Project Title	*Agmt./Task No.*	*Item No.*	*Agency Bgt. No.*
SPR-3(072) Strength and Deformation of Mechanically Stabilized Earth (MSE) Walls at Working Loads and Failure	**SPR-3(072)**		
Research Agency	*Start Date*	*Estimated Completion*	*Revised Completion*
Royal Military College of Canada	**12/1/99**	**04/30/04**	**12/31/10**
Principal Investigator(s)	*Technical Contact*		
Richard Bathurst	**Tony Allen (360) 709-5450**		
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Funding Source	*Schedule Status*		
WA, NY, ID, CA, WY, ND, MN, OR, AZ, AK	☐ On schedule ☐ Ahead of schedule ☒ On revised schedule ☐ Behind schedule		
Research Area			
Geotechnical			

Original Estimated Cost	*Revised Cost*	*% Funds Expended*	*% Work Completed*
$360,104	**$690,000**	**89%**	**91%**

Objective

Develop a design procedure for the internal stability of MSE walls, especially those reinforced with geosynthetics.

Project Progress:

1. The following papers were accepted in peer-reviewed journals and are now in press:

Bathurst, R.J., Huang, B. and Allen, T.M. 2010. Load and resistance factor design (LRFD) calibration for steel grid reinforced soil walls, *Georisk* (in press)

Miyata, Y., Bathurst, R.J., Konami, T. and Dobashi, K. 2010. Influence of transient flooding on multi-anchor walls, *Soils and Foundations*, Vol. 50, No. 3 (June) (in press)

Huang, B., Bathurst, R.J., Hatami, K. and Allen, T.M. 2010. Influence of toe restraint on reinforced soil segmental walls, *Canadian Geotechnical Journal* (in press)

2. The following papers were published:

Bathurst, R.J. and Huang, B. 2010. A geosynthetic modular block connection creep test apparatus, methodology and interpretation, *ASTM Geotechnical Testing Journal*, Vol. 33, No. 2 (online).

Huang, B., Bathurst, R.J. and Hatami, K. 2009. Numerical study of reinforced soil segmental walls using three different constitutive soil models, *ASCE Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 135, No. 10, pp. 1486-1498.

Huang, B. and Bathurst, R.J. 2009. Evaluation of soil-geogrid pullout models using a statistical approach, *ASTM Geotechnical Testing Journal*, Vol. 32, No. 6 (online)

3. The following papers were submitted to journals for publication:

Bathurst, R.J., Huang, B. and Allen, T.M. Interpretation of installation damage testing for reliability-based analysis and LRFD calibration, *Geotextiles and Geomembranes*

Miyata, Y., Bathurst, R.J. and Konami, T. Evaluation of two anchor plate capacity models for MAW systems, *Soils and Foundations*

Miyata, Y. and Bathurst, R.J. Measured and predicted loads in steel strip reinforced soil walls in Japan, *Soils and Foundations*

Bathurst, R.J., Miyata, Y. and Konami, T. Limit states design calibration for internal stability of multi-anchor walls, *Soils and Foundations*

4. The following keynote paper was prepared and submitted for presentation at Earth Retention Conference 3 (ER2010) in Bellevue, Washington, 1-4 August 2010:

Bathurst, R.J., Miyata, Y. and Allen, T. Facing Displacements in Geosynthetic Reinforced Soil Walls, 18 p.

5. The following additional papers were completed in full and publication-ready as part of the PhD thesis of Dr. Bing Huang. These papers will be submitted in sequence to peer-reviewed journals:

Huang, B., Bathurst, R.J. and Allen, T.M. Interpretation of laboratory creep testing for reliability-based analysis and load and resistance factor design (LRFD) calibration

Huang, B., Bathurst, R.J. and Allen, T.M. Load and resistance factor design (LRFD) calibration for geogrid pullout limit state using the AASHTO Simplified Method

Bathurst, R.J., Huang, B. and Allen, T.M. Load and resistance factor design (LRFD) calibration for rupture limit state using the AASHTO Simplified Method

Huang, B., Bathurst, R.J. and Allen, T.M. Load and resistance factor design (LRFD) calibration for geosynthetic rupture and pullout limit states using the K-stiffness Method

6. The principal investigator spent two months on a Japanese government fellowship gathering case study data from Japanese sources.

7. More than 12 case histories of walls with good settlement data were collected while in Japan in collaboration with Dr. Y. Miyata. These case studies include steel reinforced soil walls and geosynthetic reinforced soil walls. These data are being used to compare the accuracy of the current Simplified Method and K-stiffness Method with respect to measured reinforcement loads for situations in which significant foundation settlement occurs.

8. R.J. Bathurst, T.M. Allen, A. Nernheim and Y. Miyata won the International Geosynthetics Society (IGS) Gold Medal for their technical contributions to the advancement of reinforced soil wall design using the K-stiffness Method. This award confirms the international acclaim that our research has earned from the international community.

9. Wall 14 was constructed, loaded and unloaded.

New Period Proposed Activity:

1. Wall 14 (Phase 5) will be subjected to backfill surface water infiltration.

2. Continue with large-scale transparent soil pullout box testing.

3. Continue with development of numerical database that will be used to fill in data gaps for further refinement of the K-stiffness Method.

4. A paper on LRFD calibration of steel reinforced soil walls using the AASHTO Simplified Method will be resubmitted to the *ASCE Journal of Geotechnical and Geoenvironmental Engineering* at the invitation of the editor.