



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

July 6, 2011

Jon Huyck, P.E.
Anchor Wall Systems, Inc.
5959 Baker Road
Suite 390
Minnetonka, MN 55345

Subject: Approval of Anchor Wall System's Landmark Reinforced Soil Wall System

Dear Mr. Huyck:

The Geotechnical Engineering Unit (GEU) has reviewed the renewal submittal dated February 24, 2011 for Anchor Wall System's Landmark Reinforced Soil 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 24th submittal, several subsequent revised design calculations were received. Based on this information, Anchor Wall's Landmark wall 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/>

The Landmark system requires a 3.8 degree wall batter. Depending on the clearances, right-of-way and easements available, the Landmark system may not be applicable to many MSE wall projects since NCDOT prepares plans assuming all MSE walls will be vertical with no wall batter.

For MSE walls with SRW units, *AASHTO LRFD Bridge Design Specifications* limits the vertical spacing between reinforcement layers to twice the SRW unit width or 2.7 ft, whichever is less. However, the Landmark system does not meet this requirement because the SRW units are 15" high and approximately 12" wide. Anchor Wall Systems justifies this difference from AASHTO in the *Evaluation of Anchor Wall Systems' Landmark Reinforced Soil Wall System with T.C. Mirafi's Miragrid & Miratex Geogrid Reinforcement – Final Report* by the Highway Innovative Technology Evaluation Center (HITEC) based on the use of mechanical connections. Therefore, the Landmark system will be allowed a design exception to AASHTO regarding the maximum vertical spacing between reinforcement layers. Reinforcement may be spaced vertically up to 30", i.e., every other SRW unit.

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

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

- For geogrid reinforcement with fine aggregate in the reinforced zone

Reinforcement	T _{ult} (kips/ft)	RF _{CR}	RF _D	RF _{ID}	T _{al} (kips/ft)	F*	α	ρ (degrees)	CR _{cr}	T _{ac} (kips/ft)
Miragrid 5XT	4.3	1.58	1.3	1.1	1.9	0.60	1	31.25	0.59-0.68	1.95-2.25
Miragrid 8XT	7	1.58	1.3	1.1	3.1	0.60	1	31.25	0.40-0.42	2.15-2.26
Miragrid 10XT	9.5	1.58	1.3	1.1	4.2	0.60	1	31.25	0.52-0.72	3.80-5.26

- For geogrid reinforcement with coarse aggregate in the reinforced zone

Reinforcement	T _{ult} (kips/ft)	RF _{CR}	RF _D	RF _{ID}	T _{al} (kips/ft)	F*	α	ρ (degrees)	CR _{cr}	T _{ac} (kips/ft)
Miragrid 5XT	4.3	1.58	1.3	1.25	1.7	0.52	0.8	35.11	0.59-0.68	1.95-2.25
Miragrid 8XT	7	1.58	1.3	1.25	2.7	0.52	0.8	35.11	0.40-0.42	2.15-2.26
Miragrid 10XT	9.5	1.58	1.3	1.25	3.7	0.52	0.8	35.11	0.52-0.72	3.80-5.26

Also, Landmark lock bars 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)
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