



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

June 21, 2011

Scott Vollmer, P.E.
Keystone Retaining Wall Systems, Inc.
7312 Still Pond Court
Raleigh, NC 27613

Subject: Approval of Keystone's KeySystem I Retaining Wall System

Dear Mr. Vollmer:

The Geotechnical Engineering Unit (GEU) has reviewed the renewal submittal dated February 25, 2011 for Keystone's KeySystem I Retaining Wall System in accordance with the "NCDOT Policy for Mechanically Stabilized Earth Retaining Walls" and the GEU Standard Mechanically Stabilized Earth (MSE) Retaining Walls Provision. In addition to the February 25th submittal, several subsequent revised design calculations were received. Based on this information, Keystone's KeySystem I system is approved for use on North Carolina Department of Transportation (NCDOT) projects in accordance with the MSE wall policy and standard provision. This policy and provision may be obtained from:

<http://www.ncdot.org/doh/preconstruct/highway/geotech/msewalls/>

For your reference, the approved steel reinforcements and corresponding design parameters to be used for future NCDOT MSE wall design submittals are listed in the table below.

Reinforcement Designation	Fy (ksi)	b (in)	D or t (in)	Ac (in ²)	Rc 3'c/c-1.5'c/c	F*top	F*20 ft	α
A-W7.5	65	9	0.229	0.082	0.25/0.50	0.763	0.382	1
B-W11	65	9	0.294	0.136	0.25/0.50	0.735	0.368	1
C-W14	65	9	0.342	0.184	0.25/0.50	0.570	0.285	1
D-W17	65	9	0.385	0.232	0.25/0.50	0.321	0.160	1

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT
1589 MAIL SERVICE CENTER
RALEIGH NC 27699-1589

TELEPHONE: 919-707-6850
Fax: 919-250-4237

www.ncdot.gov/doh/preconstruct/highway/geotech

LOCATION:
CENTURY CENTER COMPLEX
ENTRANCE B-2
1020 BIRCH RIDGE DRIVE
RALEIGH NC 27610

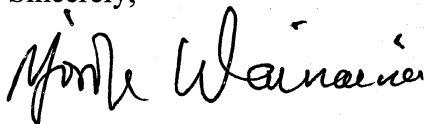
In addition, the KeyStrip reinforcement is approved for the following design parameters instead of those required for grid reinforcement in the references listed:

- Resistance Factors for Tensile Resistance of Metallic Reinforcement and Connectors (ϕ)
 - Static loading = 0.75 (Table 11.5.6-1, *AASHTO LRFD Bridge Design Specifications*)
 - Combined static/traffic barrier impact = 1.00 (Table 4-7, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume 1*, Publication No. FHWA-NHI-10-024)
- Lateral Stress Ratio (k_r/k_a) @ Top of Wall = 2.0 (Figure 11.10.6.2.1-3, *AASHTO LRFD Bridge Design Specifications*)

Also, Keystone fiberglass pins are required and defined as miscellaneous components in accordance with the GEU standard MSE wall provision.

If you have any questions, I can be reached at (919) 707-6850.

Sincerely,



Njoroge W. Wainaina
State Geotechnical Engineer

cc: K. J. Kim, Ph.D., P.E., Eastern Regional Geotechnical Manager (w/ submittal)
John Pilipchuk, L.G., P.E., Western Regional Geotechnical Manager (w/ submittal)
Mohammed Mulla, P.E., Geotechnical Contracts & Statewide Services Manager (w/ submittal)
Greg Perfetti, P.E., State Bridge Design Engineer (w/ submittal)
David Chang, P.E., Acting State Hydraulics Engineer
Chris Peoples, P.E., State Materials Engineer
Rodger Rochelle, P.E., Transportation Program Management Director
Dewayne Sykes, P.E., State Utilities Manager
Randy Garris, P.E., State Contract Officer
Mike Robinson, P.E., State Bridge Construction Engineer
Dan Holderman, P.E., State Bridge Management Engineer