

TECHNICAL DATA

GLOBE MANUFACTURING COMPANY, LLC

Variability in TPP and THL Results

We are often asked how it is possible for different manufacturers to report different values on the exact same three layer composites. The 2013 edition of NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, continues to require a minimum TPP (thermal protective performance) rating of 35, and a minimum THL (total heat loss) value of 205 W/m².

It is important to note that Underwriters Laboratories, Inc. is currently the only independent lab who certifies every single brand of turnout gear and while the certification values reported by them are accurate, they are not absolutes. For example, TenCate, the world's only producer of Advance Ultra outer shell fabric, reports a TPP range of 39-41 when Advance Ultra is tested with Defender M SL2 and Crosstech Black. However, the UL value on the exact same composite is 46.5 – for the same precise materials from the same specific suppliers! The reason for this variability is twofold: (1) the test is run on multiple fabric layers, and fabric weights are generally considered acceptable with a plus or minus tolerance of 5%, and (2) the test method itself allows for a $\pm 8\%$ variability in test samples. With regard to the fabric weights, any of the individual layers could be slightly higher or slightly lower in weight, which definitely affects the overall composite weight and the final TPP or THL value. To illustrate this point, consider that it is quite acceptable for the 7.5 osy Advance Ultra to actually weigh in at 7.8, and the 4.7 osy Crosstech Black to weigh 5.0 and the 7.8 osy Defender M SL2 to have a weight of 8.1. With this combination, your total ensemble weight would increase by almost a full ounce per square yard, greatly increasing the final TPP test result – but significantly decreasing the THL rating. And since fabrics are produced from fibers, this change in weight actually occurs within the individual rolls of fabric!

For the purposes of third party testing, the industry has joined together in “data sharing” with Underwriters Laboratories performing the required composite certification testing and the results being able to be shared among the various manufacturers who purchase the component fabrics. Given this, the THL values reported by Underwriters Laboratories would be the same for each garment manufacturer who elects to use data sharing. Unfortunately, we have seen cases where some manufacturers will report either the UL number **or their own inhouse testing**, whichever yields better results. The reason we say unfortunately is that this practice can be misleading if you don't understand the variables, and is certainly confusing to end users. This is especially true when the THL test itself allows for a 10% variable deviation in acceptable ratings. With this allowable variance, a composite that UL has reported a THL rating of 278.04 could encompass a testing range of from 250.28 to 305.84, a 55.56 point difference, and any of the numbers within that range would be accurate within tolerance.

The bottom line when specifying material layers for your protective clothing is to review all of the TPP and THL numbers presented from all different sources. If every manufacturer is providing numbers from the exact same three material layers, you should take the highest and lowest of each reported test result and figure that **on average**, your value will be somewhere in the middle. The TPP and THL values have nothing to do with garment design or construction but are strictly material based and any garment producer using the specified materials will at some point in time be at the high end, at the low end, and somewhere in the middle.