

# The importance of rehab

**Dr Howard Levitin, founder of US hazmat decon specialist company DQE, highlights that while advancements in the quality and manufacturing of PPE have markedly reduced the incidence of HAZMAT injuries, a rehab operating procedure is still vital.**

References:  
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 2. Firefighter Fatalities and Injuries: The Role of Heat Stress and PPE, Firefighter Life Safety Research Center Illinois Fire Service Institute University of Illinois at Urbana-Champaign, July 2008  
 3. Rehabilitation: Standards, Traps, and Tools, Fire Engineering, May 2004.  
 4. Making Rehab a Requirement: NFPA 1584, Fire Rescue 1 News, 12/10/07

*The NFPA 1584 requires relevant departments to have guidelines on how they will provide rehab at incidents and training exercises.*

**A**dvancements in PPE (personal protective equipment) have come at a cost. The encapsulated properties of chemical protective suits effectively keep hazardous liquids and vapours away from the wearer while at the same time severely limiting the responder's most effective method of thermoregulation – evaporative cooling.

Regardless of how hydrated, acclimated or fit a person is, if sweat cannot evaporate then thermoregulation will be compromised. The inability to maintain one's core body temperature (37°C/98.6°F) within reasonable limits results in marked dehydration, more rapid onset of muscle fatigue, increased cardiovascular strain, and cognitive dysfunction.

Although there is no stepping back in terms of the degree of protection required of HAZMAT personnel, moving forward will require a greater emphasis on ensuring that appropriate steps are taken to prevent responders from succumbing to heat-related illnesses. These steps include closely monitored work and rest cycles, providing access to proper hydration, and ensuring core body temperature is maintained.

According to the US Fire Administration (USFA) data, the leading cause of in the line of duty deaths among firefighters is sudden cardiac events. From 1990-2000, 43.9% of all firefighter fatalities were due to cardiac events, which was nearly double the rate of deaths due to trauma. These cardiovascular deaths were more likely to occur following fire suppression activities when presumably the responder's level of physical activity, metabolic rate, and heat stress levels were at their peak. Those firefighters with a previous diagnosis of coronary heart disease had a 15-fold increase in the risk of on-duty cardiac death.

Heat stress combined with the weight of PPE and its restrictive properties, adds to the metabolic work that must be performed to accomplish a task. It also interferes with the necessary evaporation of sweat due the effects of encapsulation.

Eighteen minutes of routine fire suppression physical activity while donned in PPE results in increased heart rate, core body temperature, and speed of clot formation; all contributing to or exacerbating a responder's underlying cardiovascular disease. The sudden formation of a clot in an artery supplying blood and oxygen to the heart results in a heart attack (myocardial infarction) and/or ischemia (restriction in blood supply) leading to the development of a fatal heart arrhythmia (abnormal electrical activity in the heart).

The magnitude of heat stress on the heart is influenced by a number of environmental and personal factors. Personal factors that contributed most include individual characteristics; presence of pre-existing medical conditions (elevated blood pressure, cholesterol/percent body fat), and fitness level. Any combination of these factors results in a much higher risk of sudden cardiac death.

Researchers believe that with proper modification of risk factors combined with standardised on-scene rehabilitation, the risk of cardiovascular injury and death can be reduced. These steps are clearly defined in the National Fire Protection Agency (NFPA) 1584 *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises*. It requires relevant departments to have standard operating guidelines outlining how they will provide rehab at incidents and training exercises where a safety or health risk exists.

Emergency personnel should undergo rehab following use of a second 30-minute SCBA cylinder, after a single 45/60-minute cylinder, or after 40 minutes of intense work without an SCBA. Supervisors are permitted to adjust these time frames depending on work or environmental conditions. In addition, EMS personnel have the authority to detain members in rehab or transport them for further medical evaluation and treatment.

The rehab process focuses on the following key elements detailed in the NFPA 1584 standard:

- Relief from climatic conditions – shelter responders from environmental extremes
- Rest and recovery – a minimum of 10 minutes of rest or longer
- Cooling or warming – to maintain core body temperature
- Rehydration – fluid replacement
- Calorie and electrolyte replacement – to maintain metabolic needs
- Medical monitoring – by EMS personnel
- Member accountability – proper tracking of personnel
- Release – confirm individuals are safely able to perform duty

To urgently contain the environmental impact of a hazardous substance release, to fight fires, or perform search and rescue safely under harsh environmental conditions requires personnel to be properly trained, physically fit, risk factors modified, and medical conditions properly managed. It also requires firefighters to be attuned to their needs for rest, recovery, hydration and protection from the elements. It is unacceptable that firefighters die from cardiovascular events on an average of ten years younger than the general population. Hopefully with proper intervention more will return home safely.

