# PROFESSIONAL COLUMN. *Waller & Dyker. Summer 2012/2*

## Line and Batter: Part 5 – More lines

**Fig 1. Double Lines**

Last time we ended up almost tying ourselves in knots with three lines on a slope. It can however get even more complicated. Some people like to use two lines on each side (Fig.1) to help with the accurate eye-ing of the plane they are trying to set the stones to when not building right to the line with every single stone. It can be particularly useful for large regular shaped stone and for bull nosed building (later).

**Fig 2. Double lines lined up on left**

In Fig.2 the left hand lines have been lined up so it looks as if there's only one. This means you are looking down at the correct angle and each stone should be placed so that its face lines up with the one line you can see, and does not protrude. It is then in the correct plane and its position relative to the line is easily gauged, even if the line is well above the height to which you are building. If you only use one line there is a tendency to look down a little too vertically, and then set the stone a little too far into the wall. With practice you should however be able to look at one line at the correct angle. In fact you can check this angle in a similar way to using two lines by looking down the line at an angle where you can still see the edge of the profile, and gradually adjusting the angle of your gaze. When the line lines up exactly following the profile (i.e. no gap between it and the profile visible below it) then you're looking down at the correct angle. Adjusting your gaze to look at the stone relative to the line at the same angle takes a little practice! In addition as long as you get the lower placed stones in the correct line, you should be able to eye down from your one line to the outside edge of what you've already built the face of which in effect takes the place of the second, lower line. How well you can do this is likely to be determined by experience and facilitated by the regularity of the stone, and how accurately you have maintained the line to this point. If you are eyeing to stones already set inaccurately you are likely to just exacerbate the error.

I think the use of two lines has its place. For example I have found them useful for getting the faces of large blocky stone to accurately follow the batter, but by and large I find them something of an encumbrance. However I came across an interesting use earlier this year. The photos in Figs 1&2 were taken on a training course I was visiting in USA. The lower of each pair was set at final wall height, with the second line six inches or so above it. On courses with lots of people working on a length the line is forever being caught by someone, this method reduced this problem considerably as the students were working well below the line for much of the time, and by and large (but not always) seemed to avoid the higher placed lines. However I'm not sure how well they adapted to correct eyeing and placement when the early courses were so far below the string. The jury is out, but it seems an idea worthy of some consideration.

How far above the previously set stones you set strings is determined by stone type and preference. If you are coursing then the strings fairly obviously should be set to each course (or two - especially with thinner stone- with experience you can gauge the lower coursing by the offset to the string). I build random walls and tend to set the string just above the average foundation size, then move it up the equivalent of two or three layers each time. This leaves enough space to get the larger stones in without forever tangling with the string, whilst is sufficiently close to the last building stone to make eyeing the batter relatively easy. However it is a matter of personal preference. The nearer you keep the string to the last layer, the more accurate you are likely to build especially when learning, but the more you have to move the line and the more it can potentially get in the way. I initially learned to wall without having even an inkling that profiles and strings existed. When I first started walling professionally, having graduated to their use, I often set the line for the footing then moved it up to half height, before moving it up to finished height for levelling. Even in times gone by when profiles were rare (or maybe non-existent?) a line was frequently used to set the footing, this gave a good line, then the batter was built entirely by eye following the established line, before the line as used again for the levelling and sometimes coping. Now I'm much fussier and tend to move it up in increments of 20-30cm.

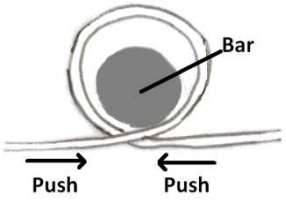


**Fig.3**

Regularly moving lines can seem tedious, another reason for working on long lengths, but in the overall scheme of things it doesn't take long. If you're using the single loop and pin method you can raise the height in smaller increments without disconnecting anything. In effect you push the string towards the profile to form a loop which you can lift up the bar (Fig.3).

This does require a little slack in the line, works better on long lengths where there is more potential for a little stretching/tightening, and only really for a couple of small increments before you need to reset the pins.

Thus far we have looked at lines and profiles in the context of new or complete rebuilds. Gaps present a slightly different problem - what to do with the profiles. The simplest thing, if lines are to be used at all, is to poke them into the wall either side of the gap and work to that. Care has to be taken to get the line in a reasonable place, and not fouled/pushed out by stones. If you are lucky you can set a line bar up against the wall and at least ensure some degree of consistency with what you're doing. Make sure the bars are not leaning at vastly different angles, if they are you might need to widen the gap until they do. It is far from ideal to work to the plane two irregularly set bars transcribe, but in reality if it's just a gap with limited time/money you might have no choice. Unfortunately by and large the wall either side of a gap will have moved a little (often a lot) since it was first built. There is a problem beyond the potential differing batter on either side. The existing wall may well have spread, and following this deformed profile usually leads to a low repair if you pack it properly (in these parts a lack of hearting can exacerbate this problem). On all but the smallest gaps I tend to set bars into the gap, away from the existing wall. How far this is depends largely on the profile of the existing wall, the worse it is the further from it the bars need to be. It is likely to be very different for differing situations. I'd also probably try to narrow the wall very slightly to provide for a tighter rebuild, and then get the repair to merge from the bars to the original. This however does not work very well for small gaps, or with walls that have bad bulges or overly vertical batter. There is no right or wrong, you just have to do your best, getting whatever you're doing as close to some ideal as you can. The wider the gap, the closer you should try to get it, and indeed be able to achieve.

Having set the lines, we now have to place stones! You should be trying to work around the lines not through them. Lapping larger stones onto the wall below the string before readjusting your grip to have one hand either side of the string helps. The more you foul the string the more likely it is to work loose or to distort the profiles.

**Fig.4**

You also need to know how to align the stone relative to the line. With straight edges this is fairly obvious, with less regular stone less so. Hopefully you realise when working right to the line that the stone shouldn't displace the line at all, that's one way in which bulges/kinks start. If you have a stone with a slightly curving face and you are setting it up against a line bar, unless you displace the line bar, then the ends will necessarily be slightly inset relative to the line. There is nothing wrong with this, in fact usually it should apply equally along the whole length. Essentially the line bar represents the correct plane at that point, the plane between the bars is represented by the string, and you should really be able to transpose the profile bar to any point along the line and reset it. So in effect at any point along the line you could have a profile bar set at the correct angle and not displaced by the already set stone. The line merely represents where the bar would be, and so equally every stone should be set as if there was a bar there and not protrude (Fig.4). It is surprising what you can achieve, I once repaired a wall where most of the stones were fairly pointy, 'cigar' shaped. I suppose each stone overhung something in some way but they had good length in so sat well despite their shape. Maintaining the correct line and batter was a case of projecting each of the stones equally (Fig.5).

**Fig.5**

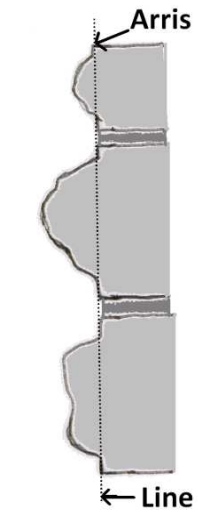

**Fig.6 Pitched stone vertical mortared wall**

Allowing individual stones to project beyond the line might occasionally be necessary, but is going to be highly circumstantial and individualistic. For example longer stones along the line, or those with more curve, can have ends effectively too offset from the line to ease subsequent building; lower stones with shelving top surfaces might need to be set out a little to facilitate subsequent building. However, by and large, what I've tried to explain should hold true for most circumstances. Another point to consider with stones which protrude beyond the line is that they obscure the correct line you should be eyeing to, and can lead to the establishment of an incorrect plane and hence a bulge. If repeated in several places they can create a meandering line.

There are however some styles where walls are built 'bull-nose', with many or all stones projecting from the line. Here the stones are set according to their 'arris'. Arris is an architectural/masonry term which the OED defines as *"the sharp edge formed by the angular contact of two plane or curved surfaces"*. Most simply understood it is the sharp right angled edge of a quoin (corner stone), but can be applied to rounded and 'compound' stones. If the stone has no defined arris you just set it to what you feel is the best compromise, aided by lots of experience! This placement is somewhat subjective and difficult to explain on paper. Perhaps the bull nose method is most commonly seen in mortared bridge parapets where the individual stones have faces which protrude from the overall line by varying amounts (Fig.6). Outside of

ends and corners and the occasional awkward large face stone it is not a method I have encountered in dry stone walling except on a very occasional basis, however I stand to be corrected. For now, as an excuse, I'll leave this as being a bit more advanced than this article is generally dealing with.

One final consideration is how you roll up your lines. Whilst it is a quick method, the worst thing you can do is just wind it up with the pin, or just hold the pin and wind the string onto it. This puts twists into the line, these get worse every time you wind it and eventually when you come to run it out it will twist on itself several times forming a nasty knot. Using a piece of wood, such as a piece of 10cm wide plank, reduces the twisting (and is fast), but doesn't facilitate the use of pins. There is a method whereby you actually load the string onto the pin in a figure of eight but I've never mastered that. I wind my string up by actually rolling the line pin and reeling the string in, which is painfully slow compared to other methods, but works for me. With time you become relatively quick at it and, without exaggeration, I've gone years without the line knotting up on itself which would waste even more time.

A number of wallers seem to object to lines. They see them as un-necessary and taking up time. Well not everyone, especially when learning, can build as accurately as they'd like by eye, so for me it's 'horses for courses'. I believe a well built wall built by eye will not be as accurate as an equally well built wall using string. This can become a question of degree of finish required, and whether you think the inaccuracies are a problem or not. In fact I'd agree that many walls built by eye are better than those built with lines, however that's down to the skill of the waller. Time-wise adjusting lines is a minimal consideration, this said, being overly fussy because you have a line, can be a bigger one. I can build without a line, but to some extent I feel lines save me time, or at least do not waste as much as you might think. I don't have to think so much, or worry about every stone, which knowing me I would. In that respect above all else the line is, I suppose, a safety blanket and I'm not double guessing myself or worrying that I'm going wrong. It's also a guide and not prescriptive, with irregular stone it is not necessary for every stone to be exactly in line. Above all else I am freed up to concentrate more on radio 4.

4 pages on lines. Finished at last. Almost 2 years on line and batter, insane. I'm off for a well deserved rest, perhaps you all deserve one more. I wanted to deal with retaining walls, but thought it prudent to hand over to someone who knows far more than me. 'See' you in 2013.

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