A study on pattern making of sleeves with curved shoulders

Zlatina Kazlacheva and Krasimira Radieva  
Trakia University of Stara Zagora,  
Faculty of Technics and Technologies, Yambol, Bulgaria  
Graf Ignatiev 38, 8600 Yambol, Bulgaria  
e-mail: zlatinka.kazlacheva@trakia-uni.bg

Abstract. The paper presents a study on pattern making of a constructional base for designing of sleeves with rounded shoulders for ladies’ dresses and jackets: kimono, raglan, semi raglan and sloped shoulders ones. The developed constructional model gives possibilities of facilitating and correct pattern making of a base of design of ladies’ dresses and jackets sleeves with curved shoulders: kimono, raglan, semi raglan and sloped shoulders ones. The use of obtained dependence between additional height in the rounded shoulders and the additional height in the armhole makes the geometrical sequence of pattern making easier. A similar study can be made for ladies’ outerwear.

1. Introduction

Analyses of lady’s fashion of 20th and 21st centuries show that the sleeves with curved or rounded shoulders are sustainable fashion element, a symbol of femininity and elegance. The more type of sleeves with curved shoulders are designed on one and the same constructional base and they are kimono, raglan, semi raglan and sloped shoulders ones. The four types of sleeves differ each other by the directions of design constructional seams which share the underarm to sleeve and bodice. In the garments with kimono sleeves, design constructional seams divided the front and back, or sleeves under underarm areas. In the clothes with raglan sleeves, the design constructional seams connect the underarms with the neckline. In the garments with semi raglan sleeves, the design constructional seams connect the underarms with the shoulders. In the clothes with sloped shoulders sleeves, the design constructional seams cross the sleeves under the shoulders.

The paper presents a study on pattern making of a constructional base for designing of sleeves with rounded shoulders for ladies’ dresses and jackets: kimono, raglan, semi raglan and sloped shoulders ones.

2. Pattern making model development

The pattern making approach is made after analysis of constructional systems for design of sleeves in clothes with padded shoulders [1, 2, 3, 4, 5, 6]. The clothes with curved shoulders are made without or with thin shoulders pads. Like the pattern making of sleeves for garments with padded shoulders, the constructing of sleeves for clothes with rounded shoulders requires additional volume for well-looking design and free of arms motions in the shoulder joints. The transformation of parts of the front bust darts and the back shoulder darts in the armholes leads to that needed additional volume. After this transformation, other modifications of the constructional base are made. In the pattern models of garments with padded shoulders, the next modifications depend on the additional height for padded shoulders. In the pattern
design of clothes with curved, the next modifications have to be connected with the slope of the sleeves to the bodice. The well looking form of sleeves and shoulders and the free motions of the arms depend on the slope of the sleeves to the bodice and the additional volume, result of the transformation of the part of the front bust darts and the back shoulder darts in the armholes.

The development of the pattern making model starts with a simple constructional base [7] for clothes without modified shoulders of kimono, raglan, semi raglan and sloped shoulders sleeves. That simple constructional base is based on the division of the one-piece sleeve into front and back parts, as the dividing line is drawn down from the top point, or the shoulder notch, of the one-piece sleeve cap. After that the front part of the sleeve is set to the front part of bodice, presented in Figure 1, as the sleeve part and the front connected in the notches of sleeve cap and armhole, and a distance of 1,0 cm (shown with a circle) between the sleeve cap and the last shoulder point. The constructing of the back is in identical way.

After that the front sleeve and front are separated as the sleeve part keeps the same slope (from the construction in Figure 1). A line, perpendicular to the sleeve cap, is drawn from the sleeve notch. The line length is equal to the distance for additional volume, result of transformation of a part of the bust or shoulder dart in the armhole, which is 0,5-1,5 cm in the armhole. The perpendicular line determines the additional width of sleeve, results from the additional volume in the armhole [4, 8, 9]. Then, as it is presented in Figure 2, the sleeve in the same slope connects to the front through the perpendicular line, which last point matches with the sleeve notch of the armhole of the front. After connection, the distance between the sleeve cap and the last shoulder point is determined by a circle. The modifications in the construction of the back are made in an identical way.

![Figure 1](image1.png) **Figure 1.** The set of the front part of sleeve to the front, and determination of the slope if the sleeve.

![Figure 2](image2.png) **Figure 2.** The connection between the front part of sleeve and the front part of the bodice through a line with length, equal to the additional volume in the armhole.
Figure 3 presents the transformation of a part of the bust dart in the armhole. The notch in the front armhole and the apex of the bust dart are connected with a straight line, as it is shown in Figure 2. This line determines the place for the transformation of a part of the bust dart for the additional volume. After that the part of the front, which is situated between the line of transformation and the bust dart, is rotated around the bust dart apex, as the distance about the additional volume in the armhole is in the interval 0,5-1,5 cm, equal to the line between the notch of the sleeve cap and the notch of the armhole. The modification in the construction of the back are made similarly.

Figure 4 shows the last transformation before the forming of the curved shoulders. The front part of the sleeve is rotated around the notch of the front armhole. The sleeve is rotated to the position in which the sleeve cap matches to the circle with the center the last shoulder point. The radius of the circle, which drawing is presented in Figure 2, is a result of the sleeve slope and determines in constructional way the distance between the sleeve cap and the last shoulder point. The modification in the construction of the back are made in an identical way.

Figure 3. The additional volume, results of the transformation of a part of the bust dart in the armhole.

Figure 4. The rotation of the sleeve to needed distance between the sleeve cap and the last shoulder point, determined in constructional way on the base on the sleeve slope.

Figure 5 presents the final of the pattern making model development. For the front: The rounded shoulder is formed with a curved line between the last shoulder point and the front part of the sleeve in the line of dividing of the one-piece sleeve into a front part and a back part. Similarly for the back: The rounded shoulder is formed with a curved line between the last shoulder point and the back part of the sleeve in the line of dividing of the one-piece sleeve into a front part and a back part.
Figure 5. The pattern making base.
3. Connection between the additional height in arm hole and the additional height in the rounded shoulder

The facilitation of the geometrical constructional base, shown in Figure 5, is possible if a dependence between the additional height in the rounded shoulder, which is between the cap of the part of the one-piece sleeve and the last shoulder point – H sh and the additional height in the arm hole for the additional volume, which is results of transformation a part of the shoulder dart – H ah has been obtained. The locations of the additional height in the rounded shoulder H sh and the additional height in the arm hole H ah are presented in a front construction in Figure 6.

![Figure 6. The locations of H sh and H ah in a front construction.](image)

Constructional bases of ladies’ dresses and jackets for pattern design of sleeves with rounded shoulder are drawn for different combinations of body sizes: the bust between 84 and 108 cm, and the body height between 158 and 176 cm. The additional height in armhole is between 0,5 and 1,5 cm (max width of the back shoulder dart in the arm hole contour). With the help of the statistical software STATISTICA 7.0 [10, 11] four linear regressions are made for the front and back of dresses and jackets using linear regression model – formula (1):

\[ Y = a + b \cdot X, \]

where Y is the dependent variable; X – independent variable; a – constant; b – coefficient of regressions.

The four regressions show remarkably close results and a linear regression with four data is made, in which the additional height in the arm hole H ah is the independent variable X and the additional height in the rounded shoulder H sh is the dependent variable Y.
The results of regressions are: \( a = 1.0125 \) and \( b = 0.7500 \). The correctness of the linear regression model is indicated by the values of \( p < 0.0000 \), \( R \)-square = 0.98857645, and Std. Error of estimate = 0.04818, and formula (1) is transformed in dependence (2):

\[
H_{sh} = 0.75 \cdot H_{ah} + 1.0,
\]

where \( H_{sh} \), cm is the additional height in the rounded shoulder; and \( H_{ah} \), cm – additional height in the armhole for additional volume.

The dependency (2) facilitates the geometrical constructing of the pattern making base, shown in Figure 5, in a following simple sequence: The additional height \( H_{ah} = 0.5-1.5 \) cm in the front and back armholes, which is needed for additional volume, is obtained after transformation of parts of front bust (shoulder) dart and back shoulder dart in the armhole. Lines with length, equal to \( H_{ah} \), are drawn in the notches on the cap in both front and back part of the sleeve. Both lines are perpendicular to the sleeve cap. Circles with centers the last points of the front and back shoulders and radius, equal to the additional height in the rounded shoulder \( H_{sh} \), are drawn. After that, the front and back parts of the sleeve are set to the front and back part of the bodice as the last points of the lines, which are perpendicular to the sleeve cap, match with the front and back notches of the armhole, and the parts of the sleeve cap connect with the circles, drawn in the last shoulder points. And after that, the rounded shoulders are formed.

4. Application

The pattern making model, shown in Figure 5, with or without facilitation of dependence (2), are the base for creating of kimono, raglan, semi raglan or sloped shoulder sleeves, as the design constructional seams, which determine the types of the sleeves, share the underarm parts to the sleeve and the bodice.

Figure 7 presents an example of a lady’s jacket with sloped shoulders sleeves, designed on the base of the pattern making model, presented in Figure 5, with \( H_{ah} = 0.75 \) cm and \( H_{sh} = 1.6 \) cm.

Figure 7. A jacket with sloped shoulders sleeves, designed on the developed constructional base.
5. Conclusion
The developed constructional model gives possibilities of facilitating and correct pattern making of a base of design of ladies’ dresses and jackets sleeves with curved shoulders: kimono, raglan, semi raglan and sloped shoulders ones according to the directions of design constructional seams which share the underarms to the sleeves and the bodice. The use of obtained dependence between the additional height in the rounded shoulders and the additional height in the armhole for additional volume makes the geometrical sequence of pattern making easier. A similar investigation can be made about the development of a constructional base of pattern design of ladies’ outerwear with sleeves with rounded shoulders.

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