Annapolis Home Brew's All-Grain Brewing Instructions

Please Note: These instructions are designed for simple all-grain equipment. We recommend: A Polarware brewpot with false bottom, a converted beer keg with false bottom, a plastic bucket with false bottom, or a round cooler with false bottom. All of these options are affordable and capable of making great beer. There's a lot of different equipment on the market. If you build or purchase special equipment, you'll need to modify these instructions to suit, or possibly abandon them to follow your equipment manufacturer's recommendations.

When mashing, you need an accurate and precise thermometer. A meat or candy thermometer is not good enough. Even if it were accurate, the scale isn't precise enough. In our experience, the cheaper electronic thermometers have precise readout but many are inaccurate - especially when exposed to steam. The best low-price thermometers are laboratory or floating spirit thermometers. They contain non-toxic ingredients instead of mercury.

You need equipment capable of boiling a large volume. To brew a 5 gallon batch, you'll begin boiling with 6 or 7 gallons of wort, because significant volume is lost as steam, plus about ½ gallon is lost to kettle sediment (trub.) Your kitchen stovetop isn't sufficient for this task. Residential stovetops simply don't have enough power to boil 6 or 7 gallons, and a weak boil will degrade beer quality. The side burner of a gas barbecue grill is even less powerful, and probably can't support the weight. You need a brew pot of at least 32-40 quart capacity, and a high-power outdoor propane cooker. Ring-burner models are most desirable.

Psychology of the Advancing Brewer: There are many different brewing techniques. As you read and learn more, it may seem like you need to do a hundred things just to make decent beer. This isn't true! But home brewers are hobbyists at heart, and we like to learn and try new things. Plus, everyone likes to earn a few bragging rights, so there's a natural tendency is to say, "All right, I've done that, now what's next?"

And there are plenty of things you can do next. Things like step-mashing, decoction-mashing, ultra-precise water chemistry, and the thousand-dollar-can't-live-without-it machine. If you want to experiment with different brewing techniques or use more advanced equipment, we encourage you. However, you should start with the simplest procedures first, then possibly go on from there... after you learn to get the simple stuff to turn out right! Always remember that this is supposed to be FUN! Don't get so bogged down that brewing isn't enjoyable anymore.

We've tried every technique you can imagine, and lots of equipment. These instructions include all of the vital steps for brewing good beer, with an emphasis on keeping the process as simple and short as possible. This is the procedure we used to develop our recipes. Using these procedures, you'll get the intended results. We try not to put in steps that require exotic equipment. *When it comes to extra steps, some of them may be worth your effort (these appear here as "bonus" steps.) Others are theoretically great, but too difficult to be practical in small-scale, low-tech home brewing. Or they may give a minor benefit at a major cost in time, effort, or money. We leave that stuff out. If you're keen to learn, there are books, websites, brew clubs, and classes out there to teach you!*

Before Brewing: (Very Important!) Recipes include live yeast.
You must prepare the yeast before brewing!

Your recipe includes a Ready-To-Pitch "Activator" yeast culture. These large 125ml pouches are superior to tube-style cultures, and are the best yeast cultures available to home brewers. An *Activator* yeast pack can be used as soon as it warms to room temperature (just like tube-style yeast cultures.) However, *Activator* yeast packs are even better, because you can give the yeast a head-start by activating it. The yeast only requires 1 to 3 hours to become active. Therefore, it's convenient to activate the package whenever you decide to start brewing. That way, it'll be ready to use by the time you need it. *Activator* yeast packs don't always swell up like the older style pouches, so don't let that worry you. You don't need to wait for swelling, because there are great benefits within the first 1-3 hours of activation before use.

Preparing an *Activator* yeast pack is fast and easy. Take it out of the refrigerator and hold it in the palm of your hand. Feel around for the inner bulge. You must burst the inner bulge by either squeezing the pack, or slapping it. The outer pouch is tough and shouldn't break open. When activated properly, the inner bulge seems to disappear. Now, leave the pouch at room temperature - don't refrigerate after activation! You can use the yeast 1-3 hours after activation, but you should not use it more than 24 hours later, because the yeast begins to weaken. At that point, it's best to purchase a fresh culture.

Annapolis Home Brew's All-Grain Brewing Instructions

SECTION 1 – MASHING (Single-Temperature Infusion Mash)

Step 1: The first step is to decide what kind of **MASH CONSISTENCY** (thickness or thinness) you want. This will determine how much **STRIKE WATER** you need. (Strike water is combined with grains to form the body of the mash.) You can use anywhere between 1 and 2 quarts of water per pound of grain.

Decide which mash consistency you want. Check one line, and then fill in the rest of that line:

○ 1 qt. per lb., to make a **thick mash**. My recipe has ________ lb. of grain, so I need ________ qt. of water.

○ 1½ qt. per lb., to make a **normal mash**. My recipe has ________ lb. of grain, so I need ________ qt. of water.

○ 2 qt. per lb., to make a **thin mash**. My recipe has ________ lb. of grain, so I need ________ qt. of water.

The advantage of a thin mash is slightly better efficiency and better heat retention. The advantage of a thick mash is that it uses less space; nice for small equipment & recipes with lots of grain. If your water is chlorinated, you should use a faucet filter or purchase spring water. Boiling can't remove modern water treatment chemicals. Distilled water should not be used for mashing. Don't use water from a salt-type softening system, or reverse-osmosis water.

IMPORTANT: *Water which lies below the false bottom doesn't count towards the total. For instance, let's assume that your recipe includes 10 pounds of grain. You decide to use 1½ quarts per pound, so you need 15 quarts of strike water. Fill the mash vessel with water until it reaches the false bottom, and then add 15 quarts.*

Step 2: Determine your desired **MASH TEMPERATURE**. Mashing occurs in the temperature range of 148º-160ºF, but you achieve different results depending on where in that range your mash actually rests.

Mashing produces sweet wort, which is basically malt extract that's never been concentrated. Like malt extract, sweet wort consists of water and several types of sugar. Most of the sugars are fermentable, so they're consumed during fermentation to become alcohol & CO_2. But about ¼ of the sugars are non-fermentable, so they remain after fermentation and contribute body, malt flavor, and sweetness to the beer. *(Malt sweetness is the reason for using bittering hops, to balance the flavor.)* Think about how you want your beer to turn out, because you can subtly shift the balance between fermentable & non-fermentable sugars.

Mashing at the low end of the temperature range, around 148º-152ºF, results in the production of a relatively small proportion of un-fermentable sugars. Such a beer ends up with a lighter body and less malt sweetness.

Mashing in the middle of the temperature range, around 154º-156ºF, results in the production of a normal proportion of un-fermentable sugars. Such a beer ends up with medium body and normal malt sweetness.

Mashing at the high end of the temperature range, around 158º-160ºF, results in the production of a relatively large proportion of un-fermentable sugars. Such a beer ends up with full body and more malt sweetness.

Write down your desired MASH TEMPERATURE:________ºF.

Keep in mind that these changes are subtle; the difference is only a few percentage points. The type of yeast, and its health play a big role in fermentability, and the hops also work to balance sweetness with bitterness.

Step 3: Now, use the mash temperature to calculate the **STRIKE WATER TEMPERATURE.** You'll make the strike water hotter than the mash temperature, because pouring in the grains cools it down. When this is done correctly, the strike water and grains combine to make just the right temperature.

At 1 quart per pound, adding the grains will drop the temperature by 16 – 18ºF. Therefore, your strike water temperature should be 16 – 18ºF hotter than your desired mash temperature.

At 1½ quarts per pound, adding the grains will drop the temperature by 12 – 14ºF. Therefore, your strike water temperature should be 12 – 14ºF hotter than your desired mash temperature.

At 2 quarts per pound, adding the grains will drop the temperature by 8 – 10ºF. Therefore, your strike water temperature should be 8 – 10ºF hotter than your desired mash temperature.

Plug in the numbers from steps 1 & 2, and write down your STRIKE WATER TEMPERATURE:________ºF.

Step 4: Heat the strike water. If it was heated in a separate pot, pour carefully into the mash vessel. Verify the temperature one last time, and go on to the next step when it's just right. If you need to adjust the temperature, drain off some water and replace with boiling water or cool water. This avoids changing the total volume.

Step 5: The grains must be at room temperature for this step to work. Don't use grains straight from cold storage or refrigeration. Pour grains into the strike water. Allow the grains settle into the strike water, then stir gently with a paddle or slim instrument to ensure even mixing. Take care not to dislodge the false bottom. Stop stirring when you see that there are no dry clumps of grain.

Step 6: Cover the mash vessel (mash tun) and wait for 1-2 minutes while the temperature equalizes. Now take the cover off and verify the temperature of the mash.

Step 7: If you need to adjust the temperature, you can add cool water or boiling water to the mash. If you run out of room to add water, drain off a portion of the mash water and either heat in a saucepan or cool it a cold water bath, then return it to the mash. Some mash tuns allow for direct heating, but always stir while applying heat.

Step 8: When you're satisfied with the mash temperature, put on the lid to preserve heat. If it's safe and convenient, you may want to add further insulation. With most recipes, 60 minutes is sufficient mashing time. You should check the temperature every 15 or 20 minutes.

Step 9: The mash tends to cool down, but for best results you should try to keep the temperature constant. Some mash tuns allow direct heating, such as a Polarware brewpot. Try applying low heat every 15 or 20 minutes to boost the temperature back up. **Always stir constantly and gently while heating!** If you can't directly heat your mash, drain off a few quarts of mash liquid, bring to a boil, and then pour it back in. Another option, if you have extra room, is to add boiling water. This thins the mash a bit but rarely has a noticeable effect.

Step 10: When about 15 minutes remain in the mash, begin heating your sparge water to 180ºF in a separate pot. You need 1½ - 2 quarts of sparge water per pound of grain. Generally, more sparge water is needed for a thick mash, and less for a thin mash. *Sparging* is the term for rinsing the liquid malt sugars from the spent grain husks.

BONUS – MASHING OUT: This is a good procedure, but you can ignore it with little or no ill effects. There are some benefits to raising the temperature at the end of the mash. You can simply rely on the hot sparge water (which you'll be adding soon) to raise the temperature, but it's better to "mash out" by heating the mash before sparging.

At the end of the mash, raise the temperature to 168 - 170ºF. If you can't directly heat the mash tun, drain off about 1/3 of the mash water and bring to a boil, then dump it straight back into the mash and stir. Mashing out does a few good things. Most importantly, it makes more of the mash-created sugars dissolve out of the grains and into the water. Sugar mixes better with hot water! Now you'll get more efficient extract from the grains, maybe gain a few Specific Gravity points, and your beer will end up a wee bit stronger.

Step 11: When the mash is complete, open the drain valve and slowly collect a few quarts of mash liquid. There will be lots of chunks & grain particles in these first runnings. Now, gently pour the first runnings back into the top of the mash without disturbing the whole grain bed. Continue re-circulating in this manner (vorlaufing) until the runoff comes out relatively clear. During this time the spent grains & husks are forming a natural filter bed.

Step 12: Begin *lautering* (collecting mash runoff) in your brewpot or a bucket. Make the flow slow enough that lautering takes 20-30 minutes or more. As the water level in the mash drops, begin *sparging* by gently adding hot sparge water to the top of the mash. Maintain the water level about 1" above the grains. If possible, keep heating the sparge water to prevent cooldown. Ideally, you should maintain 180ºF sparge water temperature until the last bit is used. Heat helps to rinse the sticky malt sugars out of the gelatinous spent grains. You may read elsewhere that 180ºF is too hot for sparging… but that's only true when using very efficient commercial brewing equipment. The real issue is that you don't want to raise the grain bed temperature above 170º. Home brewing equipment loses so much heat that we need to use hotter sparge water just to stay ahead of natural cooling.

Step 13: Stop lautering & sparging when the runoff no longer tastes sweet, or when you collect enough volume for the boil, whichever comes first. It may come to pass that you stop sparging before collecting enough volume for the boil. That's OK because you can add water. It's better to add water than to over-sparge the grains. Tasting the runoff is really a great technique. The first runnings are very sweet. As sparge water works its way through, the runoff becomes thinner and less sweet. Eventually it tastes astringent (tongue-drying like red wine.) When you taste astringency with no sweetness, stop collecting runoff immediately. In a perfect world you'd constantly test the runoff with a hydrometer, and do some math to determine the perfect stop-time. But hot runoff is hard to accurately test, and it thins so quickly on this small scale that your sense of taste is a more reliable instrument.

SECTION 2 – BOILING

Step 1: If you use your brewpot for mashing, you probably collected the sweet wort in a bucket. Now you should discard the spent grains, rinse out the brewpot, and pour/siphon in the sweet wort for boiling. If you didn't collect enough runoff, you should add water now. Because you want to end up with 5 gallons of beer, start boiling with more than 5 gallons. On a cold day, you can lose a gallon or more to steam. You'll also lose about ½ gallon to kettle sediment, and another ½ gallon to fermentor sediment. Our recipes are designed to end up with 5 gallons of beer, so don't worry that you're "watering it down" if you start boiling with 7 gallons!

Step 2: Turn on your burner to high heat. Keep an eye on the pot when it begins to boil. At first, there's a tendency to foam up and boil over. Keep a few ice cubes handy - throwing them in will stop a boil-over instantly. Adjust the heat until you have a steady rolling boil, always keeping the lid off of the pot.

Step 3: When the boil is stable, pour in the 1st bag of hops. It's labeled "Add this packet of hops at the beginning of the 60 minute boil." Watch for boil-over when adding the 1st hops! Hop pellets disperse quickly, so you don't need to stir. We recommend against using bags or strainers for hop pellets, because they prevent full hop utilization. Boiling always creates solids that settle out later as the wort cools, and the hop particles will settle too. Begin a 60-minute countdown to the end of boil. If your recipe has more than 1 bag of hops, add each bag according to instructions on the label. The number of hop additions depends on the beer style; more isn't always better. Some recipes include "dry hops," which you won't use today. Save them to add directly to the fermentor in a few days.

Step 4: If you're using an immersion-style wort chiller (highly recommended) put it into the boiling wort when 10-15 minutes remain in the countdown. The heat sterilizes the chiller. When the countdown reaches zero, turn off the heat. If your recipe has any ingredients like sugar, honey, or treacle, add it now and stir to dissolve. There's still plenty of heat to dissolve and pasteurize the ingredients you're adding, so don't worry about contamination.

Step 5: **From now on, don't let anything non-sterile touch the wort.** Cool the wort to room temperature as quickly as possible. Rapid cooling is not just a way to save time, it's crucial in preventing bad flavor compounds which can build up in wort that remains hot after boiling. The best tool for cooling is a *wort chiller.* Follow the instructions for your chiller. Be careful of hot exhaust water. If you don't have a chiller, an ice-water bath is very effective. Simply cover the pot and carefully move it to a sink or tub. Surround it with ice and cold water. Don't use ice alone, the water really helps. It's often a bad idea to add ice directly to the wort. Placing the pot outside in cold weather or snow isn't very effective. Ice-water is best because it has lots of mass to absorb heat.

Step 6: While the wort is cooling, take use the time to sterilize/sanitize (*for our purposes we'll use the terms interchangeably*) your fermentor with a brewing sanitizer. Follow the instructions for the particular brand you're using. Don't try to "improve" things! Some sterilizers don't work if you mix them too strong, and some no-rinse sanitizers don't work if you rinse them. In a pinch, you can use unscented household bleach at a rate of ½ cup per 2 gallons, but it requires a long soak, lots of rinsing, and cam leave nasty flavor deposits. It's much better to use a sanitizer which is made for home brewing. **Avoid other household disinfectants and "antibacterial" products.**

Step 7: Once the wort has cooled to below 100ºF, you can pour it into your fermentor. If you're using a glass fermentor, either siphon the wort or pour it through a sterile funnel. There will be sediment (trub) on the bottom of the pot. Trub is made of proteins and tannins from the malt, as well as hop particles. You should stop pouring when you reach the trub, but if some of it gets into the fermentor it doesn't harm the beer. Don't try to filter or strain the wort. That's a terrible waste of time for no practical benefit, unless you have elaborate equipment.

Step 8: Add water if necessary to bring the volume up to 5 gallons. You can use cold water to help cool the wort. In a perfect world, you'd use only pre-boiled (sterile) cool water, but in reality most water is clean enough to use without bothering. Again, avoid chlorinated or salt-softened water. We recommend bringing the volume up to more than 5 gallons, since you'll lose a few quarts to sediment. Our recipes are designed to end up with 5 gallons of beer, so don't worry about "watering it down!" The ideal "standard" home brew fermentor is a 6½ gallon glass carboy. The 5 gallon level is about 12 inches above the floor, so we fill them to about 12½ inches. The extra headspace in the fermentor will allow room for the yeast foam which rises during fermentation. Some brewers use a 5 or 6 gallon fermentor with a blow-off tube. We generally don't recommend blow-off because what's blowing out is healthy yeast! This often causes slow-down in fermentation, weakening the yeast population, resulting in more off-flavors.

Step 9: Stir the wort vigorously with a sterile spoon or paddle. This is more important than you might think, and for a number of reasons. Primarily, it adds oxygen to the wort. Boiling removed all of the oxygen, which the yeast needs to reproduce quickly and to grow healthy cells. Stirring in a bucket is easy, but in a small-mouthed glass fermentor it's more difficult. One recommended tool called a "Mixstir" (it looks like a collapsible propeller on a stick) which hooks to your cordless drill. The absolute best tool to have is an oxygen system made for home brewers. These have become very affordable. They quickly and easily deliver a fine mist of pure oxygen bubbles. A few 10-second shots of pure oxygen result in yeast that's incredibly healthy and vigorous - the beer ferments days faster and tastes cleaner. Mixing is also important to blend the cool, thin water with the thick, hot wort. Without some vigorous stirring, these liquids of varying thickness and temperature tend to separate into layers.

Step 10: Optional, but recommended. Use your hydrometer to test the Specific Gravity (SG) of the wort. Don't try to do this test in the fermentor. Take a sample out and use a test jar or hydrometer thief. Take care that the hydrometer is floating freely with no clinging bubbles, and then read the printed scale where it lines up with the surface. This is your Original Gravity (OG) reading, write it down. We don't give you a predicted SG reading for a good reason – it's easy to read a hydrometer wrong! We don't want another phone call or Email saying "You said it should be about 1.042, but I saw 1.045 so I dumped it out." (What a waste!) Your OG is a direct result of how much malt extract is in the batch. It's not even possible to go wrong without spilling lots of malt or missing the 5 gallon mark. Gravity starts with water at 1.000. In 5 gallons, every pound of malt extract syrup adds about .007, and every pound of solid malt extract adds about .008. Some types of steeping grains add a few points to the total.

Step 11: Open your yeast package and pitch (pour it in.) The procedures for preparing yeast are on the first page of these instructions. Simply use something sanitary to cut open a corner of the yeast pouch. It isn't necessary to stir the yeast after pitching it.

Step 12: If your fermentor is a plastic bucket, attach the lid. Fill the airlock ½ full with clean water and carefully insert it into the grommetted hole in the lid. You don't need to push the airlock all the way down, just make a good seal without pushing the grommet through its hole. If you're using a glass carboy, put the airlock in the stopper before you put the stopper in the carboy. Fill it ½ full with clean water, and then put the stopper onto the carboy. If you try to put the stopper on the carboy first, it may push through into the carboy when you try to insert the airlock.

Step 13: You should see visible signs of fermentation within 24 to 72 hours after adding yeast. Fermentation produces lots of yeast foam and lots of CO_2 gas. The CO_2 pushes its way out through the airlock, making bubbles like an aquarium ornament. In a glass fermentor, these signs are as obvious as a lava lamp. In an opaque plastic bucket, you must be a little more observant. This "lag time" before visible fermentation is one of the biggest causes of unnecessary worry. Bear in mind that Friday night to Monday morning isn't 72 hours! More seriously, some yeast strains are just naturally faster than others, and this isn't necessarily a good or bad thing. Cooler temperatures will slow down the fermentation, and again this isn't necessarily good or bad. The amount of dissolved oxygen in the wort also has a big influence on lag time. Finally, if you're using a plastic fermenting bucket, it's very common for the lid to leak - even when new. CO_2 gas will take the easy way out, so you might not see any action in the airlock even though the fermentation is going strong. Open the lid and take a look at what's going on if you see no airlock action for 2 or 3 days. Don't get so worried about lag time that you pour in some old "emergency" yeast the next day – that's a great way to ruin a batch which was probably doing just fine. We've sold tens of thousands of yeast cultures, and true "duds" are exceedingly rare. 72 hours is only a guideline, not a time to despair.

Step 14: Wait for the beer to ferment. Shield the fermentor from ultraviolet light, like sunlight or fluorescent lights. Ale Yeasts ferment well at or just below room temperature, 62-72ºF is ideal. Lager Yeasts ferment well at cooler "basement" temperature, around 55-65ºF. Some lager yeasts are tolerant of higher temperatures, and we favor these in our recipes. Wheat Beer Yeasts act like ale yeasts, but for lots of fruity-ester flavors, choose a warm area (up to 80ºF.) Keep the fermentor somewhere where the temperature is steady, not a porch or unheated garage where the temperature always changes. In a basement, the fermentor will be coolest sitting directly on the foundation slab, and perhaps several degrees warmer if you put it on a table. If all convenient areas are too cold, you can get an electric "heat belt" for your fermentor. If your home is too warm, find a small or cheap refrigerator and outfit it with a homebrewing override thermostat. This will allow you to select the exact temperature you desire.

Step 15: Fermentation usually takes 5 to 10 days, but it may be faster or slower. The only honest statement is "Fermentation is finished when it's finished!" There's no real way to predict how many days it'll take, because every brewer has different conditions, and some recipes ferment faster than others. Experience will teach you what to expect. Fermentation is usually complete when you don't see any more activity. In rare cases it can stop prematurely, usually due to lack of oxygen in the beginning or low fermentation temperature. The only way to be absolutely sure it's complete is to take another hydrometer reading. The SG should have dropped approximately 75% *(don't count the 1 before the decimal)* compared to the original reading. In other words, a beer that started at 1.048 should finish at about 1.012. If you suspect that your fermentation stopped early, move the fermentor to a warmer area, wait a day, then stir it to reinvigorate the yeast. No activity means absolutely no activity - if your fermentor is still slowly producing CO2, it's not finished yet. Also - even after it's finished it might bubble if you shake, squeeze, or tap the fermentor. This is caused by the disturbance; it's not a sign of renewed fermentation!

NOTES:

OPTIONAL – SECONDARY FERMENTATION

Most beers can benefit from a secondary fermentor. Beers which ferment slowly, such as lagers and high-alcohol ales will benefit the most. *The term "secondary fermentor" is somewhat misleading, because most of the actual fermenting happens in the first (primary) fermentor. The "secondary fermentor" is more appropriately described as an aging and clarifying vessel. Ideally, there's little or no actual fermentation in the secondary vessel.*

The best container to use for a secondary fermentor is a 5 gallon glass carboy. This is important for a few reasons:

First, you don't want any air headspace in a secondary fermentor, because oxygen in that air can contaminate the beer. Although oxygen is necessary before fermentation, after fermentation it will rapidly spoil the beer. This wasn't a concern in the primary fermentor because so much CO2 is produced there that it blows out all of the air in the headspace. However, now that your beer is in secondary, there's little or no CO2 being produced, so you can't count on the air being driven out before it does damage to the beer.

Second, you shouldn't use a bucket because of the risk of a leaky lid. It's common for buckets to "breathe" a little bit. During primary fermentation, this isn't a problem because so much CO2 is being produced that any leak is flowing outward. Since there's little or no CO2 being produced in secondary, a leak can be much more harmful.

Third, a glass carboy is superior to a plastic bucket. The obvious advantage is that you can glance right into a glass carboy to observe how the beer is settling and clarifying. Additionally, beer in a bucket has a large surface area where it might absorb oxygen. A glass carboy can be filled to the narrow neck, where the beer has only a tiny amount of surface area – another protection against oxidation.

Using your secondary fermentor is easy. Wait until fermentation is complete or nearly complete, and then gently siphon the beer from primary to secondary. Leave as much of the sediment behind as possible. You definitely want the secondary fermentor filled to the narrow part of the neck, so top up with pre-boiled cool water if necessary. Don't worry about "watering down" the beer, because you're supposed to have 5 gallons at this point. Now let the beer sit in the secondary fermentor until it's clear. Although most or all visible yeast will settle in the secondary fermentor, there will still be enough invisible suspended yeast cells to carbonate the beer in the bottles. However, if your beer sits for a long time in secondary you may want to add more yeast when bottling, or be prepared to wait longer for carbonation. Beers, especially lagers, can be cold aged in a secondary fermentor. This can knock out all of the yeast, so you may need to add a fresh culture when you bottle or risk having no carbonation.

OPTIONAL – CLARIFICATION

Finings and other clarifying agents can help the beer clear more quickly and completely, and reduce the chill haze which will form later. You don't need a secondary fermentor to use finings or other clarifying agents. They're cheap and easy to use, and won't have a bad effect on the beer. Most finings are made from natural materials. You don't need to add preservatives to your beer unless you want to. The best way to clarify is a three-part approach:

First, use Irish moss (or a refined Irish moss product like Whirlfloc) during the boil. Brewers should do this with every batch because there's no drawback to the use of Irish mss. Just add a teaspoon of Irish moss or drop in a Whirlfloc tablet during the last 10-15 minutes of the boil. Irish moss causes more protein to separate and settle out of the wort, reducing one of the main causes of haziness in the finished beer.

Second, add finings after fermentation is complete. Finings include brewer's gelatin, isinglass, SuperKleer, etc. Their job is to make particles stick together and settle more effectively. In a single fermentor, add finings a few days before bottling. If you're using a secondary fermentor, you have the alternative of adding finings when you transfer the beer. **Follow the directions on your finings.** Stirring makes finings work, even though it seems to be a step backwards. Stirring up the settled yeast looks bad, but don't worry because this heavy stuff will settle again in a day or two. But now the finings cause lighter suspended particles to stick to the heavy ones. In a few days the beer will settle again, and it will be much clearer than before you stirred it up.

Third, PVPP-type clarifiers (Polyclar, Divergan, etc.) can be added at the same time as finings. They're plastic powders which don't dissolve in the beer. You stir them in, and after a day or two they settle to the bottom. On the way down, they absorb tannins which contribute to chill haze later. Stirring is very important because the PVPP must be completely dispersed for maximum effectiveness. It's a good idea to add these powders slowly, because there's plenty of CO2 dissolved in the beer. This dissolved CO2 can foam up when the powder goes in.

SECTION 2 – BOTTLING

Correct Bottles: Glass bottles with pry-off caps are best. Home brew cappers aren't made for bottles with twist-off caps. American-made brown longneck bottles, such as Samuel Adams, are ideal. Clear bottles, like Corona, are OK, but keep them away from ultraviolet light sources (sunlight and fluorescent light.) Flip-top Grolsch-style bottles are great. Some bottles from Britain and Canada, such as Bass and Molson, are harder to cap with a handheld capper due to slight differences in mouth design. A bench-type capper is better for these.

How Many Bottles: Don't be worried if you have a few bottles more or less, but you'll need approximately:

53 – 12oz. bottles   40 – 16oz. (500ml) Bottles   29 – 22oz. Bottles   19 – 32oz. (1 liter) Bottles

Alternatives: Instead of bottling, many brewers choose to use kegs. Converted 5 gallon soda kegs are popular, because they make filtration & forced carbonation possible for very professional results. Soda keg systems generally require a dedicated refrigerator. Mini-Kegs & Party-Pigs are also popular. They're smaller, so a batch can be split between kegs & bottles, plus they fit into your existing refrigerator. Read more about kegs on our website.

Step 1: Before you start bottling, make sure fermentation is complete. Complete means no more activity. "Very slow" doesn't count! In a glass fermentor it's easily see fermentation slow down and stop. Plastic fermentors are trickier – don't rely on watching the airlock because lids often leak. It may be necessary to remove the lid. Inside, there's usually a tell-tale ring of crud that shows where yeast foam rose to the surface during fermentation. Remember: disturbing the fermentor may make bubbles to rise, but this isn't a sign of fermentation.

Step 2: Optional, but recommended. Test the Specific Gravity (SG) with a hydrometer. Don't try to test in your fermentor - use a test jar or hydrometer thief. Ensure that the hydrometer is free-floating with no clinging bubbles. Read the scale where it lines up with the surface. This is your Finishing/Final Gravity (FG) reading. Why check? Although fermentation is usually complete when activity stops, in <u>rare</u> cases it can stop prematurely. The only way to be absolutely sure is to check the SG. The SG should have dropped *(not counting the 1 before the decimal)* approximately 75% during fermentation. In other words, a beer that started at 1.048 should end at about 1.012. If you suspect that fermentation stopped early, move it to a warmer area, wait a day, then stir to reinvigorate the yeast.

Step 3: Mix up at least 2 gallons of cleansing/sterilizing solution in your bottling bucket. If the bottles are visibly soiled, soak them in warm water first to soften the deposits, and then scrub them out. Run some solution into each bottle, shake, and then pour the solution back into the bucket. Don't rinse unless the sterilizer's instructions require it. There are lots of gadgets to make cleaning, sterilizing, and draining bottles faster and easier.

Step 4: Allow bottles to drain and dry upside down. If you don't have a bottle drying tree, you can use the pins on the top rack of your dishwasher. Trying to sterilize with the dishwasher is a bad idea; dishwashers can't get much water up inside the bottles. Caps don't need to be sterilized unless they've gotten dirty. **Never boil caps!**

Step 5: While the bottles are drying, use the sanitizing solution to sterilize your racking cane, siphon hose, and bottle filler. You'll also need to sterilize a big spoon or paddle and a glass measuring cup. A *racking cane* is a clear, rigid plastic tube with a curved end and a black (or colored) anti-sediment tip on the other end. Flexible hose hooks to the curved end. Your *bottle filler* is a 12-15" clear tube with a black (or colored) valve on one end.

Step 6: Attach the bottle filler to the bottling bucket spigot. Rotate the spigot until it points upwards. Next, cut off a 1" long piece of flexible siphon hose, and use it to splice the bottle filler onto the spigot. Move your fermentor to a countertop or table. Place the bottling bucket on the floor beneath it. Soon you will siphon the beer from the fermentor into the bottling bucket, so be gentle when moving the fermentor to avoid stirring up the sediment.

Step 7: If you haven't done so already, assemble your siphon by attaching the flexible siphon hose to the curved end of the racking cane. You can use hot water to soften the hose if it's difficult to push on. Siphon the beer from the fermentor to the bottling bucket. You can start a siphon easily, and without unsanitary "sucking." Hold the entire hose-and-racking-cane siphon assembly upside-down by the ends, so it forms a big "U". Fill the whole thing with clean tap water. Hold your thumb over the hose end, and then put the rigid end down into the fermentor. Aim the hose end down low into the bottling bucket, and remove your thumb. The water in the tube and gravity will start the siphon. If this seems like a hassle, there are nice automatic siphon starters available for less than $10.00.

Step 8: Don't worry about the water used to start the siphon; it's not enough to have any effect on the beer. You should be able to let the racking cane rest on the bottom of the fermentor, because the special tip will prevent it from picking up sediment. Just try not to let the racking cane move around too much or it might stir up the sediment.

Step 9: As the beer siphons into the bottling bucket, try to make the transfer as gentle as possible. Beer that is splashing or running down the side of the bucket picks up more oxygen, which reduces shelf life. Ideally, the siphon tube should reach all the way down to the bottom of the bottling bucket. The anti-sediment tip of the racking cane will stop siphoning with about ½-inch of sediment and beer left behind in the fermentor. Thrifty brewers sometimes gently tip the fermentor to siphon out the last of the beer, especially in a secondary fermentor where there's less sediment. You shouldn't worry about a few ounces of beer at the risk of siphoning a lot of sediment, though.

Step 10: When the siphon is complete, lift the bottling bucket up to the countertop or table, placing it so that the spigot hangs a couple inches over the side. Don't put a lid on the bottling bucket. If you suspect the presence of lots of dust or other airborne contaminants, drape a clean cloth over the top of the bucket. Rotate the bottling spigot so that the filler points down. You may want to put something on the floor beneath it, because there will be a tendency to drip while you work.

Step 11: Put about a cup of hot tap water into your sterile measuring cup. Pour the bottling sugar into this and stir to dissolve. Pour this sugar solution into the beer. Stir gently but completely with a sterile spoon or paddle. Some instructions tell you to put the sugar in earlier, and let the siphon action stir it. This is a bad idea because it's very important that the sugar be mixed evenly, and siphoning should be too gentle to do it right. You can boil the sugar solution on a stove or in a microwave if you're worried about contamination, but it's probably not necessary.

Step 12: Turn the bottling spigot on. This lets beer flow into the bottle filler, but it should stop at the valve in the tip. When you slide a bottle up onto the filler, the bottom of the bottle pushes the valve to make beer flow. Let your bottle fill to the very top, because withdrawing it from the filler drops the level about an inch. Now the bottle is filled to the perfect height, so you can cap it. Keep bottling until you're out of beer! Partially filled bottles won't carbonate, so don't try to scrounge the last few ounces of beer.

CONDITIONING: Store your bottles upright at fermentation temperature for at least a week. During this time, live yeast in the beer will ferment the bottling sugar. The CO_2 produced during this time is the source of carbonation. Some beers will take longer to carbonate, so make sure that your beer is carbonated before you move the bottles to a cold storage or refrigerator, or else you may stop the carbonation (conditioning) process prematurely.

STORAGE: After the beer has conditioned (developed its carbonation), you may want to move it to a cooler storage area. Steady, cool storage temperature will keep your beer fresh for the longest time. You may have heard or read something like "this beer was lagered at 35 degrees." The term "lagering" refers to cold storage after fermentation, which improves the flavor of lagers. Ales do well when stored at room temperature or basement temperature, but cold lagering can have a good influence on some ales, especially with high alcohol recipes.

MATURING: Almost all beers will improve in flavor and aroma as they age. Most beers show the best improvement after 6 to 8 weeks in the bottle. Storage conditions have a big influence on this, as well as the strength and flavor characteristics of the beer. Generally, stronger beers age slowly, and light beers reach their peak quickly.

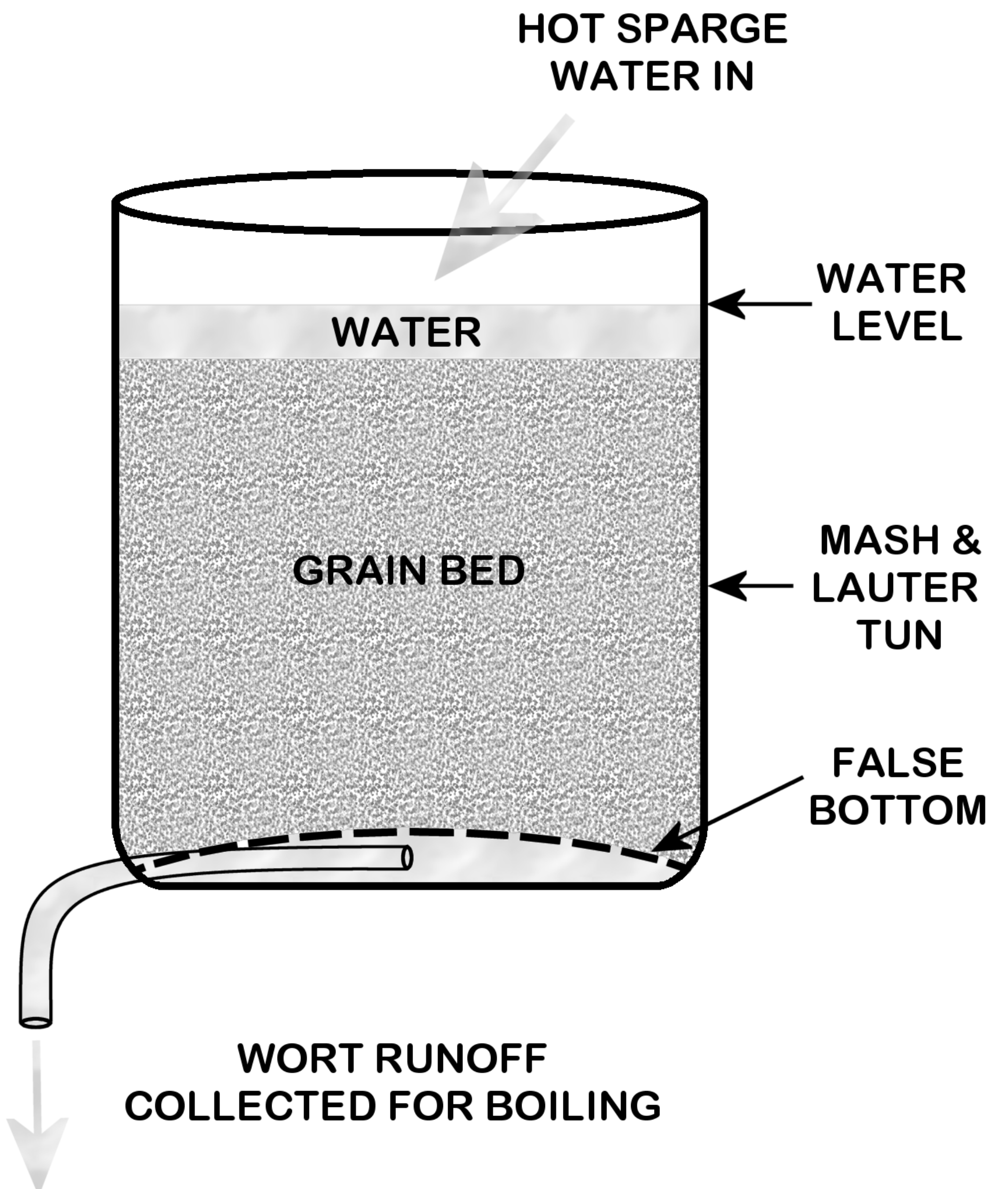
SHELF LIFE: Storage conditions have a big influence on shelf life. Try to keep your beer at a steady temperature, and away from sources of ultraviolet light. Alcohol and hops are natural preservatives, so high-alcohol and /or high-hop beers last longer. Even the lightest beers should be good for 4 months in reasonable conditions. To extend shelf life, you can add preservatives (some are mild and flavorless; others are stronger chemicals.)

SEDIMENT AND CLARITY: Naturally conditioned beer has two characteristics – yeast sediment and chill haze. Yeast sediment is a byproduct of the carbonating process, it settles on the bottom of the bottles when carbonation is complete. It's healthy to drink - full of B vitamins. Even crystal-clear beer forms haze when chilled, that's why the ads talk about cold-filtering! Chill haze is flavorless, and will settle out after refrigerating bottles for a week or two. To serve crystal clear beer, refrigerate bottles upright, and uncap them gently to avoid raising the sediment. Pour the beer into a clean glass in one smooth motion, and stop pouring when you reach the sediment.

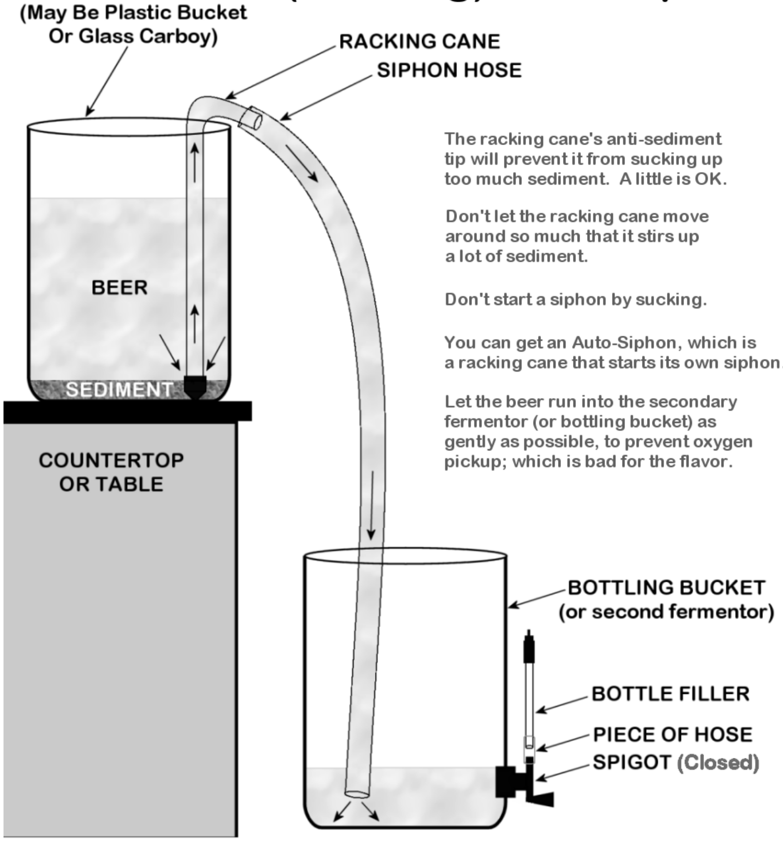
TRY OUR OTHER BEER RECIPE KITS:

Altbier *German-style*
Amber Ale *American-style*
Amber Ale *Ultimate*
American Pilsener
American Lite Pilsener
Apricot Special Ale
Australian-style Lager
Barleywine *British-style*
Belgian Dubbel
Belgian Trippel
Belgian Quad
Bitter *British-style*
Blackberry Wheat
Blond Ale
Blueberry Wheat
Bock (Traditional Dark)
Bock (Helles / Maibock)
Bock (Doppelbock)
Bock (Weizenbock)
Boston Ale
Boston Lager
Brown Ale *American-style*
Brown Ale *British-style*
Cherry Wheat
Common Beer (Steam Beer)
Common Beer *Ultimate* (Steam Beer)
Cream Ale (Canadian Ale)
ESB
Honey Brown
Hopfest Ale
Imperial Ale "60"
Imperial Ale "90"
Imperial Stout *British-style*
Imperial Stout *Russian-style*
Kolsch
Lambic (Cherry)
Lambic (Peach)
Lambic (Raspberry)
Mexican Cervesa
Mexican Lite Cervesa
Mild Ale
Munich Dunkel
Munich Lite Dunkel
Munich Helles
Munich Lite Helles
Oktoberfest
Oktoberfest *Ultimate*
Old Ale (Strong Ale)
Pale Ale "Pepperpot" (British-style)
Pale Ale "Rockfish" (British Style)
Pale Ale *Ultimate* (American-style)
Pennsylvania Lager
Pennsylvania Porter
Pilsener (Bavarian-style)
Pilsener (Bohemian-style)
Pilsener (Czech-style)
Porter (British-style Brown Porter)
Porter *Honey* (American-style)
Porter *Ultimate* (Robust Porter)
Pub Ale *Irish-style*
Raspberry Wheat
Red Lager
Schwartzbier
Scotch Ale
Stout *Chocolate*
Stout *Cream*
Stout *Irish-style*
Stout *Oatmeal*
Strawberry Blond
Summer Lemon Ale
Vienna-style Lager
Wheat Beer *American-style*
Wheat Beer *German-style*
Hefeweizen *German-style*
Winter Seasonal Ale
Winter Warmer

PROPER LAUTERING AND SPARGING TECHNIQUE



Proper Siphoning (Racking) Technique



The racking cane's anti-sediment tip will prevent it from sucking up too much sediment. A little is OK.

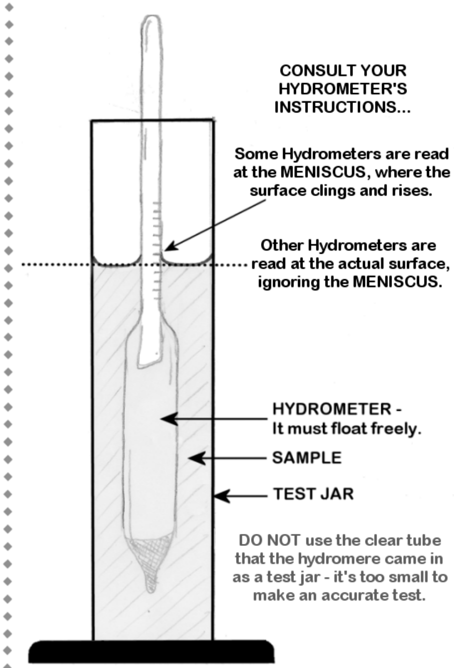
Don't let the racking cane move around so much that it stirs up a lot of sediment.

Don't start a siphon by sucking.

You can get an Auto-Siphon, which is a racking cane that starts its own siphon.

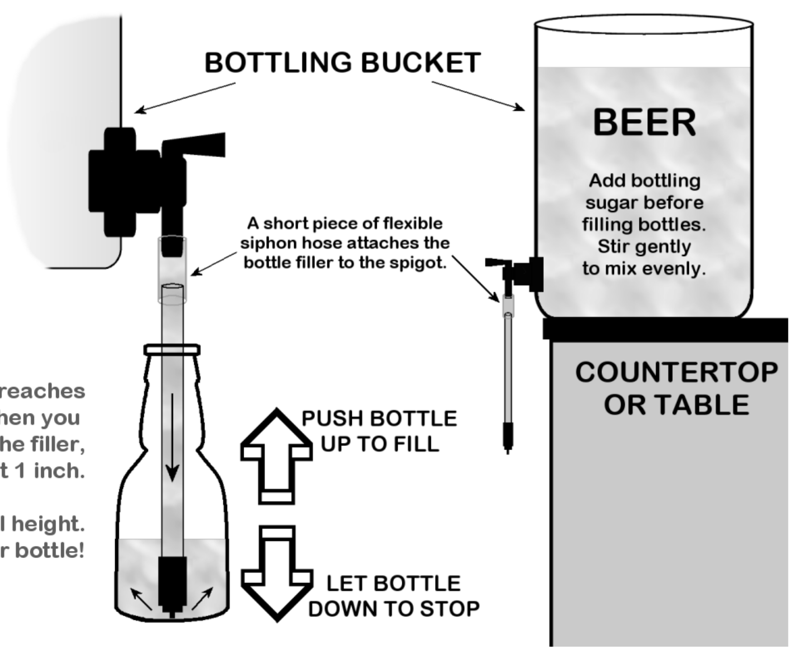
Let the beer run into the secondary fermentor (or bottling bucket) as gently as possible, to prevent oxygen pickup; which is bad for the flavor.

Proper Hydrometer Reading



A "Thief" is a nice thing to have, because it both removes a sample from the fermentor without siphoning and acts as the test jar, too.

PROPER BOTTLE FILLING



Fill the bottle until beer reaches the very top. Now, when you withdraw the bottle from the filler, the level will drop about 1 inch.

1 inch below the cap is proper fill height. You are now ready to cap your bottle!