



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE  
GOVERNOR

EUGENE A. CONTI, JR.  
SECRETARY

December 13, 2010

Peter Larkin, P.E.  
Tensor International Corporation  
453 Lake Shore Drive  
Sunset Beach, NC 28468

Subject: Approval of Tensor's ARES and Mesa Retaining Wall Systems

Dear Mr. Larkin:

The Geotechnical Engineering Unit (GEU) has reviewed the renewal submittals dated September 23, 2010 for Tensor's ARES and Mesa Retaining Wall Systems 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 September 23<sup>rd</sup> submittals, an ARES panel submittal dated November 12, 2010 and several subsequent revised design calculations were received. Based on this information, Tensor's ARES and Mesa wall systems are 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 ARES system currently uses geogrid tabs cast into the back of panels instead of slots in the back of panels as submitted for the Highway Innovative Technology Evaluation Center (HITEC) report. These tabs are connected to geogrid reinforcements with a bodkin connection and a high-density polyethylene (HDPE) bar. This connection is not considered a splice and Tensor previously submitted test results and connection strength data for the connection and a material certification for the HDPE bar.

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. Since the width of a Mesa standard unit is 11", the Mesa system will be allowed a design exception to AASHTO regarding the maximum vertical spacing between reinforcement layers. Reinforcement may be spaced vertically up to 2 ft, i.e., every 3<sup>rd</sup> SRW unit.

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[www.ncdot.gov/doh/preconstruct/highway/geotech](http://www.ncdot.gov/doh/preconstruct/highway/geotech)

**LOCATION:**  
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 (Fine Aggregate)

Reinforcement	$T_{ult}$ (kips/ft)	$RF_{C\alpha}$	$RF_D$	$RF_{D, Fine}$ Aggregate	$T_{al}$ (kips/ft)	$F^* =$ $C_i * \tan\alpha$	$\alpha$	$\rho$ for Fine Aggregate (degree)	$CR_r$	$T_{ac}$ (kips/ft)
UX1400MSE	4.80	2.62	1.1	1.12	1.49	0.506 (0.405*)	1.0	28.35	0.33	1.44
UX1500MSE	7.80	2.62	1.1	1.1	2.46	0.506	1.0	28.35	0.33	2.34
UX1600MSE	9.87	2.62	1.1	1.1	3.11	0.506	1.0	28.35	0.33	2.96
UX1700MSE	11.99	2.67	1.1	1.1	3.71	0.506	1.0	28.35	0.31	3.38

\* UX1400MSE geogrid greater than 2ft below top of wall

• For geogrid reinforcement (Coarse Aggregate)

Reinforcement	$T_{ult}$ (kips/ft)	$RF_{C\alpha}$	$RF_D$	$RF_{D, Coarse}$ Aggregate	$T_{al}$ (kips/ft)	$F^* =$ $C_i * \tan\alpha$	$\alpha$	$\rho$ for Coarse Aggregate (degree)	$CR_r$	$T_{ac}$ (kips/ft)
UX1400MSE	4.80	2.62	1.1	1.25	1.33	0.525	1.0	32.0	0.33	1.44
UX1500MSE	7.80	2.62	1.1	1.25	2.16	0.525	1.0	32.0	0.33	2.34
UX1600MSE	9.87	2.62	1.1	1.25	2.74	0.525	1.0	32.0	0.33	2.96
UX1700MSE	11.99	2.67	1.1	1.25	3.33	0.525	1.0	32.0	0.31	3.38

Also, Tensar HDPE bars and Mesa standard and DOT connectors 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)  
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 Dave Henderson, P.E., State Hydraulics Engineer  
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