FEMA TechNote

U.S. Department of Homeland Security

SAVER

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. The SAVER Program conducts unbiased 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).

Information provided by the SAVER Program will be shared nationally with the responder community providing life- and cost-saving assets 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?"

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

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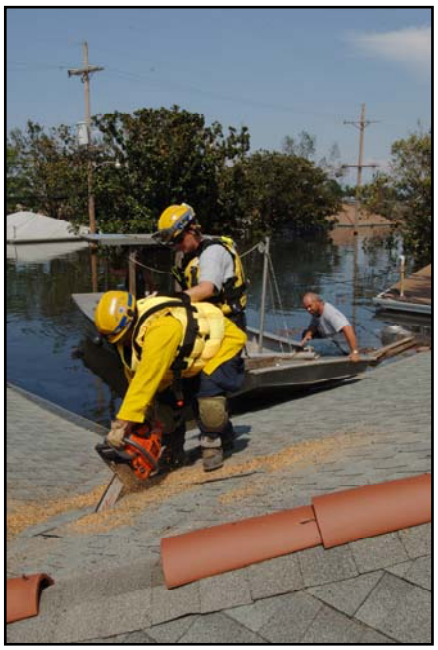
Chain Saws for Firefighting and Rescue

Chain saws are used for firefighting, rescue, and forcible entry by structural firefighters, wildland firefighters, and Urban Search and Rescue (US&R) teams. The fiscal year 2007 United States Department of Homeland Security Authorized Equipment List (AEL) reference number for chain saws is 03-SR-TPGS.

Technology Overview

The components of a chain saw are a small, two-cycle gasoline engine, a guide bar, and the cutting chain.

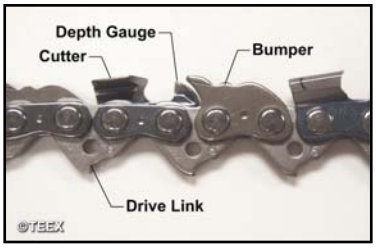


US&R team member cutting a roof with a chain saw.
(Jocelyn Augustino/FEMA)

Chain saws use two-cycle gasoline engines because they are lightweight and can be operated at any angle, including upside down. Two-cycle engines are also very powerful for their relative size. Chain saw engines have 2-10 horsepower (hp), with 5-7 hp units commonly used by responders. Many chain saw engines are protected by plastic exterior housings that are light weight and impact resistant.

The guide bar is a hard alloy steel frame, usually 12 to 36 inches long, around which the cutting chain travels. Maximum cut depth is determined by bar length. The saw engine size must be considered when selecting the bar length as more power is needed as the bar length increases.

Each link of cutting chain has a small steel blade called a "cutter" or "tooth." Cutters are oriented to chip wood from either the left or right side of the cut. Left and right cutter links are alternated to provide a straight cut. Most chains have cutting teeth on every other link with the remainder of the links having "bumpers" or "humped tie straps." Bumpers reduce kickback by lessening the impact between the cutter and the wood. The underside of each link features a drive link that is engaged by the saw's drive sprocket to move the chain around the bar.



Chain segment showing cutters, depth gauges, bumpers, and drive links.

The drive link is specially shaped to clean out the groove in the guide bar as it moves and to keep the chain centered on the bar. Many variations of this basic cutting chain are produced for specific applications. For example, cutting chains featuring carbide teeth, which are capable of cutting light gauge sheet metal as well as other challenging materials, are available.

Applications

Emergency responders use chain saws for many different purposes. In structural firefighting, chain saws are used to cut ventilation holes in roofs and walls. Firefighters also may use chain saws for forcible entry or rescue. Wildland firefighters use chain saws to clear fire lines and to remove hazard trees or snags. US&R teams use chain saws to gain entrance to collapsed or flooded buildings or to cut wood for constructing shoring systems used to stabilize unsound structures.

Northern California fire crews clearing fire line and monitoring a back burn.
(Andrea Booher/FEMA)

Chain saws are also used by road and public works personnel to clear roadways and easements of fallen trees and debris in the aftermath of storms, hurricanes, and tornados.

Performance Considerations

Chain saws come in different sizes depending on the intended use. Responders should choose a chain saw with the power and cutting depth for the materials they expect to encounter. For example, wildland firefighters in areas with heavy timber will need a saw with a larger engine and guide bar than a structural firefighter who will use a saw mostly for cutting ventilation holes.

The two-cycle engines used by most chain saws require that the gasoline be mixed with two-cycle oil to lubricate the engine. Mixing too little or too much oil can lead to engine damage or poor performance. This mixing is easily done, as manufacturers sell the oil in premeasured quantities suitable for different sized fuel cans.

Chain saw chains are lubricated by an internal oil reservoir which must be kept filled. Chain saw chains must be sharpened periodically and will quickly dull if run without oil, or if allowed to strike rocks or abrasive material like sand. Chains can be sharpened in the field with a file, or they can be easily replaced. Used chains can be sharpened for later use.

Safety

Chain saw safety expert Carl Smith states in his basic chain saw course that: “A chain saw is the most dangerous hand tool that can be purchased on the open market. It requires no license and no training to own or operate. Approximately 40,000 injuries and deaths were reported last year in the United States and most could have been prevented." Chain saws are an extremely productive and useful tool, yet they must be handled carefully and with respect. Most chain saws are powered by gasoline engines and therefore must be used outdoors or with good ventilation due to the exhaust fumes. Chain saws are also prone to kickback, which occurs when the tip of the bar catches in the wood and the saw is kicked out and back toward the operator. Operator training can help minimize this risk. Low-kick chains and chain brakes, which stop the chain in the event of kickback, further reduce the risk of injury.

Appropriate personal protective equipment should always be worn. Chain saw users should wear a hardhat, eye protection, ear plugs or muffs, gloves, boots, and chain saw chaps.

Additional Information

Kestel, Bernard. (2005). Chainsaw Operator’s Manual: The Safe use of Chainsaws. 6th edition. Landlinks Press: Australia.

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Smith, Carl. Chain Saw Safety—Advice from an Expert. Part 1: The Carl Smith Chain Saw Safety Interview http://forestry.about.com/cs/chainsaws/a/carl_smith_saw1.htm

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