



**Homeland
Security**

Science and Technology

Summary

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 operational tests 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 mission includes:

- Conducting impartial, practitioner-relevant, and operationally oriented assessments and validations of emergency responder equipment;
- Providing information that enables decision makers and responders to better select, procure, use, and maintain emergency responder equipment.

Information provided by the SAVER Program will be shared nationally with the responder community, providing a life-saving and cost-saving asset to DHS, as well as to federal, state, and local responders.

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?"

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Cordless Reciprocating Saws

As a part of the System Assessment and Validation for Emergency Responders (SAVER) Program, Texas A&M Engineering, including Texas Engineering Extension Service (TEEX) and Texas Transportation Institute (TTI), conducted a comparative assessment of cordless reciprocating saws. The findings are presented in the Final Technical Report for Cordless Reciprocating Saws, which is available by request at <https://www.rkb.us/saver>.

Background

Cordless reciprocating saws are used by emergency responders for a variety of applications. Most commonly, these systems are used to assist firefighters or law enforcement personnel in gaining access to enclosed spaces in order to fight a fire or rescue a trapped individual. Specific examples would be tactical entry into a building for law enforcement or extrication of personnel from a crashed vehicle. The cordless feature of these saws facilitates use at remote or confined locations without the hindrances that a power cord may cause.

A focus group consisting of 11 subject matter experts (SMEs) from law enforcement, fire services, emergency management, and Urban Search and Rescue (US&R) was held on January 11, 2007. The focus group identified three primary scenarios in which cordless reciprocating saw systems are used, including vehicle cutting for extrication of wounded personnel, wall cutting or breaching for law enforcement purposes, removing obstacles in a confined area during a building collapse, explosion recovery operations, and other post-disaster search and rescue.

Assessment

Based on a market survey of available equipment, 22 cordless reciprocating saws were identified as meeting focus group procurement criteria. A series of bench tests (figure 1) was performed on the 22 saws to narrow down the test set for the full assessment to eight cordless reciprocating saws.

The eight saws were then tested in simulated vehicle extrication, confined space cutting of a duct, wall breaching, and general operational testing of the systems. The eight cordless reciprocating saws that scored highest in the bench testing and were included in the final assessment were:

- *Bosch 1645-24*
- *DeWalt DC305*
- *Hilti WSR 650-A*
- *Hitachi CR 18DMR*
- *Milwaukee 0719-20*
- *Milwaukee 6514-20*
- *Panasonic EY3544*
- *Rigid R884*



Figure 1. Bench test apparatus for testing cordless reciprocating saws.

Assessment Results

Field application of cordless reciprocating saw systems for three different scenarios was performed (figure 2). Eight SMEs used and rated each cordless saw system and helped with documenting the results. The evaluators rated the saws based on the SAVER categories (affordability, capability, deployability, maintainability, and usability). Complete assessment results and SME comments are contained in the full assessment report.



Figure 2. An emergency responder SME cuts pickup truck roof posts.

Table 2 lists the composite and SAVER category scores for cordless reciprocating saws based on a maximum score of 100 points.

The following sections provide a brief summary of SAVER category scoring and evaluator comments on each assessed system.

Milwaukee 0719-20

The *Milwaukee 0719-20* saw was the highest rated of the test set and scored in the top half of the group for all assessment categories (it was the highest rated saw for capability and usability). The emergency responder SMEs had only positive comments about the saw.

DeWalt DC305

The *DeWalt DC305* saw scored in the top half of the test group for capability, deployability, maintainability, and usability (it was the highest rated saw for maintainability and deployability). It was the most expensive system in the test set. Emergency responder SMEs had mostly very favorable comments about the tool, especially about its power. A few SMEs experienced problems with the tool's blade-locking mechanism.

Hilti WSR 650-A

The *Hilti WSR 650-A* saw scored very close to the Bosch saw, and scored in the top half of the test set in capability and usability. The emergency responder SMEs commented favorably about the tool's smooth operation and power, but indicated that its size and boxy shape could cause potential usage problems.

Rigid R884

The *Rigid R884* saw scored in the top half of the test set for affordability, deployability, and maintainability (it was the least expensive system of the test set). Emergency responder SMEs indicated that the blade was easy to change on the saw and they liked the battery life indicator, but the tool received numerous comments indicating that it was under-powered for rescue work; it also overheated during the wall cutting portion of the test.

Hitachi CR 18DMR

The *Hitachi CR 18DMR* saw rated in the top half of the test group for affordability and deployability. Emergency responder SMEs indicated multiple problems with the saw, including insufficient power for rescue work, difficulties changing batteries,

Table 2. SAVER Category and Composite Scores^a for Cordless Reciprocating Saws

Saw	Composite Score	Affordability (.11 Overall Weighting)	Capability (.36 Overall Weighting)	Deployability (.09 Overall Weighting)	Maintainability (.15 Overall Weighting)	Usability (.29 Overall Weighting)
Milwaukee 0719-20	86	79	96	75	67	87
DeWalt DC305	80	28	93	82	75	86
Bosch 1645-24	73	58	85	68	66	70
Hilti WSR 650-A	73	43	82	67	65	78
Rigid R884	67	95	62	70	69	60
Hitachi CR 18DMR	61	80	60	69	65	51
Milwaukee 6514-20	59	89	55	69	45	56
Panasonic EY3544	51	56	52	67	36	50

Note:
^aScores contained in the report may be listed in a different numerical scale. For the purposes of the SAVER Summary, SAVER category scores are rounded to the nearest whole number.

difficulties changing blades, and design issues for the handle/trigger.

Milwaukee 6514-20

The *Milwaukee 6514-20* saw rated in the top half of the test set for affordability and deployability. Some SMEs indicated that the saw’s swivel handle could have positive applications for confined space use (others did not like the feature), but overall the SMEs had problems with the saw’s insufficient power for rescue work, causing the tool to overheat.

Panasonic EY3544

The *Panasonic EY3544* was the lowest rated saw in the test set for capability, deployability, maintainability, and usability. The emergency responder SMEs liked the ease with which they could change blades on the saw, but they indicated multiple problems with the saw, including insufficient power for rescue work, difficulties changing batteries, and design issues for the

handle/trigger, as well as excessive heat in the motor area cover.

Conclusion

Emergency responder SMEs used the cordless reciprocating saws for a variety of emergency response–related applications: simulated vehicle extrication activities for pickup trucks and school buses, confined space applications, HVAC duct cutting, and wall panel breaching (figure 3). Performance differences of the saws were noted when observing how fast they were able to cut vehicle roof posts. The SMEs also provided their observations of tool operations in the different scenario activities. System cost, warranty, battery shelf life, speed of battery charging, and charger/battery light indicator information was also compiled.



Figure 3. A SME performs a breach cut on a simulated wall panel.

Substantial differences were identified in the cordless reciprocating saws' performance for emergency responder applications. The lowest rated saw of the test set, the *Panasonic EY3544*, had a composite score of 50 out of 100 based on the assessment. The highest rated saw of the test set, the *Milwaukee 0719-20*, had a composite score of 86 out of 100 based on the assessment.

All reports in the series, as well as reports on other technologies, are available on the SAVER Web site (<https://www.rkb.us/saver>).

SAVER Program Category Definitions

Affordability: This category groups criteria related to life-cycle costs of a piece of equipment or system.

Capability: This category groups criteria related to the power, capacity, or features available for a piece of equipment or system to perform or assist the responder in performing one or more responder-relevant tasks.

Deployability: This category groups criteria related to the movement, installation, or implementation of a piece of equipment or system by responders at the site of its intended use.

Maintainability: This category groups criteria related to the maintenance and restoration of a piece of equipment or system to operational conditions by responders.

Usability: This category groups criteria related to the quality of the responders' experience with the operational employment of a piece of equipment or system. This includes the relative ease of use, efficiency, and overall satisfaction of the responders with the equipment or system.