

- Researchers at the National Institute of Standards and Technology (NIST) have conducted an in-depth examination of a range of textiles used in turnout gear coats and pants, which are constructed in three layers.
- The results showed that the amount of PFAS present varies widely between manufacturers and layers, with the highest PFAS concentrations observed in the outermost two. **The results of the study suggest that selecting optimal combinations of fabrics for each layer could significantly reduce the amount of PFAS present in turnout gear.**
- Researchers have shown that firefighters are burdened by [comparatively high levels](#) of at least one type of PFAS.
- The first step to better-protecting firefighters from this potential health hazard is to learn about the sources of PFAS exposure, which may include their protective gear.
- The research team collected 20 brand-new textile samples, each used for one of the three layers of turnout gear — the outer shell, the moisture barrier and the thermal liner. All meet a [standard published by the National Fire Protection Association](#) (NFPA), which specifies requirements for resisting heat, water and other hazards.
- The researchers targeted **53 PFAS within 20 textiles** used to fabricate the different layers of turnout gear. They identified and quantified the concentrations of **26 different PFAS**, uncovering some important differences among the samples.
- The team found the least amount of PFAS in the layer closest to firefighters' skin, the thermal lining, which may correspond to water repellency being a lower priority for this layer than the other two.
- At the other end of the spectrum, **the moisture barrier and the outer shell contained PFAS concentrations up to 400 times higher**, though those numbers varied widely from fabric to fabric.
- Two of the outer shell textiles they tested had not been treated with a water-repellant coating. Those samples contained far less PFAS than other outer shell layers, while the treated outer shell fabric consistently contained the greatest amounts of PFAS.
- [Ongoing work at NIST](#) is aiming to unveil the effects that wear and tear — UV exposure, heat, laundering, etc. — have on measurable PFAS in turnout gear. The researchers suspect that regular use may lead more PFAS to escape from the gear.
- The results of that research should further cement our understanding of what is inside the gear. NIST is also completing a similar study of PFAS in new and stressed hoods, gloves, and wildland gear.
- Further research by federal partners will focus on what kinds and levels of PFAS are dangerous and how the chemicals find their way into firefighters' bodies.

* Davis, R. D. (2023). *Per- and Polyfluoroalkyl Substances in New Firefighter Turnout Gear Textiles*. <https://doi.org/10.6028/nist.tn.2248>