



**Homeland
Security**

Science and Technology

TechNote

U.S. Department of Homeland Security



System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts objective assessments and validations on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

For more information on this and other technologies, contact the SAVER Program Support Office.

RKB/SAVER Telephone: 877-336-2752

E-mail: saver@hq.dhs.gov

Web site: <https://www.rkb.us/saver>

This SAVER TechNote was prepared by the National Urban Security Technology Laboratory for the SAVER Program.



Reference herein to any specific commercial products, processes, or services by trade name, trademark, manufacturer, or otherwise does not constitute or imply its endorsement, recommendation, or favoring by the United States Government. Neither the United States Government nor any of its employees make any warranty, express or implied, including but not limited to the warranties of merchantability and fitness for a particular purpose for any specific commercial product, process, or service referenced herein.

Extrication Devices

An extrication device is a tool used by emergency responders to remove and transport casualties from the scene of an emergency. Whether the incident involves only one victim or mass casualties, acquiring scene awareness is a critical first step that emergency responders take to decide what extrication device to use. Scene awareness includes assessing the nature of the emergency; the location, position, and condition of the victim; the number of casualties; and the type of environment. Extrication devices are available in various sizes, shapes, and configurations, and can be grouped into four different types, which differ in the way the patient is removed from the incident scene and transported to an ambulance.

Technology Overview

Extrication devices are used in rescue operations to remove and transport casualties from the scene of the emergency to an ambulance. What used to be just a simple flat board with straps to secure the victim has evolved over time to utilize improved materials and designs. One improvement was driven by the increased awareness of infection control, which prompted the change from porous (wood) to nonporous materials (synthetics) used to manufacture extrication devices. In addition, the increased attention to ergonomically designed devices led to using significantly lighter materials without compromising durability.

The majority of extrication devices are carry-type, while others are litter-, drag-, and roll-type.

Carry-Type Devices

Carry-type devices, e.g., rescue vests, backboards, and scoop-type stretchers, typically require two rescuers to handle and are used to transport patients with suspected spinal injuries. Carry-type devices are used in conjunction with a cervical collar to reduce the possibility of injuring the head, cervical spine, or torso when the victim is moved to a supine position onto a medical stretcher.

- *Rescue Vests* (Figure 1) are specialized backboards commonly used when a patient is stable but has an apparent spinal injury, and is found in a confined space and in a seated position, such as in an automobile accident.
- *Spine Boards or Backboards* (Figure 2) are also used when the patient has a suspected spinal injury. Spine boards can be applied more quickly than a rescue vest, and therefore are used when the patient is unstable and needs to be moved and transported immediately, or when the accident scene is unsafe.



Figure 1. Rescue Vest
Photo courtesy of Rapid Deployment Products, Inc.



Figure 2. Spine Board
Photo courtesy of Rapid Deployment Products, Inc.

- *Scoop Stretchers* are two-hinged devices with interlocking pieces that allow rescuers to gently scoop up a patient without rolling, thereby decreasing movement of the cervical spine.
- *Folding Stretchers* are carry-type devices used to transport patients with no suspected spinal injury. They are typically lightweight and made of nonporous materials for easy decontamination. Also known as pole stretchers, they can be stacked to save space in an ambulance, can be folded, and are often used in mass casualty incidents.

Litter-Type Devices

Litter-type devices are designed to be disassembled for easy carrying and are used to rescue patients from confined spaces such as a cave, or difficult-to-reach locations, including mountains and bodies of water. After initial treatment on site, the victim is secured to the litter or stokes basket, and either lowered on ropes or hoisted by helicopter.

- *Stokes Baskets* (Figure 3) feature unique tubular runner rails that cover the full length of the litter along the bottom, and provide a strong, durable base.



Figure 3. Typical Stokes Basket
Photo courtesy of Life Medical Supplier

Drag-Type Devices

Drag-type devices are typically used for rescuing emergency workers, such as firefighters, who have become incapacitated. Emergency responders' protective garments may be equipped with drag and rescue devices, such as D-rings, that can be used by a rescuer to drag an unconscious person to safety.

- *Rescue Harnesses* (Figure 4) come with D-rings and are worn by rescuers working in confined spaces.



Figure 4. Rescue Harness
Photo courtesy of Life Medical Supplier

- *Rescue Boards* can be used to drag incapacitated responders to safety even when wearing a self-contained breathing apparatus.
- *Half-Skeds* are used for rapid extrication of injured persons from spaces too tight for stretchers. This device allows rescuers to bend the patient at the hips, allowing greater flexibility to turn corners in confined spaces.

Roll-Type Devices

Roll-type extrication devices are built with rollers or wheels, and include wheeled stretchers such as stair and ambulance stretchers.

- *Stair Stretchers* (Figure 5) are used to transfer patients, who have no suspected spinal injuries, up and down staircases. They are typically made of lightweight, high-strength aluminum alloys, and can be easily folded and tucked away in an ambulance.



Figure 5. Ferno EZ Glide Stair Chair
Photo courtesy of Life Medical Supplier

- *Ambulance Stretchers* are used to move injured victims from the casualty scene to the ambulance. When a spinal injury is suspected, a patient is first secured to a spine board or rescue vest before being placed on a stretcher for transport.

Applications

Extrication devices are used by emergency responders to rescue victims with limited or no mobility. Selecting which device to use depends on whether or not the victim is stable, has a spinal injury, and if the extrication must be performed in a limited space. Overall, the primary consideration is to minimize the probability of further injuring the patient during removal and transport, while placing reasonable and manageable physical demands on the rescue workers.