

## Amethyst evolution: zero waste activewear for multiple sizes

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The purpose of Amethyst Evolution was to corroborate previous research on a method for achieving a range of garment sizes using one zero waste pattern. The method uses one zero waste layout with the pattern shapes remaining constant for all sizes with “grading” achieved by varying the width of narrow trims or strips of fabric inserted in strategically placed seams (Carrico, 2016, 2020, 2020).

Even as designers prioritize sustainability more and more, (Lee, Min, & Koo, 2021; O’Connor, 2018) most pattern layouts still generate some fabric waste on the cutting table. Zero waste patterns can eliminate the cutting waste, but the pattern design can take more time than traditional patternmaking (Rissanen, 2014). In addition to the increased time needed for making zero waste patterns, generating the designs in a range sizes has been a hurdle for taking zero waste designs to market (Carrico & Kim, 2014; Rissanen, 2014; Saeidi & Wimberley, 2018); hence, very few zero waste designs available are sold in a range of sizes for consumers. If designers were tasked with generating new patterns and zero waste layouts for each size in a range, they may not have the time necessary to devote to such work. The method used for sizing in Amethyst Evolution makes no changes to the original pattern shapes. In fact, the entire range of sizes could be cut by the one marker in Figure 1. A range of sizes from one zero waste pattern has been previously executed on different women’s separates all made of woven fabric: blouses, skirts, and pants. The objective of this design was to apply the same method for sizing to a different apparel category, athletic wear.

Working in Browzwear’s VStitcher, I drafted a zero waste skort and long-sleeve top in a size small. To ensure compatibility between the main fabric and the inserted strips, I chose a two-sided polyester and spandex knit and used the lighter side for the main pattern pieces while the darker fabric side was used for the strips for grading. The final appearance of each different size does vary more than if traditional grading methods (Moore, Mullet, & Young, 2001) were used since the strips are visible. The difference would be less obvious if the light side of the fabric was used for all parts of the garments. Fortunately, inset strips and stripes are quite common in the athletic wear category.

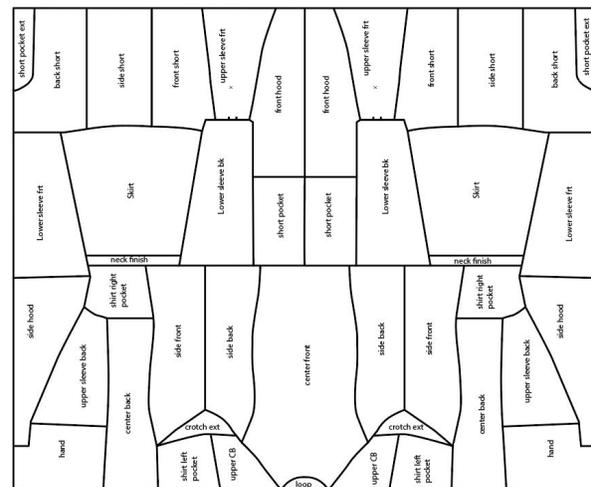


Figure 1. Pattern layout measuring 46.75 x 57.5 inches

Figure 1 shows the zero waste pattern layout for all sizes. For the skort, one strip for sizing is located at the crotch/inseam and four equally sized strips are located at the side panels, one each side to the front, and one each side to the back. The waistband of the skort is also a strip since it will be different dimensions for each size. The waistband grows primarily in length but does grow slightly in width as well. On the top, there are strips of equal widths at the front and back princess seams, side seams, and underarm seams. The strips at the armhole seams are the same width as the vertical strips for smaller sizes in the range, but they are not as wide as the vertical strips in the larger two sizes. Initially I did not intend to use a strip across the bicep area of the sleeve, but I realized it would be necessary for sleeve growth. The bicep strip is placed using the lighter side of the fabric to reduce the visual contrast in the sewn sample. For the large and extra-large sizes, a gusset was also needed under the arm to accommodate the fit. The gusset pieces are right triangles created by splitting one wide strip diagonally. The center back neck piece is a wide strip that continues into the hood of the garment. The front edge of the hood is faced with strips that appear to match the armhole strips in width but are actually wider to fold back for a clean finish. Odd shapes within the pattern layout became pockets set into the seams of the top or worked into the hood. Other small shapes were used as crotch extensions on the skort front, and a small loop is created and sewn to the skort waistband from the crescent shape created at the neck of the top center front piece.

	Strip widths	Hip / sweep measurement
XS	.22	35
S	.55	37
M	.88	39
L	1.38	42
XL	1.88	45

Table 1. *measurements in inches*

By developing the patterns first in VStitcher, I was able to test width calculations for the strips quickly and verify fit for each size by using the pressure map feature. Dress form avatars were used for the virtual fittings because they were available in a range of sizes. A video is available at <https://youtu.be/U9Ecm4vPL-c> featuring virtual renderings of sizes Extra-Small, Medium, and Extra-Large. Pressure map views are included to show the consistency of the fit, via the pressure map, across the sizes. All strips in the video are the darker purple while all light purple pieces are the unchanging pattern shapes. Table 1 shows the hip /sweep measurements of the top with the accompanying strip width. The difference in width of strips can be seen in Figure 2 which depicts prototypes for small and medium sizes.

Amethyst Evolution builds on previous work utilizing narrow fabric strips or trims as a solution to grading zero waste patterns. The continued success of this technique is significant because, as previously noted, few designers offer zero waste items in a range of sizes. This method can be utilized by designers in other categories of apparel. If contrasting strips are not a desired aesthetic, one could use matching fabric for the strips; printed fabrics with small scale motifs can work well, in fact, to camouflage the inset strips. The look is appealing for the activewear shown here, though. Further work in this realm could include other apparel categories such as eveningwear or menswear.



Figure 2. *Size small on the left (purple) and size medium on the right (orange)*

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