing the new primer into the case, it is important that the case is seated squarely into the primer hole, and that each primer is seated to the same depth as primers in all other cases. Only seat primers with a hand held primer seater. Any press seater will have too much leverage and you will not be able to feel the primer seat. By using a hand primer, you should slowly apply pressure and stop immediately upon feeling the resistance created when the primer reaches the bottom of the pocket. Check the case to ensure that the primer is lower than the head of the case. The primer will always be below the case head when the primer seating was felt properly. If you are reloading brass that previously had crimped primers, only swage the primer pocket enough for smooth seating of the new primer.

Obtain Overall Length for Rifle / Bullet Combination

Use a tool to measure the distance from the bolt face to the lands, and use this measurement as a guide when determining the bullet seating depth. Some rifles like the bullet touching the lands and others like a jump to the lands. A good place to start would be to seat bullets to be 0.015" off the lands.

Powder Case

Powder throwers can not be counted on to throw exactly the same amount of powder time after time. This becomes more and more problematic as slower burning powders are used. This is caused by the fact that slower burning powders are cut to larger individual pieces that can more easily jam within the powder thrower. Since very slow powders are commonly used for long distance shooting, the best solution to guarantee consistency is to individually weigh each thrown powder charge. This process is simplified by setting up the powder thrower to always throw slightly less than the required amount of powder. Place the thrown powder charge onto a digital scale, and use a powder trickler or a pinch between the fingers to bring the total weight to exactly the right amount. Do not use a balance scale for high accuracy work. Only a quality digital scale (recently calibrated) has the true accuracy for this kind of work. Following these steps will ensure that the same pressure is achieved within each case when the powder is ignited.

If you do choose to throw the powder directly into the case, make sure to tap the handle a few times on the up stroke, and a couple times on the down stroke. The up stroke taps will help the powder settle into the powder measure's chamber, and the taps on the down stroke will ensure all powder in the measure's chamber falls into the case. These taps will go a long way towards adding consistency throw to throw. Before throwing powder directly into the case, weight measure several throws to determine the level of consistency. It is also a good idea to throw 10 times into the scale cup, and measure their sum to determine if on average you are a little high or a little low. This helps to make the final powder measure adjustments.

Seat Bullet

The bullet should be seated based on the specific rifle OAL measured earlier unless a magazine is used in which case the OAL of a loaded round may need to be shorter than ideal to fit within the magazine. A common starting point for working up a new load would be to seat the bullet to 0.015 off the lands. Common ranges for seating depth range from 0.025 off the lands to 0.10 into the lands. Usually larger magnum bullets prefer to be seated closer to the lands, but all rifles are different. Any distance beyond .025 off of the lands will allow the bullet too much time to tilt on its axis before coming within the control of the lands. Seating into the lands is usually not recommended as the bullet can't touch equally each time due to bullet variations within the same lot and wear or fouling in the bore. When the bullet touches you will get a spike in pressure. Tests with pressure guns show the increased pressure to be about 5000 CUP. That is a significant figure if you touch once and then don't. A slight run up generally provides the best uniformity.

Another problem is that a bullet should be held as lightly as possible while still ensuring it may be removed from the chamber without the bullet pulling away from the case. The deeper the bullet is seated in the case the harder it will be held, and the harder it will be to maintain consistency in how the bullet is released from the case.

Runout

Use a gauge to test runout near the tip of the assembled round and again at the neck. Cases with excessive runout (> 0.002" neck, and > 0.004 bullet) should be run back through the seating die at 90° rotations each time rechecked on the runout gauge to negate any mechanical offset in the press. Excessive runout usually means the seating die or less likely the sizing die lock rings were tightened improperly. Before tightening a die lock ring, run a low runout case into the die to hold both the die and press in alignment while the lock ring is tightened.

Store Bullets

Store bullets in a container that will not allow them to come in contact with one another, and protect the tips from touching the bottom of the case. These two steps will protect the case and bullet from dents and dings that could affect accuracy. Use the load data card on the following page to notate all the specifics used for the loaded rounds.

Load Data Card:

Rifle = _____
Bullet Make = _____, Diameter = _____
Ballistic Coefficient = _____, Muzzle Velocity = _____
Powder Make = _____, Weight = _____
Primer Used = _____
Case Make = _____, Trim Length = _____
Case Number of Firings = _____
Bullet Weight Range Min = _____, Max = _____
Case Weight Range Min = _____, Max = _____
Neck Diameter Fired = _____, Sized = _____, Loaded = _____
Case Headspace Fired = _____, Sized = _____
OAL Rifle = _____, Round = _____, Comparator Used = Y/N
Bullet Runout Range Min = _____, Max = _____
Notes:

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Neck Wall Thickness = (Loaded Case Neck Diameter - Bullet Diameter) / 2

Neck Tension = Neck Diameter Loaded - Neck Diameter Sized (should be 0.002 bolt or 0.003 semi-auto)

Distance from Lands = Rifle Overall Length - Round Overall Length

Reloading Checklist:

- Clean Case in a Tumbler
- Eject Primer
- Inspect Case for Damage
- Lube Case Outer Wall and Mouth
- Full Length Size Case
- Debur Flash Hole (once only)
- Uniform Primer Hole
- Trim Case Length
- Chamfer Inner\Outer Neck
- Turn Outside Case Neck (once only)
- Remove Lube in Tumbler
- Segregate Cases by Weight
- Segregate Bullets by Weight
- Prime Case
- Powder Case
- Seat Bullet

