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## March 14, 2014

**Headline: Robbins EPB Pushes the Limits in Beijing**

*Sub-Headline: TBM Completes Line 6 of Capital’s Longest Subway Route*

A Robbins 6.15 m (20.2 ft) diameter EPB machine achieved an impressive run on January 13, 2014 in China’s capital. In only three months, the machine for contractor China Railway Engineering Corporation (CREC) Bureau 5 excavated through 2.3 km (1.4 mi) of soft soils, clay, sand, pebbles, and highly weathered rock. The breakthrough marks the completion of the last section of the Line 6 Phase II extension, further lengthening Beijing Metro’s longest subway route. With a population of nearly 20 million people, the extension was essential in sustaining rapidly growing transportation needs, resulting in a higher capacity metro system.

The machine was launched from a 20 m (65 ft) deep shaft at Lot 15 for the extension of Line 6. With this breakthrough, the Robbins EPB machine contributed to the 12 km (7.5 mi) of the existing 30 km (19 mi) tunnel that will allow seven new stations to open in September 2014. A second western extension, planned in 2015, will make the entire route 54 km (34 mi) in length.

“The Robbins machine is good and reliable,” said Wan Ming, the Mechanical Electrical Manager for CREC Bureau 5. Efficient excavation that led to advance rates of 125 m (409 ft) per week was achieved with the help of consistent ground conditions, field service support, and custom EPB design. This included a spoke-type cutterhead and shaft-type screw conveyor, as well as active articulation to negotiate curves down to a 1,000 m radius. Universal concrete segment rings 1.2 m in length were placed to support the variable geology. With monthly advance rates of up to 410 m, the EPB machine was able to progress at a consistent pace.

Tunneling in urban conditions made the good advance all the more challenging: structures along the tunnel route included high voltage lines within 1.5 m of the excavation, a 30 m (98 ft) wide river, a 200 m (656 ft) long machine factory, and a variety of active utility pipes.

“The ground condition in Beijing is loose, soft ground with fine sand. We reduced the torque by injecting Bentonite into the cutterhead. We were also able to maintain a good rate of advance with high-powered VFD electric motors (5 x 800 kW) and with the help of a good crew for trouble shooting,” said Andrew Han, Robbins Field Service Manager.

“We are proud that we overcame challenges through joint efforts by Robbins and the customer CREC Bureau 5. This is the first time that an EPB on this project has excavated a tunnel so quickly, breaking through in three months,” said Han.

In ongoing efforts to alleviate traffic pressure, more extensions to Beijing’s 16 active metro lines are expected. The overtaxed system currently carries 10 million passengers daily, and will be able to add 700,000 more upon completion of Line 6, according to the municipal transport commission. Once all three phases of Line 6 are complete in December 2015, the extension will run parallel to Beijing’s oldest subway Line 1, opened in 1971, and will serve as a relief to the aged and overcrowded route.

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