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GEAR STANDARDS: UNDERSTANDING THE DIFFERENCE

A Helpful Comparison of EN 469 & NFPA 1971

MATCHING GEAR TO TACTICS FOR OPTIMAL SAFETY

Fit for the Fight:

Matching Gear to Tactics for Optimal Safety

Choosing the right fire protective clothing is no small feat. It requires a deep dive into the specific needs of your fire department. Comparing NFPA 1971 and EN 469 certified turnout gear is like comparing apples to oranges. Each standard represents different firefighting tactics and community risk assessments from different regions.

It's crucial to understand that one standard is not inferior to the other; both are top-notch, tailored for different hazards and environments. NFPA-certified gear is designed for offensive positioning and aggressive firefighting tactics typical in North America. Meanwhile, EN 469-certified gear suits the more defensive and conservative approaches often used in Europe. Using the wrong gear for your tactics and risk profile can lead to serious injuries or worse.

The NFPA standard has one level of protection for structural firefighting. There are other NFPA standards that address areas such as Wildland, Technical Rescue and EMS. The EN standard has two levels of protection for duties performed by structural firefighters. Level 1 is to be used for firefighting in outside fire attacks and associated support activities and Level 2 is to be worn for inside fire attacks. Additional letter ratings are also given for heat transfer (X), water resistance (Y) and breath-ability (Z).

A thorough community risk assessment should guide your turnout gear selection. This means considering the specific hazards, response strategies, and environmental conditions your department faces. Ensuring your gear aligns with your operational tactics is key to providing optimal protection for your firefighters.

Aligning your turnout gear with your department's risk assessment and response tactics is essential for ensuring firefighter safety and operational efficiency. The charts on this spread break down key differences between NFPA 1971 and EN 469 standards, helping you make an informed decision.

Note that this is not an exhaustive list of the testing requirements for either standard as the testing requirements are extensive in order to ensure an adequate level of protection for the firefighter.

RISK ASSESSMENT: KEY CONSIDERATIONS

- **Approach to Firefighting:** Offensive or defensive
- **Duties Performed:** Ventilation, search and rescue, forcible entry, surround and protect
- **Frequency of Use:** How often each gear element is used
- **Geographic Location:** Climate and terrain
- **Incident Operations:** Types of emergencies encountered
- **Care and Maintenance:** Cleaning and repair frequency

GEAR STANDARDS

NFPA 1971

NFPA 1971 vs. EN 469

NFPA 1971	EN 469
THERMAL PROTECTION	
Thermal Protective Performance (TPP) ≥ 35.0 at heat flux of 84 kW/m^2.	**Level 2 (X_{r2})** $RHTI_{24}$ (Heat Transfer Index) ≥ 18.0 sec. HTI_{24} - HTI_{12} ≥ 4.0 sec. Radiant heat source at of 40 kW/m^2.
Transmitted and thermal stored energy time before 2nd degree burns ≥ 130s (Radiant heat source). Garment sleeve composite with additional layers.	**Level 1 (X_{r1})** $RHTI_{24}$ (Heat Transfer Index) ≥ 10.0 sec. HTI_{24} - HTI_{12} ≥ 3.0 sec. Radiant heat source at of 40 kW/m^2.
Conductive Compressive Heat Resistance (CCHR) ≥ 25 sec time to 2nd degree burn. (Conductive Heat source). Garment shoulders and knees.	**Level 2 (X_{f2})** HTI_{24} (Heat Transfer Index) ≥ 13.0 sec. HTI_{24} - HTI_{12} ≥ 4.0 sec. Flame heat source at heat flux of 80 kW/m^2.
	Level 1 (X_{f1}) HTI_{24} (Heat Transfer Index) ≥ 9.0 sec. HTI_{24} - HTI_{12} ≥ 3.0 sec. Flame heat source at heat flux of 80 kW/m^2.
BREATH-ABILITY/HEAT STRESS	
Total Heat Loss (THL) ≥ 205 W/m^2. (Higher number is more breathable).	**Level 2 (Z_2)** R_{et} >30m^2 Pa/W. (Less breathable).
	Level 1 (Z_1) R_{et} ≤30m^2 Pa/W. (More breathable).
THERMAL STABILITY	
Shrinkage ≤ 5%, no igniting, melting, or separation at a temperature 260ºC and exposure time of 5 min.	Shrinkage ≤5%, no igniting, and no melting at a temperature of 180ºC and exposure time of 5 min.

EN 469

NFPA 1971 vs. EN 469

NFPA 1971	EN 469
TEAR RESISTANT	
≥ 100 N (Outer Shell Material). ≥ 22 N (Moisture and Thermal Barrier Materials).	≥ 25 N (Outer Material). N/A (Moisture and Thermal Barrier Materials).
	≥ 25 N (Outer Material). N/A (Moisture and Thermal Barrier Materials).
WATER RESISTANCE	
Water penetration resistance minimum 172 kPa. Garment with membrane.	**Level 2 (Y_2)** Garment with membrane. Water penetration resistance ≥20 kPa.
	Level 1 (Y_1) Garment without membrane. Water penetration resistance <20 kPa.
Water absorption (outer shell) must be less than 15%.	Spray rating (outer shell) must be 4 kPa or higher (highest rating is 5).
OTHER LIQUID RESISTANCE	
No liquid penetration under pressure through the moisture barrier (barrier and seams). **Tested chemicals:** ▸ Aqueous film-forming foam (AFFF) ▸ Battery acid ▸ Fire resistant hydraulic fluid ▸ Surrogate gasoline fuel H ▸ Swimming pool chlorinating chemical ▸ Automobile Antifreeze	No liquid penetration after chemical run off to the innermost surface (barrier composite). **Tested chemicals:** ▸ Sulfuric Acid ▸ O-xylene

FIRE GEAR Q. & A.

Your Burning Questions Answered...

WHAT IS TPP?

Think of the Thermal Protective Performance (TPP) test as a way to see how thermally insulative your gear is against intense heat. The TPP test checks how much convective and radiant heat the garment composite can handle when exposed to fire. It gives you an indication of your protection from burns when exposed to flashover-like conditions. The number you get from this test is the TPP rating; the minimum TPP is 35 or 17.5 seconds of protection. The higher the TPP number, the better your gear protects you from sustaining a burn injury. A high TPP rating also gives you more time to escape the heat before getting a burn injury. But remember, higher TPP protection often means the gear is heavier and can cause more heat stress on you, the firefighter. It's a balance between keeping you safe from the flames and making sure you don't overheat while you're working.

This is where Thermal Heat Loss (THL) comes in. THL measures how well your gear allows heat and moisture vapor to escape, which helps regulate your body temperature and reduce the risk of heat stress. So, while the TPP rating ensures you're protected from external heat, a good THL rating ensures you're not overheating from the inside. Together, TPP and THL help find the perfect balance between maximum protection and comfort.

"It's a balance between keeping you safe from the flames and making sure you don't overheat while you're working."

WHAT IS HTI?

Similar to TPP, think of the Heat Transfer Index (HTI) as a way to measure how well your gear protects you from intense heat. There are two HTI methods, one with a radiant heat source and the other with a flame source. Both measure how long it takes to produce a burn injury as well as how long it takes to reach the pain threshold. The HTI values, in simple terms, are the points when you first start feeling "ouch, that's hot!" and the more serious cause of a second-degree burn.

EN gear has an HTI minimum of 13 seconds for the flame and 18 seconds for the radiant heat versions of the test for protection from a second degree burn. That's pretty important because it tells you how long your gear can protect you in a real fire situation. The HTI_{24} – HTI_{12} index is key for emergency services as it is an indication of how much time you have between first feeling the heat (pain or HTI_{12}) and when it gets dangerous (second-degree burns or HTI_{24}). It's like knowing the gap between "this is getting uncomfortable" and "I need to get out now."

Also similar to the balance of TPP and THL in NFPA gear, there is a balance between HTI and Ret in EN gear. Ret is another method of evaluating the breath-ability in PPE to reduce heat stress. As EN gear is typically less thermally protective, the comfort tends to be higher.

WHAT IS THE RELATIONSHIP BETWEEN TPP AND HTI? ARE THEY EQUIVALENT?

There is a relationship between HTI and TPP as they both measure heat protection in slightly different ways. Here's how they relate and what firefighters should know about them:

While both HTI and TPP aim to assess the protective qualities of firefighting gear, HTI separates radiant heat and flame heat

protection into two separate tests while TPP combines it with them. HTI is based on reaching temperatures associated with pain and second degree burn while TPP is a rating based on time to second degree burn at a specific energy value. Typically, for structural firefighting gear, if you divide the TPP rating by 2, you can determine the approximate time to a second-degree burn.

In summary, while HTI and TPP are not directly interchangeable, they both serve to inform you about the heat protection performance of your gear. TPP gives a more comprehensive picture by considering both radiant and convective heat, whereas HTI focuses specifically on each type of heat exposure separately. Understanding both measures can help you better assess and choose the right protective clothing for various firefighting scenarios.

HOW DO I UNDERSTAND THE HEAT FLUX MEASURE IN FIREFIGHTER GEAR TESTING?

Heat Flux is a measure of the rate at which heat energy is transferred per unit area. It's like how much heat is hitting a specific spot in a given amount of time. For example, in the context of testing firefighter gear, a heat flux of 40 kilowatts per square meter (kW/m^2) means that 40,000 watts of heat energy are being applied to every square meter of the material being tested. Think of it like standing very close to a large, intense fire. The amount of heat you feel on your protective gear is similar to what's being tested in the lab.

WHAT IS THE WATER RESISTANCE TEST AND WHY DOES IT MATTER?

The water resistance test measures how well your protective gear and the individual layers can keep water out. It's about how much water pressure the material can

FIRE GEAR Q. & A.

- **NFPA 1971 vs. EN 469:** NFPA 1971 focuses on protection for firefighters using offensive tactics in structural firefighting; EN 469 offers multiple protection levels for both interior and exterior fire attacks.
- **Gear and Risk Assessment:** Match gear to your department's specific risks and tactics.
- **TPP vs. HTI:** TPP and HTI measure burn protection; TPP evaluates combined heat types, while HTI distinguishes between pain thresholds and second-degree burns.
- **Protection vs. Comfort:** Balance high protection with breath-ability to prevent heat stress.
- **Wear Trials:** Test gear in real-world conditions to ensure safety and proper fit.

withstand before it starts to leak. "kPa" stands for kilo-pascals, which is a unit of pressure. Higher kPa values mean the material can withstand greater water pressure without letting water through. Gear with a water resistance of 172 kPa can withstand a lot of water pressure. It's like standing under a heavy rainstorm or even facing a direct spray from a hose without the water seeping through. Gear with a water resistance of 20 kPa can handle some water, like light rain or brief splashes, but it won't perform as well under heavy or prolonged water exposure. Higher resistance levels are crucial for more offensive firefighting, especially in scenarios where you might be exposed to large amounts of water, whether from hose lines or heavy rains. It ensures you stay dry, which is essential for maintaining comfort and safety. Higher water resistance means your gear keeps you dry, which helps maintain your body temperature and comfort, allowing you to focus on the task at hand. Dry gear is safer because wet gear can become heavy and less effective at insulating against heat and flames.

WHAT IS THE TEAR RESISTANCE TEST AND WHY DOES IT MATTER?

The tear resistance test measures how strong your protective gear is when it comes to propagating tears. It's about how much force the material can withstand before it starts to rip or tear apart. The "N" in the value stands for Newtons, which is a unit of force. A value of 100 Newtons (100 N) means that the material can withstand a force of 100 Newtons before tearing. Imagine trying to tear a piece of fabric by pulling it apart with your hands. The tear resistance value tells us how much pulling force the fabric can handle before it rips. In general, the human hand can tear around 31 N. If your suit has a tear resistance of 100 N, it means it's pretty tough. It takes a significant amount of force to tear it, which is crucial when you're navigating through debris, sharp objects, or rough terrain.

Gear Trials to Triumph:

Ensuring the Right Fit for Your Firefighters

Choosing the right turnout gear is a crucial decision for any fire department. The gear must be breathable, comfortable, and offer robust thermal protection. But picking the wrong gear can lead to years of discomfort and dissatisfaction for your team.

With continuous advancements in turnout gear technology, it's essential to explore all available options. Conducting wear trials is key to making informed decisions. By adhering to best practices and running structured wear trials, departments can accurately compare gear and ensure it aligns with their risk assessment and operational tactics. This alignment is critical to prevent potential injuries or fatalities.

Before settling on a standard, departments should conduct wear trials to ensure the gear meets their specific needs. Evaluating gear through these trials and structured testing scenarios allows departments to gather valuable feedback, leading to smarter purchasing decisions and enhanced firefighter safety and efficiency.

"Choosing the right gear is a crucial decision for any fire department."

In the end, the right gear is not just about meeting standards; it's about matching the gear to your unique operational tactics and environmental conditions. This approach ensures your team is equipped with the best protection, keeping them safe, effective, and ready for action!

ABOUT LION

Ready For Action:
Before, During, and After

FOUNDED IN 1898 and headquartered in Dayton, Ohio, LION is a family-owned company with a legacy and ongoing vision of introducing new products and services designed to ensure the health, safety and performance of first responders worldwide. From game-changing personal protective equipment (PPE) and Uniforms to professional gear maintenance to state-of-the-art fire safety training tools and facilities, it is LION's mission to make sure that first responders are ready for action.

TRUSTED

We provide turnout gear to 7 of the 10 largest fire departments and 25 of the top 50 in the U.S., as well as numerous departments throughout North, South, and Central America. We are also the largest supplier of chem-bio protective garments for the U.S. Military and National Guard civil support teams.

FOCUSED

But don't think we are old-fashioned. LION is on the cutting edge of our industry. We have a patent on the use of Digital LCD displays to create realistic fire training environments – and we designed, built and equipped the world's largest fire training facility in Shanghai, China. Plus, we work with research and development teams to create and produce products that meet your needs – safely, cleanly and efficiently.

COMMITTED

LION is still family owned and managed. With stable family ownership, we take the long-term approach to investment in the best people, new technology and systems.

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08/24