The Reinforced Earth Company

RECONEWS

SUMMER-FALL 2000

HIGH HEAD WALLS FOR TECHSPAN ARCH

In the fall of 1999 the Reinforced Earth Company Ltd. used a combination of Reinforced Earth® retaining walls and TechSpan® precast arch to provide a fast track solution for the emergency replacement of a culvert. The project, funded by the Province of British Columbia with assistance from the Federal Government, consisted of a 20 meter long TechSpan precast arch, of 10 meter span, encased in "back to back" Reinforced Earth Walls, 22 meters high.

"RECO WENT THE EXTRA MILE TO PROVIDE TECHNICAL INFORMATION, DESIGN AND EXPEDITE THE DELIVERY"

The entire embankment of Highway 23 over Holdich Creek had been destroyed following what was believed to be clogging due to sedimentation of a 5 meter rock tunnel. The location is just 35 km north of Revelstoke in one of the most rugged areas of Canada's Selkirk Mountains. The water and debris impounded behind the embankment rose 30 meters to within 2 meters below the road level. The Ministry created an emergency spillway across the highway and the subsequent wash out of the embankment. Since this highway was the only road leading into this part of British Columbia, including the Mica Creek hydro electric dam, a temporary ferry across Lake Revelstoke was used while the highway was closed. Since the heavy winter snowfalls and freeze up of the lake would eliminate the ferry access,

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We have a new web site address. Please visit www.ReinforcedEarth.com for complete product information and project references.

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the race was on to restore the Highway prior to the onset of winter.

A temporary detour with corrugated steel pipe was originally considered since there was little time to design, fabricate and construct a permanent structure. Examination of many bridge and culvert options by the consultants SNC-Lavalin indicated that a TechSpan permanent solution would be possible to achieve before winter freeze-up thus eliminating the extra cost of a detour and traffic interruption needed to reconstruct a permanent solution the following year.

The ability of Reinforced Earth Walls to be economically constructed to heights greater than 20 meters enabled the length of arch and the total embankment fills to be minimized, both of which saved valuable time.

"THIS WAS VERY MUCH A TEAM EFFORT AND RECO WAS A KEEN TEAM PLAYER"

The "day-labour" construction crew of local workers hired by the Ministry was challenged by heavy rains and near freezing temperatures for most of the construction. Wall erection was carried out both day and night with full time site assistance provide by Reco staff. The TechSpan was erected in only two days on October 19 and 20, 1999 and the M.S.E. walls were constructed in 30 days. The Highway was reopened on December 1, 1999.

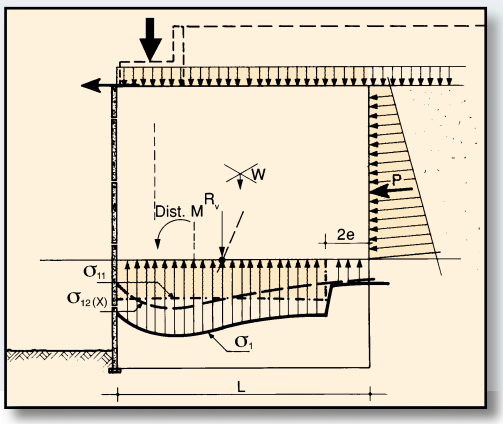
Dean Handley, Project Manager for MoTH had this to say about the use of Reinforced Earth on the project. ***"RECO went the extra mile to provide technical information, design and expedite the delivery of the Tech Span and the M.S.E. wall components. This was carried out with very tight timelines and of course the onset of winter was always a factor. This was very much a team effort and RECO was a keen team player. A tremendous effort by all saw the re-opening of the highway in four and a half months and before the heavy winter snows came."***

Client: Ministry of Transportation and Highways of British Columbia (MoTH)
Consultant: SNC-Lavalin
Geotechnical Engineer: EBA Engineering Consultants Ltd.
Supplier/Designer of Arch & Retaining Walls: Reinforced Earth Company Ltd.
RECO's Precast SubSupplier: Con-Force Structures Limited

FEATURED PRODUCT "REINFORCED EARTH ABUTMENT WALLS"

Reinforced Earth® walls are often used for the direct support of bridge superstructures and Reinforced Earth lends itself very well to this application due to it's high load carrying capabilities, flexibility and resistance to seismic forces. Precise design methods have been verified through Finite Element Studies and monitoring of full scale structures.

Although the general principals are the same as with a Reinforced Earth retaining wall, a Reinforced Earth abutment wall must account for the vertical and horizontal loads imposed on it through the concrete footing cast under the girders. Stress in the structure at any level of soil reinforcement is determined by superimposing the stress due to the retaining wall function with the diffused stress of the bridge loads as shown in the adjacent diagram. The basic equation for the total vertical stress is sigma 1 = sigma 11(retaining function stress) + sigma 12(diffused bridge stress)



MASSIVE ABUTMENTS CONSTRUCTED OF ROCK FILL AND GALVANIZED STEEL

When quality mine material is discovered beneath an existing highway, it's time to move the highway. This was the case in the desert Southwest. The steep mountain grades made it necessary for the newly located highway to cross a deep ravine atop a two span continuous bridge supported on very high bridge abutments made of Reinforced Earth® and a center pier constructed of reinforced concrete.

A unique combination of Reinforced Earth wall systems were used. The systems were composed of galvanized steel strips, rock fill, and both concrete and galvanized steel facing units. The bridge abutments consist of Reinforced Earth retaining walls designed to support the rock fill and concentrated loads of the bridge. (see Featured Product description opposite page) The Reinforced Earth walls total 25 meters in height and the bridge beams span 30 meters from each abutment to the center pier.

The bottom 10 meters of the two Reinforced Earth structures were constructed with 180mm thick precast concrete facing panels and galvanized steel strip earth reinforcements. The concrete panels provide a hard shell to protect the Reinforced Earth structures from vehicular impact. The upper 15 meters of the two structures are constructed of Terratrel™, a wire faced Reinforced Earth wall system.

The unique combination of two Reinforced Earth wall systems required special design considerations. The structures were designed for (1) extremely high loads due to the 25 meters wall height, (2) application of significant bridge loads atop the Reinforced Earth volume, (3) set back of the bridge seats in relation to the Terratrel wire facing, (4) interfacing of the wire facing with the precast panels 10 meters above the ground, and (5) design of the structures for potential earthquake loads.

The Reinforced Earth Company provided a complete design submittal package, supplied all of the wall system materials for construction, and provided onsite technical assistance to the owner during construction of the walls.

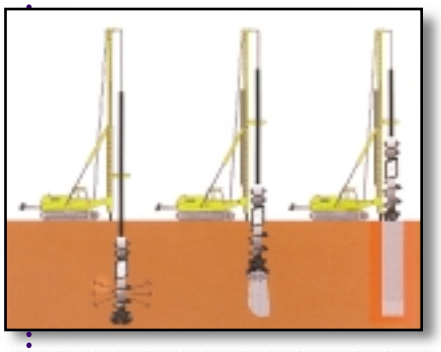
The use of Reinforced Earth technology allowed the economical construction of a roadway bridge more than 25 meters above the haul road for the mine. The completed structure demonstrates the commitment of The Reinforced Earth Company to provide comprehensive design services and to supply quality materials and construction advice in a timely manner. The Reinforced Earth Company provided a cost effective solution to the Owner's problem, on schedule and within the Owner's budget.

INTERNATIONAL CORNER

MENARD™
SOIL IMPROVEMENT SPECIALISTS

The Reinforced Earth Company is proud to offer the expertise of the Menard ™ Soil Improvement Specialists within the parent group of companies. Utilizing state of the art finite element analysis combined with several decades of experience, the optimum improvement technique is selected for the specifics of each application.

Pre and post improvement evaluations are typically performed using the Menard pressure meter, cone penetration and standard penetration tests. Menard leads the industry with the introduction of three new soil improvement methods, Controlled Modulus Column, Dynamic Replacement and Menard Vacuum Consolidation.



Controlled Modulus Column.

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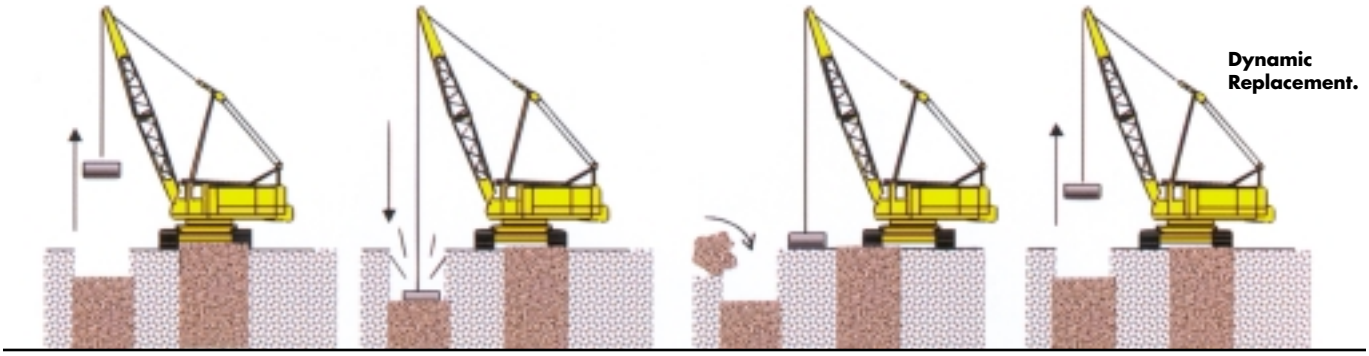

Dynamic Replacement.

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