



Standards vs Test Methods

Please explain!?

Often users mix up the many standards and test methods related to FR garments. We will go through the most relevant standard performance specification, test methods, terms and give you a summary of what you should really be looking for when considering FR garments.

ASTM F2302-08 – This is the Standard Performance Specification for Labelling Protective Clothing as Heat and Flame Resistant. Requirements: must meet requirements under Test Methods ASTM D6413 for flame resistance and ISO 17493 for convective heat resistance.

ASTM F2733-09 – This is a Standard Performance Specification for Flame Resistant Rainwear for Protection Against Flame Hazards. Requirements: must meet requirements under Testing Methods ASTM D6413 and ISO 17493 and ASTM F1930.

CGSB 155.10 – This is a Standard Performance Specification for Firefighter's protective clothing for protection against heat and flame. This Standard is SPECIFIC to Firefighter clothing, and has no relevance for any other industry. *It is commonly, and incorrectly, used to reference a fabric's resistance to ignition and self-extinguish when exposed to an open flame.*

CGSB 155.20-2000 – This is a Standard Performance Specification outlining the minimum requirements for performance workwear worn for protection against unplanned exposure to hydrocarbon flash fire. Testing includes flame resistance (fabrics tested before and after 50 domestic wash/dry cycles), thermal protective performance (TPP), heat resistance, and thermal shrinkage resistance.

What does it mean to meet CGSB 155.20-2000?

The CGSB 155.20-2000 standard refers to protective WORKWEAR that will be worn as the outermost garment (please note the wording WORKWEAR and GARMENT, as this standard relates to a completed garment, not just its components). *This standard is the most abused*; many manufacturers will claim partial compliance with statements like: (1) Meets CGSB 155.20 Par 6.1.1 (referencing only the single paragraph 6.1.1 of the standard which is related to Flame Ignition and Self-Extinguish—the actual garment is non-compliant, but the outer fabric has a basic flame retardant treatment); (2) Shell material meets CGSB 155.20 (referencing only that the outer fabric meets paragraphs 6.1.1. through 6.1.2.2 of the standard which is related to the Flame Ignition, Self-Extinguish, and Thermal Protective Properties (TPP) of the shell

fabric—the actual garment is non-compliant as the Standard requires all Components, including liners, visibility trim (tape), reinforcements, wristlets, and collar meet Flame and Heat Resistance requirements both in original state and after 50 cycles of washing; all threads must be inherently flame resistant, and all insulation MUST be Flame and Heat Resistant. Using reference portions to this standard, or unique paragraphs of this standards is misleading and deceptive to the consumer, who will assume the garment is protective against Hydrocarbon Flash Fire occurrence.

What about PVC or PU product?

Garments made of PVC or PU polymers films CANNOT meet CGSB 155.20 as it will not pass the ISO 17493 convective heat requirement due to their low melting points of 160°C, and 240°C respectively.

Standards continued...

CGSB 155.22-97 – This is the Standard Performance Specification outlining the minimum requirements for performance of fireline workwear worn for protection against the adverse effects to the firefighter's body during forest firefighting. Testing includes flame resistance (fabrics tested before and after 50 domestic wash/dry cycles), thermal protective performance (TPP), heat resistance, thermal shrinkage resistance, and seam strength.

NFPA 2112-2012 – This is the Standard Performance Specification that shall specify the minimum performance requirements and test methods for flame-resistant fabrics and components, and the design and certification requirements for garments for use in areas at risk of flash fires. Testing includes flame resistance (fabrics tested before and after 100 commercial wash/dry cycles), thermal protective performance (TPP), heat

resistance, thermal shrinkage, and manikin flash fire.

NFPA 1975-2009 – This is the Standard Performance Specification outlining requirements for the design, performance, testing, and certification of non-primary protective station/work uniforms and the individual garments comprising station/work uniforms. This standard shall also specify requirements for the thermal stability and flame resistance of textiles used in the construction of station/work uniforms.

NFPA 1977-2011 – This is a Standard Performance Specification specifying the minimum design, performance, testing, and certification requirements for protective clothing, helmets, gloves, and footwear that are designed to protect firefighters adverse environmental effects during wildland fire-fighting operations.

ASTM F1506-10a – This is a Standard Performance Specification for Textile Material for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards, as per Section 130.7 (C)(8) of NFPA 70E. Testing includes electric arc exposure, flame resistance (fabrics tested before and

after 25 commercial wash/dry cycles), tear resistance, breaking strength, dimensional change in laundering, colourfastness to laundering/dry cleaning, and yarn slippage.

QUICK SUMMARY:

- An FR designated garment refers to the fabric's treated or inherent ability to resist ignition or to self-extinguish.
- Hydro carbon flash protection; CGSB 155.20-2000 compliance tests vertical flame as well as thermal protective performance (TPP VALUE) A minimum level 6 (at 3 second) is required to meet this standard, and all materials used on the garment including the threads must be FR. (More details on Page 42.)



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Test Methods & Codes/Guides

Test methods

ASTM D6413 – The USA Testing Method and requirement for determining a fabric's resistance to ignition and ability to self-extinguish when exposed to an open flame.

CAN/CGSB 4.2 No. 27.10 – The Canadian Testing Method and requirement for determining a fabric's resistance to ignition and ability to self-extinguish when exposed to an open flame.

ISO 17493/ASTM F2894-12b – A Testing Method and requirement for determining a fabric's ability to resist ignition, melting, or shrinkage in ambient temperatures at 260°C for 5 minutes.

ASTM F1930 – A Testing Method using a manikin with a finished garment and using a heat flux of 2 cal/cm² over an exposure time of 3 seconds to determine the predicted second and third degree burn area. This test method duplicates a Hydrocarbon Flash fire incident, and predicts the garment's protection against 2nd and 3rd degree burns.

Codes / Guides

OSHA 1910.269 – This is a Code or Guide comprised of the operational and maintenance of electric power generation, control, transformation, transmission and distribution lines, and equipment. OSHA standard CFR1910.269 has brought many occupational safety principles for the protection of all the workers working in workspaces where there is always risk of injuries due to electric shocks or fire burns.

NFPA 70E-2014 – Both of these Code or Guide are for electrical safety in the workplace, composed of procedures, policies, and guidelines.

What is HRC & TPP?

HRC is changing to Arc Rated Category (CAT) – HRC is an abbreviation for Hazard/Risk Category as determined by the ATPV (Arc Thermal Protective Values) or the amount of energy from an Electric Arc a fabric will resist. The change to Arc Rated Category is to remove the "risk", and define the actual Arc protection as "risk" to a worker is more a function of multiple factors that require a risk assessment or model. This standard does not address Hydrocarbon Flash peril: HRC is going to Arc rated Category as defined as follows:

Arc CAT	ATPV Protection
CAT 1	Min 4 calories/cm ²
CAT 2	Min 8 calories/cm ²
CAT 3	Min 25 calories/cm ²
CAT 4	Min 40 calories/cm ²

Over the next year you will see a transition of labelling on FR garments from HRC to CAT (Arc Rating ATPV). HRC/CAT has a relationship with Hydrocarbon Flash Fire protection in that materials of Cotton or inherent FR (Nomex) generally will meet the TPP requirements of hydrocarbon Flash Fire protection when meeting HRC/CAT 2 or greater. However,

HRC/CAT 2 can be attained with Polymer Film fabrics like PVC which will FAIL Hydrocarbon Flash requirements. When selecting Hydrocarbon Flash Fire garments focus on the TPP values versus the HRC/CAT level.

TPP – Thermal Protective Performance of a fabric tested with radiant and convective energy to determine the total energy required to simulate a 2nd degree burn injury. The minimum requirement for a fabric used in a CGSB 155.20 garment is 6.0.

TPP in relation to CGSB155.20.2000

It is not enough that a fabric may have a TPP value of 6.0+; in order to meet the standard of CGSB 155.20, and provide the required amount of hydrocarbon flash protection to a user, the WHOLE garment must comply with the CGSB 155.20 standard. **Be careful about claims of "Fabric meets CGSB 155.20, or has a TPP value of 6.0+".**

To sum it up . . .

HRC is only used for electric arc, so a high HRC rating does not automatically imply that it will offer any hydrocarbon flash fire protection.

Depending on the material used, a high HRC garment may provide some inherent TPP value but unless stated, do not assume TPP rating.

If you are looking for basic FR...

The correct standard for "basic" FR (vertical flame and self-extinguishing, as well as Convective Thermal Resistance) is ASTM F2302-08

Hydrocarbon flash fire & Electric arc...

The correct standards for Hydrocarbon Flash Fire and Electric Arc protective clothing are:

NFPA 70E, NFPA 2112-2207, CGSB 155.20-2000, CGSB 155.22-97, and ASTM F1506A.

Each of these standards has stringent requirements for compliance, lot traceability, and independent testing. Manufacturers making any claims of compliance to these standards should be able to provide extensive testing reports in original state and after 50 washing cycles.

Limitations

Under each of the above standards there is a requirement that each garment have a clear label outlining the limitations, and use of the garment for applications. All VIKING garments with claims of "Basic" FR will be labelled as follows:

ATTENTION

This garment has been tested for and complies with ASTM F2302-08; Standard Performance specification for Labeling Protective Clothing as Heat and Flame Resistant. This garment will not combust, melt, or shrink in ambient temperatures up to 260 C°. In contact with flame, this garment will resist ignition, and/or self-extinguish. The intended use of the garment is for protection from liquids including water, oil, light acids, and caustics. This garment also provides wind resistance and acts as a thermal layer against harsh elements, while providing increased visibility of the wearer. This garment is not intended as protection from Hydrocarbon Flash Fires, Electric Arc Hazards, or welding sparks.