ICRI Introduces Hydrodemolition Technical Guideline

by Pat Winkler

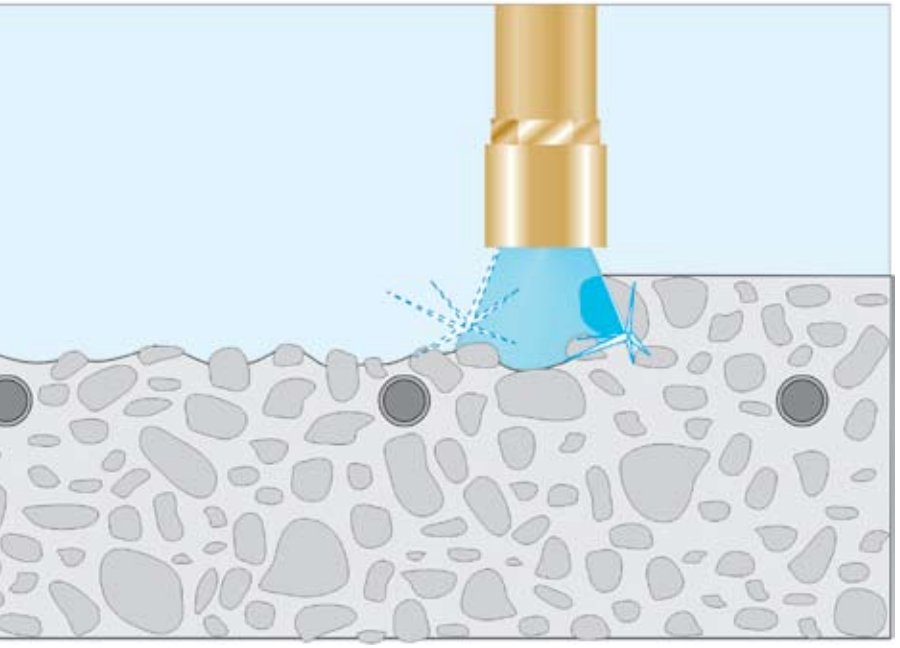

Fig. 1: Hydrodemolition does not create microfractures

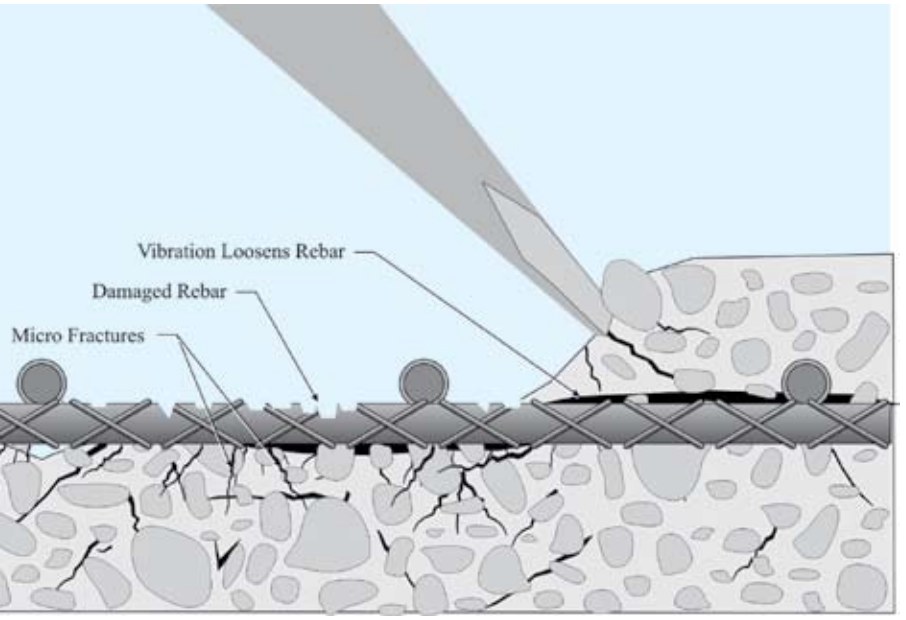

Fig. 2: Damage created by chipping hammer

"Before anything else, preparation is the key to success."—Alexander Graham Bell (1847-1922). And so it is for the success of a concrete repair: without proper surface preparation, a concrete repair will be seriously compromised, with the possibility of an immediate failure. ICRI recently published Technical Guideline No. 03737, "Guide for the Preparation of Concrete Surfaces for Repair Using Hydrodemolition Methods." While surface preparation techniques are discussed in ICRI Technical Guideline No. 03732, "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays," this new guideline focuses specifically on the use of hydrodemolition for concrete removal and surface preparation.

Hydrodemolition is the only nonmechanical method of removing deteriorated concrete in preparation for a repair material or overlay. Hydrodemolition has been in use in the U.S. for over 20 years and has been widely accepted for over 10 years. Engineers and many state departments of transportation specify hydrodemolition for concrete removal. They recognize the significant improvement in bond strength obtained using the hydrodemolition method. The quality of the surface preparation ensures the long-term success and durability of the concrete repair.

Mechanical removal equipment, such as jackhammers and rotomills, impact the repair surface and can cause microfractures to develop. The microfractures can extend 1/4 to 1/2 in. (6 to 13 mm) into the surface damaging (bruising) the substrate. This weak zone in the substrate will result in a reduction in the bond strength between the substrate and repair materials. Direct tensile bond tests show bond failure in this weakened zone with tensile strengths only fractions (10 to 50%) of the tensile strength of either the substrate or the repair material.

Hydrodemolition does not introduce microfractures into the substrate. During hydrodemolition, the coarse aggregate is exposed and not damaged. The surface texture is rough with partially exposed aggregate protruding. The elimination of microfractures and increased surface area from the rough texture creates an excellent bond with

Fig. 3: Surface preparation using a rotomill leaves a smooth surface with aggregate sheared off

Fig. 4: Surface preparation using hydrodemolition. Exposed coarse aggregate improves bonding

the repair material. Direct tensile tests typically show failure deep within the existing substrate (often the weaker of the two materials) and not at the bond line.

The new Technical Guideline No. 03737 contains information on the entire hydrodemolition process including:

- Benefits and limitations;
- The system and how it works;
- Safety;
- Applications;
- Issues to consider when using hydrodemolition;
- Wastewater control;
- Debris cleanup and disposal; and
- Test areas and methods of measuring the removal.

This guideline also explores other benefits of hydrodemolition, such as:

- Deteriorated concrete being selectively removed;
- Cleaned and undamaged reinforcement;
- Minimal structural vibration;
- Minimized dust (silicosis);
- The ability to accelerate construction time; and
- A reduction in job-site injuries by the use of robotic equipment.

As ICRI and the concrete repair industry look to the future, we will seek repair methods and procedures that enhance the quality of the repair, are less labor intensive, and improve the work environment. Technical Guideline No. 03737 will assist the reader in understanding how the hydrodemolition process works and how it can be used to enhance the quality and durability of concrete repairs.

Pat Winkler *is Vice President of Rampart Hydro Services, a hydrodemolition subcontractor providing services in the U.S. and Canada. Winkler performed his first hydrodemolition project in 1986 as a restoration contractor and has been involved in the hydrodemolition industry for the past 19 years. In 1992, he joined Flow Services, a specialty contracting firm providing hydrodemolition services across the U.S. and Canada. Flow Services became Rampart Hydro Services in 1997. He has a BA in chemistry from Michigan State University and an MBA from Rutgers University. Winkler is a member of ACI and ICRI. He is active in ICRI and is the Hydrodemolition Subcommittee Chair. He can be contacted at pwinkler@rampart-hydro.com.*