Chapter 4: Results, Discussion and Interpretation

4.1 INTRODUCTION

In this chapter, the information gathered during the postal survey and the interviews is analysed to determine the South African situation regarding body measurements used, problems experienced with body measurements, fit and wear testing, block patterns and sizing systems used.

The results of the postal survey were analysed with the use of frequency tables. The demographics of the respondents are given in table form. The response as well as the breakdown of the respondents according to garment type are discussed. The results from the interviews were analysed by means of content analysis. A breakdown of the respondents for the interviews is given in a pie chart. Information gathered during the interview regarding returns of garments is also presented and discussed.

Following the demographic information of the respondents, the results are discussed according to the objectives of the study. The body measurements required by South African manufacturers and retailers are listed in a table together with the international descriptions, and the response. Problem measurements are also identified in this table. Following the discussion of this table are the responses of the South African manufacturers and retailers regarding the descriptions of the body measurements, as well as the problems they experience with the measurements concerned. The descriptions as given by the South African retailers and manufacturers are also compared to the international definitions.

Frequency distributions regarding the relevant aspects of how block patterns are created, how fit and wear testing is done and how South African sizing systems operate are illustrated with pie charts and bar charts.

4.2 DEMOGRAPHICS

4.2.1 Total number of questionnaires sent and response

A total number of 472 questionnaires were posted to manufacturers and retailers as indicated in **Table 4.1**. One hundred and sixty three respondents were rejected because of factories that had closed down, respondents that were not manufacturers but only distributors or importers, and respondents that were untraceable. The new total of 309 manufacturers and retailers were thus used as the grand total of questionnaires in the study.

TABLE 4.1: TOTAL NUMBER OF QUESTIONNAIRES SENT AND RESPONSE

	Sent	Rejected	Total	No response	% no response	Returned	% returned
Clothing manufacturers	264	88	176	146	83%	30	17%
Footwear manufacturers	169	70	99	85	86%	14	14%
Headwear manufacturers	21	5	16	12	75%	4	25%
Retailers	15	0	15	10	67%	5	33%
Lasts / Figure forms	3	0	3	2	67%	1	33%
TOTAL	**472**	**163**	**309**	**255**	**82,5%**	**54**	**17,5%**

The response to the postal survey, namely 54 of the 309 questionnaires posted, was 17,5%. The statistics department of the University of Pretoria indicated that a 10% response to a postal survey in South Africa could be regarded as acceptable. A response of more than 10% was achieved in each of the key categories in this study. This can be accepted as a satisfactory response for the postal survey.

4.2.2 Breakdown of respondents for the survey according to garment type

Table 4.2 gives a breakdown of respondents according to garment type. The number of respondents involved in the manufacturing or retailing of a specific garment type for more than ten years is also indicated in **Table 4.2**. This is an important figure, because the number of years in business gives an indication of experience in and knowledge of the clothing industry.

TABLE 4.2: RESPONDENTS ACCORDING TO GARMENT TYPE AND YEARS IN BUSINESS

GARMENT TYPE	Number of respondents	Number of respondents in business for 10+ years	% of respondents in business for 10+ years
BABIES' / INFANTS' wear	12	10	83,3
BABIES' / INFANTS' HEADWEAR	6	5	83,3
BABIES' / INFANTS' GLOVES	4	3	75
BOYS' coats, overalls	3	1	33,3
BOYS' jackets, shirts, t-shirts	12	10	83,3
BOYS' pants, shorts	10	7	70
BOYS' swimwear	3	3	100
BOYS' underwear	6	5	83,3
GIRLS' dresses, coats, overalls	14	11	78,6
GIRLS' jackets, blouses, t-shirts	13	11	84,6
GIRLS' skirts, trousers, shorts	13	11	84,6
GIRLS' swimwear	5	4	80
GIRLS' underwear	9	7	77,8
BOYS' / GIRLS' SOCKS	6	5	83,3
BOYS' / GIRLS' HEADWEAR	5	4	80
BOYS' / GIRLS' GLOVES	3	2	66,7
SCHOOL WEAR	9	5	55,6
MEN'S coats, overalls	7	4	57,1
MEN'S jackets, shirts, t-shirts	19	15	78,9
MEN'S pants, shorts	14	12	85,7
MEN'S swimwear	4	4	100

GARMENT TYPE	Number of respondents	Number of respondents in business for 10+ years	% of respondents in business for 10+ years
BABIES' / INFANTS' wear	12	10	83,3
MEN'S underwear	9	6	66,7
LADIES' dresses, coats, overalls	17	13	76,5
LADIES' jackets, blouses, t-shirts	21	18	85,7
LADIES' skirts, trousers, shorts	18	15	83,3
LADIES' swimwear	6	4	66,7
LADIES' underwear	11	9	81,8
LADIES' foundation wear	5	5	100
MATERNITY WEAR	8	6	75
ETHNIC WEAR	0	0	0
PROTECTIVE WEAR	3	3	100
MEN'S / LADIES' SOCKS	7	6	85,7
MEN'S / LADIES' HEADWEAR	7	5	71,4
MEN'S / LADIES' GLOVES	2	2	100
Men's SANDALS	11	5	45,5
Ladies' SANDALS	15	8	53,3
Boys' SANDALS	8	5	62,5
Girls' SANDALS	10	5	50
Men's CLOSED SHOES	14	11	78,6
Ladies' CLOSED SHOES	15	11	73,3
Boys' CLOSED SHOES	9	6	66,7
Girls' CLOSED SHOES	6	4	66,7
MOULDED FOOTWEAR	3	3	100
HEALTH SHOES	4	2	50
SPORTS / ATHLETIC SHOES	5	3	60
SCHOOL SHOES	6	3	50
INDUSTRIAL FOOTWEAR (no steel cap)	4	3	75
INDUSTRIAL FOOTWEAR (steel cap)	4	2	50
CONTRACT FOOTWEAR	4	3	75
BABIES' / INFANTS' FOOTWEAR	6	4	66,7

From the information in **Table 4.2** it is clear that for most of the garment types, the majority of the respondents have been in business for ten years or longer. For men and boys, more companies were involved with garments covering the upper and

lower body separately. For ladies and girls, more companies were involved in garments covering the upper body, lower body and whole body (for example, dresses). This is understandable since men wear few garments that cover the whole body. In the case of footwear, the companies were mainly involved in ladies' sandals, and men's and ladies closed shoes. With the exception of ethnic wear, all garment types were represented in the postal survey.

4.2.3 Breakdown of the respondents for the interviews

Thirteen interviews were conducted at twelve companies. This is because the clothing and the footwear departments were interviewed separately at the one retailer. The breakdown of the interviews is illustrated in **Figure 4.1**. The respondents for the interviews consisted of seven clothing manufacturers, one footwear manufacturer, one fit-dummy manufacturer, three retailers and one footwear retailer. The seven clothing manufacturers consisted of one hat and cap manufacturer for adults, children and infants, two ladies' wear manufacturers, one manufacturer of mainly men's wear, one manufacturer of children's and infants' wear, and two manufacturers of men's, ladies' and children's wear. The shoe manufacturer made steel toe-cap safety shoes.

When referring to the first objective for the study, namely to compile a comprehensive list of all body measurements required by South African apparel manufacturers and retailers, covering the garments in the following categories:

- ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the full body;
- ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the upper body;
- ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the lower body;
- ✓ Men's/Boys'/Women's/Girls'/Babies' headwear;
- ✓ Men's/Boys'/Women's/Girls'/Babies' gloves;
- ✓ Men's/Boys'/Women's/Girls'/Babies' footwear;

it is clear that the last two categories, namely gloves and footwear, were not sufficiently represented. In the case of gloves, the number of respondents involved in the manufacturing of gloves were limited. In the case of footwear, the geographical location restricted their inclusion in the sample.

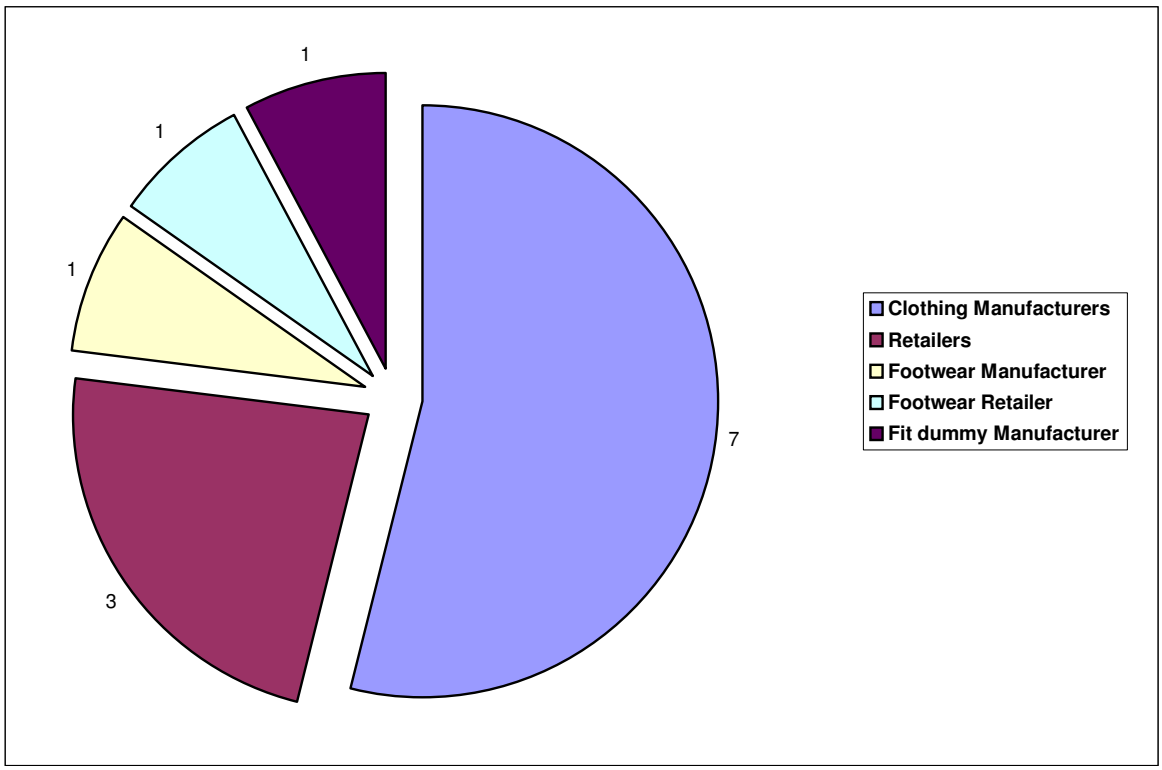

FIGURE 4.1: BREAKDOWN OF INTERVIEWS

4.2.4 Returns

The respondents were asked to give an indication of returns as a percentage of total sales. The results are illustrated in **Figure 4.2**. Four companies (two clothing manufacturers, one footwear manufacturer and one retailer) were willing to disclose that returns are about 1% or less of total sales. Two companies indicated that returns were “very low” or “very little”. These two companies were grouped with the 0-1% category. Two companies – one retailer and one clothing manufacturer – indicated that returns as a percentage of sales are confidential information, and three companies were unsure or did not know.

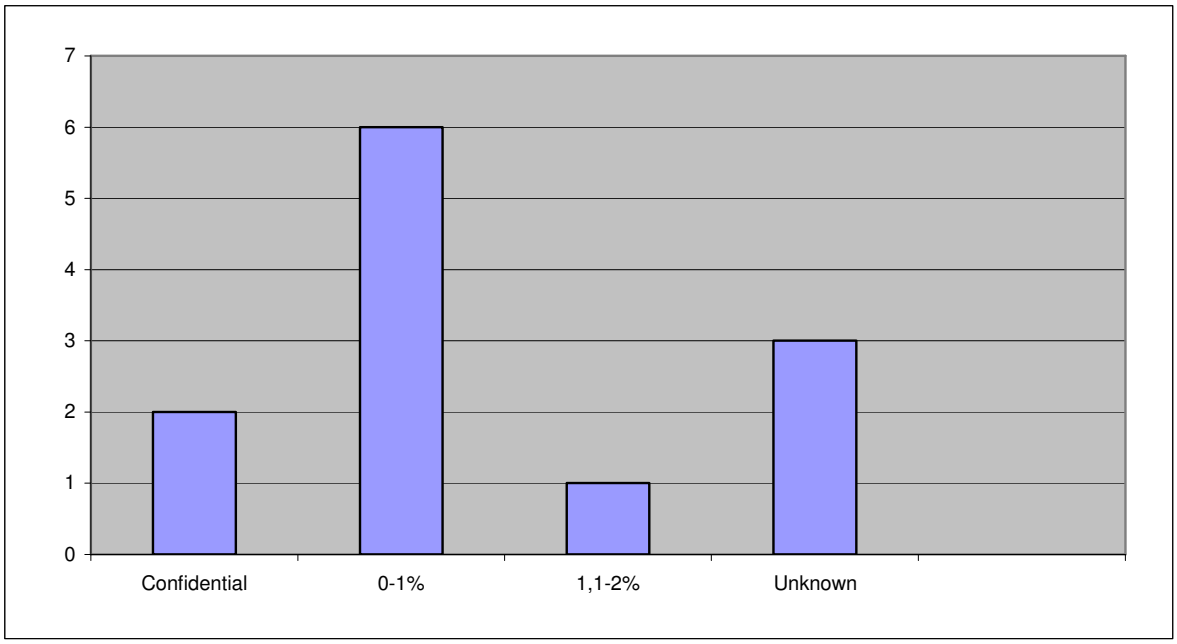

FIGURE 4.2: RETURNS AS A PERCENTAGE OF SALES

Respondents were asked whether returns were related to any specific garment type, since it could give an indication of problems with specific measurements. Returns were however not limited to one particular garment type, but for most of the respondents were evenly distributed across all garment types – as illustrated in **Figure 4.3**. This was confirmed by 10 of the 12 respondents. One manufacturer indicated that most of their returns are wet suits (diving suits), although they also manufacture other garments. The footwear retailer indicated that sports shoes and ladies' high heel shoes present the most returns.

Another reason why returns are not related to a specific garment type could be because there is no proper system of record keeping regarding returns. The returns policy of the different stores should also be considered.

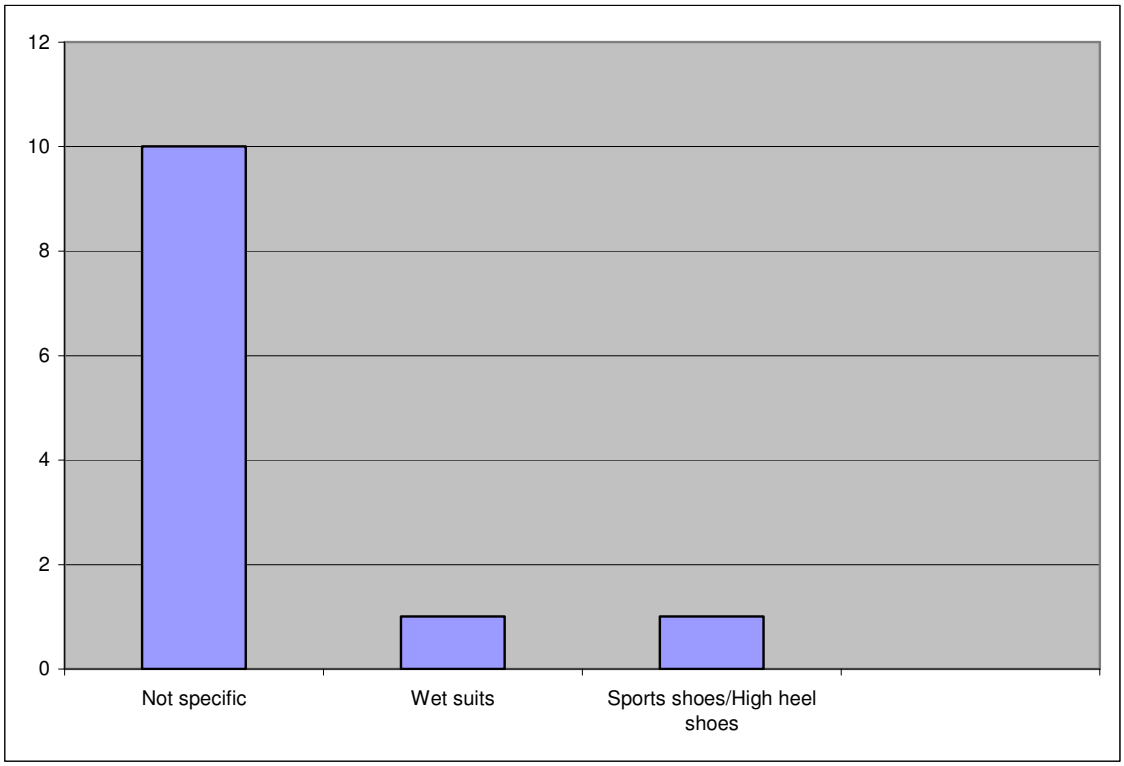

FIGURE 4.3: GARMENT TYPE RETURNED

Wet suits are the main garment type manufactured by the specific manufacturer that mentioned them as a problem. The specific manufacturer custom-make the garments and the clients have to send their measurements to the manufacturer. The fact that individuals have to take their own measurements could explain the problems that the company experiences, and it also confirms that laymen probably do not know where and how to take his measurements and do not know what their correct measurements are.

The sport shoes that the retailer referred to are in this case actually for casual wear and not for use in sports. The shoes are however not used for their intended end use (indicating customer abuse as a reason for returns) and therefore present a problem. Heels breaking off from ladies high heel shoes were mainly related to a manufacturing problem that has been sorted out since.

Reasons for returns are listed in **Figure 4.4**. Respondents were able to list more than one reason for returns. Problems with the quality of construction, as well as fabric quality, were listed as the most frequent reasons for returns. Component failure and customer abuse were also listed as reasons for returns. Component failure refers to the different items, such as zips and buttons, used in the manufacturing of a garment. Three companies listed fit as a reason for returns. One of these companies manufactures custom-made garments. Customers have to measure themselves and then send these measurements to the manufacturer, and therefore wrong body dimensions are occasionally a cause for returns. The other company manufactures uniforms to standard sizes according to a sizing system developed for the military together with Ergotech. Although fit problems for the specific company are very rare, they have experienced fit problems in the past. Fit is a very important aspect and consideration in the case of uniforms, since a neat and professional appearance is important. However, people are less likely to complain about uniforms, as will be discussed later. The third company that experienced fit problems manufactures ladies' corporate wear and noted that pattern making is sometimes a problem. This was coded as fit, since a problem with the pattern implies a problem with the fit of the garment.

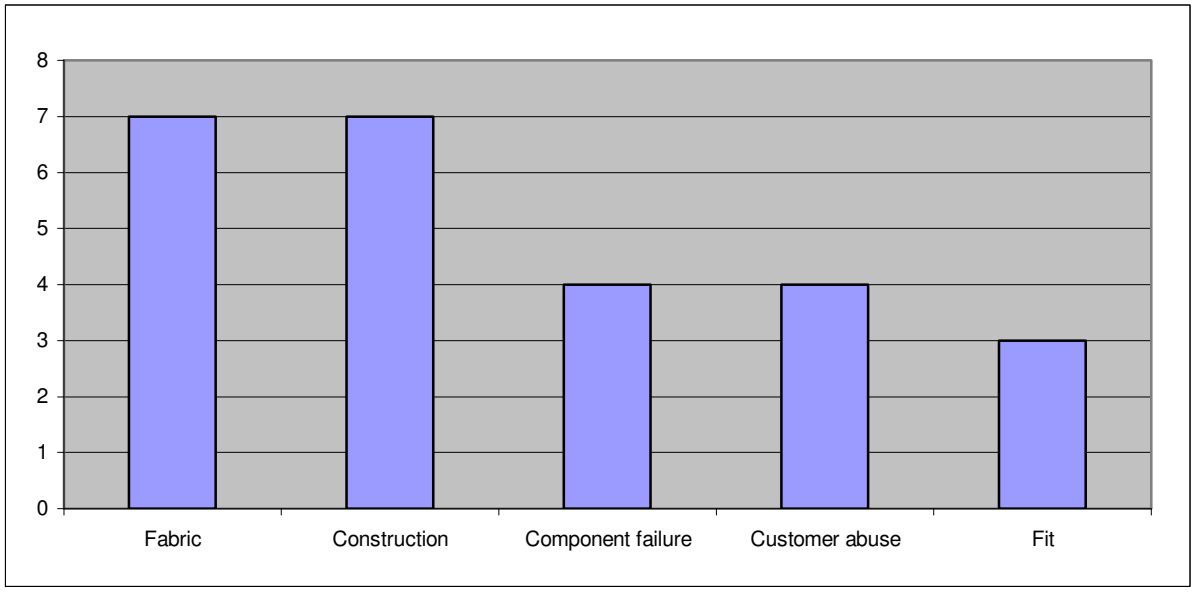

FIGURE 4.4: REASONS FOR RETURNS

Although fit is an important consideration in the case of uniforms, people accept and adjust to the way that a uniform fits and are therefore less likely to complain. People are more likely to complain about fashion garments. Retailers however handle fit problems before the garments go into the stores. Sample garments are made, fitted and examined before the go-ahead is given for production. This explains why fit is not seen as a major reason for returns. One retailer did however mention that the record keeping system regarding returns is not an accurate reflection of what happens in the stores. For example, a customer can exchange a wrong size for another size without the staff recording that there was a problem. There is also no record of lost sales, for instance, when a customer tries on a garment and then decides not to purchase. Retailers are however working on a better record keeping system. Proper training of staff with regard to recognising customer abuse, as well as bad fit, is also necessary.

One must keep in mind that it is much easier to identify problems related to the construction and the fabric quality of a garment. Even for the consumer it is difficult to verbalise the problem when a garment does not fit. Considering the difficulty of identifying fit problems, as well as the insufficient record keeping, it is not surprising that it seems as if fit is not a major problem for these companies. However, three out of twelve companies is a significant number which cannot be ignored.

4.3 IDENTIFICATION OF BODY MEASUREMENTS REQUIRED BY SOUTH AFRICAN CLOTHING MANUFACTURERS AND RETAILERS OF MEN'S, LADIES', CHILDREN'S, BABIES' AND INFANTS' CLOTHING AND FOOTWEAR (Objective 1)

Since most of the survey respondents (**Table 4.1**) have been operating for ten years or longer, one can assume that the measurements indicated in **Table 4.3** are used by experienced manufacturers and retailers in the clothing and footwear industry.

It was not possible to link the body measurements to manufacturers of specific types of garments, the reason being that in most cases manufacturers produced a variety of garment types for men and women, and in some cases also for children. If the

respondents had to indicate for which garment types every body measurement is used, it would have lengthened and complicated the questionnaire, and therefore would have had a negative impact on the reliability of the study.

Table 4.3 includes:

- ✓ a total list of required body measurements (divided into height, width, circumference, arc, seated, head, hand and foot measurements);
- ✓ number and percentage of respondents using each measurement;
- ✓ number and percentage of respondents experiencing problems with each measurement;
- ✓ sample size for each body measurement.

TABLE 4.3: MEASUREMENTS USED AND PROBLEM MEASUREMENTS

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
HEIGHTS – VERTICAL						
1	Height	54	21	38,89	0	0
2	Chin height	34	0	0,0	0	0
3	Cervical height	34	7	20,59	0	0
4	Side neck height	34	5	14,71	2	40
5	Side neck to front ground level	34	2	4,88	2	100
6	Shoulder height	34	7	20,59	2	28,6
7	Underarm height (Axilla height)	34	9	26,47	3	33,3
8	Across back height	34	9	26,47	3	33,3
9	Chest height	34	8	23,53	1	12,5
10	Bust level height	34	10	29,41	0	0
11	Underbust level height	34	3	8,82	0	0
12	Underbust to waist	34	12	34,29	1	8,3
13	Armscye to waist	34	12	34,29	2	16,7
14	Waist height	34	13	38,24	0	0
15	Preferred waist height	34	7	20,59	2	28,6
16	Waist height (at belly button level)	34	12	34,29	1	8,3
17	Upper hip height	34	12	34,29	0	0

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
18	Top hip height	34	12	34,29	0	0
19	Hip height (at maximum circumference)	34	12	34,29	0	0
20	Centre back waist to top hip	34	15	44,12	1	6,7
21	Centre back waist to upper hip	34	13	38,24	0	0
22	Centre back waist to hip (max circumf.)	34	12	34,29	0	0
23	Centre back waist to knee	34	9	26,47	0	0
24	Centre back waist to ground	34	13	38,24	0	0
25	Front waist to thigh	34	6	17,65	0	0
26	Front waist to knee	34	10	29,41	1	10
27	Front waist to calf	34	8	23,53	0	0
28	Front waist to ground	34	13	38,24	0	0
29	Side waist to hip	34	10	29,41	0	0
30	Side waist to knee length	34	10	29,41	0	0
31	Outside leg length	34	26	76,47	1	3,8
32	Inside leg length / crotch height	50	27	54	2	7,4
33	Trunk length	34	15	44,12	1	6,7
34	Total crotch length	34	20	58,82	1	5
35	Front crotch length	34	22	66,71	3	13,6
36	Back crotch length	34	22	66,71	3	13,6
37	Body rise / Crotch depth	34	20	58,82	3	15
38	Back waist length (cervical to waist)	34	17	50,00	0	0
39	Cervical to top hip	34	6	17,65	0	0
40	Cervical to upper hip	34	7	20,59	0	0
41	Cervical to hip	34	7	20,59	0	0
42	Cervical to knee hollow	34	5	14,71	0	0
43	Cervical to chest level	34	6	17,65	1	16,7
44	Side neck to chest level	34	6	17,65	2	33,3
45	Cervical to breast point	34	8	23,53	1	12,5
46	Side neck to breast point	34	9	26,47	4	44,4
47	Cervical to underbust level	34	5	14,71	1	20
48	Side neck to underbust level	34	5	14,71	2	40
49	Cervical to front waist	34	8	23,53	2	25
50	Front waist length (Side neck to waist)	34	12	34,29	2	16,7
51	Centre shoulder to bust point	34	13	38,24	2	14,4
52	Centre shoulder to underbust level	34	9	26,47	1	11,1
53	Centre shoulder to front waist – straight	34	11	32,35	2	18,2

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
54	Centre shoulder to front waist – contoured	34	10	29,41	2	20
55	Centre shoulder to back waist – contoured	34	11	32,35	1	9,1
56	Armscye depth (Cervical to underarm level)	34	10	29,41	2	20
57	Top arm length (Shoulder to underarm level)	34	14	41,18	2	14,3
58	Arm length straight (Cervical to wrist)	34	21	61,76	2	9,5
59	Arm length straight (Shoulder to wrist)	34	28	82,35	2	7,1
60	Arm length bent (Cervical to wrist)	34	14	41,18	3	21,4
61	Arm length bent (Shoulder to wrist)	34	13	38,24	2	14,4
62	Upper arm length (Cervical to elbow)	34	15	44,12	1	6,7
63	Upper arm length (Shoulder to elbow)	34	18	52,94	1	4,6
64	Under arm length (to wrist)	34	21	61,76	1	4,8
65	Under arm length (to elbow)	34	13	37,14	1	7,7
66	Thigh height	50	6	12,00	1	16,7
67	Mid-thigh height	50	3	6,00	1	33,3
68	Thigh length	50	7	14,00	0	0
69	Knee height	50	11	22,00	1	9,1
70	Calf height	50	7	14,00	1	14,3
71	Ankle height (outside leg)	50	10	20,00	2	20
72	Ankle height (inside leg)	50	10	20,00	1	10
	WIDTH – HORIZONTAL					
73	Neck width – front	38	19	50,00	4	21,1
74	Neck width – back	38	19	50,00	4	21,1
75	Back Neck width – contoured	38	17	44,74	3	17,6
76	Shoulder length	34	26	76,47	4	14,4
77	Shoulder width – back	34	19	54,88	1	4,3
78	Shoulder width – front	34	16	47,06	3	18,8
79	Across back width	34	27	79,41	2	7,4
80	Across front width	34	23	67,65	3	13
81	Breast prominence	34	11	32,35	2	18,2
82	Bust width	34	16	47,06	2	12,5
83	Chest depth	34	12	34,29	2	16,7
84	Waist width	34	21	61,76	0	0
85	Waist depth	34	7	20,59	1	14,3
86	Hip width (from front at max circumf.)	34	19	54,88	0	0
87	Buttock depth (back to front at max point –	34	11	32,35	2	18,2

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
	measured form the side)					
88	Armscye width (front to back across top of arm)	34	12	34,29	2	16,7
89	Armspan	34	8	23,53	1	12,5
	CIRCUMFERENCES					
90	Neck girth	38	18	47,37	2	11,1
91	Neck girth – around Adam's apple	38	11	28,95	2	18,2
92	Neck base girth	38	14	36,84	3	21,4
93	Shoulder girth	34	11	32,35	1	9,1
94	Chest girth	34	27	79,41	0	0
95	Bust girth	34	24	70,59	0	0
96	Bust girth contoured	34	9	26,47	0	0
97	Underbust girth	34	17	50,00	0	0
98	Waist girth	34	27	79,41	0	0
99	Preferred waist girth	34	10	29,41	1	10
100	Waist girth at belly button level	34	15	44,12	0	0
101	Upper hip girth (at prominent hip bone)	34	17	50,00	0	0
102	Top hip girth	34	17	50,00	0	0
103	Hip girth (at max circumf.)	34	25	73,35	0	0
104	Trunk circumference (Body loop)	34	11	32,34	1	9,1
105	Centre trunk circumference	34	9	26,47	1	11,1
106	Armscye girth	34	17	50,00	2	11,8
107	Upper arm girth – straight	34	16	47,06	0	0
108	Upper arm girth – bent	34	12	34,29	0	0
109	Elbow girth – straight	34	11	32,35	0	0
110	Elbow girth – bent	34	14	41,18	0	0
111	Forearm girth	34	12	34,29	0	0
112	Wrist girth	34	21	61,67	0	0
113	Thigh girth	50	18	36,00	0	0
114	Mid-thigh girth	50	12	24,00	0	0
115	Knee girth	50	14	28,00	0	0
116	Lower knee girth	50	7	14,00	0	0
117	Calf girth	50	13	26,00	0	0
118	Minimum leg girth	50	9	18,00	0	0
119	Ankle girth	50	16	32,00	0	0

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
ARC MEASUREMENTS						
120	Bust arc anterior	34	1	2,94	1	100
121	Waist arc anterior	34	1	2,94	1	100
122	Abdominal extension arc anterior	34	0	0,0	1	
123	Hip arc posterior	34	0	0,0	1	
SEATED – HEIGHTS						
124	Height	50	0	0,0	0	0
125	Cervical height	34	1	2,94	0	0
126	Shoulder height	34	0	0,0	0	0
127	Waist height	34	1	2,94	0	0
128	Knee height	50	1	2,00	0	0
129	Popliteal height (lower leg length)	50	0	0,0	0	0
SEATED – WIDTHS						
130	Hip width	34	2	4,88	0	0
131	Thigh length	50	2	4,00	0	0
SEATED – GIRTHS						
132	Waist girth	34	2	4,88	0	0
133	Hip girth	34	2	4,88	0	0
134	Thigh girth	50	2	4,00	0	0
135	Knee girth	50	1	2,00	0	0
OTHER						
136	Body mass (in kg)	50	4	8,00	0	0
137	Shoulder blade skinfold	34	0	0,00	1	
138	Triceps skinfold	34	0	0,00	1	
139	Bust to waist drop	34	4	11,76	1	25
140	Hip to waist drop	34	5	14,71	1	20
141	Bust to underbust drop	34	4	11,76	1	25
142	Front neck depth	34	5	14,71	1	20
143	Back neck depth	34	5	14,71	1	20
144	Back seat angle	34	2	4,88	2	100
145	Shoulder slope	34	9	26,47	3	33,3
146	Height (Lying down – infants)	50	2	4,00	0	0
HEAD MEASUREMENTS						
147	Head height	34	8	23,53	0	0
148	Face length (Menton-glabella)	34	2	4,88	1	50
149	Crown of scull to brows (Vertex to glabella)	38	1	2,63	1	100

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
150	Chin to nose bridge (Menton-sellion)	38	0	0,00	1	
151	Chin to pit of neck	38	2	4,26	2	100
152	Head length (brow to back of scull)	38	8	21,05	1	12,5
153	Head width – cheekbone to cheeckbone	38	4	10,53	1	25
154	Head width – above ears	38	7	18,42	1	14,3
155	Inter-pupillary distance	38	0	0,00	1	
156	Sagittal arch	38	3	7,89	1	33,3
157	Surface distance from above the ears across the top of the head (Bi-tragion coronal arch)	38	2	4,26	1	50
158	Head girth	38	14	36,84	1	7,1
	HAND MEASUREMENTS					
159	Hand thickness	34	1	2,94	1	100
160	Palm length	34	1	2,94	2	
161	Hand length (wrist to middle finger)	34	1	2,94	2	
162	Wrist to index finger length	34	1	2,94	1	100
163	Wrist to thumb tip length	34	1	2,94	2	
164	Thumb length	34	1	2,94	1	100
165	Index finger length	34	1	2,94	1	100
166	Middle finger length	34	1	2,94	1	100
167	Ring finger length	34	1	2,94	1	100
168	Little finger length	34	1	2,94	1	100
169	Hand width	34	1	2,94	2	
170	Hand girth	34	1	2,94	2	
171	Thumb girth	34	0	0,00	1	
172	Index finger girth	34	0	0,00	1	
173	Middle finger girth	34	0	0,00	1	
174	Ring finger girth	34	0	0,00	1	
175	Little finger girth	34	0	0,00	1	
	FOOT MEASUREMENTS					
176	Height of foot arch	50	9	18,00	2	22,2
177	Height of the big toe	50	8	16,00	1	12,5
178	Toe height	50	8	16,00	0	0
179	Ball height	50	6	12,00	2	33,3
180	Plantar arch height	50	3	6,00	2	66,7
181	Dorsal arch height	50	5	10,00	3	60

	BODY MEASUREMENTS	Sample size (N)	Number of respondents using the measurement	%	Number of respondents with problems	%
182	Outside ball height	50	6	12,00	3	50
183	Ankle length	50	5	10,00	0	0
184	Posterior heel contour	50	6	12,00	1	16,7
185	Foot length	50	17	34,00	3	17,6
186	Ball length (heel to ball of foot)	50	6	12,00	0	0
187	Fifth toe length	50	3	6,00	0	0
188	Outside ball length	50	5	10,00	0	0
189	Outside ball length (diagonal)	50	4	8,00	0	0
190	Width of three forward toes	50	4	8,00	0	0
191	Foot width – diagonal	50	12	24,00	4	33,3
192	Foot width (ball width)	50	12	24,00	3	25
193	Width (center line to medial border)	50	8	16,00	0	0
194	Width of instep	50	9	18,00	2	22,2
195	Heel width	50	7	14,00	1	14,3
196	Girth of heel / instep (Heel-ankle circumf.)	50	7	14,00	2	28,6
197	Instep girth (Bridge circumference)	50	13	26,00	5	38,5
198	Foot girth (ball of foot)	50	13	26,00	4	30,8
199	Angle line	50	4	8,00	1	25
200	Flare (ratio)	50	3	6,00	2	66,7
201	Proportion of sole in contact with ground	50	6	12,00	2	33,3
202	Lateral foot contour by template	50	4	8,00	1	25

Body measurements that were not used at all included chin height, abdominal extension arc anterior, hip arc posterior, shoulder height (seated), popliteal height, shoulder blade skinfold, and triceps skinfold. In some instances, more companies identified a measurement as being a problem measurement than the number that used the particular measurement. The explanation for this could be that such measurements are not used by industry because they are seen as problem measurements and are therefore not accurate or reliable to use.

The head measurement that is mainly used is, as expected, head girth. Head girth is the measurement used to indicate hat and cap sizes. It is therefore not surprising that the manufacturers make use of this measurement. Head height, head length and

head width are other measurements mostly used. Head measurements that were not used at all included chin to nose bridge (menton-sellion), and inter-pupillary distance.

Of the 54 companies that responded, there were only two glove manufacturers that used the hand measurements. It seems that the girths of the different fingers are not necessary for the manufacturing of gloves, but the different finger lengths seem to be important.

Foot length is the foot measurement that is mostly used by the respondents. This is because foot length is the measurement related to the size of footwear, but it is also used for the manufacturing of clothing such as Babygros™. Instep girth, foot girth, and foot width (diagonally and straight) are also used by a number of manufacturers.
Although all measurements are important to the clothing industry, the interview results of only those body measurements that one or more international descriptions were found for, and that more than one respondent provided a description for, are discussed and interpreted in detail. Results regarding all other measurements are presented in **Addendum D**. The reason for this is that where no international description is available there is nothing to compare the discussion of the respondent's descriptions with, and therefore one cannot make valid conclusions regarding these specific measurements. The situation is the same where no description was given by respondents. When only one description from the respondents is available it does not provide significant information about the situation regarding the specific measurement, and again one cannot make valid conclusions regarding such measurements.

4.4 COMPARISON OF INTERNATIONAL DESCRIPTIONS WITH RESPONDENTS' DESCRIPTIONS OF BODY MEASUREMENTS USED AND THE PROBLEMS THAT THE RESPONDENTS EXPERIENCE WITH BODY MEASUREMENTS (Objectives 2 and 3)

The results are grouped according to vertical height, horizontal width and depth, circumferences and other body measurements. Results are presented, discussed and interpreted in the following order:

- ✓ Percentage of survey respondents and number of interview respondents that use the measurement and/or experienced problems;
- ✓ International description of the measurement;
- ✓ Interview respondent's descriptions of the measurements and/or problem;
- ✓ Discussion / Interpretation;
- ✓ Tables summarising the results.

4.4.1 Vertical height measurements

Height (1)

Although not directly used in the manufacturing of clothing items, this measurement can indicate to the manufacturer the average height of the population that the manufacturer is catering for. This measurement is also important as an indicator when classifying the measurements of a population into a sizing system. It is clear from **Table 4.3** that 38,9% of the survey respondents made use of this measurement and none experienced problems with the measurement. Nine of the respondents interviewed indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the crown of the head and the ground (SizeUK).
- ✓ The vertical distance between the crown of the head and the ground, measured using the measuring stand (anthropometer) (Ergotech).

- ✓ The vertical distance between the crown of the head and the soles of the feet, measured with the subject standing erect without shoes and with the feet together (ISO 8559, 1989; ISO 3635, 1981).
- ✓ The vertical distance from the crown of a standing subject to the soles of the feet (ASTM 5219, 1999).

It is clear that all international descriptions describe the measurement as taken from the crown of the head to the ground.

Interview respondents' descriptions:

Respondent 1: *From head to toe, floor, without shoes.*
Respondent 3: *Total length, straight.*
Respondent 4: *Top of head straight to the floor.*
Respondent 6: *Full length.*
Respondent 7: *Mark the top of the head on the grid and measure in a straight line.*
Respondent 9: *A straight measurement from the top to the ground, no shoes.*
Respondent 11: *We'll put the person against the wall, make a mark and measure.*
Respondent 12: *Your actual height is a straight measurement.*
Respondent 13: *We let them stand against a wall, straight. Some people know their height, then we just ask them.*

It is clear that the descriptions given by the respondents correspond with the international descriptions, being a straight vertical measurement and measured without shoes. None of the respondents used an anthropometer. The reason why none of the respondents experienced problems with this measurement is probably because it is a straight-forward measurement to take.

Cervical height (3)

This measurement is useful when making garments that cover the full body and for the manufacturing of fit dummies. The measurement is used by 20,59% of the survey respondents and none of them experience problems with the measurement. Of the 13 respondents interviewed, four respondents used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the level of the centre back neck point straight to the ground (SizeUK).
- ✓ The distance, using the tape measure, from the 7th cervical vertebra, following the rear contour of the spinal column to the level of the hips, then vertically to the ground (ISO 8559, 1989).

The international descriptions do not correspond because the one describes it as a straight vertical measurement while the other description mentions following the curvature of the spine.

Interview respondents' descriptions:

Respondent 3: *Back neck straight to the floor.*

Respondent 4: *Nape to floor, following the contour of the back. Nape is identified by the prominent cervical bone at the back of the neck.*

Respondent 7: *From the nape, a straight measurement.*

Respondent 12: *A straight measurement from the back of the neck.*

The respondent's descriptions do not correspond with each other with regard to the measurement being a straight or a contoured measurement. The situation is the same internationally, although more of the respondents mentioned the straight measurement. It seems that the measurement can be measured as a straight vertical measurement, or as following the contour of the back.

Side neck height (4)

This measurement is not generally used for the manufacturing of most ordinary clothing items, but could be useful for the manufacturing of special garments that cover the full body and for the manufacturing of fit dummies. Although only 14,71% of the survey respondents use this measurement, two of the postal survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, four respondents indicated that they used the measurement and one experienced problems with the measurement.

International description of the measurement:

- ✓ Only one international index, namely SizeUK, describes the measurement. It is described as the distance between the right side neck point level and the ground.

Interview respondents' descriptions:

Respondent 3: *Side neck level (neck shoulder position) straight to the floor. Marking the neck base with a chain helps to identify the side neck position.*

Respondent 4: *Side neck to floor following the contour of the back. Identifying side neck is a problem; judge with the eye where the neck and shoulder joins.*

Respondent 9: *We normally take it as a straight measurement and when we make the pattern we add on to accommodate the bust.*

Respondent 11: *Mark at side neck point.*

It is clear that the descriptions do not correspond with each other, because some respondents take the measurement as a straight vertical height while one respondent indicated that they prefer the measurement to be taken on the contour of the body. None of the respondents indicated that the measurement should be taken on the right side of the body.

It is also clear that the problems that two of the survey respondents experienced with the measurement are probably due to the fact that it is difficult to landmark the side point of the neck. The side neck point is the position where the neck and shoulder meet, and identifying this position is the main problem. This position is usually identified by judging where the neck and shoulder meet. The ability to consistently judge it at the same point, even by the same measurer, is questionable. This is the reason why most measurements involving side neck point were identified as problem measurements. When a chain is used to mark the base of the neck, the position of the chain on the side of the neck is then used as a point of reference.

Shoulder height (6)

This measurement is useful for the manufacturing of special garments that cover the full body and also in the manufacturing of fit dummies. The measurement is used by 20,59% of survey respondents and two of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, only three used the measurement and one respondent experienced problems with the measurement.

International description of the measurement:

- ✓ Again, only the SizeUK standards describe the measurement as the distance between the level of the right armhole shoulder point and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Level of the shoulder (protruding bone at shoulder) straight to the floor.*

Respondent 4: *From shoulder to floor, straight.*

Respondent 11: *Shoulder to floor.*

All the respondents describe this measurement as a straight vertical measurement, similar to the international description; however, none mentioned that it should be taken on the right side of the body. Finding the position of the shoulder may be a problem because locating the bone that is used as the landmark is not always easy. That may be the reason why two of the survey respondents indicated that they usually experienced problems with this measurement.

Underarm height (7)

This measurement is useful for the manufacturing of special garments that cover the full body and also in the manufacturing of fit dummies. The measurement is used by 26,47% of survey respondents and three of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and two indicated that they experienced problems with the measurement.

International description of the measurement:

- ✓ Again, only the SizeUK standards describe the measurement as the distance between the right underarm level and the ground (SizeUK).

Interviewed respondents' descriptions:

Respondent 3: *Underarm straight to the floor.*

Respondent 4: *From underarm position along the side contour of the body to maximum hip, and then straight to the floor.*

Respondent 7: *Unsure about how high up under the arm it should be measured.*

Respondent 11: *From the armpit and measured straight.*

Respondent 13: *Armpit to floor, straight.*

It is clear that there is uncertainty about exactly how the measurement should be taken. Three of the respondents mentioned that it should be taken as a straight measurement and one indicated that they measure it along the body contour. The uncertainty with this measurement is as respondent 7 queries: how high up under the arm should the measurement be taken? To be able to take the measurement consistently one should know exactly from where to take the measurement. The international description is also vague about exactly how high up under the arm the measurement should be taken, since it just refers to underarm level. Land-marking the underarm point is probably the reason why so many respondents experienced problems with this measurement.

Across back height (8)

This measurement is useful for the manufacturing of fit dummies. The measurement is used by 26,47% of survey respondents and three of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and two indicated that they experienced problems with the measurement.

International description of the measurement:

- ✓ Only the SizeUK standards describe the measurement as from midway between centre back neck and underarm level to the ground (SizeUK). The across back position is usually identified as 12 cm below the nape of the neck.

However, the SizeUK description only identifies the position as midway between centre back neck and underarm level. To take consistent measurements it will be better to identify a specific distance below the nape, or a more identifiable position such as the crease where the arm and the body meet.

Interview respondents' descriptions:

Respondent 4: *From middle of armscye, following the contour of the back.*

Respondent 7: *In line with the crease or 12cm below nape, and it is a straight measurement.*

Respondent 11: *Twelve centimeters down from nape.*

It is clear that the respondents differ with regard to the taking of the measurement, and it is also, as in the case of the SizeUK standards, not clear as to exactly where the landmarks should be placed and how the measurement should be taken. Keeping in mind that the only sizing standard that actually describe the measurement, namely the SizeUK standards, is vague about the land-marking and also does not indicate whether it should be measured as a straight or contoured measurement, the uncertainty amongst the respondents is understandable.

Chest height (9)

This measurement could be useful when manufacturing men's wear covering the full body and for the manufacturing of fit dummies. The measurement is used by 23,53% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found.

✓ Distance between the level of the maximum chest and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 4: *Measured on men and children, from the widest part of the chest to the floor.*

Respondent 7: No description given.

Respondent 11: *Widest part* [of the chest] *to floor.*

The descriptions of the respondents correspond with the international description with regard to the landmarks. It is assumed that this is a straight vertical measurement, although this is not clearly stated in the descriptions.

Bust level height (10)

This measurement could be useful when manufacturing garments covering the full body and for the manufacturing of fit dummies for ladies' wear. The measurement is used by 29,41% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the level of the maximum bust projection and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 1: *From bust to floor.*

Respondent 4: *Measured on women, from the widest part of the bust to the floor.*

Respondent 6: No description given.

Respondent 7: *Straight down from the most prominent part of the bust.*

Respondent 11: *Most prominent part to floor.*

The descriptions of the respondents correspond with the international description with regard to the landmarks. It is not clear from the international description whether this is a straight vertical measurement. One of the respondents did mention that it should be a straight vertical measurement.

Underbust level height (11)

This measurement could be useful when manufacturing garments covering the full body and for the manufacturing of fit dummies for ladies' wear. This measurement is used by 8,82% of the survey respondents and none experienced problems with the

measurement. Of the 13 respondents interviewed, two used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the rib cage at underbust level and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 4: *Underbust position to the floor, on women.*

Respondent 11: *Directly under the bust straight to the floor.*

The descriptions of the respondents correspond with the international description with regard to the landmarks.

Underbust to waist (12)

This measurement is used in the manufacturing of upper body garments and underwear for women and it can also be useful for the manufacturing of fit dummies. The measurement is used by 35,29% of the survey respondents and one respondent experienced problems with the measurement. Of the 13 respondents interviewed, six used the measurement and none indicated that they experienced problems with the measurement.

International description of the measurement:

- ✓ Only Ergotech (South Africa) describes the measurement as the distance measured using the tape measure, from under the bust to the waist level, following the contour of the body (Ergotech).

Interview respondents' descriptions:

Respondent 1: *Just below bust to waistline.*

Respondent 3: *On the body from under the bust to the natural waistline.*

Respondent 4: *Under bust to natural waist on the contour of the body.*

Respondent 7: *Just below the bust along the body, to the waist. It could be a problem on big busted women to get the tape measure in right up under her boobs.*

Respondent 11: *On the body from under the bust to the waist.*

Respondent 12: This measurement was not marked on the questionnaire but the respondent made the following comment regarding the measurement: *"I actually put it flat against the contour of the body."*

Respondent 13: *Below bust to waist, on women.*

This measurement is taken only on women. The reason being that style lines (for example an empire line) which are related to such a measurement are more prevalent in ladies' wear. The descriptions given by the respondents do not correspond with the international description, because not all the respondents indicated that it should be taken on the contour of the body. The problem that two of the survey respondents experience with the measurement may also be due to the fact that it is, especially in the case of big-busted women, as respondent seven states, difficult to locate the exact "under the bust" point.

Armscye to waist (13)

This measurement is also used for the manufacturing of upper body garments and it can also be useful for the manufacturing of fit dummies. The measurement is used by 35,29% of survey respondents, and two indicated that they experienced problems with the measurement. Of the 13 respondents interviewed, six use the measurement and one indicated that they experienced problems with the measurement.

International description of the measurement:

- ✓ Only one standard describes the measurement as measured from the mid-underarm point along the side of the body to the waist height (ASTM 1998).

Interview respondents' descriptions:

Respondent 1: *From underarm to waist on the side of the body.*

Respondent 3: *From underarm, on the side of the body, to the natural waist.*

Respondent 4: *Underarm to natural waist on the side of the body.*

Respondent 6: *On the body measured from underarm.*

Respondent 11: *On the side from under the arm to the natural waist.*

Respondent 12: *Armpit to waist, flat against the contour of the body.*

The international description does not clearly state whether the measurement should be taken along the contour of the body. If one assumes that "along the side of the body" refers to the contour, then it is clear that the respondents' descriptions correspond with the international description of this measurement.

Waist height (14)

This measurement is useful for determining the length of skirts and trousers, and for the manufacturing of fit dummies. The measurement is used by 38,24% of the survey respondents and none of them experience any problems with the measurement. Of the 13 respondents interviewed, six used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the natural waist level at the right side of the body and the ground (SizeUK).
- ✓ The vertical distance from the natural waist level to the ground, measured using the measuring stand (anthropometer) at the side of the body, with the subject standing upright (ISO 8559, 1989).
- ✓ Measure from the waist level at the side of the body following the contour of the body to hip level, then vertically to the soles of the feet (ASTM 5585, 1995). The waist is described as the part of the body at the location between the lowest rib and hip identified by bending the body to the side (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 4: *From natural waist to the floor.*
Respondent 6: *Waist to ground.*
Respondent 7: *Waist, at the narrowest area, straight down.*
Respondent 11: *Waist straight to floor.*
Respondent 12: *Natural waist to floor – this is a straight measurement.*
Respondent 13: *Waist to floor, straight.*

This measurement is taken in a straight line. The description given by the respondents correspond with the international descriptions. It is a straightforward measurement to take and therefore none of the respondents experienced problems with the measurement.

Upper hip height (17)

This measurement is used for the manufacturing of lower body garments and can also be useful for the manufacturing of fit dummies. It can be useful to determine the position of the corresponding girth measurement on the pattern or fit dummy. The measurement is used by 35,29% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the top hip bone and the ground (SizeUK).
- ✓ High-Hip height at the side of the body, measured from the level of the prominent high-hip (approximately 7,5cm below the waist level) following the contour of the body to the soles of the feet (ASTM 5586, 1995).

It is clear that the ASTM describes the taking of the measurement in more detail. The SizeUK standard does not indicate whether the measurement should be taken at the side of the body.

Interview respondents' descriptions:

Respondent 1: *From 10cm below waistline to the floor.*
Respondent 4: *Top hip bone to the floor.*
Respondent 6: *Measure hip 10cm lower from waist of the person.*
Respondent 7: *10cm below waist. These are straight measurements.*
Respondent 11: *10cm below waist.*

According to the respondents, this is a straight vertical measurement; however, the ASTM description refers to taking the measurement along the contour of the body. Only one of the descriptions given correspond with the international description used

by SizeUK. The respondents referred to taking the measurement from 10cm below the waist. This is more similar to the ASTM description where the measurement is taken 7,5cm below the waist. To ensure consistency it would probably be more sensible to take the measurement from a specific distance below natural waist, whether it be at 7,5cm or 10cm, instead of "from the top hip bone".

Top hip height (18)

This measurement is used for the manufacturing of lower body garments and can also be useful for the manufacturing of fit dummies. It can be useful to determine the position of the corresponding girth measurement on the pattern or fit dummy. The measurement is used by 35,29% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Only the SizeUK standards describe this measurement as taken from midway between the waist and hip levels to the ground (SizeUK).

This description corresponds strongly with the previous measurement. It is not clear what is meant by "midway between waist and hip levels". Such a vague description could confuse those who have to take the measurement while it would probably also be difficult for the same person to take the measurement consistently.

Interview respondents' descriptions:

Respondent 1: *From 20cm below waistline to the floor.*
Respondent 3: *Straight to the floor from a position 10cm below the natural waist.*
Respondent 4: No description given.
Respondent 6: *This is from 18cm lower than waist.*
Respondent 7: *20cm below waist.*
Respondent 11: *20cm below waist.*

There seems to be confusion about where this measurement should be taken. Half of the respondents interviewed were of the opinion that it should be measured from

20cm lower than the natural waist, while one respondent gave the exact description as for the previous measurement. The international description does not specify a certain distance but refers to midway between waist and hip levels. This probably contributes to the difference in opinion as to where the measurement should be taken. As "halfway between" is not a clear indication of the exact position of the landmark, one would have expected that at least some respondents would indicate that they were experiencing problems with this measurement.

Hip height (19)

This measurement is used for the manufacturing of lower body garments and can also be useful for the manufacturing of fit dummies. It can be useful to determine the position of the corresponding girth measurement on the pattern or fit dummy. The measurement is used by 35,29% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement. It is interesting to note that the same number of survey respondents used all three the hip measurements. This may be an indication that all three hip heights are equally important to the different respondents.

International description of the measurement:

- ✓ The vertical distance from the trochanteric projections to the ground, measured using the measuring stand (anthropometer) with the subject standing upright (ISO 8559, 1989).
- ✓ Measure at the side of the body from the level of the prominent full hip to the soles of the feet (ASTM 5586, 1995).

This is a straight vertical height taken from where the widest circumference of the hips is. Only the ASTM description is clear about exactly where on the body, namely on the side, the measurement should be taken.

Interview respondents' descriptions:

Respondent 3: *From the widest part straight to the floor.*

Respondent 4: *Maximum hip to the floor.*

Respondent 6: *Measure from where the biggest part of the person is.*

Respondent 7: *At the widest circumference.*

Respondent 9: *In a straight line from the widest part.*

Respondent 11: *From the widest part.*

The descriptions of the respondents correspond with each other and also with the international description. Although all of the descriptions correspond, none of the respondents mention the position on the body where the measurement should be taken, for example on the side or at the centre back. The widest hip should be a horizontal measurement parallel to the floor, therefore one should get the same measurement regardless of whether it is measured from the front, side or back. However, to be consistent it is important to take the measurement from the same position on all the people that are being measured. In this case the ASTM suggests taking the measurement from the side of the body.

Front waist to thigh (25)

This measurement is used by 17,65% of the survey respondents and none of them experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found.

- ✓ Distance from the natural waist position over the contour of the stomach and straight to the maximum thigh girth level (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Natural waist to the widest part of the thigh, at centre front.*

Respondent 4: *Centre front waist to maximum thigh.*

Respondent 11: *Waist to the widest part of the thighs.*

The descriptions of the respondents correspond with each other and with the international description with regard to the landmarks. The descriptions of the respondents do not mention taking the measurement over the contour of the stomach. If one considers how a garment fits on the body, the measurement would be more useful for patternmaking purposes, if taken over the contour of the stomach.

Front waist to calf (27)

This measurement could be useful when manufacturing skirts, to determine the front length of the garment, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 23,53% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from natural waist over the contour of the stomach to the calf level (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Natural waist to the widest part of the calf, at centre front.*

Respondent 4: *Centre front waist to the widest part of the calf.*

Respondent 11: *Up to the widest part of the calf.*

The descriptions of the respondents correspond with each other and with the international description with regard to the landmarks. It is however not clear from the descriptions of the respondents whether the contour of the stomach should be accommodated, as the international description suggests. If one considers how a garment fits on the body, the measurement would be more useful for patternmaking purposes, if taken over the contour of the stomach.

Front waist to ground (28)

This measurement could be useful when manufacturing skirts, to determine the front length of the garment, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 38,24% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from the natural front waist over the contour of the stomach and straight to the ground (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Natural waist to the floor, at centre front.*
Respondent 4: *Centre front waist to the floor.*
Respondent 6: *Waist to ground on centre front.*
Respondent 7: *Straight measurement from the waist down.*
Respondent 11: *Straight to the floor.*

The descriptions of the respondents correspond with each other and with the international description with regard to the landmarks. However, some respondents state that it is a straight measurement, while the other descriptions are not clear regarding this issue. For patternmaking purposes and if one considers how a garment fits on the body, it would be more useful to take the measurement over the contour of the stomach.

Side waist to hip (29)

This measurement could be useful when making patterns for trousers and skirts, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 29,41% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance along the right side of the body from the natural waist level to the hip level (SizeUK).
- ✓ The distance along the side of the body from the natural waist level to the hips at the level of the greatest lateral trochanteric projection following the hip contour (ISO 1989).

The international descriptions do correspond, although the one description does not specify measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 3: *Natural waist to the widest part of the hip, along the side of the body.*

Respondent 4: *Natural waist to the maximum hip on the side curve of the body.*

Respondent 7: *Follow the curve from waist to widest hip area.*

Respondent 11: *Waist to the widest part of the hip on the side.*

Respondent 12: *Natural waist to the widest part flat against the side of the body.*

The descriptions of the respondents correspond with each other and also with the international descriptions. The respondents did however not state that the measurement should be taken on the right side of the body. To be consistent it is important to measure on the same side of the body.

Side waist to knee (30)

This measurement could be useful when manufacturing skirts, to determine the length of the side seam, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 29,41% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, four used the measurement and none experienced problems with the measurement.

International description of the measurement:

✓ The distance from the waist to the knee circumference level following the contour of the hip (Ergotech).

Interview respondents' descriptions:

Respondent 3: *Natural waist to the level of the knee, along the side of the body.*

Respondent 4: *Natural waist to knee level following the side curve of the body.*

Respondent 7: *Follow the curve and then straight to the level of the crease of the knee.*

Respondent 11: *Waist to the knee. Follow the contour and then straight.*

The descriptions of the respondents correspond with each other and also with the international description. The identification of the knee level as a landmark is

however not clearly described and could be a problem as discussed with previous measurements.

Outside leg length (31)

This measurement is used for the manufacturing of skirts and trousers. This measurement is used by 76,47% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, nine indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the right side waist level to the ground following the contour of the hip then straight to the ground (SizeUK).
- ✓ The distance from the waist to the ground measured using the tape measure following the contour of the hip, then vertically down (ISO 8559, 1989).
- ✓ The distance from the side waist to the soles of the feet, following the curve of the body (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: According to the questionnaire, this measurement is not used. The measurement chart that the respondent provided however shows outside leg as *taken from the waist to the floor over the curve of the hip and then straight.*

Respondent 3: *Natural waist to the floor, along the side of the body and then straight.*

Respondent 4: *Natural waist to the floor on the side curve of the body.*

Respondent 6: *Side seam length.*

Respondent 7: *From the waist along the side of the body and then straight to the floor.*

Respondent 8: *From the waist to the eh…, where you want the hem to be. From the waist it would naturally follow the curve of the body.*

Respondent 9: *A straight measurement from waist to ground.*

Respondent 11: *Measure waist to floor on the body and then straight.*

Respondent 12: *I go from waist to hip on the curve and then straight down (on women).*

Respondent 13: *Straight from ankle to waist.*

Two of the respondents suggested a straight vertical measurement, which would be the same as waist height (number 14). The international descriptions, as well as the rest of the respondents suggest that it be measured on the side curve of the body from waist to hip and then straight to the ground. Taking the measurement in this way is more useful for patternmaking, since this is how the side seam of a garment fits on the body. Measuring to the ground also gives more consistency than measuring to the ankle.

Inside leg length (32)

This measurement is used for the manufacturing of trousers. The measurement is used by 54% of survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, nine respondents indicated that they used the measurement and two experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the crotch level at centre of body and the ground (SizeUK).
- ✓ The distance between the crotch and the ground, measured using the tape measure in a straight line with the subject upright, feet slightly apart, and the body mass equally distributed on both legs (ISO 8559, 1989).
- ✓ The vertical distance from the crotch to the soles of the feet (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other and that the ISO gives a more complete description of exactly how to take the measurement.

Interview respondents' descriptions:

Respondent 1: *Crotch to floor.*

Respondent 3: *Level of the crotch straight to the floor. This is a sensitive measurement to take.*

Respondent 4: *From crotch level to the floor, straight or along the leg. Not taken very often because it is a very personal measurement.*

Respondent 7: *A straight measurement from the crotch down to the floor.*

Respondent 8: *Straightforward, again to the hem. People will have to take their shoes off otherwise you have the heel height in the measurement.*

Respondent 9: *Crotch to the ground in a straight line.*

Respondent 11: *Straight down from the crotch.*

Respondent 12: *Inside leg would be a straight measurement (on men).*

Respondent 13: *Crotch to ankle. Also a very awkward measurement. Person has to wear tight fitting clothes so that you are able to identify the crotch when measuring.*

This is a straight vertical measurement as suggested by the international descriptions. The respondents also note that it is a "sensitive" measurement to take, and this is where the problem with this measurement lies. Identifying the crotch position that is the landmark, also poses a problem that can negatively impact on the accuracy of the measurement. Reference is made to having to wear tight fitting clothes in order to make the identification of landmarks on the body easier. Again it is mentioned that the person should be measured without shoes. It is very important that the correct clothes are worn during measuring in order to assist with landmark identification and the taking of accurate measurements.

Trunk length (33)

This measurement is used when manufacturing one-piece garments that cover the whole body, for example swimwear and bodysuits. The measurement can also be useful for the manufacturing of fit dummies. This measurement is used by 44,12% of survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ The distance from the 7th cervical vertebra to the crotch level, measured using the measuring stand (anthropometer), with the subject standing upright (ISO 8558, 1989).

Interview respondents' descriptions:

Respondent 3: *Neck shoulder point straight to the level of the crotch.*

Respondent 4: *Side neck to crotch. Not really used because it is more applicable to bodysuits and swimwear.*

Respondent 7: *Vertical trunk, from side neck to crotch.*

Respondent 9: *That's a measurement that we only use for the children, for infants and toddlers, that is our most important measurement. Neck shoulder point to crotch.*

Respondent 11: *Side neck to crotch and it is straight.*

Respondent 12: *Like vertical front. From the neck point and it's on the contour of the body. We use this in ladies, it is important for swimwear and girls.*

Respondent 13: *Shoulder seam to the middle of the crotch. Where the neck enters the shoulder, to centre seam of crotch, standing up.* On the measurement chart provided, the description refers to the imaginary middle line at the top of the shoulder, but the picture points to the centre shoulder position. *Difficult to measure accurately, but it is so critical. It's a very sensitive measurement, but it's critical.*

It seems that this measurement is mostly measured in a straight line. The description that most of the respondents give refers to taking the measurement from the side neck point to the crotch level in a straight vertical line. Only one respondent refers to taking the measurement on the contour of the body. The respondents did not specify whether the measurement should be measured from the front or the back. This does not correspond with the international description, which suggests the measurement be taken from the nape instead of side neck. This means that the measurement should then be measured from the back. As stated before, the side neck point can be a problem to identify consistently and therefore the nape could be a more reliable position to identify on the body.

Total crotch length (34)

This measurement is critical in the manufacturing of trousers. The measurement is used by 58,82% of the survey respondents and one experienced problems with the

measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the centre of the natural waist level at the front, through the crotch to the centre of the back waist level (SizeUK).
- ✓ The distance, measured using the tape measure, from the centre of the natural waist level at the front of the body, through the crotch, to the centre of the back at the waist level (ISO 8559, 1989).
- ✓ The distance from the waist level at center front through the crotch to the waist level at center back (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *From front waistline through the legs to back waistline on the contour of the body.*

Respondent 3: *Natural waist in the front through to the natural waist at the back.*

Respondent 4: *From the waist, front to back through the crotch.*

Respondent 6: *From front below waistband, go through and measure to waist.*

Respondent 7: *A bit of a difficult one that. We don't pull it right up in between the bum cheeks where a g-string would go. It's got to be on the outside of the body.*

Respondent 9: *We do standing and seated. From the front, right through to the back.*

Respondent 11: *Front waist to the back waist, flush against the body shape.*

Respondent 12: *It's measured from waist right through to waist. I make sure of the tape position between the legs, that it sits against the body.*

The descriptions given by the respondents correspond with the international descriptions. However, one respondent mentioned taking the measurement in a seated position as well as standing. This is unusual since none of the international descriptions listed this as a seated measurement. It could be useful to have a seated version of the measurement to compare with the standing one. It could provide useful

information for improving the fit of trousers. Total crotch length is a critical measurement for the manufacturing of trousers because it will dictate the shape of the center front and center back seams of the trousers. How much of the measurement is allocated toward the front or toward the back of the garment will depend on the shape of the individual person.

Body rise (37)

This measurement is also used for the manufacturing of trousers. This measurement is used by 58,82% of survey respondents and three experienced problems with the measurement. Of the 13 respondents interviewed, nine indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the waist level at centre back and the crotch height (SizeUK).
- ✓ The vertical distance, measured using the measuring stand (anthropometer), between the waist level and the crotch level (ISO 8559, 1989).
- ✓ While sitting on a hard, flat surface, measure straight down from the waist level at the side of the body to the flat side (ASTM 5585, 1995).

The international descriptions are similar in that it is a straight vertical measurement from the waist level to the crotch. There is however no consensus on whether it is a standing or a seated measurement and whether it should be taken from the back or the side of the body.

Interview respondents' descriptions:

Respondent 1: *Waistline to crotch level.*

Respondent 3: *Waist to seat position measured on the side, with the person sitting upright on a hard surface.*

Respondent 4: *Waist to crotch.*

Respondent 6: *Waist to crotch, measured standing from the front.*

Respondent 7: *Waist to crotch, a straight line through the body.*

Respondent 8: *On a man's thing you subtract the inside leg from the outside leg, that's a calculated thing so you don't measure. On a woman,*

typically what you would do is measure the seat to waist seated, and that would determine your inside leg measurement.

Respondent 9: *Taken as a standing measurement, not seated.*

Respondent 11: *Waist to crotch, standing.*

Respondent 12: *I do it as a straight measurement (standing).*

The international descriptions are not consistent on whether the measurement should be taken on the side of the body or at center back. They also differ regarding whether the measurement should be taken in a standing or a seated position. This is also the case in South Africa if one looks at the various descriptions of the respondents. Reference is made to measuring the person in a standing as well as in a seated position. Two respondents agree with the ASTM (1995) description, which suggests taking the measurement in a seated position. The other respondents describe the measurement as being measured in a straight line from waist to crotch level although they do not clearly indicate whether measuring takes place from the side or back of the body. The measurement is critical for determining the distribution of the total crotch length on the pattern, and this ultimately determines the fit of the trousers. Such confusion regarding how to take the measurement, together with both landmarks being difficult to determine consistently on the body, should surely lead to major problems, yet less than 20% of the respondents experienced problems with this critical measurement. The only explanation for this can be total ignorance or a "don't care" attitude towards the importance of fit.

Back waist length (38)

This measurement is used for determining style lines and for the positioning and shaping of darts on patterns for full body and upper body garments. It can also be useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and not one experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the nape and the natural waist level. Measured on the contour of the centre back (SizeUK).

- ✓ The distance, measured using the tape measure, from the 7th cervical vertebra, following the contour of the spinal column, to the waist (ISO 8559, 1989).
- ✓ The vertical distance along the spine from the cervicale (*sic*) to the waist. The cervicale (*sic*) (or nape) is described as the prominent point of the seventh or lowest neck vertebra at the back of the body (ASTM 5219, 1999).
- ✓ Measure from the cervicale (*sic*) following the contour of the spinal column to the center back waist level (ASTM 5585, 1995).

It is clear that the international descriptions correspond with each other. Determining these two landmarks is also not an easy task.

Interview respondents' descriptions:

Respondent 1: *Nape to waist at centre back.*
Respondent 3: *Nape to waist on the body.*
Respondent 4: *Nape to natural waist on the contour of the back.*
Respondent 6: *Centre back down to waist.*
Respondent 7: *Nape to waist on the contour.*
Respondent 11: *Nape to waist against the back.*
Respondent 12: *Nape to waist, against the contour of the body.*

The respondents agree that the measurement should be taken on the contour of the body between the two landmarks and this also corresponds with the international descriptions. The respondents however do not indicate exactly how the landmarks are located or identified on the body.

Cervical to knee hollow (42)

This measurement is used by 14,71% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ The distance from the 7th cervical vertebra following the rear contour of the spinal column to the level of the hips and ending vertically at the level of the knee hollow (ISO 1989).

Interview respondents' descriptions:

Respondent 4: *Nape to the crease of the knee following the contour of the back.*

Respondent 11: *Nape to widest hip on the curve of the back, and then straight to the crease at the back of the knee.*

Respondent 12: *Nape to the mid-point of the knee cap.*

The descriptions of the respondents do not correspond with each other with regard to the knee position. The identification of the knee level as the landmark is a problem with this measurement. More respondents refer to the crease at the back of the knee as being the knee position, although one respondent states the mid-point of the kneecap. This position is however difficult to identify consistently on the human body. Therefore the crease at the back of the knee would be a more reliable position to identify on the body.

Side neck to chest level (44)

This measurement is used for the positioning of detail and to determine dart length on upper body garments, and it can also be useful for the manufacturing of fit dummies. Although only 17,65% of the survey respondents used this measurement, two of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, two indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Measure from the intersection of the neck base/shoulder point down to the bust point (ASTM 5586, 1995).

Interview respondents' descriptions:

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 11: *Side neck to nipple point.*

As stated before, determining the side neck position is the problem with all measurements involving the side neck point. This is the reason why respondent 4

said that they always measure from the nape. According to this respondent, the nape as a landmark can be controlled, while the side neck point is difficult to control because: where exactly is "side neck"? It is true that the nape as a position on the body can be described precisely. However, finding that exact point on the body is not always easy.

Cervical to bust point (45)

This measurement could be useful when positioning darts and design detail on ladies' upper body garments, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 23,53% of the survey respondents and one of the respondents using the measurement experienced problems with it. Of the 13 respondents interviewed, four used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ The distance from the 7th cervical vertebra, round the base of the neck, to the nipple (ISO 8559, 1989).
- ✓ The distance from the cervicale (*sic*) around the base of the neck and down to the bust point (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: On the questionnaire this measurement is not marked. The measurement chart provided does however show that it is *measured from the nape to bust point.*

Respondent 4: *Nape to the bust point, on women.*

Respondent 6: This measurement was not marked on the questionnaire, but the picture on the body chart describes this measurement as:.*From the centre back around the neck to the bust point.*

Respondent 7: *Nape over side neck to bust point.*

Respondent 11: *Same as to chest level, to the bust point or nipple point on women.*

Respondent 12: *Same as cervical to chest level, but on women.*

The descriptions of the respondents correspond with each other as well as with the international descriptions.

Side neck to breast point (46)

This measurement is used for the positioning of detail and to determine dart length on upper body garments, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 26,47% of survey respondents and four of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the neck right shoulder point to the maximum prominence of breast (SizeUK).
- ✓ The distance from the neck shoulder point to the breast point (ISO 8559, 1989).
- ✓ Measure from the intersection of shoulder and front neck base to the bust apex (ASTM 5585, 1995).

The international descriptions correspond with each other regarding the landmarks. Only one of the descriptions specifies that the measurement be taken from the right side.

Interview respondents' descriptions:

Respondent 3: *Side neck to the bust point (most prominent position).*

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 6: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from centre back neck, because the problem is: where is the shoulder?*

Respondent 7: This measurement was not marked on the questionnaire, but the respondent made the following remark: *The problem with this measurement is: where do you hold it, to get the exact shoulder line?*

Respondent 11: *The same (as side neck to chest level).*

Respondent 13: *Side neck, where the neck enters the shoulder, to the nipple.*

It seems that some of the respondents indicated the wrong measurement on the questionnaire, since they stated during the interview that they measure from the nape and not from the side neck point. The descriptions from the other respondents correspond with the international descriptions. However, not one of the respondents mentions measuring from the right side, as is the case with the SizeUK description. The problem with a measurement such as this one, as stated before, is to determine the side neck point. Even if the point where the shoulder and the neck meet is identified, the position of the imaginary shoulder seam also presents a problem.

Cervical to under bust level (47)

This measurement is used for determining style lines such as empire lines, and can also be useful for the manufacturing of fit dummies. Although only 14,71% of the survey respondents use this measurement, one of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, three indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the nape through the right shoulder neck point over the breast point to the under bust (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Nape over the shoulder to just below the bust, following the contour of the body.*

Respondent 4: *Nape through side neck to just below the bust, following the contour of the bust.*

Respondent 11: *Nape over the side neck and over the shape of the bust to directly below.*

The descriptions of the respondents correspond with the international description although none of them mention measuring on the right side of the body. In this case

the problem is locating exactly where the under bust position is, especially on the fuller figure.

Side neck to under bust level (48)

This measurement is used for determining style lines such as empire lines, and it can also be useful for the manufacturing of fit dummies. Although only 14,71% of the survey respondents use this measurement, two of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, three indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the right shoulder neck point over the breast point to the under bust (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Side neck position over the bust curve to just below the bust.*

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 11: *Just start at side neck point.*

These descriptions correspond with the international description. The problem is again identifying the side neck point as well as locating the under bust position.

Cervical to front waist (49)

This measurement is used for positioning the waistline on full and upper body garments, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 23,53% of survey respondents and two of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the nape around the base of the neck, to the right shoulder neck point, over the breast point, then straight to the waist (SizeUK).
- ✓ The distance from the 7th cervical vertebra, around the base of the neck (neck point) and over the nipple, then vertically to the waist (ISO 8559, 1989).

The international descriptions correspond with each other, although only the SizeUK description refers to measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 1: According to the questionnaire this measurement is not used, but on the measurement chart provided, it is described as *nape to waist over bust*.

Respondent 3: *Nape to natural waist, over the bust.*

Respondent 4: *Nape through side neck, over the bust contour to the natural waist.*

Respondent 7: *From nape over the side neck and then to waist. Not sure whether it should be measured straight or over the curve of the bust.*

Respondent 11: *Nape to waist over the side neck and the bust curve.*

The problem with this measurement is that the respondents are not sure how to take the measurement over the bust curve, and that causes uncertainty about the accuracy of the measurement. Some respondents mention that it should be measured over the bust or over the bust curve. One respondent was not sure whether it should be measured over the bust contour or in a straight line from the neck shoulder point. Both the international descriptions, however, state that the measurement should be taken over the bust point or nipple and then straight to the waist. This implies following the contour of the body from the neck point to the bust point or nipple.

Side neck to waist (front waist length) (50)

This measurement is used for positioning the waistline on full and upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 35,29% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, five indicated

that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the right neck shoulder point, over the breast point, then straight to the front waist (SizeUK).
- ✓ The distance from the neck shoulder point, over the nipple, then vertically straight to the front waist (ISO 8559, 1989).
- ✓ The vertical distance from the neck baseline at the center front to the waist level (ASTM 5219, 1999).

The international descriptions do not correspond. The descriptions of SizeUK and the ISO are similar. According to the ASTM description, front waist length is measured from the front base of the neck while the SizeUK and the ISO descriptions state the side neck point. Again it is only the SizeUK description that refers to measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 3: *Shoulder neck point to bust to natural waist.*

Respondent 4: Although it was marked on the questionnaire, the respondent never used this measurement. *Always measure from nape.*

Respondent 6: *From the back neck to over the bust point to the waist.*

Respondent 9: *Side neck to waist as a straight measurement.*

Respondent 11: *Side neck to waist over the bust point.*

It seems that respondent 4 and respondent 6 marked the wrong measurement on the questionnaire because their descriptions refer to the previous measurement, namely cervical to front waist. The descriptions given by the other respondents correspond with regard to the landmarks. However, some refer to measuring in a straight line and others measure over the bust point. It is surprising that more problems are not experienced with this measurement, since it is not at all clear whether this is a straight or a contoured measurement.

Centre shoulder to bust point (51)

This measurement is used to determine the length of shoulder darts on upper body garments and can also be useful for the manufacturing of fit dummies. This measurement is used by 38,24% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found.

- ✓ Distance between the centre of right shoulder length and the bust point (SizeUK).

Interview respondents' descriptions:

Respondent 1: *From the shoulder to the bust point.*

Respondent 3: This measurement was marked on the questionnaire, but during the interview, the respondent noted that it is *always measured from neck shoulder point and not from centre shoulder*.

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 6: *Middle of the shoulder to the bust point.*

Respondent 11: *Mid-shoulder straight to nipple point.*

Two of the five respondents above indicated that this is not the measurement that they use. They either use side neck to bust point or nape to bust point. Marking the wrong measurement on the questionnaire can simply be a mistake, or it can indicate that they did not read or understand the measurements clearly. This can be an indication of ignorance, not knowing the difference between the measurements, or alternatively just a "don't care" attitude towards the importance of specific measurements in the achievement of good fit. The description of respondent 1 is unclear as it only refers to "shoulder"; it does not specifically refer to centre shoulder or shoulder neck point, but since the measurement is for centre shoulder to bust, one can assume that the centre shoulder position was implied. The descriptions therefore correspond with the international description.

Centre shoulder to under bust level (52)

This measurement could be useful with style lines such as empire lines, as well as other design detail on ladies' upper body garments, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 26,47% of the survey respondents and one of those respondents experienced problems with it. Of the 13 respondents interviewed, three used the measurement and one experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the centre of the right shoulder length and underbust level, following the bust contour (SizeUK).

Interview respondents' descriptions:

Respondent 4: Although it was marked on the questionnaire, the respondent never use this measurement. *Always measure from nape.*

Respondent 6: *Centre shoulder over the bust to underbust position.*

Respondent 11: *Mid-shoulder over the nipple to directly below the bust.*

One of the respondents indicated that they do not use this measurement, but that they use the one taken from the nape. The other two descriptions correspond with each other and with the international description.

Centre shoulder to front waist – straight (53)

This measurement is used for determining the waistline on full and upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 32,35% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from the centre of the right shoulder line over the bust point, then straight to the front waist (SizeUK).

Interview respondents' descriptions:

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 6: No description given.

Respondent 9: *Just as it says.*

Respondent 11: *Mid-shoulder to waist as a straight measurement, not taking any curves into account.*

Again, one of the five respondents marked the wrong measurement. One respondent did not give a description, and the other two are of the opinion that it should be a straight measurement. This does not correspond with the international description which partly takes the bust curve into account. If one considers the way clothes fit on the upper body, it makes sense to take some of the curve into account.

Centre shoulder to front waist – contoured (54)

This measurement is useful for the manufacturing of tight-fitting upper body garments, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 29,41% of survey respondents and two of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from the centre of the right shoulder to the front waist, following the bust and rib cage contour (SizeUK).

Interview respondents' descriptions:

Respondent 1: *Shoulder to waistline on the curve of the body.*

Respondent 3: This measurement was marked on the questionnaire, but during the interview the respondent noted that it is *always measured from neck shoulder point and not from centre shoulder*.

Respondent 4: Although it was marked on the questionnaire, the respondent never uses this measurement. *Always measure from nape.*

Respondent 11: *Mid-shoulder to waist but then following the curve over the bust, the tape against the body.*

Two of the four respondents marked the wrong measurement. One of the other two descriptions corresponds with the international description, and the remaining description does not specify the position on the shoulder where it should be measured from. It is however not very simple to take a measurement accurately on the contour of the body and this is why problems are experienced with the measurement. It can be difficult to keep the tape measure flat against the body while measuring and this may result in inconsistent and inaccurate measurements. Determining the centre of the shoulder is another problem with these measurements, therefore some respondents prefer to measure from the nape which is perceived as a controlled landmark. Taking the body contour into consideration makes the measurement more useful for pattern construction. The contoured measurement, as opposed to the previous straight measurement, gives an indication to the pattern maker of the amount of ease needed in the front of the garment. Using the straight and the contoured measurements together can also give an indication of the shape of the body.

Centre shoulder to back waist – contoured (55)

This measurement is used for determining the waist position on full and upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 32,35% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used this measurement and one company experienced problems with it.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the centre of the right shoulder length, over the shoulder blade to the back natural waist level (SizeUK).

Interview respondents' descriptions:

Respondent 1: No description given.

Respondent 3: This measurement was marked on the questionnaire, but during the interview the respondent noted that it is *always measured from neck shoulder point and not from centre shoulder*.

Respondent 4: *Centre shoulder to the natural waist on the contour of the back.*

Respondent 6: No description given.

Respondent 11: *Mid-shoulder to waist with the tape against the body.*

One of the respondents again noticed that they marked the wrong measurement on the questionnaire. Two respondents did not give a description. The other two respondents' descriptions correspond with the international description, which is taken on the contour of the body. However, the respondents do not mention taking the measurement on the right side of the body. It would be important for consistency to take all measurements on the same side of the body. It is generally accepted that more people are right-handed and therefore the right side of the body is more developed. It can thus be expected that the right arm or leg might be thicker than the left arm or leg. A garment has to fit the bigger side of the body to be comfortable, and therefore it makes sense to measure that side of the body for pattern and clothing construction purposes.

Armscye depth (cervical to underarm level) (56)

This measurement is used to assist with shaping the armhole and positioning of style lines on patterns for upper body garments, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 29,41% of survey respondents and two of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the centre back neck and the armscye underarm level (SizeUK).
- ✓ The distance, measured vertically on the body using the tape measure, from the 7th cervical vertebra to the upper edge of a tape passed horizontally under the armpits (ISO 8559, 1989).
- ✓ The distance from the cervicale (*sic*) to a point level with the armpit (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other and that the ISO gives the most comprehensive description.

Interview respondents' descriptions:

Respondent 1: This measurement is not marked on the questionnaire. However, the measurement chart shows that it is *measured from the nape to the underarm level*.

Respondent 3: *Straight from nape to the level of the underarm.*

Respondent 4: *Nape to underarm level.*

Respondent 6: *Centre back to underarm.*

Respondent 7: *Scye depth is quite useful. That's usually from nape to underarm.*

Respondent 9: *Back neck straight to underarm.*

Respondent 11: *No, we don't measure it. Technically it is a measurement but I've seen it ignored in my whole entire life.*

Respondent 12: *Nape to level of armpit on the contour.*

These descriptions correspond with the international descriptions in terms of the landmarks. It is however not clear whether the measurement should be taken on the back contour or in a straight vertical line. The international descriptions do not refer to the back contour, therefore it can be assumed that it is taken as a straight vertical measurement. Identification of the landmarks is the major problem experienced with this measurement. As mentioned before, the nape is perceived as a controlled landmark even though it is not always that easy to identify on the body. The other problem is the underarm level. It is advisable to mark the position of the underarm with a tape as the ISO description suggests, but how high up under the arms should

the tape go? This question remains unanswered since none of the responses offered any suggestion on identifying the underarm position.

Top arm length (shoulder to underarm level) (57)

This measurement is necessary to determine the cap height on sleeve patterns, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 41,18% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the right armhole shoulder point and the right underarm level (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Top of the shoulder to the level of the underarm.*

Respondent 4: No description given.

Respondent 9: *Shoulder point to underarm.*

Respondent 11: *Side neck to underarm, but on a pattern, not on a body.*

The description given by respondent 11 refers to a pattern or garment measurement and not a body measurement. The other descriptions correspond with the international description. It is however not clear, not from the international description nor from the responses, whether the measurement is taken as a straight vertical measurement, or from the shoulder over the curve of the top of the arm as suggested by some patternmaking textbooks (Amaden-Crawford, 2000:79).

Arm length straight (shoulder to wrist) (59)

This measurement is used for drafting of sleeve patterns. This measurement is used by 82,35% of the survey respondents and two of them experienced problems with the measurement. Of the 13 respondents interviewed, ten indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from the right armscye shoulderline intersection straight to the far end of the prominent wrist bone (SizeUK).

Interview respondents' descriptions:

Respondent 1: *Shoulder point to wrist bone, arm hanging naturally.*

Respondent 3: *Also called overarm. Measured from the shoulder to the wrist (prominent bone) on a straight arm.*

Respondent 4: *Shoulder to the wrist, arm hanging comfortably.*

Respondent 6: *Top of crown over slightly bent elbow to wrist.*

Respondent 7: *Crown to wrist bone. So crown would be the acromion bone. On the bent arm and on the straight arm, we do it both.*

Respondent 8: *Shoulder point to the wrist.*

Respondent 9: *Shoulder to elbow to wrist.*

Respondent 11: Although this measurement was marked on the questionnaire, the respondent indicated that they measure *the arm bent*.

Respondent 12: *On woman's arm just slightly bent. Shoulder is identified by the back bone of the shoulder, the most prominent bone at the back.*

Respondent 13: *Top of shoulder to wrist.*

Most of the respondents refer to the arm hanging naturally, indicating a slightly bent arm and not a completely straight arm. The international description however seems to be measured as a straight arm. For garment construction purposes, it is more useful to have the measurement taken on the slightly bent arm. Identifying the shoulder and armscye intersection could also present some problems, and therefore identifying the more prominent back shoulder bone as respondent 12 suggests, might be a better landmark. This is also the reason why some respondents use both measurements, or prefer the previous measurement. The nape is seen as being a more reliable landmark than the shoulder armscye intersection or shoulder point; it is therefore doubtful whether this measurement is always taken consistently.

Arm length bent (cervical to wrist) (60)

This measurement is used for determining sleeve length. This measurement is used by 41,18% of the survey respondents and three experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the nape over the top of the shoulder and along the arm (bent at 90° in a horizontal position) to the right prominent wrist bone (SizeUK).
- ✓ The distance between the 7th cervical vertebra to the extremity of the wrist bone (outer point of cubitus), measured on the body using the tape measure passed over the top of the shoulder (acromion) and along the arm bent at 90° in a horizontal position (ISO 8559, 1989).
- ✓ With the arm bent at 90°, measure from the cervicale (*sic*) over the top of the shoulder to the shoulder joint, then along the outside of the arm over the elbow to the prominent wrist bone (ASTM 5585, 1995).
- ✓ With the arm bent 90° at the elbow, and raised to the chest height, measure the distance from the cervicale (*sic*) to the shoulder joint, along the outside surface of the arm, over the elbow to the greater prominence on the outside of the wrist (ASTM 6240, 1989).

The international descriptions correspond with each other. It is however not clear exactly how the arm should be held when measured; two descriptions state that the arm must be held horizontally or at chest level while the other two descriptions do not mention the position of the arm.

Interview respondents' descriptions:

Respondent 1: *Back neck to wrist bone with hand on the hip.*

Respondent 3: No description given.

Respondent 4: Although this measurement was marked on the questionnaire, the respondent indicated that *the arm must not be bent 90°*. This measurement is apparently only used *when they want to build in tolerance into the sleeve of the garment*.

Respondent 6: *On bent arm it became too long actually*.

Respondent 7: *From nape around to wrist. On the bent arm and on the straight arm, we do it both ways.*

Respondent 11: *For men, we measure from the nape over the shoulder to the wrist on a bent arm.*

Respondent 12: *Men's wear we measure on a bent (90°) elbow: nape to shoulder point to the wrist. This measurement is also called overarm.*

The problem with this measurement is that, applying the measurement to the sleeve length of garments, the sleeve becomes too long when measured on an arm bent at 90°. Too much tolerance is added to the sleeve length when the arm is measured in this position. It can however still be a useful measurement for pattern development as the pattern maker will then have an indication of the maximum length that the sleeve should be. Some of the international measurements also mention lifting the arm in a horizontal position. The respondents did not mention the exact position that the arm should be held in. It seems that for men it is measured with the arm lifted horizontally, and for women the hand is placed on the hip.

Arm length bent (shoulder to wrist) (61)

This measurement is used for determining sleeve length. This measurement is used by 38,24% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the right armscye shoulder line intersection over the elbow (bent at 90°) to the far end of the prominent wrist bone (in line with small finger) (SizeUK).
- ✓ The distance, measured using the tape measure, from the armscye/shoulderline intersection (acromion), over the elbow, to the far end of the prominent wrist bone (ulna), with the subject's right fist clenched and placed on the hip, and with the arm bent at 90° (ISO 8559, 1989).
- ✓ With the arm bent at 90° and the clenched fist placed on the hip, the distance from the shoulder joint along the outside of the arm over the elbow to the greatest prominence on the outside of the wrist (ASTM 5219, 1999).

The international descriptions generally correspond regarding landmarks. The SizeUK description does not mention placing the hand on the hip, although this is the accepted way of taking this measurement, and the ASTM description does not refer to taking the measurement on the right side of the body. The problem that can be foreseen with this measurement is identifying the armscye-shoulder intersection.

Interview respondents' descriptions:

Respondent 1: *Shoulder point to wrist bone with hand on the hip.*

Respondent 3: *From the shoulder to the prominent bone at the wrist, with the arm bent at 90°.*

Respondent 4: Although this measurement was marked on the questionnaire, the respondent indicated that *the arm must not be bent 90°*. This measurement is only *used when they want to build in tolerance into the garment*.

Respondent 7: *Crown to wrist bone. So crown would be the acromion bone. On the bent arm and on the straight arm, we do it both ways.*

Respondent 11: *For ladies' wear and children's wear just from the shoulder, with the arm bent.*

Respondent 12: No formal description given. *I'd say the overarm is the critical measure because it's not dependent on your shoulder point. The shoulder can be anywhere and yet you still control the length of your sleeve because you measure from here (nape).*

Some respondents only refer to the arm "being bent", but not specifically bent at 90°, and for this reason the descriptions do not correspond with each other or with the international descriptions. The international descriptions refer to taking the measurement with the arm bent at 90°. Some of the respondents also refer to bending the arm at 90°, but not all the descriptions from the respondents indicate placing the hand on the hip. It would be more comfortable for the person being measured to keep the arm bent in the same position if the hand is placed on the hip. Again, one respondent noted that too much tolerance is built into the measurement when the arm is bent at 90°. It is also difficult to consistently identify the shoulder-armscye intersection. For this reason, one of the respondents stated that the overarm

measurement (number 60) that is measured from the nape to the wrist, is more critical.

Upper arm length (cervical to elbow) (62)

This measurement is used for determining the length of short sleeves as well as the position of elbow darts on long sleeves. This measurement is used by 44,12% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Distance from the nape over the top of the shoulder to the elbow (SizeUK).

Interview respondents' descriptions:

Respondent 1: *Back neck to the elbow.*
Respondent 3: No description given.
Respondent 4: *Nape over the shoulder to the elbow.*
Respondent 7: No description given.
Respondent 9: *Back neck over the shoulder to the elbow.*
Respondent 11: *Just up to the elbow.*
Respondent 12: No description given.

Not all of these descriptions specifically mention to measure over the top of the shoulder but it was understood that this was implied. The descriptions therefore correspond with the international description. The ASTM (5219, 1999: 3) defines the elbow as the joint that articulates between the upper arm and the lower arm.

Upper arm length (shoulder to elbow) (63)

This measurement is used for determining the length of short sleeves as well as the position of elbow darts on long sleeves. This measurement is used by 52,94% of the survey respondents and one of them experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and one experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the right armscye-shoulderline intersection to the elbow, bent at 90° (SizeUK).
- ✓ The distance, measured using the tape measure, from the armscye-shoulderline intersection (acromion) to the elbow, with the subject's right fist clenched and placed on the hip, and with the arm bent at 90° (ISO 8559, 1989).
- ✓ With the arm bent, the distance from the shoulder joint along the outside of the arm to the prominence of the elbow (ASTM 5219, 1999).

The international descriptions correspond with each other, although the ASTM does not specify measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 1: *Shoulder point to the elbow.*
Respondent 3: No description given.
Respondent 4: *Shoulder to elbow.*
Respondent 6: *Top of arm to the elbow.*
Respondent 7: No description given.
Respondent 9: *Shoulder to elbow.*
Respondent 11: *Shoulder to elbow.*
Respondent 12: No description given.

The responses correspond with regard to landmarks although none of the respondents suggests ways to accurately identify the landmarks. Identifying the shoulder-armscye intersection consistently can again be a problem, which might reduce the accuracy of the measurements. Bending the arm as the international descriptions suggest will assist in identifying the landmark at the elbow. It is clear that locating the landmarks should be described in more detail.

Underarm length (to wrist) (64)

This measurement is used for drafting of sleeve patterns. This measurement is used by 61,76% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and none of the companies experienced problems with it.

International description of the measurement:

- ✓ Distance between the right underarm level mid-point and the level of the inside of the wrist at the same level as the prominent wrist bones (SizeUK).
- ✓ The distance from the mid-point of the armpit to the inside of the wrist at the same level as the prominent wrist bone (ulna), measured with the arm hanging naturally (ISO 8559, 1989).
- ✓ With the arm hanging naturally, measure from the armpit to the mid-point of the inside of the wrist in line with the wrist bone. (ASTM 5586, 1995).

The international descriptions do correspond with regard to the landmarks. The SizeUK and ISO description specifically refer to the mid-point of the armpit, while the ASTM description refers to the mid-point of the wrist. Only the SizeUK description mentions measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 1: *Under arm to the crease of the wrist.*

Respondent 3: No description given.

Respondent 4: *Crease of the arm to the wrist, arm hanging comfortably.*

Respondent 8: This measurement was not marked on the questionnaire. The respondent suggested it as *an alternative to the arm length because the shoulder is not always a good landmark. The fold where the arm joins the body in front gives a better landmark, so measure from that fold to the wrist.*

Respondent 9: *Front arm crease to the wrist.*

Respondent 11: *From the crease in the front to the wrist.*

Respondent 13: This measurement was not marked on the questionnaire but appears on the measurement chart. *Place the start of the tape in armpit and measure to just above wrist bone.*

One of the respondents suggested using this measurement instead of measuring arm length from the shoulder, because the shoulder can be a difficult landmark to identify. This highlights the importance of being able to identify the landmarks clearly on the different bodies being measured. The descriptions of the respondents do not

correspond with each other or with the international descriptions, because the armpit and the crease of the arm where the arm joins the body are two completely different landmarks. Placing the tape measure in the correct position under the armpit is problematic. It should not be too high under the arm and because of the close contact it can also be a sensitive measurement to take. The crease of the arm is a landmark which can be identified more accurately on all figures. However, the international descriptions measure from the underarm point or armpit and it would therefore be more acceptable to measure from the armpit.

Thigh height (66)

This measurement could be useful when shaping the legs on trouser patterns and to apply the corresponding girth measurement in the correct position on the pattern. It could also be useful for the manufacturing of fit dummies. The measurement is used by 12% of the survey respondents and one of the survey respondents using the measurement experienced problems with it. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the level of the maximum girth of the right thigh and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 3: *From the widest part of the thigh straight to the floor.*

Respondent 4: *Maximum thigh to the floor along the leg.*

Respondent 9: *Widest part of the thigh straight to ground.*

Respondent 11: *It's a straight measurement from the widest part of the thigh.*

Respondents 13: *Straight from widest level to the floor.*

The descriptions of the respondents correspond with each other and also with the international descriptions. None of the respondents however mentions taking the measurement on the right side of the body.

Mid-thigh height (67)

This measurement can be used for determining the length of shorts and skirts, and it can also be useful for the manufacturing of fit dummies. Although only 6% of the survey respondents use this measurement, one of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, two indicated that they used the measurement and none experienced problems with it.

International description of the measurement:

Only one international description was found:

- ✓ Midway between crotch height and right knee level (SizeUK).

Interview respondents' descriptions:

Respondent 4: *Halfway between maximum thigh and knee, to the floor.*

Respondent 11: *Middle of the upper leg, straight.*

The descriptions correspond with the international descriptions. The length between crotch and knee should be measured first in order to locate the mid-thigh position. As explained before, locating the crotch can be a problem. Any measurement involving the crotch position is sensitive to take. This could explain why one of the survey respondents had problems with this measurement.

Thigh length (68)

This measurement could be useful when shaping the legs on trouser patterns, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 14% of the survey respondents and none of the survey respondents using the measurement experienced problems with it. Of the 13 respondents interviewed, four used the measurement and none experienced problems with it.

International description of the measurement:

- ✓ Distance between crotch level and knee level at back (SizeUK).
- ✓ The vertical distance, measured on the inside leg using the tape measure, between the crotch (perineum) and the knee girth level (ISO 8559, 1989).

The international descriptions correspond with regard to the landmarks, but it is not clear how the knee position is identified.

Interview respondents' descriptions:

Respondent 4: *Crotch level to the crease of the knee.*

Respondent 6: No description given.

Respondent 11: *Top of the thigh to the crease of the knee.*

Respondent 13: *Crotch to knee.*

The descriptions of the respondents correspond with each other and also with the international descriptions. It is however not clear how the knee position is located on the body. Some of the respondents mentioned the crease at the back of the knee, which could be an easily identifiable landmark for the knee position. To be able to measure consistently, it is important to have a very specific description of how exactly to locate the knee position.

Knee height (69)

This measurement is used to determine the length of shorts and skirts, the knee position on trousers, and also to determine where the flare on bootleg and bell-bottom trousers should start. The measurement can also be useful for the manufacturing of fit dummies. This measurement is used by 22% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and one company experienced problems with it.

International description of the measurement:

- ✓ Distance between the right front knee level and the ground (SizeUK).
- ✓ The vertical distance, measured using the measuring stand (anthropometer), from the knee (tibial) level to the ground (ISO 8559, 1989).
- ✓ Measure from the crease in the back of the knee to the soles of the feet (ASTM 5585, 1995).

The international descriptions do not correspond with each other. It is not clear where exactly the knee position is located.

Interview respondents' descriptions:

Respondent 3: *From the knee straight to the floor.*

Respondent 4: *Crease of the knee to the floor.*

Respondent 7: *Crease of the knee to floor, straight.*

Respondent 11: *Crease of knee to floor.*

Respondent 12: This measurement was not marked on the questionnaire but the respondent mentioned that *it was not something that they really measure*. *To establish the knee position on a pattern they would calculate half inside leg plus 5cm.*

Respondent 13: Their measurement chart shows *a measurement from knee to ankle*.

Three of the descriptions correspond with the ASTM description, which is measured from the crease at the back of the knee. It is difficult to locate the knee position from the front; therefore finding the crease at the back can be done more consistently. Measuring to the floor instead of to the ankle is also better because the measurement is more controlled. One respondent indicated that the knee position on a pattern is calculated and not measured. It can however be useful to have the correct measurement of the knee position on the body. This will make it possible to compare whether such calculations are accurate or still applicable.

Calf height (70)

This measurement is used by 14% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the level of the maximum girth of the right calf and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 4: *Maximum calf to the floor.*

Respondent 7: No description given.

Respondent 11: *Widest part of the calf just below the knee.*

The descriptions of the respondents correspond with each other and also with the international description.

Ankle height (outside leg) (71)

This measurement is used for determining the length of trousers and skirts, and it can also be useful for the manufacturing of fit dummies. The measurement is used by 20% of survey respondents and two of these respondents experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and one company experienced problems with it.

International description of the measurement:

- ✓ Distance between the right outer ankle bone prominence and the ground (SizeUK).
- ✓ The vertical distance, measured using the measuring stand (anthropometer), from the outer ankle bone to the ground (ISO 8559, 1989).
- ✓ With the subject standing barefoot, the distance from the center of the prominent outside ankle bone to the floor (ASTM 5219, 1999).

The international descriptions agree with regard to measuring from the outside ankle bone and straight to the floor. The ASTM is more specific by referring to the center of the outside ankle bone. The SizeUK mentions taking the measurement on the right side of the body.

Interview respondents' descriptions:

Respondent 3: *From the protruding bone on the outside of the ankle straight to the floor.*

Respondent 4: *Ankle to the floor on the outside of the leg.*

Respondent 7: No description given.

Respondent 11: *From the bone on the outside of the leg.*

Respondent 12: No description given.

These descriptions correspond with the international descriptions, although none of the respondents refers to taking the measurement on the right side of the body. Ankle height can be useful when determining the different lengths of garments, for example clamdiggers, pedal pushers or capri pants.

Ankle height (inside leg) (72)

This measurement could be useful when determining the length of trousers and skirts. The measurement is used by 20% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the right inner ankle bone prominence and the ground (SizeUK).

Interview respondents' descriptions:

Respondent 3: *From the protruding bone on the inside of the ankle straight to the floor.*

Respondent 4: *Ankle to floor on the inside of the leg.*

Respondent 7: *Distance from the inner ankle bone to floor.*

Respondent 11: *From the bone on the inside.*

Respondent 12: No description given.

The descriptions of the respondents correspond with each other and also with the international description.

4.4.1.1 Summary of results regarding vertical height measurements

In order to be able to make valid conclusions about the use of body measurements by the respondents from the South African clothing industry, aspects of the result are summarised in **Tables 4.4, 4.5, 4.6 and 4.7**.

The results are summarised according to:

- ✓ whether an international description was available;
- ✓ whether there was consensus among the international descriptions or only one international description;
- ✓ whether there was consensus among the respondents' descriptions, only one description or no description from respondents;
- ✓ whether there was consensus among the international and the respondents' descriptions;
- ✓ whether problems were related to no consensus about measuring straight or on the contour;
- ✓ whether problems were related to landmarking;
- ✓ whether problems were related to landmarking as well as no consensus.

This enabled the researcher to get a clear picture of the relationship between consensus or no consensus on how the measurement should be taken, and the problems that the participants experienced with the measurement.

The researcher summarised the responses in **Tables 4.4, 4.5, 4.6 and 4.7**. The decisions and summaries were checked by professional peers. In cases where the researcher and professional peers could not make a 100% clear decision from the responses, it was calculated as a "no".

TABLE 4.4: SUMMARY OF RESULTS FOR VERTICAL HEIGHT MEASUREMENTS

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
1 Height *	21	0	Yes	Yes	Yes	Yes	No	No	No	No
2 Chin height	0	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
3 Cervical height *	7	0	Yes	No	No	No	No	Yes	No	No
4 Side neck height *	5	2	Yes	One description	No	No	Yes	Yes	Yes	Yes
5 Side neck to front	2	2	Yes	One description	One description	Yes	Yes	Yes	Yes	No
6 Shoulder height	7	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
7 Underarm height	9	3	Yes	One description	No	No	Yes	Yes	Yes	Yes

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
8 Across back height	9	3	Yes	One description	No	No	Yes	Yes	Yes	Yes
9 Chest height	8	1	Yes	One description	Yes	Yes	Yes	No	No	No
10 Bust level height	10	0	Yes	One description	Yes	Yes	No	Yes	No	No
11 Underbust level height	3	0	Yes	One description	Yes	Yes	No	No	Yes	No
12 Underbust to waist	12	1	Yes	One description	Yes	Yes	Yes	Yes	Yes	No
13 Armscye to waist	12	2	Yes	One description	Yes	Yes	Yes	Yes	Yes	No
14 Waist height	13	0	Yes	Yes	Yes	Yes	No	No	Yes	No
15 Preferred waist height	7	2	No description	N/A	One description	N/A	Yes	No	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
16 Waist Height (belly button)	12	1	No description	N/A	Yes	N/A	Yes	No	No	No
17 Upper hip height	12	0	Yes	No	No	No	No	Yes	Yes	Yes
18 Top hip height	12	0	Yes	One description	No	No	No	No	Yes	Yes
19 Hip height	12	0	Yes	Yes	Yes	Yes	No	No	No	No
20 Centre back waist to top hip	15	1	No description	N/A	No	N/A	Yes	Yes	No	No
21 Centre back waist to upper hip	13	0	No description	N/A	Yes	N/A	No	Yes	No	No
22 Centre back waist to maximum hip	12	0	No description	N/A	Yes	N/A	No	Yes	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
23 Centre back waist to knee	9	0	No description	N/A	No	N/A	No	No	Yes	Yes
24 Centre back waist to ground *	13	0	No description	N/A	No	N/A	No	Yes	No	No
25 Front waist to thigh	6	0	Yes	One description	No	No	No	Yes	Yes	Yes
26 Front waist to knee	10	1	No description	N/A	No	N/A	Yes	Yes	Yes	Yes
27 Front waist to calf	8	0	Yes	One description	No	No	No	Yes	Yes	No
28 Front waist to ground *	13	0	Yes	One description	No	No	No	Yes	Yes	No
29 Side waist to hip	10	0	Yes	Yes	Yes	Yes	No	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
30 Side waist to knee length	10	0	Yes	One description	Yes	Yes	No	No	No	No
31 Outside leg length *	26	1	Yes	Yes	No	No	Yes	Yes	Yes	Yes
32 Inside leg length *	27	2	Yes	Yes	Yes	Yes	Yes	No	Yes	No
33 Trunk length *	15	1	Yes	One description	No	No	Yes	Yes	Yes	Yes
34 Total crotch length *	20	1	Yes	Yes	Yes	Yes	Yes	No	No	No
35 Front crotch length	22	3	No description	N/A	No description	N/A	Yes	No	Yes	No
36 Back crotch length	22	3	No description	N/A	No description	N/A	Yes	No	Yes	No
37 Body rise *	20	3	Yes	No	No	No	Yes	No	Yes	Yes
38 Back waist length *	17	0	Yes	Yes	Yes	Yes	No	Yes	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
39 Cervical to top hip	6	0	No description	N/A	No	N/A	No	Yes	Yes	Yes
40 Cervical to upper hip	7	0	No description	N/A	No	N/A	No	Yes	Yes	Yes
41 Cervical to hip	7	0	No description	N/A	No	N/A	No	Yes	Yes	Yes
42 Cervical to knee hollow	5	0	Yes	One description	No	No	No	Yes	Yes	Yes
43 Cervical to chest level	6	1	No description	N/A	Yes	N/A	Yes	No	No	No
44 Side neck to chest level	6	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
45 Cervical to breast point	8	1	Yes	Yes	Yes	Yes	Yes	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
46 Side neck to breast point *	9	4	Yes	Yes	Yes	Yes	Yes	No	Yes	No
47 Cervical to under bust level	5	1	Yes	One description	Yes	Yes	Yes	No	Yes	No
48 Side neck to under bust level	5	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
49 Cervical to front waist	8	2	Yes	Yes	Yes	Yes	Yes	Yes	No	No
50 Side neck to waist	12	2	Yes	No	No	No	Yes	Yes	Yes	Yes
51 Centre shoulder to bust point	13	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
52 Centre shoulder to underbust level	9	1	Yes	One description	Yes	Yes	Yes	No	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
53 Centre shoulder to front waist straight	11	2	Yes	One description	Yes	No	Yes	No	Yes	No
54 Centre shoulder to front waist contoured	10	2	Yes	One description	No	No	Yes	No	Yes	Yes
55 Centre shoulder to back waist contoured	11	1	Yes	One description	Yes	Yes	Yes	No	Yes	No
56 Armscye depth *	10	2	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
57 Top arm length	14	2	Yes	One description	Yes	Yes	Yes	Yes	Yes	No
58 Arm Length straight	21	2	No description	N/A	Yes	N/A	Yes	No	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
59 Shoulder to wrist *	28	2	Yes	One description	No	No	Yes	No	Yes	Yes
60 Arm length bent *	14	3	Yes	Yes	No	No	Yes	No	Yes	Yes
61 Shoulder to wrist bent	13	2	Yes	Yes	No	No	Yes	No	Yes	Yes
62 Upper arm length	15	1	Yes	One description	Yes	Yes	Yes	No	No	No
63 Shoulder to elbow	18	1	Yes	Yes	Yes	Yes	Yes	No	Yes	No
64 Underarm length *	21	1	Yes	Yes	No	No	Yes	No	Yes	Yes
65 Underarm to elbow	13	1	No description	N/A	No	N/A	Yes	No	Yes	No
66 Thigh height	6	1	Yes	One description	Yes	Yes	Yes	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
67 Mid-thigh height	3	1	Yes	One description	Yes	Yes	Yes	No	Yes	No
68 Thigh length	7	0	Yes	Yes	Yes	Yes	No	No	Yes	No
69 Knee height	11	1	Yes	No	No	No	Yes	No	Yes	Yes
70 Calf height	7	1	Yes	One description	Yes	Yes	Yes	No	No	No
71 Ankle height	10	2	Yes	Yes	Yes	Yes	Yes	No	No	No
72 Ankle height (inside leg)	10	1	Yes	One description	Yes	Yes	Yes	No	No	No
Totals – Yes			**56** ***77,8%***	**18** ***25,0%***	**38** ***52,8%***	**34** ***47,2%***	**48** ***66,7%***	**28** ***38,9%***	**50** ***69,4%***	**23** ***31,9%***
Totals – N/A			**0** ***0,0%***	**16** ***22,2%***	**0** ***0,0%***	**17** ***23,6%***	**0** ***0,0%***	**1** ***1,4%***	**1** ***1,4%***	**1** ***1,4%***

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
Totals – No			**0** ***0,0%***	**5** ***6,9%***	**29** ***40,3%***	**21** ***29,2%***	**24** ***33,3%***	**43** ***59,7%***	**21** ***29,2%***	**48** ***66,7%***
Totals – No description			**16** ***22,2%***	**0** ***0,0%***	**3** ***4,2%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – One description			**0** ***0,0%***	**33** ***45,8%***	**2** ***2,8%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Total			**72**	**72**	**72**	**72**	**72**	**72**	**72**	**72**

Refer to addenda for further information

From **Table 4.4** it is clear that only one of the vertical height measurements was not used by any of the survey respondents, namely chin height.

With regard to the availability and consensus of international descriptions, the following is clear from **Table 4.4**:

- ✓ Only one description 45,8%
- ✓ International consensus 25,0%
- ✓ No description 22,2%
- ✓ No consensus 6,9%

It is alarming to note that for almost one third (29,1%) of the vertical height measurements, there are either no international descriptions available or no consensus among the international descriptions as to how the measurements should be taken.

With regard to the respondents' descriptions, the following is clear from **Table 4.4**:

- ✓ Consensus 52,8%
- ✓ No consensus 40,3%
- ✓ Only one description 2,8%
- ✓ No description 4,2%

Again it is alarming that for such a large proportion of the vertical height measurements (40,3%), the respondents do not agree on the description of how and/or where the measurement should be taken. If one considers the number of measurements for which no international description is available and for which there is no consensus among international descriptions, it is understandable that respondents are unsure about these measurements. The lack of international guidelines adds to the lack of consensus among the respondents' descriptions, and this has implications for the accuracy of measurements.

With regard to consensus between the international and the respondents' descriptions, the following is clear from **Table 4.4**:

- ✓ Consensus 47,2%
- ✓ No consensus 29,2%

- ✓ Not applicable 23,6% (because of no international or respondent descriptions)

It is a worrying fact that there seems to be consensus between the international and the respondents' descriptions in less than half of the vertical height measurements. Since international descriptions are available for 77,8% of the vertical height measurements, this result clearly shows that the respondents do not always agree with the international description. It may also be an indication that the international description is vague and not clearly described, which leads to confusion and a different interpretation of the description by the respondents. This has definite implications for the taking of consistent and accurate measurements, which further impacts on the drafting of well-fitting patterns.

From **Table 4.4** it is clear that the respondents experience problems with 66,7% of the vertical height measurements. This constitutes an alarming number of problem measurements, which can only predict problems with the sizing of clothing items. It is however a good sign that the respondents admit to having problems with the body measurements. It implies that the respondents from the industry probably value and strive for accurate body measurements, which highlights the need for a body measurement survey of the South African population.

From **Table 4.4** it is clear that problems are related to:

- ✓ Landmarking 69,4%
- ✓ Landmarking and consensus 31,9%
- ✓ Straight/contoured measurement 38,9%

It is clear that the problems are mostly related to landmarking, and also whether measurements should be taken in a straight line or along the contour of the body. This has important implications for taking accurate body measurements and drafting well-fitting patterns. Once again, the importance of having clear and detailed descriptions on the identification of landmarks and measuring techniques is highlighted.

The vertical height measurements for which no international description could be found were not discussed in detail in this chapter; the relevant descriptions given by respondents are listed in **Addendum D**. From **Table 4.4** it is clear that some of these measurements are used by a significant number of survey respondents. Problems with these measurements can be expected since the South African companies depend on international descriptions in order to take accurate body measurements.

The situation regarding the descriptions of the key dimensions will be discussed later in this chapter, under paragraph 4.5.5.

4.4.2 Horizontal width and depth measurements

The horizontal measurements are divided in width and depth measurements and circumferences. The width measurements are taken in a straight horizontal line, from side to side, from the front or the back of the body. Note that the width measurements differ from the arc measurements which are taken from “side seam” to “side seam”. The depth measurements are taken in a straight horizontal line, from front to back, from the side of the body. The terms from side to side or front to back used in the width and depth measurements refer to the outline or silhouette of the body. The circumference measurements, also referred to as girths, are measured horizontally around the body, starting and ending at the same position.

Width and depth measurements are not always directly used for pattern making or garment construction, but they are needed in order to analyse the shape of the body. These measurements can give an indication of how a circumference measurement is distributed around the body. Therefore the width measurements are particularly important for the manufacturing of fit dummies.

Neck width (front) (73)

This measurement is useful to determine the shape of the neckline on a basic pattern, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and four of those respondents experienced problems with the measurement. Of the 13 respondents

interviewed, eight indicated that they used the measurement and three companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the side neck points measured at right angles through the centre front neck point (SizeUK).

Interview respondents' descriptions:

Respondent 1: *Side to side at the base of the neck, measured straight.*

Respondent 3: *Measure straight across from the front at the base.*

Respondent 4: *We do not actually take this measurement because callipers are needed. It is necessary for knitwear, but to check the neck opening for woven garments they use half of the neck circumference*. No description was given, but the respondent stated that it was *an important measurement for making the patterns as well as for the dummy*.

Respondent 6: *Width from the front of the neck.*

Respondent 7: This measurement was not marked but the respondent made the following comment: *"they did a calliper width on the neck at the base there, which is very useful for us for dummies."*

Respondent 9: No description given.

Respondent 11: *At the neck base.*

Respondent 12: *Width of neck base from the front.*

Respondent 13: No description given.

The descriptions of the respondents refer to measuring at the neck base in a straight line, which correspond with the international description. The respondents experienced problems with this measurement because special equipment is needed to take the measurement. Finding the neck base can also present some problems. As suggested previously in this chapter, a chain can be used to mark the base of the neck and this will assist in taking the measurement consistently. The importance of the measurement for pattern making and manufacturing of fit dummies is highlighted

by the respondents. This is because the width measurement gives an indication of how the circumference is distributed around the body.

Neck width (back) (74)

This measurement is useful to determine the shape of the neckline on a basic pattern, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and four of those respondents experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and three companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the side neck points measured at right angles through the nape (SizeUK).

Interview respondents' descriptions:

Respondent 1: *At the back of the neck from side to side, measured straight.*

Respondent 3: *Measure from the back, straight across at the base.*

Respondent 4: *Do not actually take this measurement because callipers is needed. It is necessary for knitwear, but to check the neck opening for woven garments they use half of the neck circumference.* No description was given, but the respondent stated that it was *an important measurement for making the patterns as well as for the dummy*.

Respondent 6: *The width at the base of the neck.*

Respondent 9: No description given.

Respondent 11: *Neck base.*

Respondent 12: *Width of neck base from the back.*

Respondent 13: No description given.

The descriptions refer to measuring straight across at the neck base, which correspond with the international description. The situation regarding the problems experienced is the same as with the previous measurement. The respondents

experienced problems with this measurement because special equipment is needed to take the measurement and identifying the neck base consistently can be problematic.

Back neck width (contoured) (75)

This measurement is used for the shaping of the neckline on basic patterns, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 44,74% of the survey respondents and three experienced problems with it. Of the 13 respondents interviewed, five indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Distance between the side neck shoulder points over the nape (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Shoulder neck point over the nape to shoulder neck point.*

Respondent 4: *Side neck to side neck following the contour.*

Respondent 7: *Across over the curve of the neck.*

Respondent 11: *Over the back of the neck.*

Respondent 12: *Side neck over the curve of the nape.*

The descriptions correspond with the international description. This measurement, together with the previous measurement, will determine the curve of the neckline on the pattern. The side neck point is located where the neck base and the shoulder line meet. Identifying this position consistently on different bodies can present a problem. Considering the difficulty with locating the side neck point, it is surprising that only three of survey the respondents experienced problems with the measurement. When drafting a pattern the neckline is usually formed by previously determined dimensions that automatically form the neckline; therefore this measurement is not directly used. This might explain why only three of the survey respondents experienced problems with the measurement. It is however necessary to compare the shape and length of the neckline against the real body measurement in order to determine whether

pattern drafting formulas are still applicable, and also to ensure proper fit of the garment on the body.

Shoulder length (76)

This measurement is used to determine the shoulder length on patterns for upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 76,47% of the survey respondents and four experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and three companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the base of the right side neck (neck point) to the shoulder point (SizeUK).
- ✓ Distance from the base of the side of the neck (neck point) to the acromion extremity, measured with the arms hanging naturally (ISO 8559, 1989).
- ✓ The distance from the side neck base to the armscye line at the shoulder joint (ASTM 5219, 1999).

The international definitions correspond with each other, and it is clear that the ISO description is more complete.

Interview respondents' descriptions:

Respondent 1: *Side of neck to the shoulder point.*

Respondent 3: *Shoulder neck point to the protruding bone of the shoulder.*

Respondent 4: *Calculate this measurement by using cervical to wrist, shoulder to wrist and the neck measurement.*

Respondent 6: *Side neck to the top of the arm. We don't grade the size of the shoulders because the person doesn't get bigger.*

Respondent 7: *Side neck to the acromion bone.*

Respondent 9: *Side neck to shoulder.*

Respondent 11: *Single shoulder, as close as you can get to the neck to that little bone (back of shoulder).*

Respondent 12: *Where neck and shoulder joins, before it flattens out, to the most prominent part of the back shoulder bone.*

Respondent 13: No description given.

The descriptions correspond with the international descriptions. The most prominent part or bone at the back of the shoulder that some respondents refer to is the acromion process (Thibodeau & Patton, 1992:87), which is used as a landmark for the shoulder position. Both landmarks for this measurement are difficult to identify, as previously discussed in this chapter. The use of a chain to mark the base of the neck can assist in locating the side neck point. The shoulder point however is the position where the armscye and shoulder line intersect, and the acromion process is not clearly visible on all bodies. Again it is surprising that only four of the survey respondents have problems with a measurement with such difficult landmarks, and a similar explanation is also applicable to this measurement. The shoulder length dimension is not directly used when drafting a pattern; the length of the shoulder seam is formed in the process of drafting. However, that length should be compared to the actual body dimension in order to ensure a well-fitting garment.

Shoulder width – back (77)

This measurement is useful to determine the garment measurement over the shoulders of upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 55,88% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal distance between the back shoulders, following the contour of the back (SizeUK).
- ✓ The horizontal distance between the acromion extremities, measured with the arms hanging naturally (ISO 8559, 1989).
- ✓ The distance from shoulder joint to shoulder joint across the back (ASTM 5219, 1999).

The international descriptions correspond with regard to landmarks, but it is not always clear whether the measurement should be taken on the contour or as a straight horizontal measurement.

Interview respondents' descriptions:

Respondent 1: *From left shoulder to right shoulder, just below the nape.*
Respondent 3: *Shoulder to shoulder over the back.*
Respondent 4: No description given.
Respondent 6: *Side to side on the shoulders.*
Respondent 7: *Over the back to the acromion bones on the sides.*
Respondent 9: *Left to right on the back of the shoulders.*
Respondent 11: *Total shoulder width.*
Respondent 12: *Measure from back (shoulder) bone flat against the back.*

The descriptions correspond with each other and with the international descriptions with regard to the landmarks, namely the shoulders. The shoulders as a landmark are, as discussed previously in this chapter, not that easy to identify since the prominent bones of the acromion process are not prominent on all bodies. There is also not agreement between the respondents about measuring on the contour or in a straight horizontal line. It is important that the measurement be taken over the contour of the back. If one keeps in mind how a garment fits on the body, measuring on the contour builds some tolerance into the measurement, which is useful for pattern making and also for determining garment measurements.

Shoulder width – front (78)

This measurement is useful as an indication of a slumping posture or round shoulders, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 47,06% of the survey respondents and three experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Horizontal distance between the front shoulders (SizeUK).

Interview respondents' descriptions:

Respondent 1: *From left shoulder to right shoulder, just below the base of the neck.*

Respondent 3: *Shoulder to shoulder from the front.*

Respondent 4: No description given.

Respondent 6: *From the front of the body measured at the shoulders.*

Respondent 7: No description given.

Respondent 9: *Left to right on the front of the shoulders.*

Respondent 11: *Total width, measured from the front.*

Respondent 12: *From the front, in line with the back (shoulder) bones.*

The international description is not clear on the landmark for the shoulders in the front. The clavicle bone (Thibodeau & Patton, 1992:86) could serve as a landmark, but can sometimes be difficult to identify. Measuring up to a position in line with the acromion at the back, as respondent 12 suggests, might also be a logical position, however it can still be difficult to physically identify the position on the body. Again, it is not a measurement that is directly used in drafting the pattern, but it can be used as a control measurement to compare the pattern with, in order to ensure a proper fit. This would then explain why only three of the survey respondents indicate a problem with this measurement where the description of landmarks is vague.

Across back width (79)

This measurement is used for drafting patterns of upper body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 79,41% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal distance between the back armscyes on the level of the back width height (SizeUK). (The across back height was measured at midway between centre back neck and underarm level.)
- ✓ The horizontal distance across the back, measured half-way between the upper and lower scye levels (ISO 8559, 1989).
- ✓ The distance from back-break point to back break-point. Back-break point is defined as the location on the back of the body where the arm separates from the body (ASTM 5219, 1999).

The SizeUK and ISO description correspond with regard to the level where the across back measurement should be taken, namely at the mid-point of the armscye. The ASTM measurement measures where the arm separates from the body, in other words, where the crease is visible. This gives a position that is easier to identify on the body than the mid-point of the armscye.

Interview respondents' descriptions:

Respondent 1: *From side to side across the back, 12cm below the nape.*

Respondent 3: *When you put your arm down, your crease here, from that crease across back.*

Respondent 4: *Across the back at the centre of the armscye.*

Respondent 6: *Across back to the arm-shoulder line.*

Respondent 7: *It can be from the crease, or at 12cm below nape which is going to be safe.*

Respondent 9: *12cm below back neck.*

Respondent 11: *12cm down from nape.*

Respondent 12: *For ladies I measure 12cm down from nape. For men I would use mid-arm.*

From the above descriptions and international descriptions it seems that the position where this measurement is taken can vary. It would be difficult to identify the mid-point of the armscye on the body and therefore it is easier and more consistent to measure at a specific distance below the nape. Alternatively, one can follow the ASTM description, which identifies the break point where the arm separates from the

body as a landmark. For pattern-making purposes a specific distance below nape would be advisable, since this would ensure a more accurate translation of the measurement to a pattern.

Across front width (80)

This measurement is used to draft patterns for upper body garments as well as to determine the position of straps on off-shoulder garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 67,65% of the survey respondents and three experienced problems with the measurement. Of the 13 respondents interviewed, eight indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal distance between the front armscyes on the across front level. (2/3 depth of armscye from shoulder – for women and men) (SizeUK).
- ✓ The distance from front-break point to front-break point. Front-break point is defined as the location on the front of the body where the arm separates from the body (ASTM 5219, 1999).

The international descriptions do not agree as to where the across front level is located. The description of the ASTM indicates a landmark which could possibly be identified consistently.

Interview respondents' descriptions:

Respondent 1: *From side to side at 12cm below mid-shoulder.*

Respondent 3: *When you put your arm down, your crease here, from that crease across front.*

Respondent 4: *Across front at the centre of the armscye.*

Respondent 6: *On the same level as across front.*

Respondent 7: *From where the crease is.*

Respondent 9: *Above the bust, more or less where the crease of the arm is.*

Respondent 11: *12cm down from mid-shoulder.*

Respondent 12: *12cm down from mid-shoulder, for ladies and for men it is measured at mid-arm.*

The South African descriptions do not correspond with regard to the level where the "across front" is located. A variety of locations are given where "across front" should be measured. Being able to consistently identify the same position on a number of different bodies is the key in deciding on the exact location of the measurement. The descriptions by the respondents mention two options, namely 12cm down from mid-shoulder or alternatively the crease where the arm separates from the body. Measuring at the crease corresponds with the ASTM description. Again, to accommodate the translation of the measurement to a pattern, measuring at a specific distance from the shoulder might be the more reliable position.

Breast prominence (81)

This measurement is used for the manufacturing of upper body garments, specifically ladies' underwear, and it can also be useful for the manufacturing of fit dummies for ladies' wear. This measurement is used by 32,35% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance from the centre front between the breasts, over the bust point to the edge of the outer side of the breast (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Centre front to side over the bust.*

Respondent 4: *Centre front over the contour of the bust to the side.*

Respondent 7: No description given.

Respondent 11: *Centre front over the bust to the "side seam".*

This measurement is taken only on women, for obvious reasons, and the respondents' descriptions correspond with the international description. Identifying the "side seam" on the body can present some problems; however, it is not indicated as a problem measurement.

Bust width (82)

This measurement is used for the manufacturing of upper body garments and it can also be useful for the manufacturing of fit dummies. It is specifically used for the positioning of style lines and design detail on garments, and to determine the length of the bust darts. It must also be considered when grading a pattern, since the bust width does not necessarily increase with fuller figures. This measurement is used by 47,06% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal distance between the bust points (SizeUK).
- ✓ The horizontal distance between the nipples (ISO 8559, 1989).
- ✓ The distance across the front from the apex of one breast to the apex of the other (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Inter-nipple distance.*
Respondent 3: *Distance between nipples.*
Respondent 4: *Nipple to nipple.*
Respondent 6: *How far apart the nipples are.*
Respondent 7: *Bust point to bust point.*
Respondent 11: *Nipple to nipple.*
Respondent 12: *Literally nipple to nipple.*

The descriptions correspond with the international descriptions, and it is therefore not surprising that only two of the survey respondents experience problems with the measurement.

Chest depth (83)

This measurement is useful to describe the body shape and it is therefore also useful for the manufacturing of fit dummies. This measurement is used by 35,29% of the

survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ The horizontal distance between the chest, at the level of the bust point landmark, and the back at the same level. The subject stands erect looking straight ahead and is measured from the side. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration (Ergotech).

Interview respondents' descriptions:

Respondent 1: *Straight from front to back at the widest part of the chest.*

Respondent 4: *Front to back on the side of the person at chest level. The depth measurements give an idea of body mass distribution.*

Respondent 6: *From the side at the level of the chest.*

Respondent 7: No description given.

Respondent 11: *Side width of the body where chest girth is measured.*

Respondent 12: None of the depth measurements were marked on the questionnaire, but the respondent had the following to say about depth measurements: *"What I'd like to see is depth. I don't know how you'd actually control or measure it but it would be interesting…"*

The descriptions correspond with the international description. Depth measurements, together with width measurements as stated earlier, can give an indication of how the circumference measurement is distributed around the body. Thus it can assist with the analysis and classification of body shapes. However, only 22,2% of the survey respondents indicated that they used this measurement, which can be an indication of ignorance about the role of figure type in achieving good fit.

Waist width (84)

This measurement is useful to describe body shape and is therefore also useful for the manufacturing of fit dummies. This measurement is used by 61,76% of the survey

respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:
Only one international description was found:

✓ Width of front waist at natural waist level (SizeUK).

Interview respondents' descriptions:

Respondent 1: *From side to side straight across the body at waistline.*
Respondent 3: *Side to side across the natural waist.*
Respondent 4: *The width at the natural waist position.*
Respondent 6: *The width of the body at the waist, straight across.*
Respondent 11: *Width of the body at the narrowest point, measured from the front.*

The descriptions of the respondents correspond with the international description. It is however not clear where exactly the natural waist is located on the body. According to Ashdown (2005), this is one of the most difficult positions to determine.

Waist depth (85)

This measurement is useful to describe body shape and is therefore also useful for the manufacturing of fit dummies. The measurement is used by 20% of the survey respondents and one of them experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:
Only one international description was found:

✓ Horizontal distance between the front and back of the waist at the level of the omphalion. Subject stands erect and is measured from the side (Ergotech).

Interview respondents' descriptions:

Respondent 1: *From front to back at waist level.*
Respondent 4: *Front to back on the side of the person at natural waist level.*

Respondent 11: *Sideways at the narrowest point.*

The descriptions of the respondents correspond with each other. The natural waist is also the narrowest point on the body. This does not correspond with the international description which takes the measurement at the level of the belly button. For the purposes of pattern making, the width and depth measurements should be taken at the same position as the girth measurement in order to be of any use. When taken at the same position the measurements serve as control measurements to transfer the measurement onto a pattern.

Hip width (from front at maximum circumference) (86)

This measurement is useful to describe body shape and is therefore also useful for the manufacturing of fit dummies. This can be very helpful in achieving a better fit, especially for trousers. This measurement is used by 55,88% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Maximum width of the hips, viewed from the front (SizeUK).

Interview respondents' descriptions:

Respondent 1: *From side to side on the body at 20cm below waistline.*

Respondent 3: *Side to side at the widest part of the hips.*

Respondent 4: *The width of the body at maximum hip.*

Respondent 6: *From the front at the biggest part.*

Respondent 9: No description given.

Respondent 11: *Width from the front at the widest part on the hips.*

Respondent 12: *Measured at widest part.*

Only one of the descriptions does not correspond with the international description because it specifies that the measurement be taken at 20cm below the waist. The descriptions of the other respondents correspond with the international description.

Buttock depth (87)

This measurement can be very useful to determine the shape of the curve of the crotch seam on trousers and it can also be useful for the manufacturing of fit dummies. This measurement is used by 32,35% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ The distance between the anterior and posterior maximum buttock point. The subject stands erect and is measured from the side (Ergotech).

Interview respondents' descriptions:

Respondent 1: *From front to back at the widest part of the hip.*

Respondent 3: *Back to front, from the side, at the widest part.*

Respondent 4: *Front to back on the side of the person at hip level.*

Respondent 6: *From the side, same level as biggest hip.*

Respondent 7: No description given.

Respondent 11: *Sideways where the widest hip was measured.*

The descriptions of the respondents correspond with the international description, although they are not as detailed as the international description. One respondent refers to hip level, which can be confusing since it can be understood as the widest part of the hip or it can refer to the hip being at a specific distance, for example 20cm, below the waist.

Because callipers would be necessary to take the width and depth measurements, and the respondents do not readily have access to such equipment, it is surprising that so few of the survey respondents experienced problems with bust width (82), chest depth (83), waist width (84), hip width (86) and buttock depth (87). This can possibly be explained by the fact that these measurements are not directly used when drafting the basic blocks, but are rather used to identify body shape and then to alter the pattern with a specific body shape in mind.

Armscye width (88)

This measurement is used for shaping the armhole on the bodice patterns as well as for shaping of the sleeve cap on sleeve patterns, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 35,29% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the right front and right back armscye measured over the top of the arm (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Front to back over the upper arm.*

Respondent 4: *From front to back on top of the arm.*

Respondent 7: *That's a calliper measurement you'd have to take.*

Respondent 11: No description given.

One respondent mentions that it is a calliper measurement, in other words it is measured in a straight line. The other descriptions mention measuring over the top of the arm, which seems like a contoured measurement. It is also not clear from the international description whether it is a straight or a contoured measurement. For the purpose of manufacturing a fit dummy, a straight measurement might be more useful; however, for pattern making the contoured measurement would be more applicable. Since there is no agreement among the respondents and also no clear indication from the international description, it is surprising that so few respondents experienced problems with the measurement.

Armspan (89)

This measurement could be useful to develop this garment measurement for upper body garments. The measurement is used by 20% of the survey respondents and one respondent experienced problems with the measurement. Of the 13 respondents

interviewed, three used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ The distance between the tips of the middle fingers of the horizontally outstretched arms, which are even with the level of the shoulders. Subject stands erect against a wall mounted scale (Ergotech).

Interview respondents' descriptions:

Respondent 3: *Left to right fingertips, standing with the arms stretched out horizontally.*

Respondent 9: *Lift the arms and measure horizontally from fingertips.*

Respondent 11: No description given.

The descriptions of the respondents correspond with each other and also with the international description.

4.4.2.1 Summary of results regarding horizontal width and depth measurements

From **Table 4.5** it is clear that international descriptions were found for all the width and depth measurements that were included in this study.

TABLE 4.5: SUMMARY OF RESULTS FOR HORIZONTAL WIDTH AND DEPTH MEASUREMENTS

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
73 Neck width (front)	19	4	Yes	One description	Yes	Yes	Yes	No	Yes	No
74 Neck width (back)	19	4	Yes	One description	Yes	Yes	Yes	No	Yes	No
75 Neck width (contoured)	17	3	Yes	One description	Yes	Yes	Yes	No	Yes	No
76 Shoulder length	26	4	Yes	Yes	Yes	Yes	Yes	No	Yes	No
77 Shoulder width (back) *	19	1	Yes	No	No	No	Yes	Yes	Yes	Yes
78 Shoulder width (front)	16	3	Yes	One description	Yes	Yes	Yes	No	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
79 Across back width *	27	2	Yes	No	No	No	Yes	No	Yes	Yes
80 Across front width *	23	3	Yes	No	No	No	Yes	No	Yes	Yes
81 Breast prominence	11	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
82 Bust width *	16	2	Yes	Yes	Yes	Yes	Yes	No	No	No
83 Chest depth	12	2	Yes	One description	Yes	Yes	Yes	No	No	No
84 Waist width	21	0	Yes	Yes	Yes	Yes	No	No	Yes	No
85 Waist depth	7	1	Yes	One description	Yes	No	Yes	No	Yes	Yes
86 Hip width (max)	19	0	Yes	One description	No	No	No	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
87 Buttock depth	11	2	Yes	One description	Yes	Yes	Yes	No	Yes	No
88 Armscye width	12	2	Yes	One description	No	No	Yes	Yes	No	No
89 Armspan	8	1	Yes	One description	Yes	Yes	Yes	No	No	No
Totals – Yes			**17** ***100,0%***	**3** ***17,6%***	**12** ***70,6%***	**11** ***64,7%***	**15** ***88,2%***	**2** ***11,8%***	**12** ***70,6%***	**4** ***23,5%***
Totals – No			**0** ***0,0%***	**3** ***17,6%***	**5** ***29,4%***	**6** ***35,3%***	**2** ***11,8%***	**15** ***88,2%***	**5** ***29,4%***	**13** ***76,5%***
Totals – One description			**0** ***0,0%***	**11** ***64,7%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** **0,0%**	**0** ***0,0%***
Total			**17**	**17**	**17**	**17**	**17**	**17**	**17**	**17**

Refer to addenda for further information

With regard to consensus among the international descriptions, the following is clear from **Table 4.5**:

- ✓ Only one description 64,7%
- ✓ International consensus 17,6%
- ✓ No consensus 17,6%

With regard to the respondents' descriptions, the following is clear from **Table 4.5**:

- ✓ Consensus 70,6%
- ✓ No consensus 29,4%

It seems that there is a high level of agreement among the respondents about how the width and depth measurements should be taken. However, it is alarming that for nearly one third (29,4%) of the measurements the respondents do not agree with each other on how these measurements should be taken.

With regard to consensus between the international and the respondents' descriptions, the following is clear from **Table 4.5**:

- ✓ Consensus 64,7%
- ✓ No consensus 35,3%

Since international descriptions are available for 100% of the horizontal width and depth measurements, one might have expected more consensus among the international and the respondent's descriptions. Again, as with the vertical height measurements, this result clearly shows that the respondents do not always agree with the international descriptions. It can also be an indication that the international descriptions are vague and not clearly described, which leads to confusion and a different interpretation of the description by the respondents. This has definite implications for the taking of consistent and accurate measurements, which further impacts on the drafting of well-fitting patterns.

Although international descriptions are available for all these measurements and a high level of consensus among the respondent's descriptions exist, problems are experienced with 88,2% of the measurements. This is alarming since the horizontal width and depth measurements are important indicators of the body shape. Again,

the fact that the respondents recognise problems with such a large number of width and depth measurements, indicates an interest in and a need for clear descriptions of body measurements as well as accurate body measurement data. Bougourd (2004:10) states that retailers used the SizeUK survey to gain a better understanding of their customers' shapes and sizes, and it seems that the same need exists among the respondents of this study. It is therefore important that a database of current and accurate South African population measures are established. This can only be done if detailed and standard measurement descriptions are available.

From **Table 4.5** it is clear that problems are related to:

- ✓ Landmarking 70,6%
- ✓ Landmarking and consensus 23,5%
- ✓ Straight/contoured measurement 11,8%

Again it is clear that most of the problems are related to landmarking. This has important implications for taking accurate body measurements and drafting well-fitting patterns. This again highlights the importance of clear descriptions of recognisable landmarks.

4.4.3 Circumferences

Neck girth (90)

This measurement is useful for drafting collar patterns, for example polo necks, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 47,37% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Narrowest circumference of the neck column (SizeUK).
- ✓ The circumference of the neck approximately 25mm above the neck base (ASTM 5219, 1999).

The two international descriptions do not correspond. It is not easy to find the narrowest circumference on all necks consistently, therefore it would be better to take the measurement at a specific distance above the neck base as the ASTM description suggests. Taking the measurement at a specific distance above the neck base would be a more reliable method of taking the measurement.

Interview respondents' descriptions:

Respondent 1: *Around the widest part of the neck.*
Respondent 3: *Neck girth around the base of the neck.*
Respondent 4: *At the base of the neck.*
Respondent 7: No description given.
Respondent 11: *Measure around the base.*
Respondent 12: *At the neck base.*

The descriptions given by the respondents do not correspond with each other nor with the international descriptions. The respondents refer to measuring around the base of the neck or the widest part of the neck, which is not necessarily the same position on the neck. The international descriptions however refer to the *narrowest* circumference of the neck or at a specified distance from the neck base. The ASTM description, which specifies the distance above the neck base where the measurement should be taken, would be advisable to ensure consistency. Since there is a separate measurement for the neck base girth (no 92), it can be assumed that the respondents had the wrong measurement in mind when they marked the questionnaire and when they gave their descriptions.

Neck girth – Adam's apple (91)

This measurement is useful when drafting collar patterns to determine the length of the collar, specifically shirt collars, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 28,95% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal circumference of neck measured below the Adam's apple and at the level of the centre back neck point (SizeUK).
- ✓ The girth of the neck measured using the tape measure passed round below the Adam's apple and at the level of the 7th cervical vertebra (ISO 8559, 1989).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Around the neck, a bit higher than the base.*

Respondent 3: *Neck circumference around the middle of the neck.*

Respondent 4: This measurement was marked on the questionnaire, but according to the respondent it is *not really taken in practise. It depends on the garment neckline, but they mostly work with the base of the neck circumference.*

Respondent 7: *Now that would be fine for a shirt, for a shirt collar button position that would make sense.*

Respondent 11: *Measure around the middle of the neck.*

Respondent 12: *In the middle of the neck.*

Respondent 13: *Around the Adam's apple.*

The descriptions given by the respondents do not correspond with the international descriptions. Only one respondent mentions the Adam's apple. The other descriptions refer to the middle of the neck, which is very vague. The international descriptions also note that the tape measure should pass over the nape at the back of the neck, while none of the respondents mention this. The problems associated with this measurement as well as the previous neck girth measurement, are once again related to the ability to take the measurement consistently. Therefore the description of the ASTM at the previous measurement, giving a specific distance above the base of the neck, would be a reliable method for taking the measurement consistently.

Neck base girth (92)

This measurement is used to determine neckline length and also for drafting collar patterns, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 36,84% of the survey respondents and three of the survey respondents using it experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and three companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the nape through the side neck shoulder points to the centre front neck point (SizeUK).
- ✓ The girth of the base of the neck measured using the chainette, which passes over the base of the 7th cervical vertebra, the neck shoulder points and the medial superior borders of the left and right clavicles (ISO 8559, 1989).
- ✓ The circumference of the neck over the cervicale (*sic*) at the back and at the top of the collarbone at the front (ASTM 5219, 1999).

Although all the international descriptions are not as complete as the ISO description, they do correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Around the widest part of the neck, where neck and shoulder join.*
Respondent 3: *Circumference around the base of the neck.*
Respondent 4: *At the base of the neck.*
Respondent 7: *The neck base runs over your nape and around to just above the supersternal notch.*
Respondent 8: *A bit higher up where the collar would fall. A more relaxed measurement, must be able to breathe.*
Respondent 11: *Measure right on that base, right at the bottom of the neck.*
Respondent 12: *Around the neck base.*

The descriptions given by the respondents do not correspond with each other. There are some descriptions that do correspond with the international descriptions; however, most of the respondents just refer to the base of the neck and do not offer

any specific landmarks to help identify the position of the base of the neck. The description of respondent 8 seems to refer more to the previous measurement, since the neck base is not where a shirt collar would fall. Finding the neck base by just looking at a person is sometimes a problem. As discussed earlier in this chapter (refer to side neck height), marking the neck base with a chain is suggested and makes it possible to take the measurement accurately.

Three of the survey respondents who used neck base indicated that it is a problem measurement. Identifying the position of the neck base is one part of the problem. The other part of the problem is related to the use of neck base for collar patterns. The pattern maker must use his/her own judgment to shape the collar to fit snugly around the neck, not too loose and also not too tight.

The previous two circumferences are not always available in the size charts and therefore the neck base girth is mostly used. This also presents a problem to manufacturers of fit dummies with regard to shaping the neck on the dummy. When looking at the descriptions given at neck girth (90), it is clear that the respondents were referring to neck base girth. Therefore it is possible that the number of respondents using neck base girth can actually be higher than indicated in this discussion.

Shoulder girth (93)

This measurement can be useful for the manufacturing of protective wear and for the manufacturing of fit dummies. This measurement is used by 32,35% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Horizontal circumference at level of maximum protrusion of right deltoid. Subject stands erect with the arms relaxed at the sides (Ergotech).
- ✓ With arms down at sides, the maximum distance around the shoulders at the top of the arms (ASTM 5219, 1999).

The international descriptions do not correspond, since the one description is very vague and it does not give a clear indication of the landmarks that should be used.

Interview respondents' descriptions:

Respondent 3: *Circumference around the shoulders and top of the arms.*

Respondent 4: No description given.

Respondent 7: No description given.

Respondent 11: *Measure around the shoulders and the top of the arms.*

Although the two descriptions are vague they do correspond with each other. No specific landmarks are described by the respondents and for this reason the descriptions of the respondents do not correspond with the international descriptions. It is not a measurement that is generally used for the production of fashion wear and therefore the ignorance regarding the measurement is understandable.

Chest girth (94)

This measurement is used for the manufacturing of patterns and upper body garments for men and children, and it is also necessary for the manufacturing of fit dummies. This measurement is also very important when deriving sizing systems and as a size designation for garments. This measurement is used by 79,41% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, nine indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Maximum circumference of chest, measured from the centre back at the level of the armpits, under the armpits and across the front chest to a corresponding point (SizeUK).
- ✓ The maximum horizontal girth measured during normal breathing with the subject standing upright and the tape measure passed over the shoulder blades (scapulae), under the armpits (axillae), and across the chest nipples (ISO 8559, 1989).
- ✓ Measure the circumference of the body parallel to the floor, under the arms, and over the fullest part of the chest (ASTM 6240, 1998).

- ✓ Measure horizontally around the body under the arms and across the nipples so as to include the lower portion of the shoulder blades (ASTM 5826, 1995; ASTM 4910, 1999).

It is clear that the international descriptions correspond with each other, although some descriptions are more specific about the exact landmarks. The ISO gives the most detailed description of how chest circumference should be measured.

Interview respondents' descriptions:

Respondent 1: *On men, around the widest part of the chest.*

Respondent 3: *Measured around the widest part of the chest on men and children.*

Respondent 4: *At the widest part of the chest parallel to the floor, on men.*

Respondent 6: *Around the widest part of the chest.*

Respondent 8: *Perhaps not as simple as it sounds. They must drop their arms and relax, and you must measure as high up under the arms as possible and over the widest point, and to make sure that the tape measure isn't hanging down at the back.*

Respondent 9: *Around the widest part, over the nipples and parallel to the ground.*

Respondent 11: *At the widest part of the chest, tape parallel to the floor.*

Respondent 12: *The most prominent part. We make sure it goes over the shoulder blades and parallel to the floor.*

Respondent 13: *Bust would be similar to a man's chest. On ladies they usually call it bust and on men they call it chest. Measure as high up as possible. Drop your arms after placing tape in position.*

Although the respondents are not very specific about the exact names of the landmarks, the general ideas do correspond with the international descriptions. The respondents mention that the tape measure should be parallel to the floor while measuring, while being as high up as possible under the arms, over the shoulder blades at the back and parallel to the floor. The respondents also note that the measurement, although well known, is not that simple to take and great care should therefore be taken when measuring.

Bust girth (95)

This measurement is exactly the same as the previous measurement but it is measured on women. It is used for the manufacturing of patterns and upper body garments for women, and it is also necessary for the manufacturing of fit dummies. This measurement is also very important when deriving sizing systems and as a size designation for garments. This measurement is used, without any problems, by 70,59% of the survey respondents. Of the 13 respondents interviewed, eight indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Maximum circumference measured over/under the shoulder blades, under the armpits and across the bust points (SizeUK).
- ✓ The maximum horizontal girth measured during normal breathing with the subject standing upright and the tape measure passed over the shoulder blades (scapulae), under the armpits (axillae), and across the nipples (ISO 8559, 1989).
- ✓ Measure the bust circumference horizontally around the body under the arms, across the nipples, and parallel to the floor. (ASTM 5585, 1995).

It is clear that the international descriptions correspond with each other and that the ISO provides the most comprehensive description.

Interview respondents' descriptions:

Respondent 1: *On women, around the widest part of the bust, 3cm below the armhole.*

Respondent 3: *Measured around the most prominent part of the bust on women. Circumferences must be measured snugly, but not so tight as to distort the shape.*

Respondent 4: *Around the widest part of the bust parallel to the floor and high under the underarm.*

Respondent 6: *Around the fullest part of the bust.*

Respondent 7: *Over the widest area of the bust.*

Respondent 8: *Same as chest but measured on women.*

Respondent 11: *For women, around the most prominent part of the bust. Keep the tape straight.*

Respondent 12: *Same as chest but measured on women.*

Respondent 13: *A big problem we think in the women's industry, because you could find a circumference and yet she could have very big [lateral back muscles]. Much bigger around the back than around the front. They are going to have to get to width.*

The bust measurement is taken on women, in the same way that the chest circumference is measured on men. The descriptions of the respondents do not exactly describe the precise landmarks, but the general ideas do correspond with the international descriptions. One respondent mentioned that the tape measure should pass 3cm below the arms.

During the discussion at the interview the respondents did mention that in practice it was difficult to pass over all the landmarks as described for chest and/or bust, and at the same time keep the tape measure parallel to the floor. It seems that the measurement is taken over the nipples and at that level parallel to the floor. Depending on the shape of the body the other landmarks cannot be reached while keeping the tape measure parallel to the floor; for example, on some bodies the tape measure will pass high under the armpits while on others it will be lower down under the armpits in order to keep it parallel to the floor when it is over the nipples.

Underbust girth (97)

This measurement is used for the manufacturing of ladies' wear and specifically for fitted tops, swimwear and underwear. This measurement, together with bust girth, is important for the sizing of underwear. It is also useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and none experienced any problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

✓ Circumference of the body immediately below the breasts (SizeUK).

- ✓ The horizontal girth of the body just below the breasts (ISO 8559, 1989).
- ✓ The circumference of the body under the breasts and parallel to the floor (ASTM 5219, 1999).

It is generally accepted that girth measurements should be taken parallel to the floor. Therefore it can be accepted that the international descriptions correspond with each other, although only the one description states that it must be parallel to the floor.

Interview respondents' descriptions:

Respondent 1: *Measured just below the bust, on women.*

Respondent 3: *Measured below the bust on women.*

Respondent 4: *This is a tight measurement just below the bust. It is mostly used for underwear and swimwear.*

Respondent 7: *It should be measured against the body, under the bra. The underbust is quite a critical measurement.*

Respondent 11: *Just under the bust. This is a difficult one to measure on the outsizes.*

Respondent 12: *Directly under the bust and it's vital to take it straight (parallel to the floor).*

Respondent 13: *Below the bust measurement, only for ladies.*

The descriptions of the respondents correspond with the international descriptions. However, it is not clear from the international descriptions nor from the respondents' descriptions, how underbust is located. As discussed previously in this chapter, the position of the underbust can be difficult to determine especially on the fuller figure. It is therefore surprising that none of the survey respondents experienced problems with the measurement.

Waist girth (98)

This measurement is used for drafting patterns for upper and lower body garments, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 79,41% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, ten indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the natural waist between the top of the hip bone and the lower ribs at the sides (SizeUK).
- ✓ The girth of the natural waistline between the top of the hip bones (iliac crest) and the lower ribs, measured with the subject breathing normally and standing upright with the abdomen relaxed (ISO 8559, 1989).
- ✓ The circumference of the waist immediately below the lowest rib (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other. This measurement refers to the natural waist and it is located below the lowest rib. Despite such a clear description it is not always possible to locate the waist position, for example on men, children and the straight figure type.

Interview respondents' descriptions:

Respondent 1: *Around the narrowest part of the body.*

Respondent 3: *Measured around the natural waistline. Bend sideways and find the crease to locate natural waistline.*

Respondent 4: *Around the natural waist.*

Respondent 6: *The natural waist of the person.*

Respondent 7: *The biggest problem with mens' wear is the waist description. The natural waist is the narrowest part of the torso. When I measure somebody I put an elastic in their waist to begin with.*

Respondent 8: *Measure the waist just above the trouser waistband. Measure snugly or without allowance, but not pulling in too much.*

Respondent 9: No description given.

Respondent 11: *You find the waist by just looking, you often judge with the navel. The waist is just the narrowest point.*

Respondent 12: *Identifying the waist position can be difficult, and it must be natural waist. For women they tie a string around the waist until it's settled. On men they tend to estimate the waist position.*

Respondent 13: *The waist you take it between the eleventh rib and the hip bone.*

The descriptions of the respondents correspond with the international descriptions. The waist is described as the narrowest part of the torso, but on some figure types the narrowest part is not that clearly visible. The international descriptions use the lower ribs and hip bones as reference points to assist in identifying the waist, as do respondent 13. Locating the natural waistline, especially on men, children and straight figure types, is the biggest problem experienced with this measurement. On some bodies it is also not possible to take the waist measurement parallel to the floor. Therefore it is surprising that none of the survey respondents experienced problems with such an important measurement.

Preferred waist girth (99)

This measurement could be useful when making patterns for the currently fashionable dropped waist styles. The measurement is used by 29,41% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, four used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ This measurement was listed as a measurement taken for the Nedscan sizing survey, however no international description was listed in the Nedscan document, and no international description could be found in other standards documents.

Interview respondents' descriptions:

Respondent 1: *Measure where the customer wants the waist to be.*
Respondent 4: No description given.
Respondent 11: No description given.
Respondent 12: Did not know how to measure this but would find it interesting. *If there were some kind of consistency it would be interesting.*

The respondents were not sure how this measurement should be taken. The measurement would only be useful if it can be taken consistently. A vertical measurement would have to be taken together with this measurement to identify the

position on the body. In this way it would also be possible to transfer the measurement onto a pattern.

Waist at belly button girth (100)

This measurement is used to determine the waist length on dropped waist garments. This measurement is used by 44,12% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

No international description could be found.

Interview respondents' descriptions:

Respondent 3: *Measure around the body at the level of the belly button.*

Respondent 4: *At the level of the belly button parallel to the floor.*

Respondent 11: *Measure at the level of the navel.*

Respondent 12: *5cm below waist, not at the belly button specifically.*

Respondent 13: *If you ran it across the navel it's spot on. For men and ladies, I would say again around the belly button is going to have to be the spot.*

It seems that measuring at belly button level parallel to the floor would be the acceptable position. This measurement could be useful when manufacturing the currently fashionable hipster styles. Knowing only the circumference would not contribute to manufacturing better fitting garments. It is also necessary to know how much lower the belly button is in relation to the natural waistline. The natural waistline is used as a point of reference when drafting a basic pattern. Therefore the pattern maker will need to know the vertical distance from the natural waist to the belly button in order to take the waist position lower on the pattern.

Upper hip girth (101)

This measurement can assist with the shaping of the waist to hip curve on the patterns of trousers and fitted skirts, and it can also be useful for the manufacturing of

fit dummies. This measurement is used by 50% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the upper hip measured at the upper hip level (SizeUK).
- ✓ The circumference of the body at a point approximately 7,5cm below the waist and parallel to the floor (ASTM 5219, 1999).

The international descriptions do not correspond with each other. The one description refers to "the upper hip level", which is a very vague landmark, while the other description states a distance of approximately 7,5cm below the waist. It would be more consistent to measure at a specific distance below the waist.

Interview respondents' descriptions:

Respondent 1: *Measured at 10cm below waistline.*
Respondent 3: *Over the hip bone area, traditionally 10cm below waist (high hip).*
Respondent 4: *Measure at the hip bone.*
Respondent 6: *Measure at 10cm below waist.*
Respondent 7: The respondent did not mark this measurement but made a note next to top hip girth that *it should be measured 10cm below waist.*
Respondent 11: *This is 10cm below waist.*
Respondent 12: *I measure 10cm down (from waist).*

The descriptions of the respondents do not correspond with the international definitions. Nearly all the respondents refer to 10cm below waist, while the international description states that upper hip is at about 7,5cm below the waist. There seems to be agreement among the respondents about measuring at 10cm below waist. This differs from the international descriptions but should not present a problem if it is measured consistently at this position.

Top hip girth (102)

This measurement can also assist with the shaping of the waist to hip curve on the patterns of trousers and fitted skirts, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Circumference of the top hip measured at top hip level (midway between natural waist and hip level) (SizeUK).

Identifying the mid-point between natural waist and the maximum hip circumference can be difficult. The vertical distance from natural waist to top hip can vary greatly since the level of maximum hip girth can also vary considerably on different body types. This can lead to some confusion between this and the previous measurement.

Interview respondents' descriptions:

Respondent 1: *Measured at 20cm below waistline.*
Respondent 3: *Traditionally 20cm below waist (full hip).*
Respondent 4: No description given.
Respondent 6: *Measure at 18cm below waist.*
Respondent 7: This measurement was marked by mistake. (Note comment at upper hip girth)
Respondent 11: *This is 20cm below waist.*
Respondent 12: *20 cm down from waist.*

The descriptions of the respondents do not correspond with the international description. The respondents' descriptions refer to measuring at 20cm, and one respondent at 18cm, below natural waist. The international description refers to "midway between natural waist and hip level", which is more difficult to identify on the body, and it will also not be at a specified distance below the waist. From all the descriptions it is not clear where on the body this measurement should be taken and

it is surprising that none of the survey respondents experienced problems with the measurement. However, there seems to be agreement among most of the respondents about measuring at 20cm below waist, and this could explain why it is not identified as a problem measurement. When transferring the measurement to a pattern to determine the waist to hip curve, it should not present a problem if the measurement is consistently taken at this position, 20cm below natural waist.

Hip girth (103)

This measurement is very important when deriving sizing systems and as a size designation for lower body garments because it is the maximum circumference on the lower body. It is used for drafting patterns for trousers and skirts, and it is also necessary for the manufacturing of fit dummies. This measurement is used for the manufacturing of lower body garments and can also be useful for the manufacturing of fit dummies. This measurement is used by 73,35% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, nine indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the hip measured around the fullest part of the buttocks (SizeUK).
- ✓ The horizontal girth measured round the buttocks at the level of the greatest lateral trochanteric projections, with the subject standing upright (ISO 8559, 1989).
- ✓ The maximum circumference of the body at the level of maximum prominence of the buttocks (ASTM 5219, 1999).

It is clear that this measurement should be taken around the widest part of the lower body, and that the international descriptions correspond with each other in this regard.

Interview respondents' descriptions:

Respondent 1: *Around the widest part of the hips.*

Respondent 3: *Should be the fullest part of the hip. It is also important to determine the distance of the fullest part of the hip from waist.*

Respondent 4: *At the maximum hip.*

Respondent 6: *Measure at 30cm below waist.*

Respondent 7: *This is the circumference at the widest part of the hip area. Some women are wider at a lower point; can be up to 38cm below waist.*

Respondent 8: *This should be at the widest point of the hips.*

Respondent 11: *This is the widest part on the hips.*

Respondent 12: *Measure the widest part.*

Respondent 13: *Measure around the centre of the buttocks, widest area.*

The descriptions of the respondents do not correspond with each other nor with the international descriptions, although most respondents state that it should be measured around the widest part of the hips. One of the respondents states a specific distance of 30cm below natural waist. It is not really possible to measure at a specific distance below natural waist because on different bodies the widest part can be at a variety of levels below waist. This is supported by respondent 7, who states that the widest part can be up to 38cm below natural waist. It is however very important, as respondent 3 mentions, to also measure the vertical distance from the natural waist to the widest hip in order to be able to use the measurement at all. To locate the position on the pattern where the widest hip dimension has to be applied, the pattern maker will need the vertical distance as well.

Trunk circumference (body loop) (104)

This measurement is used for the manufacturing of garments covering the whole body, for example one piece swimwear, catsuits, overalls and diving suits, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 32,34% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five indicated that they used the measurement and one company experienced problems with the measurement.

International description of the measurement:

- ✓ Distance from the centre of the right shoulder length down the back, between the legs, over the projection of the right breast/nipple to the starting point (SizeUK).
- ✓ The distance, measured using the tape measure, from the right shoulder line, midway between the neck base and the armscye (acromion), with the tape measure passing down the back between the legs, through the projection of the right breast to the starting point (ISO 8559, 1989).
- ✓ The distance from the right shoulder line midway between the neck base and the shoulder joint, down the back through the crotch and over the projection of the right breast to the starting point (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: According to the questionnaire this company does not use this measurement. It is however listed on the measurement chart that they provided. It is measured *from neck point to neck point over the bust and through the crotch*.

Respondent 3: *Shoulder neck point over bust through crotch to shoulder neck point.*

Respondent 4: *Side shoulder to side shoulder around the body.*

Respondent 7: *We measure from the shoulder around. And some measure from mid-shoulder. For me it's always better to take it from the highest point and against the body.*

Respondent 11: *Side neck through crotch and up all the way.*

Respondent 12: *Side neck through legs and it is on the contour of the body.*

The descriptions of the respondents differ from the international descriptions with regard to the position on the shoulder from where the measurement should be taken. The respondents agree about taking the measurement from the side neck point instead of from mid-shoulder as the international descriptions suggest. Again, this should not present a problem if measured consistently from the side neck point. All three the international descriptions refer to taking the measurement from the right

shoulder. The interview respondents did not mention taking the measurement from a specific side of the body. To ensure consistency it is important to take all measurements from the same side on the body when doing a body measurement survey.

Centre trunk circumference (105)

This measurement could be useful for the manufacturing of garments that cover the full body, for example diving suits, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 20% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, four used the measurement and one of the respondents experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Distance from the nape between the legs to the base of the front neck (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Centre front neck through the crotch to nape.*

Respondent 4: *Supersternal notch to nape.*

Respondent 7: This measurement was not marked but the respondent indicated that it could be useful.

Respondent 11: *Centre front through crotch and up to nape.*

Respondent 13: Although this measurement was marked on the questionnaire, the respondent indicated that it was not used.

The descriptions of the respondents correspond with each other and also with the international description. Any measurement concerning the crotch is regarded as a sensitive measurement to take and therefore the accuracy with which the measurement can be taken is affected.

Armscye girth (106)

When drafting a bodice pattern, the armhole opening usually is formed automatically. This measurement is useful to compare the armscye on the pattern with the actual

body measurement. In this way it is also possible to check that pattern drafting methods are still applicable. It can also be useful for the manufacturing of fit dummies. This measurement is used by 50% of the survey respondents and two experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of right armscye measured from the underarm mid-point, around the arm, over the shoulder point and back to mid-point (SizeUK).
- ✓ The girth of the armscye measured using the tape measure passed through the underarm mid-point and vertically over the shoulder, with the subject standing upright with the arm hanging naturally (ISO 8559, 1989).
- ✓ With the arm hanging down, the distance from the shoulder joint through the front-break point, the armpit, the back-break point, and to the starting point (ASTM 5219, 1999).

Only one of the three international descriptions states that the measurement must be taken on the right side of the body. However, the descriptions do agree with regard to the landmarks. The ASTM description seems to be the most comprehensive.

Interview respondents' descriptions:

Respondent 1: *Top of the shoulder through under arm.*

Respondent 3: *Shoulder through under arm, not too tight.*

Respondent 4: No description given.

Respondent 7: *The other difficult measurement is the scye measurement, armhole. Are you going to take it right up into the armpit. Some people take that measurement with a chain, because then you can actually see where it is going. The chain is also useful for the other scye measurements.*

Respondent 9: *Measure around from the shoulder point through the underarm.*

Respondent 11: *Shoulder around through armpit.*

Respondent 12: No description given.

The descriptions correspond with the international descriptions. Using a chain to identify the armscye, as respondent 7 suggested, could be very useful and would also assist in identifying the landmark in other measurements involving the armscye, as well as the shoulder point.

Upper arm girth – straight (107)

This measurement is used when drafting sleeve patterns. This measurement is used by 47,06% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Maximum girth of the right upper arm measured with arm straight (SizeUK).
- ✓ The maximum girth of the upper arm at lowest scye level, measured with the subject standing upright with arms hanging naturally (ISO 8559, 1989).
- ✓ The maximum circumference of the arm usually midway between the elbow and the shoulder joint (ASTM 5219, 1999).

The international descriptions do correspond with each other. Again only one description refers to measuring on the right arm.

Interview respondents' descriptions:

Respondent 3: *Around the widest part of the upper arm, with the arm hanging naturally.*

Respondent 4: *Measure at the widest part of the upper arm.*

Respondent 7: *Bicep, at the widest part of the upper arm.*

Respondent 11: *This measurement was marked but it is taken with the arm bent.*

Respondent 12: Although this measurement was marked on the questionnaire the respondent stated that it was *taken with a bent arm*.

Respondent 13: *Around the biceps part, widest part of the arm.*

Two of the respondents marked the wrong measurement because they indicated that the measurement is taken with the arm bent, which is the next measurement. The other respondents agree on measuring around the widest part of the upper arm

which also corresponds with the international descriptions. However, the respondents do not mention measuring around the right arm like the SizeUK description does. As discussed earlier in this chapter it is important to take all measurements on the same side of the body. In most people the right side is more developed because most people are right-handed. It is therefore also important that specifically upper arm girth be measured around the right arm since the right arm is bound to be thicker than the left arm on the majority of people.

Upper arm girth – bent (108)

This measurement is used when drafting sleeve patterns. This measurement is used by 35,29% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Maximum circumference of right upper arm with arm bent at 90° and fist clenched (SizeUK).

Interview respondents' descriptions:

Respondent 1: *Midway around the upper arm with the arm bent.* The diagram provided with the measurement chart shows a straight arm though.

Respondent 3: *Around the widest part of the upper arm with the arm bent at 90°.*

Respondent 4: Not measured with a bent arm, although the measurement was indicated on the questionnaire.

Respondent 6: *Biggest top arm measurement, arm slightly bent.*

Respondent 11: *The widest part of the upper arm, with the arm bent.*

Respondent 12: *The widest part. We do it bent.*

The descriptions do not correspond with the international description because only one of the respondents mention bending the arm at 90° and none of the respondents mention measuring around the right arm. The others just refer to a bent arm. To ensure consistency when taking the measurement, it would be advisable to take the

measurement as the international description suggests, on the right arm and with the arm bent at 90°. This measurement is used by respondents that did not use the previous measurement around the straight arm. Respondent 3 was the only respondent that used both measurements. The straight arm girth was used for sleeve patterns for ladies, and the bent girth for sleeve patterns on menswear. This is probably because men are more muscular and therefore the difference between the bent and straight arm girth would be more significant.

Elbow girth – straight (109)

This measurement is used when drafting sleeve patterns. This measurement is used by 32,35% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ Circumference of right elbow with arm straight (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Around the protruding elbow bones with the arm hanging naturally.*

Respondent 4: *Measure at the elbow.*

Respondent 7: No description given.

Respondent 11: *This measurement was marked, but it is taken with the arm bent.*

Respondent 12: *Although this measurement was marked on the questionnaire, the respondent stated that it was taken with a bent arm.*

Respondent 13: No description given.

Two of the respondents indicated that the measurement is actually taken on a bent arm, which indicates that they did not read the questionnaire properly. The other description mentions that the arm must hang naturally. The international description states that it must be measured with the arm straight. It is not clear whether the term "straight" refers to the arm hanging naturally or having the arm really straightened. It would be important to clarify this before a survey is undertaken. Considering how the garment is worn, taking the measurement on the arm hanging naturally might be the

preferable method. The descriptions also do not mention taking the measurement on the right arm, which is another important aspect as discussed previously.

Elbow girth – bent (110)

This measurement is used for drafting sleeve patterns. This measurement is used by 41,18% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right elbow with arm bent at 90° (SizeUK).
- ✓ The girth of the elbow measured with the subject standing upright, the arm bent at approximately 90°, and the hand and fingers facing forward (ISO 8559, 1989).
- ✓ With the arm bent at 90° and the clenched fist placed at the hip, the circumference of the elbow (ASTM 5219, 1999).

The international descriptions correspond with each other although different positions are described for the hand. Only one of the international descriptions refers to measuring on the right side of the body. The description of the ISO of "the arm bent at approximately 90°" is probably more accurate since it might not be humanly possible for all bodies to bend the arm at exactly 90°, but they can bend as close to 90° as possible.

Interview respondents' descriptions:

Respondent 1: *Around the elbow with the arm bent.* The picture provided with the measurement chart however shows a straight arm.

Respondent 3: *Around the protruding elbow bones with the arm bent at 90°.*

Respondent 4: Not measured with a bent arm although the measurement was indicated on the questionnaire.

Respondent 7: *Take the measurement around a bent elbow.*

Respondent 11: *I would always take it as bent.*

Respondent 12: *Bent.*

The descriptions given by the respondents correspond with the international descriptions. Although only one respondent specifically state that the arm must be bent at 90°, it seems that the "bent arm" always refers to the arm bent at 90°. None of the respondents refers to measuring on the right arm, but as discussed earlier it is important for the sake of consistency and also because the right arm might be thicker than the left arm on most human bodies.

Forearm girth (111)

This measurement is used for sleeve patterns to determine the hem circumference on three-quarter sleeves. This measurement is used by 35,29% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Maximum circumference of the right forearm measured with the elbow at 90° (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Around the widest part of the forearm.*
Respondent 4: *Just below the elbow.*
Respondent 11: No description given.
Respondent 13: *Below the elbow.*

The descriptions given by the respondents do not correspond with the international description. The descriptions given by the respondents do not specify whether the arm must be bent and that the measurement must be taken on the right side. To ensure that the measurement is taken consistently it would be best to follow the international description.

Wrist girth (112)

This measurement is used for drafting sleeve patterns, and it is also necessary to determine the length of cuffs. This measurement is used by 61,67% of the survey

respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right wrist measured over the prominent wrist bone in line with the little finger (SizeUK).
- ✓ The girth over the wrist-bone measured with the arms hanging naturally (ISO 8559, 1989).
- ✓ The circumference over the prominence of the inner and the outer forearm bones (ASTM 5219, 1999).

It is clear that the international descriptions correspond, although the ASTM description mentions the inner forearm bones as an additional landmark. Again only the SizeUK states that the measurement must be taken on the right arm.

Interview respondents' descriptions:

Respondent 1: *Around the wrist, where the hand joins the arm.*
Respondent 3: *Around the protruding wrist bones.*
Respondent 4: *At the wrist over the wrist bone.*
Respondent 7: *Over the bone.*
Respondent 11: *Over the wrist bones.*
Respondent 12: *The wrist.*
Respondent 13: *Around the wrist, and over the wrist bones.*

The descriptions given by the respondents correspond with the international descriptions. None of the respondents mention taking the measurement around the right arm. It is an important aspect to consider, because taking the circumferences around the right arm could result in a wider sleeve pattern.

Thigh girth (113)

This measurement is used for drafting trouser patterns, to determine the leg width, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 36% of the survey respondents and none experienced problems with the

measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Maximum circumference of the right thigh (SizeUK).
- ✓ The horizontal girth measured, without constriction, at the highest thigh position, with the subject standing upright (ISO 8559, 1989).
- ✓ The maximum circumference of the upper leg close to the crotch (ASTM 5219, 1999).

The international descriptions do not correspond with each other. There is no agreement about the position on the leg where the measurement should be taken. The highest thigh position is not necessarily the maximum circumference. Only one of the descriptions refers to measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 1: On the questionnaire it is indicated that this measurement is not used. The measurement chart however shows the measurement as *taken around the widest part of the thigh.*

Respondent 3: *Just below the crotch, around the widest part of the thigh.*

Respondent 4: *Over the widest part of the thigh.*

Respondent 7: *Top thigh obviously is the widest.*

Respondent 11: *The girth around the widest part of the upper leg.*

Respondent 12: *Generally on the widest part.*

Respondent 13: *It is just below where the buttock comes into the leg. Measure as high up the leg as possible.*

There is no agreement among the respondents about where on the upper leg the measurement should be taken. Most of the respondents state that the measurement should be taken over the widest part of the upper leg; however, one respondent states that it should be taken at the highest position. Not one of the respondents refers to measuring on the right side of the body. The situation is therefore the same as with the international descriptions. Since there is no agreement about where the circumference should be measured, it is surprising that none of the survey

respondents experienced problems with the measurement. The explanation for this could be that the difference between the girth at the highest point of the thigh and around the widest part of the thigh is not significant.

Mid-thigh girth (114)

This measurement is used for drafting trouser patterns, specifically for tapering the leg and also to determine the hem circumference of shorts, and it can also be useful for the manufacturing of fit dummies. This measurement is used by 24% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, four indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right thigh measured midway between the crotch and knee levels (SizeUK).
- ✓ The horizontal circumference of the thigh measured, without constriction, midway between the hip level and the knee, with the subject standing upright (ISO 8559, 1989).
- ✓ Measure the mid-thigh circumference of the upper leg between the hip and the knee, parallel to the floor (ASTM 5586, 1995).

The international descriptions do not correspond with each other. They differ in that the SizeUK and the ASTM describe mid-thigh as midway between the hip and the knee. The ISO description takes mid-thigh at midway between the crotch and the knee. Again only one description mentions measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 4: *Halfway between the crotch and the knee.*
Respondent 7: No description given.
Respondent 11: *The middle from the widest part to the knee.*
Respondent 13: *In the middle of the thigh.*

The respondents do not agree on the level where mid-thigh is located and also do not correspond with the international descriptions. The respondents also do not mention

measuring on the right side of the body. The mid-thigh girth is not a critical measurement, but it is again surprising that although there is such variation in the descriptions to locate mid-thigh, none of the survey respondents indicated that they experienced problems with this measurement.

Knee girth (115)

This measurement is used for drafting trouser patterns and is especially important when shaping the leg for bootleg or bell-bottom styles. It can also be useful for the manufacturing of fit dummies. This measurement is used by 28% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right knee measured with leg straight (SizeUK).
- ✓ The circumference of the knee measured with the subject standing upright and the upper border of the tape measure at the tibial level (ISO 8559, 1989). With the leg straight, the circumference of the knee over the knee cap and parallel to the floor (ASTM 5219, 1999).

The international descriptions do not correspond with each other. The way that the knee is identified as a landmark varies, or is vaguely described. Again only one description mentions measuring on the right side of the body.

Interview respondents' descriptions:

Respondent 1: *Measured around the knee on a straight leg.*
Respondent 3: *Measure around the knee where it can bend.*
Respondent 4: *Knee circumference at the crease.*
Respondent 7: *Measure around the knee, with the leg straight.*
Respondent 11: *Around the knee, at the centre of the kneecap or in line with the crease.*
Respondent 13: *Around the knee.*

None of the respondents states that the measurement should be taken on the right leg. As discussed earlier in this chapter, this is important for consistency but also because measurements on the right side might be slightly larger and in this case would influence the width of trouser legs. The descriptions given by the respondents in some instances are vague and do not specify exactly how the knee is located, while the others do offer some ways of identifying the knee consistently. It is assumed that the measurement is taken on a straight leg, although not all the respondents indicated that the leg should be straight.

Lower knee girth (116)

This measurement could be useful for shaping the legs and to allow ease when making patterns for fitted trousers, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 14% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none of the respondents experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right leg measured immediately below the kneecap (SizeUK).
- ✓ The circumference of the knee measured with the subject standing upright and the upper border of the tape measure at the tibial level (ISO 8559, 1989).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Measured just below the knee.*
Respondent 4: *Circumference just below the knee.*
Respondent 11: *Narrowest part just under the knee.*

The descriptions given by the respondents correspond with each other and also with the international descriptions.

Calf girth (117)

This measurement is used to determine the circumference of the hemline on pedal pushers and capri pants. It can also be useful for the manufacturing of fit dummies. This measurement is used, by 26% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, six indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Maximum circumference of the right calf (SizeUK).
- ✓ The maximum circumference around the leg between the knee and ankle, parallel to the floor (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other, although only the one description states that it should be measured around the right leg.

Interview respondents' descriptions:

Respondent 1: This measurement was not marked on the questionnaire, but it is indicated on the measurement chart as *measured around the widest part of the calf*.
Respondent 3: *Around the widest part of the calf.*
Respondent 4: *Circumference at the widest part of the calf.*
Respondent 7: *At the widest point.*
Respondent 11: *The widest part of the calf.*
Respondent 12: *Widest part below the knee.*
Respondent 13: *Around the biggest part of the calf.*

The descriptions given by the respondents correspond with each other as well as with the international descriptions. None of the respondents states that the measurement should be taken on the right leg. As discussed previously it is important to measure the "bigger" side of the body and to do so consistently.

Minimum leg girth (118)

This measurement could also be useful for shaping the legs and to allow ease when making patterns for fitted trousers, and it could also be useful for the manufacturing of fit dummies. The measurement is used by 18% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, three used the measurement and none of the respondents experienced problems with the measurement.

International description of the measurement:

- ✓ Minimum girth of the right lower leg measured above the ankle (SizeUK).
- ✓ The minimum girth of the lower leg measured horizontally just above the ankle with the subject standing upright (ISO 8559, 1989).

It is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Around the smallest part of the leg.*
Respondent 4: *Just above the ankle bones.*
Respondent 11: *Narrowest point below the calf and above the ankle.*

The descriptions given by the respondents correspond with each other and also with the international descriptions.

Ankle girth (119)

This measurement is used for drafting trouser patterns and to determine the minimum width of tapered trousers. It can also be useful for the manufacturing of fit dummies. This measurement is used by 32% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right ankle measured over the centre of the ankle bone prominence (SizeUK).

- ✓ The circumference of the leg measured at the level of the centre of the ankle bone with the subject standing upright (ISO 8559, 1989).
- ✓ The circumference of the leg over the greatest prominence of the ankle (ASTM 5219, 1999).

Although only one description states that it should be measured on the right ankle, it is clear that the international descriptions correspond with each other.

Interview respondents' descriptions:

Respondent 1: *Over the ankle bones.*
Respondent 3: *Around the protruding ankle bones.*
Respondent 4: *The circumference around the ankle.*
Respondent 7: *Measure over the ankle bones.*
Respondent 11: *Measure over the ankle bones.*
Respondent 12: *At the narrowest point because it gives an idea of bone structure.*
Respondent 13: *Just above the ankle, about a centimetre above the ankle.*

The descriptions of the respondents do not correspond with each other. Two of the respondents describe the measurement as taken just above the ankle or around the narrowest point. These two descriptions do not correspond with any of the international descriptions. Even though the descriptions do not correspond, none of the survey respondents experienced problems with this measurement. The hemline of trousers is never tight fitting and therefore with the necessary ease added it accommodates some variation in the measurement. This could explain why no problems are experienced with the measurement, even though the descriptions of the respondents vary.

4.4.3.1 Summary of results regarding circumferences

Because of the importance of these measurements one would expect a high level of consensus among the international and also between the respondents' descriptions.

TABLE 4.6: SUMMARY OF RESULTS FOR CIRCUMFERENCES

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
90 Neck girth	18	2	Yes	No	No	No	Yes	No	Yes	Yes
91 Neck girth (Adam's apple)	11	2	Yes	Yes	No	No	Yes	No	Yes	Yes
92 Neck base girth *	14	3	Yes	Yes	No	No	Yes	No	Yes	Yes
93 Shoulder girth	11	1	Yes	No	Yes	No	Yes	No	Yes	Yes
94 Chest girth *	27	0	Yes	Yes	Yes	Yes	No	No	Yes	No
95 Bust girth *	24	0	Yes	Yes	No	No	No	No	Yes	Yes
96 Bust girth contoured	9	0	Yes	One description	One description	Yes	No	No	Yes	No
97 Underbust girth	17	0	Yes	Yes	Yes	Yes	No	No	Yes	No
98 Waist girth *	27	0	Yes	Yes	Yes	Yes	No	No	Yes	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
99 Preferred waist girth	10	1	No description	N/A	One description	N/A	Yes	No	No	No
100 Waist girth at belly button	15	0	No description	N/A	No	N/A	No	No	No	No
101 Upper hip girth	17	0	Yes	No	Yes	No	No	No	Yes	Yes
102 Top hip girth	17	0	Yes	One description	No	No	No	No	Yes	Yes
103 Hip girth *	25	0	Yes	Yes	No	No	No	No	Yes	Yes
104 Trunk circumference	11	1	Yes	Yes	Yes	No	Yes	No	Yes	Yes
105 Centre trunk circumference	9	1	Yes	One description	Yes	Yes	Yes	No	Yes	No
106 Armscye girth	17	2	Yes	Yes	Yes	Yes	Yes	No	Yes	No
107 Upper arm girth straight *	16	0	Yes	Yes	Yes	Yes	No	No	No	No
108 Upper arm girth bent	12	0	Yes	Yes	No	No	No	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
109 Elbow girth straight *	11	0	Yes	One description	No	No	No	No	No	No
110 Elbow girth bent	14	0	Yes	Yes	Yes	Yes	No	No	No	No
111 Forearm girth *	12	0	Yes	One description	No	No	No	No	No	No
112 Wrist girth *	21	0	Yes	Yes	Yes	Yes	No	No	No	No
113 Thigh girth *	18	0	Yes	No	No	No	No	No	Yes	Yes
114 Mid-thigh	12	0	Yes	No	No	No	No	No	Yes	Yes
115 Knee girth	14	0	Yes	No	No	No	No	No	Yes	Yes
116 Lower knee girth	7	0	Yes	Yes	Yes	Yes	No	No	No	No
117 Calf girth	13	0	Yes	Yes	Yes	Yes	No	No	No	No
118 Minimum leg girth	9	0	Yes	Yes	Yes	Yes	No	No	No	No
119 Ankle girth	16	0	Yes	Yes	No	No	No	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
Totals – Yes			**28** ***93,3%***	**17** ***56,7%***	**14** ***46,7%***	**12** ***40,0%***	**8** ***26,7%***	**0** ***0,0%***	**18** ***60,0%***	**12** ***40,0%***
Totals – N/A			**0** ***0,0%***	**2** ***6,7%***	**0** ***0,0%***	**2** ***6,7%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – No			**0** ***0,0%***	**6** ***20,0%***	**14** ***46,7%***	**16** ***53,3%***	**22** ***73,3%***	**30** ***100,0%***	**12** ***40,0%***	**18** ***60,0%***
Totals – No description			**2** ***6,7%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – One description			**0** ***0,0%***	**5** ***16,7%***	**2** ***6,7%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Total			**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**

Refer to addenda for further information

With regard to the availability and consensus of international descriptions, the following is clear from **Table 4.6**:

- ✓ Only one description 16,7%
- ✓ International consensus 56,7%
- ✓ No descriptions 6,7%
- ✓ No consensus 20,0%

Considering the importance of the girth measurements with regard to the sizing of garments, as well as for pattern drafting, it is alarming that for 26,7% of the circumferences there are no consensus or no descriptions available internationally.

With regard to the respondents' descriptions, the following is clear from **Table 4.6**:

- ✓ Consensus 46,7%
- ✓ No consensus 46,7%
- ✓ Only one description 6,7%

Because of the importance of these measurements one would have expected a much higher level of consensus among the respondents' descriptions. Uncertainty or confusion about taking the circumference measurements can only predict chaos with the fit and sizing of garments.

With regard to consensus among the international and the respondents' descriptions, the following is clear from **Table 4.6**:

- ✓ Consensus 40,0%
- ✓ No consensus 53,3%
- ✓ Not applicable 6,7% (because of no international descriptions)

It is a worrying fact that there seems to be consensus among the international and the respondent's descriptions for less than half of the circumference measurements. Since international descriptions are available for 93,3% of the circumference measurements, this result clearly shows that the respondents do not always agree with the international description of a measurement. It can also be an indication that the international description is vague and not clearly described, which leads to confusion and a different interpretation of the description by the respondents. This

has definite implications for the taking of consistent and accurate measurements, which further impacts on the drafting of well-fitting patterns.

It is surprising that problems are only experienced with 26,7% of the circumference measurements. One would have expected more of the measurements to be regarded as problem measurements, since there is no consensus and no international descriptions for 60,0% of the circumference measurements. The low number of problems experienced is not supported by the 60% of measurements with landmarking problems and 36,7% of measurements with problems related to landmarking together with no consensus. This could be an indication of ignorance or a "don't care" attitude towards problems with the circumference measurements. Another explanation could also be that, because the circumference measurements are commonly used everyday in the clothing industry, it could be that the problems with the measurements are so well-known and solutions for handling it have been established, and therefore the measurements are not seen as problem measurements.

The respondents' attitudes during the interviews were one of "people know how to take the measurements". But the results of this study seem to indicate that people are not so sure, and this is an indication of the dilemma in which the South African industry finds itself with regard to taking accurate standardised body measurements.

4.4.4 Other body measurements

To be able to compile a comprehensive list of body measurements needed by the clothing industry in South Africa, the widest possible spectrum of measurements was included in this study. This included arc measurements, head, hand and foot measurements.

From **Table 4.7** it is clear that these other body measurements are not used much. Due to low response from footwear, headwear and glove manufacturers, valid conclusions regarding these measurements were not possible. Therefore, the

measurements included in the following discussion are the ones specifically related to the manufacturing of garments.

4.4.4.1 Head measurements

Head height (147)

This measurement could be useful for the manufacturing of protective headwear. The measurement is used by 23,53% of the survey respondents and none experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ Distance between the high point of the crown of the head and the chin (SizeUK).

Interview respondents' descriptions:

Respondent 3: *Top of the head to the bottom of the chin.*
Respondent 4: *Length of the head up to the chin.*
Respondent 7: No description given.
Respondent 11: No description given.
Respondent 12: No description given.

A number of the respondents did not give any description, which is an indication of their uncertainty about how to take the measurement. The descriptions do correspond with the international description.

Crown of skull to brows (Vertex to glabella) (149)

This measurement was used by only one survey respondent, who also had a problem with the measurement. This respondent was included for the interview.

International description of the measurement:

Only one international description was found:

✓ The vertical distance from the vertex (crown of skull) to the glabella (brows). The subject sits erect with head in the Frankfort plane (Ergotech).

Interview respondents' descriptions:

Respondent 2: This measurement was not indicated on the questionnaire but during the interview the respondent mentioned that it was *necessary. It is measured from the centre of the head on top, over the forehead up to and in line with the brows.*

Respondent 4: *Top of the head to the eyebrows.*

According to the one description, the measurement is measured on the contour of the head, while the other description does not specify. The international description is however a straight vertical measurement. Again confusion regarding how exactly the measurement should be taken is the main cause for problems with this measurement, and also the fact that the respondents do not have the correct equipment to take the measurement with.

Head length (brow to back of skull) (152)

This measurement could be useful when making patterns for hooded upper body garments. It could also be useful to determine the distribution of the head girth around the head, in other words to determine the shape of the head. The measurement is used by 21,05% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ The horizontal distance between the glabella landmark (between the eyebrows) to the most posterior surface on the back of the skull (Ergotech).

Interview respondents' descriptions:

Respondent 3: *Front to back in a straight line, just above the brows to the back of the head.*

Respondent 4: *From the eyebrows to the back of the head.*

Respondent 7: No description given.
Respondent 11: No description given.
Respondent 12: No description given.

Again there are a number of respondents that do not give any description, which indicates that they do not have the knowledge how to take the measurement. The descriptions given do correspond with the international description.

Head width (above the ears) (154)

This measurement could be useful for the manufacturing of protective headwear. The measurement is used by 18,42% of the survey respondents and one experienced problems with the measurement. Of the 13 respondents interviewed, five used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

- ✓ The maximum horizontal breadth of the head just above the attachment of the ears. The subject sits erect with the head in the Frankfort plane (Ergotech).

Interview respondents' descriptions:

Respondent 2: *The production manager indicated that this measurement is not used and that it should have been the head girth.*
Respondent 3: *In a straight line from side to side, just above the ears.*
Respondent 4: *Width of the face in line with the top of the ears.*
Respondent 7: No description given.
Respondent 13: *Across the face, just above the ears.*

The descriptions of the respondents correspond with the international description.

Head girth (above ears) (158)

This measurement is used to determine the size of headwear. It is also an important measurement to consider for garments without an opening, for instance t-shirts. This measurement is used by 36,84% of the survey respondents and one experienced

problems with it. Of the 13 respondents interviewed, seven indicated that they used the measurement and none experienced problems with the measurement.

International description of the measurement:

Only one international description was found:

✓ The maximum circumference of the head above the ears (ASTM 5219, 1999).

Interview respondents' descriptions:

Respondent 2: *This measurement was mistakenly not marked on the questionnaire by the hat and cap manufacturer. It is however a very important circumference which is measured around the head above the ears and above the brows.*

Respondent 3: *Circumference of the head just above the ears.*

Respondent 4: No description given.

Respondent 7: No description given.

Respondent 8: *Typically just above the ear, around the widest point.*

Respondent 11: *Measure above the ears.*

Respondent 12: *Above the ears.*

Respondent 13: *Head circumference just above the ears.*

The descriptions given by the respondents correspond with the international description. This measurement is critical for the sizing of headwear. The head circumference measurement also has implications for the inclusion of neck fasteners in garments' necklines. With knitwear, and especially with children's and babies' garments, it is extremely important that the garment go over the head comfortably. The use of this measurement is necessary to ensure that the neck opening on such garments is large enough.

4.4.4.2 Foot measurements

Foot length (185)

This measurement is necessary for the manufacturing of one piece garments or lower body garments that include a closed foot, for instance Babygros. This measurement is used by 34% of the survey respondents and three experienced

problems with it. Of the 13 respondents interviewed, five indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Distance between the most prominent toe and the most prominent part of the heel on the right foot (SizeUK).
- ✓ With the subject standing barefoot, the distance from the most prominent part of the heel where it touches the floor to the end of the most prominent toe (ASTM 5219, 1999).

It is clear that the international descriptions correspond with each other, although only the SizeUK mentions measuring the right foot.

Interview respondents' descriptions:

Respondent 3: No description given.

Respondent 5: *From the back of the heel to the longest toe, straight.*

Respondent 7: No description given. Marked all measurements since no information on hands and feet are available.

Respondent 10: *Longest toe to the back of the heel.*

Respondent 12: No description given.

The descriptions correspond with the international descriptions; however, the respondents do not mention measuring the right foot as the SizeUK description does.

Instep girth (bridge circumference) (197)

This measurement is used by 26% of the survey respondents and five of the survey respondents using it experienced problems with it. Of the 13 respondents interviewed, five indicated that they used the measurement and two companies experienced problems with the measurement.

International description of the measurement:

- ✓ Circumference of the right foot at the highest point of the arch (SizeUK).

- ✓ The circumference at the bridge of the foot, measured across the navicular bone. The subject stands erect with the body weight evenly distributed between both feet (Ergotech).

The international descriptions correspond with each other, although only the SizeUK mentions measuring the right foot.

Interview respondents' descriptions:

Respondent 3: No description given.

Respondent 5: *Circumference around the bridge of the foot. Foot flat on the floor.*

Respondent 7: No description given. Marked all measurements since no information on hands and feet are available.

Respondent 10: *Girth around the bridge of the foot.*

Respondent 12: No description given.

The descriptions given do not clearly identify where the bridge of the foot is. Difficulty in identifying the exact position to measure is probably the reason why problems are experienced with this measurement.

4.4.4.3 Summary of results regarding other body measurements

It seems clear that the respondents were not familiar with these measurements or that they did not regularly use these measurements.

TABLE 4.7: SUMMARY OF RESULTS FOR OTHER BODY MEASUREMENTS

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
120 Bust arc anterior	1	1	Yes	Yes	One description	Yes	Yes	No	Yes	No
121 Waist arc anterior	1	1	Yes	One description	One description	Yes	Yes	No	Yes	No
122 Abdominal extensions arc anterior	0	1	Yes	One description	No description	N/A	Yes	N/A	Yes	N/A
123 Hip arc posterior	0	1	Yes	One description	No description	N/A	Yes	N/A	Yes	N/A
124 Seated height	0	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
125 Seated cervical height	1	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
126 Seated shoulder height	0	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
127 Seated waist height	1	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
128 Seated knee height	1	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
129 Popliteal height	0	0	Yes	One description	No description	N/A	No	N/A	N/A	N/A
130 Seated hip width	2	0	Yes	One description	One description	Yes	No	No	No	No
131 Seated thigh length	2	0	Yes	One description	One description	No	No	No	No	No
132 Seated waist girth	2	0	Yes	One description	One description	Yes	No	No	Yes	No
133 Seated hip girth	2	0	Yes	Yes	One description	Yes	No	No	No	No

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
134 Seated thigh girth	2	0	Yes	One description	One description	No	No	No	No	No
135 Seated knee girth	1	0	Yes	One description	One description	Yes	No	No	No	No
136 Body mass	4	0	Yes	Yes	No description	N/A	No	N/A	N/A	N/A
137 Shoulder blade skinfold	0	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
138 Triceps skinfold	0	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
139 Bust to waist drop	4	1	Yes	One description	One description	Yes	Yes	No	Yes	No
140 Hip to waist drop	5	0	No description	N/A	One description	N/A	No	No	Yes	**No**

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
141 Bust to underbust drop	4	1	No description	N/A	One description	N/A	Yes	No	Yes	No
142 Front neck depth	5	1	Yes	One description	One description	Yes	Yes	No	Yes	No
143 Back neck depth	5	1	Yes	One description	One description	Yes	Yes	No	Yes	No
144 Back seat angle	2	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
145 Shoulder slope	9	3	Yes	Yes	One description	Yes	Yes	No	No	No
146 Height (infants)	2	0	Yes	One description	One description	Yes	No	No	No	No
147 Head height	8	0	Yes	One description	Yes	Yes	No	No	No	No
148 Face length	2	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
149 Crown of skull to brows	1	1	Yes	One description	Yes	No	Yes	Yes	No	No
150 Chin to nose bridge	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
151 Chin to pit of neck	2	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
152 Head length	8	1	Yes	One description	Yes	Yes	Yes	No	No	No
153 Head width (cheekbones)	4	1	Yes	One description	One description	Yes	Yes	No	No	No
154 Head width	7	1	Yes	One description	Yes	Yes	Yes	No	No	No
155 Inter-pupillary distance	0	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
156 Sagittal arch	3	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
157 Surface distance from above the ears across the top of the head	2	1	Yes	One description	One description	Yes	Yes	No	No	No
158 Head girth *	14	1	Yes	One description	Yes	Yes	Yes	No	No	No
159 Hand thickness	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
160 Palm length	1	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
161 Hand length	1	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
162 Wrist to index finger	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
163 Wrist to thumb tip length	1	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
164 Thumb length	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
165 Index finger length	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
166 Middle finger length	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
167 Ring finger length	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
168 Little finger length	1	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
169 Hand width	1	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
170 Hand girth	1	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
171 Thumb girth	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
172 Index finger girth	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
173 Middle finger girth	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
174 Ring finger girth	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
175 Little finger girth	0	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
176 Height of foot arch	9	2	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A
177 Height of big toe	8	1	Yes	One description	One description	Yes	Yes	No	No	No
178 Toe height	8	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
179 Ball height	6	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
180 Plantar arch height	3	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
181 Dorsal arch height	5	3	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
182 Outside ball height	6	3	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
183 Ankle length	5	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
184 Posterior heel contour	6	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
185 Foot length *	17	3	Yes	Yes	Yes	Yes	Yes	No	No	No
186 Ball length	6	0	Yes	One description	One description	Yes	No	No	No	No
187 Fifth toe length	3	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
188 Outside ball length	5	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
189 Outside ball length diagonal	4	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
190 Width of three forward toes	4	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
191 Foot width diagonal	12	4	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
192 Foot width (ball width) *	12	3	Yes	Yes	One description	Yes	Yes	No	No	No
193 Width	8	0	No description	N/A	No description	N/A	No	N/A	N/A	N/A
194 Width of instep	9	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
195 Heel width	7	1	Yes	One description	No description	N/A	Yes	N/A	N/A	N/A

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
196 Instep *	7	2	Yes	Yes	One description	No	Yes	No	No	No
197 Bridge circumference	13	5	Yes	Yes	Yes	Yes	Yes	No	Yes	No
198 Foot girth (ball of foot)	13	4	Yes	One description	One description	Yes	Yes	No	No	No
199 Angle line	4	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
200 Flare	3	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
201 Proportion of sole in contact with ground	6	2	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
202 Lateral foot contour by template	4	1	No description	N/A	No description	N/A	Yes	N/A	N/A	N/A
Totals – Yes			**59** ***71,1%***	**8** ***9,6%***	**7** ***8,4%***	**23** ***27,7%***	**59** ***71,1%***	**1** ***1,2%***	**11** ***13,3%***	**0** ***0,0%***

Refer to addenda for further information

Measurement (* = key dimension)	Number of respondents using the measurement	Number of respondents indicating problems	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
Totals – N/A			**0** ***0,0%***	**24** ***28,9%***	**0** ***0,0%***	**56** ***67,5%***	**0** ***0,0%***	**54** ***65,1%***	**52** ***62,7%***	**54** ***65,1%***
Totals – No			**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**4** ***4,8%***	**24** ***28,9%***	**28** ***33,7%***	**20** ***24,1%***	**29** ***34,9%***
Totals – No description			**24** ***28,9%***	**0** ***0,0%***	**54** ***65,1%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – One description			**0** ***0,0%***	**51** ***61,4%***	**22** ***26,5%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Total			**83**	**83**	**83**	**83**	**83**	**83**	**83**	**83**

Refer to addenda for further information

With regard to the availability and consensus of international descriptions, the following is clear from **Table 4.7**:

- ✓ Only one description 61,4%
- ✓ International consensus 9,6%
- ✓ Not applicable 28,9% (because no international description was available)

For more than one quarter (28,9%) of the other body measurements there are no international descriptions available.

With regard to the respondents' descriptions, the following is clear from **Table 4.7**:

- ✓ Consensus 8,4%
- ✓ Only one description 26,5%
- ✓ No descriptions 65,1%

It seems clear that the respondents were not familiar with these measurements or that they did not regularly use these measurements, because for nearly two thirds of these other body measurements no descriptions were received from the respondents.

Problems were experienced with 71,1% of these body measurements. For only 1,2% of the measurements the problems were related to measuring straight or on the contour of the body and for 13,3% of the measurements problems were related to landmarking. Since the respondents gave descriptions for so few of these measurements, one would have expected problems with a larger number of these measurements. Problems seem to be mostly related to landmarking, but because of the limited feedback on these measurements it is not conclusive what the problems with these other body measurements are.

It seems that a wide variety of measurements are needed and are used in the South African clothing industry, and that an alarming number of problems exist with regard to the taking of these measurements – probably resulting in the consumer's current dilemma of not being able to find well-fitting garments.

4.5 SOUTH AFRICAN SIZING SYSTEMS (Objective 4)

The manufacturer of the fit dummies was not interviewed regarding sizing systems, block patterns, fit testing and wear testing (illustrated in **Figures 4.5 to 4.28**), since the company is not involved in the manufacturing of garments. Therefore the total number of respondents for the following results will be 12. It is however important to note that in some cases there were more than 12 responses because the respondents could give more than one answer, or less than 12 responses because the question was not applicable to all 12 of the respondents.

A study by Chun-Yoon and Jasper (1993) which compared international sizing systems, was used as the basis for the analysis of South African sizing systems. The South African sizing system will be described according to the following aspects:

- ✓ how it defines figure types or body shapes
- ✓ how it groups garment types
- ✓ how long the sizing system has been used
- ✓ where the sizing system originated
- ✓ how garment sizes are described
- ✓ which key dimensions are used for different garment types

4.5.1 Defining figure types or body shapes

From the results illustrated in **Figure 4.5** it is clear that the sizing systems being used in South Africa do not define figure type. Ten companies, including the three retailers, indicated that they do not differentiate between different figures and only cater for the average figure. Two manufacturers do provide for different heights. One retailer indicated that age is taken into account in the case of children's wear. One company made use of weight and age for infants. Three companies, one retailer and two manufacturers indicated that height and age are used in the case of children's wear. Three companies do provide for the fuller figure and one company provides for petite

or short figures. None of the companies define figure types by drop value (i.e. the difference between hip and bust circumference measurements) or body shape.

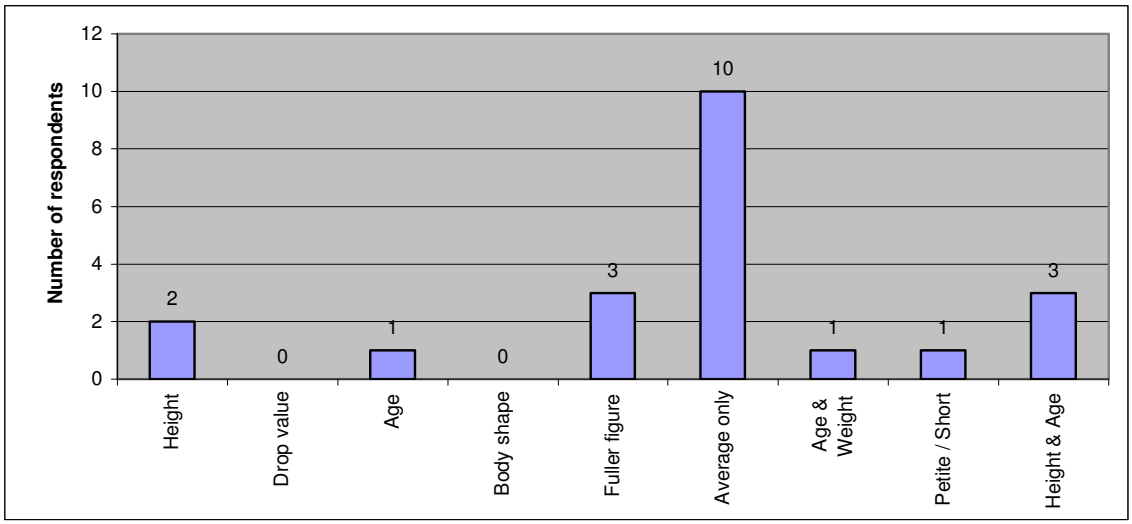

FIGURE 4.5: THE SA SIZING SYSTEM: DEFINING FIGURE TYPES

Drop value can assist in defining body shape. The international sizing systems studied by Chun-Yoon and Jasper (1993) classified female figure types in different terms although the same criterion were used, namely the drop value. The South African sizing system is not as sophisticated and this is confirmed by the fact that none of the companies use drop value or body shape to define different figure types. The use of height and age are mainly found in children's wear and it is more related to the size indication than to different height groups. It is not related to the changing of the body shape, proportions and posture with age. The average figure that the South African sizing system caters for, differs from one company to another, as will be discussed later. It is also true that the South African consumer is not as sophisticated as the international consumer, and the existing sizing system is already confusing. The general opinion is also that the market is too small for the sizing to be further split into different figure types and height groups. It would also complicate the distribution of stock to retail stores. This is precisely why a survey of the South African population measurements is so necessary. Only then will it be possible to establish exactly the shapes of the South African market. A proper survey of the body measurements of the South African population will not only provide accurate and current measurements, but also information on geographical distribution of the

population with regard to specific garment sizes. This will enable retailers to distribute garment sizes and styles more precisely to different locations, which will have a definite financial benefit for the retailers and manufacturers alike.

4.5.2 Classification of garments within the sizing system

Figure 4.6 illustrates how garments are grouped or classified. Two companies, one retailer and one manufacturer, group garments according to outerwear, underwear, lounge wear and swimwear, which is similar to the South Korean sizing system as discussed by Chun-Yoon and Jasper (1993). Six companies group garments by item or garment type, for example skirts, trousers, and so forth. One retailer groups garments according to formal wear, casual wear, outerwear and underwear. The other retailer groups garments according to smart wear, casual wear, active wear, lingerie, and each category divided into knitted or woven tops or bottoms. Shoes are grouped according to SAFLIA's classification.

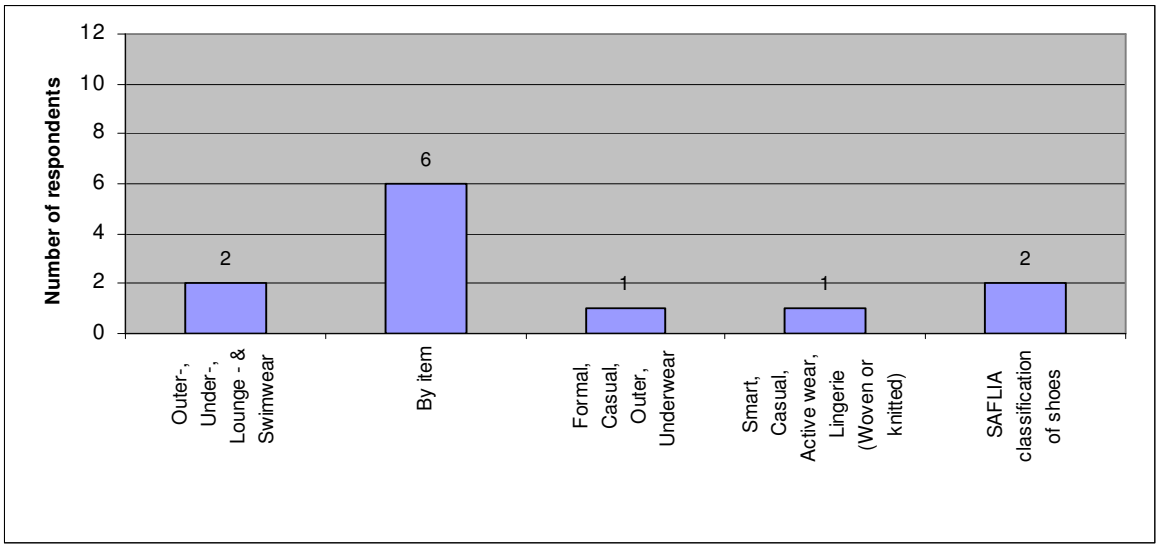

FIGURE 4.6: THE SA SIZING SYSTEM: GARMENT CLASSIFICATION

According to Chun-Yoon and Jasper (1993), most sizing systems classified garments into outerwear, underwear and other, and then sub-classified into upper-, whole, and

lower-body garments. In this study however, more of the respondents grouped garments by item, which is similar to the Japanese sizing system as discussed by Chun-Yoon and Jasper (1993). This means that size indication and key dimensions within the same grouping or classification of garments would be similar.

4.5.3 Origin and use of the sizing system in South Africa

From **Figure 4.7** it seems that the sizing system used in South Africa has been in use for a long time. Nine of the twelve companies indicated that the sizing system has been in use “forever”, or that they have “always” used it. Only three respondents did not know or, were not sure how long the sizing system has been used. It can be accepted that the sizing system used in South Africa has been in use for more than ten years, since more of the respondents have been in business for ten years or longer (see **Table 4.4**).

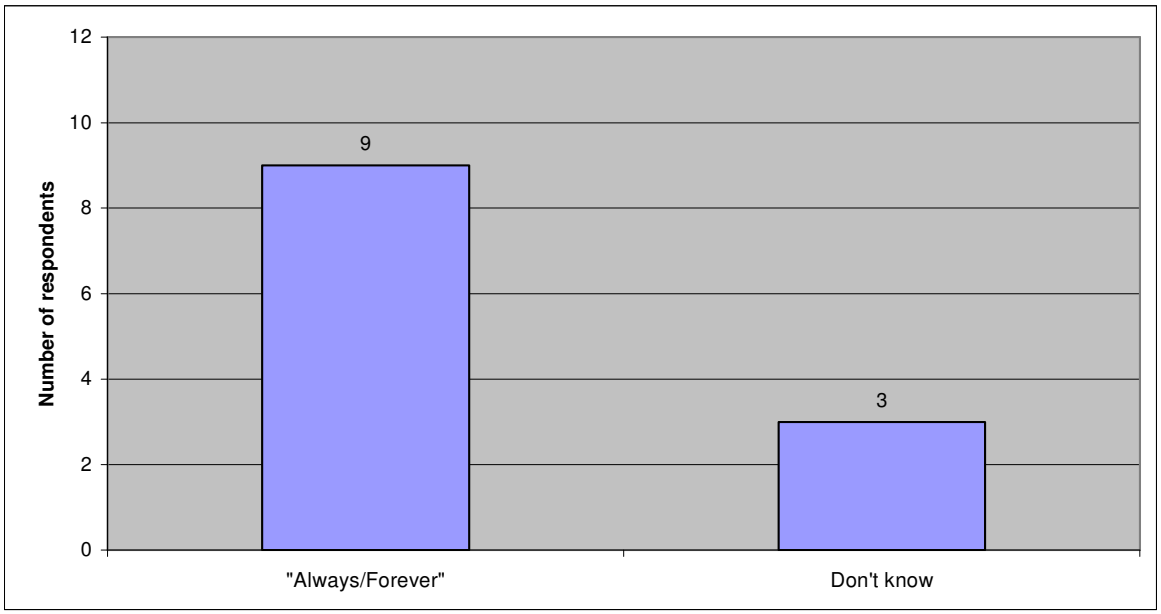

FIGURE 4.7: THE SA SIZING SYSTEM: HOW LONG HAS IT BEEN USED IN SA

The fact that the respondents do not really know since when the sizing system has been used, could be an indication of a don’t care attitude towards proper garment fit, since it is just another way of saying: “I don’t know.” It seems that the suitability of the

measurements of the sizing system is not considered, it is just accepted since it has been used "forever". This is obviously not necessarily an indication of a good or flawless system.

The sizing system in use in South Africa seems to be based on the British system as shown in **Figure 4.8**. Five companies indicated that the origin of our sizing system is British. Moritz (2000:40) also states that South Africa's sizing system has historically been based on the SizeUK charts. One manufacturer thought that the origin is a European system and another one, the manufacturer of diving suits, indicated that the sizing system is South African. The remaining five respondents were unsure of where the sizing system originated from. None of the respondents were of the opinion that the sizing system is of American or Japanese origin. The large number of respondents that do not know where the sizing system originated is a worrying aspect since this is an indication of ignorance, or a don't care attitude. The body size and shape of the population of the country where the sizing system was developed and the body size and shape of the South African population could give an indication of the applicability of the sizing system currently in use.

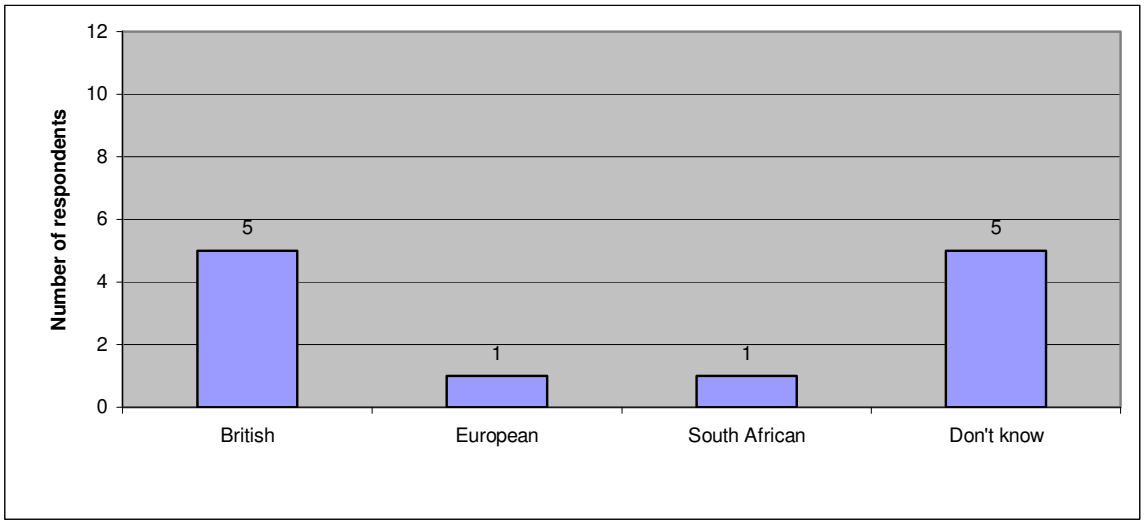

FIGURE 4.8: ORIGIN OF SOUTH AFRICAN SIZING SYSTEM

Measurements have been adjusted (see **Figure 4.9**) over time as changes were noticed in the South African consumer. According to Defty (1988:16), no rigid rules

can be applied to sizing charts. Seven respondents confirmed that the standard measurements supporting the sizing system are adjusted from time to time. All seven did however state that it was not done on a regular basis or at specific intervals. The remaining five respondents did not adjust the measurements. These five respondents included the hat and cap manufacturer, the footwear retailer, the footwear manufacturer and two clothing manufacturers who were more involved in the manufacturing of uniforms and corporate clothing, which could explain why they do not alter their standard size charts. Hats and caps are made from standard blocks and footwear is made on standard lasts, and therefore depended on the measurements used for the manufacturing of the equipment. Uniforms and corporate wear are not so much influenced by fashion and the fit has to stay consistent. Uniforms and corporate wear are supplied over longer periods and do not change as often as fashion garments. This explains why these five respondents indicated that their sizing charts are not adjusted.

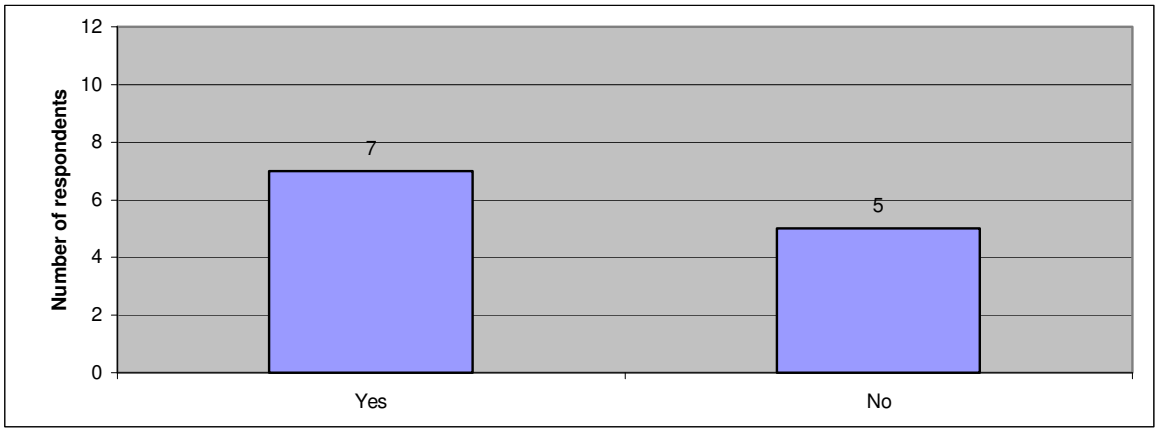

FIGURE 4.9: THE SA SIZING SYSTEM: ADJUSTMENTS OVER TIME

Although the South African system seems to be based on the British system, according to the respondents, the data behind the sizing system are South African as far as possible. This data is gathered through experimenting with measurement changes and experience of the South African consumers' preferences. Measurement surveys have been undertaken in the past by some retailers, but the information is not available for everybody in the clothing industry to use. Experimenting with the

measurements can be costly to the retailer and the manufacturer, because sales are lost when garments do not fit. This once again highlights the importance of an independent survey of the body measurements of the South African population.

The measurements of the size chart supporting the sizing system are adjusted for a variety of reasons and these are illustrated in **Figure 4.10**. Customer complaints are the most common reason for altering the measurements of the sizing system, with five companies listing that as a reason. Two companies based the changes on research (doing body measurement surveys). One company used feedback from fit testing, and three companies monitored their sales. This included investigating lost sales, as well as good sellers.

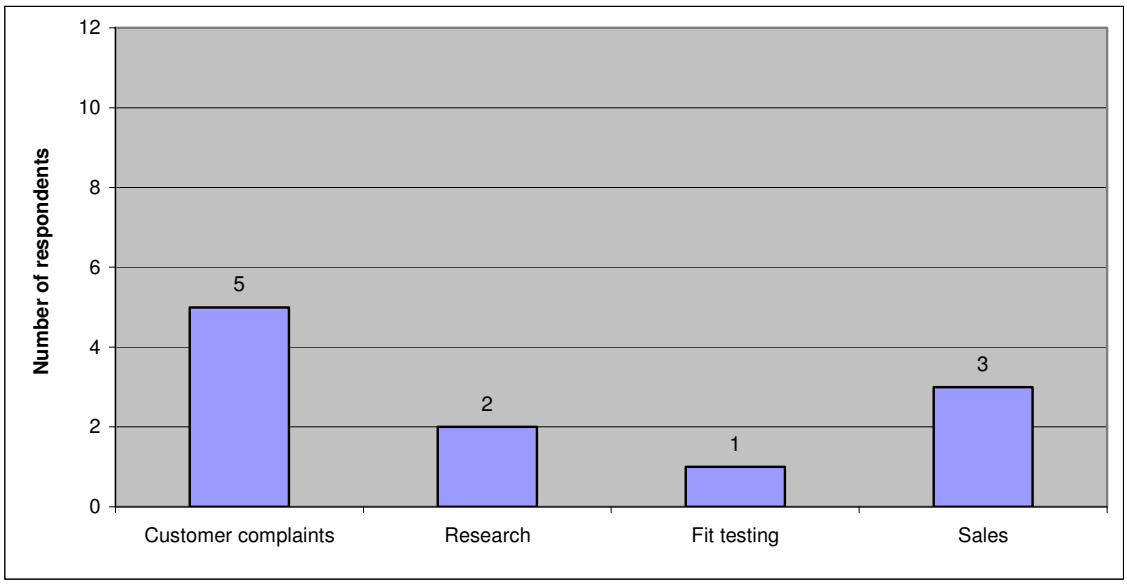

FIGURE 4.10: THE SA SIZING SYSTEM: REASONS FOR ADJUSTING MEASUREMENTS

It seems that customers play an important role in identifying the need for changes to the body measurements used in the size charts. Sales information also reflects customer satisfaction with the garments. Only two companies mentioned the use of research, which included measurement surveys and focus groups, to base amendments to the standard measurements on. This again highlights the need for a comprehensive South African body measurement survey with information that is

accessible to all the interested parties in the clothing industry. It is interesting that only one company makes use of fit testing for feedback regarding the body measurements. It might be worthwhile for all the companies to investigate the potential of gaining more information from fit testing, since it is done in any case.

4.5.4 Size designation

Consumers use size labels to establish the garment size before they try on the garment (Chun-Yoon & Jasper, 1993). Size designation will be illustrated and discussed according to garment type. **Figure 4.11** indicates that for sportswear or non-fitting garments, six companies make use of small, medium, large and so forth to identify the size of the garment. One manufacturer noted that in the case of children's wear, age is used to indicate size for this garment type.

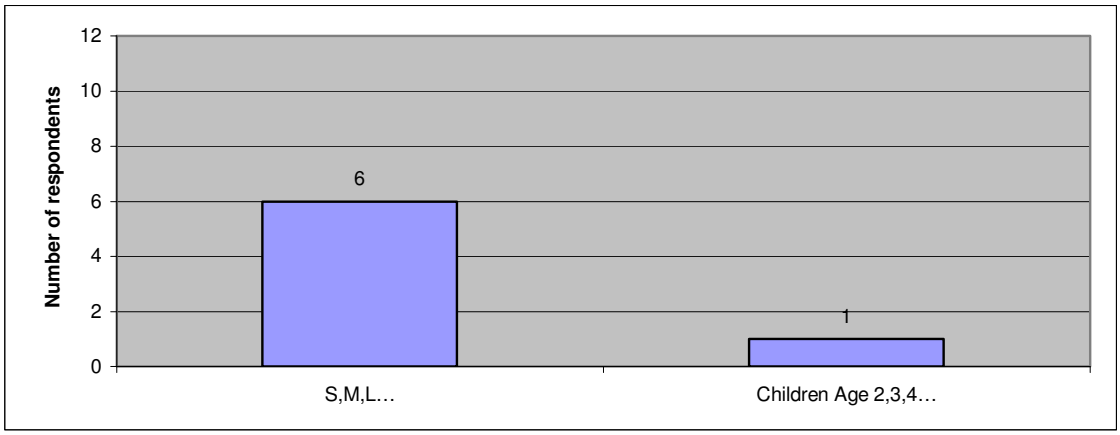

FIGURE 4.11: THE SA SIZING SYSTEM: SIZE DESIGNATION FOR SPORTSWEAR OR NON-FITTING GARMENTS

When clothes are loose fitting, fewer sizes are necessary to accommodate the whole population. Additional tolerance is built into a size to make it possible for individuals of different body measurements to fit into the same size, a medium for example. The use, availability and fashionability of stretch fabrics make this an acceptable size designation even for fitting garment styles, since the stretch fabrics can accommodate a variety of body measurements within one size.

For trousers, four companies use the codes 8, 10, 12, and so forth on ladies' trousers and/or 32, 34, 36, and so forth on ladies' as well as men's wear to indicate the size (see **Figure 4.12**). One retailer used both size codes together: 8/32, 10/34, 12/36 and so forth, on their ladies' wear trousers. For tailored pants, traditional men's suit sizes are used by two companies to indicate size. Two companies also indicated that men's waist measurement in centimetres, for example 76 or 81 and so forth is used to indicate the size of men's trousers. For children's trousers, age in years, for example 2, 3 and older, indicate the size of the trousers. These results are illustrated in **Figure 4.12**.

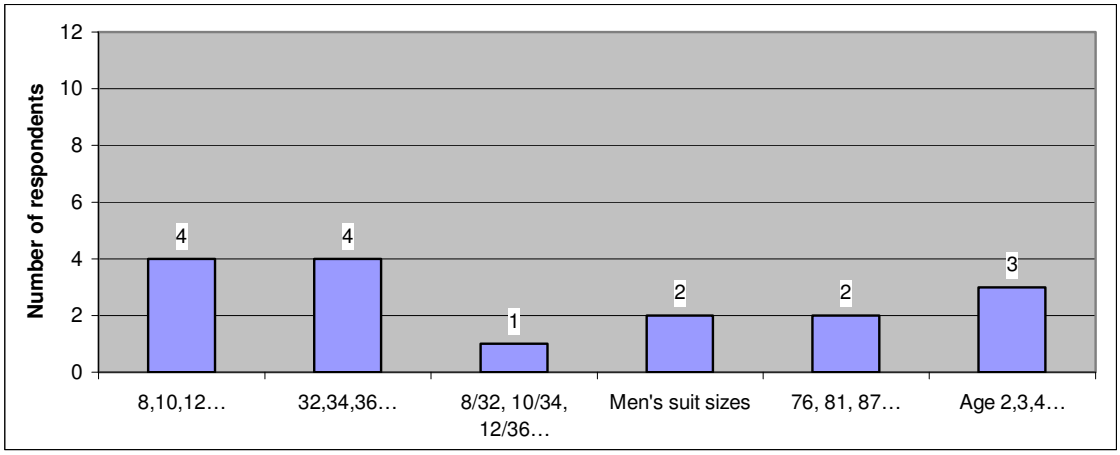

FIGURE 4.12: THE SA SIZING SYSTEM: SIZE DESIGNATION FOR TROUSERS

Figure 4.13 gives a breakdown of how sizes are indicated on skirts. Four companies use the symbols 8, 10, 12 and larger. Three companies still use 32, 34, 36 and larger. One retailer used both size designations (8/32, 10/34, 12/36 and so forth) to identify the size of their skirts. Only one manufacturer, making uniforms, uses hip circumference in centimetres to indicate skirt sizes. For children's skirts, age in years, for example 2, 3, 4 and older indicates size.

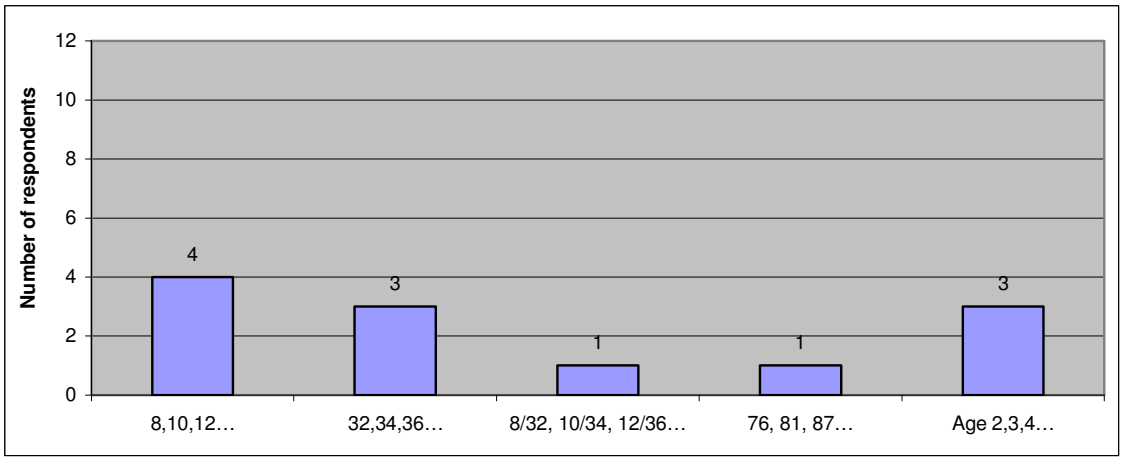

FIGURE 4.13: THE SA SIZING SYSTEM: SIZE DESIGNATION FOR SKIRTS

The size designation for upper body garments are illustrated in **Figure 4.14**. Four companies use the size codes 8, 10, 12 and larger to indicate the size of ladies' upper body garments. Three companies use 32, 34, 36 and larger to indicate the size of ladies' upper body garments. One retailer used both 8/32, 10/34, 12/36 and larger to identify the size of ladies' upper body garments. Five companies confirmed that for men's shirts the neck circumference in centimetres is used to indicate size, for example 38, 39, 40 and larger. Two companies indicated that traditional men's suit sizes are used for size identification on men's upper body garments. Two companies use chest circumference in centimetres to indicate the size of men's upper body garments. For children's upper body garments, three companies use age in years, for example 2, 3, 4, and older to indicate the size.

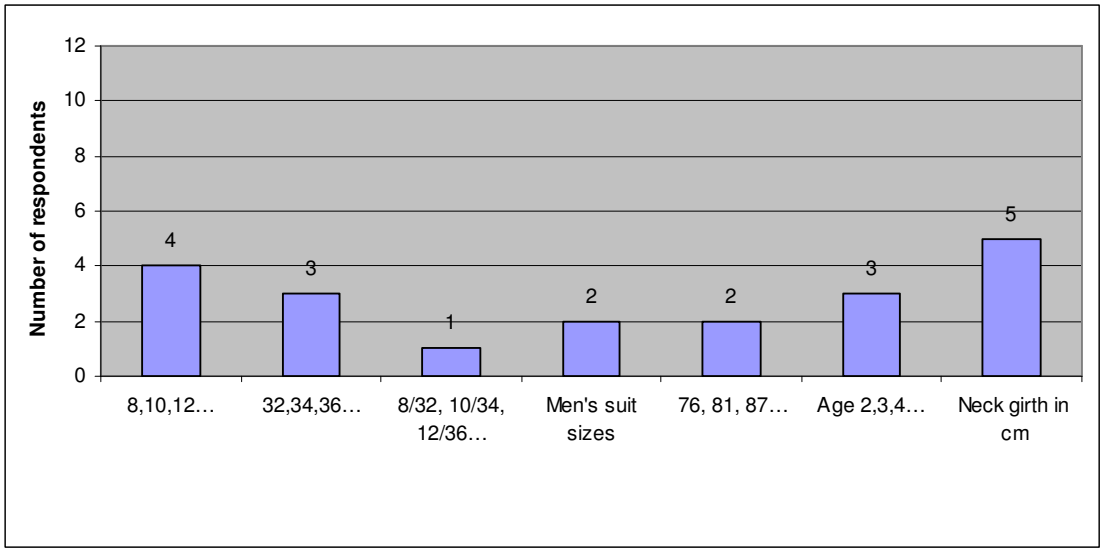

FIGURE 4.14: THE SA SIZING SYSTEM: SIZE DESIGNATION FOR UPPER BODY GARMENTS

It is clear from **Figures 4.12, 4.13 and 4.14** that in the case of trousers, skirts and upper body garments a numerical value is used to indicate the size on a garment. Women's sizes are labelled by arbitrary numeric codes which do not represent body measurements or age (Winks, 1997b:2 and Chun-Yoon & Jasper, 1993). This practise is confirmed by the South African companies, where the numerical size code on ladies' wear is not an indication of any specific body measurement.

In the case of men's wear the numerical code is related to the relevant body measurement for the garment type, for instance waist circumference in centimetres in the case of trousers and neck circumference in centimetres in the case of shirts. Traditional suit sizes are also sometimes used in the sizing of men's tailored pants and jackets.

It seems that infants' and children's wear are mostly sized according to age, regardless of whether it is loose fitting garments such as tracksuits or something more snugly fitting such as jeans. The numerical size code on children's wear therefore refers to the age group that the garment is supposed to fit. This confirms

Winks's (1997b:4) statement that children's and infants' clothing is often designated by age alone.

TABLE 4.8: THE SA SIZING SYSTEM: SIZE DESIGNATION FOR HATS AND CAPS

Garment type	Size designation		
Hats	Children and adult sizes: S, M, L and larger	Baby sizes: 0-6 months; 6-12 months; 12-18 months; 18-24 months	
Caps			Baby all fit; 2-6 years; 7-14 years; Adult all fit

Only one company manufactured hats and caps. The size designations for headwear are listed in **Table 4.8**. Caps often have an adjustable strap at the back, which makes it possible to fit a variety of head circumferences with just a few sizes.

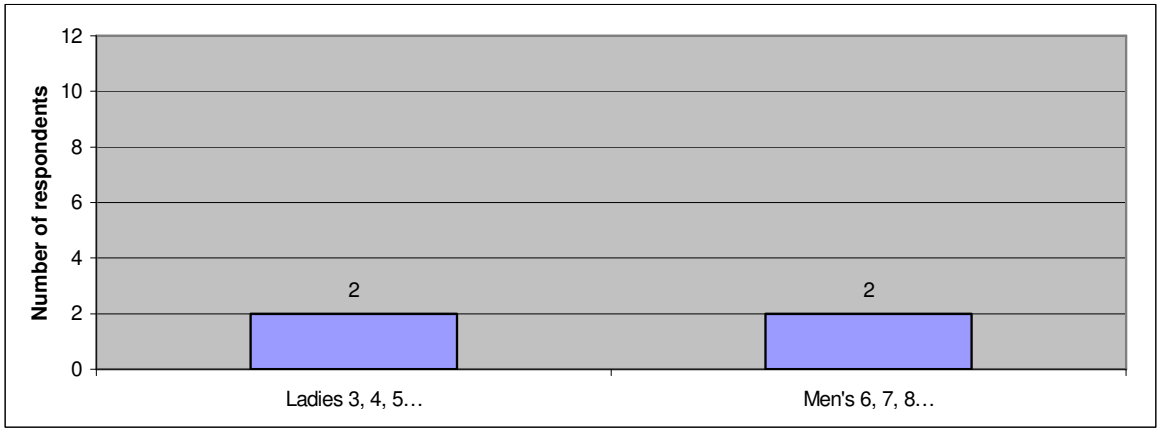

FIGURE 4.15 THE SA SIZING SYSTEM: SIZE DESIGNATION FOR SHOES

The shoe retailer and manufacturer both indicated that shoe sizes are for ladies' shoes from size 3 to size 9, and for men's shoes from size 6 to size 13. This is illustrated in **Figure 4.15.**

The shoe retailer noted that only some sport shoes are available in half sizes, which allow a bit of extra width in the shoe. According to the International Shoe Size Conversion Charts, the size designation used in South Africa seems to be similar to that used in the United Kingdom.

4.5.5 Key dimensions

Key dimensions are the suggested body measurements that can be used to describe the size of a garment (Chun-Yoon & Jasper, 1993). The ISO suggests that key dimensions be indicated on the size labels, but this is not the case in South Africa. The respondents were asked to name the critical measurements for pattern making and thus for ensuring a good fit.

The descriptions of the key dimensions were compared with regard to the following aspects:
Whether an international description was available;

- ✓ whether an international description was available;
- ✓ whether there was consensus among the international descriptions or only one international description;
- ✓ whether there was consensus among the respondent's descriptions, only one description or no description from respondents;
- ✓ whether there was consensus between the international and the respondents' descriptions;
- ✓ whether problems were related to no consensus about measuring straight or on the contour;
- ✓ whether problems were related to landmarking;
- ✓ whether problems were related to landmarking as well as no consensus.

Table 4.9 reflects the complete list of key dimensions identified by the respondents as well as the summary of the results from the above comparison.

TABLE 4.9: SUMMARY OF RESULTS FOR KEY DIMENSIONS

Key dimension	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
1 Height	Yes	Yes	Yes	Yes	No	No	No	No
3 Cervical height	Yes	No	No	No	No	Yes	No	No
4 Side neck height	Yes	One description	No	No	Yes	Yes	Yes	Yes
24 Centre back waist to ground	No description	N/A	No	N/A	No	Yes	No	No
28 Front waist to ground	Yes	One description	No	No	No	Yes	Yes	No
31 Outside leg length	Yes	Yes	No	No	Yes	Yes	Yes	Yes
32 Inside leg length	Yes	Yes	Yes	Yes	Yes	No	Yes	No
33 Trunk length	Yes	One description	No	No	Yes	Yes	Yes	Yes
34 Total crotch length	Yes	Yes	Yes	Yes	Yes	No	No	No
37 Body rise	Yes	No	No	No	Yes	No	Yes	Yes

Refer to addenda for further information

Key dimension	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
38 Back waist length	Yes	Yes	Yes	Yes	No	Yes	Yes	No
46 Side neck to breast point	Yes	Yes	Yes	Yes	Yes	No	Yes	No
56 Armscye depth	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
59 Shoulder to wrist	Yes	One description	No	No	Yes	No	Yes	Yes
60 Arm length bent	Yes	Yes	No	No	Yes	No	Yes	Yes
64 Under arm length	Yes	Yes	No	No	Yes	No	Yes	Yes
77 Shoulder width (back)	Yes	No	No	No	Yes	Yes	Yes	Yes
79 Across back width	Yes	No	No	No	Yes	No	Yes	Yes
80 Across front width	Yes	No	No	No	Yes	No	Yes	Yes
82 Bust width	Yes	Yes	Yes	Yes	Yes	No	No	No
92 Neck base girth	Yes	Yes	No	No	Yes	No	Yes	Yes
94 Chest girth	Yes	Yes	Yes	Yes	No	No	Yes	No
95 Bust girth	Yes	Yes	No	No	No	No	Yes	Yes
98 Waist girth	Yes	Yes	Yes	Yes	No	No	Yes	No
103 Hip girth	Yes	Yes	No	No	No	No	Yes	Yes

Refer to addenda for further information

Key dimension	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
107 Upper arm girth straight	Yes	Yes	Yes	Yes	No	No	No	No
109 Elbow girth straight	Yes	One description	No	No	No	No	No	No
111 Forearm girth	Yes	One description	No	No	No	No	No	No
112 Wrist girth	Yes	Yes	Yes	Yes	No	No	No	No
113 Thigh girth	Yes	No	No	No	No	No	Yes	Yes
158 Head girth	Yes	One description	Yes	Yes	Yes	No	No	No
185 Foot length	Yes	Yes	Yes	Yes	Yes	No	No	No
192 Foot width (ball width)	Yes	Yes	One description	Yes	Yes	No	No	No
196 Instep	Yes	Yes	One description	No	Yes	No	No	No

Refer to addenda for further information

Key dimension	International description	International consensus	Consensus among respondents	Consensus between International and respondents' descriptions	Problems – yes / no	Problems related to straight / contoured	Problems related to landmarking	Landmarking difficulties and no consensus
198 Foot girth (ball of foot)	Yes	One description	One description	Yes	Yes	No	No	No
Totals – Yes	**34** ***97,1%***	**20** ***57,1%***	**12** ***34,3%***	**15** ***42,9%***	**21** ***60,0%***	**9** ***25,7%***	**21** ***60,0%***	**15** ***42,9%***
Totals – N/A	**0** ***0,0%***	**1** ***2,9%***	**0** ***0,0%***	**1** ***2,9%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – No	**0** ***0,0%***	**6** ***17,1%***	**20** ***57,1%***	**19** ***54,3%***	**14** ***40,0%***	**26** ***74,3%***	**14** ***40,0%***	**20** ***57,1%***
Totals – No description	**1** ***2,9%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Totals – One description	**0** ***0,0%***	**8** ***22,9%***	**3** ***8,6%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***	**0** ***0,0%***
Total	**35**	**35**	**35**	**35**	**35**	**35**	**35**	**35**

Refer to addenda for further information

With regard to the availability and consensus of international descriptions, the following is clear from **Table 4.9**:

- ✓ Only one description 22,9%
- ✓ International consensus 57,1%
- ✓ No description 2,9%
- ✓ No consensus 17,1%

Because these are the key dimensions for pattern drafting and sizing of garments, it is alarming that for 20,0% of the measurements there are no international consensus or no international description. One would have expected international descriptions for all key dimensions, since they are so important for ensuring good fit.

With regard to the respondents' descriptions, the following is clear from **Table 4.9**:

- ✓ Consensus 34,3%
- ✓ No consensus 57,1%
- ✓ Only one description 8,6%

Again, it is alarming that for such a large number of key dimensions (57,1%), the respondents do not agree on the description of how and/or where the measurement should be taken. Because of the importance of the key dimensions, this finding is real cause for concern. This aspect needs serious attention from the industry, since these measurements are critical for providing a good fit in garments.

With regard to consensus between the international and the respondents' descriptions, the following is clear from **Table 4.9**:

- ✓ Consensus 42,9%
- ✓ No consensus 54,3%
- ✓ Not applicable 2,9% (because no international description was available)

It is a worrying fact that there seems to be consensus between the international and the respondents' descriptions for less than half of the key dimensions. Since international descriptions are available for 97,1% of the key dimensions, this result clearly shows that the respondents often disagree with the international descriptions.

It can also be an indication that the international description is vague with regard to landmarking and measuring method, which leads to confusion and a different interpretation of the description by the respondents. This has definite implications for the taking of consistent and accurate measurements, which further impacts on the drafting of well-fitting patterns.

From **Table 4.9** it is clear that the respondents experience problems with 60,0% of the key dimensions. This is an alarming number of problem measurements, which can only predict problems with the sizing and fit of clothing items. The industry clearly realises the problem by admitting to having problems with the key dimensions. It implies that the respondents from the industry probably value and are interested in having accurate body measurements, which highlights the need for a body measurement survey of the South African population.

From **Table 4.9** it is clear that problems are related to:

- ✓ Landmarking 60,0%
- ✓ Landmarking and consensus 42,9%
- ✓ Straight/contoured measurement 25,7%

It is clear that the problems are more related to landmarking, as well as landmarking and consensus. This has important implications for taking accurate body measurements and drafting well-fitting patterns, especially because the key dimensions are the foundation of the basic patterns. Once again, the importance of having clear and detailed descriptions on the identification of landmarks and measuring techniques is highlighted. Since the key dimensions are so important for proper fit and correct sizing of garments, it is clear that the situation regarding the descriptions of key dimensions needs serious attention from the clothing industry.

The key dimensions named by the respondents are now illustrated and discussed according to main garment types. A study by Simmons and Istook (2003:308) identified 16 body measurements, as identified by pattern making experts and textbooks, which were considered critical for the drafting of basic block patterns. In the discussion and interpretation, the identified key dimensions will also be compared

to the relevant measurements from the 16 identified for the study by Simmons and Istook (2003).

The key dimensions used for trousers are illustrated in **Figure 4.16**. For trousers, eight respondents used waist circumference as a key dimension. Seven respondents used hip circumference. All the retailers and manufacturers of garments (nine) listed outer leg length and eight listed inner leg length as key dimensions. One respondent noted that inner leg is used for men's trousers and outside leg for ladies' trousers. Crotch length is used by six of the respondents. Only one respondent indicated that rise height was a key dimension for trousers. Thigh girth was used by four respondents.

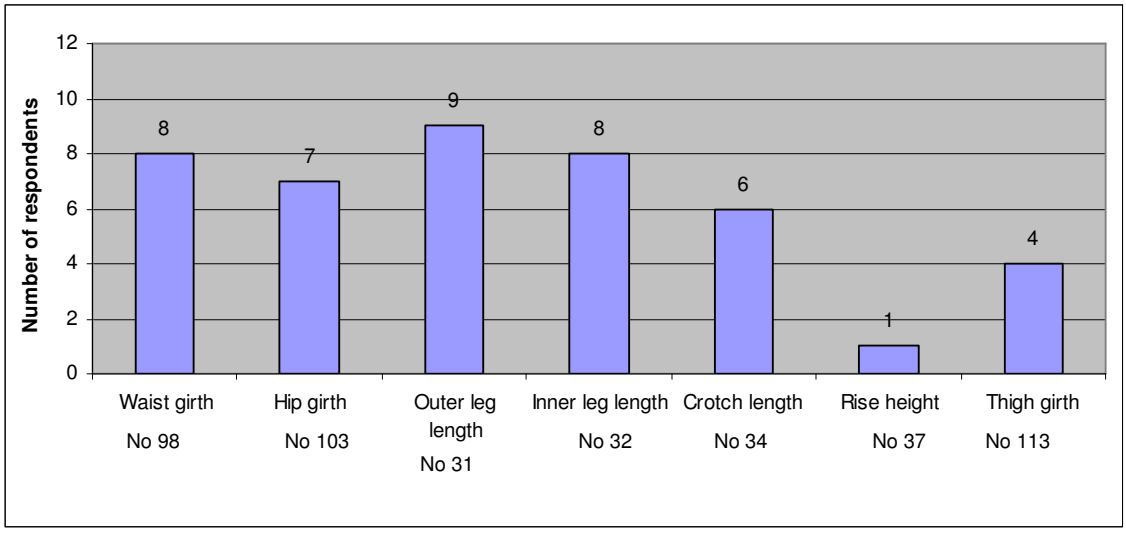

FIGURE 4.16: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR TROUSERS

The critical measurements identified by Simmons and Istook (2003) that would be applicable to trousers included waist by natural indentation/waist by navel circumference, hips/seat circumference, inseam, outseam, rise, crotch length and thigh circumference. The key dimensions stated by the respondents correspond with the critical measurements identified in the study by Simmons and Istook (2003). It is important to note that the respondents refer to the circumference at the natural waist and not at the level of the navel which is suggested as an alternative measurement

by Simmons and Istook (2003). Rise is however identified as a key dimension by one respondent only, which is a worrying fact. Rise is very important in order to distribute the crotch length and subsequently determine the curve of the crotch seam. The correct shape of the crotch seam is critical for the fit of trousers, and it is therefore surprising that more respondents did not regard the rise measurement as a key dimension.

The key dimensions used for skirts are illustrated in **Figure 4.17**. Five companies use waist as a key dimension and six companies use hip as a key dimension. Three companies indicated that centre back length of the garment is also necessary. Only one company listed centre front length of the garment as a key dimension. These however refer to garment measurements and not actual body measurements, although garment measurements are based on body measurements. Waist and hip girth are also the only ones among the 16 critical measurements identified by Simmons and Istook (2003) that are applicable to skirts.

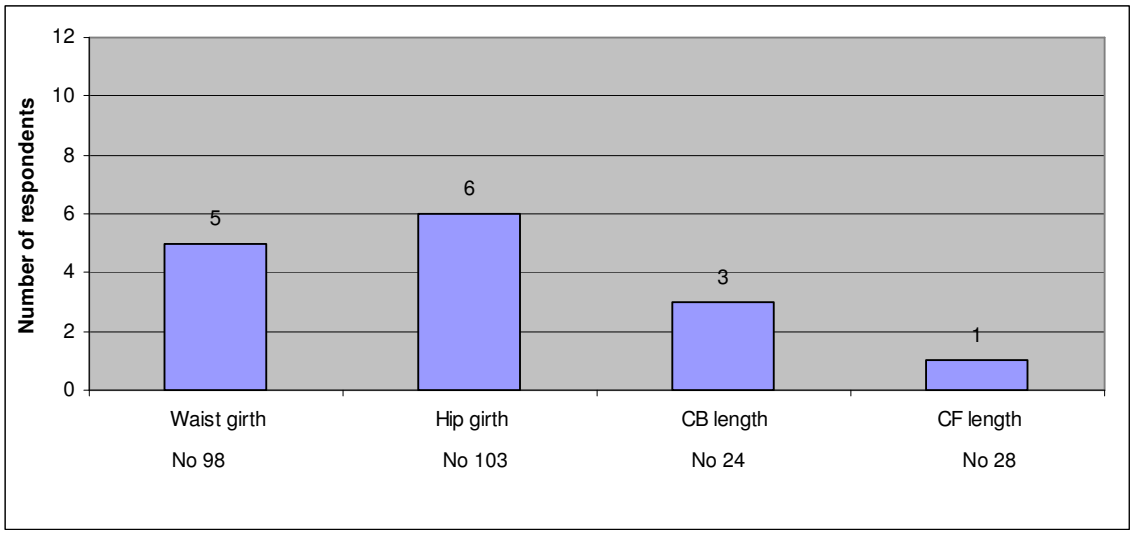

FIGURE 4.17: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR SKIRTS

Hip circumference, waist circumference and garment length (outer leg length for trousers) are the most used measurements for skirts and trousers, as suggested by

Chun-Yoon and Jasper (1993:34). If one refers to **Figures 4.15** and **4.16**, this is confirmed by the results from this study.

Key dimensions for upper body garments are illustrated in **Figure 4.18**. All the retailers and clothing manufacturers use bust or chest circumference as a key dimension for upper body garments. Waist circumference and hip circumference are used by six and seven respondents respectively. Bicep circumference is used by four and wrist circumference by one manufacturer. These two measurements are necessary when manufacturing tight fitting ladies' garments. Neck circumference was listed by five respondents and is critical for the manufacturing of men's shirts. Nape to waist was listed by one respondent and centre back length of the garment was listed as a key dimension by three of the respondents. Across back and across front were listed as key dimensions by three and two companies respectively. Overarm or sleeve length (measured differently) was noted to be a key dimension by four of the respondents. Two of the respondents use shoulder to shoulder as a key dimension. One respondent listed shoulder to bust point and bust point to bust point as critical measurements for ladies' wear. These measurements are important for the placement of pockets or embroidery on the front of ladies' blouses. One respondent also listed scye depth, forearm circumference and underarm length as key dimensions.

The critical measurements from the study by Simmons and Istook (2003) that would be applicable to upper body garments included mid-neck/neck base circumference, chest/bust circumference, waist by natural indentation/waist by navel circumference, hips/seat circumference, sleeve length/arm length, shoulder length, across-back, across-chest, back of neck to waist, biceps circumference, and wrist circumference. These measurements were also identified as key dimensions by the respondents, except for shoulder length, which refers to the distance from side neck to the shoulder joint (Simmons and Istook, 2003:313). A study by Chun-Yoon and Jasper (1996:90) also identified shoulder length as a key dimension for ladies' upper body garments. The respondents noted that shoulder to shoulder is a key dimension; however, the above two studies did not mention this measurement. Shoulder to shoulder could be critical for men's wear to aid in determining the corresponding garment measurement. This would be applicable to men's shirts and t-shirts that are

not really close-fitting. For ladies the appearance of the garment at the shoulder can determine the success of the garment, particularly in tailored jackets for instance. If the shoulder seams do not fit properly the garment can appear to be too small or too large, regardless of whether the bust dimension is correct. Therefore the shoulder length, from side neck to shoulder, is a critical measurement.

The respondents identified centre back garment length as a key dimension. Although only one respondent identified nape to waist as a key dimension, the centre back garment length would incorporate the nape to waist dimension. Garment length was also listed as a key dimension for ladies' upper body garments by Chun-Yoon and Jasper (1993:35).

Again, it must be noted that the respondents referred to the circumference at the natural waist, and not at the level of the navel, which is also suggested as an alternative measurement by Simmons and Istook (2003). The neck girth that the respondents referred to is also the neck base girth and not the mid-neck girth, which is suggested as an alternative measurement. The mid-neck girth is more applicable to men's formal shirts, since it is used as the collar measurement. The neck base girth is however more useful for ladies because of the variety of collarless garment styles (Simmons & Istook, 2003). The respondents also noted that bicep girth is especially important when manufacturing for the fuller figure. It seems that the upper arm is a problem area on the body and that little information is available regarding accurate measurements.

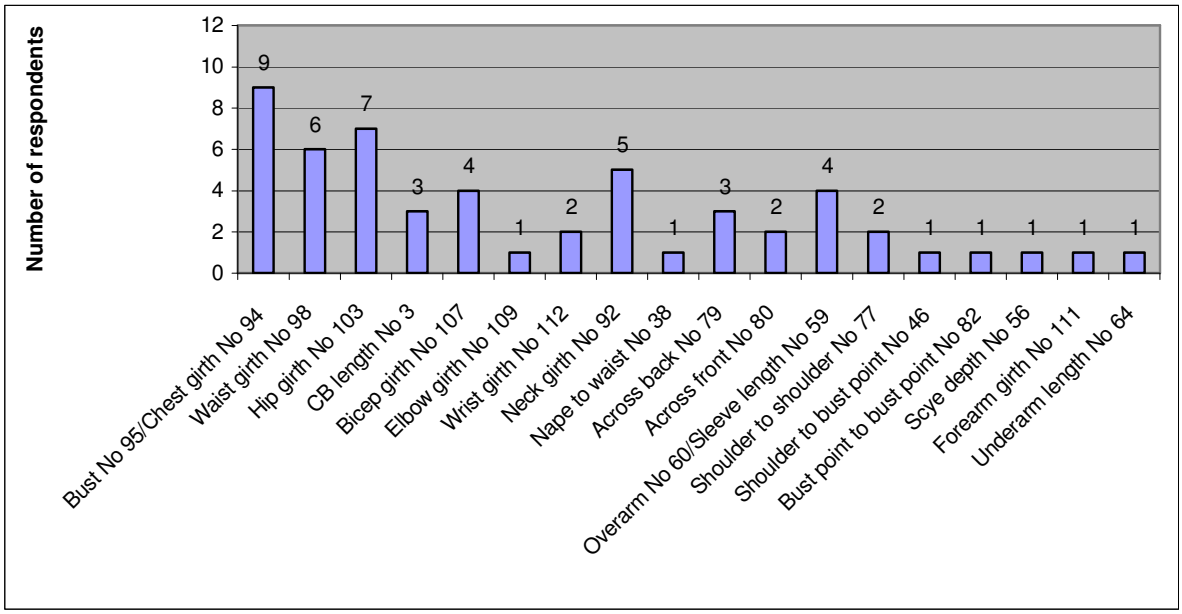

FIGURE 4.18: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR UPPER BODY GARMENTS

Measurements that are required for garments covering the whole body are illustrated in **Figure 4.19**. These measurements are required together with the key dimensions for upper body garments as well as trousers and skirts. One company noted that neck shoulder point to foot, and neck shoulder point to crotch are critical for making Babygros™. The other company stated that neck shoulder point to crotch and total height, were critical in the manufacturing of diving suits. These measurements are used together with the relevant measurements from lower and upper body garments as illustrated in **Figures 4.16, 4.17** and **4.18**, for instance bust, waist, hip circumference and garment length.

The measurements identified in **Figure 4.19** for full body garments were not included in the list of 16 critical measurements identified by Simmons and Istook (2003).

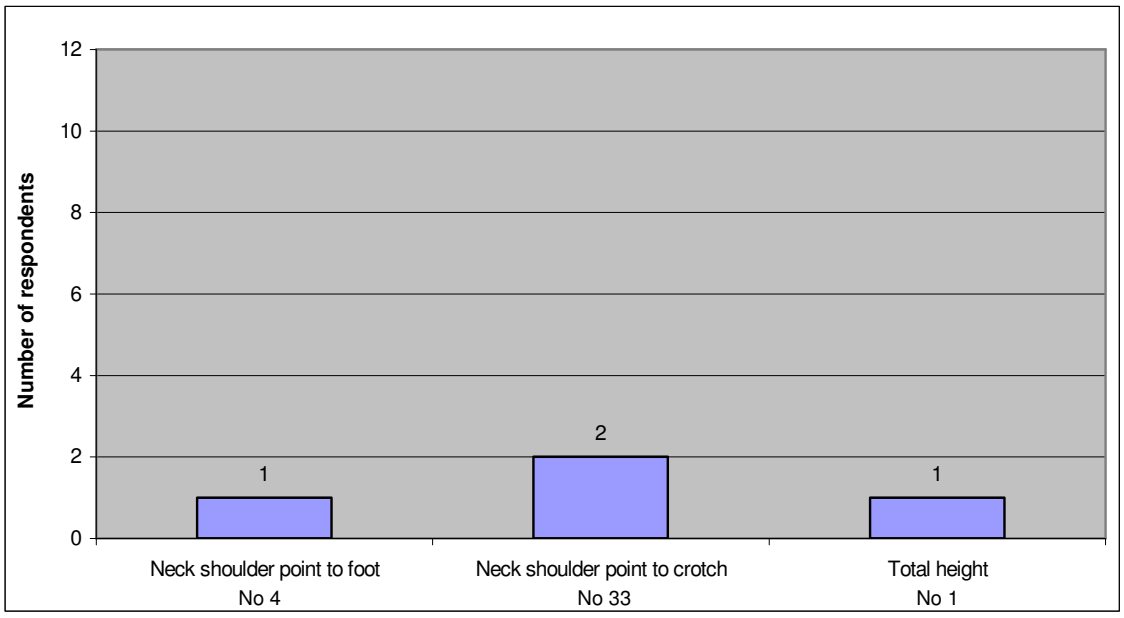

FIGURE 4.19: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR FULL BODY GARMENTS

The one hat and cap manufacturer confirmed Winks' (1990:22) statement that for the sizing of headwear a single body measurement – that of head girth – is sufficient to provide a range of fittings. This is illustrated in **Figure 4.20**.

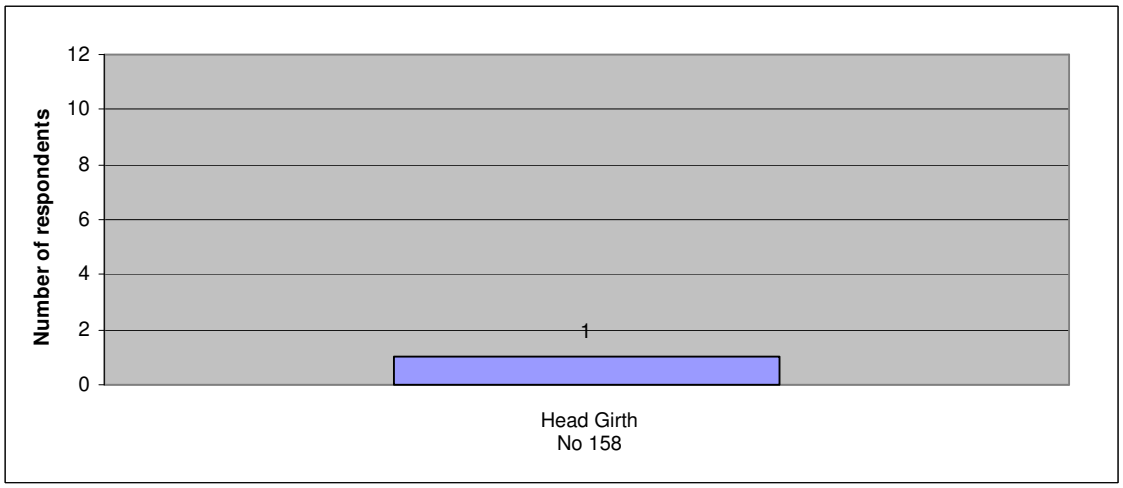

FIGURE 4.20: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR HEADWEAR

The key dimensions for footwear are illustrated in **Figure 4.21**. The shoe manufacturer listed foot length, foot width and instep girth as critical measurements. The shoe retailer listed foot length, instep girth and joint girth, or girth around ball of foot, as critical measurements.

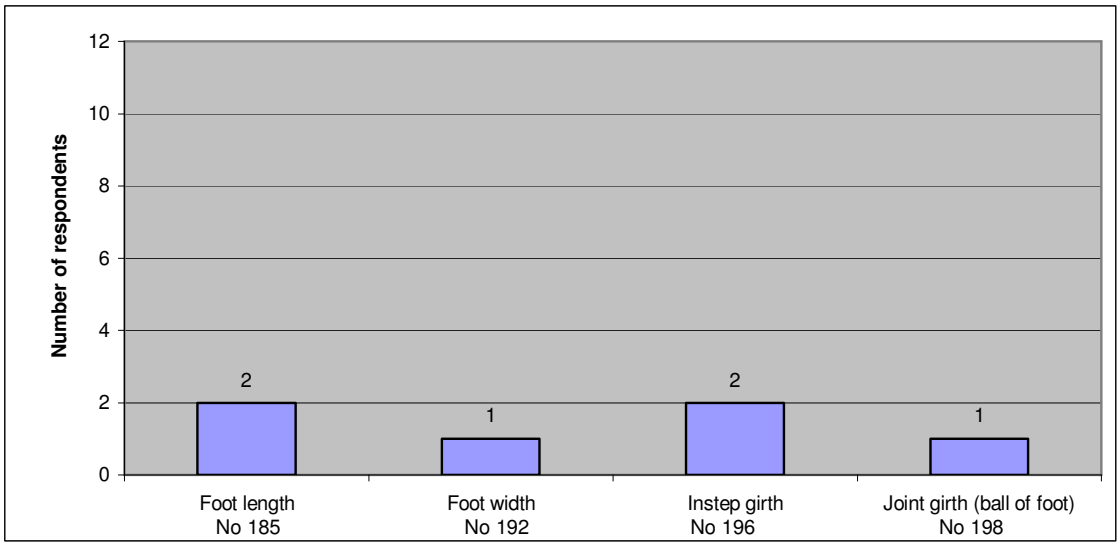

FIGURE 4.21: THE SA SIZING SYSTEM: KEY DIMENSIONS FOR FOOTWEAR

4.6 BLOCK PATTERNS (Objective 5)

The basic pattern is a simple pattern that fits the body with just enough ease for movement and comfort. It is sometimes called a master or foundation pattern and the drafted pattern is referred to as a block. The basic pattern is the starting point for pattern designing and it is the basis for fit of garments (LaBat & DeLong, 1990:44; Hollen, 1981:5).

One retailer developed the basic blocks and supplied them to their manufacturers. The other two retailers, as well as six of the seven clothing manufacturers, indicated that the manufacturers were responsible for developing the block patterns. The

headwear manufacturer used existing block patterns of which the origin was unknown. The shoe manufacturer and retailer both indicated that standard lasts were used for developing the patterns for shoes.

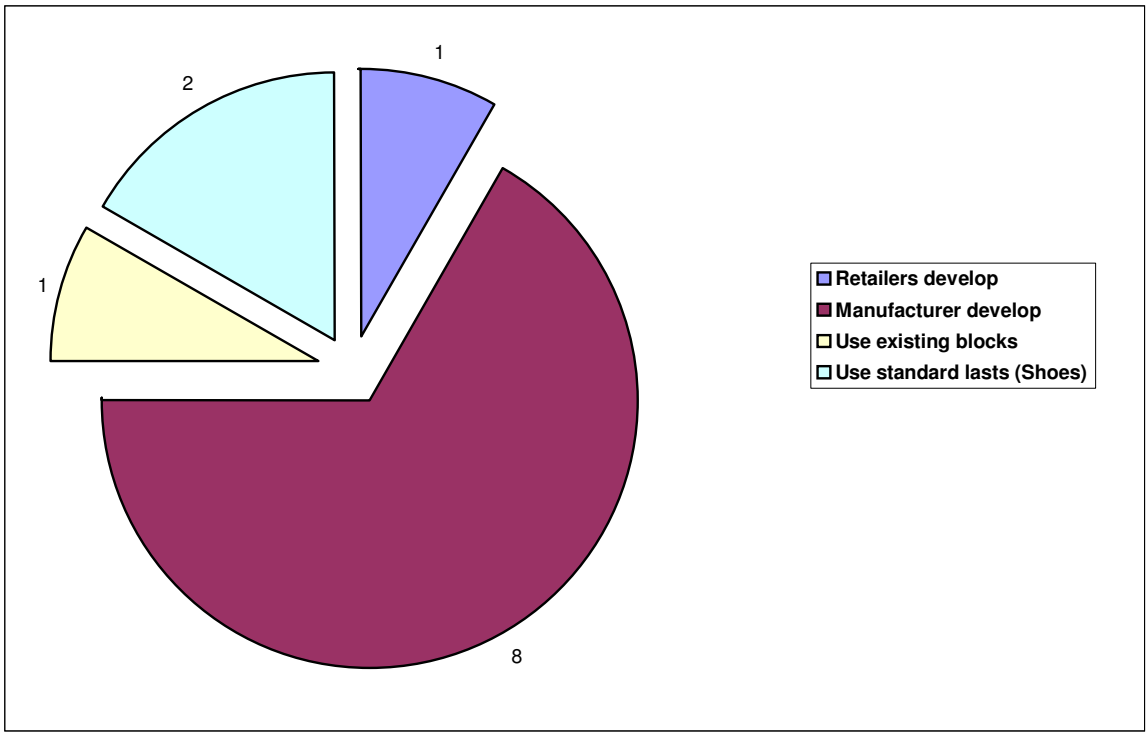

FIGURE 4.22: ORIGIN OF BASIC BLOCKS

The respondents were not willing to explain which method was used for drafting a basic or foundation pattern. It seems that existing patterns that have been used in the production of various styles are adjusted for the new styles every season. For instance, if a particular style of pants sells well in the current season, the necessary changes will be made to the pattern to accommodate the style changes for the new season. The pattern for a new style is not drafted from the basic or foundation pattern each time. This method is an economic and less time consuming way of drafting a new style. However, smaller problems with the fit are transferred to the pattern of the new style and may be enhanced by different fabrics.

4.7 FIT TESTING (Objective 6)

Testing for fit entails verifying that a garment designed for a specific size does indeed fit the dimensional specifications determined by the sizing system (Le Pechoux & Ghosh, 2002:26). A live model or a dummy can be used to verify whether a garment fits the measurement specifications (Fan, Yu & Hunter, 2004:33).

As illustrated in **Figure 4.23**, all twelve of the respondents do fit testing on their products. None of the companies interviewed fitted on a fit-model only. Two manufacturers fitted on the dummy only with no live person involved in the fitting. These were the footwear manufacturer, who fitted the shoes on the lasts, and the headwear manufacturer, who fitted the hats and caps on the blocks. The footwear department of the one retailer did fit testing by fitting only on staff members. Three different people from the staff, with the same shoe size are used to fit shoes. Foot shapes of the three people were however different. One of the retailers did fit testing both on the dummy and on a fit model, as well as fitting children's and infants' wear at schools and crèches. One ladies' wear manufacturer fitted on the dummy and on staff members. One manufacturer of infants' and children's wear and ladies' sleepwear, fitted on the dummy, staff and at schools and crèches. The other six companies made use of dummies as well as live models to do fit testing. These in-house models are employed by these companies for the specific purpose of fitting garments. The models' measurements were checked for consistency at regular intervals as illustrated in **Figure 4.25.**

According to Le Pechoux and Ghosh (2002:17), fit is subjective and therefore live models must be used to test for fit. Each person has personal preferences and the way a garment feels can vary with movement; that is why live model testing can be useful (Le Pechoux & Ghosh, 2002:31). The majority of respondents do use live fit models, together with dummies to do fit testing. Staff as well as children and infants at schools and crèches are other live persons used for fit testing. This proves the statement by Le Pechoux and Ghosh (2002:17) that these tests are not done in a standardised manner by industry and that the statistical significance may be very low.

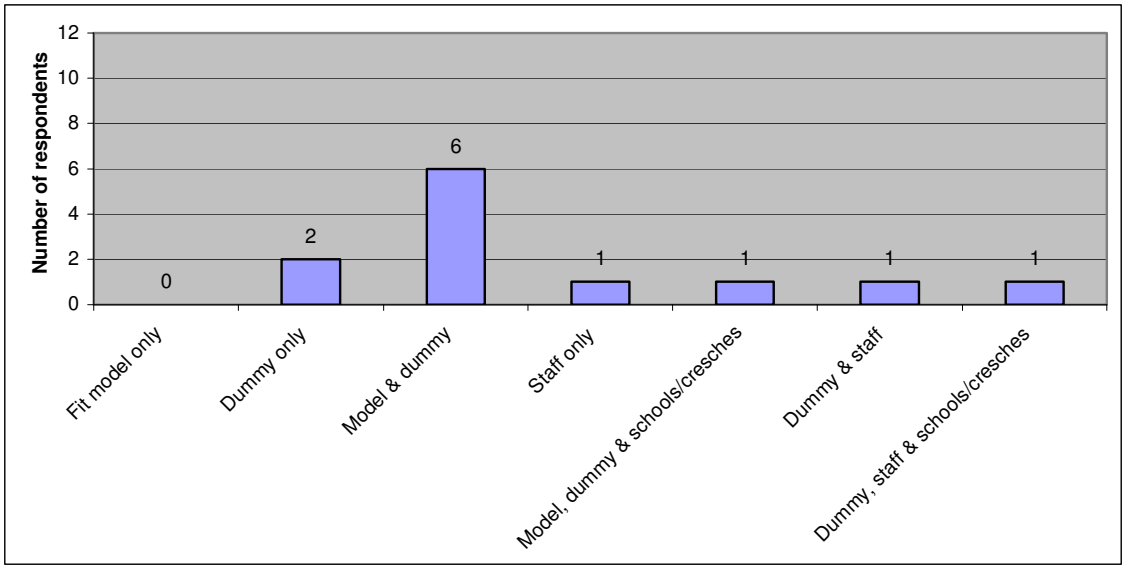

FIGURE 4.23: HOW FIT TESTING IS DONE

Le Pechoux and Ghosh (2002:26) suggest that fit testing can be done at the end of production as part of quality control. The South African companies, however, do fit testing before mass production commences. One retailer mentioned that fit testing is done before and after production. It is a good practice to ensure fit before production starts and also to check it again before the garments go into the stores.

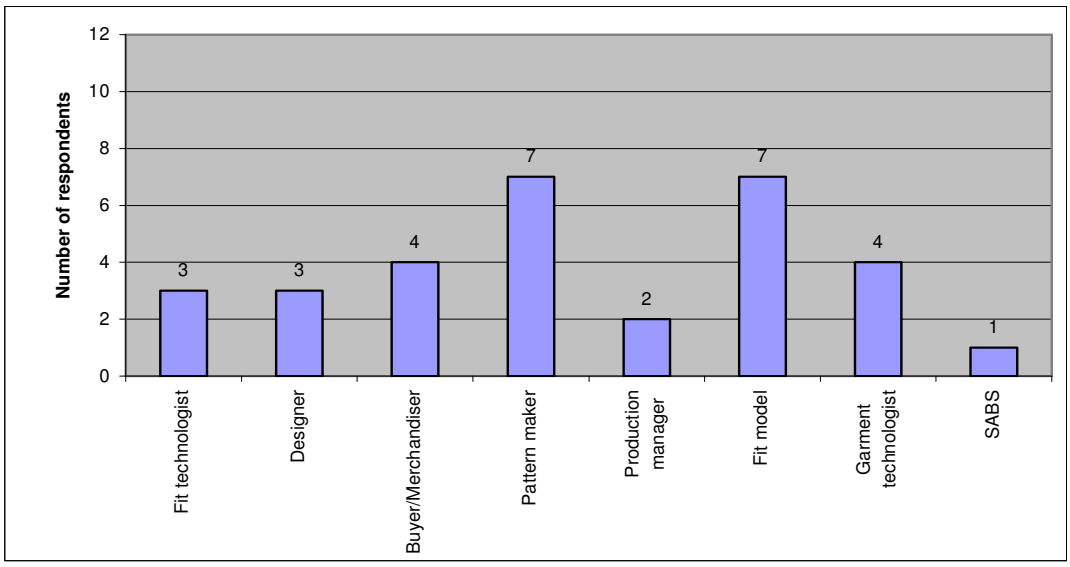

FIGURE 4.24: PEOPLE INVOLVED IN EVALUATING FIT

The people involved when fit is evaluated, are illustrated in **Figure 4.24**. The footwear manufacturer indicated that the fit of their products is evaluated by the SABS. For the manufacturers, fit of the garments was evaluated by the designer, pattern maker and technologists. For the retailers, fit was evaluated by the fit and/or garment technologists and the buyer. The pattern maker of the retailer that supplies block patterns to its manufacturers, also evaluated fit.

It is clear that the fit model, as well as the pattern maker, has an important role to play in fit testing. The model can give feedback on the comfort and movement of the garment. The pattern maker is equally important, since he/she has to interpret the feedback from the model and other experts in order to adjust the pattern. Fitting on dummies can be more objective because they provide ideal dimensions, but they are static and again part of the objectivity is lost due to the personal preference of each individual person involved in the assessment of fit (Le Pechoux & Ghosh, 2002:31).

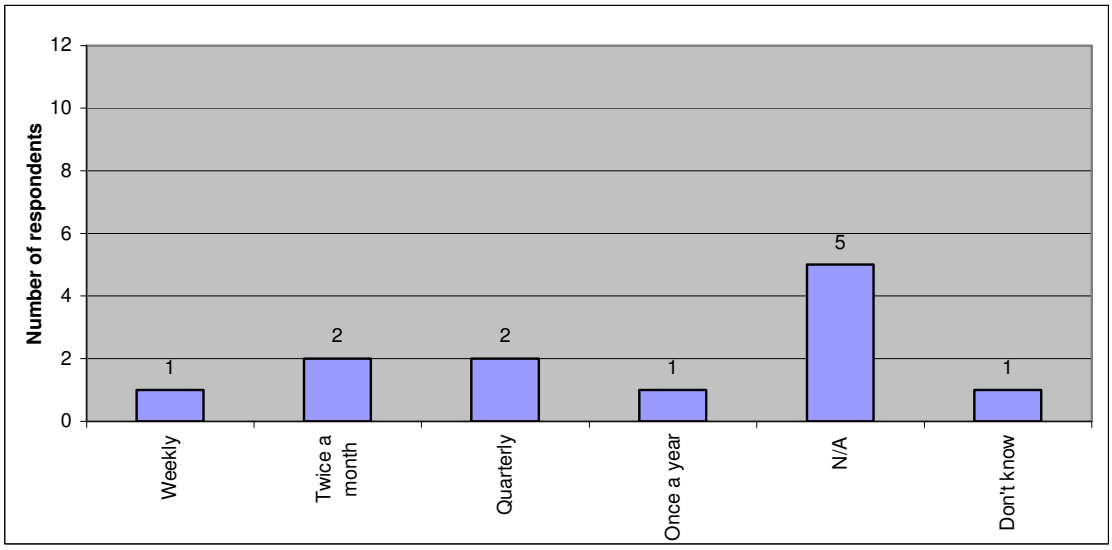

FIGURE 4.25: MEASUREMENT OF FIT MODEL

The measurements of employed fit models should be checked on a regular basis to ensure that it stays consistent, and this is illustrated in **Figure 4.25**. Five companies did not employ a fit model and measured on dummies and/or staff, and therefore the

question was not applicable to their situation. One company measured the fit models every week. Two companies, both retailers, measured the models at least twice a month. Two companies, one retailer and one manufacturer, measured the models on a quarterly basis. One company, a manufacturer, measured their fit models once a year only. One company did not know how often fit models were measured.

None of the respondents indicated measuring the fit models every six months. It seems that measuring of the fit models is not a priority in the industry, although it is very important to ensure consistency of the fit testing. The respondents seemed to rely on the stability of the fit model's body, since they did mention that the fit models were very good and that his/her body measurements did not vary much. One company did mention that they would fit a previous garment to check if the model has changed. According to Le Pechoux and Ghosh (2002:31), fitting on dummies can be more objective because they provide ideal dimensions. It is therefore very important to ensure that the live model's measurements have remained unchanged before every fitting. The model's measurements should at least be checked before every fitting.

The body shapes that are provided for are illustrated in **Figure 4.26**. Five companies indicated that they only provide for the average person. They did however not describe what this average person looks like. This could be because they were not willing to share the information or because they were themselves not sure what "average" meant. Four companies (including the dummy manufacturer) indicated that different retailers provide for different body shapes. Sometimes different shops within the same group will each target a different body shape. In other cases different clothing ranges within the same shop will target different body shapes. The dummy manufacturer confirmed this practice, since they manufacture the fit dummies used by all South African retailers and manufacturers. Defty (1988:16) also confirms this practice by stating that each manufacturer (and retailer) has what are to him/her "ideal" measurements. The other four companies were able to supply custom-made garments when required.

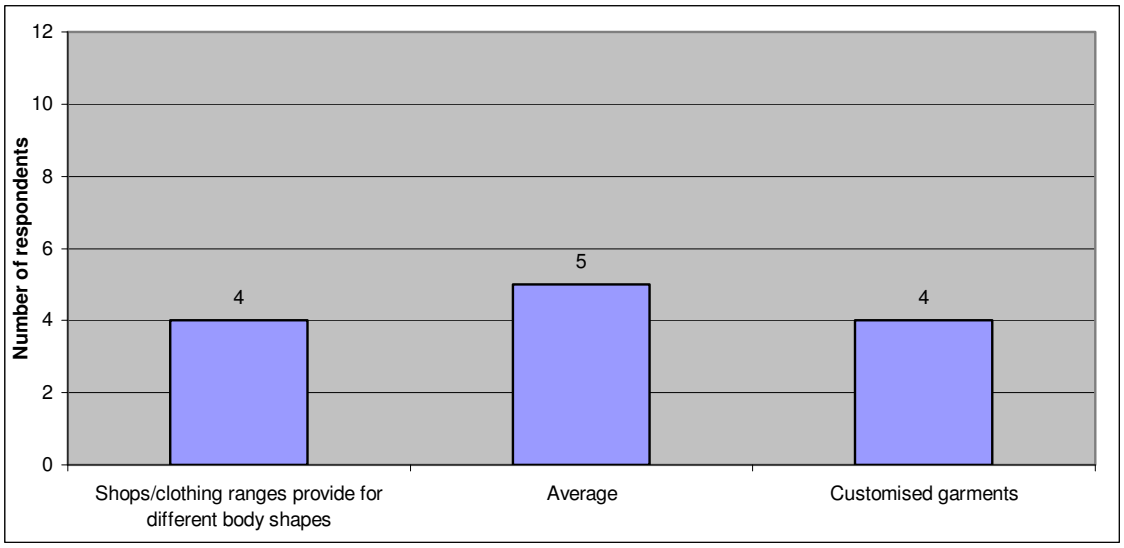

FIGURE 4.26: BODY SHAPES PROVIDED FOR

4.8 WEAR TESTING (Objective 7)

Nine of the 12 respondents indicated that wearer trials are done. This is illustrated in **Figure 4.27**. Three of the nine stated that wearer trials are done by the retailer or customer that they manufacture for. The three companies that did not do wearer trials included the shoe manufacturer, the hat and cap manufacturer, and the manufacturer of ladies' corporate wear.

From **Figure 4.28** it is clear that the main purpose of wearer trials is to evaluate fabric behaviour and performance. Nine companies indicated that wearer trials are done to test functionality and durability of the garment fabric. One company indicated that it is also done to test a style or colour. Two companies stated that wearer trials are only done when new fabric is used. Two retailers stated that wearer trials are only done in the case of high volume products. Only one company indicated that wearer trials are done to evaluate fit.

Wearer trials can be a valuable source of information regarding fit and fit changes over time (Ashdown, 2002). It seems however that the South African companies

focus mainly on performance characteristics of fabrics. It would be worthwhile to also pay some attention to the fit information that can be gained during the process.

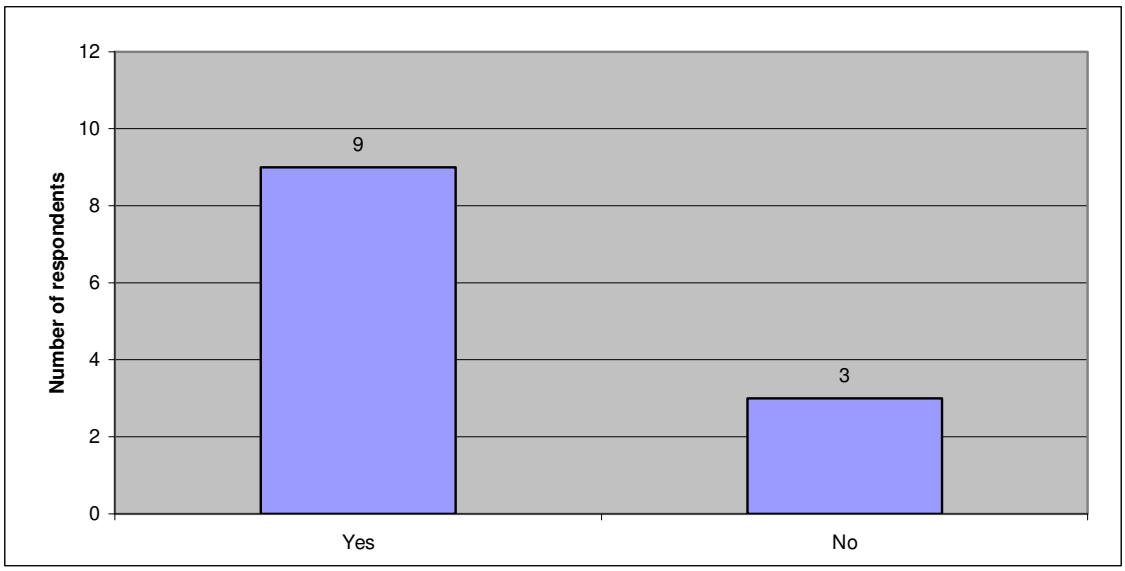

FIGURE 4.27: WEARER TRIALS

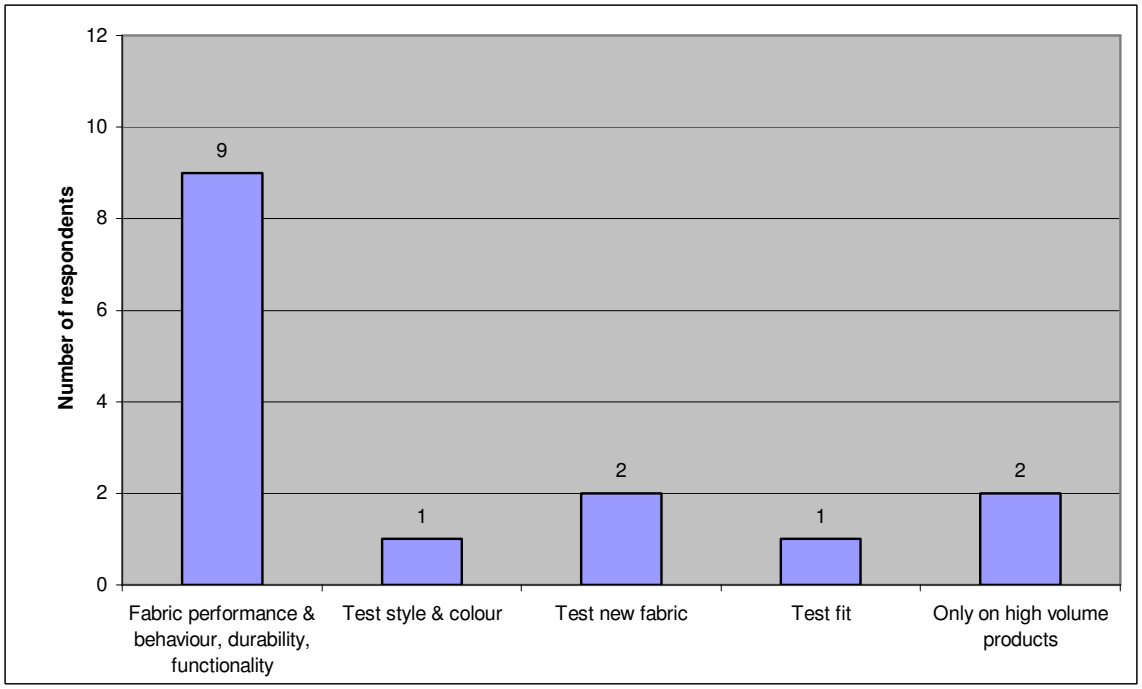

FIGURE 4.28: PURPOSE OF WEARER TRIALS

The respondents were not specific about exactly how the wearer trials are done. They vaguely mentioned that the garments are given to people to be worn and cared for according to prescribed instructions, for a specific period of time, usually a maximum of 14 days. The participating person has to evaluate the garment and it is then returned to the company to be evaluated as well. The criteria used for these evaluations vary according to garment type and end use.

Clearly the supply of well-fitting garments is of concern and of great importance to the South African manufacturers and retailers. Problems are however experienced and because of the risks involved there are no quick solutions to these problems.