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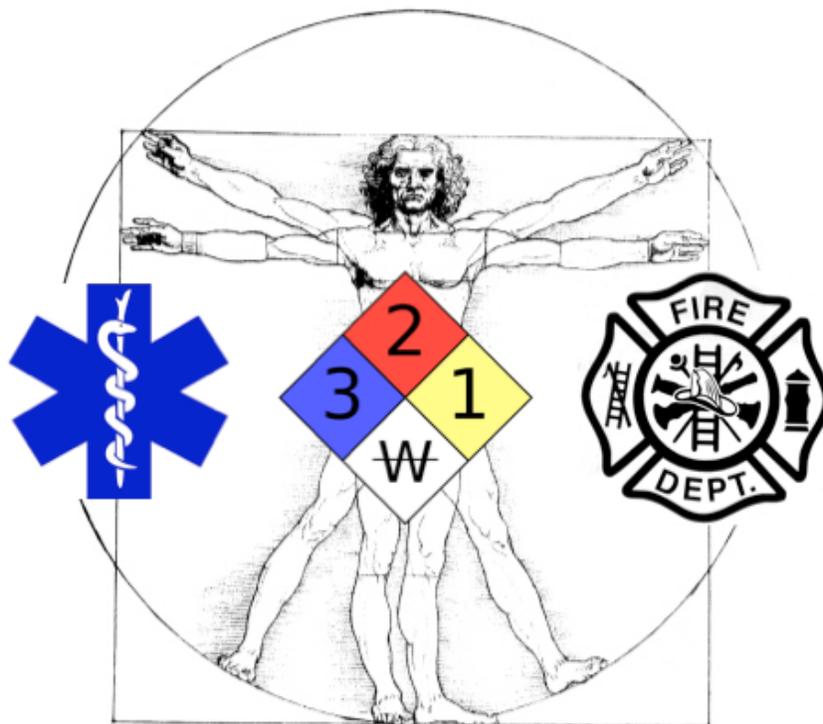
# Newer isn't always better.

**A review of Physiological responses to wearing a prototype firefighter ensemble compared with a standard ensemble** *Original article written by:* W. Jon Williams et al. Journal of Occupational and Environmental Hygiene 2011 8:49-57.

May, 2015

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[www.firefighterresearch.org](http://www.firefighterresearch.org)

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## Introduction

Firefighters are at risk of heat stress and over exertion. During firefighting, increased heart rate, body temperature, oxygen demand, and cardiovascular strain are caused by radiant heat stress from the fire and metabolic heat stress due to physical exertion. The combination of workload, heat exposure, and extra weight of protective clothing and equipment increases metabolic heat production and decreases work capacity.

## What the study did

The study sought out to investigate the physiological responses to wearing a standard firefighter ensemble (SE) and a prototype ensemble (PE). The prototype ensemble was a modification of the standard turnout gear, in which there were additional features including magnetic ring enclosures at the glove-sleeve interface and an incorporated boot-pant interface. The prototype ensemble also included a hose arrangement that rerouted exhaust gases from the self-contained breathing apparatus to the upper portion of the jacket. It was hypothesized that the prototype ensemble would provide more protection by closing the potential gaps at the wrist and leg and that the hose assembly would provide convective cooling and reduce the thermal and reduce physiological stress of the wearer.

## What the study reported

It was found that the prototype ensemble hose assembly rerouting of exhaust gases from the SCBA to the jacket did not provide significant convective cooling or reduce the thermal/physiological stress when compared to the standard firefighter ensemble. In fact, the enhancements of the prototype ensemble increased energy demands placed on the wearer. The additional protection of the prototype ensemble increased heart rate, sweat rate, and skin temperature and decreased exercise time.

## What it means for the fire service

Turnout gear is an unavoidable aspect of firefighting. While the ensemble worsens heat stress, the protection it provides is invaluable. Most advances in

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protective clothing technology have benefitted firefighters. The shift from long coats and high boots to short coats and turnout pants and the adoption of SCBA has undoubtedly prevented many burns and saved lives. Improvements in thermal protection have made it possible to enter burning structures even though modern building materials have created hotter and more intense fires. However, with each advance in technology, fire departments must carefully evaluate the risk benefit ration before spending their limited funds.

The additional seals in the prototype ensemble at the gloves and boots would provide important protection in two areas that are common sites for thermal burns. They may have also increased the value of the ensemble in certain hazmat/chemical exposure scenarios. However, the increased protection resulted in less work time and placed more strain on the firefighter.

The SCBA attachment to exhaust exhaled breath into the turnout gear was unable to counter the additional strain of the prototype ensemble. This is consistent with the literature. Firefighters accumulate heat at a tremendous rate and no practical, personal cooling device has been able to prevent the heat stress associated with fire suppression.

We commend the company and the researchers for making this head-to-head comparison and publishing the results. Newer isn't always better and the risk benefit ratio is constantly changing. Next time you are in the market for new turnout gear, or any other piece of equipment, demand to see the data before you spend your money.

