

The Development of the Bodysuit Pattern on Golden Body Proportion Focusing on Middle-Aged Women

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Abstract

Background/Objectives: The aim of this study is to develop the body-suit pattern that enhances the reshaping effect of mid-forties women body type. **Methods/Statistical Analysis:** In order to produce a basic pattern, body surface shells from gypsum molds of three middle aged females was employed. Golden body proportion was applied to the design of bodysuit pattern and its pattern design. **Findings:** To calculate the total length of this body suit, outlining the measurement method is required. That is, in the condition of 8 to 10 % reduced ratio, the front part starts at bust point and the ratio of the distance to waist line and the distance to hip, which sets its width, is 1 to 1.2. Ratio reduction is not applied to the body suit length. Naming the body suit design method for this study as 80 BMQ size (80 is under bust circumference size; B stands for breast cup size; M indicates the length of body suit; and Q means hip circumference) is not by body measurement data but by the result of research conducted by a researcher who has produced body suit products with a body suit-specialized company as a part of industry-academic cooperation for a long time. Under bust circumference, waist circumference and hip circumference are reduced by 4 to 6 %; 9 to 10 %; and 1 to 2 % respectively. **Application/Improvements:** As a result, body-suit pattern for reshaping of mid forty women body was developed. It is required to pay attention to stretching the meaning depending on body suit designs by manufacturing enterprises.

Keywords: Body-Suit, Body Surface Shell, Basic Pattern, Golden Body Proportion, Gypsum-Mold

1. Introduction

The purpose of this study is to develop the body suit pattern design method that maximizing the reshaping effect on women in their mid-forties who need body reshaping due to sagging breast and buttocks, pot-belly and thick waist of their over-mature bodies, and to provide requirements for its production. Many studies have been conducted innerwear, brassiere, all-in-one¹⁻¹². However, it is difficult to find research that suggests bodysuit pattern design focusing on middle-aged women. The body suit for the study is designed to completely envelop chest and hip without pushing subcutaneous fat of chest towards armpit or upper forearm, and to wrap back fat as well. In addition to this, the study also aims to offer fundamental measurement items for body suit pattern design by reexamining the crotch vent-the location of snap button), which was commented as uncomfortable in a preceding research, hip circumference, waist size, bra cup size and

the basic measurement items used by major companies today. As a result, it will be able to give assistance to body suit producing business in developing their products with excellent functionality and wear-ability.

2. Research Methods and Procedures

2.1 Subjects and Measurements

Three subjects are selected from middle aged females of standard body type with average age of 47.6 years old and their bra size in 80B. The 80B size means that the circumference of one's chest under the breasts is 12.5 cm smaller than one's bust measurement. If the circumference of one's chest under the breasts is 80 ± 2.5 cm (78.5 cm-82.5 cm), the cup size will be 92.5 ± 2.5 cm (90 cm~95 cm). Fourteen items are measured and they are bust size, under bust circumference, waist size, abdominal circumference,

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Table 1. Physical properties of research bodysuit

Fabric	Weight (g/m ²)	Thickness (mm)	Density (piece/5cm)		Tensile strength (N)	Tensile elongation strain (%)	Restoration (%)	Fiber mixture rate (%)	
			wale	course				Nylon	Polyurethane
Shell	173.1	0.40	wale	94.4	251.1	337.0	34	Nylon	77.1
			course	122.2	226.5	272.5	94	Polyurethane	22.9
Lining	152.1	0.40	wale	74.8	174.4	381.5	74	Nylon	70.6
			course	137.8	190.7	220.4	98	Polyurethane	29.4
Lace	121.2	0.41	-	-	12.8	84	95.8	Nylon	88.1
					13.0	236	96.6	Polyurethane	11.9
TR	80	0.3	-	-	-	-	-	Nylon	100
Tape	4.9	1.03	-	-	32.8	288	96.8	Nylon	78.2
								Polyurethane	21.8

waist size, hip circumference, below diameter of breast, inner diameter of breast, outer diameter of breast, bodysuit length, and vertical length of torso. To calculate the total length of this body suit, outlining the measurement method is required. That is, in the condition of 8 to 10 % reduced ratio, the front part starts at bust point and the ratio of the distance to waist line and the distance to hip, which sets its width, is 1 to 1.2. Ratio reduction is not applied to the body suit length (M) and the length is measured as the distance from the lowest point of breast outline to hip joint. Ratio of under bust circumference, waist circumference and hip circumference are reduced by 4 to 6%; 9 to 10 %; and 1 to 2 % respectively. Detailed design method of each area is exhibited in the following Figure 3.

3.1 Pattern Design for Bodysuit

3.1.1 Basic Line Drawing

- Draw a rectangle with total length (width 68cm)/2 and width of the front and back (height 3cm)/2, and name this rectangle as A, B, A', B'.
- Draw a side line parallel to A, B with distance of 21 cm, then name it A'', B''.
- Draw a line parallel to AA' with 10.4 cm, which aligns to the height of below diameter of breast, and name it CC' (bust line).
- Draw a parallel line to CC' with distance of 18 cm and name it DD' (waist line).
- Draw a parallel line to DD' with distance of 11 cm to the left and name it EE' (under bust line).
- Draw a parallel line to DD' with distance of 21.6 cm and name it FF' (hip line).
- Name the points of intersection between CC', DD', EE', FF' and A'', B'' as C'', D'', E'', F'' respectively.

3.1.2 Finish Line Drawing for the Front

- Draw a parallel line to A', B' with distance of 7.4 cm and passing under bust point and name it GG'. Then, name its intersecting points with CC' as O, those with EE' as O', those with DD' as O'', and those with FF' as O'''.

3.1.3 Perimeter of Bra Cup

- Draw a diagonal line linking a point, 1 cm left from and 0.7 cm above C', to O', divide this line evenly into three, and connect the points, 2 cm below each 1/3 point of the diagonal line, and the end points of the diagonal line by curve.
- Draw a diagonal line linking a point, 8.1 cm above and 2.5 cm left from O, to O', divide this line evenly into three, and connect the points, 2.6 cm and 2.1 cm above each 1/3 point of the diagonal line, and the end points of the diagonal line by curve.

3.1.4 Side Line

- Draw a curve connecting a point 1.2 cm above C'', a point 2cm below D'', a point 0.8 cm above F'', and a point 6.2 cm right to F''.
- Connect a starting point of perimeter of bra cup and C'; and connect an end point of Side Line and an end point of perimeter of bra cup.
- Finish Line Drawing for the Back.

3.1.5 Neck Line in the Backside

- Draw a diagonal line connecting a point, 3 cm left and 0.5 cm above Canda point, 10.8 cm below A, and draw a curve passing a point 2 cm below its bisection point.

3.1.6 Center Line of Back

- Draw a natural curve linking an end point of Neck Line, E, a point 0.8 cm below D, a point 1.5 cm above F, and B.

3.1.7 Side Line

- Draw a curve connecting a point 0.5 cm above C", a point 1.5 cm above D", a point 0.8 cm below F", and a point 6.2 cm right to F". Match the length to Side Line of the Front.

3.1.8 Armhole Line

- Draw a curve between an end point of Side Line and the width of the Strap (1.6cm).

3.1.9 Cutting Line

- Draw a line for attachment of additional layer on the crotch area with distance of 8.2 cm from B, and draw a straight line passing bisection points of this line and EE".
- Make a dart of 0.8~1 cm around Waist Line, give volume of 1.8~2 cm around hip Line, and draw a natural curve.

3.1.10 Circumference of Front and Back Parts of Leg

- Draw a curve connecting, a point the width of Snap/2 from a point 9.2 cm from F' and a point 1.5 cm above and 2 cm right from O". Connect this line with Side Line.
- While maintaining the width of additional layer for Crotch in 7~8 cm, draw a curve connecting the front and back line of additional layer for Crotch.

3.1.11 Lining Line

- The Front: Draw a curve linking O', a point 2.5 cm below O", and a point 1.5 cm above and 2 cm right from O".
- Draw a diagonal line from F' with the angle of 45 degree for Tummy Line. Draw a Lining Line by drawing a curve, similar to a parallel line to Tummy Line and starting from a bisectational point of Snap. Draw a Lining Line connecting a point 4~5 cm below a bisectational point between E' and D' and Side Line.
- The Back: For the Lining Line of Upper Back, draw the Lining. For the Lining Line of Hip, draw an arc to give volume to hip.

3.2 Pattern Design for the Cup Pattern for the Lower Part

3.2.1 Basic Line Drawing

- Draw a rectangle with the Lower part of the Cup Width of 18 cm and the Lower part of the Cup Height of 8.6 cm. Then, name it A B, A'B'.
- Draw a parallel line to A, B with distance of 4 cm and name it A", B".
- Draw a parallel line to AA' with distance of 7.2 cm and name it OO".

3.2.2 Finish Line Drawing

- Draw a line between a point 0.9 cm below A", and O". Divide this line into three equal parts.
- Draw a curve passing points 0.9 cm and 1.2 cm above each two trisection points.
- Draw a line between a point 1.3 cm below B", and O". Divide this line into three equal parts, and draw a curve passing points 0.6 cm and 0.9 cm above each two trisection points.
- Draw a curve linking a point 0.9 cm below A", and O.
- Draw a curve linking a point 1.3 cm below B" and O.
- Draw a line linking points 0.7 cm both left and right from O" to O'.

3.3 Pattern Design for the Cup Pattern for the Upper Part

3.3.1 Basic Line Drawing

- Draw a rectangle with width of 18.9 cm and height of 14.8 cm, and name it A B, A'B'.
- Draw a parallel line to A, B with distance of 8.2 cm and name it A", B".
- Draw a parallel line to AA' with distance of 8.8 cm and name it OO".

3.3.2 Finish Line Drawing

- Draw a curve passing a point 0.5 cm above A, a point 0.8 cm above B and O.
- Draw a diagonal line connecting a point 4 cm above A and a point 3 cm above B".
- Draw a line passing a point, 4 cm above A and 1 cm inward, and a point 0.5 cm above A. Make this line into 4 cm.
- Indicate points 0.8 cm (Strap/2) left and right from a point 3.6 cm inward from B'.

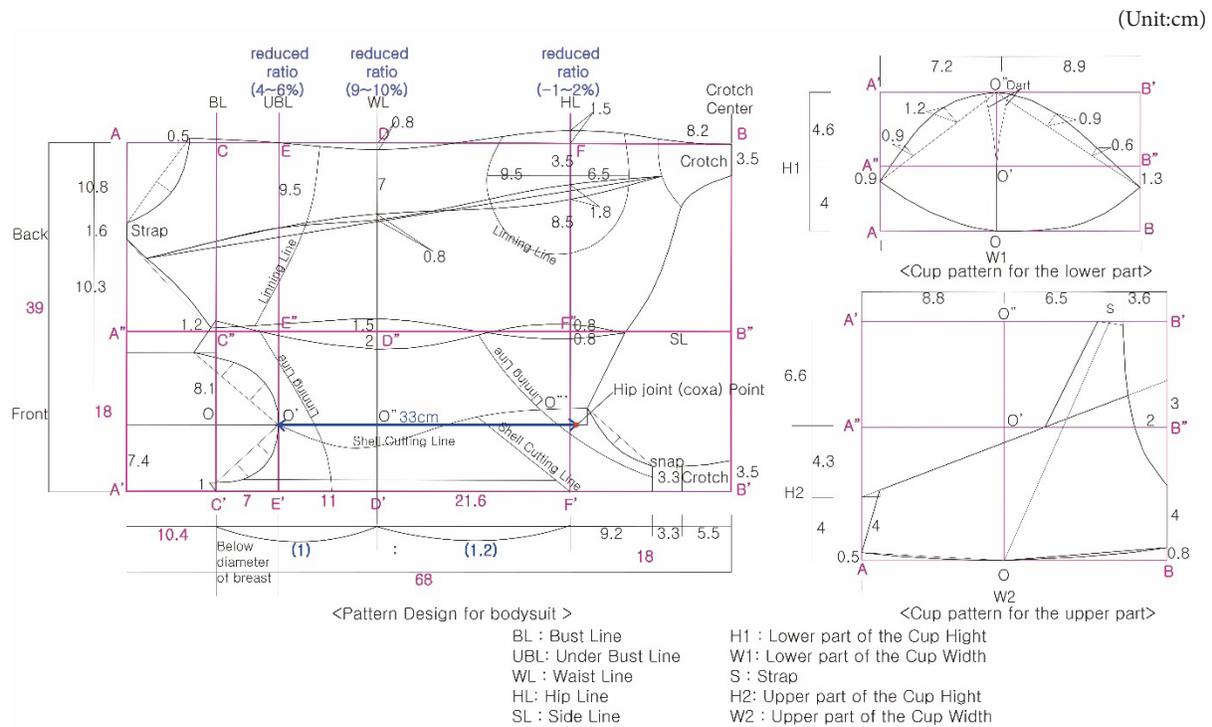


Figure 3. Detailed design method of each area of bodysuit pattern.

- Draw a natural curve from a point 4 cm from a point 0.8 cm above B, a point 2 cm inward from B'' to the Strap.
- Draw a line linking O and the central position of Strap. Draw a parallel line to this line with consideration of the position of the Upper part of the Cup.

to purchase the right size. The design method of research bodysuit based on Golden proportion is considered to enhance the effectiveness of production in bodysuit manufacturers and to complement the basic data used for developing bodysuit product with excellent functionality and wear-ability.

4. Conclusions

In this study, the design and pattern of bodysuit in order to increase the effect of reshaping for middle aged women in their forties, who need reshaping, proposed Golden body proportion and, at the same time, developed the design and pattern of body suit in order to increase the effect of reshaping. Ten measurement points are identified as key reference requirements to designing body suit, which allows more functionality. Korean Standards Sizing Systems for Foundation Garments recommend dissimilar seven measurement items. As a result, it contributes to produce body suit with higher added value, especially for designing mid-forties women body suit. For the research bodysuit, sizing system is marked as 80BMQ. Hip circumference (Q) supplement the sizing system in addition to under bust circumference (80), bust size (B), body suit length (M). It will support customers

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