The Reinforced Earth Company

RECONEWS

FALL-WINTER 2001

ABUTMENT WALLS ON HWY 407 EXPRESS TOLL ROUTE (ETR) EXTENSION

- 407 ETR (Express Toll Route) is the world's first all-electronic, open access toll highway.
- No need to slow down entering or leaving the highway, as tolls are determined either by transponder or by a photo record of the license plate.
- Traffic volume has risen steadily since tolling began and continues to grow with over 303,000 average workday trips.

Progressive Development

- 36 km from Hwy 410 to Hwy 404: June 1997
- 56 km from Hwy 401 to McCowan: Feb 1998
- 67 km from Hwy 403 to Markham: June 1999
- 108 km from Burlington to Pickering: August 2001

True Abutment wall for 407 ETR over CPR Havelock rail line.

True Abutment wall for 407 ETR over Ramp 403E-407W

After extensive involvement in the first two phases of Toronto's 407 ETR toll highway construction project, Reco is proud to continue their participation in the third phase extension of this highway. Reco designed and supplied retaining walls for three structures on the west extension, four structures on the east partial extension, and two structures as part of the interchange upgrades on the central section, for a total of approximately 7,000m^2 of retaining wall.

Reco worked as an integral part of the design team on this project. As is the case with many design-build projects, there were several design iterations before the most economical wall configuration was accepted by the owner. Of particular note is the Hwy 403 overpass originally designed and tendered as a CIP rigid frame structure. This structure was redesigned as a Reinforced Earth® abutment to provide a more cost-effective solution.

Although "True" Reinforced Earth

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Abutments ("True" indicates that the bridge is directly supported by RE without piles) have been used several times in Ontario and several thousands of times around the world, this marks the first time that "true abutment" designs have been used on a major highway (400 series) in Ontario. RECo is proud to be the only approved supplier for true bridge abutments by the Ministry Of Transportation Of Ontario.

Owner:

Consortium comprised of Cintra Concesiones de Infraestructuras de Transporte (100% owned by Groupo Ferrovial), a Spanish company, SNC-Lavalin Group Inc., a Canadian engineering and construction company and Capital d'Amerique CDPQ, a subsidiary of Caisse de depot et placement du Quebec.

Consultant for Structures: UMA Engineering Ltd.

Contractor for 1) West Extension RE structures: Soncin Construction Corporation

Contractor for 2) East Extension RE structures: Brennan Paving & Construction Ltd.

Precaster of Reinforced Earth Panels: Hy-Grade Precast Concrete

Designer and Supplier of Retaining Walls: Reinforced Earth Company Ltd.

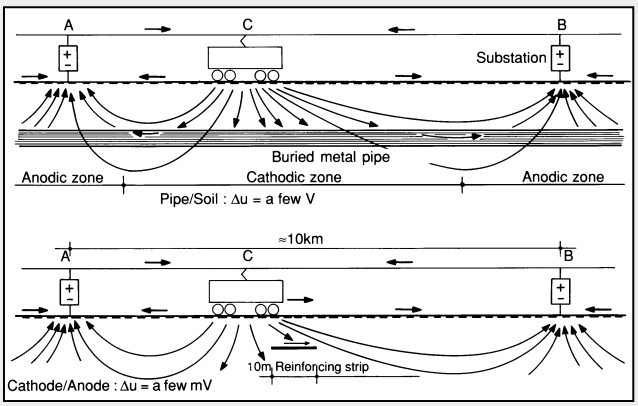
FEATURED PRODUCT: REINFORCED EARTH WALLS SUPPORTING ELECTRIFIED RAIL LINES

For more than 20 years, Reinforced Earth structures have been used extensively to support electrified rail lines. As electric trains produce stray currents there was some concern in the beginning as to the effect this would have on the galvanized steel strips. It has become quite evident that the effect of stray current corrosion on Reinforced Earth Structures is of little concern. Railway administrations and their corrosion consultants worldwide researched and eliminated any early concerns and have recommended Reinforced Earth for such applications. This following discussion of stray currents explains why.

Electrified trains use rails as conductors to return current to the substations. However, since the tracks are poorly insulated, some of the current is transferred to the ground or buried metal structures. A risk of corrosion occurs when stray currents returning to the substation leave the conductor in which they had been moving taking Fe++ ions with them. Such risk only exists with direct current, since the rapid reversals of direction present with alternating current do not allow enough time for oxidation reactions in the metal.

Power lines and buried pipelines running parallel to tracks are particularly vulnerable, since they collect current over the entire period during which a train is moving from one substation to the next (see figure). In contrast, the reinforcing strips in Reinforced Earth structures are insulated from one another and are very short compared to the distance between substations.

For these reasons the current they collect as the train nears is reversed as soon as it passes. In addition, the current is associated with only very slight differences in potential. These rapid, low-amplitude variations, which resemble an alternating current, have no significant effect on the reinforcements.



PORTLAND MAX LIGHT RAIL LINE: REINFORCED EARTH USED IN DESIGN-BUILD PROJECT

A bold alliance among four public agencies and a private company has extended Portland, Oregon's existing Metropolitan Area Express (MAX) light rail system to the Portland International Airport, making extensive use of Reinforced Earth walls in the process.

Construction of this public transportation system resulted from a unique design-build partnership characterized by a fast-track schedule, strong cooperation among the partners and, most notably, the exchange of public works construction for the rights to commercially develop Cascade Station, a 120 acre Port-owned parcel adjacent to the airport and zoned for hotels, restaurants and commercial buildings. The partners in this $125 million MAX extension include the Port of Portland, the Tri-County Metropolitan Transportation District of Oregon (Tri-Met), the Portland Development Commission and, as contractor/developer, Bechtel/Trammell Crow Company.

The project concept evolved from the rapid growth of Portland International Airport and the projected lack of parking to support future growth. In October 1998, the parties completed a plan to construct a 5.5 mile (8.8 km) extension of the existing light rail system along Interstate 205, providing a link between the Gateway Transit Center and the Airport's passenger terminal. The MAX line is situated in the median of I-205, requiring a major flyover bridge to carry the light rail line from the median, across the travel lanes of I-205, and into the airport.

To minimize disruption of traffic on the busy Interstate, Bechtel constructed a cast-in-place segmental bridge with long spans and a 550-ft (168 m) horizontal radius of curvature. The Reinforced Earth (Mechanically Stabilized Earth or MSE) retaining walls were initially selected for the ramps leading up to the bridge because they could be constructed entirely from the backfill side of the wall, solving the problem of construction access to a site flanked by heavily-traveled roadways. The wall-selection decision was solidified by the extensive experience and successful performance of Reinforced Earth walls both for electrified rail lines and in seismically active regions. In plan, this U-shaped Reinforced Earth ramp and bridge abutment structure consists of two parallel, back-to-back approach walls and the abutment wall in front of the pile-supported abutment.

For Bechtel, selecting The Reinforced Earth Company to provide complete design and fabrication of the MSE walls was a simple decision given Bechtel's long and favorable experience working with both The Reinforced Earth Company and the Reinforced Earth technology. RECo engineers worked with the Bechtel team in San Francisco to develop the design criteria and the wall construction methodology. Then the design calculations and shop drawings were produced, reviewed and revised as needed to meet the changing conditions typical of a design-build project.

Construction of this MAX line extension required three bridges and four Reinforced Earth walls. Goodfellow Brothers Inc. performed the earthwork, while Keywest Retaining Systems of Portland completed the Reinforced Earth structures. The Reinforced Earth Company is proud to have helped turn Portland's and Bechtel's high-risk plan into a successful venture for all parties.

INTERNATIONAL CORNER

CREATIVE FACING OPTIONS

Our International Corner story features facing options of Reinforced Earth Walls located throughout Japan, designed and supplied by licensees of the Reinforced Earth Group of Companies. These photos eloquently highlight some very diverse and creative solutions and clearly illustrate the flexibility of Reinforced Earth Walls.

United States

The Reinforced Earth Company

8614 Westwood Center Drive, Suite 1100
Vienna, Virginia, 22182-2233
TEL 1-800-446-5700 • FAX 703-821-1815

www.reinforcedearth.com

- Atlanta (770) 242-9415
- Boston (978) 664-2830
- Chicago (630) 898-3334
- Dallas/Ft. Worth (817) 283-5503
- Irvine, CA (949) 587-3060
- Orlando (407) 240-3257
- Seattle (425) 391-0111
- Vienna, VA (703) 821-1175

Canada

Reinforced Earth Company Ltd.

1550 Enterprise Road, Suite 229
Mississauga, Ontario, L4W 4P4
TEL 1-800-263-7097 • FAX 905-564-2609

www.reinforcedearth.ca NEW

- Edmonton AB (780) 453-8983
- Montreal PQ (450) 466-6566
- Toronto ON (905) 564-0896
- Truro NS (902) 897-0982
- Vancouver BC (604) 714-0766