

# Surface Preparation on the Dan Ryan Expressway Using High-Speed Scarification

By Kyle Winkler

**T**he Dan Ryan Expressway (I-94) reconstruction project, between 13th Street and the I-57 interchange in Chicago, IL, involved the reconfiguration of ramps and interchanges, installation of enhanced sewers, construction of new lanes, as well as repair of the existing lanes. Part of the process of repairing the existing bridge lanes was to prepare the surface and install a microsilica concrete overlay. The Illinois Department of Transportation (IDOT) required that equipment must be used to remove the weak concrete at the surface, including the microfractured concrete surface layer remaining as a result of mechanical scarification. IDOT further specified minimum tensile bond strengths on the prepared surface of

175 and 150 psi (1.2 and 1.0 MPa) on the bonded overlay. To achieve this requirement, IDOT required mechanical grinding followed by high-speed hydroscarification or simply high-speed scarification (HSS).

Initial removal was accomplished using mechanical milling, which left a weakened surface due to splitting the coarse aggregate and creating microfractures in the substrate. HSS removed microfractures, provided a 1/4 in. (0.64 cm) profile, and left a rough bondable surface. Normally, hydroscarification, done with a hydrodemolition robot, has a production rate of 4000 to 6000 ft<sup>2</sup> (372 to 557 m<sup>2</sup>) per shift, so to meet the overlay schedule, the subcontractor introduced the HSS





process. HSS uses truck-mounted equipment with a 2 ft (0.6 m) wide scarifying head, capable of carrying 4000 gal. (15,140 L) of water and generating 36,000 psi (248 MPa) of water pressure. The truck is connected to a vacuum system allowing for a neat and efficient scarifying operation. Production rates averaged 30,000 ft<sup>2</sup> (2787 m<sup>2</sup>) per shift.

Tests of the overlay bond involved both a direct tensile strength test on the prepared surface as well as on the overlay. For the prepared surface, IDOT required that the average of six tests, of a minimum 600 ft<sup>2</sup> (56 m<sup>2</sup>) area, be at least 175 psi (1207 kPa) and each individual test have a minimum strength of 160 psi (1103 kPa).

For the overlaid surface, IDOT required that each individual test have a minimum strength of 150 psi (1034 kPa). Bond tests on the prepared surface were as high as 350 psi (2413 kPa) with an average of 230 psi (1586 kPa) out of 60 pull-off tests performed. The overlay pulloff tests also yielded tensile strengths as high as 350 psi (2413 kPa) with an average of 63 tests being 220 psi (1517 kPa).

Only one pass was required for both scarification and cleanup, over approximately 1,800,000 ft<sup>2</sup> (167,225 m<sup>2</sup>) at 1/4 in. (0.6 cm) removal. A vacuum truck connected to the HSS unit controlled water and collected the debris. Once IDOT's engineer and contractor confirmed the necessary bond strength, the surface was overlaid with fiber-reinforced microsilica concrete.

## Dan Ryan Expressway

### Owner

Illinois Department of Transportation

### Contractor

Walsh Construction

### Surface Prep Subcontractor

Rampart Hydro Services



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