What's wrong with percentages?
or
A rant about shrinkage rates.

by
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The Felt Tipped Pen Articles

Shrinkage - What's wrong with percentages? Part 1

Now down to business. Anyone who has been at one of my workshops has heard my tirades about this subject. Using percentages to calculate the end result of your felting is wrong. It is wrong - mathematically, logically and importantly feltingly. (Is there such a word? There is now.) When someone says "it shrank by about 30%" could very well be correct BUT you can only calculate that after you have made the felt and NOT before. So instructing, advising or informing someone to just add 30% to the size of their template is WRONG!

For those who are not familiar with shrinkage a little lesson first.

We all know that felt shrinks. The age old question has always been by how much. Well that depends on multiple factors:

the wool - species, micron size, colour, coarseness, fibre length.
the number of layers of wool - odd, even.
what you add to the felt - silk, fabric, decoration etc.
rolling and sanding - which direction, how many times, evenness.
tossing and tumbling - which direction, how many times, evenness.
which way you held your tongue in the corner of your mouth..
I think we're all getting the picture. There are plenty of things that affect shrinkage. So how can we possibly calculate shrinkage? Make a sample first. This is a pretty good motto for all craft, firstly if you have never made this particular combination of the factors (listed above) before, how do you what's going to happen? I would rather make a mess of a sample and learn from my mistakes than waste my resources on a larger piece that can not be salvaged and is doomed for the BOYD pile.

Secondly, it is the ONLY way to calculate shrinkage.

Shrinkage - What's wrong with percentages? Part 2

Just to recap using percentages to calculate how much wool to lay is wrong.
For example:
Jane made a piece of felt that ended up 20cm by 20cm. Soosie admired it and asked how much did it shrink by? And like so many other people she said, "Oh about 30%".

Soosie heads off to her studio to make a similar piece and thinks to herself (obviously its not me cos I would have said it aloud. To my dogs.) "Mmmmm.   It ended up 20cm, shrank by 30% so 30% of 20 = about 7. I have to lay 27cm of wool."

Off she goes felting away. BUT when she is finished the piece is only 18cm x 18cm!?!?! She made it exactly the same way Jane did - same wool, same layers, same decoration yet it ended up smaller.   WHY?

Because 30% less of 27cm is 18cm. Jane laid 30cm of wool to get 20cm of felt. You can't calculate something you don't know the starting measurement of. Soosie only knew the finished measurement. Here in lies the big problem with using percentages. How do we fix this? Use shrinkage rates. Once you have determined the shrinkage rate you can apply it to any finished size to calculate accurately your starting measurement.

And the only way to calculate shrinkage is by making a sample.

Cut a piece of bubble wrap or foam or plastic (something durable) measuring EXACTLY 30cm x 30cm to maske a sample template.
Using the template lay the wool EXACTLY the same way you intend to make the final piece.
Felt the way you usually felt.
Measure the finished piece of felt. For example 20cm x 20cm.
Calculate how much it shrank by:- Original measurement divided by finished measurement.
30/20 = 1.5 ← this is your shrinkage rate.

Shrinkage - What's wrong with percentages? Part 3

I think I have ranted enough about why we need shrinkage rates (and not percentages) now it's time to discuss how to apply them. Firstly, lets address why we need to know how much our felt will shrink. You always need to calculate this if you NEED a "fairly" accurate result. I say "fairly" as it is almost impossible to replicate an exact size of felt, but shrinkage rates are the *most* accurate method. For example: you need a shrinkage rate if you wanted to make anything that fits over, around, through, between or on an item. The item may be: hats, slippers, bags, pockets, pouches, clothes, even wraps and scarves. There's nothing worse than a wrap or scarf that just isn't long enough or wide enough or is so big you drown in it.

To apply your shrinkage rate you simply multiply your finished size by your shrinkage rate.

For example:
I want a bag to be 45cm wide and 60cm deep. My shrinkage rate is 1.7 (anything under this is probably not felted properly and I will address this in another post later.) The calculation looks like this:

45cm x 1.7 = 76.5cm
60cm x 1.7 = 102cm
My template ends up being 76.5cm wide and 102cms deep. When I am fulling my bag I will keep fulling until it is 45cm wide and 60cm deep. It will then be fulled.

Shrinkage - What's wrong with percentages? Part 4

You made your sample and its not square. :(Which measurement do I use?
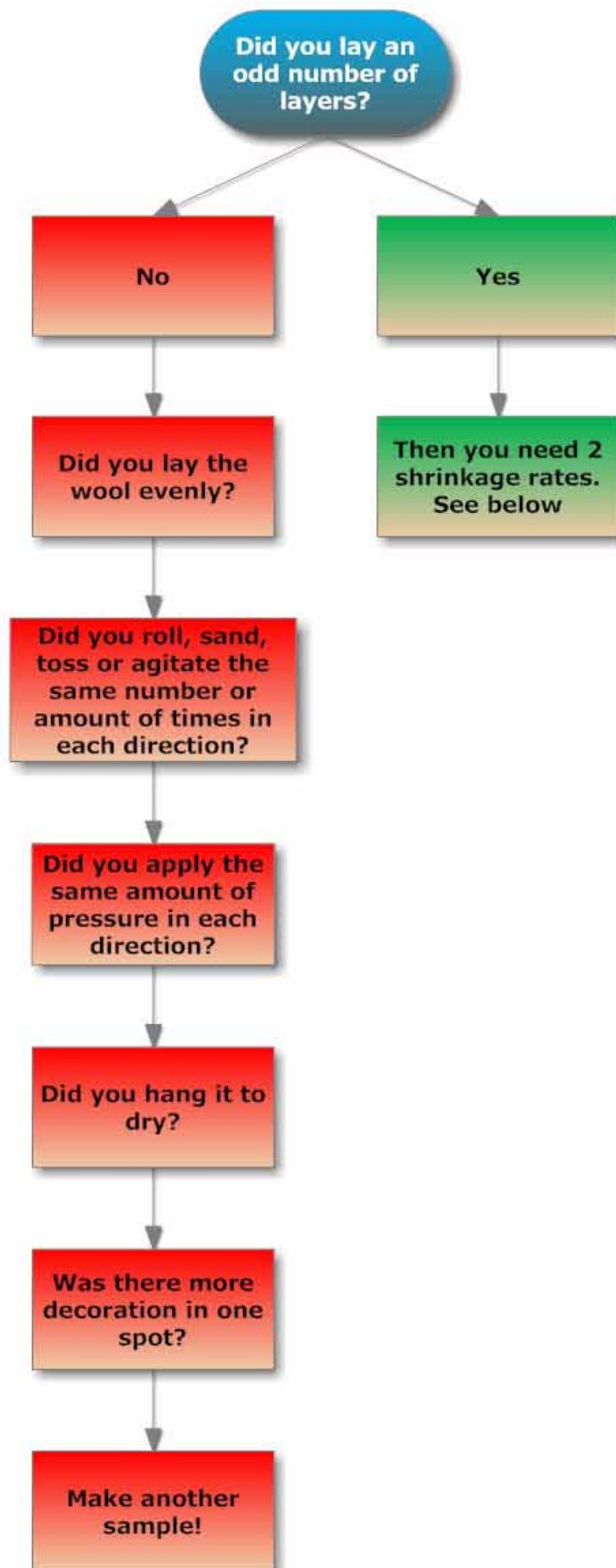
If the difference is minimal use an average of both. For example:
Assuming you have laid 30cm x 30cm accurately.
One side measures 15cm and the other 17cm then use 16cm.

The maths: 15 + 17 = 32. 32 / 2 = 16. This is the average.

If the difference is large there are a couple of questions to ask:

Did you lay an odd number of layers?

No

Yes

Did you lay the wool evenly?

Then you need 2 shrinkage rates. See below

Did you roll, sand, toss or agitate the same number or amount of times in each direction?

Did you apply the same amount of pressure in each direction?

Did you hang it to dry?

Was there more decoration in one spot?

Make another sample!

If all else fails remake the sample and try again.

But if you have used an odd number of layers then you need two shrinkage rates, one vertical and one horizontal:

Make your sample.
Measure and designate one side vertical (16.5cm) and one side horizontal (15cm).
Vertical - 30/16.5 = 1.8
Horizontal - 30/15 = 2
Now apply to your template. I'll use the bag example from the last post - the finished size is 60cm deep (vertical) and 45cm wide (horizontal).

Therefore:

Vertical is 60cm x 1.8 = 108cm
Horizontal is 45cm x 2 = 90cm.
Full until bag is finished size.

Shrinkage - What's wrong with percentages? Part 5
To finish off my long(I know, I know) story of Percentage vs Shrinkage I have included a table in the pdf booklet (see link below) remembering my little rant about mitigating factors. But one thing I am certain of - is that if your shrinkage rate is below 1.7 it's not fulled properly for any type of clothing or wearable.

If you have enjoyed reading this and have any suggestions for topics I am happy to rant about most things. Or if you have a rant in you, let me know: info@feltwest.org.au

Make a sample

Cut a piece of bubblewrap measuring 30cm by 30cm, this (30) is Measurement A. This is your template for making samples, you can use this repeatedly. Layout your wool, fabric and decorations that you intend you use. Felt the sample using your preferred method and full it to the necessary point.
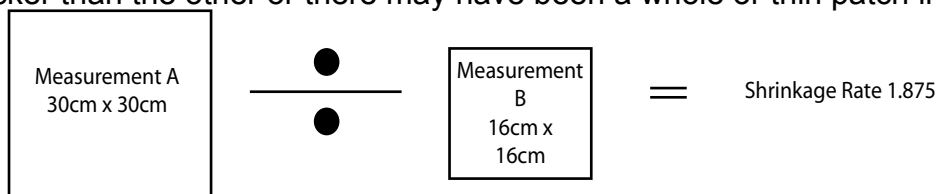
Single Shrinkage Rate

Single Shrinkage Rates are for even number of layers of wool. To calculate the shrinkage rate, measure the final size of your sample, this is called Measurement B. The shrinkage factor is calculated by dividing A by B.

For example A =30, B =16 then 30/16= 1.875. This is your single shrinkage rate.

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┌─────────────────────┐
│                     │
│   30cm x 30cm       │
│   or 12in x 12in    │
│                     │
└─────────────────────┘
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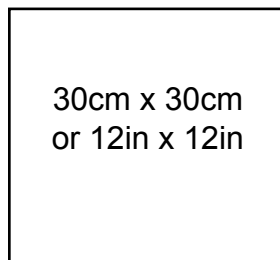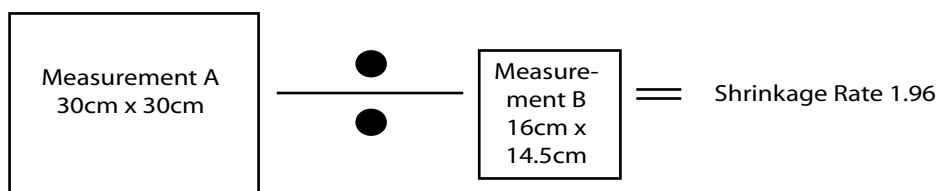
If the finished sample is longer one side than the other, then use an average of the measurements. For example A =30cm, B =16cm & 14.5cm (average of 16cm and 14.5cm=15.25cm) use 15.25 then 30/15.25 = 1.96.

If the difference is large, the anomaly could be in the laying technique or the fulling process. One layer may be thicker than the other or there may have been a whole or thin patch in one layer.

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┌─────────────────┐
│                 │      ●
│  Measurement A  │    ─────     ┌──────────────┐
│   30cm x 30cm   │      ●       │ Measurement  │    ═══    Shrinkage Rate 1.875
│                 │              │      B       │
└─────────────────┘              │   16cm x     │
                                 │    16cm      │
                                 └──────────────┘
```

When fulling, one part may have been more intensely worked than the other. If in doubt do the sample again.

If you lay your wool with odd number of layers it will shrink more in that direction than the other. This involves a double shrinkage rate.

```
┌─────────────────┐
│                 │      ●
│  Measurement A  │    ─────     ┌──────────────┐
│   30cm x 30cm   │      ●       │  Measure-    │    ═══    Shrinkage Rate 1.96
│                 │              │   ment B     │
│                 │              │   16cm x     │
└─────────────────┘              │   14.5cm     │
                                 └──────────────┘
```

Double Shrinkage Rate

If you lay your wool in one direction only, or have more layers in one direction than the other, you will have a different shrinkage rate for the length and width. The rate is calculated in the same way but there will be two calculations and rates, one applied to the width measurements and the other applied to the length measurements. Your template will end up looking strange but the different rates will take care of this in the fulling process.

For example:

Length Shrinkage Rate: $30 \div 1\,5 = 2$

Width Shrinkage Rate: $30 \div 22 = 1.36$

Fulling Implications

Garment	Purpose	Layers of wool	Fulling ro shrinking	Result	Approx Shrinkage Rate
Coat, Hat or Slippers	Warmth & durability	At least 3	Heavy full-ing`	Well felted together, dense, less drape, very tough and warm	2.0
Jacket	Warmth	At least 2	Medium to heavy	Wel felted, drapes easily, softer texture	1.875
Skirt	Winter wear	At least 2	Medium	Smooth fine felt, drapes like woven fabric, soft texture	1.75
Scarf or Wrap	Light warmth	1-2	Light to medium	Light fine felt	1.7

Mermaid - Resist body, stuffed and sculpted, beaded, painted and stitched. 2012 approx 30cm long.

Thorny Devil - Resist body, stuffed and sculpted, beaded, painted and stitched. 2012 approx 20cm long.