

NC State to develop next generation HazMat boots

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Local firefighters try out the prototype boots and evaluate them for comfort, stability and traction. Credit: Roger Winstead, NC State University

The rubber boots that emergency personnel wear when responding to situations where hazardous materials (HazMat) are present may be functional, but they're not very comfortable. New research coming out of North Carolina State University hopes to provide a next generation HazMat boot that meets both criteria.

"We've learned from firefighters and other first responders that the current rubber boots are slippery and uncomfortable; they'd prefer a leather boot similar to ones they wear during non-HazMat situations," explains Dr. Roger Barker, professor of [Textile Engineering](#) Chemistry and Science, director of the Textile Protection and Comfort Center (T-PACC), and lead researcher for this study.

HazMat boots have traditionally been made of rubber so that they can easily be decontaminated and cleaned. Leather boots, which are more comfortable, have not been used because leather absorbs liquids - making decontamination a major technical issue. However, with the availability of new textile materials and surface treatments, researchers at NC State are confident they can develop a comfortable - and functional - leather boot for use in both fire-fighting and HazMat operations.

"We're currently in the process of creating prototypes of this new HazMat boot. We have been exploring options like providing a finish to the leather that would reduce chemical absorption, while making it easy to clean and decontaminate," Barker says. "So we're not just creating a leather HazMat boot, we're also designing a simple cleaning method to use on the boot that is readily available to onsite emergency personnel. If they have to send their boots off to a lab to be decontaminated, the boot is no longer functional."

Barker and his team, which includes Dr. Don Thompson, associate director of T-PACC, along with Dr. Keith Beck, Shawn Deaton, Dr. Gerardo Montero, and graduate student Ashley Bradham, have demonstrated the ability of the special [leather](#) material to repel [toxic chemicals](#). They are currently conducting their research in T-PACC's state-of-the-art Man-in-Simulant Test (MIST) laboratory - which allows researchers to evaluate the performance capability of protective footwear, gloves, masks and garments against a non-toxic vapor

resembling chemical and biological agents in a manner simulating how those garments systems would be used by a first responder. They are also testing the prototype boots for comfort, ergonomic function, traction and stability.

"We'll be doing tests by visiting fire departments and getting [first responders](#) to wear the different prototypes while performing activities such as walking up and down steps, on different terrains, and through a simulated task routine " Barker says.

The research on this new tactical chemical, biological, radiological, and nuclear (CBRN) first responder boot is funded by an \$800,000 grant from the Department of Defense through the Combating Terrorism Technical Support Office.

After the final prototype has been demonstrated, it will be evaluated and certified to National Fire Protection Association standards by independent laboratories. Following certification, private footwear companies would be responsible for manufacturing the final product and bringing it to market.

Provided by North Carolina State University

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