

A Metal Locator for Contractors

Inexpensive device requires minimal training for users needing to locate bars in concrete

by Luke M. Snell

Most contractors will occasionally need to locate reinforcing bars in a concrete structure—for example, when they want to miss the reinforcement when drilling holes into concrete. While there are many metal locators on the market, many are very expensive and require extensive training to be used successfully. Such equipment is designed to be operated by engineers conducting a detailed structural evaluation of an existing building.

Because contractors have only the occasional need to find reinforcing in concrete, they need an inexpensive metal locator that is relatively easy to use. A device to meet this need is the MetalliScanner® m40 metal locator, developed by the Zircon® Corporation, based in Campbell, CA.

To activate the m40 metal locator, users simply push the power button and pass the device over the surface of the concrete. A green light-emitting diode (LED) shows that the device is on. As the m40 approaches a metal object, its red LEDs progressively light from the bottom up. A lighted blue coil and an audio tone indicate when a metal target is located. The m40 metal locator does not indicate the cover depth, nor does it indicate the size of the bar. If this information is required, a more expensive piece of equipment will have to be used.

Users are cautioned that a single reading at one location does not show the position of the reinforcement but simply that there is metal at that location. A single reading might indicate a nail, a steel can, or a loose tie wire. Thus, the user should do multiple readings at several locations to be able to trace the placement of the reinforcement.

Experimental Trials

In May 2013, I took a Zircon m40 to Ethiopia and conducted a series of experiments with students at Addis Ababa University in Addis Ababa and Bahir Dar University in Bahir Dar, Ethiopia. I gave them the m40 metal locator along with the written instructions and instructional DVD that came with the device. The experiments had a dual



A student uses the Zircon m40 to locate vertical bars in a concrete column

purpose: to determine if users could quickly learn how to operate the equipment and if the instructions were adequate for people who have learned English as a second language.

We had prepared concrete samples with reinforcement at known locations so the students could gain experience in being able to detect bars. After they completed these experiments, they were asked to locate bars within a concrete column. A concrete column was selected because the bars would be in the corners in a predictable pattern.

As most of us would probably do, the students did not read the instructions but instead elected to watch the video instructions. After watching the DVD two or three times, the students felt confident enough to use the equipment and were able to successfully locate the bars in the prepared samples and concrete columns.

I concluded from these tests that the video provided adequate instruction for people to use the equipment and



A simple test setup to evaluate the metal locator



A demonstration of how to use the m40

that formal instruction was not required. I also concluded that with minimal practice with the m40, the operator had confidence in his/her ability to use the equipment.

A second study was authorized by Zircon to determine the accuracy of the m40 in locating bars as a function of cover. This experiment was done in Phoenix, AZ. It was also repeated at the Mongolian University of Science and Technology at Ulaanbaatar and at Darkhan.

The equipment needed for this evaluation comprised:

- a concrete block;
- reinforcing bars of various sizes. For the tests in Phoenix, we used No. 3 (10 mm), No. 4 (13 mm), No. 6 (19 mm), and No. 10 (32 mm) bars;
- a ruler or a tape measure; and
- spacers (concrete, wood, or a magazine) to allow the participants to vary the cover over the reinforcement.

Table 1 summarizes the results. From the testing trials completed in the United States and in Ethiopia, the Zircon MetalliScanner m40 was found to be able to locate small bars with cover of up to 3 in. (75 mm). The tests in Phoenix also indicated that larger bars can be located at even greater depths. Finally, all tests indicate that a first-time user can easily learn how to operate the equipment by watching an instructional video.

Table 1:
Maximum depth of cover at which the m40 scanner accurately located steel reinforcing bars

Bar size number (diameter in mm)	Maximum depth of cover, in. (mm)
No. 3 (10)	3 (75)
No. (13)	3-1/4 (95)
No. (19)	4 (10)
No. 10 (32)	4-1/2 (115)

—Zircon, www.zircon.com

Selected for reader interest by the editors.



Luke M. Snell, FACL, is a Professor Emeritus of Southern Illinois University, Edwardsville, IL, and currently a Senior Materials Engineer with Western Technologies, Inc., Phoenix, AZ.