TOOLS AND EQUIPMENT FOR SPECIALIZED RESCUE BY RAY DOWNEY

In my last article (January 1995), I spoke about specialized training and its major role as the foundation of the fire service. Most likely, I will get some arguments concerning what some consider an equally important part of the fire service—tools and equipment—and how they play an important role in our daily firefighting and rescue operations.

This article and the next few articles will look at specialized tools and equipment needed for rescue: what is available to the rescue community in 1995 and what is needed for practical application in specialized rescue situations. One of the problems in developing these much-needed tools and equipment is the cost. For example, numerous types of equipment are available for lifting tons of concrete from open and accessible areas. But how about for moving the same size and amount of concrete from a confined space, where only one or two rescuers have enough room to operate? Can modern technology develop a tool with this capability at an affordable price for the fire service?

The disasters of the '80s and '90s (especially earthquakes) clearly highlighted the need for specialized tools and equipment capable of penetrating concrete, locating trapped victims, communicating in complex confined spaces, and performing difficult and delicate rescues.

Overcoming the formidable challenge of penetrating concrete has been made somewhat easier by the development of concrete-cutting and breaking/breaching tools. A number of saws—powered electrically, pneumatically, hydraulically, or by fuel—use special diamond-segmented blades to cut concrete. These saws range in size from the everyday handyman circular saw to the larger circular power saws that cut concrete on roads and highways. The hydraulically powered chain saws with diamond-segmented blades can cut through 18 inches of reinforced concrete. These saws have been used successfully for entry and victim removal—both in training exercises and real-life situations.

When penetrating concrete, there is a clear distinction between cutting and breaking/breaching. The cutting technique is used to remove sections of concrete in one piece so that a minimal amount of excess concrete drops away. The breaking or breaching technique, on the other hand, is used for blowing out a hole, without concern for excess concrete. This is especially significant when gaining access to victims. Construction-type tools such as jackhammers, rotary hammers, breakers, and chippers have the capability to breach, break, or chip concrete. They come in a variety of sizes, with various power sources and different capabilities. Smaller tools can be extremely useful in confined spaces, while larger tools are more suited for nonrestrictive areas.

Most often, a concrete drilling tool is needed to provide an opening for search cameras or fiber-optic scopes. These search devices are extremely useful in determining if victims are trapped under concrete or in confined spaces and assist in pinpointing their locations. Many of us have experienced fiber-optics as they are used in the medical field. The same techniques are used in search and rescue, only with a much larger target (a trapped victim). A search camera relays a picture from the head of the probe to a TV monitor. When searching through tons of concrete, these devices can save

■ **RAY DOWNEY** is a battalion chief and 32-year veteran of the City of New York (NY) Fire Department and the former captain of Rescue 2. He is a member of FEMA's US&R Working Group for Equipment, Advisory Committee, and Technical Review Panel. He is also the author of the book *The Rescue Company*, the video *Rescue Operational Planning: Factors for Success*, and the video series *Collapse Rescue for the Fire Service*, published by Fire Engineering Books.

valuable time.

Using seismic/acoustic detection systems also can help locate trapped victims. Probes or sensors placed in and around a collapse area send signals indicating noises, tapping, or banging possibly transmitted by survivors. There are a number of these devices out today, all of which require familiarization training (See "Listening Devices in Heavy Search and Rescue," by Uwe Beckmann, *Fire Engineering*, July 1991).

Communication is an extremely important part of every rescue operation. In many rescue incidents, rescuers entering voids or access openings break visual contact with those on the outside. If this occurs, rescuers must have audible contact with outside personnel. The safety of the rescuers must always be a prime consideration. (A common saying is, "A rescuer should never become a victim.") Communications can be transmitted over a radio, hardwire, or sound-powered cable. The least reliable is the radio because its signals can be blocked by walls, metal, distance, or other obstructions. Sound-powered or hardwired systems can be very effective, especially in confined-space operations (which many collapses and other rescues are). Any system used should be intrinsically safe and meet the requirements of OSHA Regulation 1910.146.

OSHA requirements for confined-space operations call for atmospheric-monitoring equipment, ventilation equipment, communications equipment, retrieval equipment (harnesses, tripods, winches, etc.), respiratory protection, and patient-packaging equipment. These regulations have motivated manufacturers to design and produce tools and equipment that are most suited for confined-space operations. Many of the new confined-space tools and equipment have provided the rescue community with additional resource capability in their day-to-day operations.

Collapse operations require a wide variety of tools and equipment. Stabilization of rubble, debris, walls, floors, and so on is achieved through wood cribbing and shoring. Shoring can be accomplished with mechanical screw jacks, pneumatic and hydraulic shores and struts, and various sizes of lumber. The size and type of collapse will dictate your equipment needs. Operating in a confined space with a localized small collapse generally will require much less equipment than when operating in larger buildings. The larger buildings may require exterior rake shoring with large-size dimension lumber. Air bags often are used in stabilization during collapse operations as well. Available in varying sizes, they have proven to be very effective during confined-space operations where lifting, moving, or stabilizing is required.

Torches (burning equipment) often are needed during rescue operations (see "Trapped in a Collapse: Queens Gas Explosion," *Fire Engineering*, May 1994). They are available in various sizes and types. The large commercial type O_2/acetylene may be appropriate where space dictates. But what

In no area of operations are firefighters more dependent on specialized tools than that of heavy rescue. To address the need for new and better equipment, you've worked with manufacturers of high-tech rescue products, adapted products designed originally for other applications, and created your own. But whether fiber-optic search device,

if entry through steel is required during a rescue operation in a confined space? Does your team have the equipment for the job? Fortunately, there are portable burning setups that can be utilized in confined spaces, voids, and collapse areas. One of the newest units on the market is an exothermic cutting unit that provides a flexible torch cable for burning. This unit is unique because it requires no other accessories at the point of operation. The oxygen supply and controls can be located outside of the operating area or taken into the confined space.

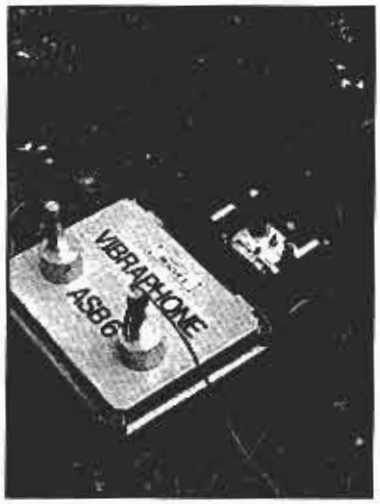
There has been a great amount of research and development dedicated to rescue technology with emphasis on tools and equipment. Yet much more is still required. Most contemporary rescue tools and equipment meet the current needs in many areas of rescue work. These tools have been developed to face the challenges that past rescue incidents showed the need for. In most cases, we have had to adapt many industrial and commercial tools for the rescue community.

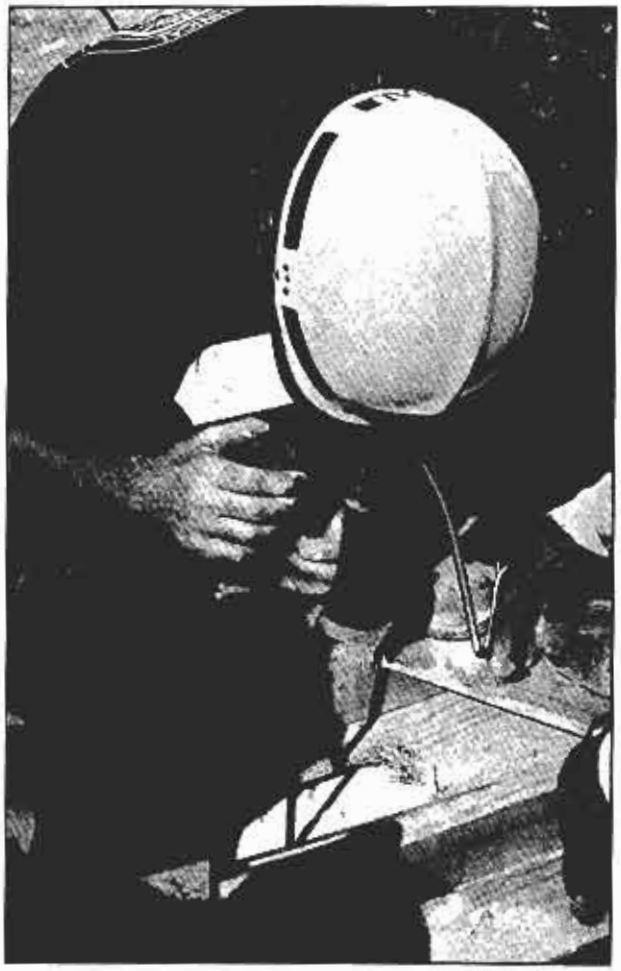
The one problem that still surfaces after each disaster is the lack of equipment necessary to handle every rescue incident. We seldom respond to incidents that duplicate themselves; each rescue incident is usually unique. The incidents may fall under the same category (impalement, entrapment, collapse, confined space, etc.), or they may have their own individualism, but the common saying "No two fires are ever the same" absolutely applies to rescue as well.

There is a special need for portable and versatile tools capable of performing the necessary tasks in rescue operations. Every critique of rescue incidents usually includes the famous line "If we only had had an 'XYZ' tool, we would have had the victim out in no time." Well, what about those "XYZ" tools? Have they been developed? Do we have a camera that can see through concrete? Do we have a listening device that can identify human sounds and pinpoint the victim's location? How about an SCBA that isn't bulky or heavy, doesn't require an in-line supply system, and will last for an hour or two? Or safe, reliable, and hands-free communications for confined-space operations? The list could go on and on. We have seen the modern technological advances in hose, nozzles, fittings, monitors, apparatus, etc. We need the same type of advances and commitment from manufacturers of high-tech rescue equipment and tools.

This has been a brief overview of some of the specialized tools and equipment used in rescue operations. Future articles will discuss in detail many of these tools and other rescue tools scheduled to hit the market in 1995. ■

Note: The U.S. Fire Administration will be issuing a report in 1995 that discusses technologies currently available to rescuers and others from the military, construction, and mining fields that might be able to be adapted for use in rescue operations.





jackhammer, or "hefty hauler," the rescue specialist's tool needs will grow as challenges and expectations increase. Only your continued commitment to improve, networking with other professionals, and reaching out to the manufacturing community will bring you closer to never having to say, "If we only had that tool...."