

# CARBON X

# TRULY NON-FLAMMABLE TEXTILES



Steel Mill Safety Director

*‘Our company has moved from using FR cotton and Nomex clothing to using CarbonX clothing to protect our employees in high-heat and high-exposure areas. We have found that CarbonX offers better protection and is more comfortable. CarbonX clothing also wicks better and wears cooler than any other fabric. The increase in safety that CarbonX brings to our employees has been immeasurable and because of the protection and longevity of the fabric, the cost savings have been significant. In my 30 years of working in the safety field, I have never seen a material that is as comfortable and offers as much protection as CarbonX.’*

## DEMONSTRABLY SUPERIOR FABRICS ENGINEERED TO SURPASS WORKPLACE SAFETY STANDARDS

A word of caution about personal protective equipment (PPE) for workers who are routinely exposed to direct flame, extreme heat, molten metal, hot liquids, or arc flash: You may think that your flame-resistant (FR) protective clothing is more protective than it really is.

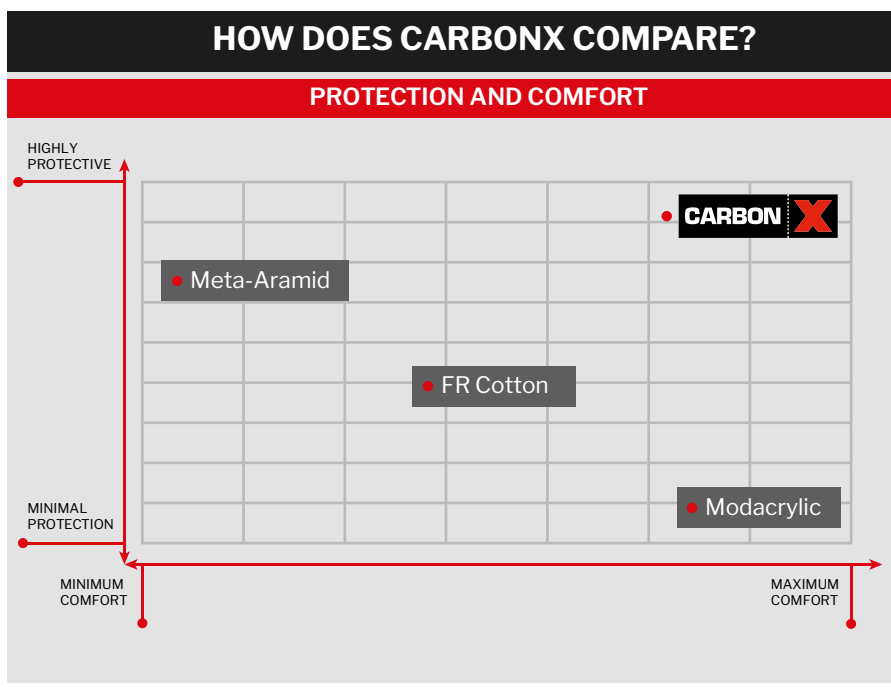
The reality is that not all FR protective gear provides the same level of protection, and performance varies greatly from FR-treated materials that typically provide minimal protection to high-performing fabrics constructed of truly non-flammable fiber blends. Companies and safety managers must be able to ensure that workers’ garments and equipment won’t burn, melt, or ignite — even when coming into contact with direct flame, extreme heat, flammable liquids, or molten metal — so it’s crucial to select the right FR material for the specific application at hand.

The bulk of the protective clothing solutions on the market today are categorized as flame resistant, fire resistant, FR, flame retardant, or fire retardant, although the latter two terms are often used to describe a chemical substance that imparts flame resistance on a fabric. Flame resistance may be achieved by using fibers that have this property inherently in the polymer or by applying a chemical finish to a fabric. If a fabric is inherently flame resistant, its thermal protective properties will not wash out or wear away.

The most defining characteristic of a FR fabric is that it doesn’t support combustion in the absence of an external flame source. FR products ignite with difficulty, burn slowly when set on fire, and most importantly, self-extinguish when the heat source is removed. Some FR fabrics off-gas to prevent combustion and may char or break open after exposure.

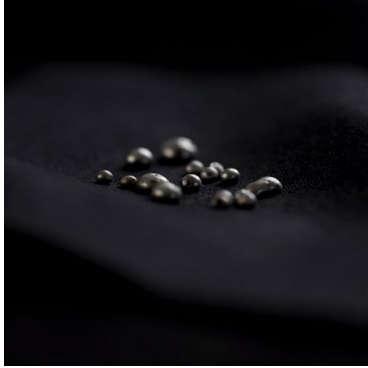
These types of materials can be highly beneficial — even life-saving — for professionals working on jobs with a high risk of conflagration. In fact, many companies are now incorporating FR materials into their employees’ clothing to provide reliable protection against exposure to electrical arc, flash fires, and other explosive or combustible events.

But not all FR materials are created equal. On the high-end of the spectrum are non-flammable, fire-proof, and non-combustible products. CarbonX® dominates this space in performance and versatility.



## DEMONSTRABLY SUPERIOR FABRICS ENGINEERED TO SURPASS WORKPLACE SAFETY STANDARDS

# CARBON



CarbonX Repel™

CarbonX products are constructed to be truly non-flammable. They will not burn, melt, drip, ignite, shrink, or char when exposed to direct flame or extreme heat. Even after intense exposure, CarbonX products maintain their strength and integrity and continue to protect. Because of their extraordinary protective properties, CarbonX products also provide multifunctional protection, which can offer safety managers a “one solution fits all” option for selecting protective clothing and limiting the number of protective garments that are required to outfit workers. CarbonX fabrics are designed to protect against numerous types of hazards in hot environments in one single garment, including: resistance to molten metal, petrochemicals and other flammable liquids; radiant heat protection; arc flash protection; and protection against harsh weather conditions.

The superior performance of CarbonX products can be attributed to a high-performance fiber blend. This patented fiber blend of OPAN and a variety of strengthening fibers provides an extraordinary level of protection and enables PPE solutions to be optimized for a wide variety of applications, including baselayer garments and outerwear, liners, engine and welding blankets, and full-body suits. CarbonX is used to protect professionals in industrial safety, steel/welding, motorsports, tactical, firefighting, pulp and paper, utilities, construction, and oil and gas.

The CarbonX product line of knit, woven, and non-woven fabrics are designed to not only meet common industry standards — such as Thermal Protective Performance (TPP) and Arc Thermal Performance Value (ATPV) standards — but also exceed them, ensuring the highest level of protection possible.

### COMMON FIRE SAFETY STANDARDS

Across all types of industries, there are standards in place to ensure workers have adequate protection against fire hazards. The National Fire Protection Association (NFPA) is one organization that works to develop and maintain safety regulations designed to protect workers. The NFPA has established several Hazard Risk Categories (HRCs), ranging from HRC 0 to HRC 4; each category requires the use of different types of FR materials to ensure that workers can perform their duties with a reasonable level of safety. When deciding what equipment or clothing to use for a specific application, it's critical to carefully consider the different HRCs in order to determine at what level materials need to be able to perform.

When selecting or designing PPE, it's also important to consider a material's TPP rating. A TPP rating measures a garment's thermal insulating performance against both convective and radiant heat exposure. These ratings typically apply to PPE used in settings where there is a high risk of exposure to flash fire. A fabric's TPP rating is determined by exposing samples of the material to heat sources in order to see how much heat is transferred through the sample, which is measured by referencing the temperature change that occurs. A fabric's TPP score is simply two-times the number of seconds it takes for a second-degree burn to occur when exposed to a 2.0 cal/cm<sup>2</sup> flame. The higher the TPP rating, the higher the level of protection.

While HRCs and TPP ratings are both very useful for ensuring that a product provides a certain level of protection, they are not always reliable indicators that a product is a good fit for a particular job. For example, safety managers often select garments that meet these standards but don't realize that those garments may not effectively

**WATCH A CARBONX TEAM MEMBER PUT A PIECE OF SOFT CARBONX® FABRIC IN THEIR OPEN PALM AND AIM A 2300°F BUTANE TORCH FLAME DIRECTLY AT IT—WITHOUT HESITATION.**



**CARBONX® - PENNY DEMO VIDEO**



CarbonX NSM  
18-19 Hood



CarbonX Ultimate™  
Baselayer

# DEMONSTRABLY SUPERIOR FABRICS ENGINEERED TO SURPASS WORKPLACE SAFETY STANDARDS

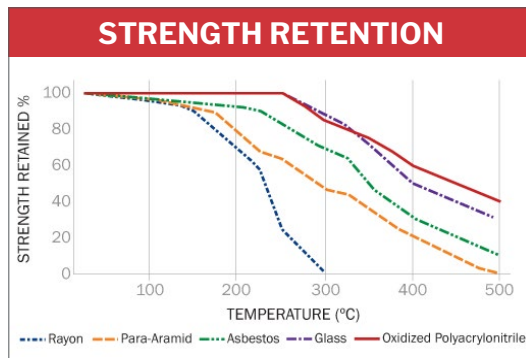
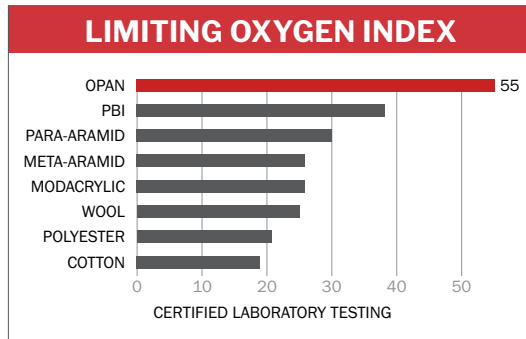


mitigate the specific risks posed to their employees. At CarbonX, a different approach is taken using HRC, TPP, and other ratings and standards as a baseline for protection, and then creating a customized solution that will optimize safety for each unique situation.

## SURPASSING INDUSTRY STANDARDS WITH CARBONX FABRIC

Committed to providing reliable thermal barriers with minimal heat conductivity, the team at CarbonX designs products that will not only meet industry standards, but also exceed them. While the industry has set basic “no-melt, no-drip” requirements, these typically just require that a fabric will not contribute to or accelerate burn rate during thermal exposure.

But CarbonX products actually protect the wearer from the thermal event itself. The CarbonX fiber blend scores far above other materials commonly used in FR fabrics — especially in terms of limiting oxygen index (LOI). The CarbonX patented fiber blend, which is largely comprised of OPAN fibers, features a special design that requires a very high oxygen level — nearly three times as high as the level present in air — in order to burn. This unique blend also carbonizes and expands when exposed to intense heat, allowing it to eliminate any oxygen content within the fabric itself.



materials are also very comfortable, specifically engineered and manufactured to be soft-to-the-touch, lightweight, flexible, odor-resistant, and quick-drying. Plus, they are breathable, designed to wick away moisture so workers stay cool on the job.

CarbonX products are also known for their superior ability to retain strength, even when exposed to extreme heat. After intense exposure to 250°C heat, the CarbonX fiber blend possesses 100 percent of its original strength. Even after 10 minutes of exposure to a temperature of 500°C, a CarbonX fabric will still preserve 40% of its original strength.

## PROTECTION MEETS COMFORT

CarbonX non-flammable materials are built to last, and their protective properties won't weaken due to normal wash and wear. In fact, CarbonX products are strong enough to be worn daily. And, though tough enough to withstand even the most extreme environments, CarbonX

SETTING A NEW STANDARD FOR PPE					
	HRC	TPP	ATPV	AFTER FLAME	CHAR LENGTH
Industry Standard	2	3.0 cal/cm <sup>2</sup>	8.0 cal/cm <sup>2</sup>	2 seconds or less	4" or less
CarbonX Active/TK-60 6 oz/yd <sup>2</sup>	2	9.5 cal/cm <sup>2</sup>	10.0 cal/cm <sup>2</sup>	None/ 0 seconds	9.398 mm (0.37")
CarbonX NSM 18-19 7.0 oz/yd <sup>2</sup>	2	11.6 cal/cm <sup>2</sup>	11.9 cal/cm <sup>2</sup>	None/ 0 seconds	8.89 mm (0.35")
CarbonX Ultimate/DJ-77 8 oz/yd <sup>2</sup>	2	13.0 cal/cm <sup>2</sup>	12.3 cal/cm <sup>2</sup>	None/ 0 seconds	10.16 mm (0.40")
CarbonX C-59 Repel 8.5 oz/yd <sup>2</sup>	2	9.8 cal/cm <sup>2</sup>	9.3 cal/cm <sup>2</sup>	None/ 0 seconds	24.638 mm (0.97")
CarbonX CR-80 Repel 9.5 oz/yd <sup>2</sup>	2	7.8 cal/cm <sup>2</sup>	8.6 cal/cm <sup>2</sup>	None/ 0 seconds	8.382 mm (0.33")



DEMONSTRABLY SUPERIOR FABRICS ENGINEERED TO SURPASS WORKPLACE SAFETY STANDARDS



**USING CARBONX FABRIC IN YOUR APPLICATION**


At CarbonX, a skilled team of engineers collaborates closely with leading safety-supply manufacturers and distributors to create highly customized PPE solutions. Through this cooperative design strategy, they're able to incorporate valuable input from partner engineers early on in the design and development process.


This method allows the CarbonX team to pinpoint customers' specific needs while gathering important insights from the product development team to deliver totally customized solutions. This has also allowed for innovative product developments that not only help keep workers safe in dangerous work environments, but also increase business opportunities for manufacturer and distributor partners.

Ready to discuss how CarbonX custom truly non-flammable PPE can benefit your company? [Contact the team](#) at CarbonX today to learn more about these industry-leading products.



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COMMON APPLICATIONS	
<b>Industrial Safety</b>	Knits: Baselayer garments, hoods, sleeves, gloves, socks, stocking caps, beanies, neck gators Wovens: Coveralls, shirts, pants, jackets Nonwovens: Boot liners
<b>Steel/ Welding</b>	Knits: Baselayer garments, hoods, sleeves, gloves, socks Wovens: Full-body suits, coats, jackets, hoods, coveralls, pants, aprons, bibs, spats Nonwovens: Boot liners, welding blankets
<b>Fire Safety</b>	Knits: Baselayer garments, hoods, facemasks, helmet shrouds, gloves, socks Wovens: Turnout gear Nonwovens: Boot liners, vehicle lining, equipment bags, bandanas, blankets, quilted barrier in clothing, thermal insulator barriers, heat shields, structural heat shields
<b>Motorsports</b>	Knits: Baselayer garments, hoods, helmet shrouds, gloves, socks Wovens: Racing suits, shifter boot covers Nonwovens: Boot liners, vehicle lining, quilted barrier in clothing, engine blankets
<b>Pulp and Paper</b>	Knits: Baselayer garments, hoods, sleeves, gloves, socks Wovens: Jackets, coveralls, shirts, pants, aprons, bibs, spats Nonwovens: Boot liners
<b>Tactical</b>	Knits: Baselayer garments, hoods, helmet shrouds, gloves, socks Wovens: Uniforms, jackets Nonwovens: Boot liners, vehicle lining, equipment bags, bandanas
<b>Utilities</b>	Knits: Baselayer garments, hoods, sleeves, gloves, socks Wovens: Coveralls, shirts, pants, jackets Nonwovens: Boot liners
<b>Construction</b>	Knits: Baselayer garments, hoods, sleeves, gloves, socks Wovens: Jackets, coveralls, shirts, pants, aprons, bibs, spats Nonwovens: Boot liners



BUILDING A BETTER PROTECTIVE MARKET

