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The Effect Of Applying Overfeed During Drying At Different Levels Of Widthways Stretch On The Properties Of Interlock Fabric

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Contents

1. Introduction

It is a well known fact that it is possible to reduce the potential residual length shrinkage of a knitted fabric by finishing that fabric to a greater width. This is obviously done at the expense of higher residual width shrinkage levels and numerous workers have attempted to relate shrinkage to changes in course and wale spacings mathematically.

The predictive model which has been devised for interlock and 1x1 rib will predict course and wale spacings, width and weight at various levels of residual length and width shrinkages fed in by the operator.

What could be assumed from the computer predictions and from the classical equations is that if a fabric width is increased, its length will always contract readily. This is a big assumption and in practice is rarely the case.

This operation is assisted by a technique known as overfeeding where the fabric is fed to the zone in which the width is to be increased at a higher rate than it is being removed. If the degree of overfeeding is inadequate, then length tension develops and rather than bringing about a reduction in length, the converse occurs.

The machine setting which controls overfeed can only be used as a guide and the machine operator must use his judgement as to the settings required, because so many other factors can influence the amount of overfeed actually applied.

The presence or absence of tensions on the finishing machines also has a bearing on the permanence of the treatment. It is well known that, with knitted fabrics in particular, width creep-back can occur and many finishers make an allowance for this expected creep-back when setting their finishing specifications.

This allowance is usually made by trial and error and is non-systematic.

Clearly there are many factors which are not, and possibly cannot be, taken into consideration in a predictive model, but at this point in time, we simply do not know the extent to which these factors are likely to influence the final outcome.

It was felt, therefore, that some practical evaluations were necessary and a trial was planned with the following objectives in mind.

1. To determine the relationship between length and width shrinkage where:
    a) allowance is made for length contraction during processing (overfeed applied)
    b) allowance is not made for length contraction during processing (zero overfeed).
2. To determine the amount of width creep-back likely to be expected at various target width levels and to what extent this is influenced by overfeed.
3. To determine the effect on fabric properties of applying widthways stretch both with and without lengthways tension (absence of overfeed).
4. To establish whether excessive processing tensions have any permanent effect on the fabric structure.

This report describes a limited trial which was carried out to try to answer some of these questions.

2. Outline Of The Trial

The object of the trial was to take a standard interlock fabric and to finish it to a number of different target widths on a stenter, both with and without overfeed, and to observe:

1. the contraction in length attained;
2. the amount of width creep-back over a period of time;
3. the effect on finished and fully-relaxed properties.

Ideally, for each alteration of processing conditions we should have used a different piece of fabric, but this would have been very expensive and the decision was taken to carry out the trial by using only two pieces of fabric and reprocessing them using different machine settings. Whether the fact that the fabric received numerous wet-relax/dry cycles has any influence on the results is open to speculation.

The basic processing sequence was as follows.

Winch scour

Hydroextract

De-twist

Stenter Dry

This was repeated a number of times on the two pieces of fabric; the only difference between the two fabrics being that during the stenter drying operation, overfeed was only applied to one of the pieces.

After drying, the fabric was measured for width, course and wale spacings and length contraction. Similar measurements were taken over a period of three days to ascertain the permanence of the treatment.

3. Description Of Procedures

Two pieces of interlock fabric were manufactured on the 18 gauge Wildt Mellor Bromley 9RJ double jersey jacquard machine located in the TRD workroom.

This machine was set up to produce an interlock construction (with a 2 needle delay) and 1/34's Ne combed yarns were knitted with a nominal stitch length of 0.385 cm. One of the feeders was set up with a coloured yarn so that the fabric possessed parallel, narrow, width-ways stripes. This was done so that changes in fabric length could be easily measured when it was otherwise impractical to take course measurements.

The number of needles on the knitting machine was 1708.

The two rolls of fabric (approx. 60 metres each) were designated A and B and representative samples were submitted for laboratory grey testing. The results are given in *Table 1*.

In addition to the lab testing, the fabric widths and the separation distances between a number of the coloured stripes (13) were measured.

Both rolls of fabric were manually slit into open width and were then loaded into the Leemetal shallow-draught winch in the Shirley Institute workroom, where they were scoured at the boil in 1 g/1 Synperonic NX for three hours.

After one hour, and immediately before removal, a measurement of stripe separation was taken to determine the alteration in fabric length from grey state. After rinsing, the fabric was removed from the winch and was hydroextracted. It was then manually de-twisted ready for stenter drying on the Artos 2-bay stenter.

At this stage, the K3 predictive model was used to predict at what width the fabric should be stentered to give a residual width shrinkage of 10%. A copy of the print-out is given as *Figure 1*.

The two pieces, A and B, were sewn together with piece A to be the first piece processed. The computer predicted a width of 142 cm would result in a 10% residual width shrinkage and, therefore, to allow for fabric overlap on the pin plates, the actual stenter frame width was set at 138 cm. Piece A was stentered with the overfeed set such that the ripple was just eliminated as the fabric entered the drying enclosure. As the sewing between pieces A and B passed over the pinning wheels, the overfeed control was re-set to 0% and the drying continued uninterrupted.

At the exit end of the stenter, the fabrics were plaited with the plaiter tension controller kept to a minimum so that minimum length elongation occurred.

A 2-metre sample was removed from approximately the middle of both pieces and, within fifteen minutes of completion of drying, measurements of width, courses/3cm, wales/3cm and stripe separation were carried out. These samples were then placed unrestricted on a flat surface.

Similar measurements were carried out after 24 and 48 hours. These samples were designated Al and B1 and were retained for subsequent testing.

The two pieces were reloaded into the Leemetal winch and re-scoured in boiling water for approximately 30 minutes. (A measurement of stripe separation indicated that the fabric had elongated to its initial scoured length).

After hydroextraction and de-twisting, the fabric was stenter dried to the width predicted by the computer to give a width shrinkage of 15%. Piece A was processed with overfeed and Piece B with zero overfeed.

Samples were immediately removed (A2 & B2) from representative sections of either piece and the pre-described measurements were taken after 15 minutes, 1 day, 2 days, and 3 days. The same procedure was repeated a further 4 times with the stenter width set to correspond to 20%, 25%, 30% and 47% (maximum width setting of machine) residual width shrinkage. Again with the 20% & 25% levels, overfeed was applied in one case (Piece A) and not in the other (Piece B).

With the 25% level at zero overfeed (Sample B4), the fabric was extremely tight on the frame and it was felt that this was the maximum width that could be obtained without tearing the fabric.

At this stage, we considered terminating the processing of Piece B and to continue with just Piece A, but we then decided to carry on with the exercise but to treat Piece B identically to Piece A. This would tell us whether the excessive tensions applied to this piece had any permanent effect or whether further relaxation in the winch followed by drying with overfeed would restore it to a similar state to Piece A.

The exercise was continued until the maximum width setting of the stenter was reached. According to the prediction, this corresponded to a residual width shrinkage level of 47%. (Judging by the tension of the fabric on the frame we could have carried out quite a few more treatments before reaching a width limit).

The samples on which the measurements had been taken were submitted to the lab for testing and the results are given in *Table 2*.

The key to the samples is as follows.

Sample	Shrinkage Target, %	Overfeed
A1	10	Yes
B1	10	No
A2	15	Yes
B2	15	No
A3	20	Yes
B3	20	No
A4	25	Yes
B4	25	No
A5	30	Yes
B5	30	Yes
A6	47	Yes
B6	47	Yes

The process measurements for the various treatments are given in *Tables 3-8*.

4. Discussion Of Results

4.1. Relationship Between Length and Width Shrinkage

The length and width shrinkages are plotted in *Figure 2* and it can be seen that a very good linear relationship exists between the two. Where overfeed has been applied, an increase in fabric width does result in a reduction in residual length shrinkage but the increased width is apparent in higher residual width shrinkage levels. Where overfeed has not been applied, increasing fabric width develops tension in the fabric length, and this can be seen as an increase in length shrinkage.

One point of interest is that if the shrinkage values of samples B5 and B6 are plotted they also fall close to the line derived from samples Al - A6.

It may have been noticed that the width shrinkage levels given in *Table 2* are considerably lower than those aimed for. This is due to the fact that, once the fabric left the constraint of the stenter pins, considerable immediate snap-back occurred and this, together with the additional creep-back over a period of three days, has resulted in a considerably lower fabric width.

4.2. Relationship Between Target Width and Degree of Creep-Back

Figure 3 shows the relationship between the stentered width, the width after immediate snap-back (15 minutes) and the width after three days.

In practice, the stenter frame width would not be set to a predetermined value, as with this trial, but would be adjusted until the fabric leaving the frame was at the required width. In this way, allowance is made for immediate snap-back.

The following table shows the effect of target width and overfeed on the amount of creep-back obtained.

	A1	**A2**	**A3**	**A4**	**A5**	**A6**
Target width, cm	142	150	160	170	182	242
Actual width (15 min), cm	132	140.5	146	157	167	226
Stored width, cm	130.5	138.5	144	152.5	161	217
Creep-back, cm	**1.5**	**2.0**	**2.0**	**4.5**	**5.0**	**9.0**
	B1	**B2**	**B3**	**B4**	**B5**	**B6**
Target width, cm	142	150	160	170	182	242
Actual width (15 min), cm	129.5	138	152	162.5	167	226
Stored width, cm	128.5	134.5	146	159	162.5	218
Creep-back, cm	**1.0**	**3.5**	**6.0**	**2.5**	**4.5**	**8.0**

What is surprising is that the creep-back on the fabric finished without overfeed is very similar to that obtained when overfeed is applied. It had been expected that this would have been considerably greater.

If *Table 2* is examined it can be seen that realistic and typical commercial shrinkage figures have been obtained with samples A4 and A5.

A4 Length shrinkage 17.2% Width shrinkage 11.9%

A5 Length shrinkage 11.9% Width shrinkage 16.5%

At these levels of residual shrinkage the fabric crept by 4.5 to 5 cm. This ties up with what we have found in commercial practice.

Engel, for example, always allows four centimetres on his stentered width for creep-back.

4.3. Effect of Overfeed and Width Stretch on Course Spacings

Figure 4 shows the effect of width stretch and overfeed on the finished and fully-relaxed course spacings. It can be seen that increasing the width with overfeed applied results in more courses in the finished fabric, whereas when overfeed is not applied, fewer courses are present. This can be seen very clearly in *Figure 4A.*

Note for the Digital Version:

> *In the modern terminology, "Fully-relaxed" would be "Reference-State".*
>
> *Also, notice how high by modern standards is "typical commercial shrinkage"*

If the fully-relaxed courses are considered, however, finishing to increasing widths with overfeed appears to have little effect. There is a suggestion however that in the absence of overfeed, increased widths can result in a lower fully-relaxed course count. This is also apparent with samples B5 and B6 which were initially highly stretched but which were then winch relaxed and treated as samples A5 and A6.

4.4. Effect of Overfeed and Width Stretch on Wale Spacings

Figure 5 shows the effect of width stretch and overfeed on the finished and fully-relaxed wale spacings. It is not advantageous to compare the finished wale curves since the fabrics are of slightly different width in the finished state.

Again, if we consider the fully-relaxed wale spacings, there is a suggestion that width tension in the absence of overfeed does result in a slight increase in the number of wales when compared with the same fabric finished with overfeed.

At the higher levels of width stretch (47%) with overfeed, there is a suggestion that the fully relaxed wale count is slightly reduced indicating permanent deformation.

4.5. Effect of Overfeed and Width Stretch on Fully-Relaxed Yarn Count

Figure 6 shows that, within the range of normal processing conditions, the fully relaxed yarn count is unaffected by widthways stretching. There is a suggestion that at high degrees of tension there may be slight permanent stretching of the yarn but this would have to be investigated in more detail since the differences are within normal count variation.

4.6. Effect of Overfeed and Width Stretch on Finished and Fully-Relaxed Stitch Lengths.

Figure 7 shows the effect of widthways stretch and absence of overfeed on the finished stitch length, but there is no evidence to suggest that this is permanent. The differences in stitch length measured are within the differences observed between the two pieces in the grey state, even though they were knitted consecutively at the same knitting machine settings.

4.7. Effect of Overfeed and Width Stretch on Finished and Fully Relaxed Weight.

Figure 8 shows the effect of widthways stretch and absence of overfeed on the finished and fully-relaxed weight, the difference in the finished weight being very apparent. There is evidence that the fully-relaxed weight is reduced by approximately 10 gsm (5%) when high tension has been applied.

4.8. Effect of Overfeed and Width Stretch on Finished and Fully Relaxed Thickness.

Figure 9 indicates that the fully-relaxed thickness is slightly reduced by width-ways stretching, but there does not appear to be any difference between drying with overfeed and drying without overfeed in the normal range of width stretch. Within the normal range (up to 25% width stretch) the reduction in fully-relaxed thickness is approximately 7%.

5. Conclusions

1. This exercise has shown very clearly the importance of applying the maximum amount of overfeed possible at the drying stage. The amount of overfeed which can successfully be applied is controlled entirely by the difference in the pre-stentered width and the stenter frame width.

   On the evidence of this trial, reducing length shrinkage from say 15% to 10% by increasing width would mean increasing width shrinkage from 13% to 22.5%.

2. The total difference between stenter frame width and eventual fabric width (after snap-back and creep-back have occurred) ranged from 12 cm to 29 cm.

If sample A5 is taken as being a typical commercial treatment (length shrinkage 11.9%, width shrinkage 16.5%) the following observations may be of interest.

Fabric width on stenter frame	182cm
Fabric width after snap-back	167cm
Fabric width after creep-back	161cm

3. When fabric is unrestrained, the creep-back occurs over about 3 days, but what is not known is how long the creep-back period is for fabric rolled onto a cardboard tube.

4. There is evidence to show that tension applied during the drying operation can have some effect on the fully-relaxed properties of the fabric. This is shown in the course and wale spacings, weight, and, to some degree, thickness.

   There is no conclusive evidence to suggest that finishing tensions have any effect on the fully-relaxed yarn count or stitch length.

5. The finished test results given in *Table 2* have been used to test the (K3) predictive model and this will be the subject of a separate Research Record.

Appendix

Tables & Figures

Table 1

INTERNATIONAL INSTITUTE FOR COTTON. KNITTING REF. EDL 578 LAB. REF. REF 736 SUBMITTED BY: EDL DATE: 28/11/80

TESTS REQUIRED	✓	A	95%CL	B	95%CL		95%CL		95%CL		95%CL		95
% SHRINKAGE length	✓	21.85	1.14	23.01	1.11								
width	✓	9.92	0.83	8.2	2.11								
FABRIC WEIGHT BW													
AW													
C/3 CM BW	✓	34.9	0.23	34.3	0.35								
AW	✓	45.1	0.41	44.9	0.41								
W/3 CM BW	✓	35.1	0.41	35.1	0.63								
AW	✓	38.9	0.41	38.4	0.50								
STITCH LENGTH BW		3.837	0.003	3.857	0.01								
AW	✓	3.829	0.01	3.778	0.01								
BURST STRENGTH KN/m² BW/AW													
DISTENTION mm BW/AW													
SPIRALITY ANGLES BW													
FABRIC WIDTH AW	✓	147		147.5									
STRIPE SEPARATION	✓	19.7		19.7									

COMMENTS:

FABRIC DETAILS:

Table 2

INTERNATIONAL INSTITUTE FOR COTTON. KNITTING REF. EDL 580 LAB. REF. 753 SUBMITTED BY: EDL DATE: 6/3/81

TESTS REQUIRED	✓	A1	95%CL	B1	95%CL	A2	95%CL	B2	95%CL	A3	95%CL	B3	95
% SHRINKAGE length	✓	22.43		28.64		18.91		30.05		17.6		29.8	
width	✓	0.22ext		2.09ext		3.26		1.01		8.52		9.52	
FABRIC WEIGHT BW	✓	170.2	3.0	161.9	2.53	167.9	4.65	149.6	6.56	162.8	3.74	133.5	2.50
CUT & WEIGH AW	✓	215.1	8.3	213.9	6.5	208.7	3.89	211.2	4.94	208.9	4.42	198.2	5.39
C/3 CM BW	✓	31.8	0.56	28.8	0.3	32.9	0.41	27.60	0.50	33.1	0.41	26.3	0.35
AW	✓	41.3	0.48	40.8	0.56	40.4	0.77	39.2	0.45	40.6	0.50	38.7	0.48
W/3 CM BW	✓	39.6	0.77	40.53	0.66	37.6	0.56	39.4	0.60	35.6	0.60	36.55	0.69
AW	✓	39.9	0.71	39.1	0.65	38.3	0.68	39.8	0.66	39.1	0.79	39.9	0.53
STITCH LENGTH BW	✓	3.789	0.01	3.785	0.01	3.782	0.01	3.792	0.01	3.777	0.004	3.817	0.01
MM. AW	✓	3.772	0.02	3.781	0.01	3.768	0.02	3.780	0.01	3.783	0.02	3.780	0.02
BURST STRENGTH BW													
AW													
SPIRALITY ANGLES BW													
AW													
YARN COUNT BW	✓	35.27		36.63		35.89		35.6		35.58		35.86	
AW	✓	35.53		35.78		36.42		35.85		35.94		36.12	
THICKNESS BW	✓	0.968	0.009	0.878	0.007	1.011	0.012	0.805	0.007	0.974	0.006	0.705	0.007
AW	✓	1.405	0.007	1.383	0.009	1.373	0.009	1.312	0.013	1.316	0.011	1.302	0.007

COMMENTS: Shrinkage – 2 samples tested from each.

FABRIC DETAILS:

Table 2 (cont.)

INTERNATIONAL INSTITUTE FOR COTTON. KNITTING REF. LAB. REF. BDL 580 SUBMITTED BY: BDL DATE: 6/3/81

TESTS REQUIRED		A4		B4		A5		SAMPLE B5		A6		B6	
	✓		95%CL		95%CL		95%CL		95%CL		95%CL		95%CL
% SHRINKAGE length	✓	17.19		31.65		11.94		11.93		4.29		4.48	
width	✓	11.94		19.76		16.55		20.38		34.14		35.16	
FABRIC WEIGHT BW	✓	156.7	4.94	116.8	4.2	159.0	5.9	142.1	5.16	129.5	4.35	119.2	3.98
AW	✓	208.3	5.05	196.1	4.28	204.4	8.14	195.7	6.63	202.0	6.81	191.6	7.14
C/3 CM BW	✓	33.5	0.51	25.5	0.38	35.2	0.45	32.0	1.34	38.6	0.6	36.2	0.45
AW	✓	39.5	0.51	37.8	0.56	40.2	0.45	37.1	0.41	40.2	0.66	37.8	0.66
W/3 CM BW	✓	34.33	0.54	32.4	0.66	32.6	0.60	31.8	0.45	25.1	0.41	24.2	0.45
AW	✓	39.13	0.59	40.2	0.67	38.7	0.59	40.1	0.71	37.0	0.67	37.9	0.62
STITCH LENGTH BW	✓	3.774	0.002	3.862	0.01	3.762	0.01	3.820	0.01	3.763	0.002	3.803	0.01
M.M. AW	✓	3.783	0.01	3.808	0.01	3.761	0.01	3.811	0.01	3.781	0.01	3.791	0.01
BURST STRENGTH BW													
AW													
SPIRALITY ANGLES BW													
AW													
YARN COUNT BW	✓	35.62		36.43		35.25		35.97		35.72		35.50	
" " AW	✓	36.22		36.74		36.05		36.09		36.36		36.94	
THICKNESS BW	✓	0.899	0.008	0.609	0.007	0.920	0.019	0.860	0.011	0.815	0.006	0.747	0.011
AW	✓	1.300	0.012	1.260	0.01	1.306	0.01	1.240	0.008	1.283	0.009	1.178	0.010

COMMENTS: FABRIC DETAILS:

Table 3

SHRINKAGE

WIDTH ^ SPECIFICATION — 10%

		A	B
GREYSTATE WIDTH		147 cms	147.5 cms
GREYSTATE STRIPE SEPARATION		19.7 cms	19.7 cms
STRIPE SEPARATION IN WINCH		23 cms	23 cms
WIDTH AFTER HYDRO EXTRACTION		135 cms	136 cms
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		138 cms	138 cms
COURSES / 3 CM	15 MINUTES	30.5	29.5
WALES / 3 CM	15 MINUTES	39	40
FABRIC WIDTH	15 MINUTES	132 cms	129½ cms
STRIPE SEPARATION	15 MINUTES	23 cms	23.6 cms
COURSES / 3 CM	1 DAY	30	28
WALES / 3 CM	1 DAY	39	40/41
FABRIC WIDTH	1 DAY	130.5	128.5
STRIPE SEPARATION	1 DAY	21.2 cms	23.3 cms
COURSES / 3 CM	2 DAYS	30.5	28
WALES / 3 CM	2 DAYS	39	40
FABRIC WIDTH	2 DAYS	130.5	128.5
STRIPE SEPARATION	2 DAYS	20.6	23.0
COURSES / 3 CM	3 DAYS		
WALES / 3 CM	3 DAYS		
FABRIC WIDTH	3 DAYS		
STRIPE SEPARATION	3 DAYS		

Table 4

SHRINKAGE
WIDTH SPECIFICATION — 15%

		A	B
GREYSTATE WIDTH		147 ins	147.5 ins.
GREYSTATE STRIPE SEPARATION.		19.7 ins	19.5 ins.
STRIPE SEPARATION IN WINCH.		23 ins	23 ins.
WIDTH AFTER HYDRO EXTRACTION		127.5 ins	127.5 ins.
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		146 ins	146 ins.
COURSES / 3 CM.	15 MINUTES.	31.75	26
WALES / 3 CM.	15 MINUTES.	37	38
FABRIC WIDTH.	15 MINUTES.	140.5 ins.	138 ins
STRIPE SEPARATION	15 MINUTES.	20.2 ins	24.5 ins.
COURSES / 3 CM.	1 DAY.	32.5	27
WALES / 3 CM.	1 DAY.	37	37.5
FABRIC WIDTH.	1 DAY.	139.5 ins	136 ins
STRIPE SEPARATION	1 DAY.	20.1 ins	24.2 ins
COURSES / 3 CM.	2 DAYS.	32	27
WALES / 3 CM.	2 DAYS.	37.5	38.5
FABRIC WIDTH	2 DAYS.	138.5 ins	134.5 in
STRIPE SEPARATION	2 DAYS.	20.0 ins	23.8 ins
COURSES / 3 CM.	3 DAYS.	32.5	27
WALES / 3 CM.	3 DAYS.	37.5	38.5
FABRIC WIDTH	3 DAYS.	138.5 ins	134.5 ins
STRIPE SEPARATION	3 DAYS.	19.9 ins	23.8 ins

Table 5

SHRINKAGE

WIDTH SPECIFICATION – 20%.

		A	B
GREYSTATE WIDTH		147 cms	147.5 cms
GREYSTATE STRIPE SEPARATION		19.7 cms	19.5 cms.
STRIPE SEPARATION IN WINCH.		23 cms	23 cms.
WIDTH AFTER HYDRO EXTRACTION		136 cms	138 cms.
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		156 cms	156 cms.
COURSES / 3 CM.	15 MINUTES.	33	25.5
WALES / 3 CM.		35/36	33/34
FABRIC WIDTH.		146 cms	152 cms.
STRIPE SEPARATION		19.5 cms	25.3 cms.
COURSES / 3 CM.	1 DAY.	33	25.5.
WALES / 3 CM.		37	35.
FABRIC WIDTH.		144 cms	148 cms.
STRIPE SEPARATION		19.7 cms	25 cms.
COURSES / 3 CM.	2 DAYS.	33	26
WALES / 3 CM.		37	36
FABRIC WIDTH		143 cms.	146 cms.
STRIPE SEPARATION		19.7 cms	24.5 cms.
COURSES / 3 CM.	3 DAYS.	33	25¾.
WALES / 3 CM.		34	35/36
FABRIC WIDTH		144 cms	146 cms.
STRIPE SEPARATION		19.7 cms	24.6 cms

Table 6

WIDTH SPECIFICATION — 25%

		A	B
GREYSTATE WIDTH		147 cms	147.5 cms
GREYSTATE STRIPE SEPARATION		19.7 cms	19.5 cms
STRIPE SEPARATION IN WINCH		23.4 cms	23.5 cms
WIDTH AFTER HYDRO EXTRACTION		147 cms	147 cms
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		167 cms	167 cms
COURSES / 3 CM	15 MINUTES	32/33	24/25
WALES / 3 CM	15 MINUTES	32/33	30/32
FABRIC WIDTH	15 MINUTES	157 cms	162.5 cms
STRIPE SEPARATION	15 MINUTES	19.8 cms	26 cms
COURSES / 3 CM	1 DAY	32.5	24.5
WALES / 3 CM	1 DAY	33	32
FABRIC WIDTH	1 DAY	153.5 cms	161.5 cms
STRIPE SEPARATION	1 DAY	19.8 cms	25.9 cms
COURSES / 3 CM	2 DAYS	32	24.5
WALES / 3 CM	2 DAYS	33.5	31/32
FABRIC WIDTH	2 DAYS	152 cms	159.5 cms
STRIPE SEPARATION	2 DAYS	19.7 cms	25.9 cms
COURSES / 3 CM	3 DAYS	32.5	25
WALES / 3 CM	3 DAYS	34	31/32
FABRIC WIDTH	3 DAYS	152.5 cms	159 cms
STRIPE SEPARATION	3 DAYS	19.7 cms	25.7 cms

Table 7

WIDTH SHRINKAGE SPECIFICATION — 30%

		A	B
GREYSTATE WIDTH		147 cms	147.5 cms
GREYSTATE STRIPE SEPARATION		19.7 cms	19.5 cms
STRIPE SEPARATION IN WINCH		23.5 cms	23.6 cms
WIDTH AFTER HYDRO EXTRACTION		144 cms	144 cms
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		179 cms	179 cms
COURSES / 3 CM	15 MINUTES	34/35	32
WALES / 3 CM	15 MINUTES	30/31	31
FABRIC WIDTH	15 MINUTES	167 cms	167 cms
STRIPE SEPARATION	15 MINUTES	18.6 cms	20.1 cms
COURSES / 3 CM	1 DAY	34/35	31/32
WALES / 3 CM	1 DAY	31	30/31
FABRIC WIDTH	1 DAY	162.5 cms	164 cms
STRIPE SEPARATION	1 DAY	18.6 cms	20.2 cms
COURSES / 3 CM	2 DAYS	34/35	32
WALES / 3 CM	2 DAYS	31	30/31
FABRIC WIDTH	2 DAYS	161 cms	164 cms
STRIPE SEPARATION	2 DAYS	18.6 cms	20.2 cms
COURSES / 3 CM	3 DAYS	34	32
WALES / 3 CM	3 DAYS	32	31/32
FABRIC WIDTH	3 DAYS	161 cms	162.5 cms
STRIPE SEPARATION	3 DAYS	18.6 cms	20.2 cms

Table 8

SHRINKAGE

WIDTH SPECIFICATION – 47%

		A	B
GREYSTATE WIDTH		147cms	147.5cms
GREYSTATE STRIPE SEPARATION.		19.7cms	19.5cms
STRIPE SEPARATION IN WINCH.		24.0 cms	24.0 cms
WIDTH AFTER HYDRO EXTRACTION		144 cms	144 cms
STENTER WIDTH SETTING (WIDTH BETWEEN PINS)		242 cms	242 cms
COURSES / 3 CM.	15 MINUTES	37.5	36
WALES / 3 CM.	15 MINUTES	22.5	22.5
FABRIC WIDTH.	15 MINUTES	226 cms	226 cms
STRIPE SEPARATION	15 MINUTES	16.8cms	18.1 cms
COURSES / 3CM.	1 DAY	38	36
WALES / 3CM.	1 DAY	23	22.5
FABRIC WIDTH.	1 DAY	220 cms	221.5cms
STRIPE SEPARATION	1 DAY	16.8cms	17.9 cms
COURSES / 3 CM.	2 DAYS	37	35½
WALES / 3 CM.	2 DAYS	23.5	22.5
FABRIC WIDTH	2 DAYS	217cms	219cms
STRIPE SEPARATION	2 DAYS	17cms	18cms
COURSES / 3 CM.	3 DAYS	37	35½
WALES / 3 CM	3 DAYS	23.5	23
FABRIC WIDTH	3 DAYS	217 cms	218cms
STRIPE SEPARATION	3 DAYS	17cms	17.9cms

Figure 1

18G INTERLOCK : WB

As knitted			Fully relaxed			As delivered								
Ne	1	TF	Ne	1	TF	%LS	%WS	c/cm	w/cm	Wt	Tub. Wid	Open Wid.	Stenter chain width *
34.0	0.385	10.0	35.2	0.373	11.0	0.0	0.0	13.7	13.4	218	64	128	124
34.0	0.385	10.0	35.2	0.373	11.0	0.0	5.0	13.7	12.7	207	67	134	130
34.0	0.385	10.0	35.2	0.373	11.0	0.0	10.0	13.7	12.0	196	71	142	138
34.0	0.385	10.0	35.2	0.373	11.0	0.0	15.0	13.7	11.4	185	75	150	146
34.0	0.385	10.0	35.2	0.373	11.0	0.0	20.0	13.7	10.7	174	80	160	156
34.0	0.385	10.0	35.2	0.373	11.0	0.0	25.0	13.7	10.0	164	85	170	166
34.0	0.385	10.0	35.2	0.373	11.0	0.0	30.0	13.7	9.3	153	91	182	178
34.0	0.385	10.0	35.2	0.373	11.0	0.0	47.0	13.7	7.1	116	121 †	242	238

* There is approximately 2 x 2cm overlap of fabric on the pin plates

†. Maximum stenter setting possible

Figure 2

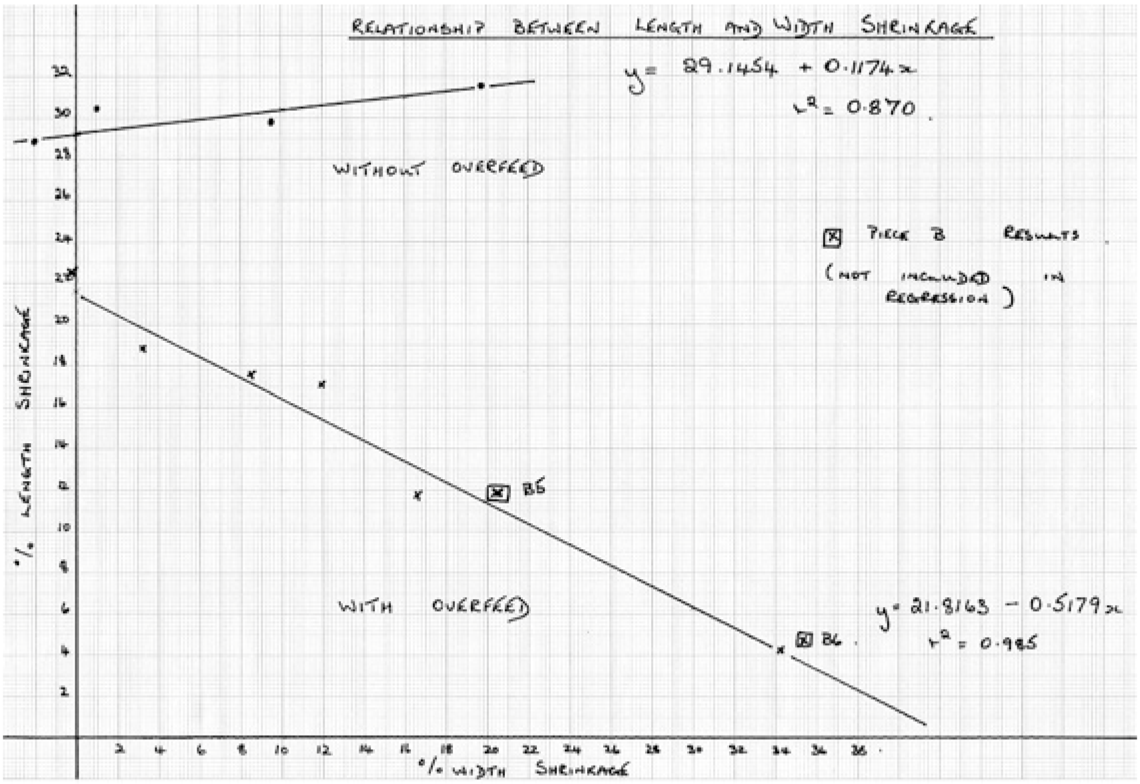
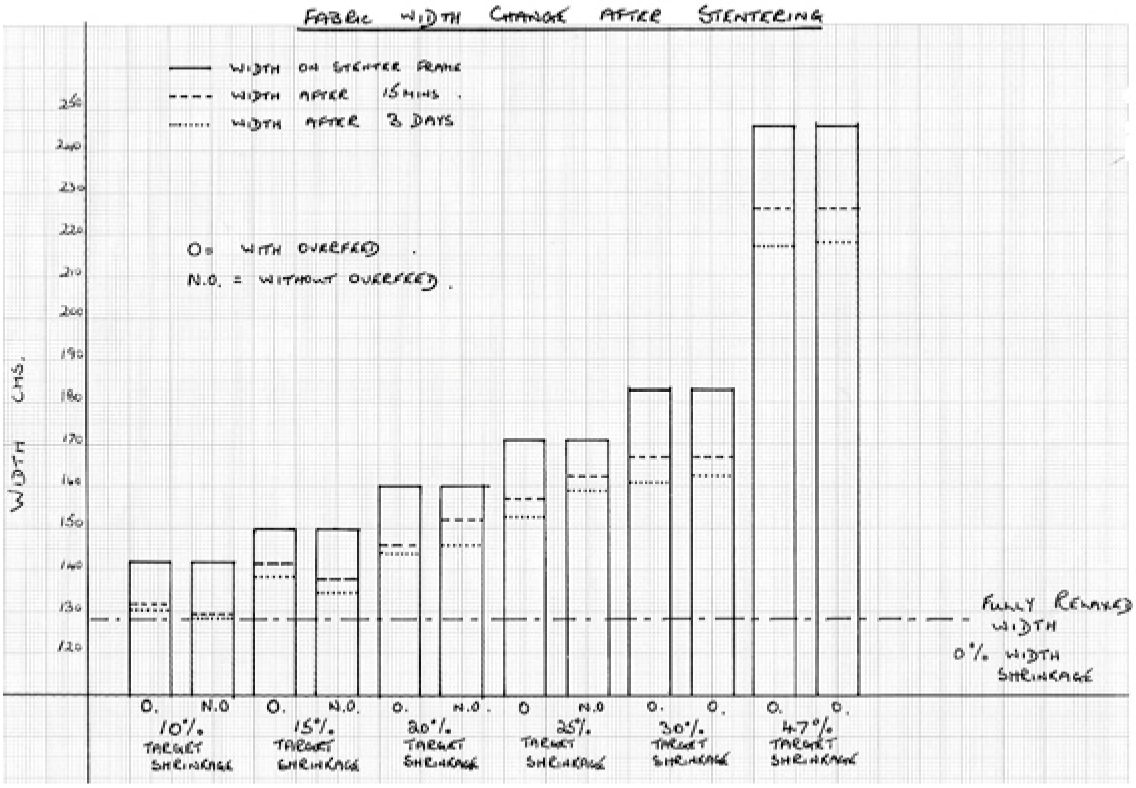


Figure 3



FABRIC WIDTH CHANGE AFTER STENTERING
WIDTH ON STENTER FRAME
WIDTH AFTER 15 MINS.
WIDTH AFTER 3 DAYS
O = WITH OVERFEED.
N.O. = WITHOUT OVERFEED.
WIDTH CMS.
FULLY RELAXED WIDTH
0% WIDTH SHRINKAGE
10% TARGET SHRINKAGE
15% TARGET SHRINKAGE
20% TARGET SHRINKAGE
25% TARGET SHRINKAGE
30% TARGET SHRINKAGE
47% TARGET SHRINKAGE

Figure 4

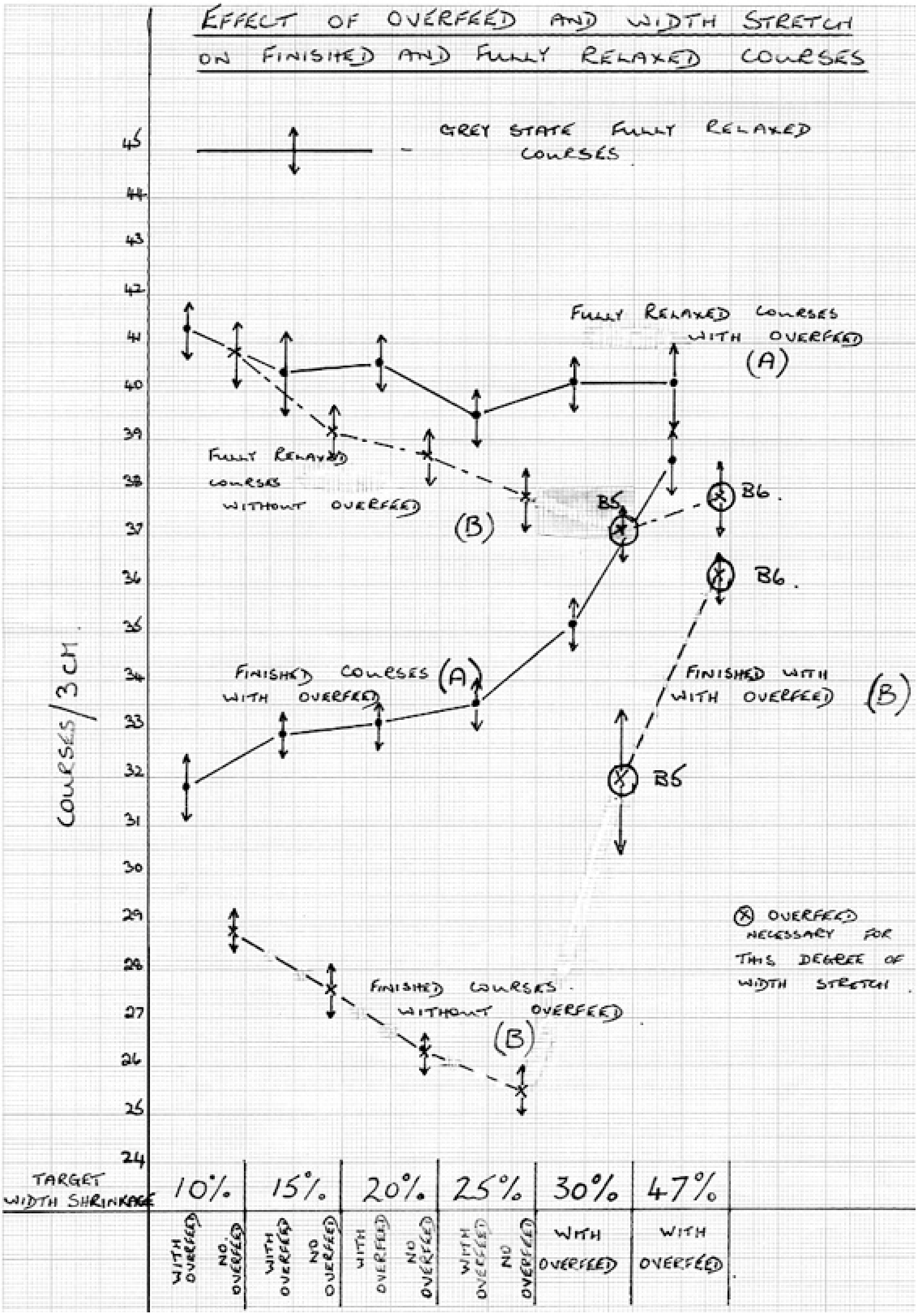

EFFECT OF OVERFEED AND WIDTH STRETCH
ON FINISHED AND FULLY RELAXED COURSES
GREY STATE FULLY RELAXED COURSES
FULLY RELAXED COURSES WITH OVERFEED (A)
FULLY RELAXED COURSES WITHOUT OVERFEED (B)
FINISHED COURSES WITH OVERFEED (A)
FINISHED WITH WITH OVERFEED (B)
FINISHED COURSES WITHOUT OVERFEED (B)
B5
B6
OVERFEED NECESSARY FOR THIS DEGREE OF WIDTH STRETCH
COURSES/3 CM
TARGET WIDTH SHRINKAGE
10% 15% 20% 25% 30% 47%
WITH OVERFEED
NO OVERFEED
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

Figure 4a

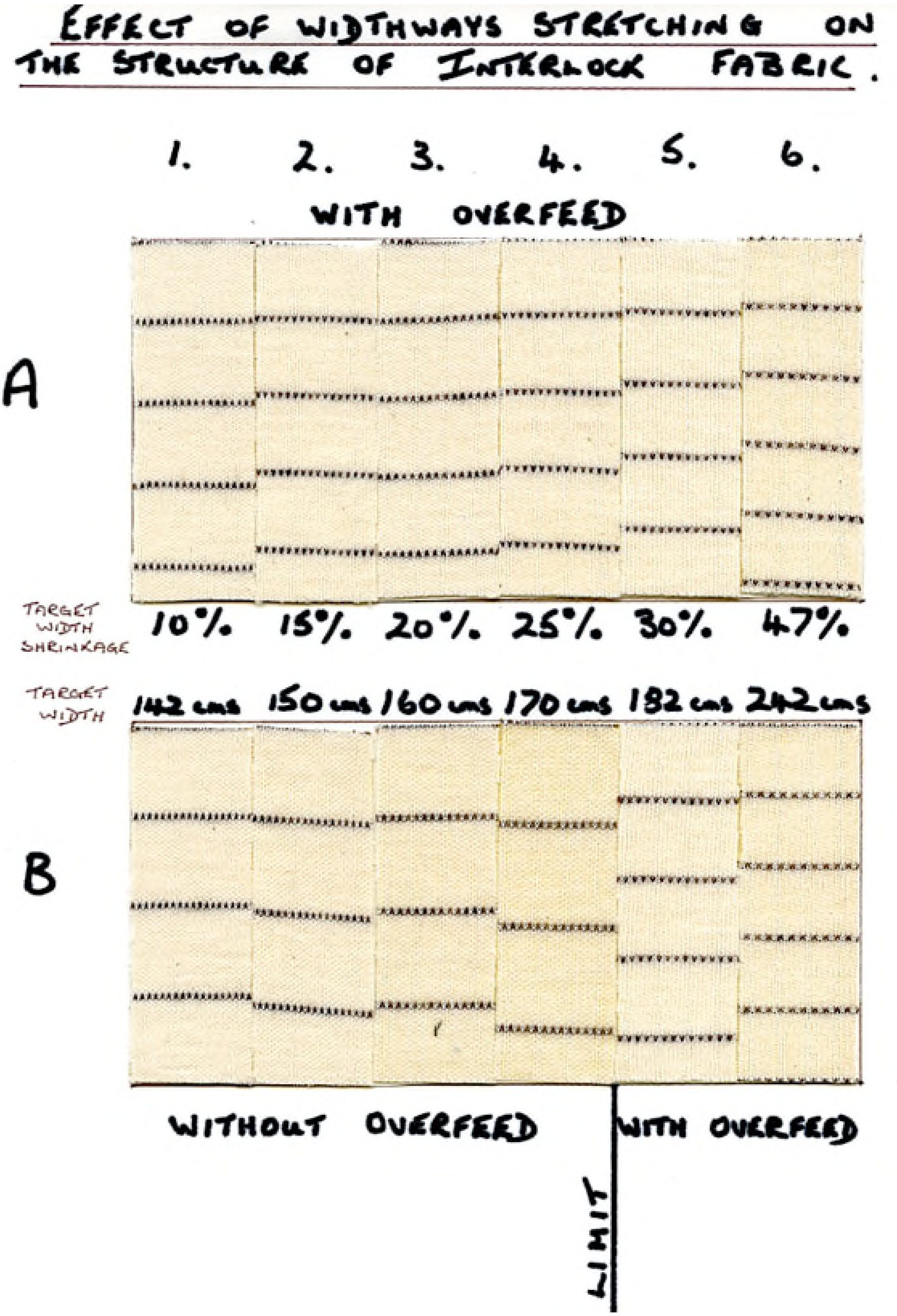
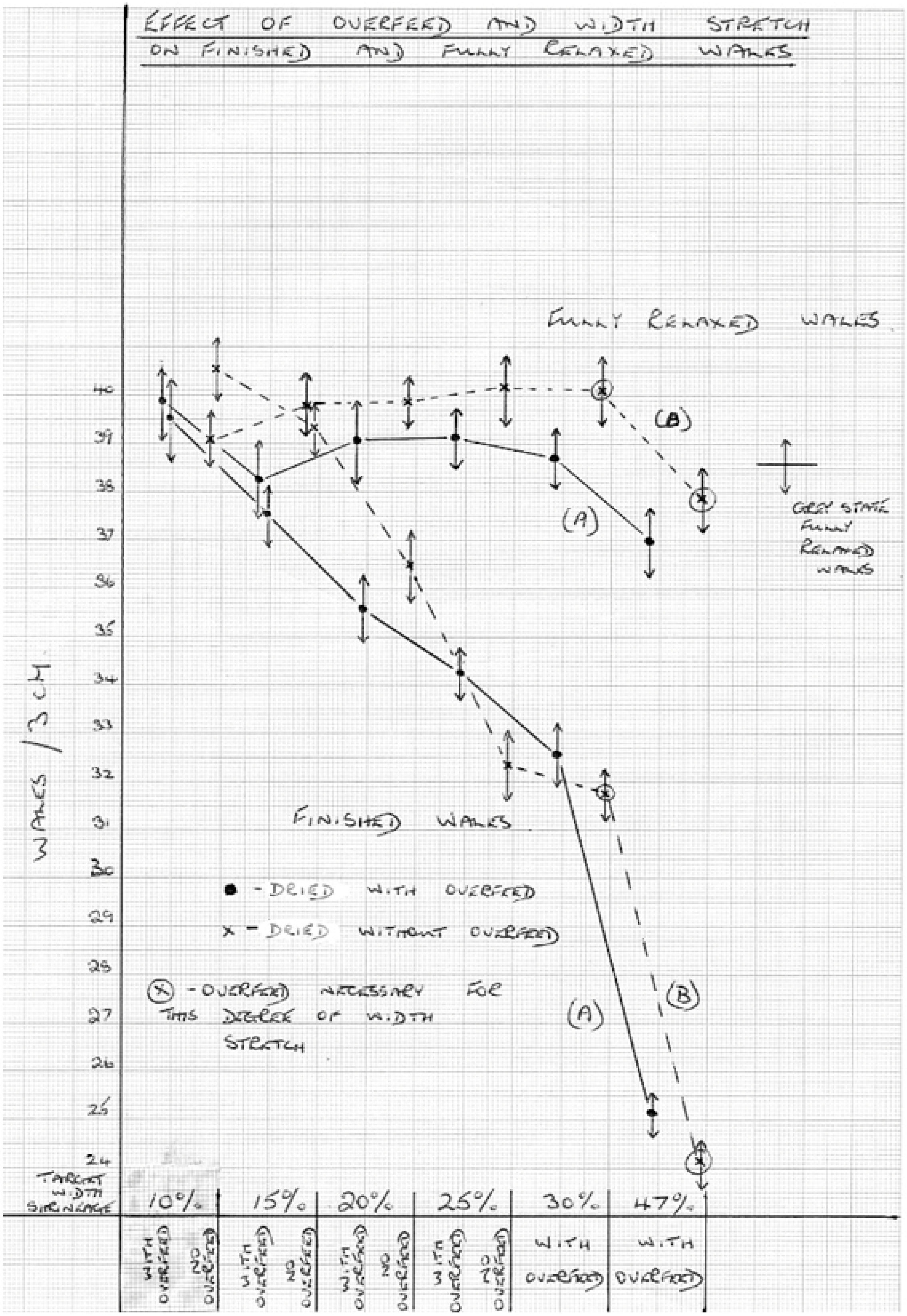

EFFECT OF WIDTHWAYS STRETCHING ON THE STRUCTURE OF INTERLOCK FABRIC.
1. 2. 3. 4. 5. 6.
WITH OVERFEED
A
TARGET WIDTH SHRINKAGE
10% 15% 20% 25% 30% 47%
TARGET WIDTH
142 cms 150 cms 160 cms 170 cms 182 cms 242 cms
B
WITHOUT OVERFEED
WITH OVERFEED
LIMIT

Figure 5



EFFECT OF OVERFEED AND WIDTH STRETCH ON FINISHED AND FULLY RELAXED WALES
FULLY RELAXED WALES
FINISHED WALES
(A)
(B)
GREY STATE FULLY RELAXED WALES
● - DRIED WITH OVERFEED
x - DRIED WITHOUT OVERFEED
ⓧ - OVERFEED NECESSARY FOR THIS DEGREE OF WIDTH STRETCH
WALES / 3 CM
40
39
38
37
36
35
34
33
32
31
30
29
28
27
26
25
24
TARGET WIDTH SHRINKAGE
10%
15%
20%
25%
30%
47%
WITH OVERFEED
NO OVERFEED
WITH OVERFEED

Figure 6

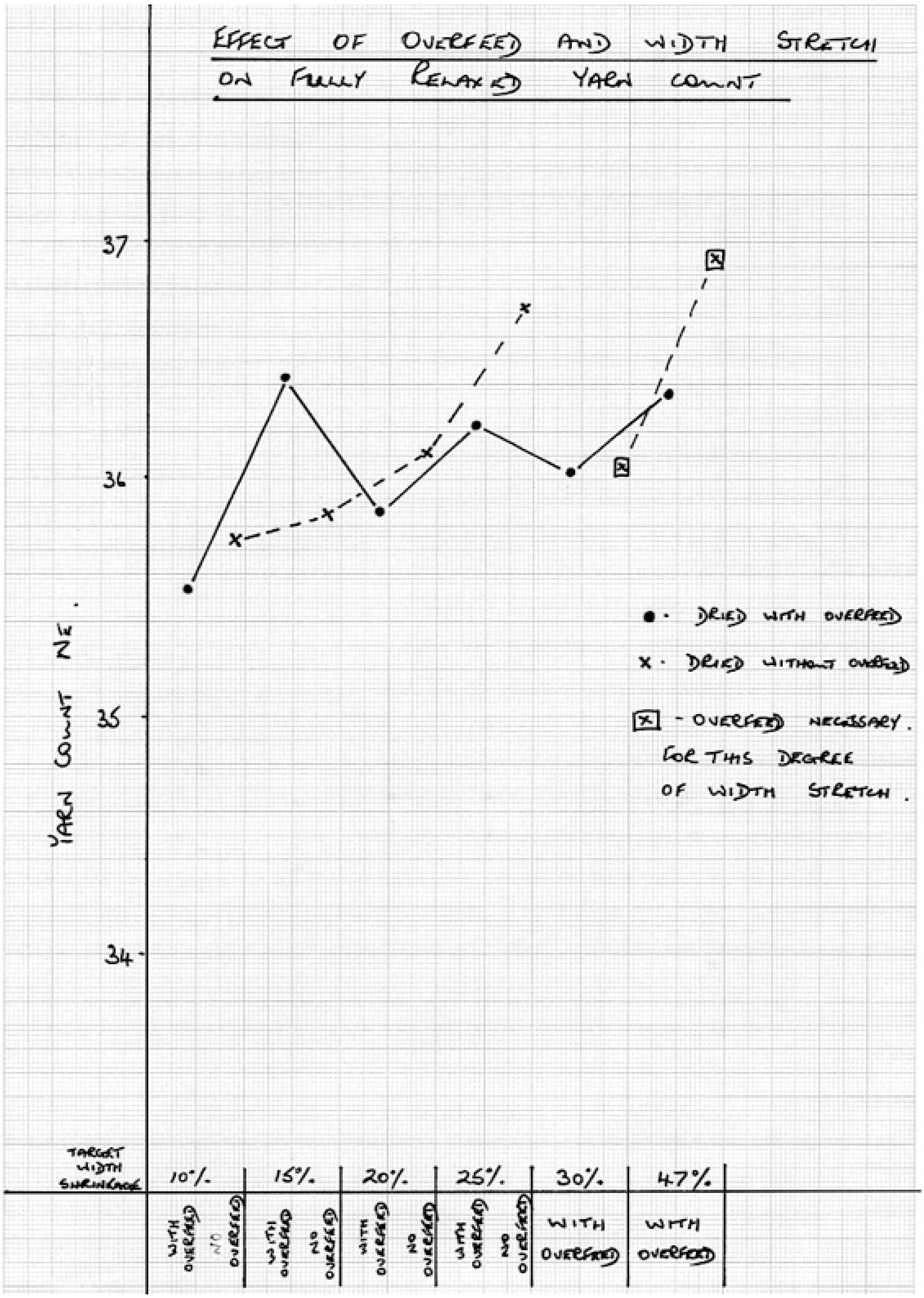

EFFECT OF OVERFEED AND WIDTH STRETCH
ON FULLY RELAXED YARN COUNT
YARN COUNT No.
37
36
35
34
• · DRIED WITH OVERFEED
x · DRIED WITHOUT OVERFEED
☒ - OVERFEED NECESSARY.
FOR THIS DEGREE
OF WIDTH STRETCH.
TARGET WIDTH SHRINKAGE
10%
15%
20%
25%
30%
47%
WITH OVERFEED
NO OVERFEED
WITH OVERFEED
NO OVERFEED
WITH OVERFEED
NO OVERFEED
WITH OVERFEED
NO OVERFEED
WITH OVERFEED
WITH OVERFEED

Figure 7

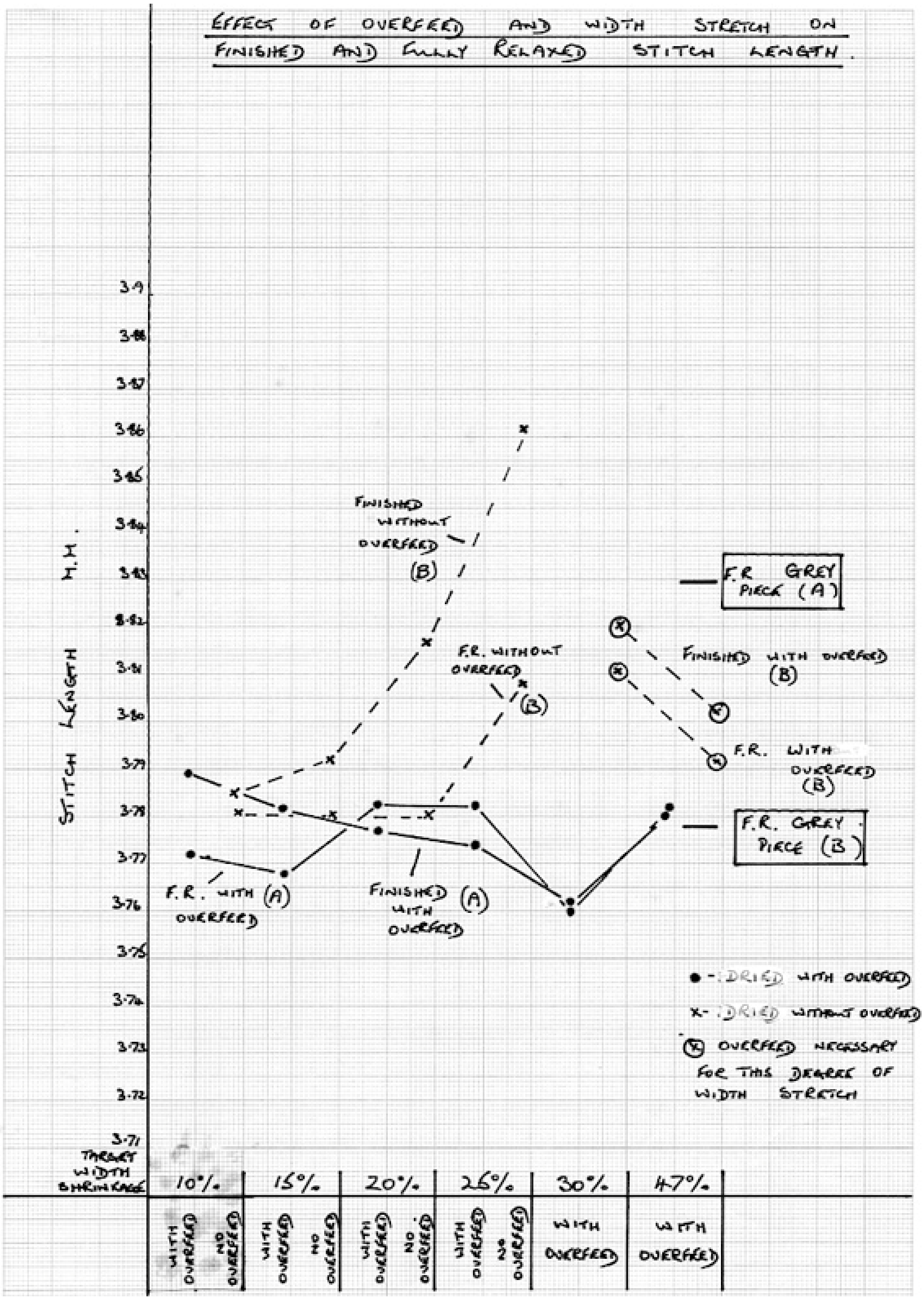

EFFECT OF OVERFEED AND WIDTH STRETCH ON FINISHED AND FULLY RELAXED STITCH LENGTH.
STITCH LENGTH M.M.
FINISHED WITHOUT OVERFEED (B)
F.R. WITHOUT OVERFEED (B)
F.R. WITH OVERFEED (A)
FINISHED WITH OVERFEED (A)
F.R GREY PIECE (A)
FINISHED WITH OVERFEED (B)
F.R. WITH OVERFEED (B)
F.R. GREY PIECE (B)
• - DRIED WITH OVERFEED
X - DRIED WITHOUT OVERFEED
⊗ OVERFEED NECESSARY FOR THIS DEGREE OF WIDTH STRETCH
TARGET WIDTH SHRINKAGE
10% 15% 20% 26% 30% 47%
WITH OVERFEED
NO OVERFEED

Figure 8

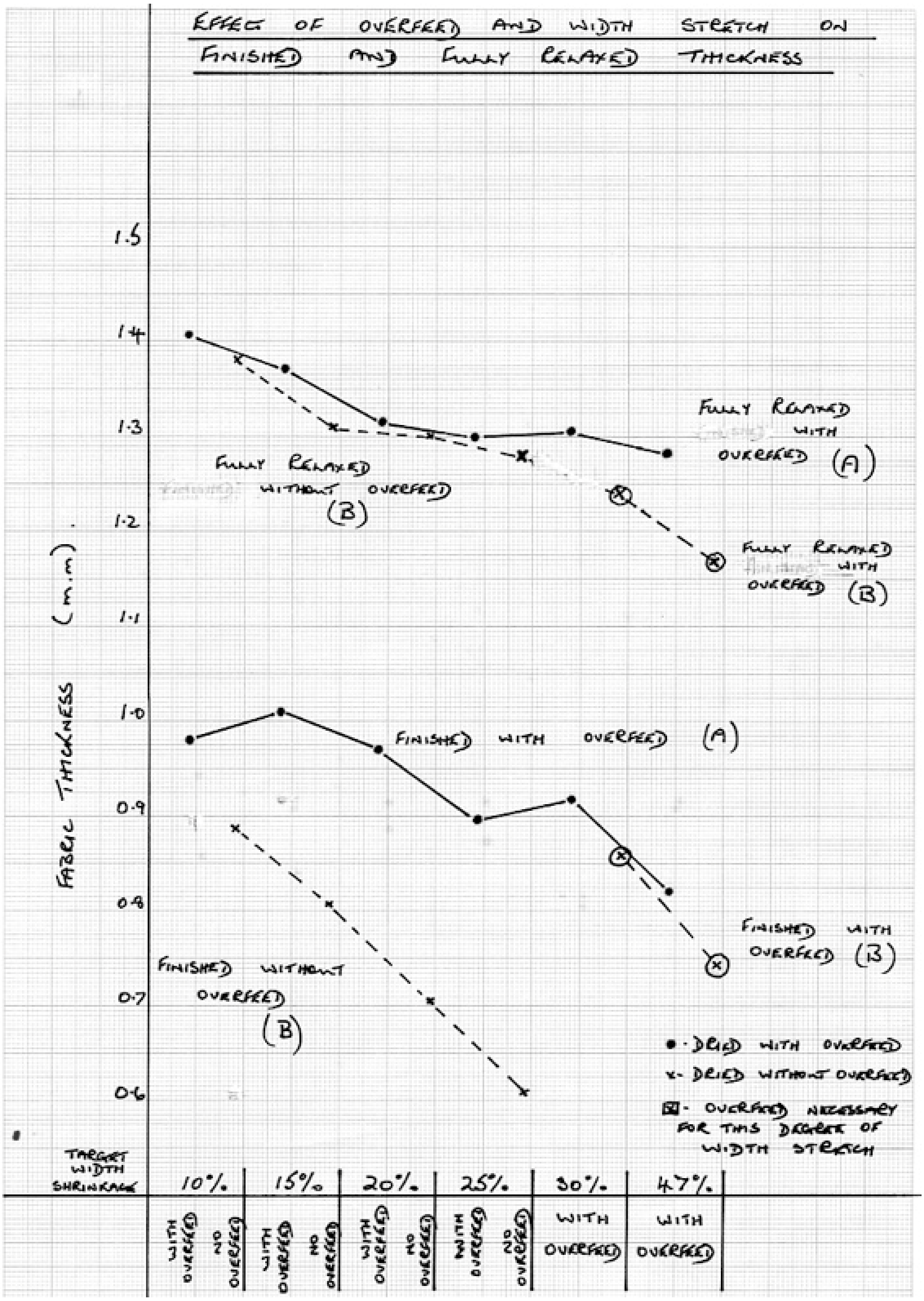
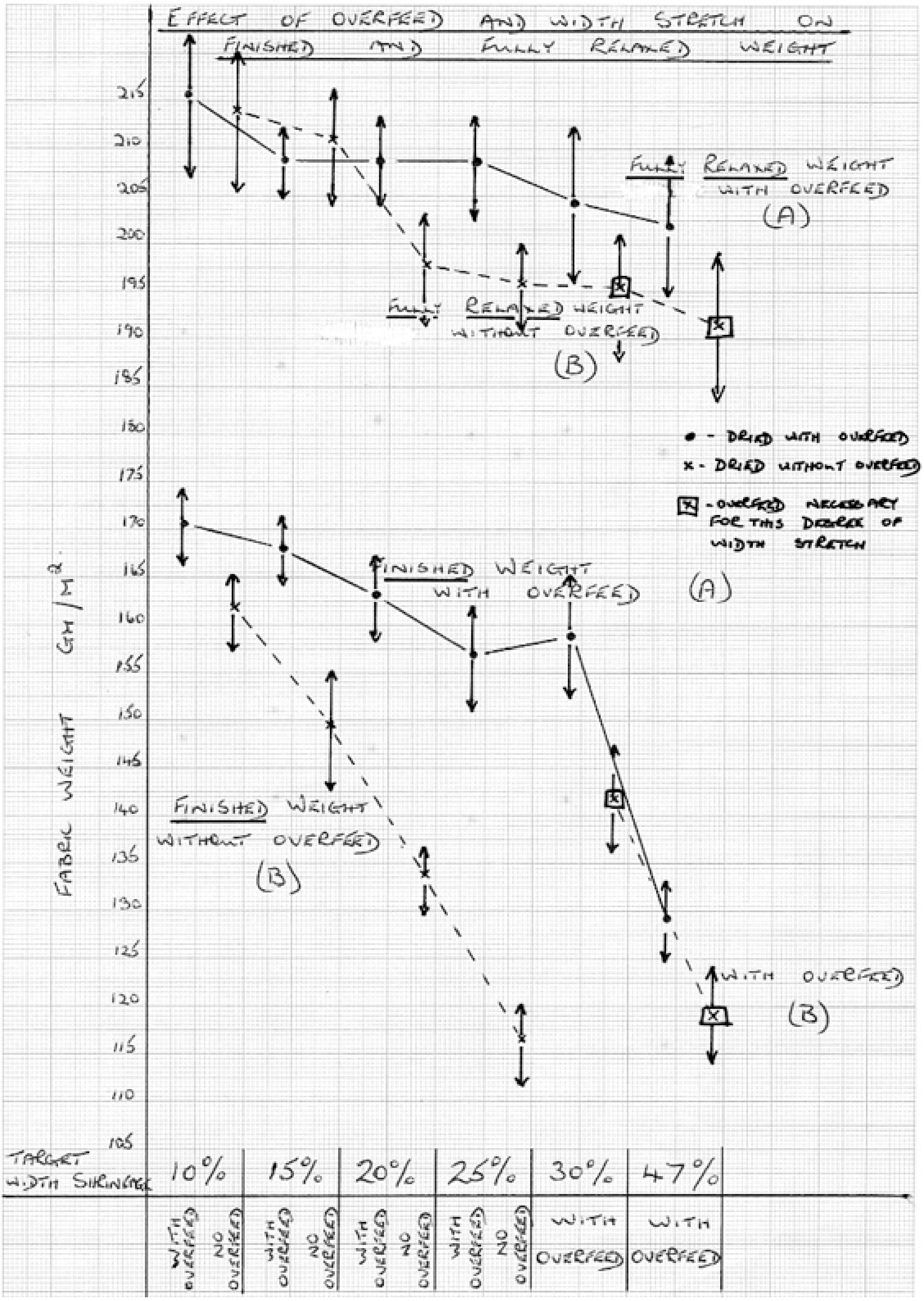

EFFECT OF OVERFEED AND WIDTH STRETCH ON
FINISHED AND FULLY RELAXED THICKNESS
FABRIC THICKNESS (m.m)
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
FULLY RELAXED WITH OVERFEED (A)
FULLY RELAXED WITHOUT OVERFEED (B)
FULLY RELAXED WITH OVERFEED (B)
FINISHED WITH OVERFEED (A)
FINISHED WITH OVERFEED (B)
FINISHED WITHOUT OVERFEED (B)
• - DRIED WITH OVERFEED
x - DRIED WITHOUT OVERFEED
⊠ - OVERFEED NECESSARY FOR THIS DEGREE OF WIDTH STRETCH
TARGET WIDTH SHRINKAGE
10%
15%
20%
25%
30%
47%
WITH OVERFEED
NO OVERFEED

Figure 9


EFFECT OF OVERFEED AND WIDTH STRETCH ON FINISHED AND FULLY RELAXED WEIGHT
FULLY RELAXED WEIGHT WITH OVERFEED (A)
FULLY RELAXED WEIGHT WITHOUT OVERFEED (B)
• - DRIED WITH OVERFEED
x - DRIED WITHOUT OVERFEED
☒ - OVERFEED NECESSARY FOR THIS DEGREE OF WIDTH STRETCH
FINISHED WEIGHT WITH OVERFEED (A)
FINISHED WEIGHT WITHOUT OVERFEED (B)
WITH OVERFEED (B)
FABRIC WEIGHT GM/M²
215
210
205
200
195
190
185
180
175
170
165
160
155
150
145
140
135
130
125
120
115
110
105
TARGET WIDTH SHRINKAGE
10%
15%
20%
25%
30%
47%
WITH OVERFEED
NO OVERFEED
WITH OVERFEED
WITH OVERFEED