

# *Engineered Fit - The Application of Engineering to Pattern Drafting and Garment Design*

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The creation of patterns for wearable garments has been traditionally considered an art form – one with almost mystical practices and rules. While many of these are rooted in very practical experience, such as the placement of back shoulder darts at the halfway point of the shoulder length, those rules have evolved into unquestioned requirements for pattern drafters. Unfortunately, the rules themselves were developed with specific ranges of body styles and shapes in mind, and do not always apply to bodies or shapes that differ from that expectation.

When I was first looking at pattern drafting, one of the major things that I noticed was that these rules seldom had justification or corresponding rationale with them. Instead, they are presented as “do this...”, “add 0.5 inch to this...”, and other such statements. This quickly caused significant problems for me, since the bodies for which I was developing patterns did not fall within the mythical “norm”. When I tried to adapt the rules to body variances, it became quickly evident that the rules only provided glimpses of points on some sort of mathematical relationship. That relationship is between the body being clad, and the garment that is the intended covering.

As more and more of these garment-to-body factors were uncovered, it occurred to us that what we were in fact doing was articulating the covering of the body in a similar manner to the way that an airplane skin was developed – with an understanding of pivot points, intended flexibility, and stress and strain lines. A whole new paradigm was required to capture these characteristics, including different ways of measuring the body, so that the structural and soft tissue elements were addressed. Our mantra became something on the order of “If you cannot state the reason for the rule, then the rule must be discarded”. Obviously, this made for a longer development time, since drafting patterns is only the end state of developing the needed language, metrics, mathematical algorithms and processes.

The resulting application suite takes the components of a mathematically-defined body, the characteristics of the proposed covering, and the body articulation to produce garment patterns that are specifically designed (or engineered) for an individual. Since the general rules of pattern drafting are not used as such (e.g., grading rules), the normal distortion of garments as they are traditionally produced for larger or smaller bodies does not occur. With an engineered fit, the patterns become completely scalable, whether that pattern is for a 4 inch fashion doll or someone that is 8 foot tall and 600 pounds.

There are many aspects of garment drafting that change with this paradigm shift, including things like the treatment of garment ease and the way that the body is measured. However, the end goal is to produce wearable and reproducible garments for a unlimited variety of bodies. While this is difficult in the traditional framework of pattern drafting and garment design, it is definitely achievable in the world of engineered fit.

One of the ways that it is possible to realize this increased garment control and fit is through the inclusion of draping into the engineering. Since the thrust of the engineering fit aspect focuses on the better understanding of the body movement and pivot, it is then possible to actually have the computer use a draping method for the garments, rather than simply block draft them. As many garment designers have found, draping provides the best overall perspective for garment design – allowing the designer to account for the fall of the garment, the relaxation of fabric tension and other dynamics that truly make the end garment more closely tied to the vision in the mind of the creator.

Of course, not everyone wants that exact of a fit – so we found that including both blocked and draped patterns was essential for those sewers and designers with less exacting requirements, or for those that are trying to create garments with a more general public in mind.

The latest challenge in this area has been to make that highly mathematical process and construction usable by non-engineering and math people. With the appropriate application front-end, we believe that this has been achieved. As we continue in our journey for perfectly-controlled fit, we hope that this becomes the norm in the sewing world. The merger of engineering and pattern drafting has produced the reliability of engineering design as a support for the creativity of the garment, home décor and craft sewer. Rather than make sewing more rigid, the engineering supports the art.

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