TECHNICAL SERVICES DEPARTMENT

VARIABIALITY 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 2018 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, regardless of manufacturer, and while the certification values reported by them are accurate, they are not absolute. The reason for this is that the NFPA standard does not set minimum weights for the various materials, but rather relies upon performance characteristics to dictate acceptable weight. It is a fact that material weights change within the rolls of fabric and a tolerance of $\pm$ 5% is generally considered acceptable. A second factor is that the test method itself allows for a $\pm$ 8% variability in the individual test samples and the final result is actually the average of five specimens. With regard to the fabric weights, each of the separate layers could be slightly higher or slightly lower in weight than the nominal listing, 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 Gemini shell 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. Since fabrics are produced from fibers, this change in weight is not unusual but rather the norm.

For the purposes of third party testing, the industry has joined together in "data sharing" with Underwriters performing the required composite certification testing and the results being able to be shared among the various manufacturers who purchase the individual 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 in-house testing**, **whichever yields better results.** The reason we say unfortunately is that this practice can be misleading if you do not 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 as having a THL rating of 278.04 could encompass a testing range of 250.28 to 305.84, a 55.56 point difference, and any of the numbers within that range would be accurate and acceptable within tolerance. Likewise, a TPP value of 42.4 could test as low as 39.0 or a high as 45.7 – and still acceptable.

Globe only reports UL certification values for TPP and THL and we encourage all users to insist upon being provided with the UL certification results for these two tests. As pointed out in this paper, the TPP and THL values have nothing to do with garment design or construction but are strictly the result of the three fabric layers specified and any garment produced using those same specified materials will at some point in time be at the high end, at the low end, and somewhere in the middle.

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