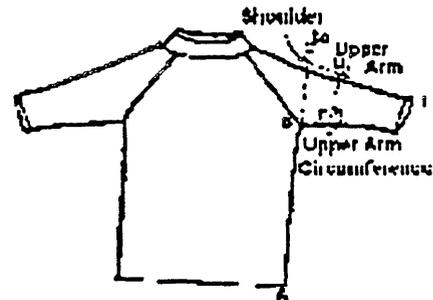


# Tab E

Measurement of Upper Arm

The final sleepwear amendments published in the Federal Register of September 9, 1996 describe the method to measure the upper arm as: measure at a line perpendicular to the sleeve extending from the outer edge of the sleeve to the arm pit. In examining this issue, the Commission staff **agrees that** constructing a garment to meet **this** measurement as described in the final standard will generally require the armhole to be too small and therefore, be uncomfortable to the wearer.

Therefore, effective immediately, the staff will exercise its enforcement discretion **by** measuring the upper **arm** measurement at a point between the **shoulder** and the elbow. The following figure shows how to determine the shoulder location. Measure by extending a line from side seam (A to B) to shoulder (C) of garment. Measure from this point down to the center fold of the sleeve (C to D) the distance specified in the chart below for the appropriate garment size. At this point the sleeve will be measured (perpendicular to the fold - D to E) and the measurement multiplied by 2 to determine the upper arm circumference measurement. This measurement must be less than or equal to the maximum upper arm circumference dimensions published in the final amendments in order to be considered tight-fitting at that point. These measurements were derived from the arm length measurements in the ASTM standards **D4910-95a** and **D5826-95** and the 1977 Anthropometric Study of U.S. Infants and Children conducted by the University of Michigan. The staff plans to modify the standard in the near future to incorporate this change.



<b>9-12mo.</b>	<b>12-18mo.</b>	<b>18-24mo.</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>6x</b>
<b>5.8cm</b> 2 1/8"	<b>6.6cm</b> 2 5/8"	<b>7.4cm</b> 2 7/8"	<b>7.4cm</b> 2 7/8"	<b>8.1cm</b> 3 1/4"	<b>8.8cm</b> 3 1/2"	<b>9.5cm</b> 3 3/4"	<b>10.3cm</b> 4"	<b>11cm</b> 4 3/8"
<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	
<b>11.4cm</b> 4 1/2"	<b>11.7cm</b> 4 5/8"	<b>11.9cm</b> 4 3/4"	<b>12.5cm</b> 4 7/8"	<b>12.8cm</b> 5"	<b>13.1cm</b> 5 1/8"	<b>13.7cm</b> 5 3/8"	<b>14.2cm</b> 5 5/8"	

You may immediately make garments based on this method of measurement.

Please contact Patricia **Fairall** at 301-504-0400 x 1369 or Marilyn Borsari at 301-504-0400 x 1370, if you have any questions.

Sincerely,

David Schmeltzer



United States  
CONSUMER PRODUCT SAFETY COMMISSION  
Washington, D.C. 20207

MEMORANDUM

DATE: March 31, 1998

TO : The File

Through: Andrew Stadnik, AED for Engineering Sciences  
Nick Marchica, Director, ESME

FROM : Margaret L. Neily,  Project Manager  
ESME

SUBJECT: Technical Amendments of the Children's Sleepwear  
Flammability Standards--Analysis of "Snug-fitting"  
Requirements

I. INTRODUCTION

In September 1996, the Commission issued amendments to the Children's Sleepwear Flammability Standards (16 CFR 1615 and 1616) that provided an alternative to sleepwear garments made from flame resistant fabrics.<sup>1</sup> The Commission determined that snug-fitting (previously referred to as tight-fitting) garments could provide a level of safety comparable to complying garments. In this memorandum, the term "snug-fitting" will replace "tight-fitting." Tight-fitting carries a negative image--tight, restrictive, uncomfortable--which is inconsistent with the garment intended by the standards. A snug-fitting garment that touches the body, is designed well and made of appropriate fabric will be none of these.

Snug-fitting garments generally provide a lesser likelihood of ignition and progression of burning if ignition occurs. <sup>The</sup>

<sup>1</sup> Superscripts in the text refer to references at the end of this report.

regulations now allow the sale of non-flame resistant sleepwear garments if they meet specific dimensional restrictions [Sections 1615.1(o) and 1616.1(m), respectively]. The requirements specify maximum allowable garment dimensions for chest, waist, seat (hip), upper arm, wrist, thigh, and ankle, equaling standard body measurements for sleepwear in sizes 9/12 months to 14. This was intended to ensure that non-flame resistant sleepwear is form-fitting, i.e., fitting the body closely and touching the body at key points. Sources for these garment dimensions are documented by Human Factors in Attachment 1.

During the development of the amendments, the Commission recognized that a number of limitations would be inherent in the snug-fit requirements. To allow for comfort and movement, complying garments would have to be made of fabrics that could stretch adequately--specifically, knits. Many traditional knit fabrics and some design features, such as hemmed cuffs and over stitching might not be usable because they lack adequate stretch. Shrinkage would have to be controlled before sale so that fit would be snug from the start (but not change unacceptably after use) and so compliance could be determined readily by manufacturers, their customers (retailers) and the Commission's enforcement staff. Manufacturing tolerances larger than the specified dimensions were not included in the standards for the same reasons shrinkage allowances were not included. Jump-sizing (e.g. garments marketed in small, medium, and large sizes) might not be feasible because each size would have to meet the dimensions of the smallest numerical size included in the range. Nevertheless, one need only look at actionwear (for biking, dancing, aerobics) and leggings to see that such popular, comfortable snug-fitting garments are indeed feasible and technologically practicable.

Consumer acceptance of snug-fitting sleepwear is another matter. Even today, after limited marketing of snug-fitting sleepwear, the level of acceptance is uncertain. A retail sizing expert at the Commission% June 24, 1997, Systems Anthropometry workshop stressed that our societal definitions of good fit depend on the type of garment and its function. For instance, consumers expect a t-shirt to fit differently than a suit coat. Clearly, snug-fitting sleepwear would not meet the usual consumer expectations of a comfortable pair of pajamas. When the Commission voted to issue the snug-fitting sleepwear regulation,

the American Apparel Manufacturers Association (**AAMA**) promised to conduct a consumer education campaign to inform consumers of the safety provided by this "new" style of sleepwear. This consumer information was believed essential to the successful marketing of snug-fitting garments.

## II. DESIGN AND **MANUFACTURING** PROBLEMS

The Commission has allowed non-flame resistant sleepwear to be marketed as underwear under a stay of enforcement since 1993.<sup>2</sup> When the stay expires in June 1998 (extended from March 9, 1998, by Commission vote October 30, 1997) non-flame resistant sleepwear garments will have to meet the snug-fitting requirements to be exempt from the standards.

When it came time for manufacturers to design snug-fitting sleepwear to be sold as early as 1997, but especially for the spring 1998 season, they began to identify new problems with design and construction and with potential rejection by their retail customers. Most of the industry does this designing at least a year in advance of the selling season; importers require additional time. A brief chronology of events since the issuance of the snug-fitting amendments is in Attachment 2.

In late 1996, the major controversy centered on the location of the measurement and the dimension of the upper arm.<sup>3</sup> Commission staff sent an enforcement letter (December 9, 1996) to the industry clarifying the measurement of the upper arm because constructing a garment as described in the final standard would generally require the armhole to be significantly smaller and, therefore, uncomfortable under the arm. This enforcement letter was sent to about 1,300 childrenswear manufacturers and others and was posted on the CPSC web site.

Although other manufacturers came to the staff with their problems, the major spokesman for the industry remained AAMA. At a meeting with the Commission staff on March 6, 1997, AAMA presented a comprehensive list of manufacturing problems their members had encountered in attempting to make snug-fitting sleepwear.<sup>4</sup> These concerns were many: cuffs are too tight, waist measurement is too tight, diaper ease is inadequate, upper arm measurement is too tight, head opening problems, seat to

thigh ratio problems, set-in sleeve problems, multi-size garment enforcement, disruption of garment production cycles, ornamentation problems, retailers are rejecting garments, hanger appeal is poor. They offered to form a task force to develop workable garment specifications that would solve these problems.

On June 4, 1997, the Industry Task Force presented recommendations for producing cotton garments that they believed meet consumers' comfort, quality, and safety expectations.<sup>5</sup> They proposed a new set of garment dimensions allowing for fabric characteristics (stretch, recovery, and shrinkage), revised points of measure, and suggested methods of enforcement. Most measurements were larger than the dimensions in the standards. . The end result was intended to be garments that meet the current body dimensions of the Standards after **three launderings**. The staff observes that the specifications proposed would not work equally well with all fabrics. Garments made from fabrics with good shrinkage control would not become snug-fitting as required.

The Task Force recommendations were followed on June 9, 1997, by another set of more clearly focused proposals from the AAMA which were discussed in a public meeting on June 25, 1997.<sup>6</sup> Their five recommendations involved increasing the allowed dimensions for wrist, ankle, and sweep (bottom edge of garment top) along with moving measurement points and enlarging the dimensions for the upper arm and thigh. Their most serious problem remained the dimension of the upper arm. Without significant changes in this area, AAMA and others believe they can not successfully market the snug-fitting garments. As with the Task Force recommendations, increasing the garment dimensions beyond snug-fitting would reduce the safety of the garments.

### III. POTENTIAL TECHNICAL AMENDMENTS

The Commission staff reviewed the various concerns and recommendations from individual industry members, the Task Force, and AAMA from the perspective that an amendment should be considered only if it is technically infeasible to construct a practical, wearable garment under the current provisions of the standards. The staff was not convinced that increases in the garment dimensions were necessary; such changes would also make garments less snug-fitting. Therefore, the staff review

addressed feasibility and manufacturing problems and fine-tuned the snug-fitting garment specification while maintaining safety as defined by the technical literature and laboratory studies referenced in earlier briefing packages supporting the amendments.'

In the staff's view, the primary difficulties in producing functional garments under the standards were caused by the descriptions of and instructions for making garment measurements required by the standards. Garment measurements are required to be made at points that do not match the points of the body from which dimensions were obtained. Another potentially troublesome problem was the top of a 2-piece garment riding up to the waist, creating bunching of fabric in that area.

The staff identified four potential technical amendments to address these problems. The four potential amendments involved: (1) measurement of the upper arm as in the enforcement letter of December 1996, (2) measurement of the seat as originally intended, (3) measurement of the thigh slightly below the crotch/inseam intersection, and (4) allowing the "hour glass" silhouette for the top of a 2-piece garment? See illustrations in Attachment 3.

From August through December 1997, the staff sought input on the practicality, usefulness, and impact of these potential amendments from manufacturers, retailers, garment designers, textile experts, affected trade associations and others. These technical amendments did not involve changes in the body/garment dimensions specified in the current rules and would, therefore, not result in looser-fitting garments. The rationale for garment safety would remain tied to the garment's close contact with the body.

#### IV. STRUCTURED OBSERVATIONS

To help determine whether these technical amendments are needed (will they clarify requirements for the industry and result in practical garments), the staff conducted structured observations of garment practicality (similar to fittings) with children. The observations allowed the staff to evaluate a garment made to the current standards' provisions and others made

according to the various **amendments** under consideration. In a limited way, the staff could also compare judgments about appropriate fit, evaluate the effect of consumer up-sizing (buying a garment a size or more larger than the child), and the effects of controlled and uncontrolled shrinkage. A number of industry members were producing and attempting to market **snug-fitting** garments late in 1997. Many of them provided the staff with samples of their stock or prototype garments for the observations. This kind of study was not possible in earlier stages of the snug-fitting requirement's development because these garments did not exist.

**A. Methodology** Three CIPSC staff members with university level training/teaching experience in garment design and construction formed the evaluation team for the observations. The structure and activities of the observations and the specific observations to be emphasized were developed in consultation with recognized experts who teach apparel design (esp. childrenswear and actionwear)<sup>9,10</sup>, various manufacturers, and practicing designers.

The methodology for the observations is discussed separately and in detail by Human Factors in their memo, "Methodology for Structured Sleepwear Observations."<sup>11</sup> Children close to the standard body dimensions for their respective sizes were chosen to model the sleepwear garments. Children were observed putting on and taking off the garments, actively playing, "sleeping," and in specific poses for photographs. Observers looked for garment features causing binding or points of stress and signs of comfort/discomfort, such as the child adjusting the garment. They looked at garment "fit" vs. "tightness" (touching vs. constricting), all the while making the distinction between various design problems caused by the standard and others within control of the designer.

**B. Observation Garments** The chart below outlines the garments used in the observations which include as many different fabrics (three 1 x 1 rib knits, five interlock knits, and one thermal knit) and manufacturers (eight) as possible. Even with the dimensional restrictions of the standards, designers produced differing patterns, esp. in the sleeves and pants.

<b>OBSERVATION GARMENTS AND MODELS</b>						
<b>MODELS</b>	<b>Boy Size 4</b>	<b>Girl Size 5</b>	<b>Boy Size 12/18 + months</b>	<b>Girl Size 4</b>	<b>Boy Size 10</b>	<b>Girl Size 12</b>
<b>GARMENTS</b>						
1. Current Standard Specifications, white interlock				size 4		
2. 1x1 rib (A)--new	size 6		sizes 2T and 3T	size 4	size 10	size 12
3. 1 x 1 rib (A)--washed				size 4	size 10	size 12
4. 1 xl rib (B)--new		size 5				
5. 1x1 rib (B)--new		size 8				
6. 1x1 rib (C)						Hr glass size 12
7. Interlock (A)--new	size 5				size 12	
8. Interlock (A)--washed		size 5				size 12
9. Interlock (B) w/ buttons--new	size 4					
10. Interlock (C)			18mo			
11. Interlock (D)			size 3T			
12. Interlock (E)						size 12
13. Thermal knit union suit			18/24 mo			

All garments were 2-piece pajamas except garment 13, which was a 1-piece union suit. Garment 1 was the only garment that met all of the current standards' specifications for the various dimensions, including the seat measured at the bottom of the crotch. The top of garment 6 was constructed with a conservative "hour glass" silhouette; the waist and sweep were cut to the standard dimensions for the waist and chest, respectively. Other garments met the specified dimensions (coming close to the maximum allowed) as they would be measured in the technical amendments under consideration except the larger upper arms of garments 9 and 11. Garments were marked where critical compliance measurements would be made (upper arm, seat with

alternatives, and thigh) to facilitate evaluation during the observations.

**C. Discussion of Observations** staff observations on garment feasibility and practicality, child and parents' comments, and design and manufacturing/marketing issues are described here. Refer to Attachment 4 for relevant photographs of garments on models from the observations. A discussion of observations relevant to each specific technical amendments is given in the next section.

### 1. Garment Feasibility/Practicality

The one garment specially made to meet the current specifications was shown to be impractical for several reasons. Measuring the upper arm from the arm pit produces an armhole too small for comfort; further, it was not possible for the 4 year old model to remove the garment top without help from her parent. This is considered a major problem for a child who has otherwise mastered dressing herself. with the thigh and seat dimensions being measured at the same point, at the bottom of the crotch, both the thigh and **seat** dimensions had to be reduced in order to produce a proportional crotch seam. This resulted in an unnecessarily tight pant in the seat and thigh areas that would further restrict the fabrics that could be used successfully in this garment style.

The other observation garments were made in keeping with the possible technical amendments. A number of manufacturers produced garments that were wearable, comfortable, and suitable for sleeping and active play. The designing of this style garment is not as simple as cutting down the dimensions of currently produced pajamas; according to many in the industry, the armhole design was particularly challenging. Garments number 6 and 13 were two of the best interpretations of the intent of the standard% snug-fitting garment provisions. Although all designs were not equally successful in achieving the best elements of this form-fitting garment, as a group, they demonstrated that it can be done well.

Children (or parents in the infant's case) had no problem putting these pajamas on and removing them. Tops did not ride up to and remain at the waist like earlier garments the staff

observed. Body coverage was maintained during activities and the stretch of the fabrics accommodated leg movement as well as bent elbows and knees. This allowed for squatting, bending, running and rolling without restriction. The stretch of the fabrics provided more than enough diaper ease for the infant model. See Attachment 4. Children reported no discomfort or other problems with sleeping overnight in these garments with one exception. Our oldest model is used to sleeping in very loose garments and found the snug-fitting pajamas uncomfortable.

When the children wore garments larger than those designed for them, the snug-fitting style was closer fitting than t-shirts or traditionally styled pajamas, but not as snug-fitting as intended by the regulation.

Shrinkage control varied among the garments used in the observations as noted in the chart below with percent shrinkage in the length and width of the fabric.

FABRIC SHRINKAGE AND STRETCH			
Garment(s)/Fabric	Shrinkage Control	%Shrinkage (L x W)	%Stretch before/after laundering*
1. Interlock/original specs.	unknown		70% / --
2,3. 1x1 rib knit (A)	compacting	1 x3*	85% / 80%
4,5. 1x1 rib knit(B)	unknown	unknown	65, 80%** / --
6. 1x1 rib knit(C)	none	6x8***	70% / --
7,8. Interlock (A)	none	8x7*	60% / 80%
9. Interlock (B)	unknown		70% / --
10. Interlock (C)	unknown		60% / --
11. Interlock (D)	unknown		60% J --
12. Interlock (E)	unknown		60% J --
13. Thermal knit	garment wash	4x4**	65% / --

Shrinkage and stretch measured **after** 1 laundering per 16 CFR 1615,1616.

\*\* Size 5 had 65% stretch; size 8 had 80%. Print patterns and base fabric differed.

\*\*\* Shrinkage after 3 launderings, reported by manufacturer

Interlock garments 7 and 8 were the washed and unwashed versions of the same garment; shrinkage was not controlled. While this fabric had the highest shrinkage, approximately 8% (length) x 7% (width), after one laundering, it retained much of its stretch. The amount of stretch increased from approximately 60% to 80% after washing, still allowing a reasonable fit.

Garments 2 and 3 were reviewed in three different sizes before and after washing. This 1 x 1 rib knit had been compacted, a common method of controlling shrinkage, and showed approximately 1 x 3% shrinkage after one laundering. When the garments were on the children, the effect of shrinkage was small: Although we did not observe a washed version of garment 13, this thermal knit garment had been garment washed (washed after the garment was manufactured), another effective method of controlling shrinkage. According to the manufacturer, shrinkage can be limited to 4 x 4% in this manner. A relatively minor change in fit of this garment would also be expected after washing.

The amount of stretch in the observation garments fabrics varied as well and is critical for the performance of this style garment. A standards search by Laboratory Sciences (Attachment 5) identified ASTM D-2594 method for measuring stretch properties of knitted fabrics that could be appropriate for characterizing fabrics used in this evaluation. However, because the equipment was not available, the informal (and probably less accurate) method presented by the Industry Task Force was used. Fabrics that worked well in this style garment had stretch ranging from 65% to 85%.

## 2. Parents' Comments

Parents came to the observations with varying expectations for the "tight-fitting" sleepwear. One parent commented that "These are much more like regular pajamas than I expected." Yet another said "I wouldn't buy these unless my daughter would wear them." Although these comments are anecdotal, the parents found the snug-fitting garments generally acceptable and came to appreciate the value of stretch and its contribution to comfort of this style of garment.

### 3. Children's Comments

The children, all except the infant who could not yet talk well, stated that their garments were comfortable during the observation activities. As with fittings that manufacturers have shared with us, younger children were less able to articulate critically how a garment felt to them than the older children. With the 10 and 12 year olds, the staff explained the concept of fit so they could make the distinction between comfortable fit when the garment is touching your body and uncomfortable fit when the garment is constricting in **some way**. Without this discussion, a description of tight had meaning only in the context that the children were used to sleeping in much looser garments at home. For example, the 10 year old boy noted a snug, not uncomfortable or tight, fit in upper arms and calves and, after laundering, in the trunk of one garment in his size.

The 12 year old girl had very definite opinions about what style, color and pattern garments she would be willing to wear. Even though the garments "did not bind or anything," she was used to sleeping in much looser garments, and these snug-fitting pajamas felt uncomfortable by comparison. The other children (and the infant's parents) noted that their garments felt fine for the sleeping at home segment of the observation.

### 4. Design Perspective

The observation team noted a number of design features of various garments that were not caused by the standard's restrictions and that would likely be modified as manufacturers refine their designs. Many designs had low or droopy crotches which observers and parents found objectionable, but the children did not. Some legs were too long, tops and sleeves too short, and rises too short to allow pants to cover the back when a child curled up to "sleep."

### 5. Producer Perspective

Manufacturers of these and other snug-fitting cotton sleepwear have overcome a number of obstacles in the marketing of their products. They have chosen design features such as rib knit rather than hemmed cuffs at the wrists and ankles because they stretch enough to go over hands and feet easily. They have

selected fabrics with adequate stretch, which has not been a concern in specifying fabric for sleepwear until now. A practical, standard measurement method for stretch suitable fabrics could improve specifications.

These manufacturers have controlled shrinkage with compacting and garment washing. One interlock fabric, with high shrinkage and considered unsuitable by usual sleepwear standards, had good residual stretch that allowed appropriate fit after laundering. While consumer demand has been for 100% cotton fabrics, blends with other fibers (e.g. cotton and polyester) or careful fabric engineering to obtain desired properties may also be used to control shrinkage, if economical for a particular manufacturer.

Manufacturers have also been successful with producing and marketing their sleepwear with the negative tolerance allowed by the current standards. Some manufacturers undercut the size specifications and others carefully inspect production and resew seams where necessary to stay close to the maximum dimensions allowed. This is not to say they would not like to have a positive tolerance as well, but they have managed their cutting and sewing operations to meet the needs of their retail customers and consumers.

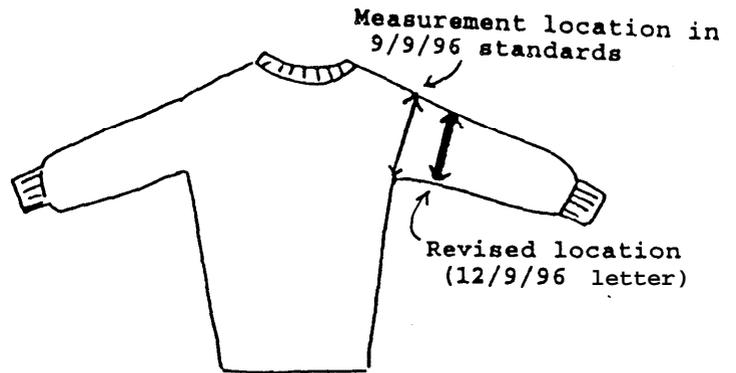
Printing of stretchable fabrics has posed challenges as well. Manufacturers have found ways to apply printing inks so the stretch is not adversely affected and so colors and patterns are pleasing even when the garment is stretched.

## **V. DISCUSSION OF POSSIBLE AMENDMENTS**

The general conclusions of the structured observations are that the current specifications need several minor changes to make it possible to produce practical snug-fitting garments. The following is a discussion of these potential amendments as they relate to ensuring that garment dimensions are measured in the appropriate locations for accuracy and reasonable fit. Refer to the revised measuring instructions and drawings in Attachment 6.

## A. Measurement of Upper Arm

The current standards require measurement of the upper arm dimension at the arm pit. Constructing a garment to meet this measurement requires the armhole to be too small and, therefore, uncomfortable to the wearer. Garment 1 in the structured observation showed this problem as well as the equally serious problem of making the garment impossible for the child to remove. In a December 9, 1996, enforcement letter, the upper arm measurement point was moved from the armpit of the garment to the



Upper Arm Measurement

halfway point between the shoulder and the elbow (as in Attachment 6). This theoretically coincides with the point on the body where the upper arm measurements are made for the specifications in the standards.

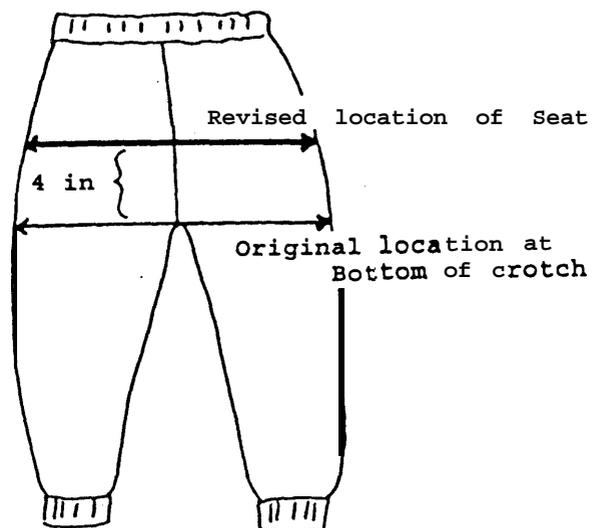
Other suggestions (besides increasing the specified dimensions) included measuring the upper arm from the sleeve seam 2 inches below the armhole, using a single measurement point for each appropriate size group (e.g. size 7 - 14), and moving the measurement point to the elbow. These would create additional problems with consistent and accurate measuring: points much higher on the upper arm than the mid-point, disproportional points for sizes at size group extremes, and points that do not match the upper arm of the body, respectively.

Although the measurement method in the enforcement letter is somewhat complicated, it produced a more accurate upper arm measurement point on the garments evaluated than the current method. In all cases, the measurement was made about midway between the shoulder and elbow or a little lower. Also, measurements made by this method allowed manufacturers to produce garments with reasonable, comfortable sleeves that did not bind at the arm pit or prevent easy removal by the children or

parents.

## B. Measurement of Seat

The language in the current standards states that the seat measurement is taken at "the widest location between waist and crotch," a typical though imprecise description used in the industry. This location has been read literally, leading to an incorrect measurement at a point immediately above the bottom of the crotch and essentially at the same location where the thigh measurement is taken. This is not where seat/hip measurements are normally made in the industry, and it was not the intent of the regulation to measure in an unusual location.



Seat Measurement

The staff discussed measurement alternatives with industry members and designers and considered several options:

(1) measure just above the curve in the crotch seam by measuring a specified number of inches above the bottom of the crotch. Specify a distance for size groups to facilitate compliance; e.g.  $2\frac{1}{2}$ " above the bottom of the crotch for infant sizes; 3" for sizes 2T through 7; and  $3\frac{1}{2}$ " for sizes 8-14. These measurements were based on several manufacturers' patterns for this style garment. Observation garments were marked with these locations and additional increments up to 4 inches.

(2) measure 4 inches up from the bottom of the crotch for every size. This option was based on measurements of various patterns used by major manufacturers on the AAMA's Sleepwear Committee.

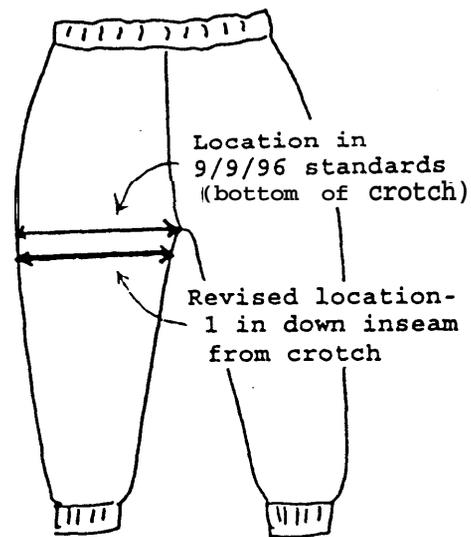
(3) measure down from the waist because crotch designs vary. This would not work well with a one-piece garment where there is no clearly defined waist, and standard distances for each size

are not readily available.

The markings on the garments from option 1 size groups revealed considerable variation in the positioning of the seat measurement in relation to the widest part of the child's body, depending on the garment design in the crotch area. Droopy or low crotch designs produced low seat measurements. With a better designed crotch, the seat measurement location more closely matched the child's seat. The staff preferred option 2, measuring at the 4 inch mark above the crotch. This gave a more consistent and accurate seat measurement location (in terms of matching the body part intended) for all garments than either the current regulation or option 1. The staff measured over a dozen manufacturers' garments in various sizes of this style and confirmed that the garment dimensions do not change between the end of the curve in the crotch seam and the waist. This helps insure accurate measurements. Further, the same distance above the crotch for all sizes simplifies compliance monitoring efforts.

### C. Measurement of Thigh

The standards require the thigh measurement to be taken at the bottom of the crotch. In a form-fitting garment such as this, the bottom of the crotch seam does not actually touch the thigh, making the measurement inaccurate. It is typical practice in the design and manufacturing industry to measure the thigh at a point 1 inch down the inseam from its intersection with the crotch seam. This shift in measurement point gives a more accurate measure of the garment at the thigh without interference from the bulky seam intersection.



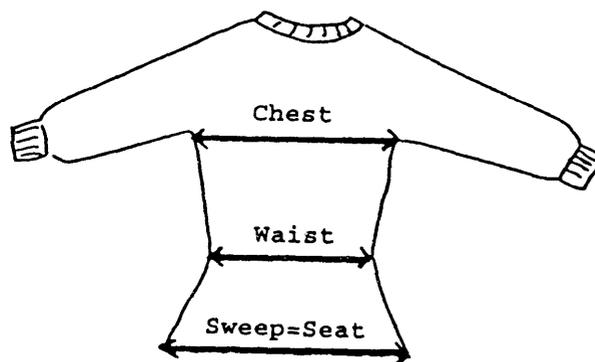
Thigh Measurement

This reduces garment restriction in the crotch area and, according to AAMA designers, allows them to design a better

fitting crotch. Even in the droopy crotch designs we observed, this lowered measurement point was touching the thigh. With the best fitting pants of garments 6 and 13 in our observations, it was clear that this 1 inch from the crotch seam is needed for an accurate thigh measurement.

#### D. Sweep Measurement on the Top of a 2-piece Garment

The sweep (bottom of the top garment) must currently be equal to or less than the waist dimension specified in the standards. The staff considered another option with the potential to reduce fabric bunching at the waist or produce a more functional garment: the "hourglass" silhouette currently specified in the standards for one-piece garments. See Attachment 6. The sweep could be as large as the specified seat dimension, and the narrowest part of the top between the sweep



"Hourglass" Silhouette

and the chest measurement could equal the specified waist dimension. Several manufacturers thought this option might be helpful for larger girls sizes where the seat is considerably larger than the waist, but not helpful for other sizes. For the observation, garment 6 (girls size 12) was constructed with a conservative hour glass silhouette; the sweep was equal to the smaller chest dimension required by the standard.

The top of the garment fit nicely while the model stood still; however, when she raised her arms or moved during the observation, the sweep flared away from the body significantly. The concept of snug-fitting is readily defeated with the hour glass silhouette in a 2-piece garment. For this reason, the staff is not recommending this option.

## VI. CONCLUSIONS/RECOMMENDATIONS

The structured observations confirmed earlier industry concerns that strict adherence to the measurement points as currently described in the children's sleepwear flammability standards would produce **impractical, unwearable** garments. It is also the staff's conclusion that comfortable, practical, **snug-fitting** children's sleepwear garments can be produced with slight changes in the standards. Several technical (clarifying) amendments are needed for measurements of required garment dimensions to be accurate (correspond to the appropriate part of the body) and to insure proper fit of the garments:

1. Measure the upper arm as specified in the Commission's enforcement letter of December 9, 1996.
2. Measure the seat 4 inches above the bottom of the folded crotch on all sizes.
3. Measure the thigh 1 inch down the inseam from the bottom of the crotch on all sizes.

These recommendations for technical amendments are based upon numerous inputs from the **manufacturers, importers, designers, and textile and clothing experts**. These amendments are limited to those considered necessary for the production of safe, snug-fitting garments, as defined by maintaining contact with the body at key points. Many other suggestions by manufacturers and retailers were judged unnecessary because the goal could be attained with appropriate fabrics and certain style features (e.g. ribbed cuffs at the wrists and ankles). The structured observations of actual garments worn by children confirmed that the construction of practical snug-fitting garments is feasible. Further, a number of manufacturers report that they are successfully marketing-the snug-fitting garments with few customer returns. The technical amendments recommended here (Attachment 6) are incorporated in a Federal Register notice prepared by the Office of the General Counsel.

Attachment(s)

## REFERENCES

1. *Federal Register*, 61 FR 47634, September 9, 1996, Rules and Regulations/ Consumer Product Safety Commission, 16 CFR Parts 1615 and 1616, Standards for the Flammability of Children's Sleepwear (Sizes 0-6x and 7-14); Final amendments.
2. *Federal Register*, 58 FR 4078, January 13, 1993, Rules and Regulations, Consumer Product Safety Commission, 16 CFR Parts 1615 and 1616, Standards for the Flammability of Children's Sleepwear (Sizes 0-6x and 7-14); Stay of enforcement.
3. Memorandum to Ronald Medford, Assistant Executive Director, EXHR, from Patricia Fairall, Assistant Director, CRM, Industry Reports of Sizing Difficulties in Sleepwear Standards, December 11, 1996, U.S. Consumer Product Safety Commission.
4. Log of meeting, Children's Sleepwear - Possible Stay of Enforcement extension and other technical issues related to the recent amendments, March 6, 1997, Patricia Fairall, Assistant Director, CRM, and other commission staff with American Apparel Manufacturers Association representatives.
5. Log of meeting (including handouts and materials), Industry Working Group proposal for improving the recently amended Children's Sleepwear Flammability Standards, June 4, 1997, Margaret Neily, ESME, and other CPSC staff with Task Force members.
6. Log of meeting (including AAMA letter of 6/9/97 to Margaret Neily), Children's Sleepwear Standard--Recommended changes from the American Apparel Manufacturers Association (AAMA), June 25, 1997, Margaret Neily, ESME, and other CPSC staff with AAMA representatives.
7. Earlier Briefing Packages leading to the September 9, 1996, amendments of the Children's Sleepwear Flammability Standards: Advance Notice of Proposed Rulemaking, November 3, 1992; Notice of Proposed Rulemaking, July 19, 1994; and Final Rule, October 11, 1995.

8. Neily, M., "For Discussion, Potential Technical Amendments of the Children's Sleepwear Standards (16 CFR 1615 and 1616)," September 8, 1997.

9. Personal communication w/ Joann Arbuckle, Professor, Childrenswear Specialty, Fashion Institute of Technology, New York, New York, September 1997.

10. Personal communication w/ Leann Thomashow, Children's and Adultwear, Pratt Institute, Brooklyn, New York, November 1997.

11. Memorandum to Margaret Neily, Project Manager, ES, from Carolyn Meiers, ESHF, "Methodology for Structured Sleepwear Observations,,, March 31, 1998, U.S. Consumer Product Safety Commission.



United States  
CONSUMER PRODUCT SAFETY COMMISSION  
Washington, D.C. 20207

MEMORANDUM

DATE: February 2, 1998

TO : Margaret Neily, Project Manager, Sleepwear, ES

Through: Dr. Robert B. Ochsman, Division Director, ESHF *RO*

FROM : Carolyn Meiers, Engineering Psychologist, ES *CM*

SUBJECT: Sources of the Snug-Fitting Dimensions in the Standards for the Flammability of Children's Sleepwear: Sizes 0 through 6x and 7 through 14 (16 CFR Parts 1615 and 1616)

This memorandum lists the sources from which the snug-fitting dimensions in the children's flammability standards were derived. It also provides synopses of the sources.

## BACKGROUND

Amendments to the children's sleepwear flammability regulation (16 CFR Parts 1615 and 1616) went into effect January 1, 1997. These amendments exempt sleepwear in sizes above 9 months to size 14 from the regulation, if the garments are snug-fitting. In the regulation, "snug-fitting" garments are defined as those which do not exceed the maximum dimensions specified for the chest, waist, seat, upper arm, thigh, wrist, or ankle (Sections 1615.1(o)(1) and 1616.2(m)(1)).

## DISCUSSION

The tables that follow list the primary and secondary sources from which the snug-fitting dimensions were derived. The synopses included in this memorandum can be used to readily determine the basis of the dimensions given in the sources. During the development of the dimensions, some interpolation of measurements were made to provide for consistent grading between sizes. The dimensions in the standards are the same for both boys and girls in all sizes, except for the seat and thigh measurements in sizes 7 to 14.

Sleepwear Standard Dimensions for Sizes.....	Derived from.....	Which were derived from.....
9 months - 24 months	ASTM D 4910 - 95 Standard Tables of Body Measurements for Infants, Sizes 0 to 24 Months	<ul style="list-style-type: none"> <li>• Original research conducted by U.S. Dept. of Agriculture in the 1930's</li> <li>• Children's growth patterns reflected in the 1980 charts for the National Center for Health Statistics</li> </ul>
2-6x	ASTM D 5826 - 95 Standard Tables of Body Measurements for Children, Sizes 2 to 6x/7	<ul style="list-style-type: none"> <li>• Anthropometry of Infants, Children, and Youths to Age 38 for Product Safety Design, University of Michigan, 1977 (50th percentile data)</li> </ul>

Sleepwear Standard Dimensions for Sizes.....	Derived from.. . . .	Which were derived from.....
7-14 Girls	<ol style="list-style-type: none"> <li>1. Draft ASTM Standard: Standard Tables of Body Measurements for Girls, Sizes 7 to 16</li>   <li>2. Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design, University of Michigan, 1977 (50th percentile data)</li> </ol>	<ol style="list-style-type: none"> <li>1. Body measurements currently used by apparel manufacturers and retail organizations which were derived from....  NBS Product Standard PS 54-72 Effective April 14, 1972 which was derived from... .  Original research conducted by the U.S. Dept. of Agriculture in the 1930's</li>   <li>2. Original research sponsored by CPSC</li> </ol>
7-14 Boys	<ol style="list-style-type: none"> <li>1. NBS Product Standard PS 36-70 Effective October 10, 1970</li>   <li>2. Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design, University of Michigan, 1977 (50th percentile data)</li> </ol>	<ol style="list-style-type: none"> <li>1. Original research conducted by the U.S. Dept. of Agriculture in the 1930's (Note: Presumed; Closely parallels development of NBS Product Standard PS 54-72 for girls)</li>   <li>2. Original research sponsored by CPSC</li> </ol>

# **ASTM D 4910 - 95a Standard Tables of Body Measurements for Infants, Sizes 0 to 24 Months**

**Effective Date: '1 995**

**Sources: US Dept of Commerce data, based on original research conducted by the US Dept of Agriculture done in the 1930's; 1977 Anthropometric Study of US Infants and Children, University of Michigan**

**Standard takes into consideration children's growth patterns reflected in 1980 charts for the National Center for Health Statistics**

**All sudden shifts of proportion have been eliminated so as to reflect the gradual growth and development of the child**

**A limited sampling of children was measured and fitted with garments made as directed in these tables to verify the proposed body measurements**

**Purpose: To assist manufacturers in developing patterns and garments that are consistent with the current anthropometric characteristics of the population of interest**

**To reduce or minimize consumer confusion and dissatisfaction related to apparel sizing**

**Scope: Although the measurements in the standard are body measurements, they can be used as a baseline in designing apparel for infants in this age range when taking into account such factors as fabric type; ease for body movement, styling, and fit**

**Clothing Allowance: Measurements are for the nude body. No allowance has been given for clothes or diapers**

**Standard states that approximately 3" should be added to the vertical trunk measurement to accommodate diaper**

**Number of Body Measurements:  
30**

# **ASTM D 5826 - 95 Standard Tables of Body Measurements for Children, Sizes 2 to 6x/7**

**Effective Date: 1995**

**Sources: US Dept of Commerce data, based on original research conducted by the US Dept of Agriculture done in the 1930's; 1977 Anthropometric Study of US Infants and Children, University of Michigan**

**Standard takes into consideration children's growth patterns reflected in 1980 charts for the National Center for Health Statistics**

**All sudden shifts of proportion have been eliminated so as to reflect the gradual growth and development of the child**

**A limited sampling of children was measured and fitted with garments made as directed in**

**these tables to verify the proposed body measurements**

**Purpose: To assist manufacturers in developing patterns and garments that are consistent with the current anthropometric characteristics of the population of interest**

**To reduce or minimize consumer confusion and dissatisfaction related to apparel sizing**

**Scope: Although the measurements in the standard are body measurements, they can be used as a baseline in designing apparel for infants in this age range when taking into account such factors as fabric type; ease for body movement, styling, and fit**

**Clothing Allowance: Measurements are for the nude body. No allowance has been given for clothes or diapers**

**Standard states that approximately 3" should be added to the vertical trunk measurement to accommodate diaper.**

**Number of Body Measurements:  
31**

# NBS Voluntary Standard PS 54-72

## Body Measurements for the Sizing of Girls' Apparel

These are body, not garment, measurements.

**Effective Date: April 14, 1972**

**Sources:** US Dept of Commerce, National Bureau of Standards: Office of Engineering Standards - Charles W. Devereux II, Technical Standards Coordinator

The measurements were developed from a US Dept. of Agriculture survey using age groups from 60 (5 yrs) to 167 months (14 yrs).

**Purpose:** To provide standard classification and size designations for girls' ready-to-wear apparel

To provide guidance to those preparing pattern specifications for ready-to-wear garments and to assist in correct size selection regardless of price, type of apparel, or manufacturer of the garment

**History: January 19, 1949 -** Standard developed at the request of the Mail Order Assoc. of America

**June 1967:** Revised as CS 153-48 by above organization. Primary reason for revision was to include "Slim" and "Chubbie" classifications. Garment lengths were deleted, size 9 was deleted and size 16 was added.

Span charts and grading charts were added as appendices.

**January 7, 1972:** Went out for review as TS 117

**April 14, 1972:** Became effective.

**Present:** ASTM proposed sizing chart for girls is based on this standard. It adds the following measurements: vertical measurement - armscye to waist and width & length measurement - cervicale to wrist. This last measurement has always been in the boys' NBS standard.

**Sizes:** Sizes are designated by numbers which identify a specific set of body measurements. Sizes do not identify ages.

**Classifications:** regular, slim and chubbie - based on girths and weight

**Size range:** 7,8,10,12,14, and 16

The numbers represent the height of the girls. A size 10 girl whether slim, regular or chubbie will always be 55" in height.

**Number of body measurements:** 33 for each of the 3 classifications

**Clothing Allowance - Weight:** The size scales represent girls dressed in undergarments. Added 20 oz. to body weight in all classifications and sizes to account for this.

**Clothing Allowance - Girth:** Added allowances for chest, waist hip, vertical trunk and total crotch length.

***"Nude" data may be obtained by deducting the following allowances from body measurement data:***

- 1. Weight - 20 ounces***
- 2. Chest Girth - 3/4 "***
- 3. Waist Girth - 1/2 "***
- 4. Hip Girth - 3/4 "***
- 5. Vertical Trunk Girth - 1 "***
- 6. Total Crotch Length - 1/2 "***

# NBS Voluntary Standard PS 36-70

## Body Measurements for the Sizing of Boys' Apparel

Measurements given are body, not garment, measurements

**Effective Date: Oct. 10, 1970**

**SOURCES:** US Dept of Commerce, National Bureau of Standards: Office of Engineering Standards - Charles W. Devereux II, Technical Standards Coordinator

Sizes 23b & 24b were extrapolated from US Dept. of Agriculture survey data

**Purpose:** To establish standard size designations & definitions for guidance of those engaged in producing, distributing or specifying boys' apparel & patterns.

To provide sales clerks & purchasers with a means of associating standard size designations with boys' body types so the best fit may be obtained irrespective of price, type of garment, or by whom purchased.

**History:** 1950 published as: Commercial Standard CS 155-50. Standard

developed at the request of the Mail Order Association of America

**May 1968:** Revision requested by above to include additional classifications Slim & husky

References to trouser lengths deleted & span and grading charts added as appendices

**June 9, 1970:** Went out for review as TS 5502c

**Oct. 10, 1970:** Became effective and is what is presently used for boys' standards.

**Sizes:** Sizes are designated by numbers which identify a specific set of body measurements. Sizes do not identify ages.

Height is the primary guide to size. ( 5'4" will be size 10)

Classification (reg, slim, husky) based on girth (waist and chest) which is secondary guide to size

### Size range:

Regular - 2 to 24  
Slim and Husky - 6 to 24

### Number of body measurements:

\* 30 for all body types above size 5

\* 23 for sizes 2 to, 5 - body measurements less extensive for these sizes

### Application of Standard:

- \* Sizing or grading of garment patterns
- \* Preparing specs for apparel & model forms
- \* Coordinating body measurements with classifications & size designations for apparel
- \* Studying & marketing aspects of apparel sizes

**Clothing Allowance - Weight:** added extra weight to the body weights to account for ~~clothes worn during~~ measurement. Different weights added to different size ranges and classifications.

**Clothing Allowance - Girth:** (arbitrarily selected) include chest, waist, hip, verticle trunk girth, total crotch length

**Nude/skin measurements can be obtained by deducting the follo wing clothing allowances from the body measurement data:**

1. Chest -  $\frac{3}{4}$ "
2. Waist - 1"
3. Hip -  $\frac{3}{4}$ "
4. Vertical Trunk Girth - 1"
5. Total Crotch Length -  $\frac{5}{8}$ "

## **Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design**

**Date: Final Report, May 31, 1977**  
Highway Safety Research  
Institute, The University of  
Michigan, Ann Arbor, Michigan  
48109

**Sample Size:** 4127 infants,  
children and youths representing  
48 states of the US

50.7% - male  
**49.3%** - female  
86.5% - white  
1.1% - black  
.9% - oriental  
**.1%** - American Indian  
1.5% - other

**Age Range:** 2 weeks through 18  
years

Measuring for 5-18 year olds was  
conducted at public schools,  
some at summer camps

2-5 year olds - nursery school and  
day-care centers

**Infants** - recruited from birth  
announcements in newspapers,  
University of Michigan Well Baby  
Clinic & pediatrician's clinic in  
Pontiac Michigan

**Purpose:** to provide a complete  
source of anthropometric data on  
US children for consumer product  
design, hazard assessment and  
guidance in establishing  
requirements or recommendations  
for standards

**Body Measurements: 87**  
traditional and functional  
measurements

Measurements divided into 4  
groups:

- Group 1: 22 Core measurements  
taken on every subject;
- Group 2: Body Shape;
- Group 3: Linkage and center-of-  
gravity;
- Group 4: Head, face & hands

Groups 2,3,&4 taken sequentially  
on every 3 subjects.

On any one subject only 42-45  
measurements taken. While the

sample size for the core  
measurements is equal to the  
total number of subjects in the  
study, for the other 3 groups the  
sample size is  $\frac{1}{3}$  the total sample  
size

**Infants** - separate list of 34  
measurements, taken on each  
subject - no time constraints as in  
schools

Since infants are not capable of  
performing most of the functional  
measures and do not have mature  
skeletal and muscular systems,  
many of the measurements taken  
on 2-18 year olds cannot be  
taken on infants

**Clothing Allowance:** No clothing  
allowance included in  
measurements

**Children's Body  
Measurements for Sizing  
Garments and Patterns-US  
Dept of Agriculture  
Miscellaneous Publication  
No. 365, Sept 1939**

These standards are part of a report based on the study of children's body measurements done by the Works Progress Administration (WPA) and supervised by the Textiles & Clothing Division of the Bureau of Home Economics, US Dept of Agriculture

**Purpose:** to obtain scientifically taken measurements of a large and representative sample of children and to analyze the variations of the dimensions to determine the most satisfactory basis for sizing children's garments and patterns.

Dimensions were to be used to construct a series of standard mannequins that manufacturers could use to size garments and patterns.

Up to this time no large, scientific study of body measurements used in the construction of women's and children's garments had been reported.

**Sample Size:**  
147, 088 measured; 133, 807 completed records -  
69, **661** boys  
64, 146 girls

**Population: "general run of white American-born" boys & girls** in public & private schools, on playgrounds, in camps and clubs. Any child able to take part in normal school & playground activities was included.

**Number of Measurements taken:**  
36 on each child.

At first planned to take measurements of feet, hands, and heads for sizing shoes, gloves and hats. Not done because of fatigue factor for children when too many measurements taken

Therefore, measurements restricted to weight and

measurements used in making garments worn on trunk of body

**Clothing Allowances:**  
No clothing allowances. Measurements were taken next to the skin therefore, they are body measurements and not garment sizes.

Standards for garments and patterns can be developed by agreement in the trade on tolerances for construction, style and other clothing features.

**Age Range of Children: 4 to 17-** chosen because large groups of children of these ages could be reached in schools

**Scope of Study:** 16 states and  
**D C**

**Time Frame of study:**  
Feb. 8, 1937 to June 30, 1939

**Comments:** Sizes in this standard are based on height and girth of hips.

Attachment 2

**CHRONOLOGY OF RECENT CHILDREN'S SLEEPWEAR ACTIVITIES**

- 1/13/93 Stay of enforcement against **garments** used as sleepwear but marketed as underwear first became effective.
- 9/9/96 Final Rule published in the *Federal Register*, incorporating the snug-fitting amendments in both sleepwear standards.
- 12/11/96 Memo from Patricia Fairall to Ron Medford, "Industry Reports of Sizing Difficulties in Sleepwear Standards"-- including enforcement policy and new guidance on measuring the upper arm.
- 1/1/97 Effective date of the snug-fitting rule. Manufacturers can sell non-FR cotton garments as *sleepwear* if they met the specified dimensions. (Manufacturers can also sell non-FR garments as underwear under the stay of enforcement until June 9, 1998.)
- 3/6/97 Compliance meeting with sleepwear manufacturers and retailers.
- 6/4/97 Industry Task Force presentation
- 6/8/97 Additional AAMA proposals received
- 8/97 - 12/97 Staff collects input on possible technical amendments and designs structured observations of practicality of garments constructed to the snug-fitting rule.
- 8/14/97 Additional input from AAMA re: suggested amendments. (Phone log)
- 10/97 - 2/98 Structured observations conducted.
- 10/30/97 Commission votes to extend stay of enforcement for three months from 3/9/98 to 6/9/98.
- 2/18/98 CPSC staff meeting with manufacturers and retailers of

snug-fitting sleepwear to discuss technical amendments and joint consumer I&E efforts.

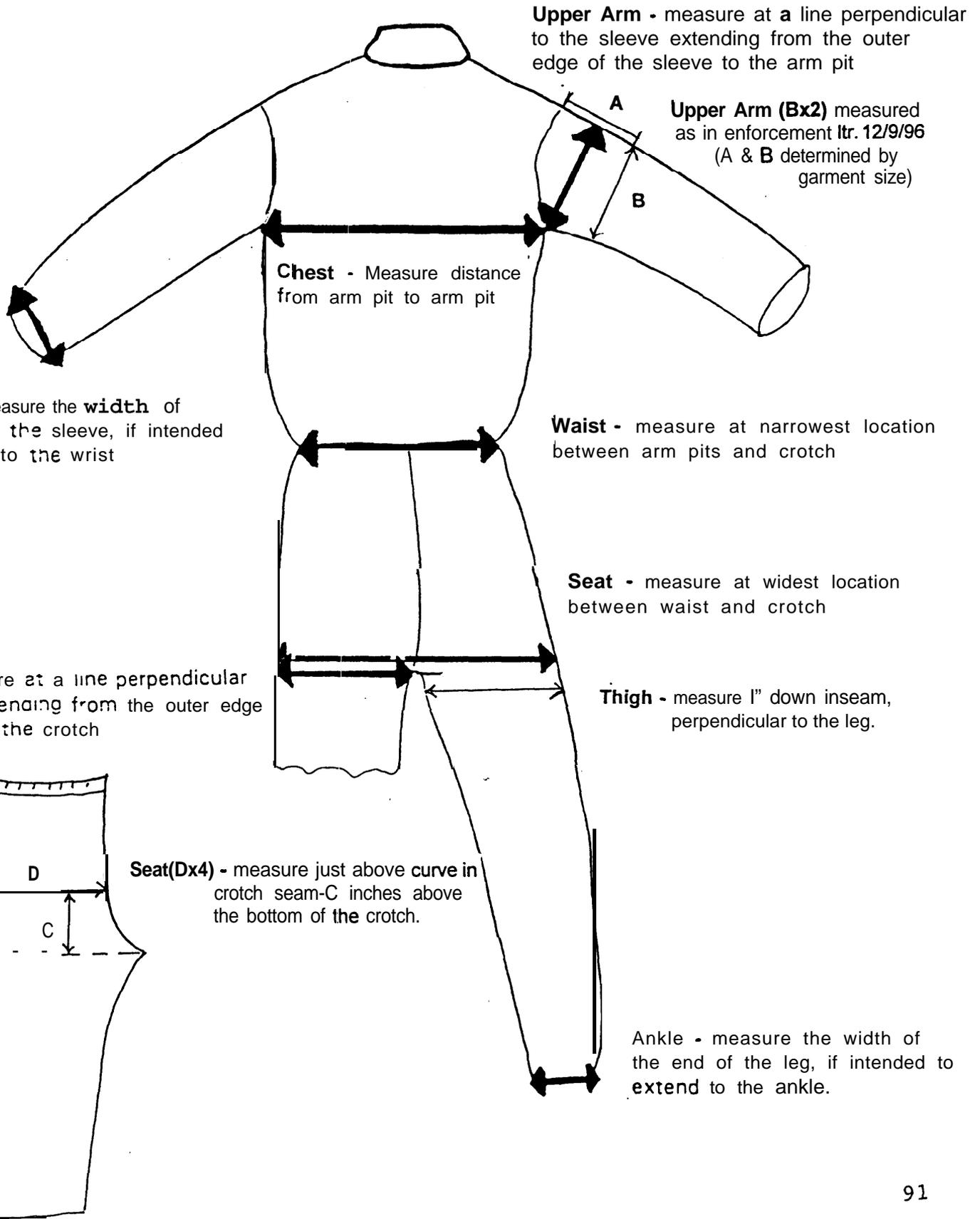
3/9/98 Original expiration date of stay of enforcement against garments used as sleepwear but marketed as *underwear* as noted in *Federal Register* on 9/9/96.

6/9/98 Extended expiration date of stay of enforcement against garments used as sleepwear but marketed as *underwear*, as amended by Commission vote on 10/30/97.

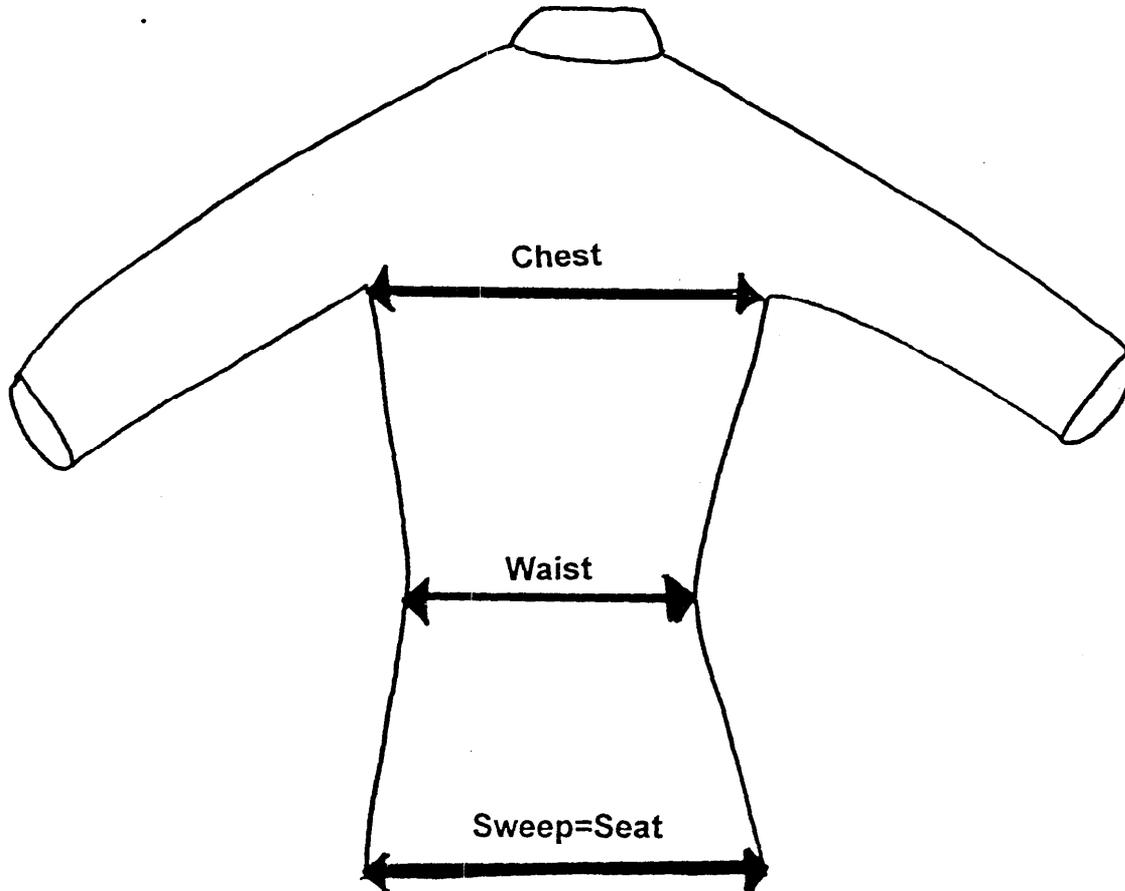
Attachment 3

↔ CHILDREN'S SLEEPWEAR--current standard measurement points

↔ POSSIBLE TECHNICAL AMENDMENTS-measurement points



**POSSIBLE 'TECHNICAL AMENDMENTS**

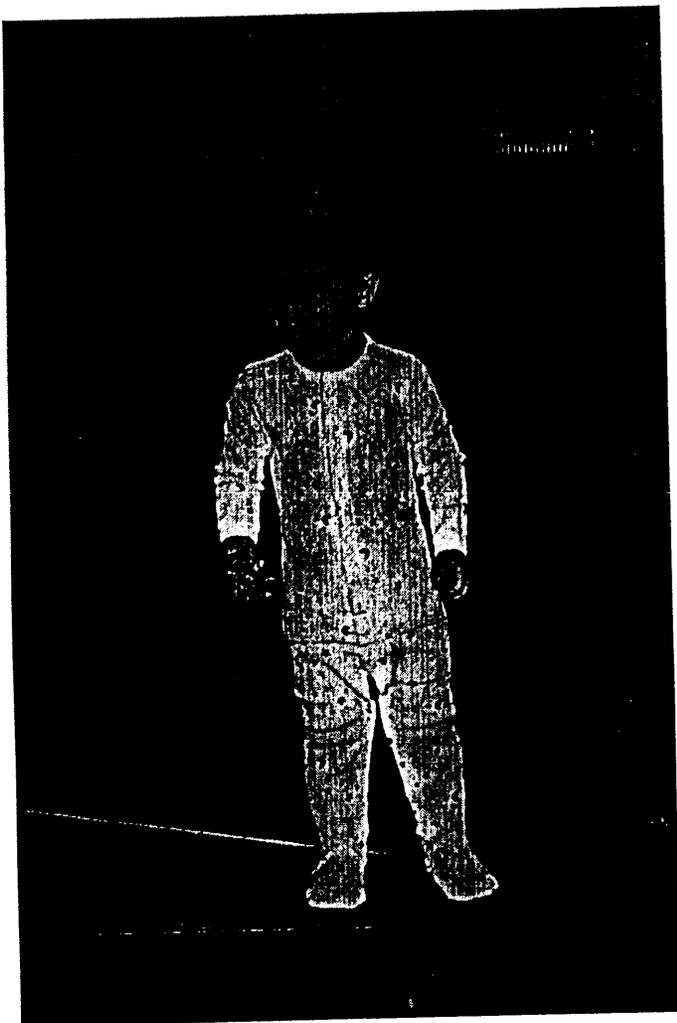


**HOUR GLASS SILHOUETTE FOR  
TOP OF 2-PIECE GARMENT**

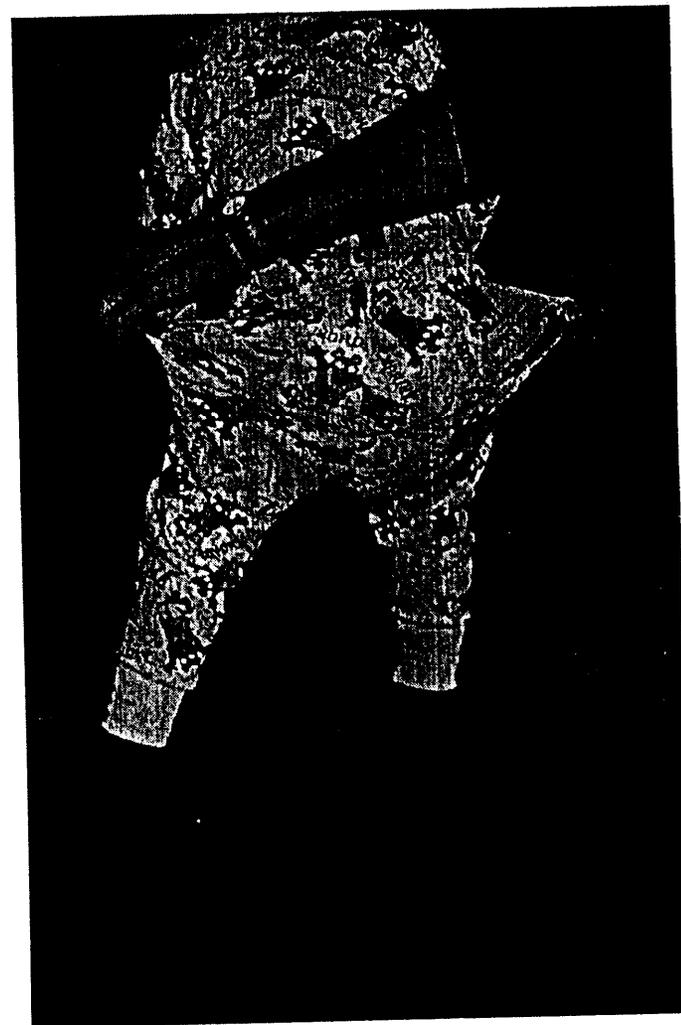
Attachment 4  
**STRUCTURED OBSERVATION GARMENTS**



**GARMENT 1**  
Original specs  
Size 4  
Tight armhole



**GARMENT 13**  
Union suit  
Size 18/24 mos.  
Good fit



**GARMENT 2**  
Size 2T  
Room for diapers



**GARMENT 5**

Size 8 on a

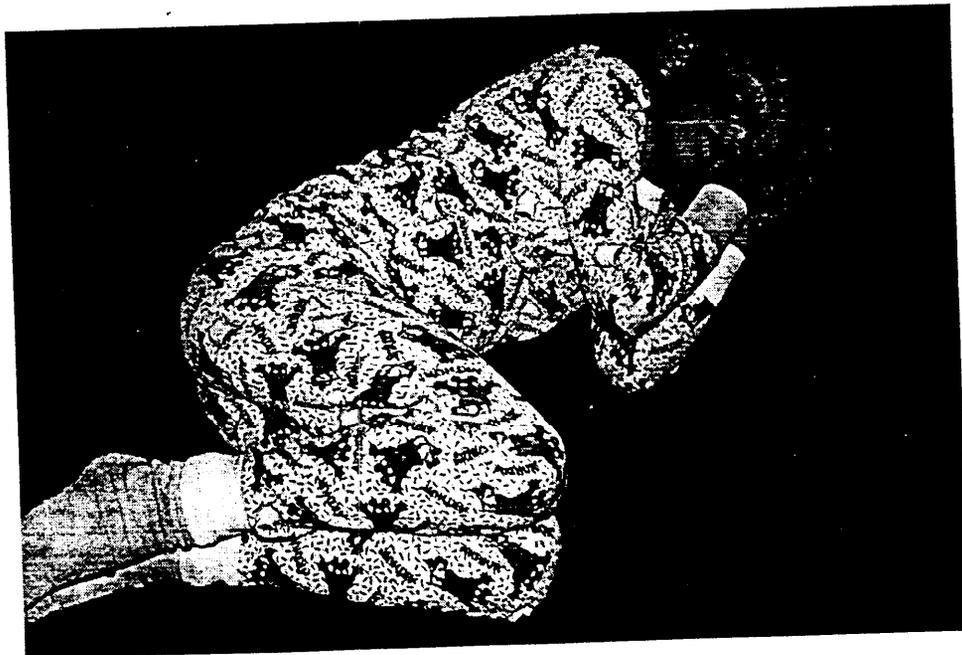
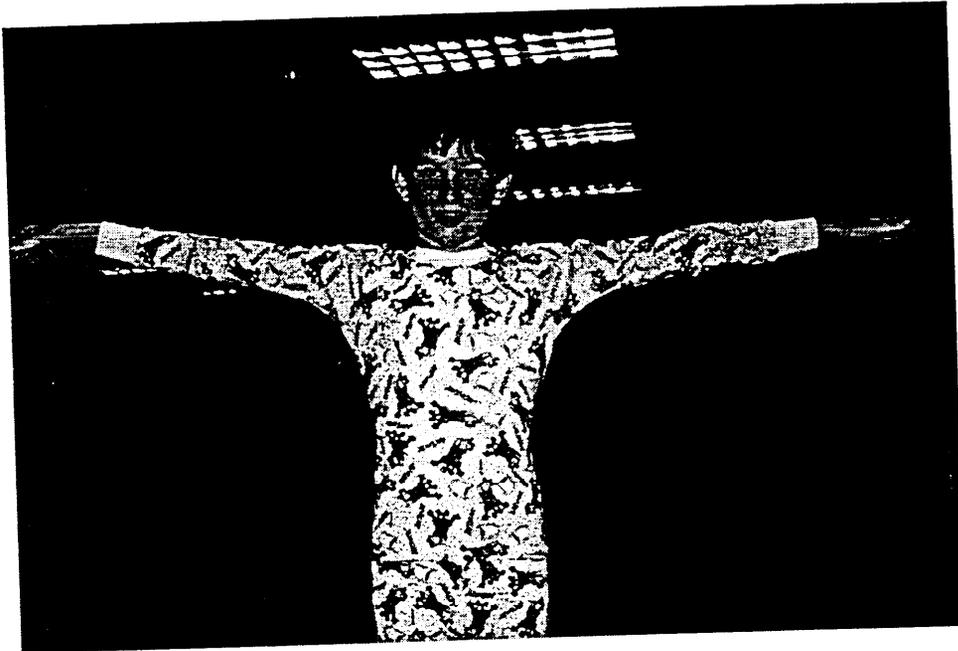
Size 5 child

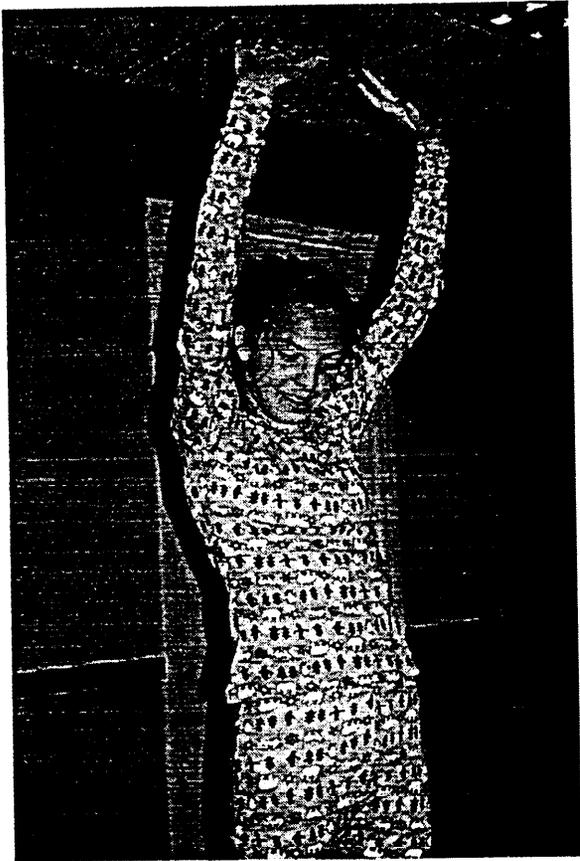
Upsizing example

**GARMENT 2**

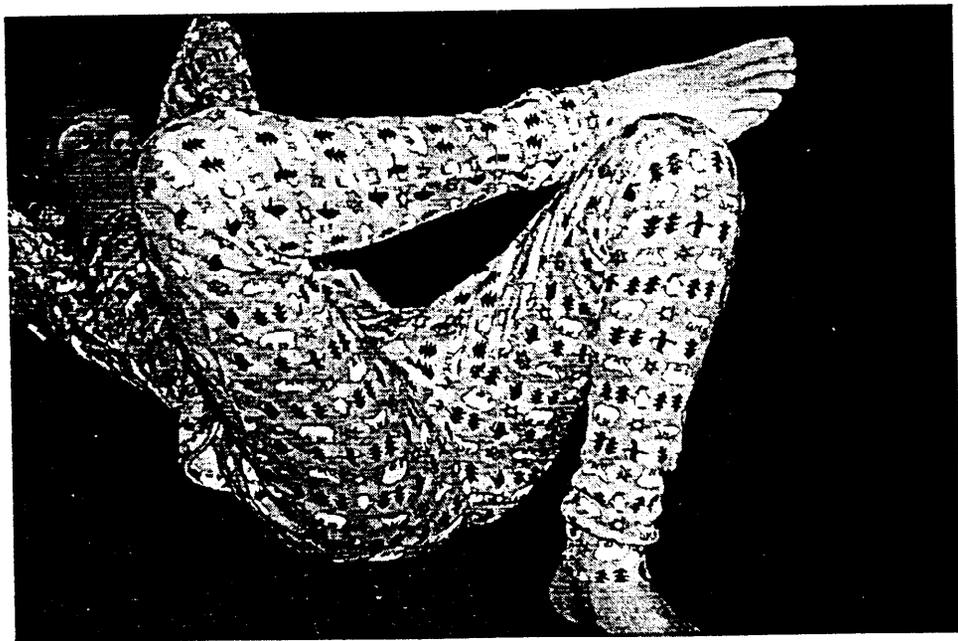
Boy size 10

Snug-fitting and  
comfortable for  
sleeping





**Garment 6**  
Girl size 12  
Hour glass top  
Flares away from  
The body





United States  
 CONSUMER PRODUCT SAFETY COMMISSION  
 Washington, D.C. 20207

## MEMORANDUM

DATE: February 20, 1998

TO : Margaret L. Neily, Directorate for Engineering Sciences,  
 Project Manager, Children's Sleepwear

Through: Andrew G. Ulsamer, Associate Executive Director, **AGU**  
 Directorate for Laboratory Sciences

FROM : Linda Fansler, Division of Engineering **LF**

SUBJECT: Measuring Fabric Stretch

## BACKGROUND

The Children's Sleepwear Standards were amended to exempt sleepwear garments sized 9 months and under and snug-fitting sleepwear garments in sizes above 9 months. These amendments were published by the Commission on September 9, 1996, and became effective January 1, 1997.<sup>1</sup>

The garments considered to be snug-fitting must meet maximum dimensions specified for each garment size. CPSC staff has identified several technical amendments needed to clarify how the specified dimensions are to be measured on such garments. These technical amendments are needed to assure that garment dimensions are measured in the appropriate locations for accuracy and reasonable fit. Such technical amendments do not involve changes in the body/garment dimensions specified in the current rule. However, these changes could alleviate a manufacturing concern identified by the children's sleepwear industry. The amount of fabric stretch needed to assure a comfortable but snug-fitting garment is of concern to the sleepwear industry,

By definition, these snug-fitting sleepwear garments will be constructed of knit fabrics. Knit fabrics have stretch and recovery properties, that are essential to assure that a garment will expand over the body, fit comfortably and result in a snug-fitting garment. The amount of stretch in a knit fabric depends on the type of knit construction or stitch, fiber content and finishing process. The Directorate for Laboratory Science has been asked to identify methods for measuring the stretch of

<sup>1</sup>Superscript refers to references on page 4.

knit fabrics. A search revealed three ASTM standards related to measuring the stretch of knit fabrics as well as methods from Vogue Patterns and an industry source. This memorandum discusses the applicability of these standards and methods for measuring the stretch of knit fabrics.

## DISCUSSION

### ASTM STANDARDS

ASTM D2594-87, Standard Test Methods For Stretch Properties Of Knitted Fabrics Having Low Power, measures the growth and stretch of knitted fabrics. Fabric growth is defined as the difference between the original length of a specimen and its length after the application of a load. Low power stretch is defined as the property of a fabric that defines its ability for high fabric stretch and good recovery from low loads. Using this ASTM method to determine fabric stretch, a load is applied to a fabric specimen of a known length. The length of the fabric specimen after the application of this load is measured and the fabric stretch is calculated. This ASTM method uses a frame and hanger assembly to support the specimen along with a tensiometer to apply the load to the specimen.\*

ASTM 04964-96, Standard Test Method For Tension And Elongation Of Elastic Fabrics (Constant-Rate-Of-Extension Type Tensile Testing Machine), measures the tension and elongation of wide or narrow elastic fabrics made from natural or man-made elastomers. Using this ASTM method, fabric specimens are tested in a loop configuration by either measuring the loop tension at specified elongations or measuring the elongation at a specified loop tension. Although this test method was developed specifically for elastic fabrics which are defined as a textile fabric made from an elastomer either alone or in combination with other textile materials, it may still be appropriate for use with knit fabrics used for children's sleepwear.<sup>2</sup>

ASTM D1775-81, Standard Test Methods For Tension And Elongation Of Wide Elastic Fabrics, measures the tension and elongation characteristics of wide elastic fabrics made from natural or man-made elastomers. In this ASTM method, looped fabric specimens are subjected to a load recovery cycle to determine the elongation at a specified load using a constant-rate-of-load (CRL) type of tensile testing machine which uniformly increases the force applied to the fabric specimen. This test method was also developed specifically for elastic fabrics, it also may be appropriate for use with knit fabrics used in children's sleepwear.<sup>2</sup>

## **VOGUE PATTERNS**

Vogue Patterns developed a Stretch Gauge for the home sewer's use in determining the stretchability of individual knit fabrics. The stretch is measured using the gauge, by gently stretching a specified length of fabric just until the edge of the fabric starts to curl and noting the stretch category into which it falls. The three categories of stretchability for knit fabrics defined by Vogue Patterns are: stable, moderate, and stretchable. Stable knits have a limited degree of stretch and retain their original shape well. This type of knit fabric moves with the body, retains its shape and resists wrinkling. Moderate knits are intermediate and combine some characteristics of both stable and stretchable knits. Stretchable knits have pronounced stretch and recovery characteristics. These fabrics are used in a stretched conditioned over body curves.<sup>3</sup> A copy of the Vogue Patterns Gauge is attached in the Appendix on page 5.

## **INDUSTRY METHOD**

Another method for measuring the stretch of a knit fabric was presented in 1996 by a group made up of manufacturers and retailers of children's sleepwear to the CPSC staff working on the children's sleepwear project. This method is similar to the Vogue Patterns Stretch Gauge but uses a ruler in place of the gauge. The stretch is measured by extending a specified length of fabric until the fabric just starts to bow and recording this amount. In addition to measuring a fabric's stretch this method can also be used to determine the fabric's recovery, although it has a disclaimer stating recovery is "very difficult to measure accurately". To measure the recovery, the stretched fabric is placed against the ruler and the length of the fabric measured. The current fabric length is converted to the amount of recovery.<sup>4</sup> A copy of the Industry Stretch Ruler is attached in the Appendix on page 6.

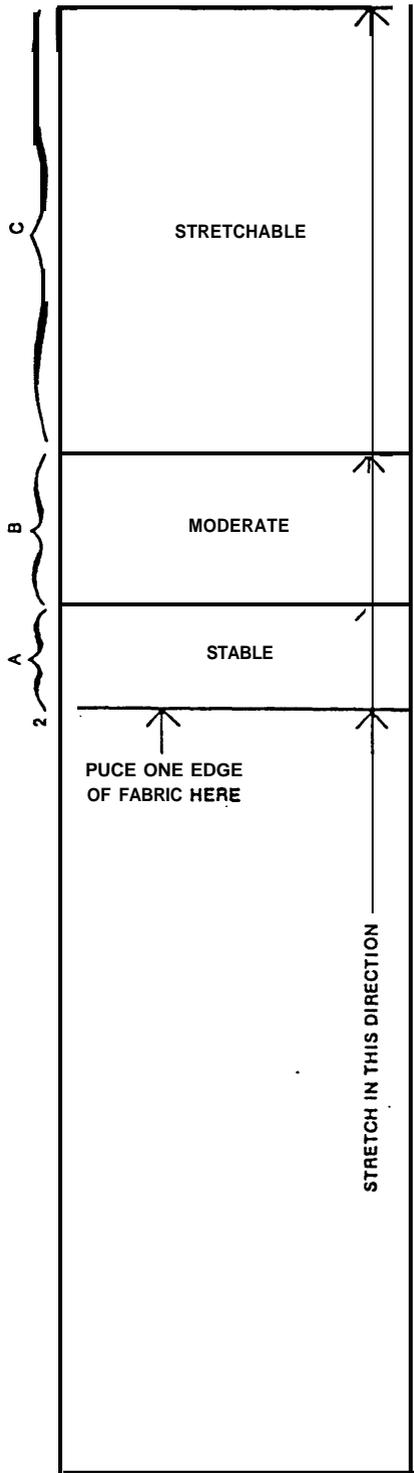
## **CONCLUSIONS**

There are several ways to measure a knit fabric's stretch. The three methods specified by ASTM require specific test equipment and have been evaluated for their precision and bias or accuracy. With the exception of ASTM 02594-87, however, they may be time consuming and require skill to operate the test equipment in a laboratory environment. The two non-ASTM methods using either a gauge or ruler can measure stretch rather quickly with relatively little training and could be as accurate as the ASTM methods if care is taken in the measurement process. These two methods along with ASTM D2594-87 can also be used outside of a test laboratory due to the portability of the test equipment involved. The choice of method for measuring the stretch of knit fabrics therefore depends in part on the availability of test equipment and test location restrictions.

## REFERENCES

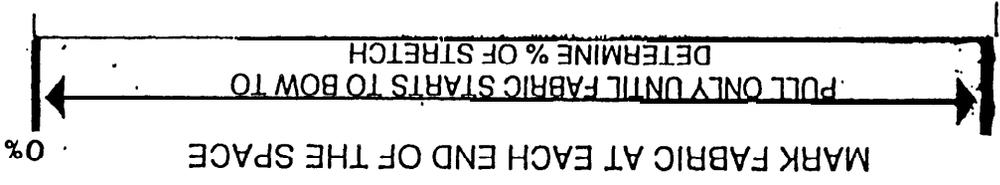
1. Federal Register, Vol. 51, No. 175, Monday, September 9, 1996, Rules and Regulations, Page 47634.
2. Annual Book of ASTM Standards, Vol. 7, Section 7, Textiles - Yarns, Fabrics, and General Test Methods, ASTM, PA, 1996.
3. The Vogue Sewing Book, Published by Vogue Patterns, New York, 1973.
4. Information provided to CPSC Staff by the "CPSC Task Force Committee Members", 1996.

APPENDIX



VOGUE PATTERNS GAUGE

RULER



10 20 30 40 50 60 70 80 90

**INDUSTRY STRETCH TOLERANCE STANDARDS: ±10% 0**



INDUSTRY STRETCH RULER

-6-

Attachment 6

**NOTE:** Measure the dimensions on the front of the garment. Lay garment, right side out, on a flat, horizontal surface. Smooth out wrinkles. Measure distances as specified below and multiply them by two. Measurements should be equal to or less than the maximum dimensions given in the standards.

**Chest** - measure distance from arm pit to arm pit (A to B) as in Diagram 1.

**Waist** - See Diagram 1. One-piece garment, measure at the narrowest location between arm pits and crotch (C to D). Two-piece garment, measure width at both the bottom/ sweep of the upper piece (C to D) and, as in Diagram 3, the top of the lower piece (C to D).

**Wrist** - measure the width of the end of the sleeve (E to F), if intended to extend to the wrist, as in Diagram 1.

**Upper arm** - draw a straight line from waist/sweep D through arm pit B to G. Measure down the sleeve fold from G to H. Refer to table below for G to H distances for each size. Measure the upper arm of the garment (perpendicular to the fold) from H to I as shown in Diagram 1.

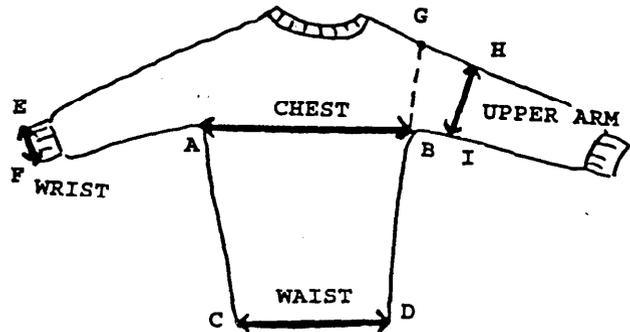


Diagram 1

Distance from shoulder (G) to (H) for Upper Arm Measurement for Sizes 9 Months through 6x								
9-12 mo	12-18 mo	18-24 mo	2	3	4	5	6	6x
5.8 cm 2 1/8"	6.6 cm 2 5/8"	7.4 cm 2 7/8"	7.4 cm 2 7/8"	8.1 cm 3 1/4"	8.8 cm 3 1/2"	9.5 cm 3 3/4"	10.3 cm 4"	11 cm 4 3/8"

**Seat** - Fold the front of the pant in half to find the bottom of the crotch at J as in Diagram 2. The crotch seam and inseam intersect at J. Mark point K on the crotch seam at 4 inches above and perpendicular to the bottom of the crotch. Unfold the garment as in Diagram 3. Measure the seat from L to M through K as shown.

**Thigh** - measure from the bottom of the crotch (J) 1 inch down the inseam to N as in Diagram 2. Unfold the garment and measure the thigh from the inseam at N to O as shown in Diagram 3.

**Ankle** - measure the width of the end of the leg (P to Q), if intended to extend to the ankle, as in Diagram 3.

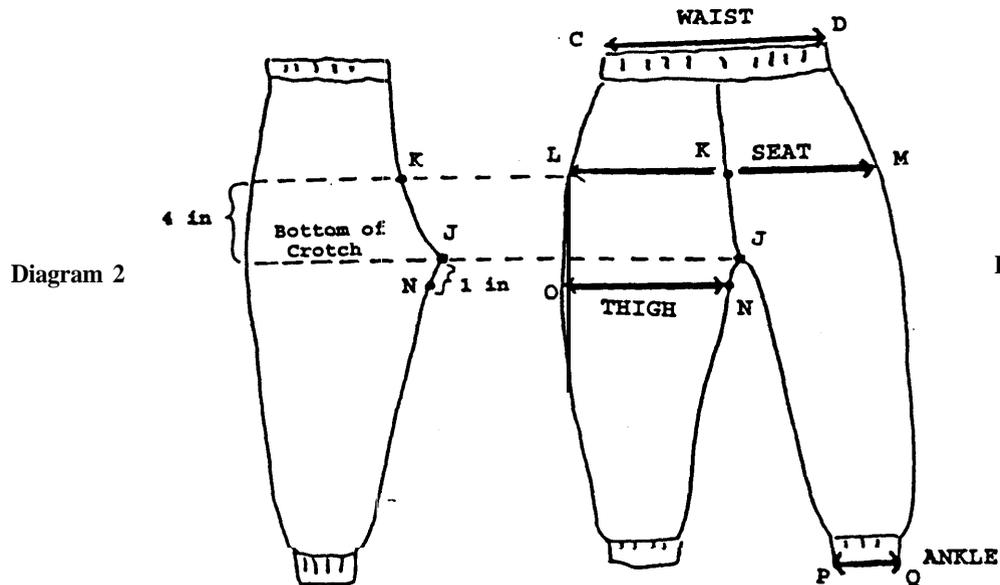


Diagram 2

Diagram 3

# Tab F

LOG OF MEETING

DIRECTORATE FOR ENGINEERING SCIENCES

CPSA 6 (b)(1) *copy*  
~~No Mfrs/Prvtlbrs by~~  
 Products Identified  
 Excepted by \_\_\_\_\_  
 CPSC/OFC OF THE PRMS Modified  
 Comments Processed  
 3:17

**SUBJECT:** Children's Sleepwear--snug-fitting requirements

**DATE OF MEETING:** February 18, 1998

**DATE OF LOG ENTRY:** March 4, 1998

**SOURCE OF LOG ENTRY:** Margaret Neily, ESME

**LOCATION:** CPSC, Room 410 A/B/C, East West Towers

**CP'SC ATTENDEES:** See attached attendees list.

**NON-CPSC ATTENDEES:** See attached attendees list.

**SUMMARY OF MEETING:**

The purpose of the meeting with manufacturers and retailers marketing snug-fitting sleepwear was (1) to share the status of staff work on possible technical amendments to the children's sleepwear flammability standards and (2) to explore ways of cooperatively getting the message to consumers about the availability and safety of these garments.

Ron Medford, Director of the Office of Hazard Identification and Reduction, began by asking attendees to share their experiences of producing/marketing the snug-fitting sleepwear. Five manufacturers (including three who could not attend) reported producing to or below the specs of the standard and experiencing good sales with no major complaints or return problems. Two manufacturers reported producing to most but not all specs (eg. upper arm) with reasonable sales, but not necessarily as good as with larger garments. Another manufacturer is "producing to the specifications", but reports sewing variances(above specs) are causing a problem with sales to retailers. Four of the five manufacturers in attendance (and one of the others) are using an informative hang tag like the AAMA (American Apparel Manufacturers Association) label on their products.

AAMA reported that they had submitted documents to CPSC stating that some of their members are exiting the snug-fitting cotton sleepwear market because of problems they have experienced. Brian Axell, International Mass Retail Association, offered to collect and provide quantitative information regarding their members' sales experience with snug-fitting garments following the meeting.

Margaret Neily, Project Manager, presented a summary of CPSC staff work resulting in the upcoming recommendation of several technical amendments to the snug-fitting requirements of the children's sleepwear flammability standards. The staff concluded that it is not feasible to construct practical garments with the current specifications. With several

clarifications of measurement locations, practical, wearable garments can be constructed. Copies of handouts and overheads are attached. A briefing package is planned for March.

From Dennis Sargent, American Marketing Enterprises, and others, there was further discussion of the need for adding sewing tolerances to the specifications. When garments are undercut to stay below the specifications, the garments can be perceived to be of poor quality. Various attendees (manufacturers and retailers) offered to share manufacturing tolerances they currently use for CPSC staff consideration. Sargent offered to fund the development of tolerances specific to this garment if that would help. Medford noted that an amendment of this nature might require additional rulemaking steps beyond what is now contemplated, a three rather than two step process. Commission staff will review this matter in the next few weeks.

Several compliance questions were addressed. When the current stay of enforcement against sleepwear being sold as underwear expires on June 9, 1998, these garments can no longer be sold by manufacturers or retailers. Non flame resistant sleepwear must then meet the snug-fitting requirements (16 CFR 1615 and 1616), including the compliance letter (upper arm measurement clarification) of December 9, 1996. The staff will provide further guidance to the industry if new amendments being proposed to the Commission have not become final by June 9.

The discussion shifted to what could be done cooperatively to get messages to consumers about the availability and safety of snug-fitting sleepwear. CPSC and AAMA had previously developed a package of materials to support a consumer information campaign. Materials included a hang tag, brochure, fact sheet and other information. Larry Martin indicated that he believed AAMA had copyrighted the text and the designs used in the campaign materials. AAMA is committed to implement the program IF the product is something they want to promote. They will consider making that decision again when the final briefing package (with proposed amendments) goes to the Commission.

In the meantime, with many manufacturers using the AAMA hang tag (or the label language), a consistent message is being offered the consumer. This consistent message is important, too, for retailers who are using informative signs in their stores. Target representatives described their upcoming program that will include hang tags, in-store signs, employee newsletters and a magalog with advertizing. Anyone willing to coordinate a consumer information campaign among interested manufacturers/retailers was encouraged to contact Margaret Neily, Project Manager, at (301) 504-0550.

## ATTENDANCE

### Manufacturers and Retailers of Snug-fit Sleepwear February 18, 1998

NAME	COMPANY	PHONE NUMBER
Margaret Neily	CPSC/Engineering	(301) 504-0550, x2354
DENNIS SARGENT	AMERICAN MARKETING BMT.	(212) 279-3600
Lois STEWART	WM CARTER CO.	270 961 8722
Mary Howell	AAMA	703/524-1864
Larry Martin	AAMA	" "
STEVE LEFTIN	WM-CARTER CO.	770-228-0930
Lucille Bertorello	Wandies INC.	212-695-8181
BUTCH DAVID	CROWN-TEX CORP	212-279-8318
PATRICIA SASSON	VARON	305-836-6411
Joanne Risine	National Retail Federation	202/8626-8152 <sup>fax</sup> -8198
Charlene Hines	Kmart	248-643-5705
SARAH HALIME	KMART	248-637-1533
Marilyn Borsari	CPSC	301 504-0400
Sara Yerkes	NFPA	702-516-4346
Patly ADAM	NCC	202 745 7805
Linda Fanster	CPSC/LS	301 413 0153
Brian Axell	IMNA	703-841-2300
Sam Cristy	Product Safety Letter	703-247-3423
Bruce Nardano	National Highway Traffic Safety Board	202-915-6006
John Wolaver	RSA	202 452 4413
Cecelyn Meiers	CPSC	301-504-0468 x1281
James F. Hodal	CPSC	301 504 .0494x 1380
T. Karls	CPSC	x1320
Cray Munn	CPSC	301 504 0420 1270



# Tab G



United States  
CONSUMER PRODUCT SAFETY COMMISSION  
Washington, D.C. 20207

MEMORANDUM

DATE: April 8, 1998

**TO :** Margaret L. Neily, Directorate for Engineering Sciences,  
Project Manager, Children's Sleepwear

**Through:** Andrew G. Ulsamer, Ph.D., Associate Executive Director, AGU  
Directorate for Laboratory Sciences

**FROM :** Linda Fansler, Division of Engineering LF

**SUBJECT:** Production Tolerances For Snug-fitting Children's Sleepwear

**BACKGROUND**

The Children's Sleepwear Standards were amended to exempt sleepwear garments sized 9 months and under and snug-fitting sleepwear garments in sizes above 9 months. These amendments were published by the Commission on September 9, 1996, and became effective January 1, 1997.<sup>1</sup>

Commission staff met with manufacturers and retailers marketing snug-fitting children's sleepwear and representatives of several trade associations on February 18, 1998.<sup>2</sup> At this meeting, several manufacturers and retailers discussed the need for adding sewing tolerances to the specifications for snug-fitting children's sleepwear. The Directorate for Laboratory Sciences was asked to reexamine the issue of allowing a production tolerance for snug-fitting children's sleepwear garments. This memorandum provides a review of the information submitted by the industry concerning tolerances and the factors influencing the flammability of children's sleepwear.

**DISCUSSION**

**Industry Position**

Some manufacturers of snug-fitting children's sleepwear requested that sewing tolerances be allowed as part of the requirements for snug-fitting children's

<sup>1</sup> Superscript refers to references on page 6.

sleepwear.<sup>2</sup> They proposed that the patterns developed for these garments conform to the specifications for **maximum garment** dimensions for the seven body locations specified in the standard; however, in addition they proposed that tolerances be specified for the garment dimensions at the seven body **locations**.<sup>2,3,4</sup> Tolerances are normally used in the production of all garments and allow for permissible variations to the pattern specifications that can occur during cutting or sewing of the **garment**.<sup>3,4</sup>

Variations to the pattern specifications occur during cutting because the fabric is stacked into several layers depending upon the weight of the fabric, the specific garment order, the experience of the cutting operator and the cutting instrument.<sup>3,4</sup> A spreading machine is used to smooth out the layers of fabric in the fabric stack for cutting, followed by a 24 hour relaxation period. One source reported that using manual cutting equipment, the top layers of the fabric are cut most accurately according to the pattern specifications and that the garment pieces cut from the lower part of the stack of fabric are **smaller** than the top pieces.<sup>3</sup> Another source reported . that using a cutter operated by a computer is much more accurate and the top and bottom pieces of the fabric stack end up the same size after cutting.' During sewing, variations to the pattern specifications can occur due to human error as the sewing operators are required to stitch up the garments quickly. Using the manual cutting equipment and the sewing operation during the manufacturing process of garments can result in garments not quite meeting the pattern specifications. Therefore tolerances are generally used to accommodate these variations to individual garments that occur during the manufacturing **process**.<sup>3,4</sup>

Tolerances are established by individual manufacturers and depend on the type of garment and fabric specified. In some cases the retailer also establishes tolerances which the manufacturer must meet. A manufacturer may also use the expertise of an independent laboratory to recommend the amount of tolerance depending also on the garment's silhouette and fabric: being used.<sup>4</sup>

Knit fabrics are used to construct snug-fitting children's sleepwear garments. Knit fabrics are used because they have the stretch and recovery properties needed to expand over the body, fit comfortably and result in a snug-fitting garment. The amount of stretch for a given knit fabric depends on the type of knit construction, i.e. stitch, fiber content and the finishing process. Larger tolerances are often established for knit fabrics because even **though** care is taken, stretching still occurs during the cutting and sewing processes.<sup>3,4</sup>

Manufacturers are concerned that if garments "grow" during production they may not meet the specifications for garment dimensions established by the **Commission**.<sup>3,4</sup> Some manufacturers are reluctant to "undercut the fabric" to assure that garments meet the specifications established by the Commission. Undercutting occurs when patterns are used that are smaller than specified garment dimensions. Some manufacturers are concerned that these smaller, undercut garments may be perceived to be of poor **quality**.<sup>2,4</sup>

Other manufacturers report that they are manufacturing snug-fitting children's sleepwear to or below the garment dimensions established by the Commission and

are experiencing good to reasonable sales with no return problems.\* This may be due to the cutting equipment available and the careful choice of fabrics used by these manufacturers and careful planning before and during the manufacturing process to build in tolerances to the pattern so that the finished garment after assembly will meet the required specifications.

### Tolerances Provided By Industry

There is no official standard tolerance used in the industry for snug-fitting sleepwear garments. However, at the February 18, 1998, meeting, one manufacturer offered to fund the development of tolerances specific to this type of garment.<sup>2,4</sup> In the interim, two manufacturers, one retailer and one manufacturer/retailer have sent CPSC staff information concerning tolerances specified by their companies.

In general the manufacturers' tolerances for the seven body locations specified in the standard are similar with the exception of the thigh location. One manufacturer reported using  $\pm 1/4$  inch and another  $\pm 3/8$  inch for the thigh. Some of the tolerances provided by the retailer are smaller than those provided by the manufacturers. In addition, this retailer allows only a negative tolerance. Tolerances are usually stated for the flat measurement or one-half of the garment at each location. To determine the total amount over the garment dimension established by the Commission, each reported tolerance must be doubled. The following table contains the information provided by the manufacturers and, retailers.

TABLE 1  
TOLERANCES PROVIDED BY INDUSTRY

Garment Location	Manufacturer A	Manufacturer B	Manufacturer C	Retailer D
	tolerance (inches)*	tolerance (inches)*	tolerance (inches)*	tolerance (inches)*+
Chest	$\pm 1/2 (.50)$	$\pm .50$	$\pm 1/2 (.50)$	-.375
Waist	$\pm 1/2 (.50)$	$\pm .50$	$\pm 1/2 (.50)$	-.5 or .375
Seat	$\pm 1/2 (.50)$	$\pm .50$	$\pm 1/2 (.50)$	-.375
Upper Arm	$\pm 1/4 (.25)$	$\pm .25$		-.25
Thigh	$\pm 1/4 (.25)$	$\pm .375$		-.375
Wrist	$\pm 1/4 (.25)$	$\pm .25$		-.25
Ankle	$\pm 1/4 (.25)$	$\pm .25$		-.25

\* All tolerances given are for flat measure and must be doubled for the full measurement.

+ Tolerances given are for Girls Underwear Sleepwear Garment (sizes 4 to 14).

**NOTE:** With the exception of Retailer D, the tolerances provided are not for a specific garment or size.

## Impact Of Adding Tolerances To Snug-Fitting Sleepwear Garments

Using the suggested tolerances provided by the three manufacturers can result in a range of garment dimensions of as much as 1 inch and as little as 1/2 inch over the specifications depending on the garment dimension location. This would result in less than snug-fitting sleepwear garments at the upper end of this range. The snug or close to the body fit is important 'to maintain as the fit can influence the garment's flammability. The ease of ignition increases when the wearer's clothing stands away from the body and the excess fabric: functions as a connector to the ignition source. If ignition occurs, the availability of oxygen on the under side of the garment and the absence of a heat sink increases the opportunity for sustained burning."

Before proposing amendments to exempt snug-fitting sleepwear garments, Commission staff reviewed technical literature on this subject? This review of the literature confirmed the importance of fit and it's influence on garment flammability. Although the literature review did not reveal a specific safe level or range of fit, there is some evidence that even a spacing of 1/8 inch between the fabric and the body can increase the likelihood of thermal injury, thus more heat may develop when the fabric is away from the body than when the fabric is next to the body.

Section 4(b) of the Flammable Fabrics Act requires that a flammability standard must be "stated in objective terms" so specific garment dimensions were stated in the amendments to define what is meant by snug-fitting garments. Snug-fitting garments must also be labeled to indicate the size to which it was manufactured.' The size information on the label aids Commission staff and others in determining compliance with the standard. The addition of a tolerance to the garment dimensions specified in the standard could increase the range of garment sizes which in many cases leads to overlapping sizes, i.e. garments would fit two sizes. For example, the addition of a positive tolerance that would increase the wrist measurement by 1/2 inch in a size 4 garment would create a range that would extend into the range created for a size 8 garment. Another example is increasing the chest dimension with a positive tolerance of 1 inch for a size 12 would create a range that would overlap the range of a size 14 garment.

Using the suggested tolerances provided by retailer D (see Table 1) can result in garment dimensions less than the garment dimensions specified in the standard. The garment dimensions specified in the standard are maximum dimensions for the seven body locations indicated. Manufacturers are allowed to sell snug-fitting sleepwear garments as long as the garment dimensions for a specific size are not exceeded. In addition, even if the manufacturer undercut the fabric somewhat, with the high degree of stretch of the knit fabric the garment would still fit the intended size child.

## **Garments Manufactured Under The Stay Of Enforcement**

The children's sleepwear standards were amended in part due to the desire expressed by consumers for cotton sleepwear garments for children.' Traditional long underwear garments were often used as a substitute for traditional complying sleepwear, as non-flame retardant treated cotton fabric does not meet the children's sleepwear standards. When the amendments to the children's sleepwear standards were published on September 9, 1996, the Commission extended the stay of enforcement of the sleepwear standards for 18 months for close or snug-fitting garments labeled and promoted as underwear. Under the stay, these garments must have dimensions at three body locations equal to or less than body measurements. No production tolerances (except for a diaper allowance in the smaller sizes), are given in the guidance provided in the "Supplemental CPSC Staff Guide To The Enforcement Policy Statements Of The Flammability Standard For Children's Sleepwear" published in 1989. Manufacturers have learned how to meet the sizing requirements for the garments sold under the stay and for traditional long underwear. Manufacturers found ways to manufacture an acceptable garment that consumers purchased for use as children's sleepwear. They have done this through the selective use of specific knit fabrics that allow for the necessary stretching and recovery and result in a garment that hugs the body, and through careful considerations in the manufacturing process.

## **CONCLUSION**

The addition of a production tolerance which would increase the garment dimensions from those specified in the standard would result (assuming a positive variation) in a less than snug-fitting sleepwear garment. Research indicates that snug-fitting garments can be less hazardous even when made from a potentially flammable fabric like cotton, but that the degree of fit is very important. Sleepwear garments exempt from the current children's sleepwear standards need to be snug-fitting to provide an acceptable level of risk. Comfortable, snug-fitting sleepwear garments made from knit fabrics can be and are being manufactured under the stay and more importantly using the garment dimensions specified in the amendment. Manufacturers are finding ways to deal with the issue of production tolerances and produce garments meeting the garment dimensions in the amendment to the Children's Sleepwear Flammability Standards. The garment's safe design, i.e., snug-fit would be compromised with the addition of tolerance.

## REFERENCES

1. Federal Register, Volume 61, No. 175, Monday, September 9, 1996, Rules and Regulations, Consumer Product Safety Commission, 16 CFR Parts 1615 and 1616, Flammable Fabrics Act: Children's Sleepwear (Sizes 0-6x, 7-14) Flammability Standards; Final Rule.
2. Log of Meeting, Children's Sleepwear -Snug Fitting Requirements, February 18, 1998, Margaret Neily, ESME, CPSC And Other Commission Staff With Manufacturers and Retailers Marketing Snug Fitting Sleepwear.
3. Log of Telephone Conversation, Addition of Tolerances To Snug-Fitting Children's Sleepwear, March 5, 1998, Linda Fansler, LSE, CPSC With Ms. Lucille Bertorello, Wundies, Inc.
4. Log of Telephone Conversation, Addition of Tolerances To Snug-Fitting Children's Sleepwear, March 12, 1998, Linda Fansler, LSE, CPSC With Mr. Dennis Sargent, American Marketing Enterprises, Inc.
5. Log of Telephone Conversation, Cutting Equipment For Apparel, March 23, 1998, Linda Fansler, LSE, CPSC With Mr. Leonard Schwab, The Schwab Company.
6. Memorandum To Terrance R. Karels, Project Manager, Children's Sleepwear Project, ECPA From Linda Fansler, ESME, Technical Rational Supporting "Tight Fitting" Children's Sleepwear Garments, March 14, 1994, U.S. Consumer Product Safety Commission.