

GORE-TEX CROSSTECH® PYRAD® STRETCH TECHNOLOGY FOR TECHNICAL RESCUE RESPONDERS

FLASH FIRE AND PATHOGEN PROTECTION –
LIGHTWEIGHT AND ELASTIC

GORE-TEX
PRODUCTS



ABSTRACT

Rescue teams need lightweight, breathable, waterproof clothing that is specifically designed to protect against the risks that come with this specialised area of operations. In an era when less than 20% of responses are structural fires, wearing structural fire suits to tackle rescue incidents reduces operational effectiveness at scene and increases the risks associated with heat stress.

Gore has transformed protection for rescue teams with the introduction of the first lightweight protective suit with GORE-TEX CROSSTECH® PYRAD® stretch technology that combines enhanced levels of freedom of movement, comfort and high visibility with waterproof protection from fire, chemicals and blood borne pathogens and can be cleaned in a decontamination wash process.

THE CHALLENGE

The nature and complexity of technical rescue varies significantly and the working environment of a rescue incident such as a road traffic accident, water or animal rescue is completely different from a fire. These incidents now account for over 80% of callouts for fire and rescue services across Europe. While this trend continues to increase, in most cases, firefighters respond to them wearing full structural firefighting gear which is not as well suited to the task at hand but is in most of the cases the only PPE they have available. The structural fire gear which is designed to provide thermal protection over protects for technical rescue situations and doesn't offer as much freedom of movement required for rescue work. It is difficult to operate in a confined space when wearing a thicker, more restrictive fire fighting suit.

Many services provide lighter weight specialised suits for their technical rescue teams, but they do not protect from all additional risks such as fire, chemicals and blood pathogens and often pick up rain and moisture, becoming cold and uncomfortable.

Up until now, protecting firefighters at rescue incidents has always involved compromise – either they work in structural fire gear that offers barrier protection against liquid and flame but are insulated or they operate in more insulated and robust structural gear that over protects for technical rescue situations or operating in lightweight suits that don't protect from all the risks and quickly become very uncomfortable.

THE GOAL

The goal was to find a lightweight solution that offers high levels of comfort and freedom of movement, without compromising protection against the key the risks associated with rescue work.

Firefighters cited comfort as their main requirement in rescue clothing, after meeting required protections levels defined by their risk assessment. Rescue incidents are often protracted and they need clothing that will protect them from the elements, keeping them dry and warm in the cold and rain, but also cool in the sun. They need a garment that is light and can move with them in confined and awkward spaces and it must offer protection from fire, chemicals and the risks associated with exposure to viruses, blood and body fluids. It also can be cleaned and decontaminated as often as needed.

Fire scenes staged in controlled environment with stuntpeople and pyrotechnicians.



THE SOLUTION

Gore has developed the **first lightweight, high visibility, breathable, waterproof** technical rescue fabric that combines **flame resistance, viral, pathogen and chemical protection** with stretch technology to meet the specific needs of technical rescue work. It is durable enough to withstand industrial decontamination wash cycles.

The revolutionary new fabric is a game changer for technical rescue, combining several of Gore's proven world leading technologies in a bespoke rescue application.

GORE-TEX technology ensures the fabric is highly waterproof and breathable, giving full protection in all weathers.

CROSSTECH® technology protects from common chemicals and viral and blood borne pathogens.

PYRAD® technology offers incidental flame protection.

STRETCH technology enables enhanced freedom of movement and comfort.

THE BENEFITS

This unique combination of proven technologies sets a new standard in protective clothing for technical rescue:

PROTECTION FROM HAZARDS

- ◆ Protection against incidental flame and flash fire
- ◆ Prevents penetration from viral and blood borne pathogens and common chemicals often found at rescue incidents



FLAME
RETARDANT



BLOOD BORNE AND
VIRAL PATHOGEN
PROTECTION



RESISTANT TO
CHEMICALS

AGILITY AND COMFORT

- ◆ The fabric is very light and can stretch four ways to allow the freedom of movement to work effectively in challenging rescue environments
- ◆ Elasticity allows for better fit and expands and contracts easily so layers underneath can be varied in line with weather conditions
- ◆ Moves with the wearer like a high-performance sports garment
- ◆ Garment dries quickly after washing or use



STRETCH



LIGHTWEIGHT



BREATHABLE



QUICK
RE-DRY

WEATHER PROTECTION

- ◆ Highly breathable fabric delivers high levels of comfort
- ◆ Wind and waterproof with efficient water run off that prevents moisture build up and keeps the wearer dry throughout extended operations



DURABLY
WATERPROOF



TOTALLY
WINDPROOF

DURABILITY AND VISIBILITY

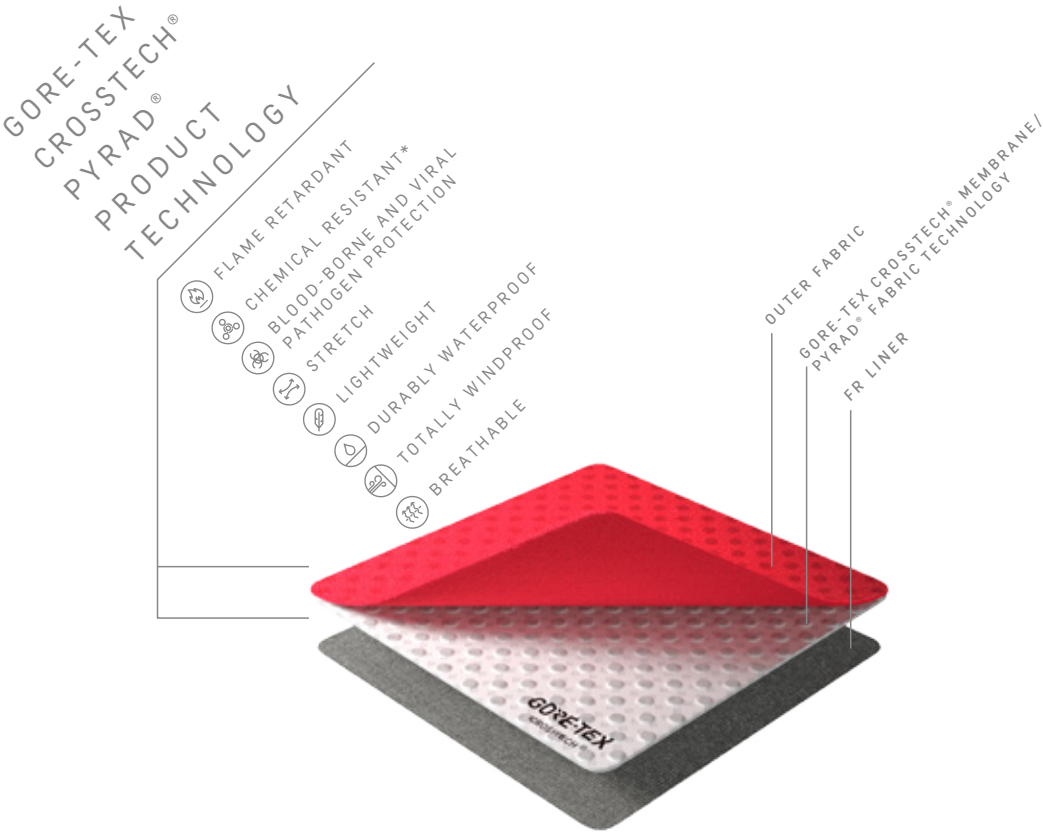
- ◆ The fabric does not degrade after repeated washing and decontamination
- ◆ Available in a wide range of hi visibility colours or colour matching options



LONG LASTING
PERFORMANCE AFTER
FREQUENT WASHING



INNOVATIVE LAYER ASSEMBLY COMBINING MULTIPLE TECHNOLOGIES



PROVEN TECHNOLOGY

THE GORE-TEX MEMBRANE

The GORE-TEX membrane is an extremely thin layer of expanded polytetrafluoroethylene (ePTFE) that incorporates over 1.4 billion microscopic pores in every centimetre. It is these pores that allow evaporating sweat to escape out through the fabric but are too small to let water or wind penetrate the membrane from the outside. GORE-TEX technology makes the fabric durably waterproof, windproof and breathable and can meet the EN 343 Class 4 full weather garment certification. This technology has a proven track record of over 40 years in firefighter protection around the world.



CROSSTECH® TECHNOLOGY

CROSSTECH® technology delivers a powerful barrier preventing penetration from pathogens found in blood and body fluids, as well as common chemicals such as petrol, battery acid and hydraulic fluid. It has been tested in accordance with ISO 16604 procedure C on laminate and seams for checking resistance to blood borne pathogens using the bacteriophage PHI-X174. Barrier properties remain intact even after extended use and decontamination and cleaning of 50 wash cycles. The surrogate PHI-X174 virus used in the test is the same size as a hepatitis pathogen identified as a risk of exposure for firefighters when in contact with blood and body fluids. All CROSSTECH® product laminates pass on the ISO 16604 method C for blood borne pathogen protection.



PYRAD® TECHNOLOGY

PYRAD® technology is durably flame retardant and when exposed to flame forms a self-extinguishing char which protects the user from incidental flame. Gore designed prototype garments constructed with this fabric were tested in a thermal manikin test at EMPA laboratories according to ISO 13506 with a 3 second full engulfment at 83 kW/m². There was no evidence of dripping or melting after the test garment was exposed to flame and the pain prediction was only 7%, with no burn prediction whatsoever. The material stayed flexible and was easily removed from the manikin without breaking open. Although the test set up does not reflect a real life scenario, it gives a good indication of an incidental flash fire accident.*

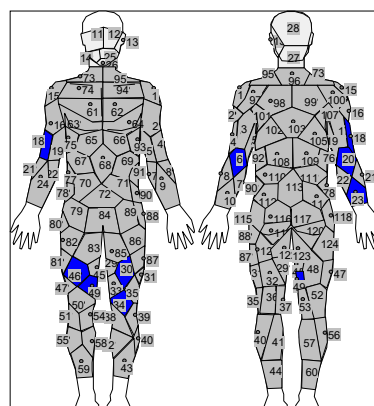


Pyroman testing: 3 seconds at 83 kW/m²

GORE-TEX CROSSTECH® PYRAD® STRETCH 2L laminate

+ 80 g/m² Aramide FR Rayon lining

Cotton T-Shirt + Cotton boxer underwear



Degree of burning

- no
- pain
- 1st
- 2nd
- 3rd

Burn risk after 60 s

- pain: 7.0%
- 1st degree: 0.0%
- 2nd degree: 0.0%
- 3rd degree: 0.0%

*ISO 13506: protective clothing against heat and flame, part 1: test method for complete garments at EMPA laboratories.

STRETCH TECHNOLOGY

Full garment stretch technology maximises elasticity and wearer comfort. When tested, it achieves 13% stretch at 30 N and 95% recovery after 1 minute. The high stretch and recovery enhances freedom of movement for the wearer. The improved fit creates better breathability as sweat evaporates through the garment much more efficiently when the fabric is closer to the skin.



HI-VISIBILITY

Visibility at rescue incidents is essential. All GORE-TEX CROSSTECH® PYRAD® stretch garments are compliant with EN ISO 20471 high visibility requirements for professional use, which are required to be visible and recognisable at road traffic accidents. The unique PYRAD® technology allows for a range of hi visibility colours, such as red, orange, yellow as well as the potential for a broad range of other colours to better match specific suit colours of Fire & Rescue Service departments (navy, sand, red, etc.).



DURABILITY

GORE-TEX products have a proven track record in withstanding the rigours of technical rescue. Like all GORE-TEX products, the new product technology will maintain performance standards for the operation life-time of the garment as the liquid, flame and pathogen protection does not degrade over time and the seams and fabric will remain intact after washing. GORE-TEX CROSSTECH® PYRAD® stretch garments have been tested to withstand over 50 industrial washes using EN ISO 15797 table 1, method 2, washing garments at 60°C and using tumbler drying method A (DGUV 105 rules).



**Most typical Technical Rescue
Call Outs**



FIELD TESTS AND USER FEEDBACK

When GORE-TEX CROSSTECH® PYRAD® stretch garments were taken to technical rescue teams around Europe the response was immediate and enthusiastic. As soon as they picked the garments up, firefighters commented on how light they were. They said that the gear felt more like sport or leisure wear and really appreciated the freedom

of movement and comfort. Those that tried the clothing in the rain were surprised at how easily the water ran off the fabric and were dry throughout the day. Fire fighters present at fire testing were surprised by the fire resistant performance in such a lightweight garment. Many were reluctant to give the test samples back.

“The hot feeling, I usually have with my gear is not perceivable here. I sweat but I’m not feeling wet.”

“It’s the best PPE I ever worn.”

“I can’t believe this is certified PPE.”

“When I move in the garment I don’t feel any restriction, it’s like moving in my undergarment.”



TECHNICAL INFORMATION

GORE-TEX CROSSTECH® PYRAD® STRETCH 2-LAYER LAMINATE

- ◆ **Weight:** 230 g/m² + 10 g/m²
- ◆ **Stretch:** machine direction 13% @30N
weft direction 5% @30N
- ◆ **Face textile abrasion resistance:**
9kp > 50 000 cycles
12 kpa > 30 000 cycles
1000 cycles sandpaper abrasion / waterproof @100kPA
- ◆ **Tensile strength:** warp 1000 N
weft 750 N
- ◆ **Burst strength:** > 500 kPa
- ◆ **Tear strength:** single > 30 N
double > 50N
- ◆ **Burn behavior:**
ISO 15025 – Index 3 without any after flame or after glow
- ◆ **Thermal stability:** 180 °C = 1% warp & weft
- ◆ **Wash shrinkage:** Post 5HLC 6N + F60: < 3%
Post 5 x GUV cycles 60 °C + F70: < 3%

SUSTAINABILITY

W. L. Gore & Associates is committed to continuously improving the environmental impact of its products without compromising on the durability of their performance. This is achieved by using the globally standardized (ISO 14040-14044) Life Cycle Assessment approach to measure and understand the environmental impacts of Gore products.

By keeping products in use for longer, their overall lifecycle impact is reduced. Because most of the resources and energy are consumed during the production and distribution processes, garments with a longer product life significantly reduce use of these resources. This improves the sustainability of the product.

GORE-TEX CROSSTECH® PYRAD® stretch fabric for technical rescue work has a longer than average lifespan while still made to withstand the operational rigours and frequent decontamination and washing. The flame and pathogen protection does not degrade over time and the seams and fabric will remain intact after washing to ensure performance throughout the lifetime of the garment. The longer operational lifespan reduces the number of replacements required, which in turn lowers environmental impact. Using this garment for technical rescue activities lowers wear and tear of structural fire gear, prolonging its life as well.