

# Viking Age Buckets For the Real Viking Project

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## SUMMARY

Buckets were a necessary tool in the Viking Age. The need to carry liquids and quantities of dry goods is ever-present, particularly in an encampment or on a farm. The basic form of the bucket has changed little over the centuries since the Viking Age; only the materials have changed.

This document will teach you the basics of creating buckets or washtubs for use in your encampment. The buckets described here will meet RVP Level 1 standards of authenticity.

## Historical Documentation

### *Bucket Basics*

Buckets are similar in form to barrels, though simpler. The skill of making buckets and barrels, known as coopering, requires great skill and experience. The principles presented here might assist, but are not intended to teach, the more complex task of making barrels. The term "white coopering" is applied to making buckets and tubs, and requires much less skill than barrels ("wet coopering" or "dry coopering", depending on whether the barrel holds liquid).

Buckets are simple, with several parts. Shown to the right are a reconstructed bucket and washtub from the Viking Age Farm at Fyrkat fortress in Denmark, and show all the typical features. The side of the bucket is made up of pieces of wood called staves. The bottom of the bucket is a flat piece of wood that fits into grooves in the staves. The staves are the boards that make up the side of the bucket. Sometimes, two staves are longer and are used to attach a handle. The staves are held together by two



photo by Isabel Ulfsdottir

or more hoops of iron or wood, holding the staves in place with tension and compression forces. Sometimes the staves are shaved so the bucket is round, and sometimes they remain faceted. The bucket and tub shown have all the features described.

### ***Period Examples***

Morris' book, *Wood and Woodworking in Anglo-Scandinavian and Medieval York*, describes the excavation, preservation, and classification of thousands of wood artifacts from the Viking and Medieval period, found at the Coppergate site in York. A majority of these artifacts were tools, waste, and products from the art of woodturning. There are many examples of buckets from Viking Age York and the surrounding countryside. They appear in a wide range of sizes, and varying degrees of skill and decoration went into their construction. They were made from oak, yew, willow, fir, and had chamfered (angled) edges to give a tight seal between staves (Morris 2228). Some buckets had staves of varying width, and the number of staves in the bucket varied from six to nineteen (ibid).

Metal hoops were usually riveted into hoops, heated, and then placed on the bucket, so that when the metal cooled it would shrink to tightly bind the staves. A few iron hoops were nailed in place. Records show, however, the iron-bound buckets cost twice as much as wood-bound buckets (Morris 2230), and were mostly used in well buckets. Wooden hoops, which appeared to be more common, were made from thin strips of wood and nailed or pegged in place.

Handles were made from rope, wood, or metal. Often, the holes in the bucket through which the handles attached were reinforced with metal, particularly when the handle was made of metal.

The best surviving specimens were found in wells, due to the water preserving the wood. Well buckets tended to be smaller at the bottom than the top so that, when lowered into the water, they would tip easily to fill themselves. This shape is the most common type of bucket found (Morris 2228), closely followed by buckets with parallel sides. This bucket shape has carried through into use today. The bucket shown to the right is made of yew wood with five brass hoops. The bottom is two pieces, with 17 staves shaved so the bucket is round inside and out. The hoop on the rim also has the handle mountings integrated in it. The handle is brass, slightly flattened in the center and flanked by two simple animal heads. It was found inside another bucket, inside a barrel buried in the prow of the Oseberg ship. This bucket, finely constructed with brass fittings, is certainly the product of a skilled craftsman, and worthy of being buried with the queen. This bucket is believed to have been imported from England.



Roesdahl #159

Buckets used for carrying liquids or dry goods, on the other hand, show varying aspect ratios. Morris shows many bucket staves, some from buckets that were larger at the bottom. My theory is that some buckets were built this way because this shape makes them less likely to tip when set down, or to splash their contents when carried. The bucket shown to the right is typical of this type. It is made of 10 staves of pine and is widest at the bottom. The hoops, mostly gone now, were of beechwood and held in place by iron nails still visible in the photo. The bottom is one piece, caulked with resin. The handle is twisted iron with a wider plate at the center, attached to the bucket with simple bent iron loops nailed in place. It has a runic inscription "**asikrir**", which translates to "Sigrid owns [this bucket]." This bucket, of simpler materials and construction, is more likely to be typical of the "everyday" bucket used by Norse people in the Viking Age.



Roesdahl #160

### ***Finishing***

Finishing the bucket would require smoothing the surface sufficiently that it would not cause splinters, and sealing the wood to resist the materials being carried and the weather.

Period abrasives include many different materials and techniques. For buckets, the likely method would be planing. I saw many wood planes in the Danish National Museum, whose form was not substantially different from the modern plane in my workshop. Planing would be followed by sand and cloth, or by scraping with the edge of a sharp knife or a tool called a scraper, which is similar in form to a razor blade held edge-wise. If the cooper wanted a bucket with smooth round sides, he could use a plane, spokeshave, or drawknife on the outside of the staves and a barrel-shave (a drawknife-like tool with a convex-curved cutting edge) to round the inside of the staves. Careful use of the plane and the barrel-shave would produce a smooth surface that would not require further finishing.

The bucket could be caulked with resin if it had to hold hot liquids, such as a washtub, or beeswax if it only carried cold liquids or dry goods. A good cooper could produce a barrel or bucket that was watertight without the need for caulking. The outside wood could also be sealed with vegetable oil to prevent moisture damage.

### **Materials and Tools**

Any wood that you have is appropriate for making a bucket, though poplar is the best compromise of weight and strength and is readily available in period and today. I made mine from scrap pine which worked just fine. If you buy the wood fresh from the lumber yard, you should let it dry a bit, so that if it warps you can incorporate the warp into the bucket's shape. You will also need scrap wood to make the various jigs you will need. All the bucket parts can be done with "1x" stock, i.e. lumber-yard 3/4-inch thick wood in whatever width you can get. If you were making the exact bucket described here, 1x4s would be ideal if you don't mind wasting some wood. Wider boards would be less wasteful, and would use fewer pieces for the bottom.

Tools consist of a bandsaw, table saw, or hand saw, plus block plane, chisels, hand files, a router (optional if you have a table saw), and sand paper or scraper if you want a really smooth finish.

## Method of Construction

### *Design Decisions*

First, you must decide whether to make a bucket that tapers, how many staves to use, and the height and circumference of the bucket. Then, you determine what jigs you will need. Finally, you must decide on a material and method for making the hoops and handle. A non-tapered bucket would challenge a novice woodworker, while a tapered bucket proved to be a challenge for an intermediate woodworker such as myself. The entire project takes 5-8 hours, depending on your skill, level of care, and the type of hoops you make.

If you are using a hand saw, you will need a lot of guide sticks (straight sticks clamped on each side of the saw's path to ensure a straight cut) because a mitre box is not suitable for ripping. A table saw or band saw does not require guide sticks because it has table and angle settings to accomplish the same thing. You will also need to get or make a taper jig if you want a bucket that tapers like those shown above. Once the size decisions are made and the jigs are ready, you can cut the wood, assemble the bucket, and create and install the hoops.

The method shown here will make a bucket or tub from staves that are identical in width, with two longer ones that will attach the handle. For this document, I will choose sizes arbitrarily. This method avoids most of the mathematics, and is probably the way things were done then, given the varying sizes of buckets that have been found. I will, however, show a mathematical shortcut to determining one critical angle, which may or may not have been done in period. Then, if you want a wash tub or bucket of a different size, you can use the method shown to derive your own measurements.

First, I decide the bucket will be 12 inches high. Such a bucket will hold a respectable amount and has pleasing proportions. I also decide that the bucket will have 10 staves. More staves mean more of a circular appearance and more difficult assembly. I chose a circumference that can easily be divided by 10, such as 40 inches. That will result in a bucket about 13 inches in diameter ( $40 / 3.14 = 12.7$ ), but the important thing is that  $40 / 10 = 4$  inches, the width of each staff. The overall proportions of this bucket will be similar to Roesdahl #160 shown above.

Before you start cutting, I want to review some general principles of woodworking. First, check all measurements, guides, jigs, and the direction you will cut at least twice before cutting. Second, keep in mind the width of the cut (kerf) the saw will make in the wood when measuring. Finally, once you set up a certain cut, make all cuts that require that setup; once you set the blade at a particular angle, make all cuts that require that angle. Taking care with these principles helps ensure consistent results of which you can be proud.

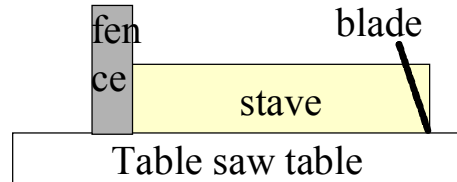
First, cut the staves. If you want a tapered bucket, study but do not execute the next section. If you want a bucket that does not taper, execute to the next section then skip the section after that.

### *Cutting Staves for a Straight, Non-Tapered Bucket*

Cut 10 staves that are 4 inches wide. Eight staves will be 12 inches long, and two will be 14 inches long, the extra two inches being for the addition of a handle.

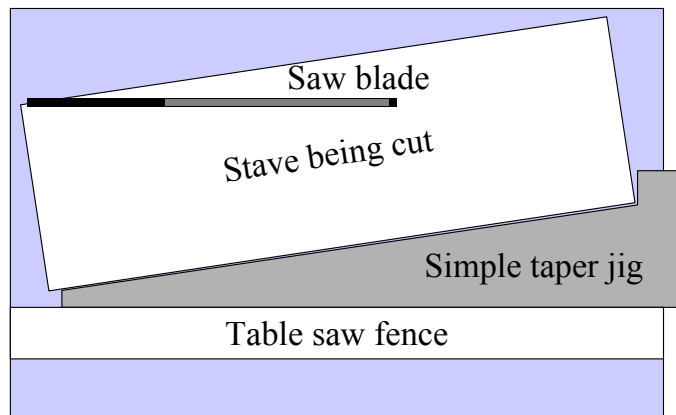
Now, it is time to bevel cut the chamfer edges of the staves. In period, the cooper may have done this by hand or with a diagram, using his eyes and experience to achieve a tight fit. We will take a shortcut to make up for our limited experience. A bucket is a circle, 360 degrees. A theorem from geometry tells us that for any number of sides greater than 3, the angles for a polygon add up to 360 degrees (consider a square box, with 4 90-degree angles). Since each join angle is the meeting of two staves, the chamfer angle on each stave is half the join angle (with the box, each 90-degree angle is where two boards with 45-degree chamfers meet). Therefore, the chamfer angle for 10 staves is 360 degrees / 10 staves / 2 sides = 18 degrees per stave side.

Set this 18-degree angle on the table or band saw, set the fence 4 inches away from where the blade comes out, and run the stave through the saw against the fence. Using the fence this way ensures consistent angles and widths for all the staves. The drawing to the right shows the setup for a table saw. With a band saw it is the table that tilts rather than the blade, but the principle is similar. Pay particular attention when cutting the angle on the other side of the stave, to ensure that the angles both come out on the same side, and that you keep the chamfered edge against the fence. When you have chamfered all the staves, skip the next section and go to the Test-Fitting section.

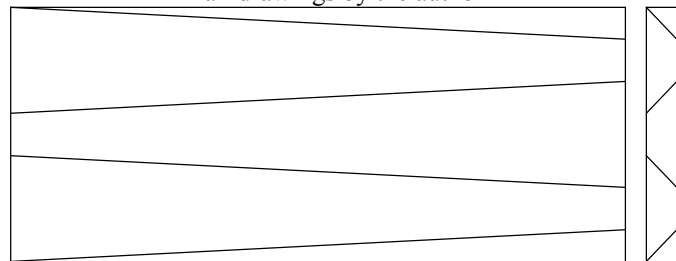


### ***Cutting Staves for a Tapered Bucket***

I have chosen to make a tapered bucket, so when I cut the staves, they must be tapered, and I will waste less wood if I cut the angles and the tapers at once. Set the 18-degree angle on your table saw or band saw (study the section above for discussion of the chamfer angles). The top picture shows a simple taper jig cut from a board, being used on a table saw. The taper jig is cut at an angle, with a protrusion on the back to ensure consistent placement of each stave and to push the stave into the saw. I recommend a very small angle on the taper -- three degrees per side gives a pleasing shape. Make a narrow taper jig for using against an untapered side of the board. The bottom drawing shows how to get multiple staves out of a wider board with less waste. If



all drawings by the author



you use this approach, you will use the narrow jig for the first cut and one exactly twice that angle for cuts against an already-tapered side. The second jig must be exactly twice the angle of the first, or your taper will not be even on both sides and you will not like the result. Careful checking before each cut is crucial to getting equally-sized staves that taper in the correct direction, equally tapered on both sides, and with the chamfers also going the correct direction.

Again, there are two ways to get tapered, chamfered staves: (1) cut them from a wider board as shown above, using the narrow taper on the first cut and the wider taper on subsequent cuts, or (2) taper each individual stave from both sides (using the smaller angle). It wastes more wood, but is much easier to cut all the staves individually, because you only need one taper jig.

Drill small holes in the top of the two longer staves, centered and 1 inch down from the top, for later attachment of the handle. The holes should be slightly larger than the size of your handle material.

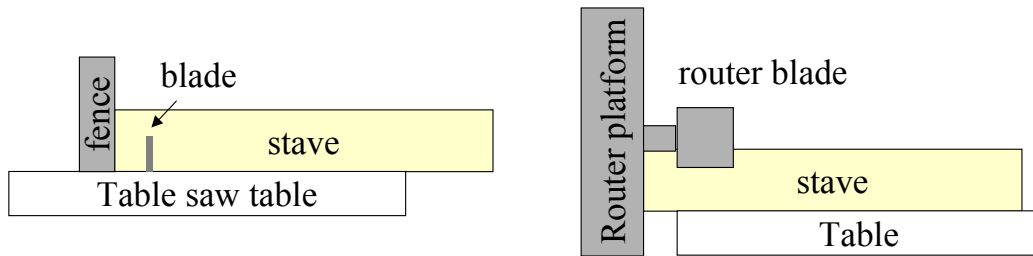
### ***Test-Fitting the Staves***

Assemble the staves together temporarily with tape, ensuring the longer ones are on opposite sides to balance the handle. Then, use a rope clamp or adjustable cargo strap to tighten the staves against each other. If you measured carefully when cutting, the ends should meet evenly and the joints should be tight, forming a circular shape. If your bucket tapers, carefully measure the angle at which it tapers, measuring between the flat of one of the staves and the vertical. This angle will be used later, and is referred to below as the "bucket taper angle." Set this stave assembly aside for the moment.

Measure the approximate diameter of the outside of the bucket and make the bucket bottom to that length and width. If you do not have one wide board, you can glue the boards together. Peg them with dowels, or make spline joints (long thin strips of wood, grain turned sideways to the boards being joined, glued into thin cuts made in the edge of the boards so as to be hidden when joined). However you join the boards, the method should not be visible when the bucket is assembled. Join, glue and clamp them so that they will dry into one strong wide board. For a bucket of the size described here, you can use a 1x12 so that the bottom will be one piece.

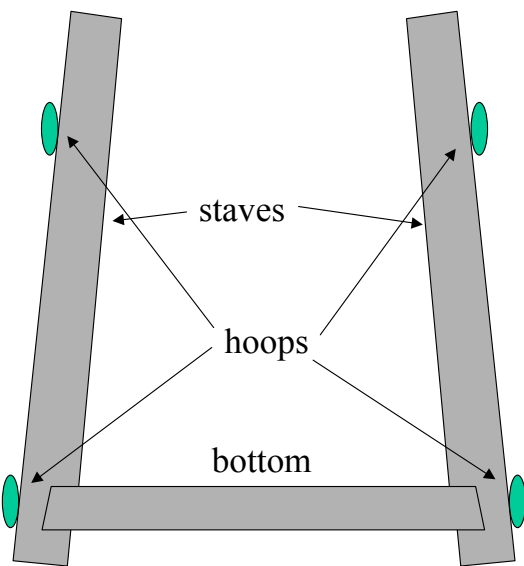
Set the assembled staves on the bucket bottom, as centered as you can make it, trace the inside bottom, and set the staves aside. The resulting tracing on the bottom is a polygon. If you made a non-tapered bucket, add a 3/8 inch radius to all sides of the polygon, making it slightly larger, and carefully cut along the lines of the larger polygon. If you made a tapered bucket, add 1/4 inch to the tracing on all sides, and chamfer the cuts at an angle equal to the bucket taper angle, chamfered **outward** from the outer line you drew.

Notch the staves to accept the bottom. This is easiest to do on a table saw. If you are making a non-tapered bucket and have a 3/4 inch dado blade, you can do this in one pass. Otherwise, set the blade to a 0-degree angle for a non-tapered bucket, or the bucket taper angle for a tapered bucket, and a depth of 3/8 inch. Set the fence 1/2 inch away from the blade. For a bucket that tapers toward the top, the blade should angle toward the fence, and for a bucket that tapers toward the bottom, the blade should angle away from the fence. As mentioned before, a non-tapered bucket will have a 0-degree blade angle. Run all the staves through sideways, with their wide ends against the fence, as shown in the drawing below left.



Reset the fence to 1 1/8 inches and run the staves through again, then again at 5/8, 3/4, 7/8, and 1 inch. You may have to vary the measurements to fit the kerf (teeth width) of your blade to get a notch (called a rabbet) 3/8 inch deep and 3/4 inch wide, starting 1/2 inch above the end, in each stave. For a non-tapered bucket, the rabbet can also be cut on a router with a 3/4 inch high, 3/8 inch deep square blade, set to a 1/2 inch depth, as shown above right. Take care to clamp the wood securely for your own safety and to avoid poor cuts.

You are now ready to test-fit the bucket to its bottom. The drawing shows a side cross-section of how the parts go together. Test-fit all the parts by holding the bucket together with the cargo strap or rope clamp, taking note of where the fit is not good, and trimming with a saw, plane or chisel if something does not fit quite right. This is the most time-consuming part of the construction if you exercise the proper amount of care, but well worth the effort to get tight joints. It is easier if you number the sides of the bottom so you can make notes of where to trim. As you find a stave that fits well on a particular side, number it as well.



If you want a bucket with a round exterior, now is the time to trim the stave edges with the plane, drawknife, or spokeshave, doing the sections not covered by the cargo strap, then moving the strap and doing the remaining sections. This trimming must be done while the bucket is assembled to ensure the joints are smooth, but before the hoops are installed because, once installed, the hoops cannot be moved.

### ***Making and Installing the Hoops***

When you are satisfied that test-fitting looks good, make your hoops. Measure the bucket where you want each hoop to go to get the circumference for each hoop. You need two or more hoops.

Wooden hoops are more difficult to make than metal, but are more impressive. For wooden hoops, take a 4 foot stick of green wood (yew, ash, or osage orange are best), clamp it in a vise, and using wedges, carefully split it into 2 or more relatively flat strips. Carefully bend the strips into hoops the size you want. Take your time and let the wood adjust to its new shape gradually. When the hoops have reached the right amount of bend, overlap the ends and tie them in place with glue and the inner bark from the stick, clamping it until the glue dries.

You can make metal hoops using thin strips of metal (between 1/2 and 1 inch wide), 1/8 inch or 3/16<sup>th</sup> inch rod, or heavy wire (16 gauge or larger steel wire, or 10 gauge or larger nickel or

brass) wire. Metal hoops make a very strong bucket, because you will heat them up to install them and allow them to shrink in place as they cool, which will make a very tight bucket.

When you are ready to install the hoops, put a thin line of glue in the rabbet where the bottom fits into the staves, and on the chamfers where the staves meet. Strap the bucket together, so that the straps are holding the staves together but are not where you plan to put the hoops.

#### Hoops for a Tapered Bucket

If the bucket is tapered, make the hoops slightly smaller than you think they need to be, to ensure they pull the bucket staves together tightly.

Take the wooden hoops, glue them into a circle, and bind the joint with the inner bark of the wood or a natural fiber string, using glue to hold that on as well. You can use small tacks or staples if you want, but it looks better if these are hidden on the back of the hoop. When the glue is dry, take the hoops and, from largest to smallest, drop them onto the bucket.

Metal hoops for a tapered bucket should also be fastened off the bucket. For wire, twist them together one full turn, and leave 1 inch of end sticking out (we will bend it over later and drive it like a nail into the bucket). For metal strips or rod, rivet them together. Then, heat the hoop in an oven, kiln, or outdoor grill, at least 500 degrees but as close as you can get to 1000 degrees (with the lights off, the metal has a faint orange glow at this temperature). Put on thick leather gloves, and starting with the largest, take out the hoop, drop it onto the bucket. With metal hoops, tighten each one down before putting on the next one, so you can work with them while they are hot. Technically, a metal hoop on a tapered bucket should have a conical section, not cylindrical, so the narrower the hoop is, the less likely this oversight will be noticeable if you lack the skill to make a conical hoop. My solution to this problem was to use metal rod instead of strap to make the hoops.

As you put each hoop onto the bucket, slip it into place by pushing it down, tapping gently with a mallet and flat stick. While you do this, look at the side of the bucket while it sits on a level surface, to ensure the hoops sit level. Be cautious not to tighten wooden hoops too much, or they will break. If the hoops are wooden, secure them in place with glue and small nails. Metal hoops can be secured by letting them shrink as they cool. If you used wire for the hoops, cool down the ends with a wet rag, which will harden the wire ends so you can bend them over and drive them into the wood like nails.

#### Hoops for a Non-Tapered Bucket

For a non-tapered bucket, installing the hoops tightly is more of a challenge, because there is no taper on the bucket to tighten them into place.

For wood hoops, tighten the bucket staves with the cargo straps. Use small nails and glue to secure the hoop as you wrap it around the bucket. When the glue is dry, remove the straps.

For metal strip or rod hoops, heat them up as before and then, while hot, nail one end to a stave, wrap the hoop around, and nail it into place through predrilled holes. For metal wire hoops, heat them up and then, while hot, wrap them around, pull tightly with 2 vise-grip pliers (invented by a

Danish immigrant, by the way), twist them together, and bend the ends over, then drive them into the wood like nails. As before, quench the ends of the wire with a wet rag to harden the wire enough to withstand being driven into the wood.

While the glue is drying, make your handle.

### ***Final Assembly***

The handle can be made from a rope, wooden dowel, or metal rod.

A rope handle is the easiest to make. For a rope handle, use a natural fiber rope such as hemp or sisal. Cut a piece of rope 1 1/2 times the diameter of the bucket, wrap the ends in string and glue so they do not unravel, tie a knot in one end, run the rope through the holes, and tie a knot on the end to secure it. You can adjust the length of the handle by moving the knots.

You can install a wooden dowel for a handle simply by slipping it through the holes in the handle. Ensure you use a dowel sturdy enough to hold the weight of a full bucket, and make it at least 1/2 inch longer than it needs to be. Secure one end to the stave with a nail, and leave the other one loose and protruding 1/2 inch so that the dowel can flex a bit under load. If you prefer, find a branch that is curved like a handle and use that. Carve the ends to shape, then insert it through the holes while it is still green and flexible, and allow it to cure in place.

If the handle is metal, you should reinforce the opening with metal to prevent the handle from wearing through the wood. In period, this was done with two simple metal rods, beaten flat at the ends and bent into a U shape the same size as the hole. Nail them to the inside of the staves with the curve at the top, to take the weight of the bucket off the stave's hole.

Paint the inside with wax or resin. I recommend that you coat the outside with oil to preserve the wood. Then, your bucket will be ready to provide years of use.

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