

## BATTERY-POWERED RESCUE TOOLS FOR VEHICLE EXTRICATION

*Battery-powered rescue tools for vehicle extrication, including spreading, cutting, and spreading/cutting combination tools, are used by emergency responders to create greater access to persons trapped within vehicles by spreading or removing areas of damaged vehicle from around them. This equipment falls under the Authorized Equipment List (AEL) reference number 03SR-02-TPHY titled "Tools, Power, Hydraulic, Pneumatic."*

### Overview

Extrication tools originated from efforts of rescuers in the race car industry to remove drivers quickly and safely from damaged vehicles and evolved into an essential tool for emergency personnel responding to certain automobile accidents. [1]

Early systems required large pickup-truck-mounted, gasoline-powered hydraulic pumps. Despite their power, these traditional tethered extrication tools were hampered by their reliance on cumbersome support equipment, such as hydraulic pumps, air compressors

and generators. Inclement weather, inaccessible location and harsh terrain can hinder emergency personnel responding to incidents that require extrication. The introduction of battery-powered tools for vehicle extrication increased the mobility and speed with which responders can arrive and setup on scene. These battery-powered tools reduce tangling and tripping hazards and are single-person portable, allowing responders to maneuver around vehicles and coordinate rescue operations quickly and efficiently while accessing tight spaces.



Figure 1. An early version of the Hurst Power Rescue Tool  
Image credit: Kevin Brick and National Museum of American History

### Operation

Battery-operated extrication tools are most often self-contained hydraulic systems that electrically power an internal high-pressure pump and pistons, which control the flow and direction of the hydraulic fluid through input and output valves and chambers. These systems typically use a fire-resistant and electrically non-conductive synthetic fluid known as phosphate-ester, which is considered safer than traditional hydraulic fluid for operating at a crash scene. Internal hydraulic processes allow a single operator to control the opening and closing of the tool. This capability reduces the number of support personnel it takes to manage rescue operations and allows responders to use multiple tools on scene, such as one person operating a spreader and another operating a cutter simultaneously, which can lead to faster extrication operations.

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) program to inform emergency responder equipment selection and procurement decisions.

Located within the Science and Technology Directorate, the National Urban Security Technology Laboratory (NUSTL) manages the SAVER program and works with emergency responders to conduct objective operational assessments of commercially available equipment.

SAVER knowledge products provide information on equipment that falls under the categories listed in the DHS Authorized Equipment List (AEL), focusing primarily on two main questions for the responder community: "What equipment is available?" and "How does it perform?"

To explore the full library, visit SAVER online at [www.dhs.gov/science-and-technology/saver-documents-library](http://www.dhs.gov/science-and-technology/saver-documents-library).

For additional information on the SAVER program, email NUSTL at [NUSTL@hq.dhs.gov](mailto:NUSTL@hq.dhs.gov).

## Spreading Tools

Spreaders have “arms” that can forcefully widen openings. The tips of the spreader arms are wedged into tight areas to expand openings in the damaged vehicle’s metal. Manufacturers offer a variety of spreader tips with different geometrical shapes and gripping surfaces. Tips that extend the length of the spreader arms increase the opening width of the tool, providing improved gripping contact while reducing the chances of tool slippage. Spreaders are used primarily when trying to access people through vehicle doors, dashboards, and firewalls.

## Cutting Tools

Cutters have heat-treated blades that are either curved or straight and may be serrated. Curved cutters are primarily used to cut door hinges, curved door posts, steering columns, and rooftops, as they are best suited to fit with the contours of these vehicle parts. Curved blades also reduce blade twisting and torque when cutting harder material. Straight blades are most often used for flat and angled steel, mounting brackets and drive train components.



Figure 1. AMKUS iS700 Short Blade Cutter  
Image credit: AMKUS Rescue Systems

## Spreading/Cutting Combination Tools

Combination tools, offer responders an option to use a single tool for extrication though functionalities may differ from single purpose tools. The inner edges of the tool arms usually have cutter blades, and the outer portion of the arms are configured for spreading. The cutter blades are typically serrated in order to enhance the grip onto the metal and pull it into the tool for cutting. To enhance spreading capability, extended tips can be attached.



Figure 1. Genesis Rescue 11C-SL3 EFORCE combination tool  
Image credit: Genesis Rescue Systems

## Batteries

Untethered rescue tools are typically powered by a removable, rechargeable lithium-ion battery pack inserted directly into the body of the tool. Some manufacturers use a proprietary battery, which may allow for additional capabilities such as underwater use, while others use standard construction tool battery packs, which are more readily available and cost less. Some manufacturers also offer alternate options for powering the tools such as external battery packs with increased amp-hour capacities. Alternate sources can limit portability as they may require a corded connection to the tool.

## Standards and Regulations

The National Fire Protection Association (NFPA) is a non-profit consortium devoted to eliminating death, injury, property, and economic loss due to fire, electrical and related hazards. NFPA 1936: “Standard on Rescue Tools” [2], maintains the design, performance, testing and compliance standards for extrication tools. The NFPA 1936 standardized tests applicable to battery-powered spreaders and combination tools include the spreader’s opening and travel distance, lowest spreading force, highest spreading force, highest pulling force, lowest pulling force, operating noise level in decibels measured at four meters, and an alphanumeric cutting performance level rating for various material categories. The most recent release of NFPA 1936 in 2020 added an optional test (referred to as “F#”) for the capability to cut high-strength material found in some modern vehicle roof pillars. For a product to be advertised as “NFPA-compliant,” the testing must be conducted by an Occupational Safety and Health Administration-approved, third-party laboratory.

## References

- [1] A. Bryant, " "The History of the Jaws of Life " , " 2 February 2022. [Online]. Available: [www.firerescue1.com/fire-products/extrication-tools-cutters-and-spreaders/articles/how-the-jaws-of-life-became-a-tool-to-snatch-you-from-the-jaws-of-death-cZfOfIBNVLiTVuS/](http://www.firerescue1.com/fire-products/extrication-tools-cutters-and-spreaders/articles/how-the-jaws-of-life-became-a-tool-to-snatch-you-from-the-jaws-of-death-cZfOfIBNVLiTVuS/).
- [2] National Fire Protection Association, "Standard on Rescue Tools, NFPA 1936," 2020.