

NEWS RELEASE

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Researchers Unveil Cutting-Edge Protection for Firefighters

FOR IMMEDIATE RELEASE

Researchers at North Carolina State University's College of Textiles today unveiled a prototype of the next generation of firefighter turnout gear that not only offers increased protection from fire, but also provides protection from chemical and biological agents.

NC State partnered with Globe Manufacturing and DuPont for the project awarded by the Department of Homeland Security and the Technical Support Working Group.

"This prototype incorporates all the aspirations that we had for the original design, which was to develop a suit that not only had the fire protection, but also a level of chemical and biological protection," said Dr. Roger Barker, head of the Textile Protection and Comfort Center (TPACC) at NC State's College of Textiles.

To the casual observer, the new suit won't appear greatly different from other firefighter turnout gear. But looks can be deceiving. The new suit has all the functional features of a traditional suit, but with added protection. The thermal liner, an important component in heat protection, was developed at NC State. According to Barker, it utilizes a new non-woven thermal material that incorporates new fiber technologies offering better protection from heat.

In addition to using their well-known heat-resistant material KEVLAR® in this suit, DuPont also developed a special "breathable" membrane that provides chemical and biological protection. Through the process of selective transport – the diffusion of water across a selectively permeable membrane – this membrane allows sweat evaporation and body heat to escape to keep the firefighter cool. At the same time, the membrane blocks harmful agents from entering the suit. "It's a new technology that represents quite a large advance over what's available now," Barker said.

The best suits today offer protection against several chemicals, like battery acid for example, but Barker says that protection is limited. "Our suit is going to take that protection to an entirely new level with a wider range of chemical resistance at higher levels," he said.

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There are also ergonomically advanced features, such as how the suit moves with the wearer. “When you raise your arm, the rest of the coat doesn’t lift up or move in any way. That helps limit the firefighters’ exposure to a hazardous environment,” Barker said. Other features include cinches at the wrist and ankles to allow the firefighter to close off the suit from the outside world. There’s also a special hood built into the collar that can be deployed to protect against chemicals.

“This suit should not be thought of as a hazardous materials suit. It wasn’t designed to be taken into a known dangerous area. This suit buys the first responders more time at the scene of an event to get victims and themselves out of the dangerous environment. It’s more protection than they currently have,” Barker said.

In addition to the increased protection offered by the new suit, it weighs 5 percent less than the best current suit, and firefighters say they can immediately notice a difference.

NC State was also responsible for material integration – determining how all the elements of the suit work and how they should they work together. “For example, if the fire suit is a three-layer system, how does what I do with the chemical and biological barrier affect the thermal liner and how does that affect the other elements? From an engineering standpoint, that’s a challenging part of the project – figuring out how all the pieces of the puzzle should work together,” Barker said.

NC State’s Textile Protection and Comfort Center will also test the suit to ensure it meets all the required standards for protection, but also test for comfort and ergonomics – making sure it’s easy to put on, wear and take off. Other tests will determine the level of harmful vapor infiltration.

While currently available turnout suits can cost upwards of \$1,500, Barker says it’s too early to say how much this new suit might cost, but the team is working hard to minimize increases. “Cost is always an issue, but with a product like this – where safety is the primary issue – balancing cost with performance is also important.”

One of the first six prototype firefighter suits was presented to the Raleigh Fire Department at a ceremony on Tuesday, Aug. 26 at the College of Textiles, located on NC State’s Centennial Campus.

Researchers sought out firefighters around the country, including Raleigh, for input. Capt. A.C. Rich of the Raleigh Fire Department says while firefighters tend to be very traditional, there is great interest in this new product. “The enhancements made to the material of the gear and its protective capability was a definite plus. Our folks are very excited,” he said.

“All the tests we’ve done on the material level have been very promising, but we’ve still got a long way to go in terms of qualifying the exact level of performance,” NC State’s Barker says. “We’ll undoubtedly make changes along the way, but we’ve got a good start.”