

Line and Batter: Part 3 – Frames & Line Bars

Last time in the interests of space and general sanity the non-linear relationship of batter ratios was avoided. Don't panic it's not about to barge in here, I did promise something more practical. However for the true anoraks it should by now be accessible on a site set up by American waller and DSWA member Mark Jurus - <http://drystonereresource.blogspot.com/>. You might have to dig a little; I don't have the exact address, in fact as I write this Mark does not yet know...

There is of course plenty of technical information on line bars and frames in all the usual places, but it still amazes me how often you see lopsided frames, offset bars etc. Small discrepancies probably do not really matter but when setting out this column I work from the basis of trying to promote understanding of principles – the better you understand the less likely it is to go wrong; and setting some sort of ideal – probably unachievable - but missing it, is not as problematic as if you start out thinking that much less is acceptable and then do not even achieve that.

If you're going to go to the effort of building a batter frame you might as well get it right. However for many we are likely to enter the realms of grandmothers and eggs here. But I shall make no assumptions, as the saying goes ASSUME = ASS + U + ME.

Perhaps the easiest way to make a symmetrical frame is to start with a sheet of plywood and mark out the wall's profile on that. For sake of argument, illustration and nice round figures, we'll take a wall 1.2m high, with a base width of 80cm and top width of 40cm. Numbers correspond to Figure 1.

1. Mark the base width (here 80cm)
2. Mark a line 1.2m from the base of the ply parallel to it. It is best to make at least three marks 1.2m from the base, that way you can be more sure that your top line is parallel to the bottom one as it should intersect with all your marks (bear in mind that the marks are unlikely to be exactly 1.2m from the bottom unless you are measuring exactly at right angles, but you should be able to get it close enough).
3. Mark in from the edge of the ply the position of the middle of the top of the wall, on the top line, this will correspond to half the base width (in this instance $80\text{cm}/2=40\text{cm}$).
4. Divide the top width below cope by two (i.e. in this case $40\text{cm}/2=20\text{cm}$) and mark this distance either side of the centre mark.
5. Mark in the outside faces of the wall by joining the corners

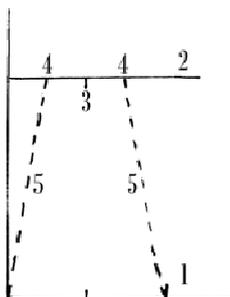
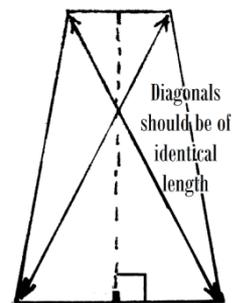


Figure 1

As long as you started off with a piece of ply cut at right angles (best to check, but you have to work that out for yourself) you can now join these lines to the bottom corners to give the profiles. You should also notice that the 'length' of the face (line 1 to 4) is not 120cm, the slope will always be more than the vertical height – (in this instance it will be around 121.66cm or thereabouts). Now you can construct a frame using the guidelines as a template. Setting the sides inside or outside the line is largely a matter of personal taste. Setting the base cross piece should be easy enough, but you will need to take care with the top one as it's easy to slip off of parallel – just be aware. One diagonal cross brace, et voilà.

Of course you can do it without the ply, making marks on the base/top piece and diagonals, then twisting and tweaking to try and get top and bottom parallel but it rarely works well. Checking that the diagonals are identical (Figure 2) can help, but usually means a little tweak here which sets everything else out again. Likewise the centre point of the base and top should be at right angles to each other – to check this you'd need a square, I sometimes carry a roofers square in my kit – usually for pillars and the like. Roofers' squares come in a variety of patterns, all bigger than a carpenter's square so better for extrapolating lengths and some models are well under a tenner. With a little care, attention and awareness of the pitfalls, you should be able to get quite close. If you need a second frame you can use the first as a template. This will create the



Dashed line at right angles to base should bisect top and bottom widths

Figure 2



mirror image of any inaccuracies so you have to remember to use the frames in reverse to each other, either having the braces facing each other or way from each other (sounds a bit complicated but it should be easier to see what I mean in practice). If you do not then any inaccuracy will in effect be doubled.

A variation on the standard frame – is the build through frame. This omits the foundation cross piece and has the bracing above the top cross piece, or even a piece of ply as can be seen in the photo from the Dry Stone Conservancy's competition in Kentucky, where competitors are provided with identical frames. Such frames are useful where you need to set up long lengths, where a number of wallers are working on a single length, if you want a marker or two on a curve, etc.

When setting frames in the field you do need to ensure that the top cross pieces are accurately set to the horizontal – this is often done with cheap torpedo levels which are often far from accurate themselves and should be checked against a more expensive longer level. In addition the bubbles in cheaper levels are frequently much smaller than the gap between the lines, and if you want true accuracy it is not always enough to just get the bubble between the lines although generally it's close enough for most situations. Beyond this advice there is insufficient space here to go into more detail. BTCV's "*Dry Stone Walling*" deals with most situations reasonably, although the information is a little disjointed being spread between pages 32-4, 49-50, and 62-3.



i phone with digital level being used to show an inverse batter.

If you use line bars there are a couple of tips which can help improve consistency/accuracy. You can use an adjustable vial level to set an angle and measure the angle of the bars. However there is very little difference in terms of angle between well battered and little battered. The difference between 1:6 and 1:10 is less than 4 degrees (most walls would fall in the range of 5 -10 degrees of batter, to find out more you need the anorak part of the last article). It's difficult to set most variable levels with such great accuracy, but you should be able to set them to something and stick to it. You do need to hold them at right angles to the line of the wall, as you rotate them around a battered line bar the effective angle of batter changes – if you try it you'll see what I mean. This point is particularly relevant if using bars as markers on a curve (where you need to aim at the centre of the radius, i.e. tangential to the line of the wall). You can get expensive digital levels which are more accurate, and there's even an i-phone app.

You can use a standard level to check and maintain the correct offset/batter.

To measure batter place a spirit level vertically and then at a fixed point (say 1m -i.e. 100cm- up) measure the offset - the gap between the top of the level and the bar, then duplicate this both sides and along the wall. If you want to set to a specific batter then you have to work out the ratios – for a 1m length a 1:10 batter has an offset of 10cm ($10/100 = 1/10$), 1:8 is 12.5cm, 1:6 is just under 16.7cm.

The biggest problem with bars is keeping them in place, some people like to use wooden clamps to do this, these are described in "*Dry Stone Walling*", but the use of 4 bolts is a little cumbersome.

The following advice for clamps with 3 bolts - two outside and a central one is - adapted from that offered up from Les Maxwell on the DSWA discussion site (<http://forum.dswa.org.uk/> - which I'm sure you all visit on a regular basis...)ⁱ

1. Set bars in the ground for the base width.
2. Attach the clamp to the bars and set the correct height of the clamp (wall height below copes) making sure it's level.
3. Tighten the middle nut one of the end nuts leaving some give on the remaining nut so you can move the bar along the clamp.
4. Set bar to the correct distance from the middle nut (half the width of the wall below copes) then hammer the rod home and tighten the outside nut.
5. Loosen the nut on the opposite side and repeat the process.

Using winged nuts can make life easier.

You can also check the accuracy of bars (when clamped) by a variation on the centre point of the top/bottom at right angles idea for frames. Basically hang the plumb bob you happen to be carrying (or measure with long level/level plus spare bar) from the centre of the clamp, it should reach the ground at the midpoint between the two bars. If not tweak (and reset the clamp to level etc etc).

Other points to bear in mind with bars is that if you set them to a width at the base of the trench and then batter them you will effectively narrow that width, in the real world it probably doesn't make much difference on tests and competitions where/if you are working to a set specification it can make a significant difference.

A variation on this is the effect of knocking bars out if they are not clamped (or I suppose distorting them if they are). Knocking a bar out by ½cm say 15cm up when setting the footing in a 1.2m high wall, which is supposed to be battered 1:8, would move the bar out 4cm at the finished height, changing the batter to more or less 1:11. So be very careful! The exaggeration of these small errors low down should not be underestimated, similarly if you use the plumb bob method above just being slightly out and saying it will do is likely to be ignoring a more significant error.

ENOUGH!! Nick Aitken tells me "On the batter" is a west coast Scottish expression for one who is going all-out for a good time with the maximum intake of alcohol. Could explain a lot on all sorts of levels.

Next time this marathon will visit something on lines and stone placement.

Craig Arbennigol

ⁱ <http://forum.dswa.org.uk/viewtopic.php?f=2&t=1224&p=4528&hilit=clamp#p4528> extracted 30.10.11