**Emisor Oriente**

**Three Robbins EPBs bore Vital Wastewater Tunnel in Mexico**

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| **Machine Type** | [Earth Pressure Balance Machine (EPB)](http://www.robbinstbm.com/our-products/tunnel-boring-machines/earth-pressure-balance/) |
| **Diameter** | 3 x 8.93 m (29.3 ft) |
| **Tunnel Type** | Wastewater Line |
| **Tunnel Lengths** | 4.6 km (2.9 mi), 8.6 km (5.3 mi), 9.2 km (5.7 mi), 10.2 km (6.3 mi) |
| **Owner** | National Water Commission (CONAGUA) |
| **Contractor** | Ingenieros Civiles Asociados (ICA), S.A. de C.V. (Lots 1, 5); Carso Infraestructura y Construcción, S.A. de C.V. (Lots 3, 4) |
| **Location** | Mexico City, Mexico |

**Project Overview**



In an urgent effort to prevent flooding in the urban capital of Mexico City, the National Water Commission (CONAGUA) has ordered the construction of a 62 km (39 mi) long wastewater line, Emisor Oriente, which is expected to help increase Mexico City’s wastewater capacity and ease some of the city’s related problems.  Torrential rains and continuing floods in Mexico’s capital during the rainy season have increased the urgency of the job, quickly making it the country’s most critical infrastructure project.

The Emisor Oriente project was divided into six lots – Lots 1, 2 and 5 awarded to Mexican contractor Ingenieros Civiles Asociados (ICA), S.A. de C.V., Lots 3 and 4 to Carso Infraestructura y Construcción, S.A. de C.V., and Lot 6 to Lombardo Construcciones and Constructora Estrella.  Three 8.93 m (29.3 ft) Robbins Earth Pressure Balance Machines (EPBs) will excavate Lots 1, 3, 4, and 5 of the tunnel.

**Geology**

Mexico City is located in the Valley of Mexico.  The area contains an ancient, drained lake bed and is surrounded by volcanic mountain ranges.  The soil is mainly made up of watery clays running up to 80 m (262.5 ft) deep with the water table just 2 to 3 m (6.6 to 9.8 ft) below the surface.  The ground also contains boulders up to 600 mm (23.6 in) in diameter.  Due to the complex ground conditions, engineers believed for years that the ground would be too difficult to excavate.  Despite the challenging terrain, Mexico City’s main wastewater line, Emisor Central, was hand-mined in 1964 approximately 100 m (328.1 ft) below ground, paving the path for future underground construction projects.

**Equipment Features**

The Robbins EPBs were designed for the particularly difficult ground conditions they would be facing on the job site.  Although difficult ground was anticipated, shaft excavations in 2009 and 2010 revealed much more complex terrain than originally expected, resulting in various modifications on each machine.  The EPBs were built with mixed-ground, back-loading cutterheads with carbide cutter bits to deal with variable ground conditions, and ribbon-type screw conveyors to remove large boulders.  Redesigned pressure bulkheads were added to the machines to accommodate the higher water pressures of the region, and enhanced wear detection was added to the cutter bits to ensure optimal performance.  Robbins continuous conveyors will also be used behind each machine in order to quickly remove muck from the jobsite and minimize downtime.  Each continuous conveyor system and vertical belt will be installed once the machines have bored ahead 150 m (492.1 ft) from their launch points.

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**Excavation**

One Robbins EPB was launched for Lot 1 on July 13, 2011 – a change from its originally scheduled tunnel drive at Lot 5.  A flood at Lot 1 delayed the Herrenknecht machine that was originally designated to bore the area for six months, prompting the contractor to begin boring with the Robbins EPB.  The machine started excavation at shaft 5 of Lot 1 using umbilical cables connected to the surface and a sludge pump for muck removal.  Once the Robbins EPB has bored its 4.6 km (2.9 mi) drive to shaft 3A of Lot 1 it will be dismantled, removed, and reassembled at Lot 5 for its original 8.6 km (5.3 mi) long bore.

Excavation at Lot 1 was fast-tracked because of problems with Mexico City’s main open sewer line, the Gran Canal.  The canal was constructed in 1910 and floods its banks on a regular basis, causing road closures and significant health problems to the city’s residents.  The canal has a positive vertical alignment, resulting in potentially large volumes of water that could overload current pumping stations and send untreated water back into the city.  The canal’s slope loss is due to the area’s sinking lake clays.  To help remedy this problem, a treatment plant and pumping station are being constructed in shaft 5 of Lot 1 so water diverted from the section of the Gran Canal to Emisor Oriente can be pumped back into the Gran Canal where the slope has not been compromised.

The remaining two Robbins EPBs are scheduled to launch later in 2011, working on 9.2 km (5.7 mi) and 10.2 km (6.3 mi) drives at Lots 3 and 4, respectively.

When finished, the Emisor Oriente line will operate jointly with Emisor Central.  The population of Mexico City has more than doubled since the construction of Emisor Central and has caused significant strain on the current system’s capacity.  Construction of Emisor Oriente is expected to be completed in 2014, and will add 150 cubic meters of water per second (5,300 cubic feet per second) to the wastewater capacity of Mexico City.  Emisor Oriente is only one of a number of tunnel boring machine projects planned for the near future in Mexico City.

Updates of this project will be posted as boring continues.