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Multidisciplinary Research in Transportation

Pullout Resistance of Mechanically Stabilized Earth Reinforcement in Backfills Typically Used in Texas: Volume 3, Test Reports for MSE Reinforcements in Type A (Gravelly) Backfill

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Texas Department of Transportation

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16. Abstract:

This report documents findings from a three-year research study that examined the pullout resistance of inextensible MSE reinforcements in backfills typically used in Texas. The study involved an extensive laboratory test program in which a total of 687 pullout tests were completed. These tests were conducted using a large scale pullout test system that consisted of a test box with dimensions of 12ft x 12ft x 4ft and capability to simulate overburden pressures equivalent to 40 feet of fill. Tests were conducted on ribbed strip reinforcements, welded steel grid reinforcements, and a limited number of smooth bars embedded in two types of backfill, designated as Type A (gravelly) and Type B (sandy) select backfill as per TxDOT specifications. A subset of strip and grid reinforcements in each backfill type was instrumented with strain gages to provide further insight into mechanisms that control pullout resistance. The research design evaluated pullout resistance factors for both strip and grid reinforcements for a variety of independent variables including overburden pressure, reinforcement length, skew or splay angle, grid wire size, and grid geometry including both transverse and longitudinal wire spacing. Appropriate statistical analyses were used to interpret the data within the context of published AASHTO design guidance for inextensible MSE reinforcements. This volume, Volume 3, presents pullout test reports from a total of 320 pullout tests completed on MSE reinforcements embedded in TxDOT Type A backfill, and accompanying strain gage test reports. Volume 1 summarizes the research findings, and Volume 2 presents test reports for reinforcements in Type B backfill.

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Pullout Resistance of Mechanically Stabilized Reinforcements in Backfills Typically Used in Texas

Volume 3, Test Reports for MSE Reinforcements in Type A (Gravelly) Backfill

by

Timothy D. Wood

Priyantha Jayawickrama

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Research Project Number 0-6493

Research Report Number 0-6493-1, Volume 3

Sponsored by the Texas Department of Transportation

in cooperation with the U. S. Department of Transportation Federal Highway Administration

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October 2012

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There was no invention or discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine, manufacture, design or composition of matter, or any new useful improvement thereof, or any variety of plant which is or may be patentable under the patent laws of the United States of America or any foreign country.

ENGINEERING DISCLAIMER

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TRADE NAMES AND MANUFACTURERS' NAMES

The United States Government and the State of Texas do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

ACKNOWLEDGMENT S

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Appendix N: MSE Reinforcement Pullout Test Reports: Smooth Bars in Type A Backfill

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Appendix P: MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type A Backfill

Appendix L

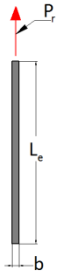
MSE Reinforcement Pullout Test Reports: Ribbed Strips in Type A Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 1:44:00 PM
Test Identification:	TS30.13-S-L8-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

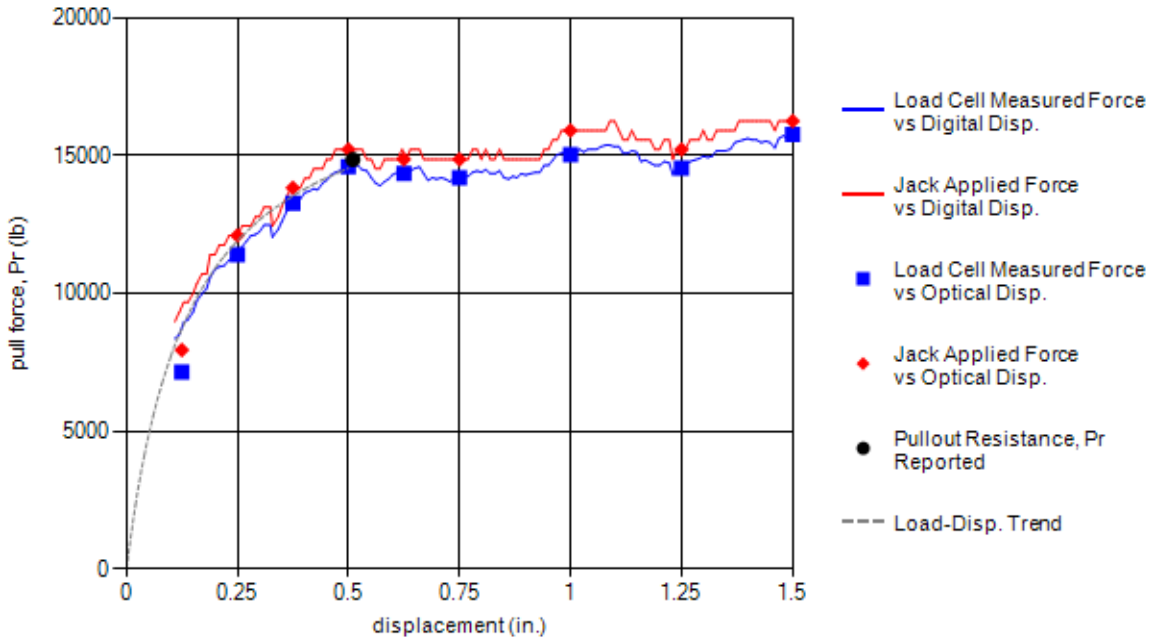
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.51	601	14849	5.00	**9.27**

Load-Displacement Curve



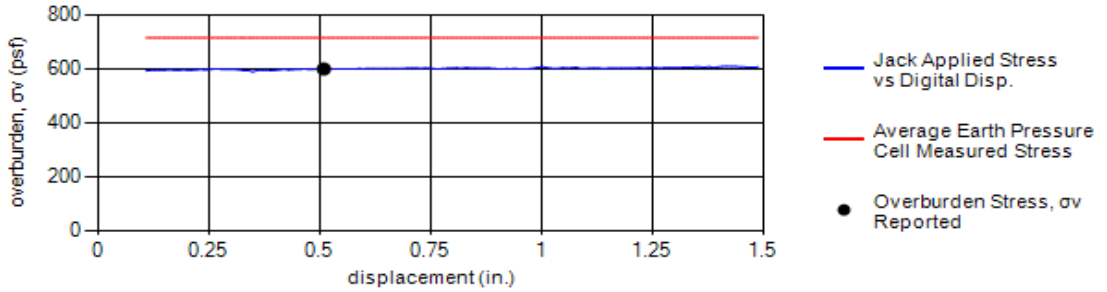
Comments

Digital displacement: pullout and elongation undifferentiated.

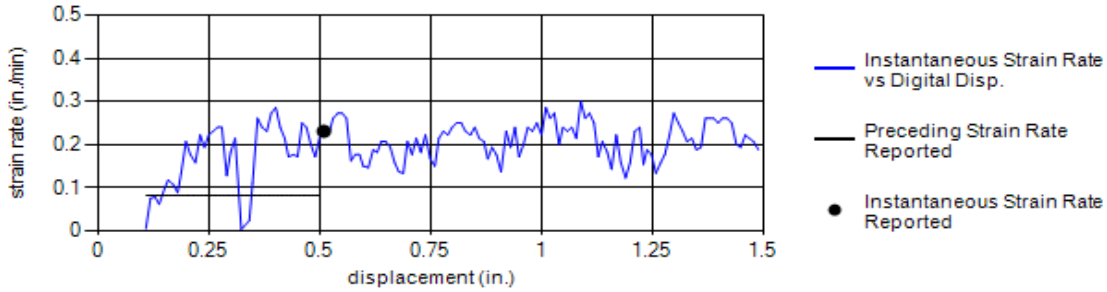
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
905	608	485	784	803	717	7.69	601



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.08	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

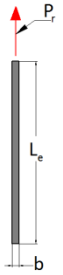
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 1:28:00 PM
Test Identification:	TS30.14-S-L8-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

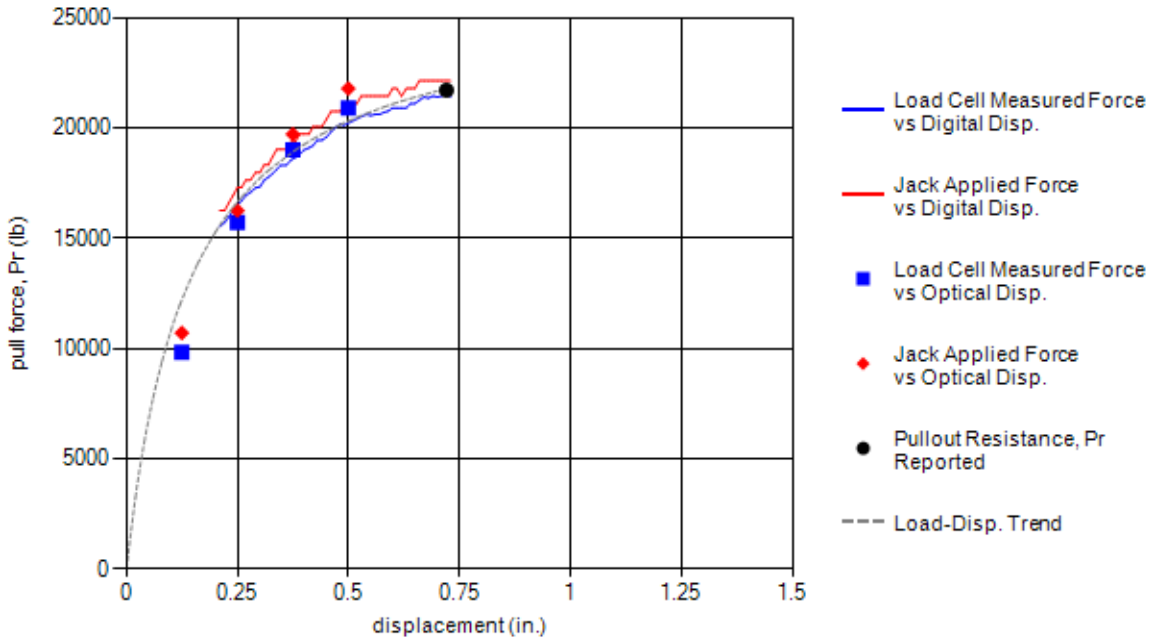
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Rupture	0.72	616	21703	5.10	**13.22**

Load-Displacement Curve



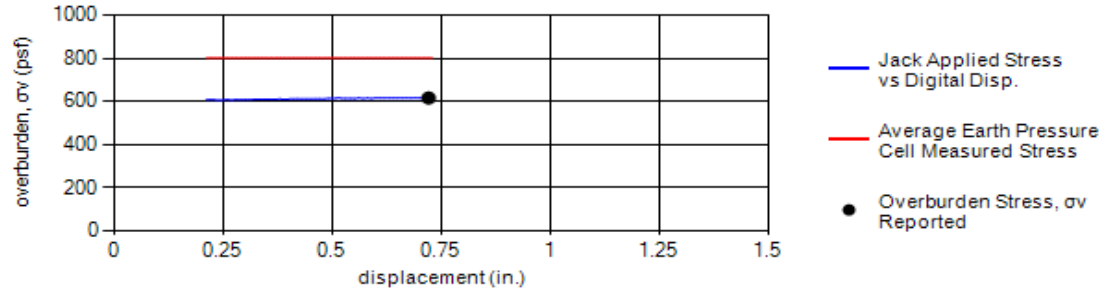
Comments

Connection rupture at 0.72in. Digital displacement: pullout and elongation undifferentiated.

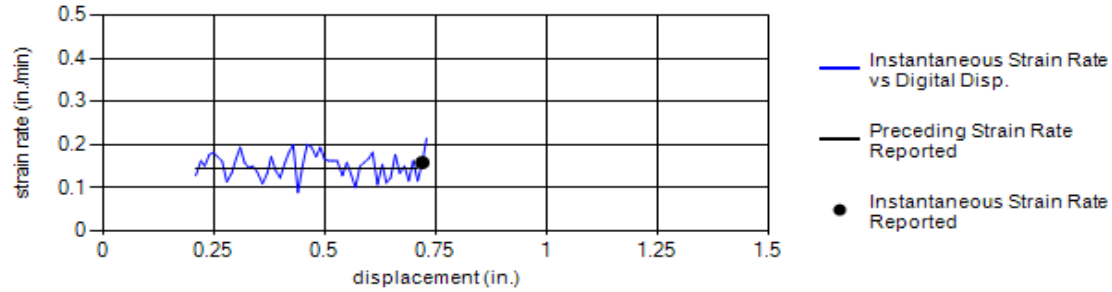
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
916	737	508	831	1018	802	7.70	615



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.14	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

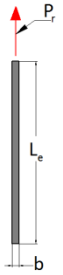
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 1:12:00 PM
Test Identification:	TS30.15-S-L8-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

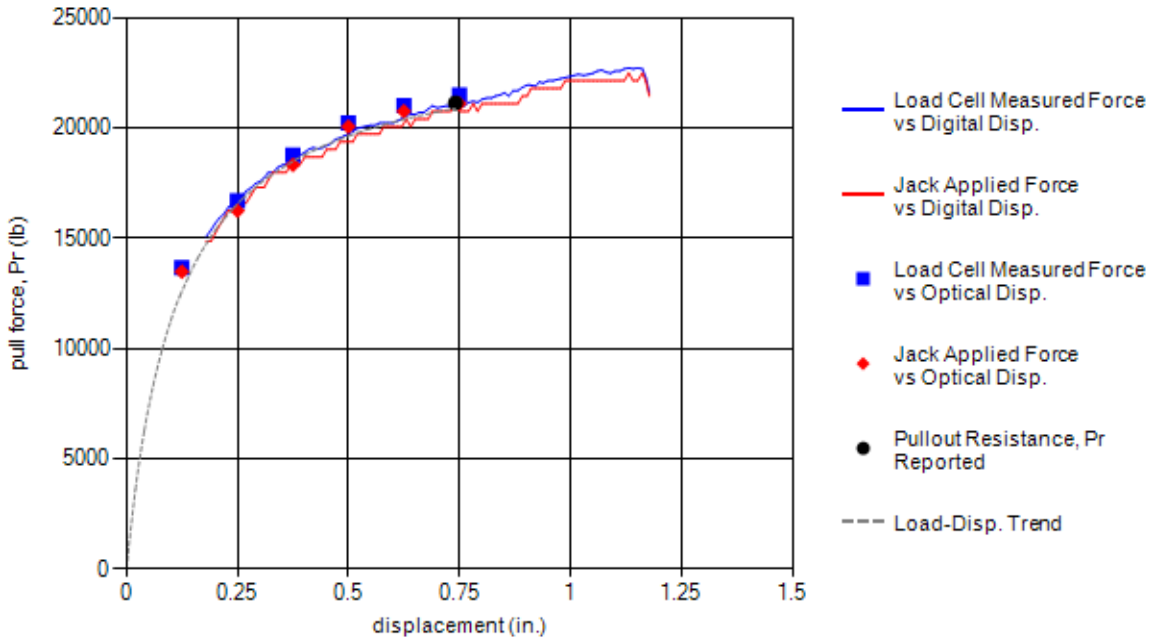
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	621	21125	5.20	**12.75**

Load-Displacement Curve



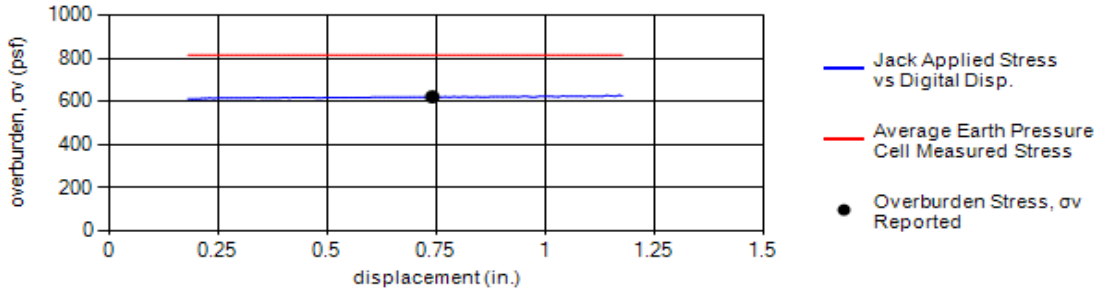
Comments

Connection rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

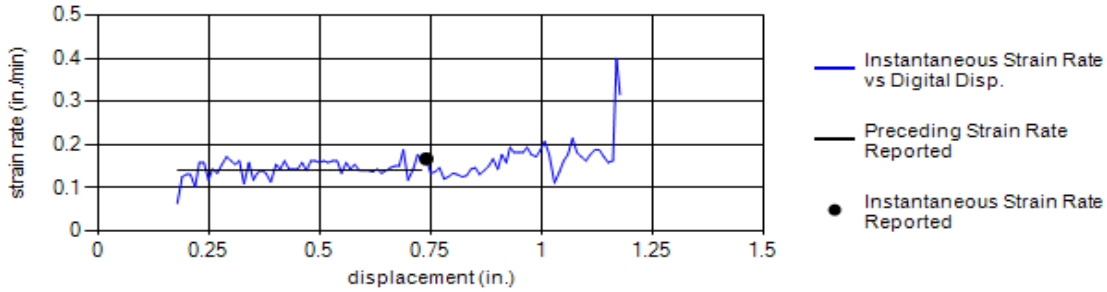
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
854	711	563	844	1100	815	7.82	621



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.14	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

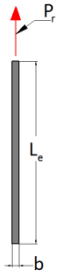
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/22/2011 6:30:00 AM
Test Identification:	TS31.13-S-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

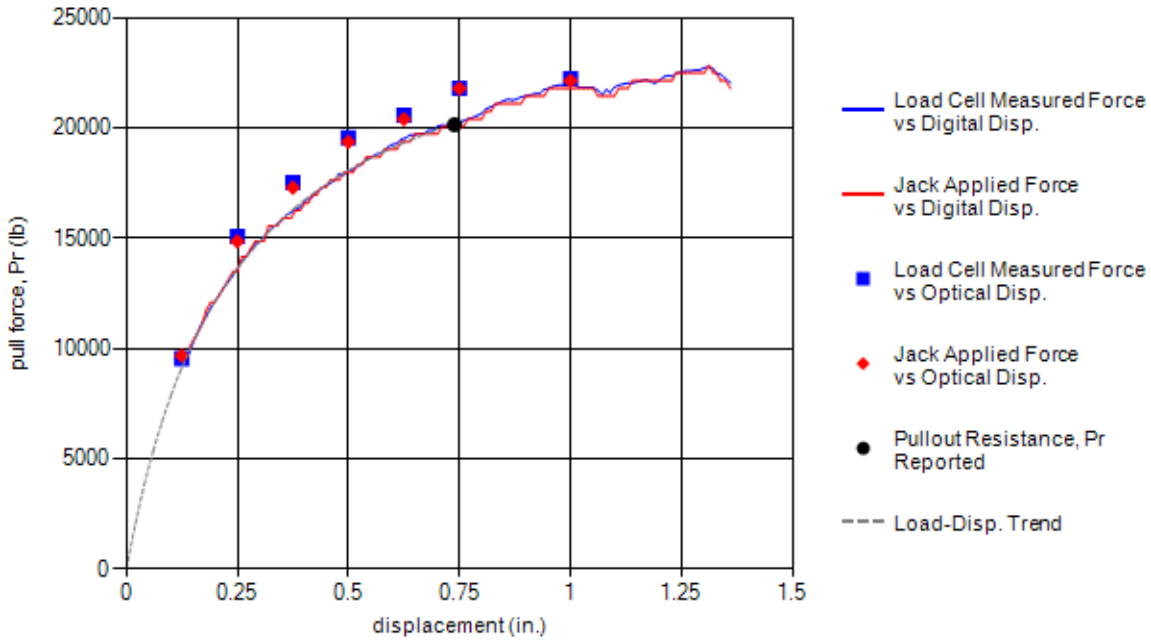
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	560	20137	4.70	**8.98**

Load-Displacement Curve



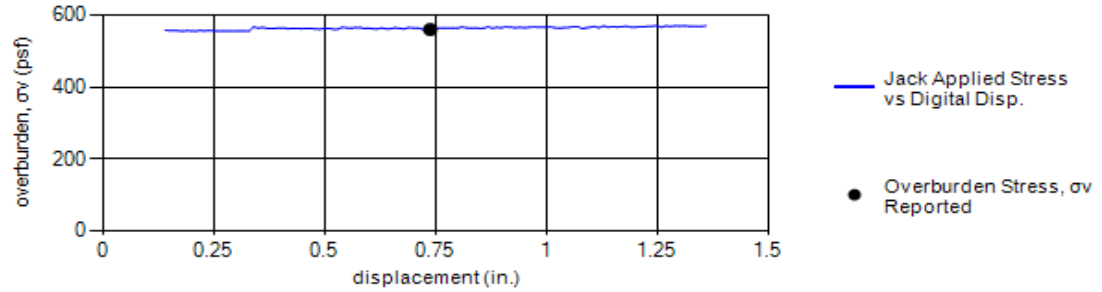
Comments

Connection rupture beyond 0.75in. displacement. No earth pressure cell data.
Digital displacement: pullout and elongation undifferentiated.

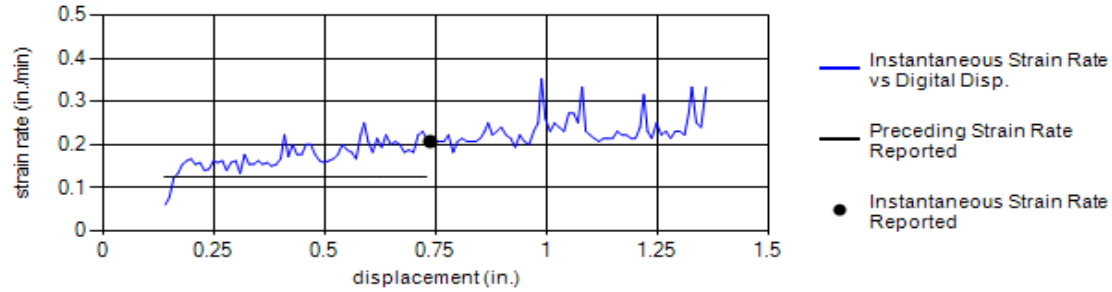
Personnel

Tested:	AS AJ DH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	8.24	560



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.13	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

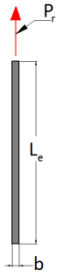
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/22/2011 6:44:00 AM
Test Identification:	TS31.14-S-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

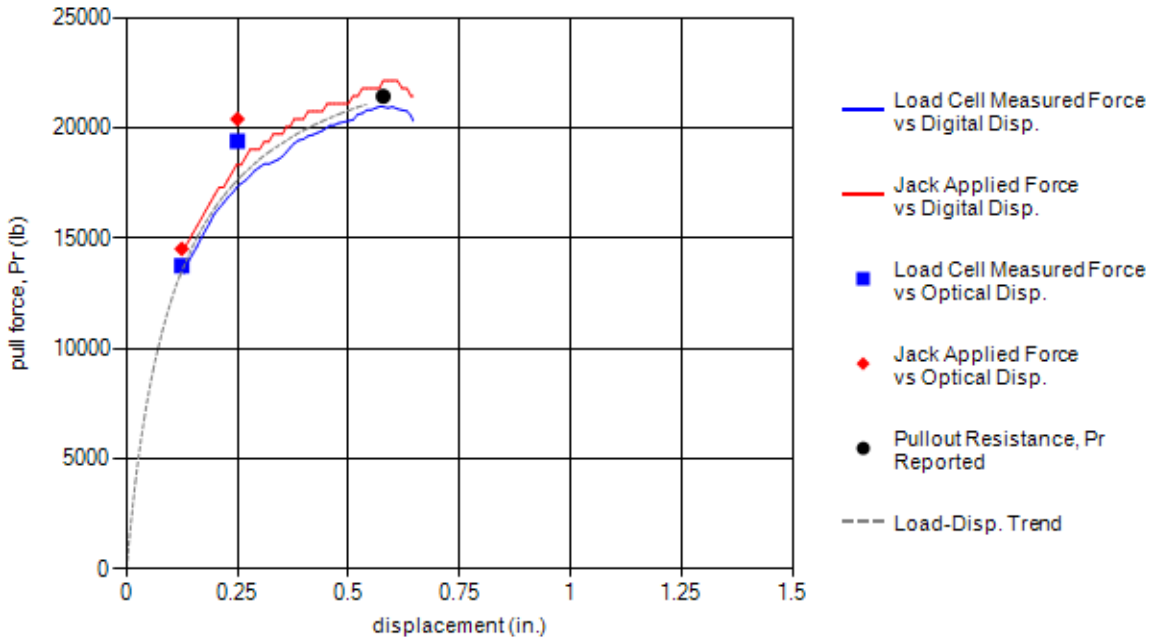
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.58	1320	21423	11.00	**4.06**

Load-Displacement Curve



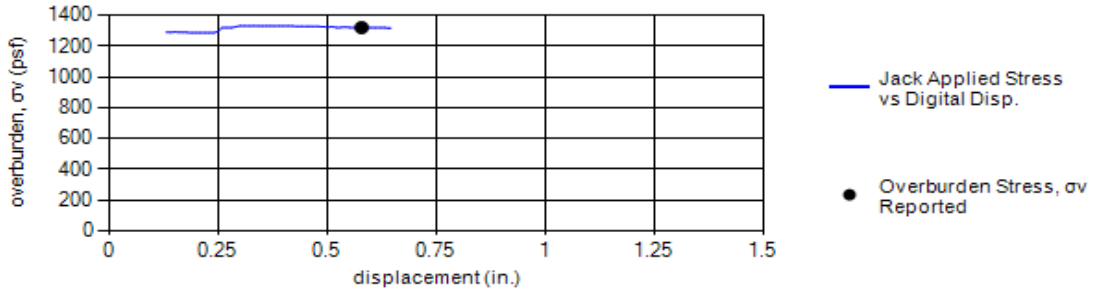
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

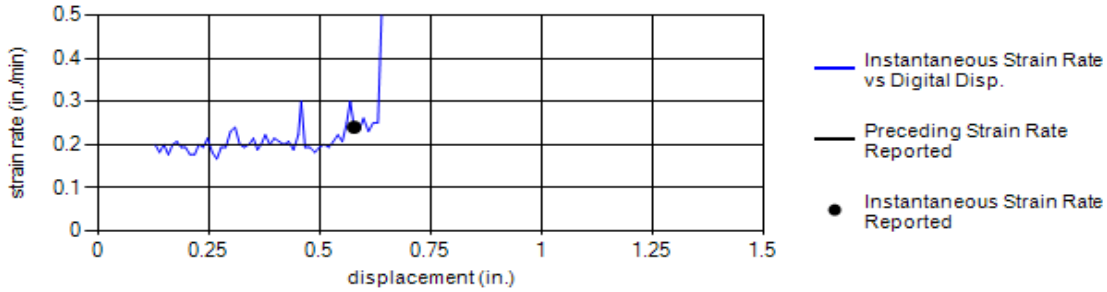
Personnel

Tested:	AS AJ DH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.50	1320



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.20	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

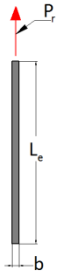
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/22/2011 7:16:00 AM
Test Identification:	TS31.15-S-L12-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

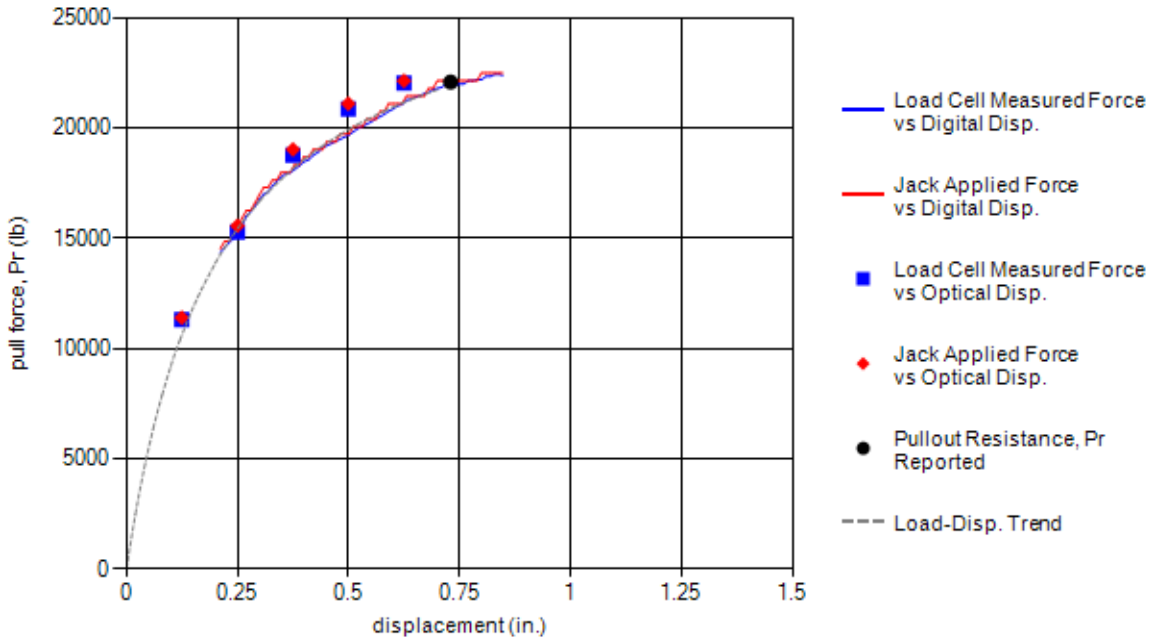
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	578	22071	4.80	**9.54**

Load-Displacement Curve



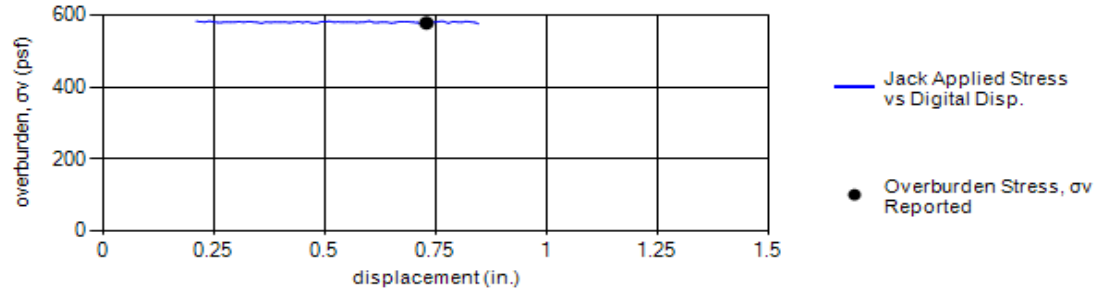
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

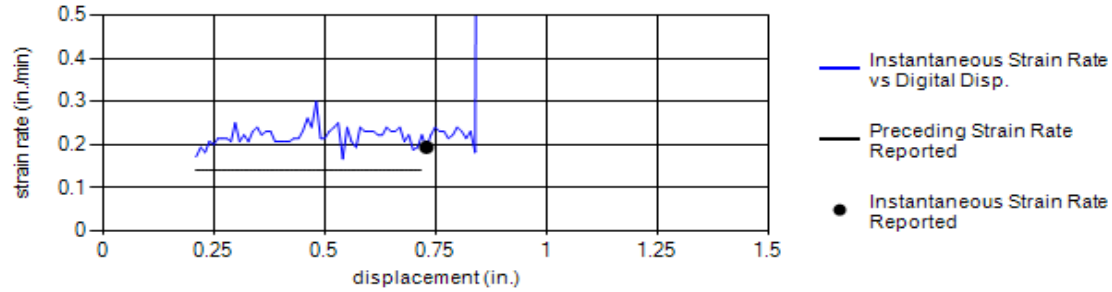
Personnel

Tested:	AS AJ DH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	8.20	578



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.14	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

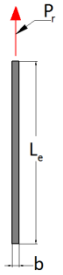
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/22/2011 7:28:00 AM
Test Identification:	TS31.16-S-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

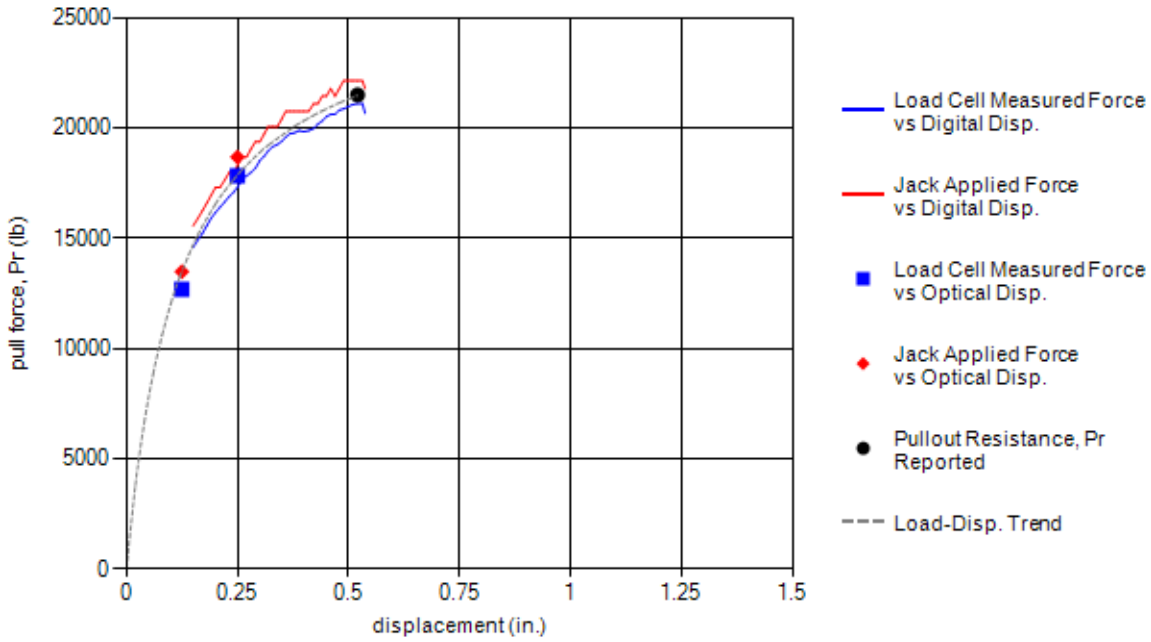
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.52	1330	21487	11.10	**4.04**

Load-Displacement Curve



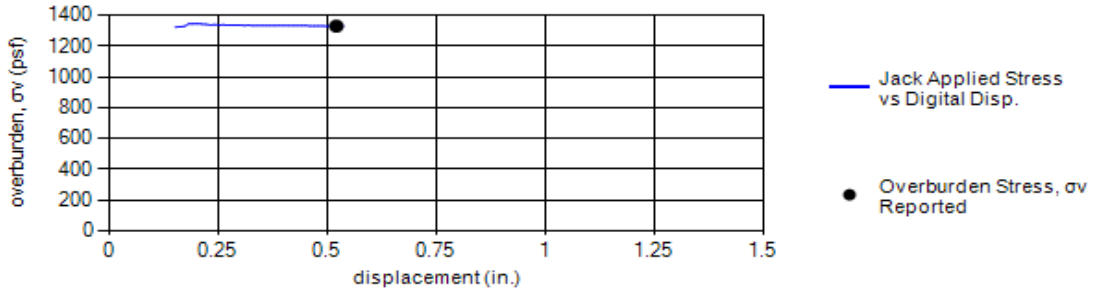
Comments

Connection rupture at 0.52in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

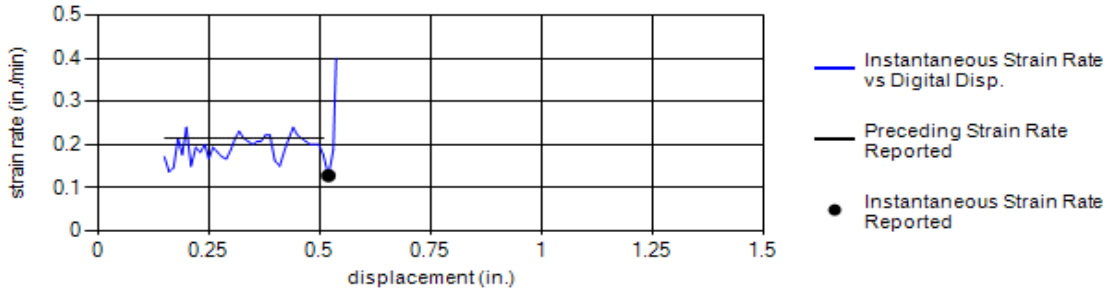
Personnel

Tested:	AS AJ DH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.57	1330



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.21	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

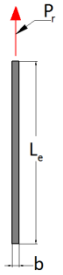
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 1:14:00 PM
Test Identification:	TS32.13-S-L6-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	6.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

Moisture Density Relationship (TEX-114-E)

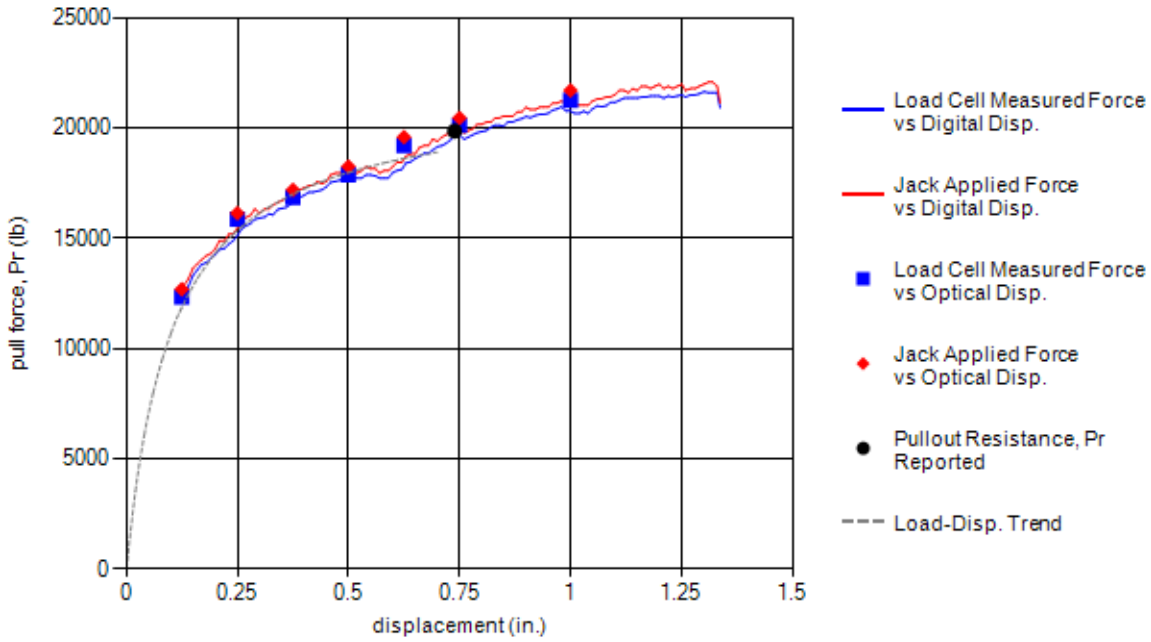
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	4991	19849	39.60	**1.99**

Load-Displacement Curve



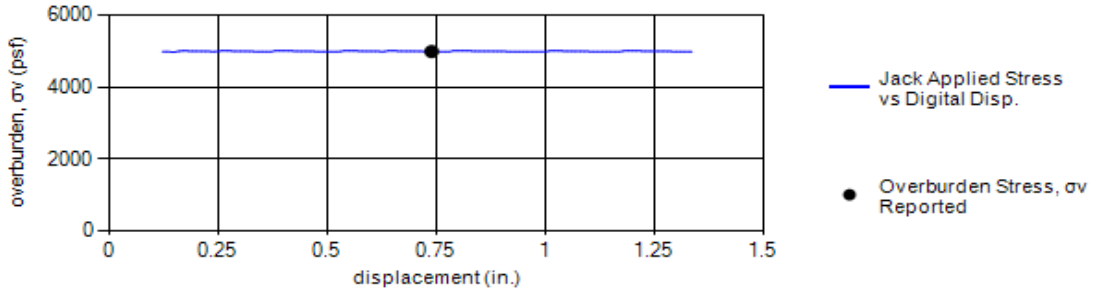
Comments

Connection rupture beyond 0.75in. displacement. No earth pressure cell data.
Digital displacement: pullout and elongation undifferentiated.

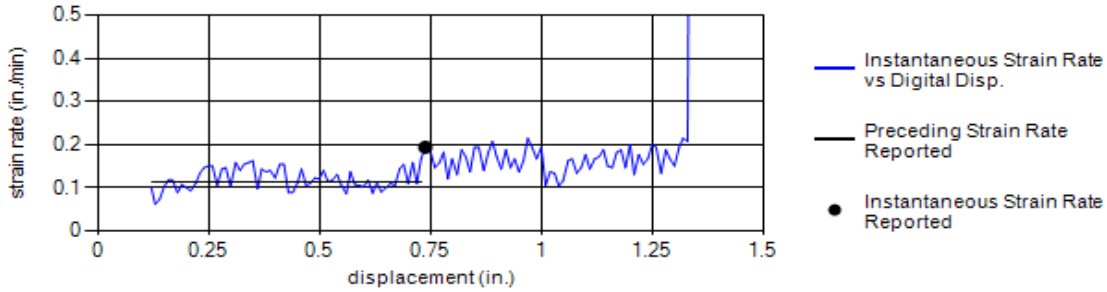
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	0.93	4991



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

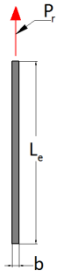
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 12:49:00 PM
Test Identification:	TS32.14-S-L8-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

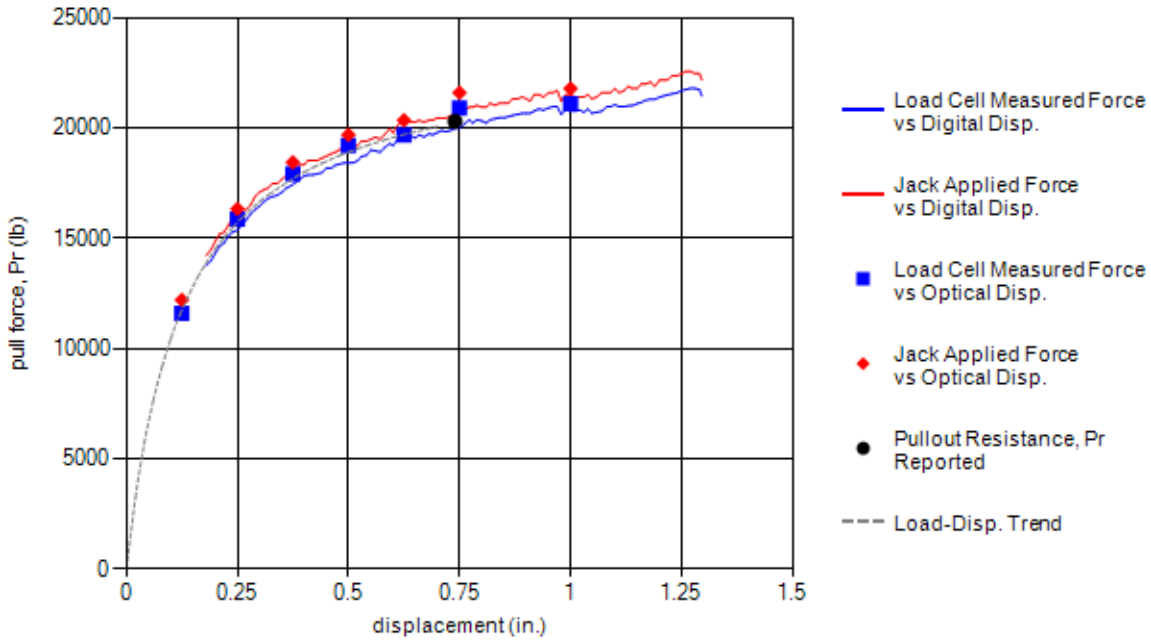
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.74	1501	20291	11.90	**5.07**

Load-Displacement Curve



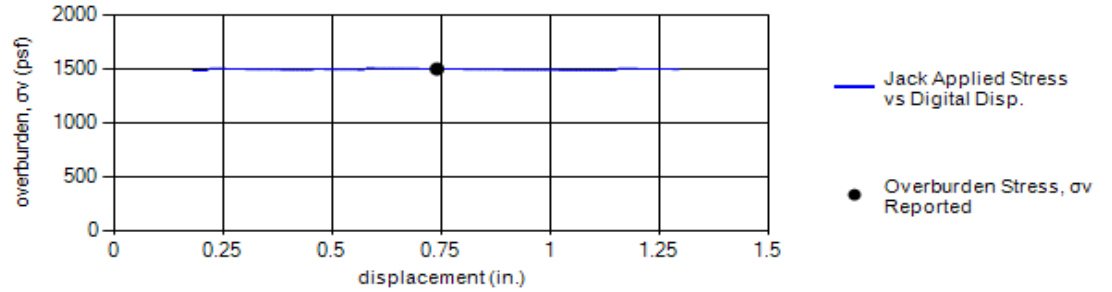
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

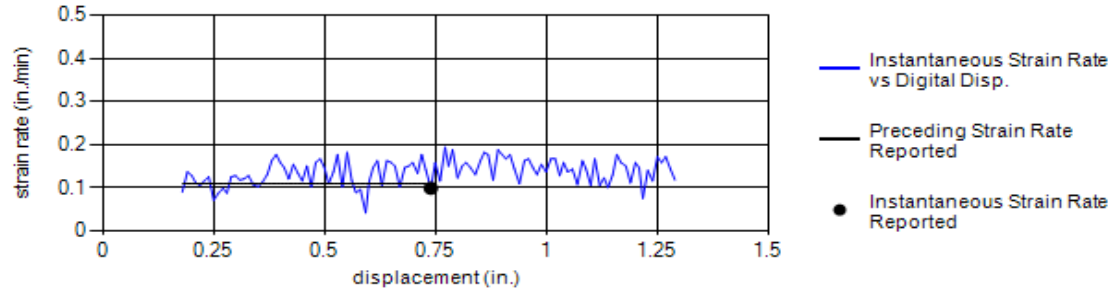
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.08	1501



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.11	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

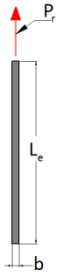
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 12:38:00 PM
Test Identification:	TS32.15-S-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

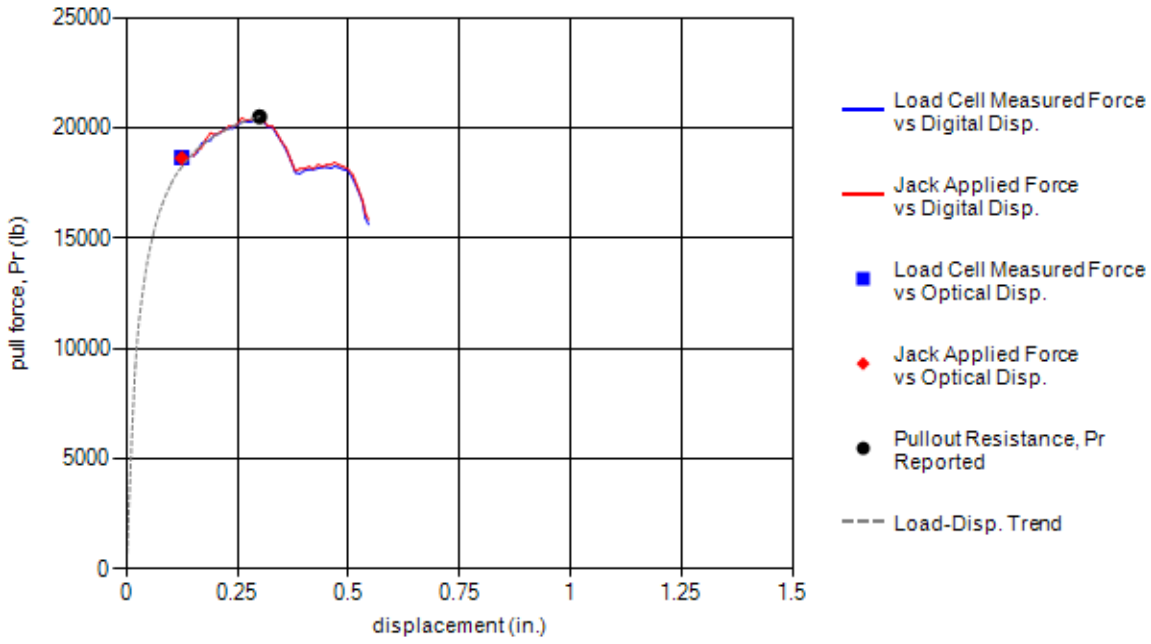
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.30	2473	20500	19.60	**2.07**

Load-Displacement Curve



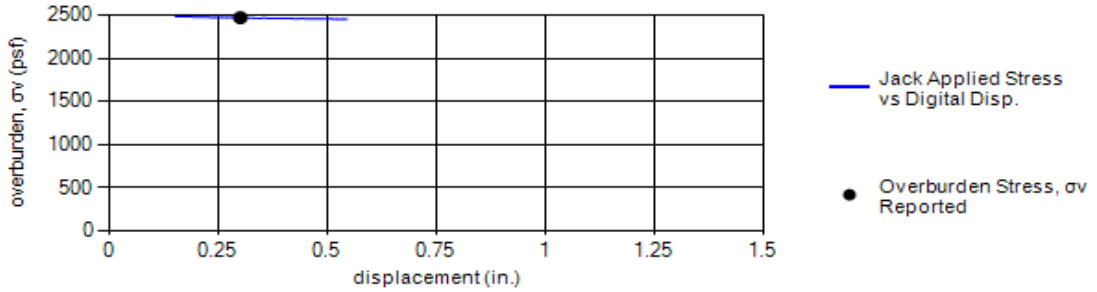
Comments

Connection rupture at 0.30in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

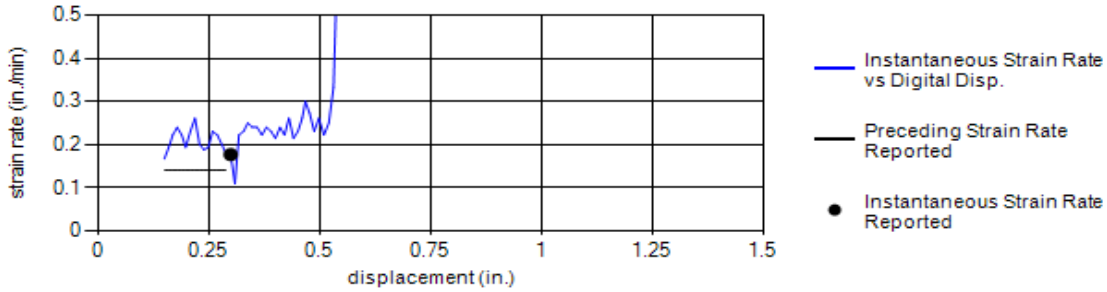
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.87	2473



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.14	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

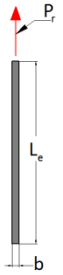
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 1:35:00 PM
Test Identification:	TS32.16-S-L6-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	6.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

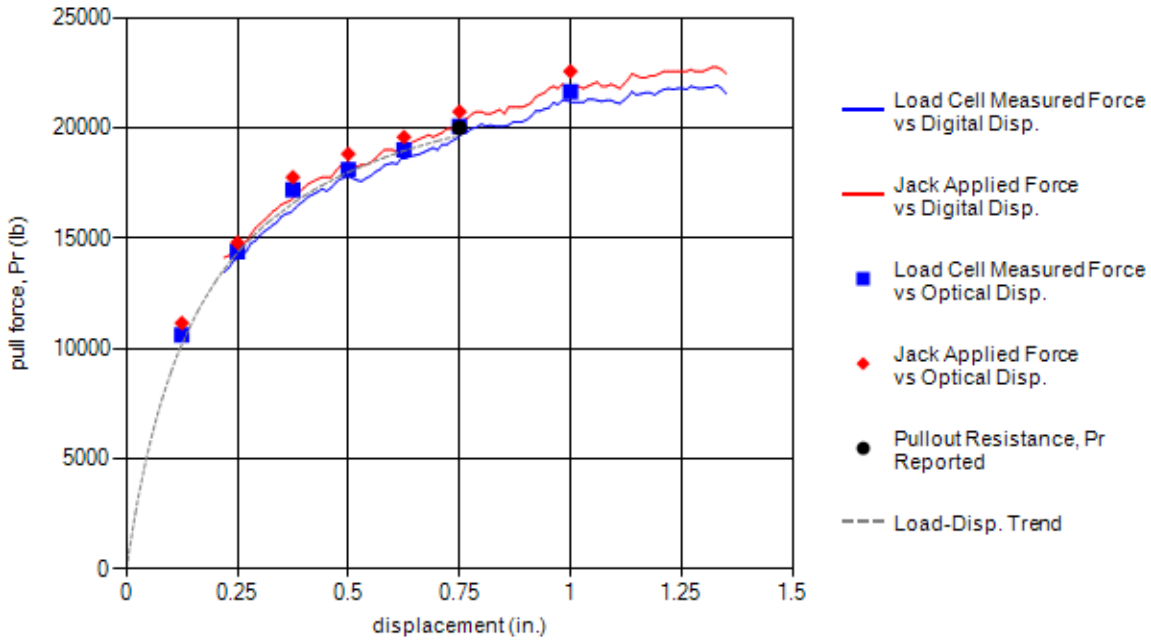
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.75	4998	19996	39.60	**2.00**

Load-Displacement Curve



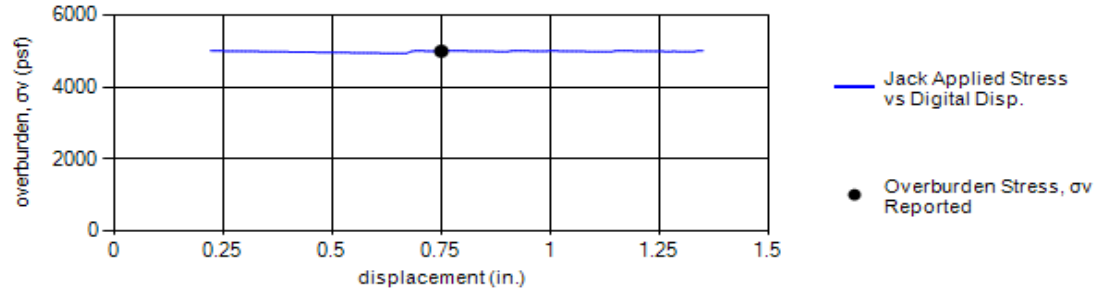
Comments

Connection rupture beyond 0.75in. displacement. No earth pressure cell data.
Digital displacement: pullout and elongation undifferentiated.

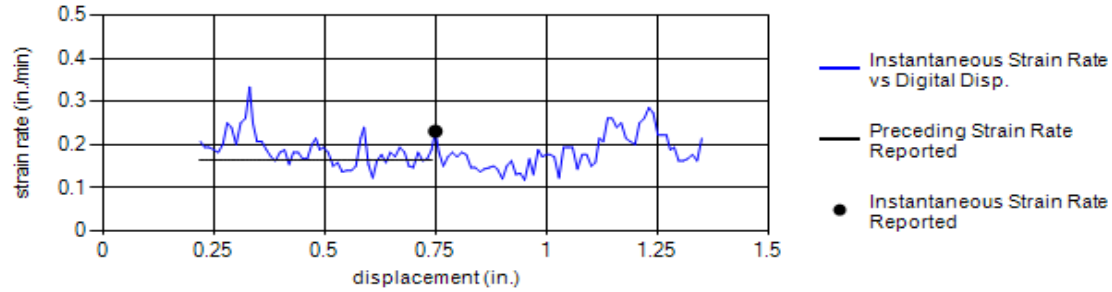
Personnel

Tested:	AS RH AJ
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	0.95	4998



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.16	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

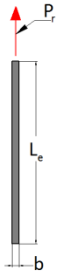
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 12:18:00 PM
Test Identification:	TS32.17-S-L8-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

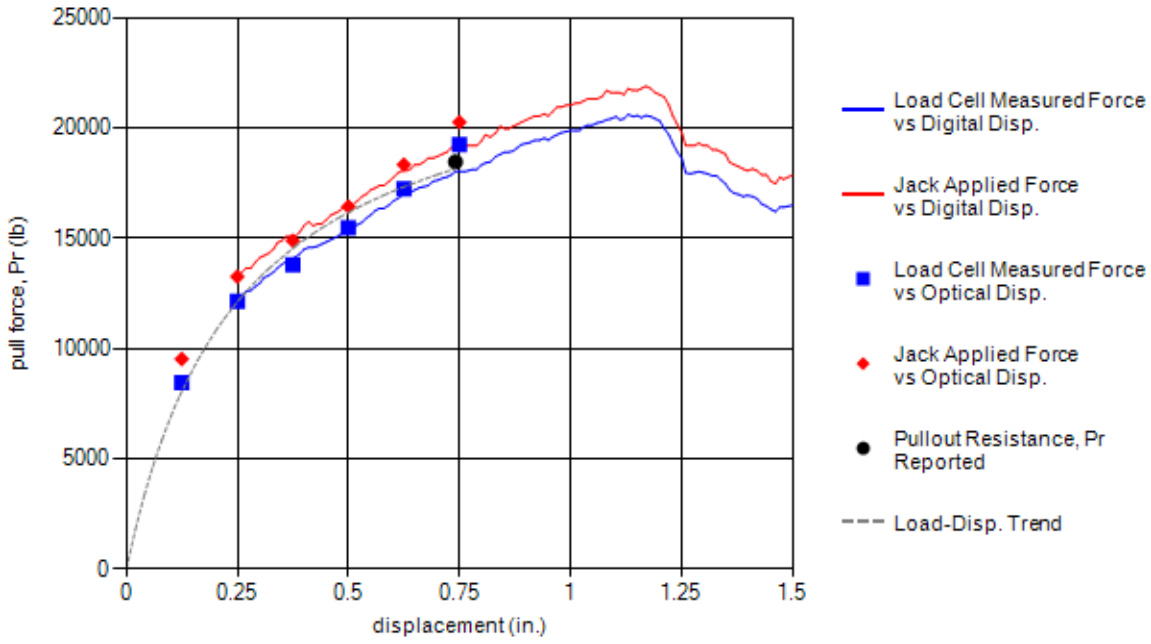
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.74	1510	18453	12.00	**4.58**

Load-Displacement Curve



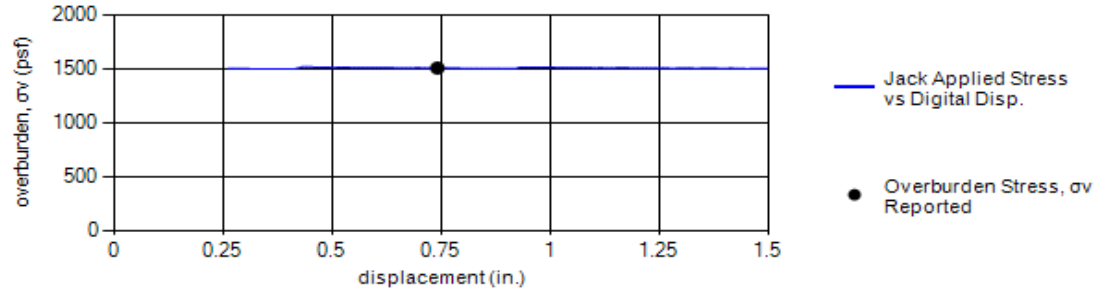
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

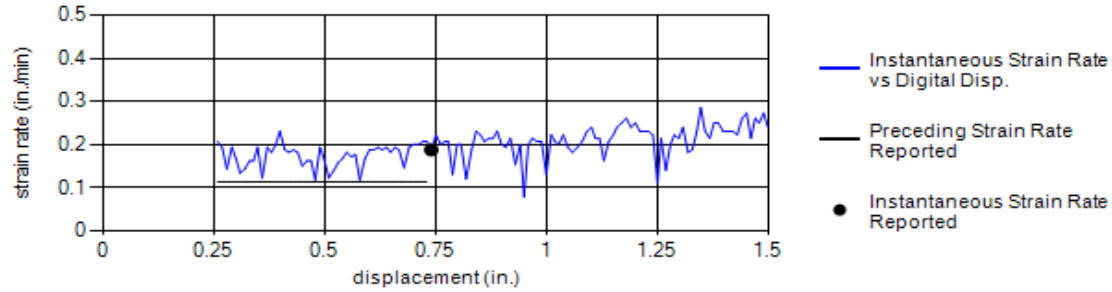
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.15	1510



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.11	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

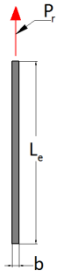
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 12:09:00 PM
Test Identification:	TS32.18-S-L12-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

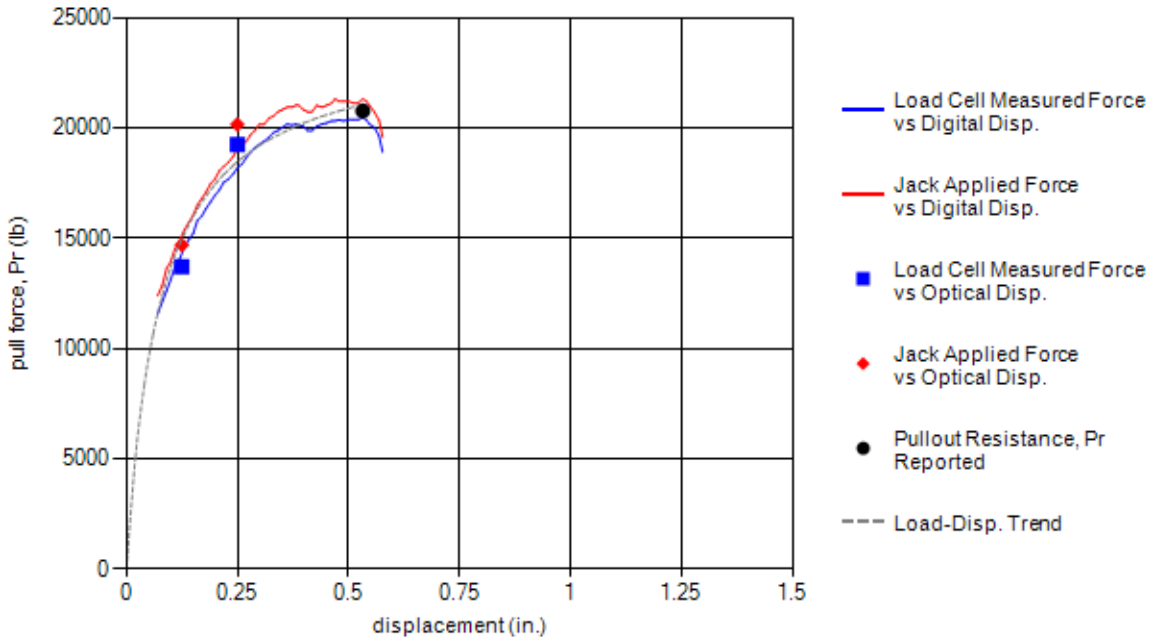
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Rupture	0.53	2495	20768	19.80	**2.08**

Load-Displacement Curve



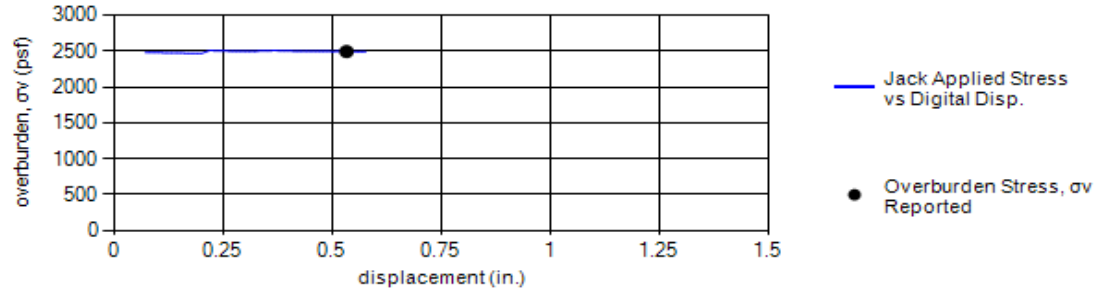
Comments

Connection rupture at 0.53in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

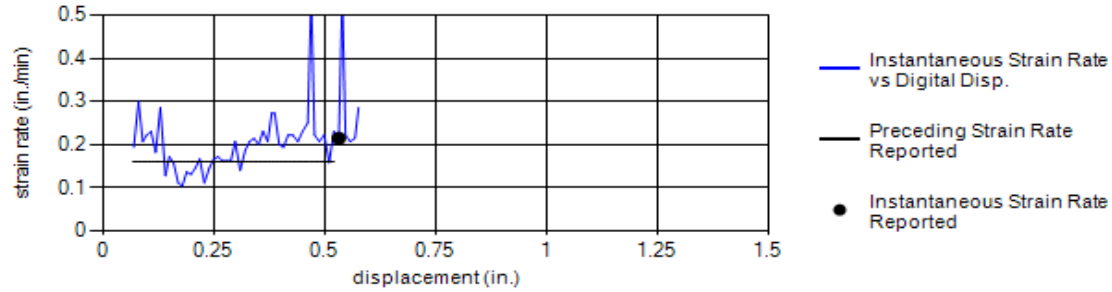
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.90	2495



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.16	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

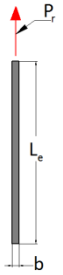
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 1:50:00 PM
Test Identification:	TS32.19-S-L6-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	6.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

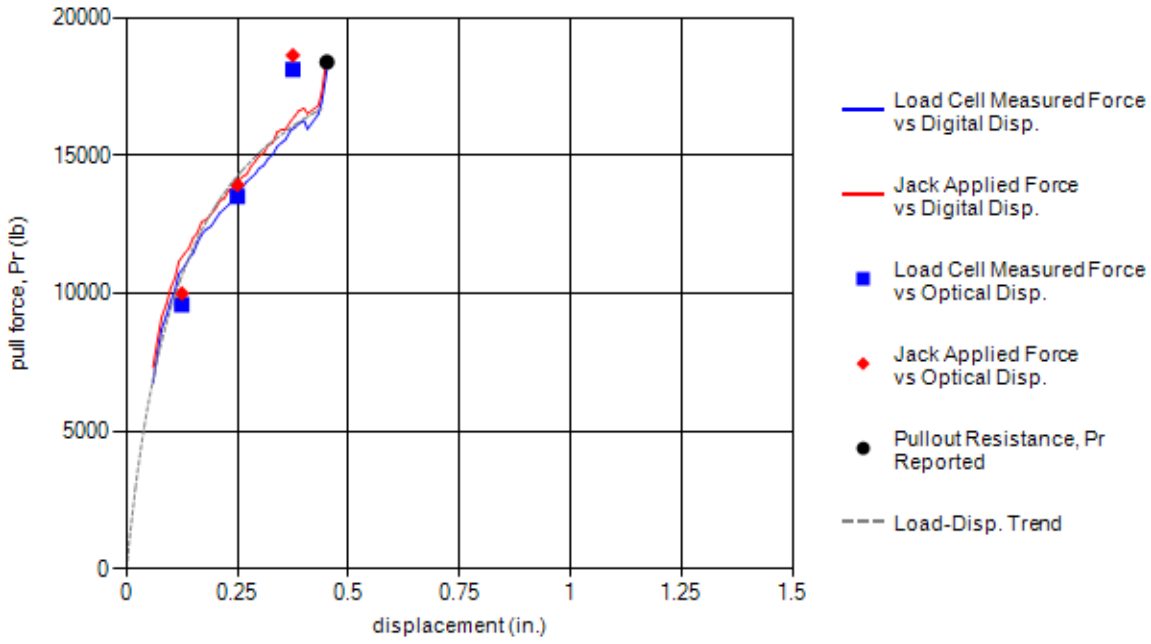
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.45	4998	18380	39.60	**1.84**

Load-Displacement Curve



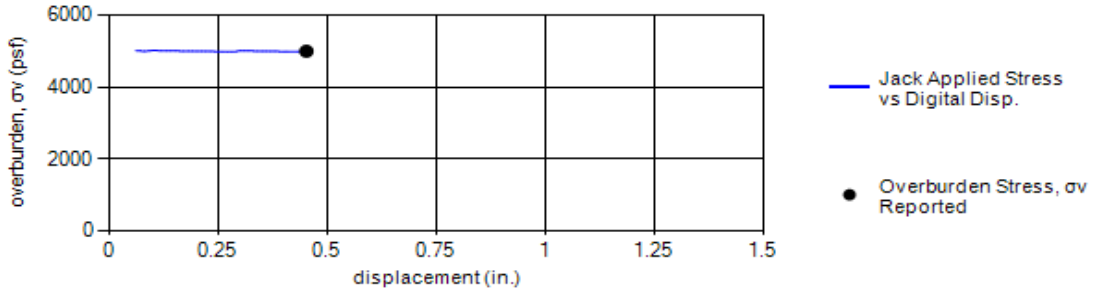
Comments

Connection rupture at 0.45in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

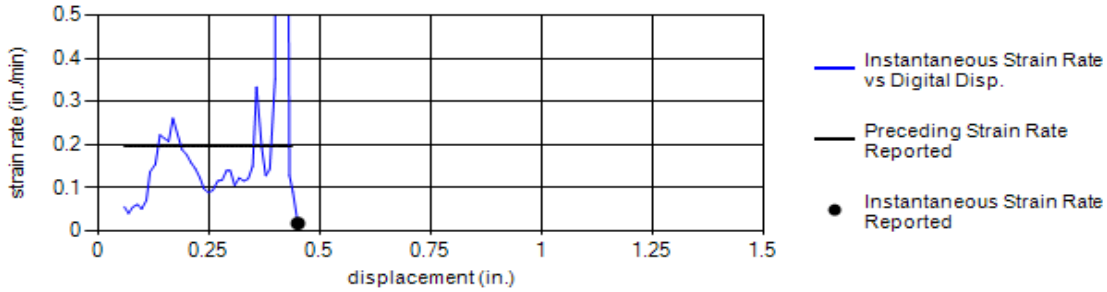
Personnel

Tested:	AS RH AJ
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	0.98	4998



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.19	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

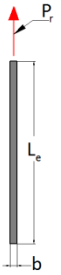
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 11:59:00 AM
Test Identification:	TS32.20-S-L8-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

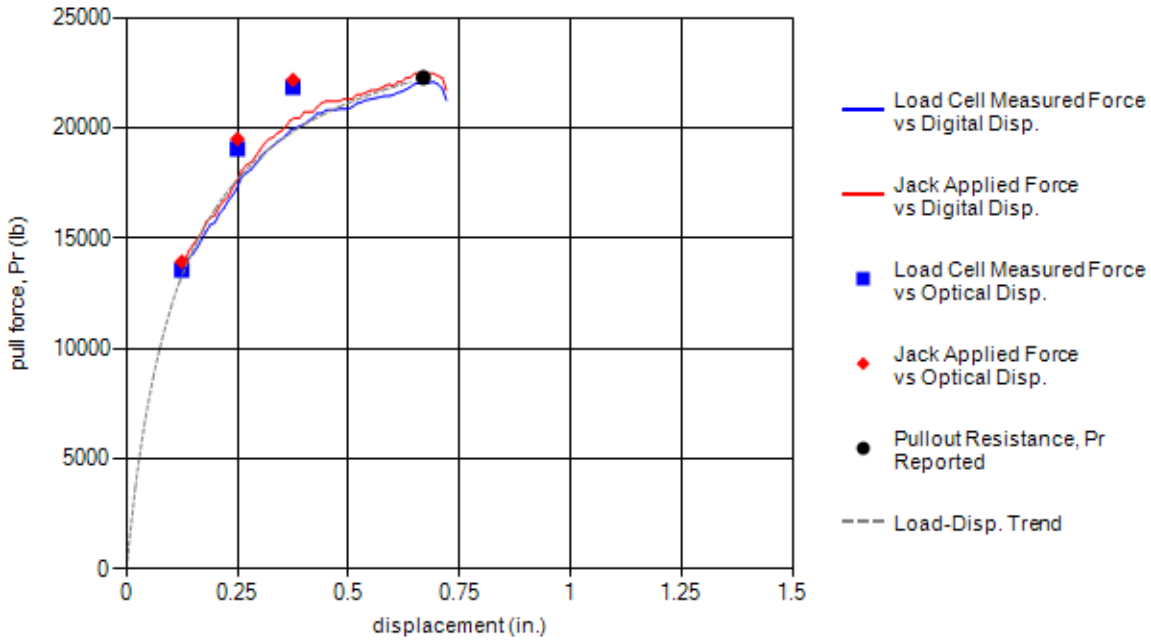
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.67	1509	22271	12.00	**5.53**

Load-Displacement Curve



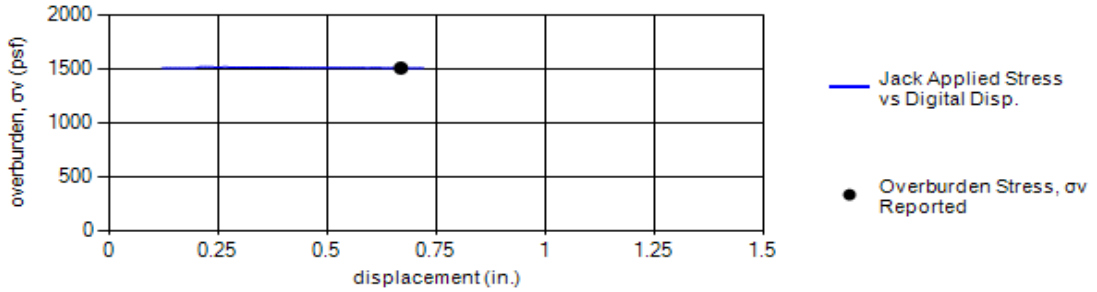
Comments

Connection rupture at 0.67in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

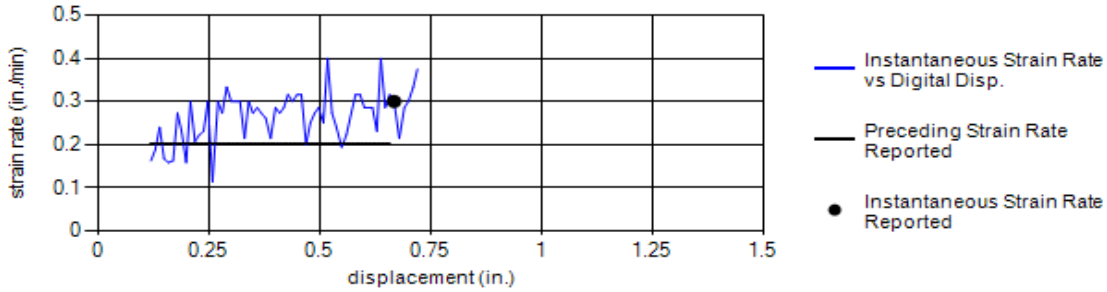
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.23	1509



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.20	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

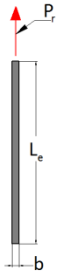
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 11:49:00 AM
Test Identification:	TS32.21-S-L12-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

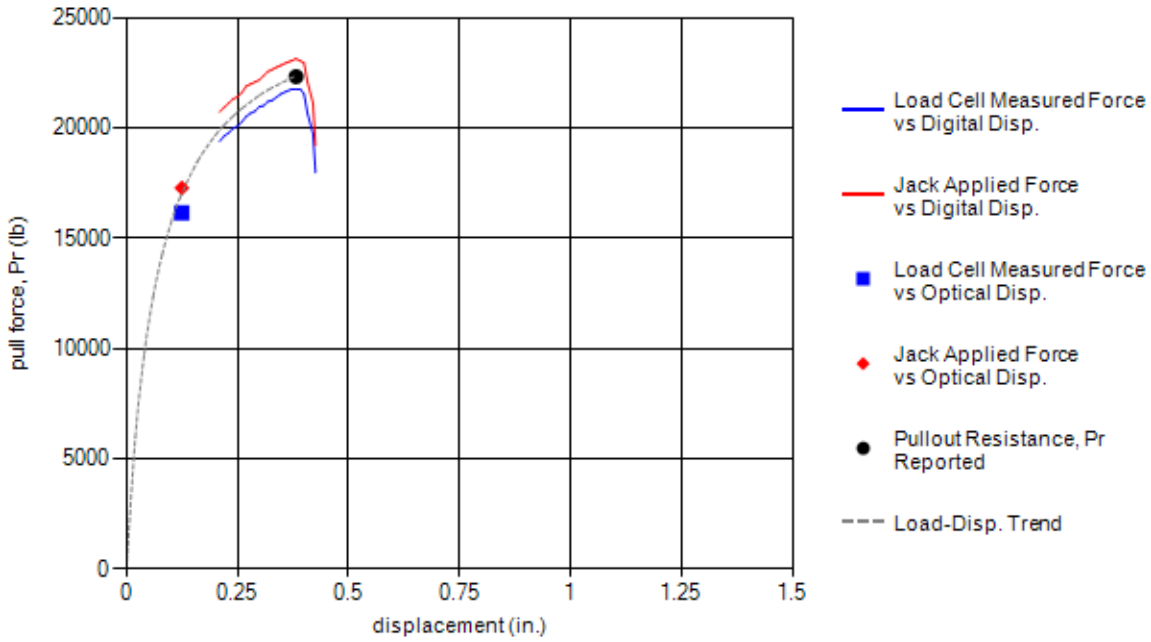
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.38	2478	22318	19.60	**2.25**

Load-Displacement Curve



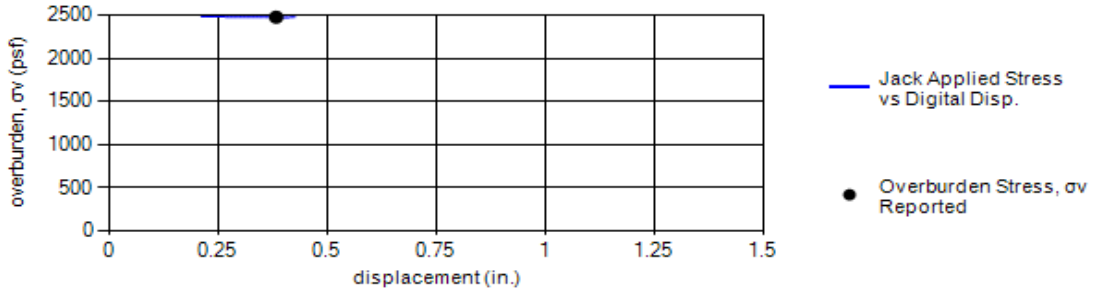
Comments

Connection rupture at 0.38in. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

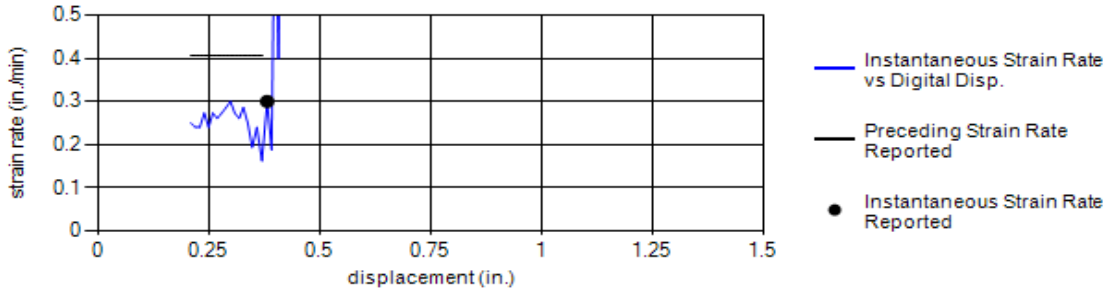
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.97	2478



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.41	0.23



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

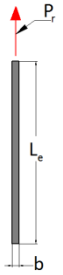
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 12:32:00 PM
Test Identification:	TS35.13-S-L4-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

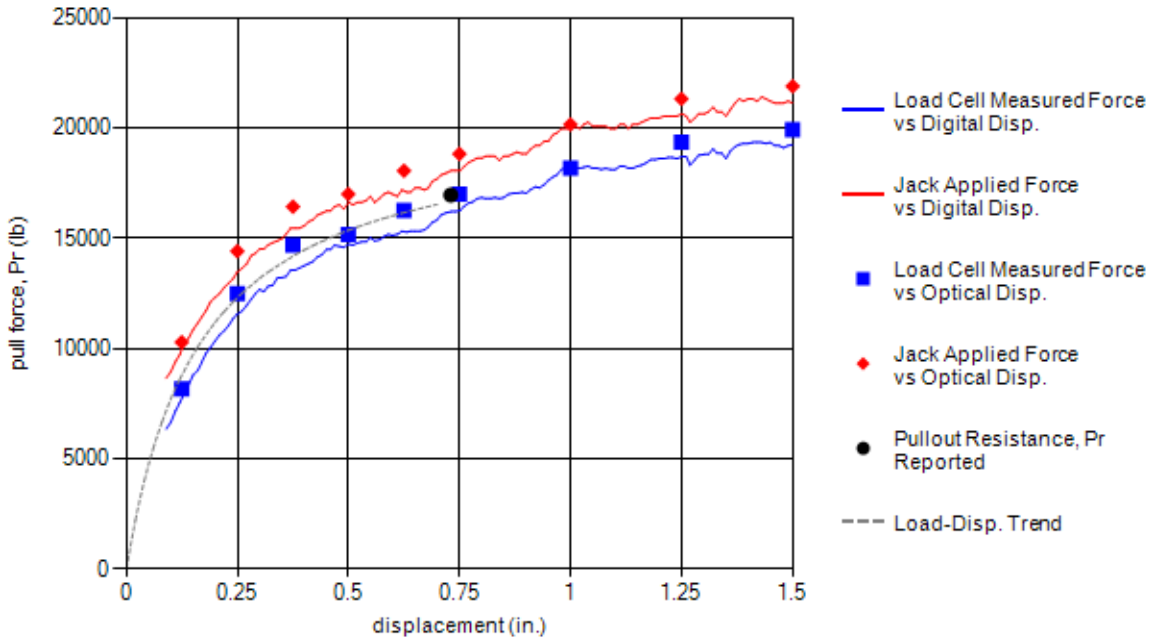
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	2489	16951	19.00	**5.11**

Load-Displacement Curve



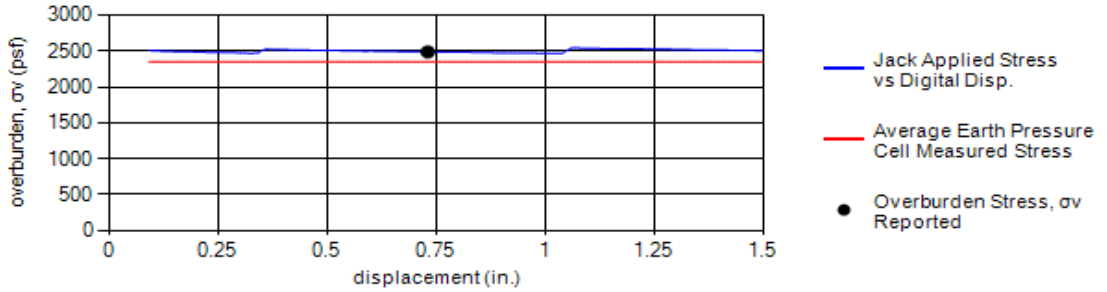
Comments

Digital displacement: pullout and elongation undifferentiated.

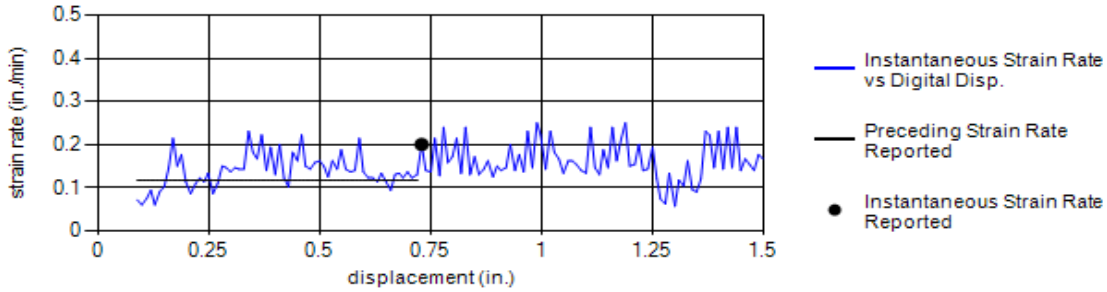
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2202	1841	2957	2217	2556	2354	2.17	2489



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.12	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

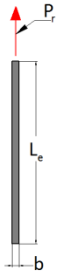
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 12:12:00 PM
Test Identification:	TS35.14-S-L4-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

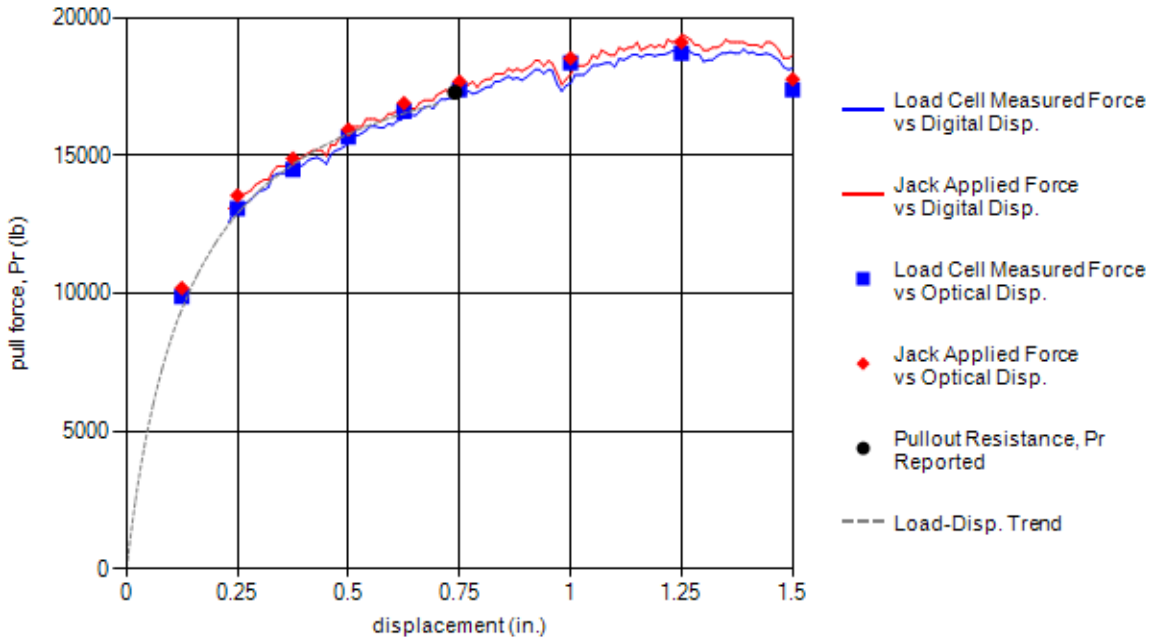
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2433	17283	18.60	**5.33**

Load-Displacement Curve



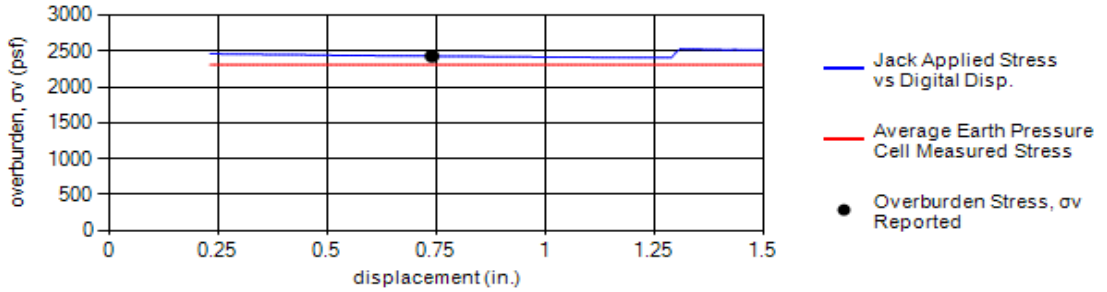
Comments

Digital displacement: pullout and elongation undifferentiated.

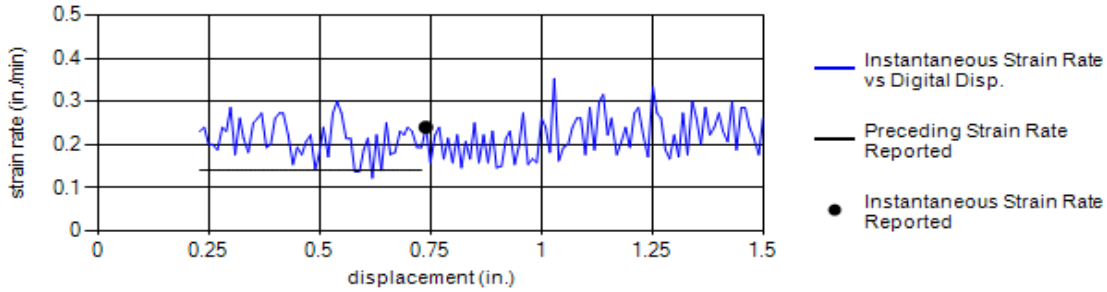
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2154	1752	2898	2180	2572	2311	2.25	2433



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.14	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

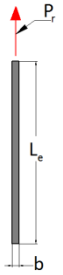
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 10:04:00 AM
Test Identification:	TS35.15-S-L4-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

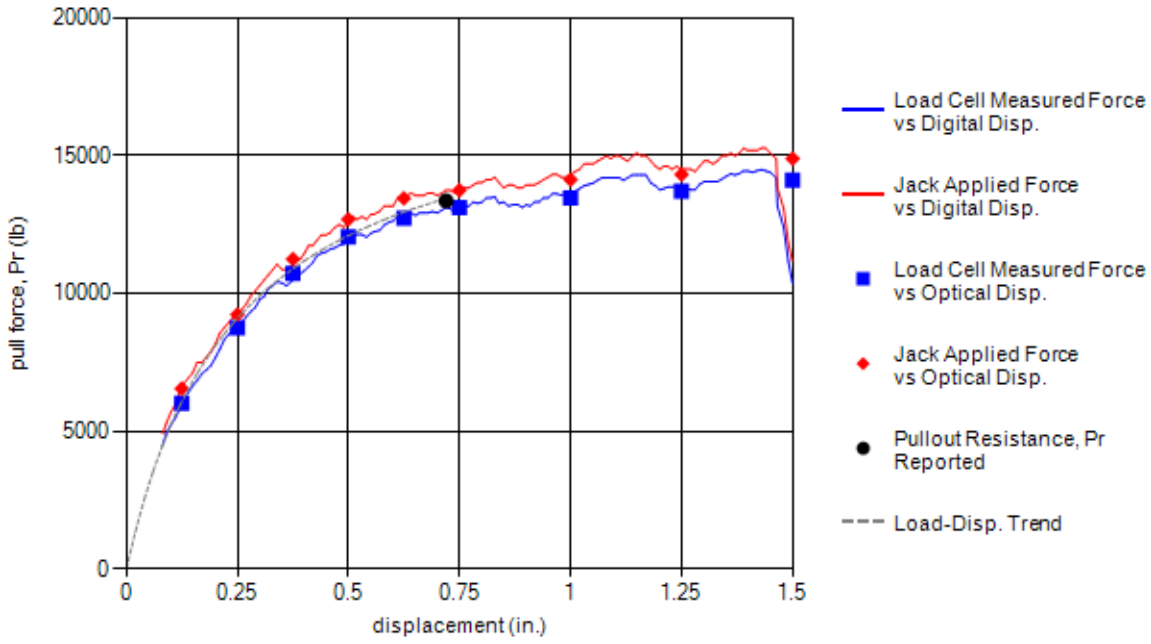
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	2504	13352	19.10	**4.00**

Load-Displacement Curve



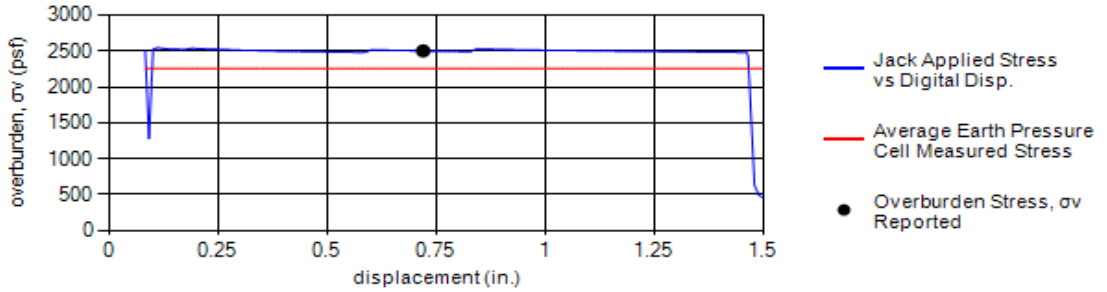
Comments

Digital displacement: pullout and elongation undifferentiated.

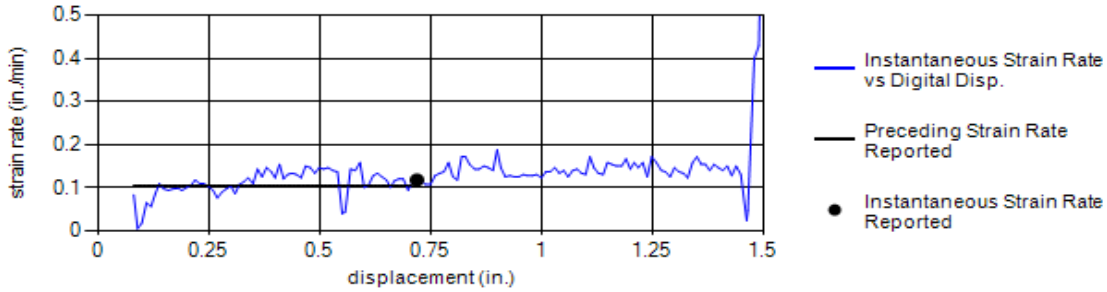
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2175	1725	2858	2175	2372	2261	2.35	2504



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.10	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

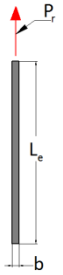
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 2:16:00 PM
Test Identification:	TS37.16-S-L8-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

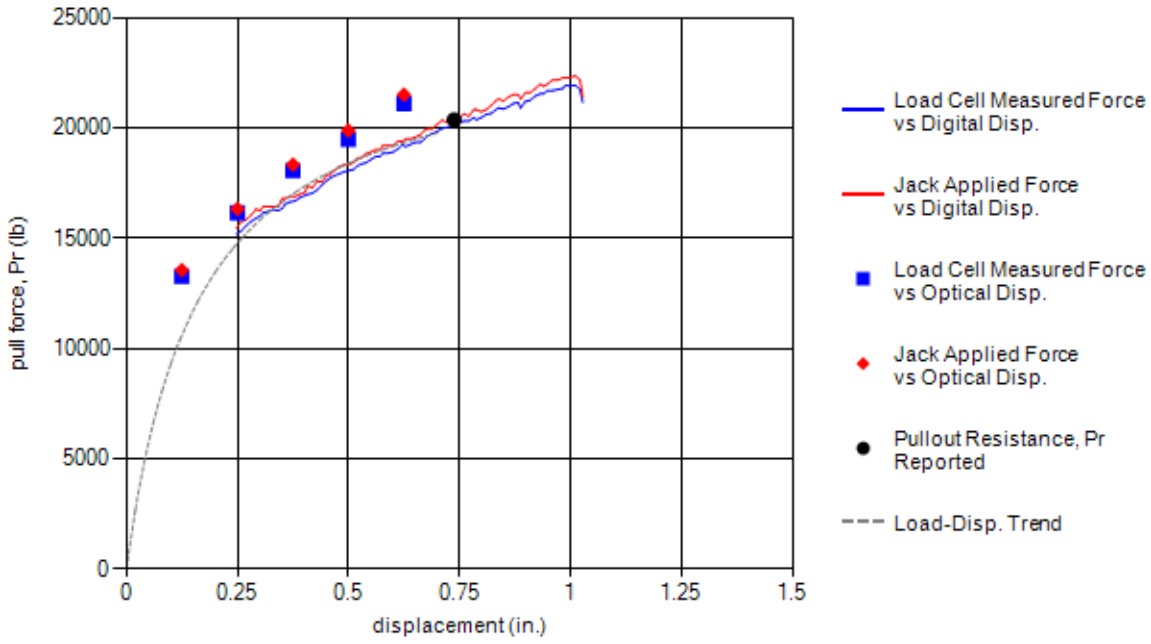
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2597	20365	20.10	**2.94**

Load-Displacement Curve



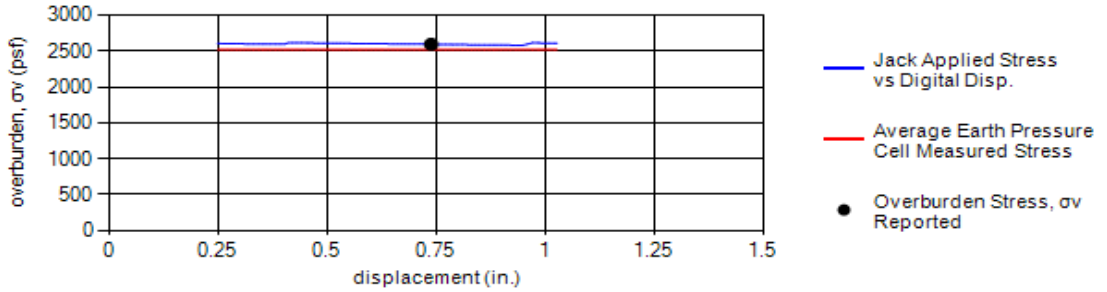
Comments

Digital displacement: pullout and elongation undifferentiated.

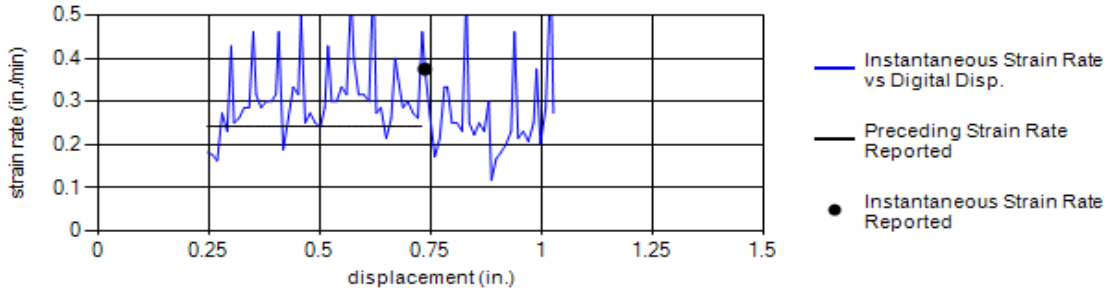
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2493	1693	3545	2361	2508	2520	2.00	2597



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.37	0.24	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

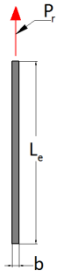
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 2:29:00 PM
Test Identification:	TS37.17-S-L8-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

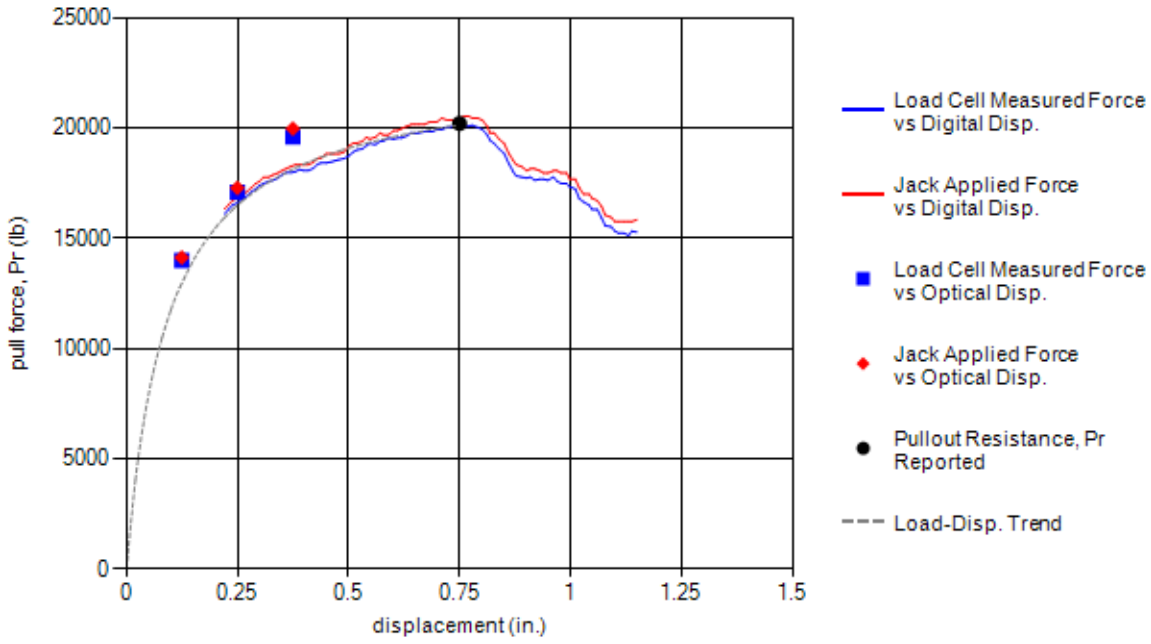
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.75	2583	20195	20.00	**2.93**

Load-Displacement Curve



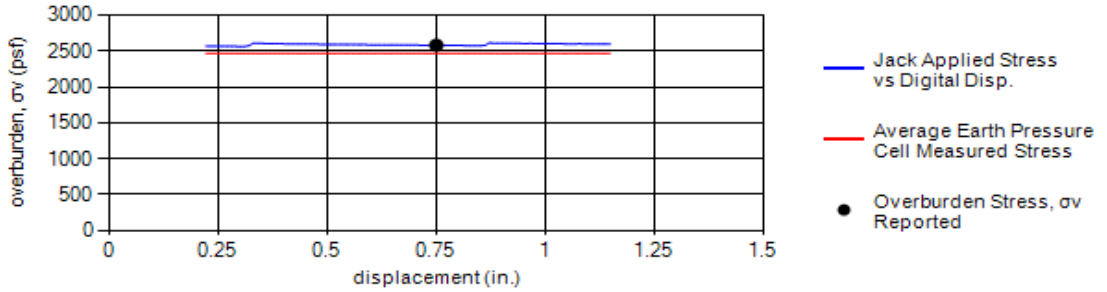
Comments

Digital displacement: pullout and elongation undifferentiated.

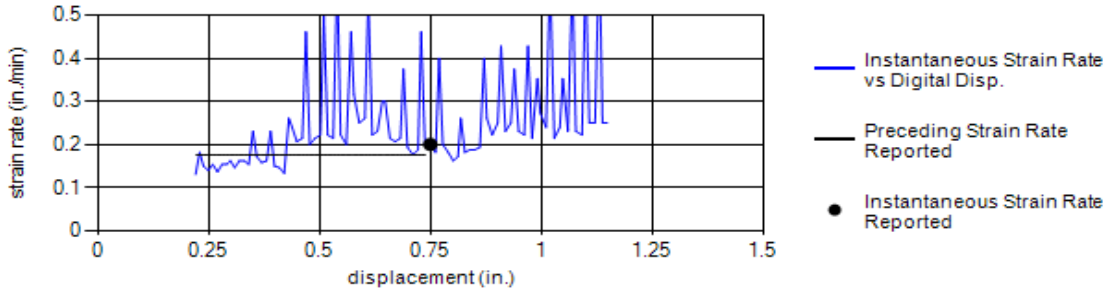
Personnel

Tested:	AJ AJ AS
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2375	1693	3529	2295	2447	2468	2.10	2583



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.18	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

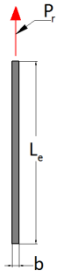
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 3:00:00 PM
Test Identification:	TS37.18-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

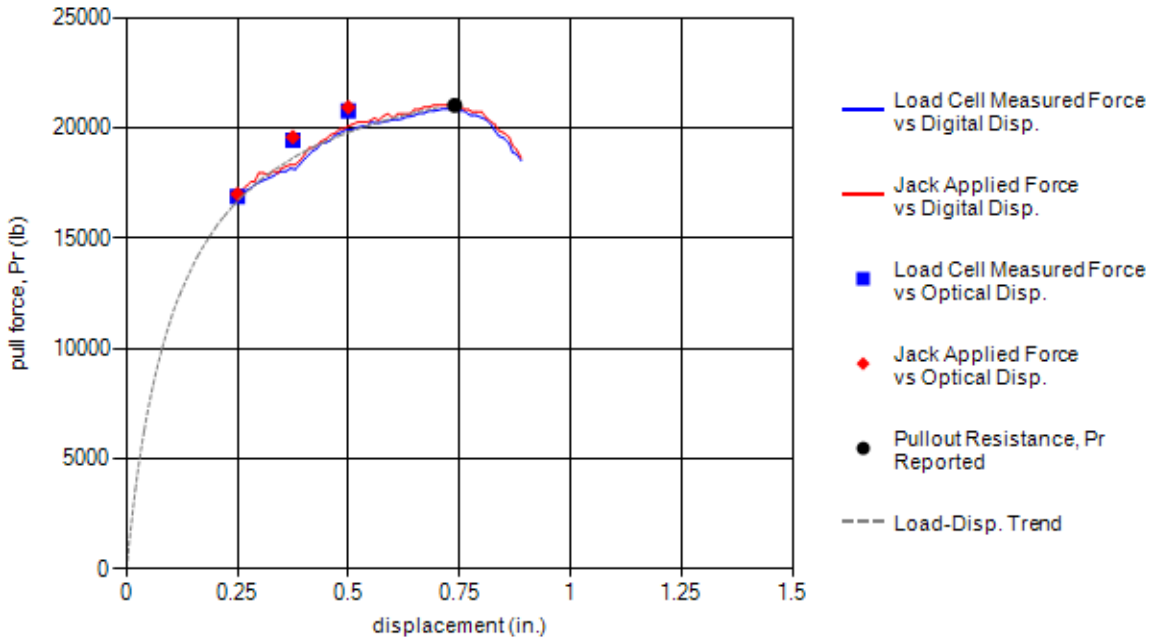
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2617	21016	20.20	**3.01**

Load-Displacement Curve



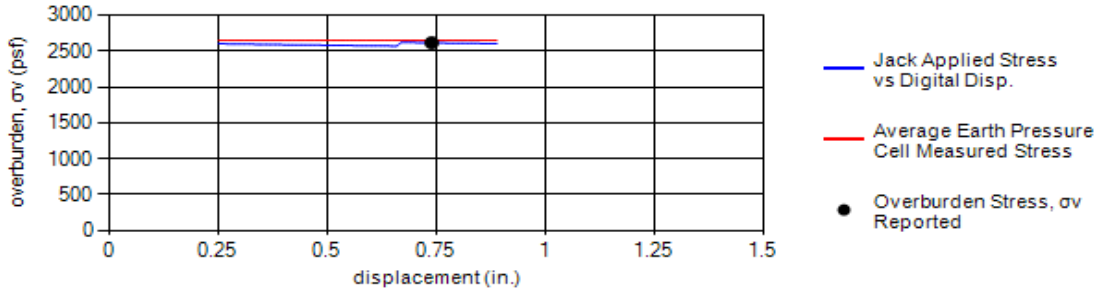
Comments

Digital displacement: pullout and elongation undifferentiated.

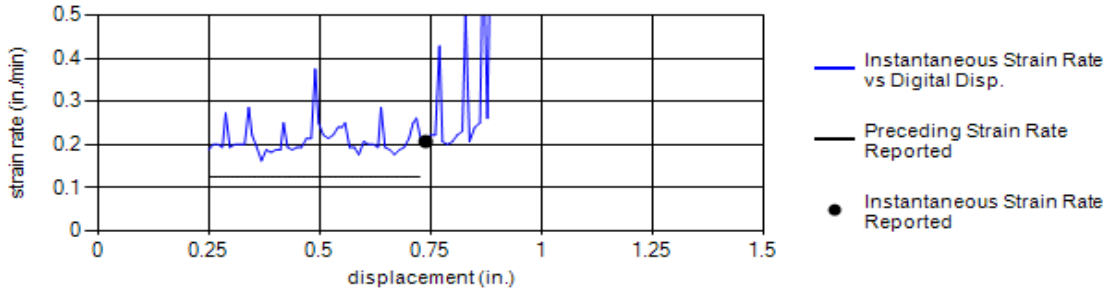
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2508	1858	3763	2485	2636	2650	2.02	2617



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.12	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

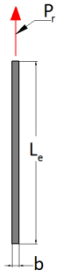
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 3:45:00 PM
Test Identification:	TS37.19-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

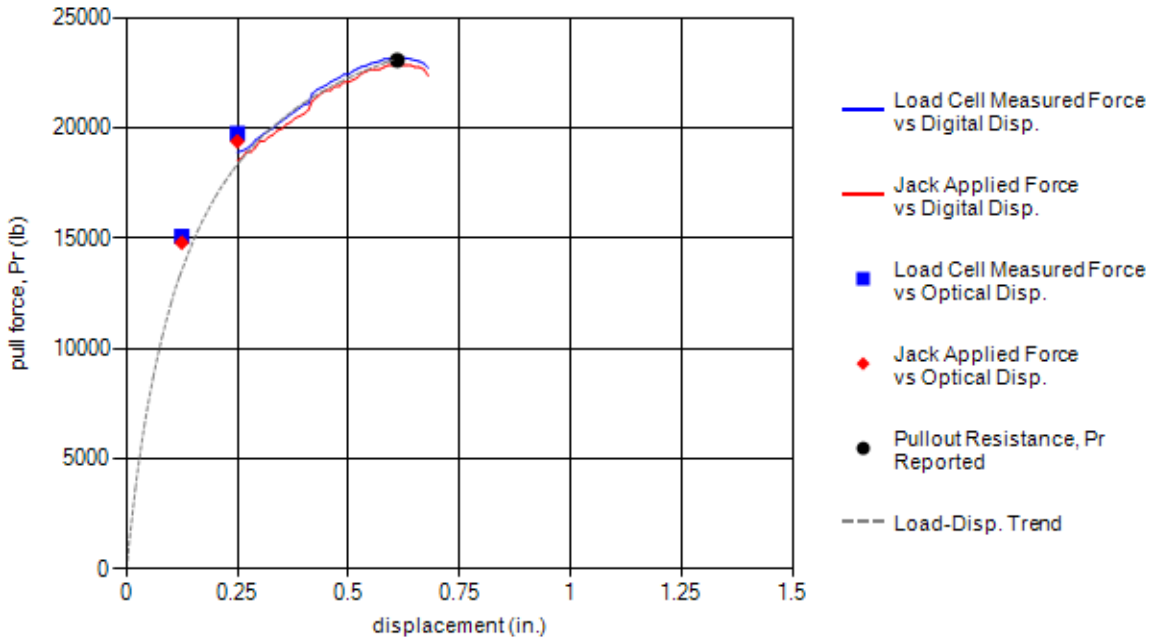
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.61	2513	23059	19.40	**3.44**

Load-Displacement Curve



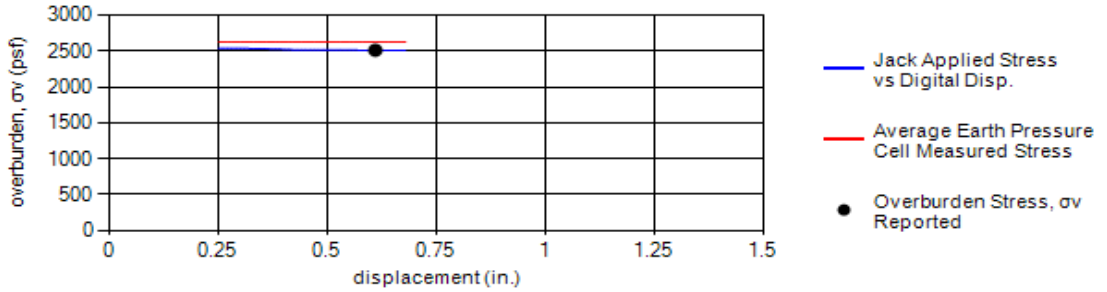
Comments

Digital displacement: pullout and elongation undifferentiated.

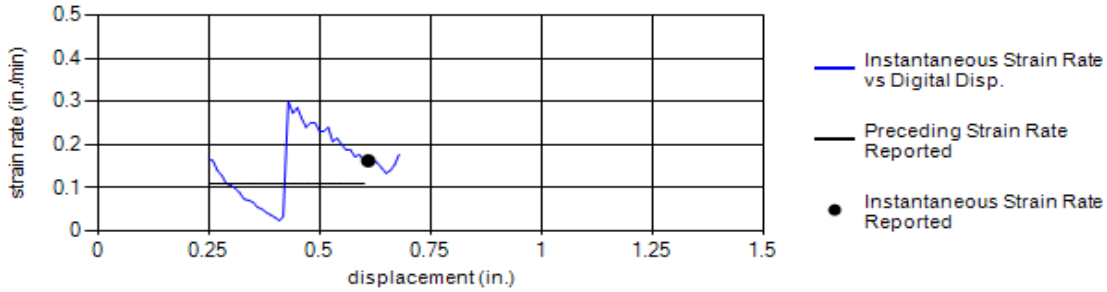
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2530	1826	3770	2468	2562	2631	2.03	2513



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.11	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

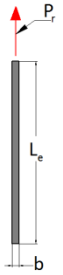
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/14/2011 11:54:00 AM
Test Identification:	TS38.14-S-L8-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

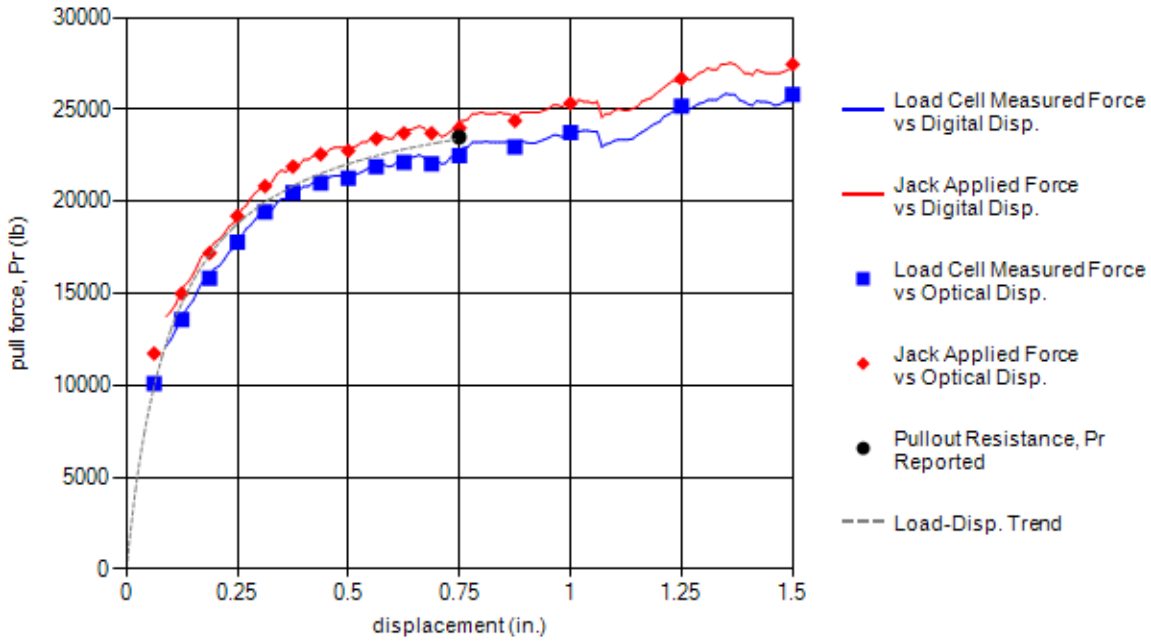
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.75	2493	23494	21.30	**3.53**

Load-Displacement Curve



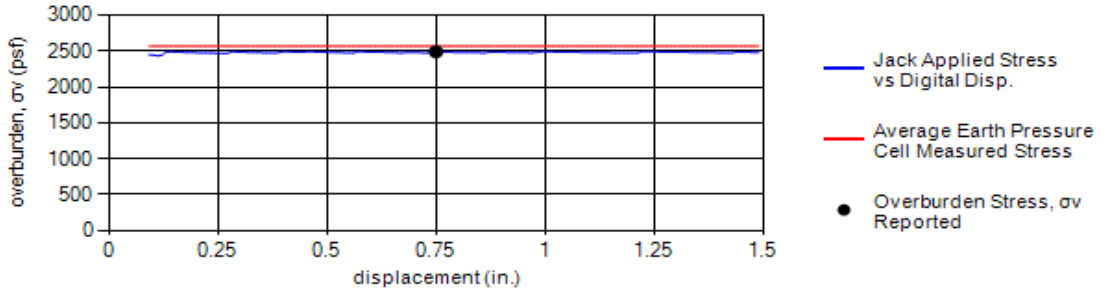
Comments

Digital displacement: pullout and elongation undifferentiated.

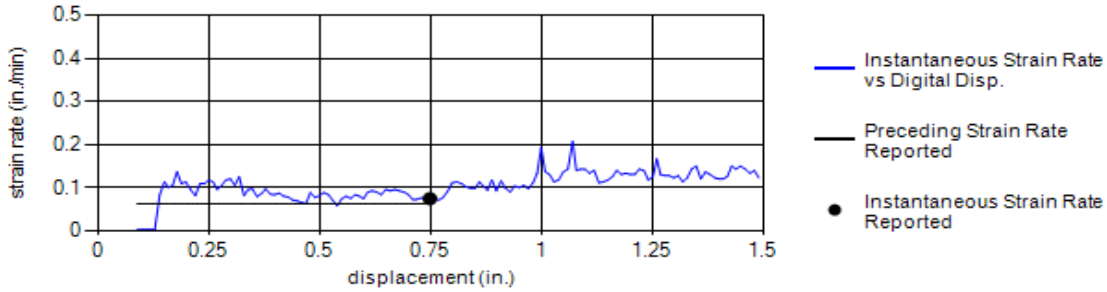
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2855	2056	2957	2589	2401	2572	2.18	2493



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

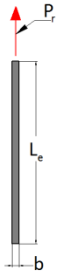
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/14/2011 11:04:00 AM
Test Identification:	TS38.15-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

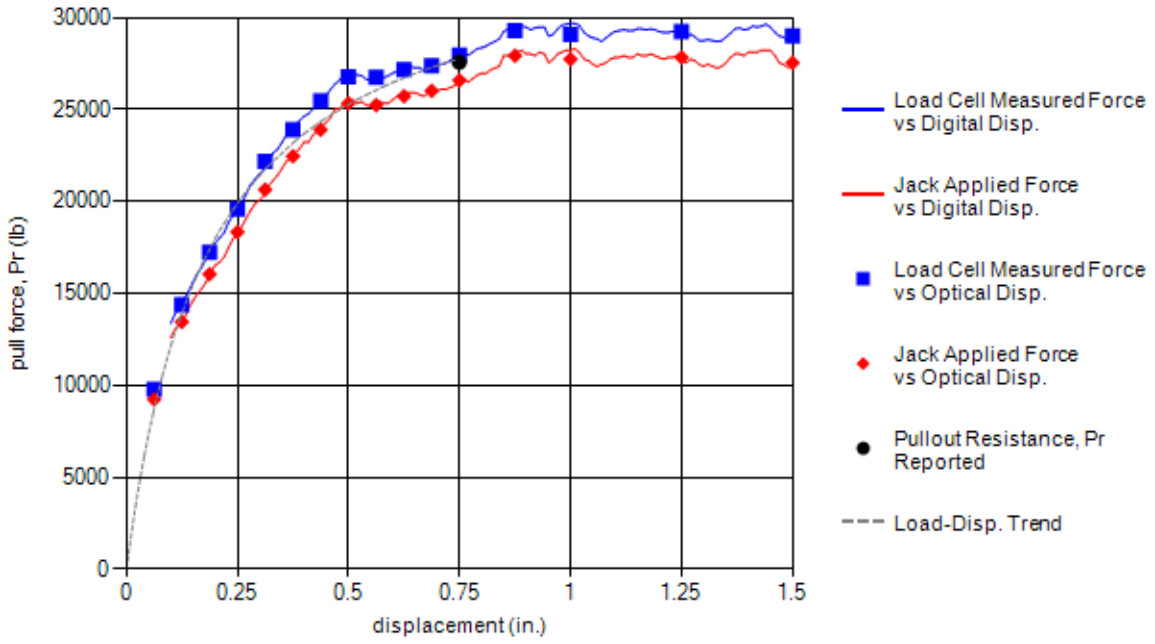
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2605	27560	22.20	**3.97**

Load-Displacement Curve



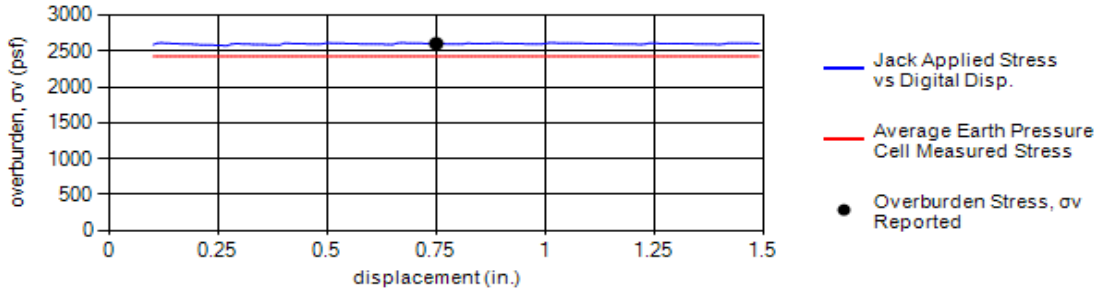
Comments

Digital displacement: pullout and elongation undifferentiated.

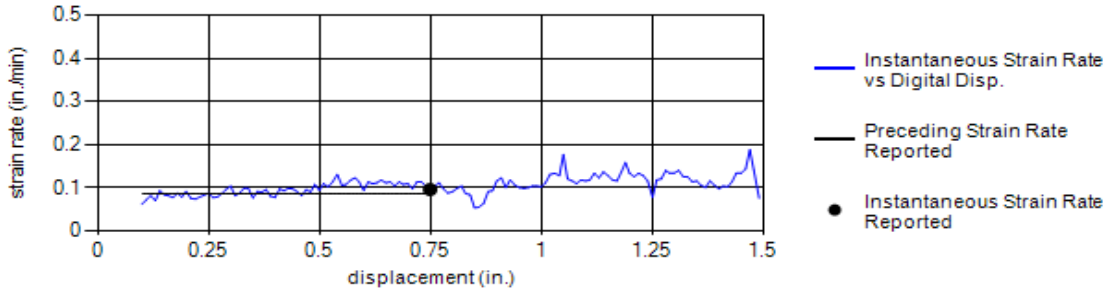
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2768	1971	2804	2488	2107	2428	2.26	2605



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Backfill Material Properties	
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

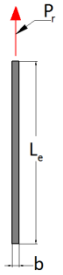
Gradation (TEX-110-E) (% Retained)			
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/15/2011 11:45:00 AM
Test Identification:	TS40.13-S-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

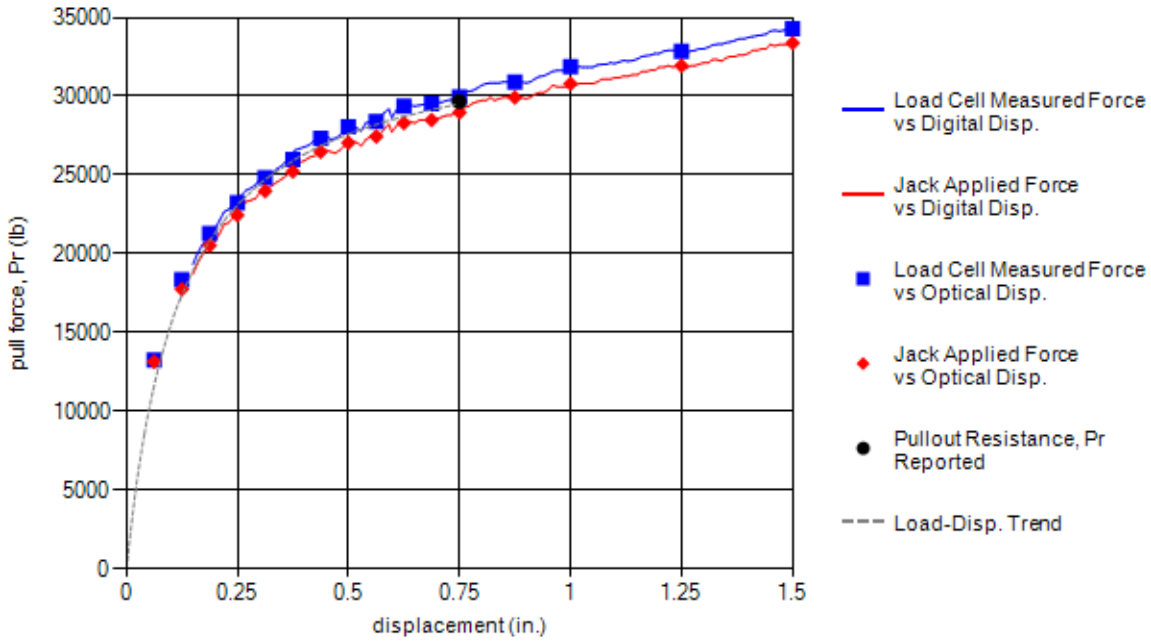
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1509	29665	12.70	**4.91**

Load-Displacement Curve

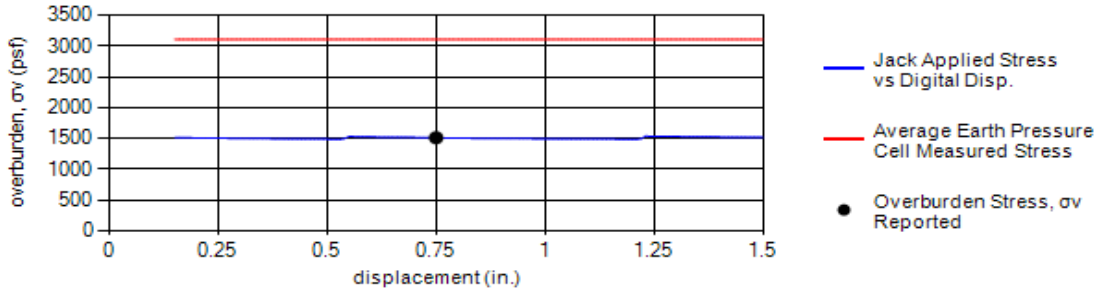


Comments

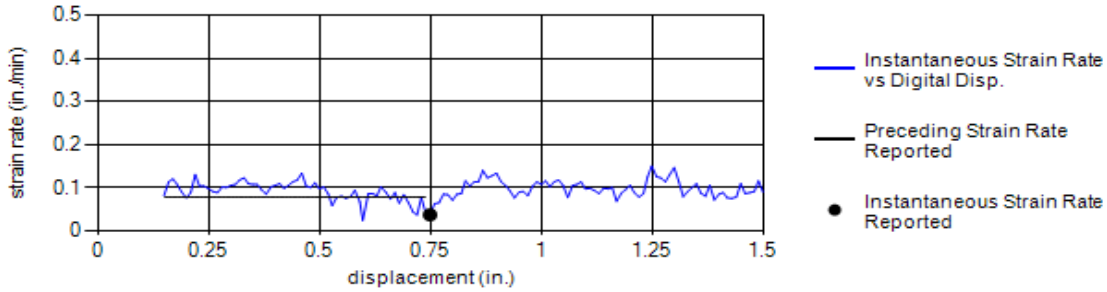
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2894	2966	3121	3207	3364	3110	2.18	1508



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

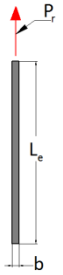
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/15/2011 10:45:00 AM
Test Identification:	TS40.14-S-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

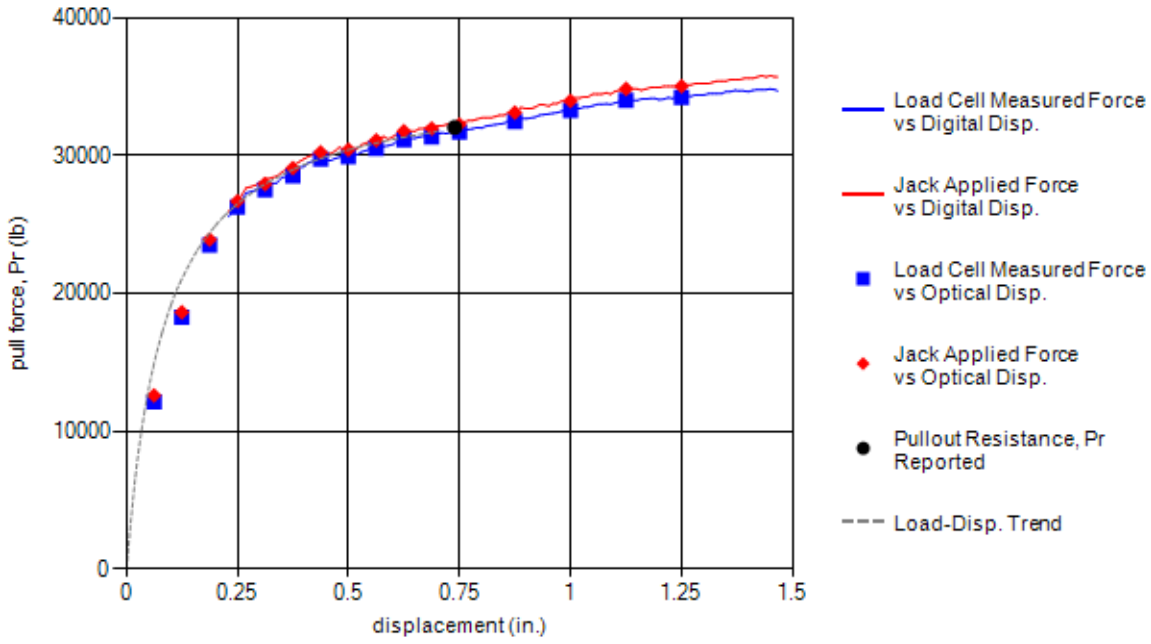
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2397	32024	20.10	**3.34**

Load-Displacement Curve

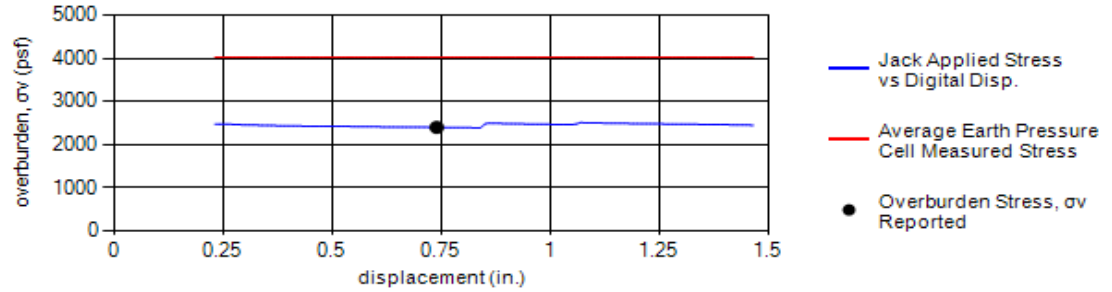


Comments

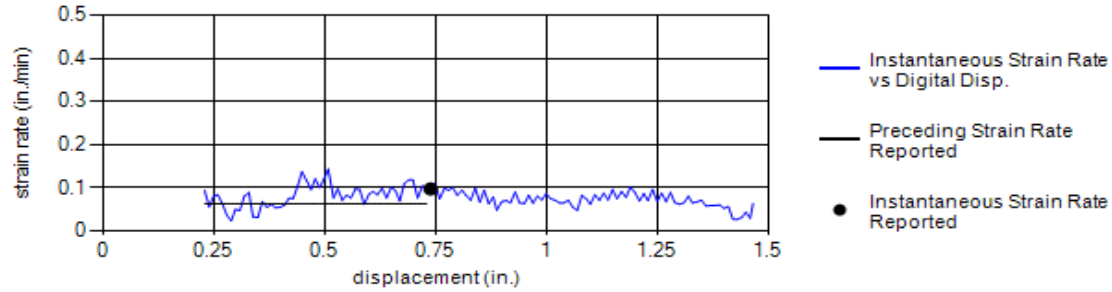
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3815	3708	4186	4099	4326	4027	1.68	2397



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

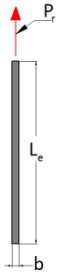
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/18/2011 6:23:00 PM
Test Identification:	TS40.15-S-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

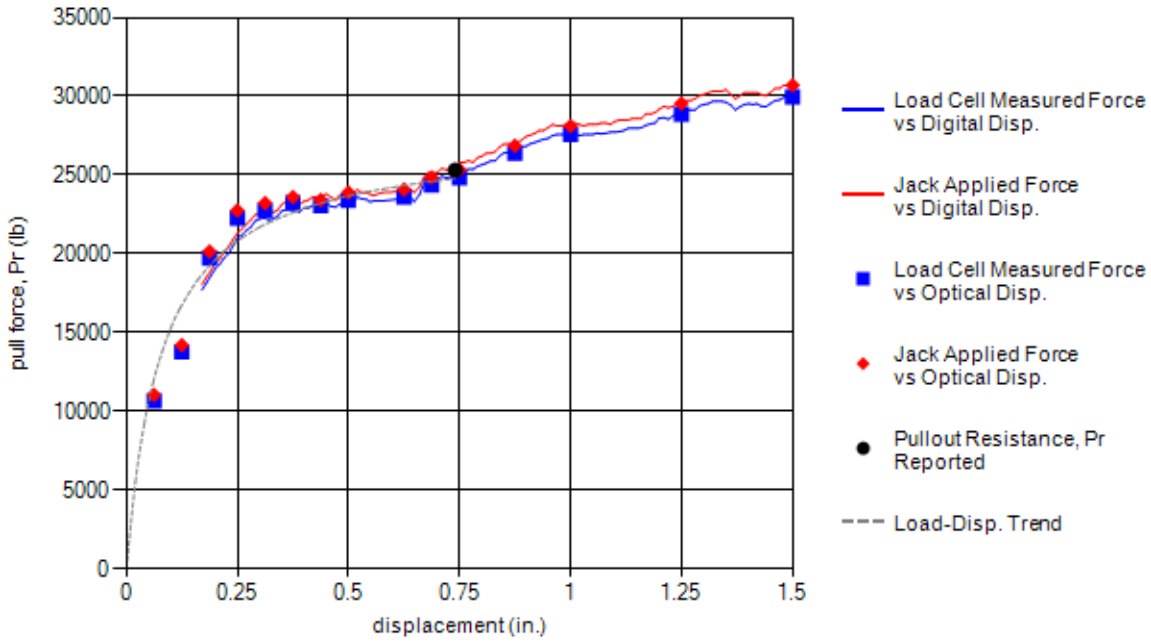
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1509	25309	12.60	**4.19**

Load-Displacement Curve

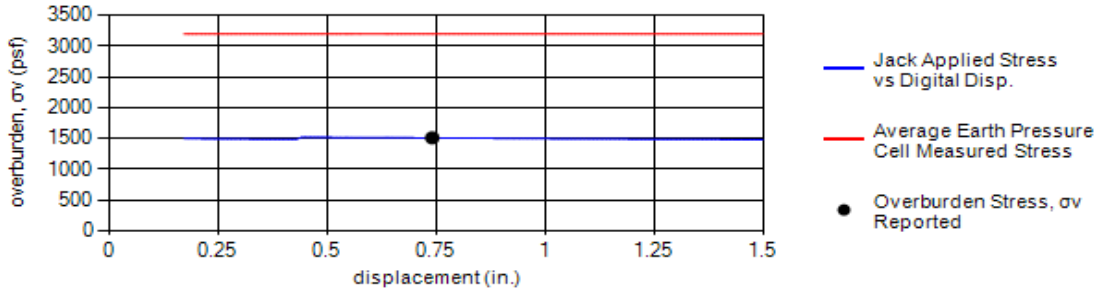


Comments

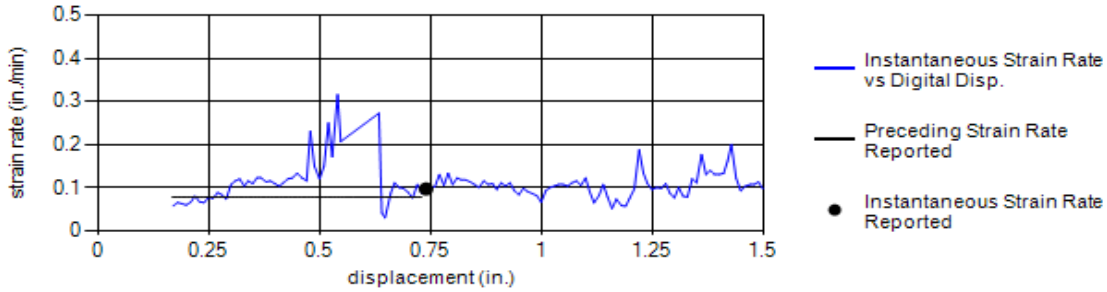
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3004	3163	3223	3228	3350	3194	2.12	1506



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

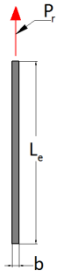
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/15/2011 3:02:00 PM
Test Identification:	TS40.17-S-L12-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

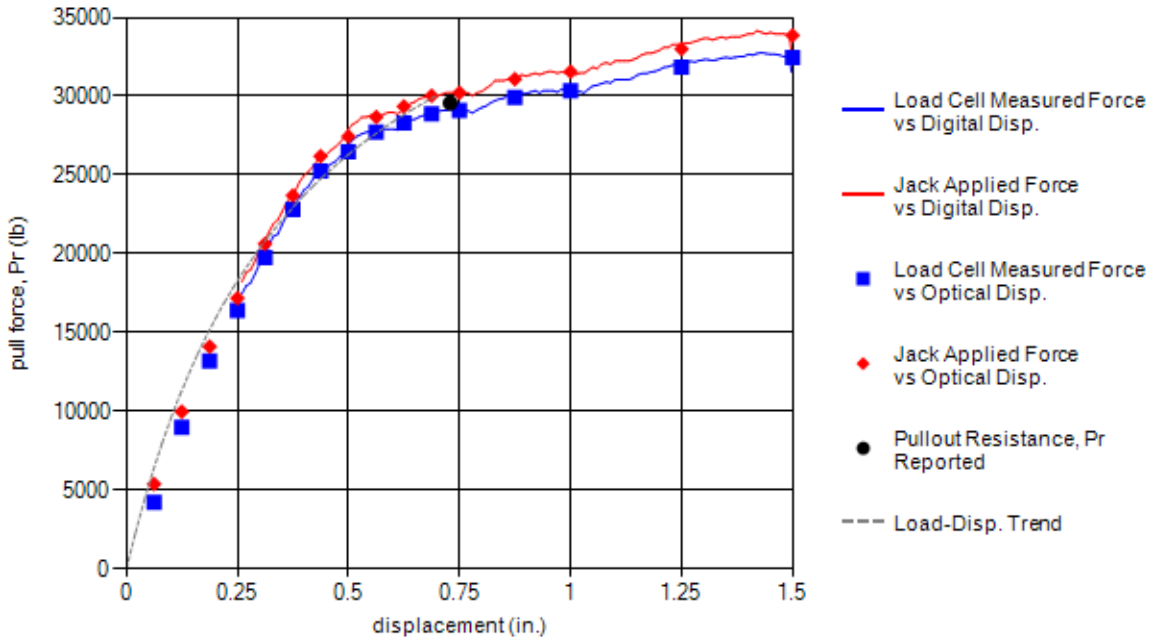
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.73	1492	29568	12.50	**4.95**

Load-Displacement Curve

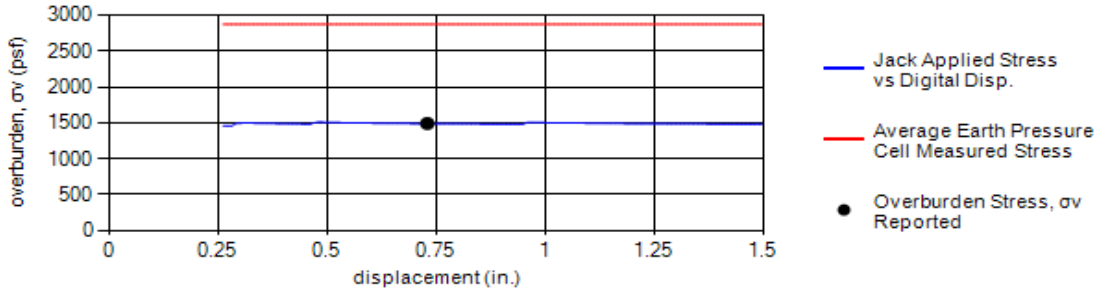


Comments

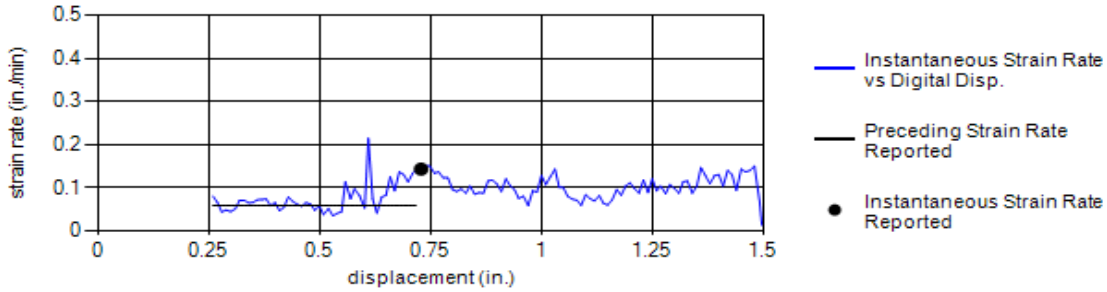
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2701	2783	2831	2947	3119	2876	2.36	1491



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

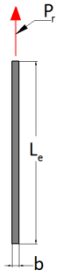
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/15/2011 1:45:00 PM
Test Identification:	TS40.18-S-L12-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

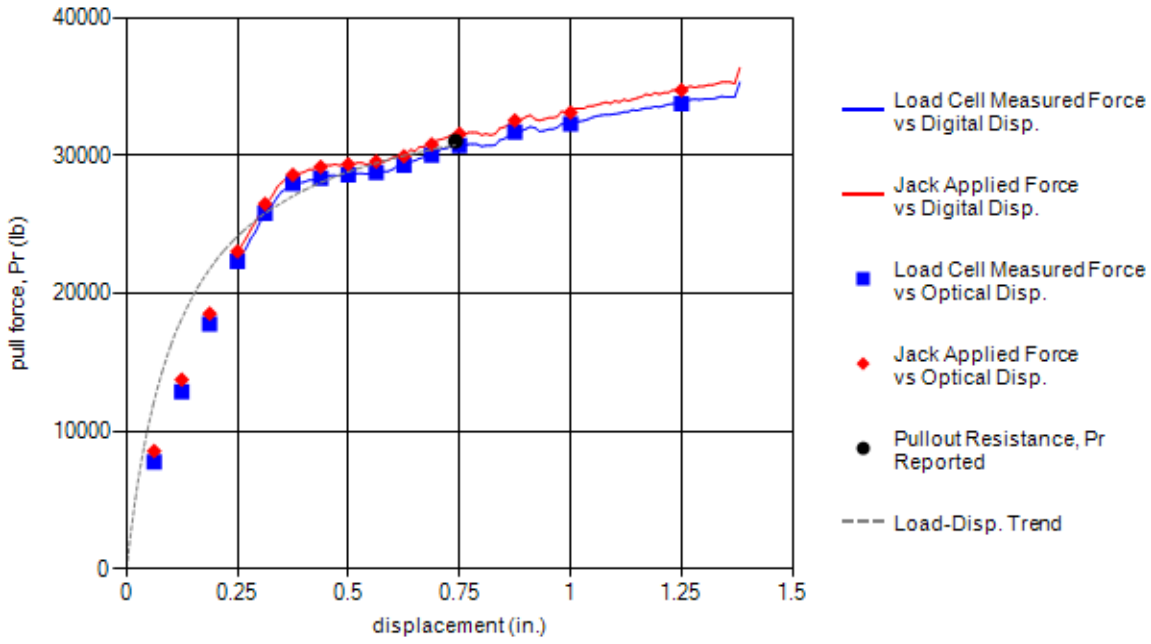
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2499	31021	20.90	**3.10**

Load-Displacement Curve

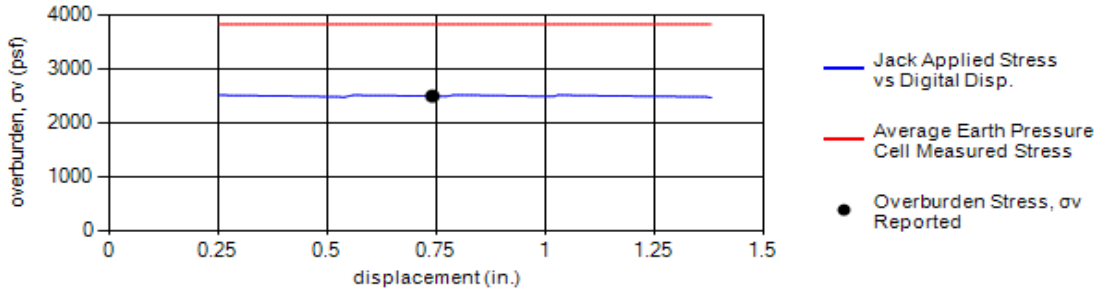


Comments

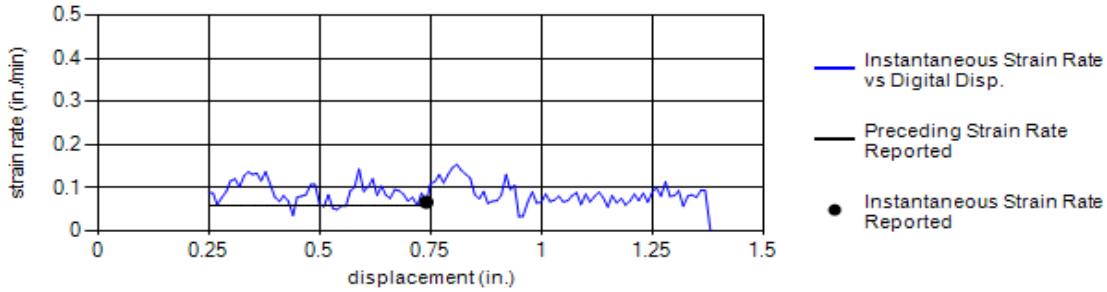
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3630	3551	3981	3924	4086	3834	1.77	2498



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

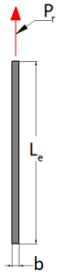
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 11:13:00 AM
Test Identification:	TS41.14-S-L12-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

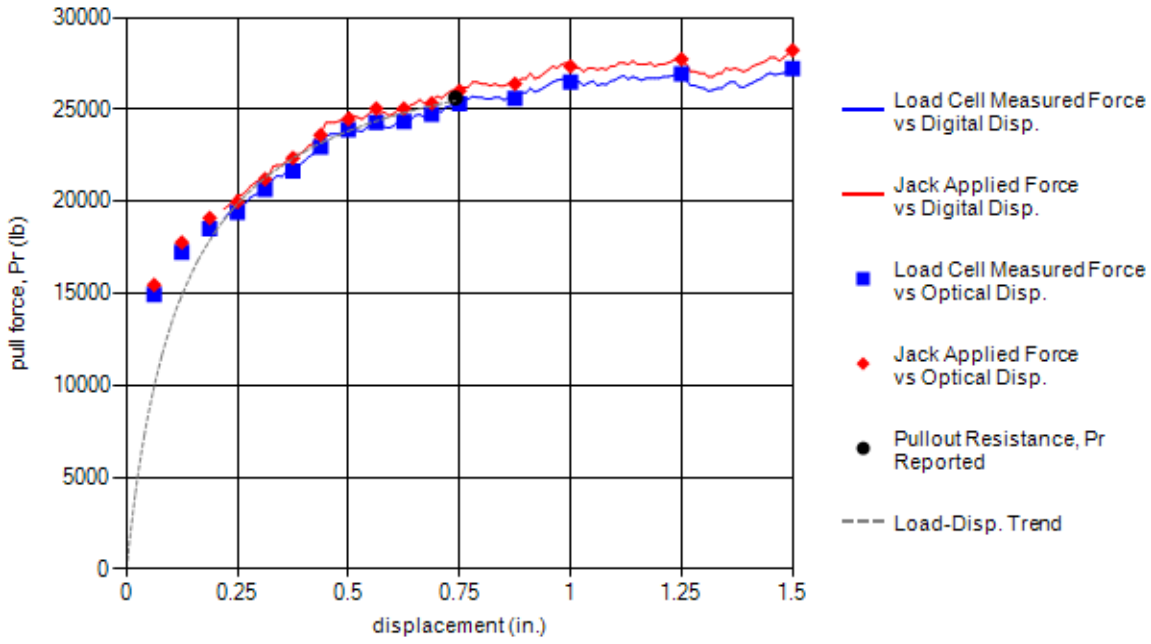
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	4995	25618	40.90	**1.28**

Load-Displacement Curve

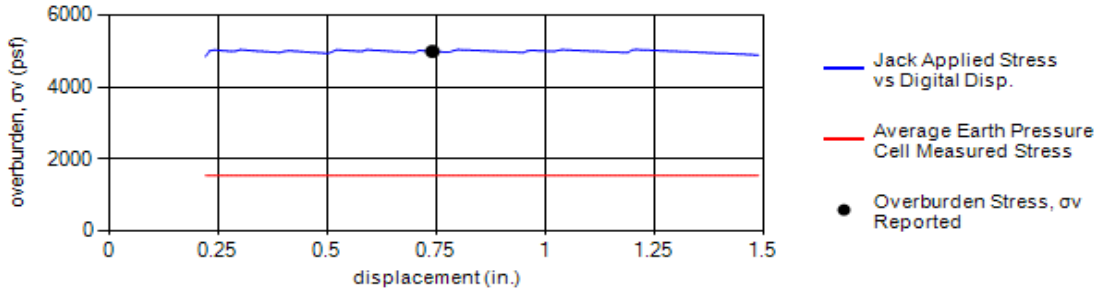


Comments

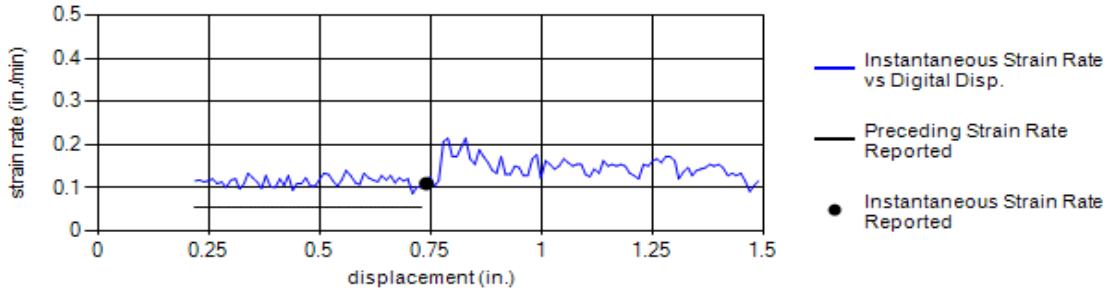
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1535	1336	1838	1631	1352	1538	3.27	4998



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.05	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

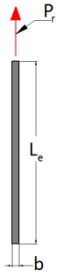
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 2:47:00 PM
Test Identification:	TS41.15-S-L12-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

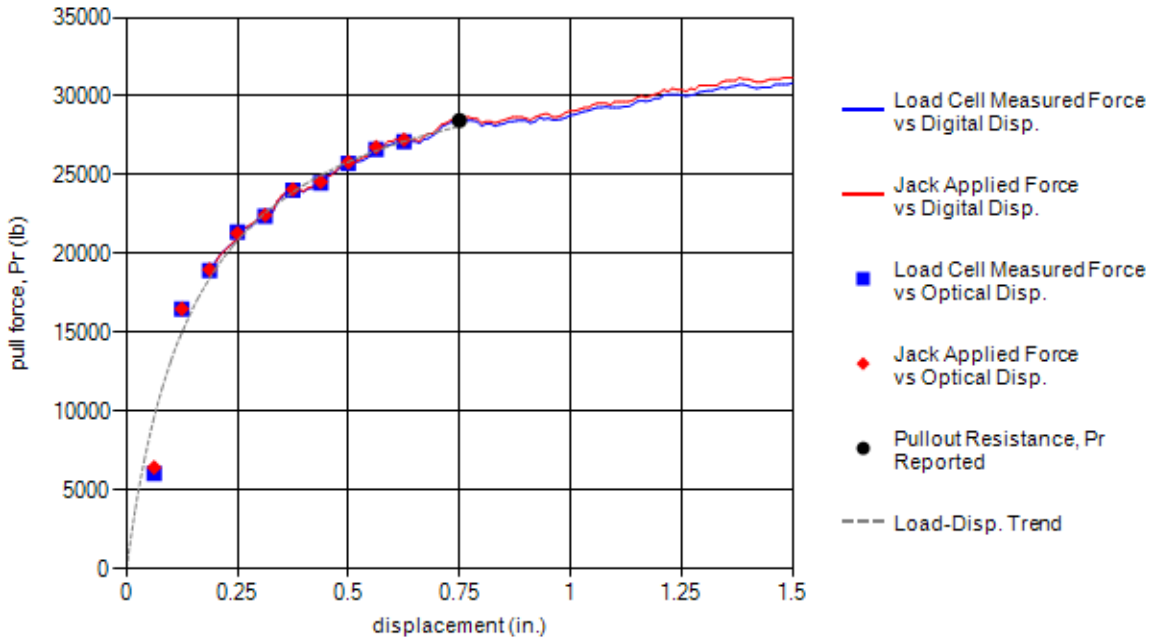
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	4911	28464	40.20	**1.45**

Load-Displacement Curve

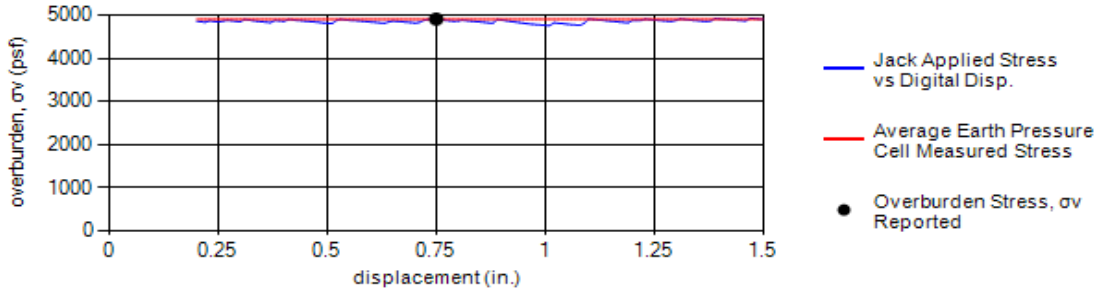


Comments

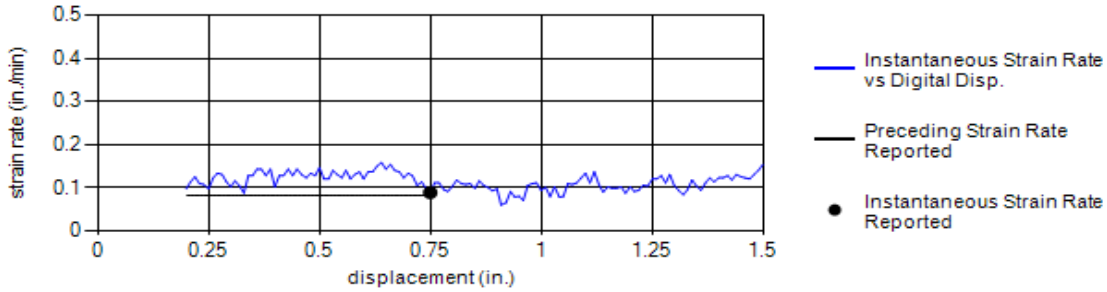
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5268	3477	6432	5053	4313	4909	1.04	4911



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

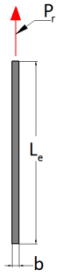
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/4/2012 4:39:00 PM
Test Identification:	TS41.17-S-L8-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

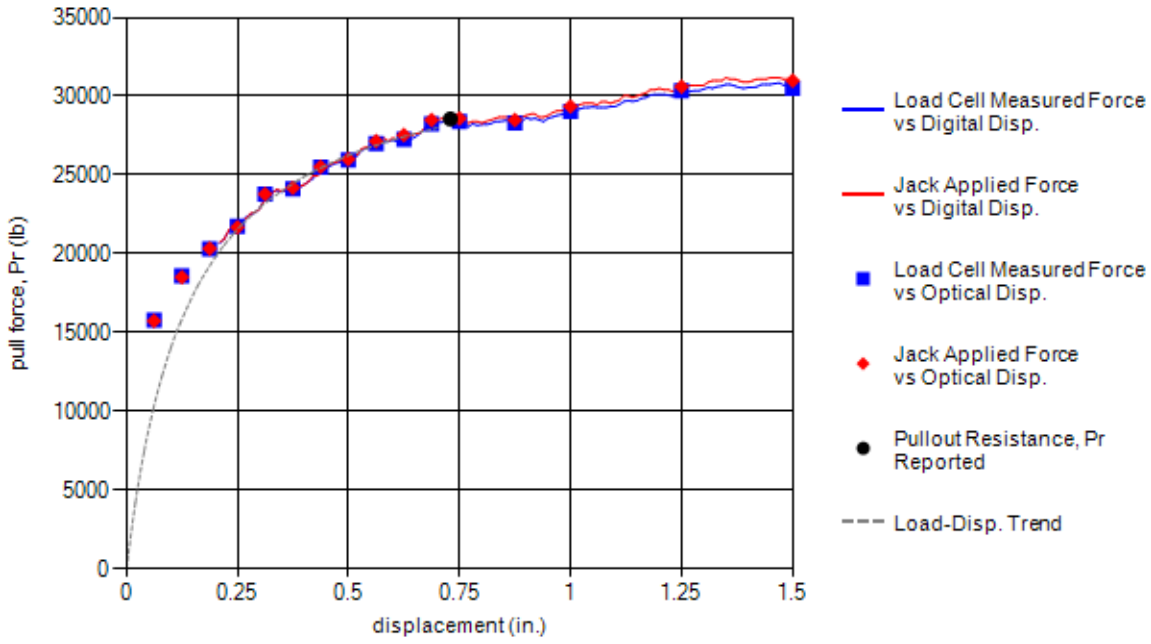
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	5017	28562	40.90	**2.13**

Load-Displacement Curve

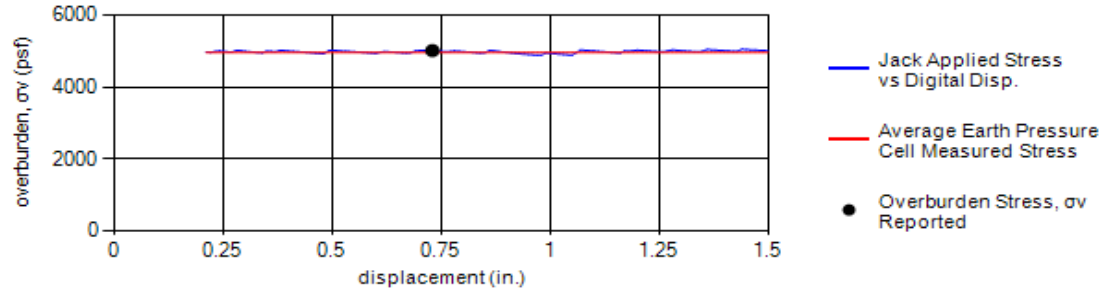


Comments

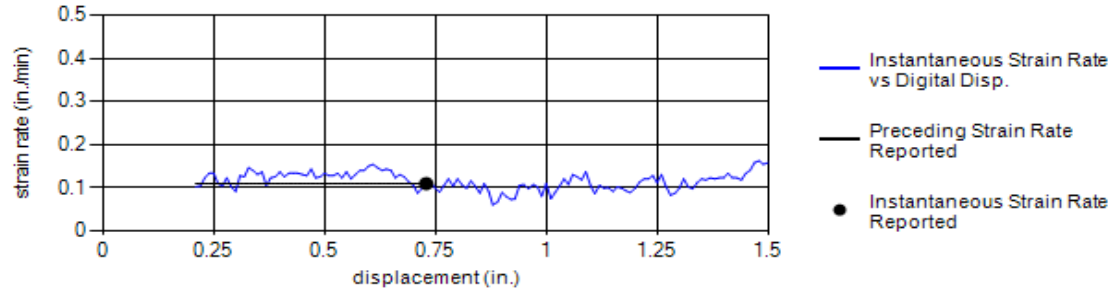
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5262	3668	6490	5162	4254	4967	1.02	5017



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.11	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

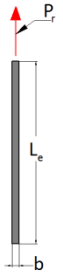
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 10:31:00 AM
Test Identification:	TS41.18-S-L12-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

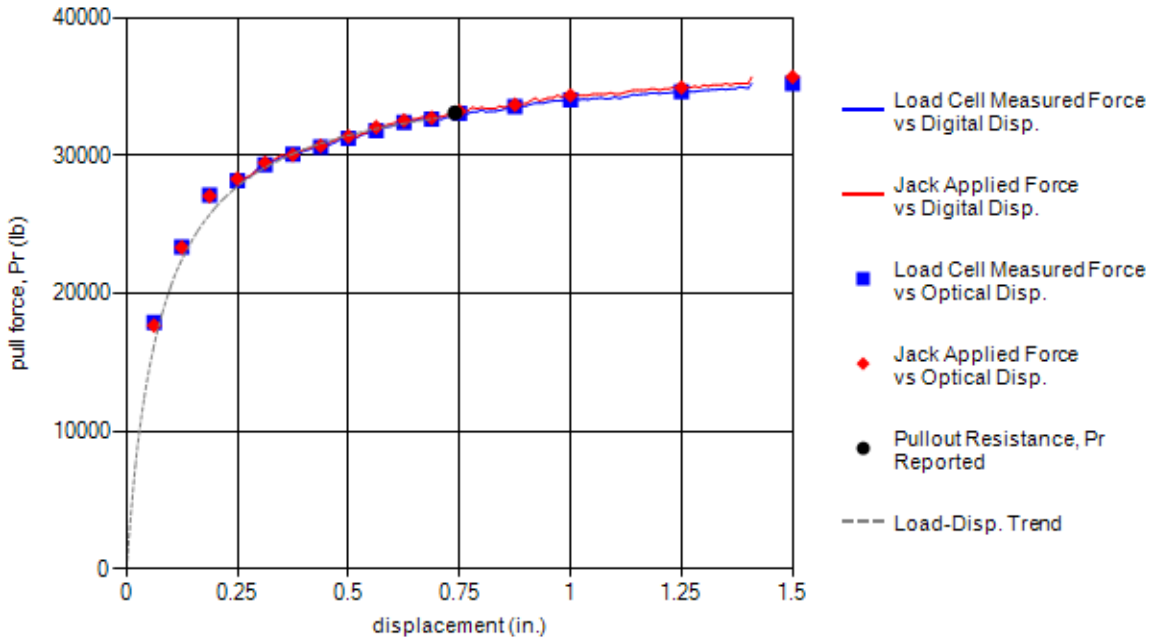
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	4993	33076	40.70	**1.66**

Load-Displacement Curve

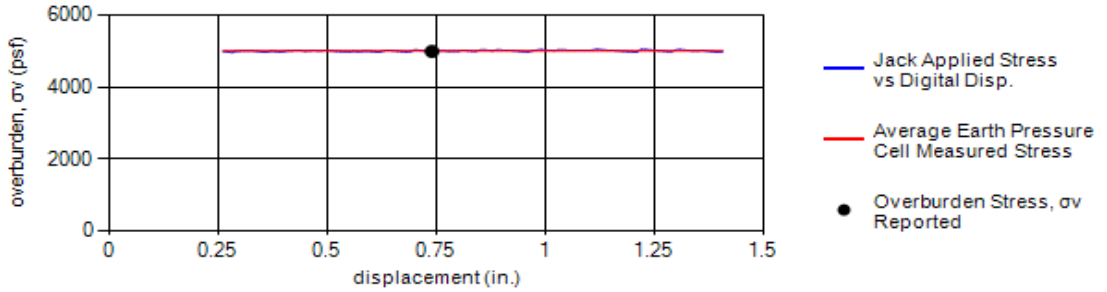


Comments

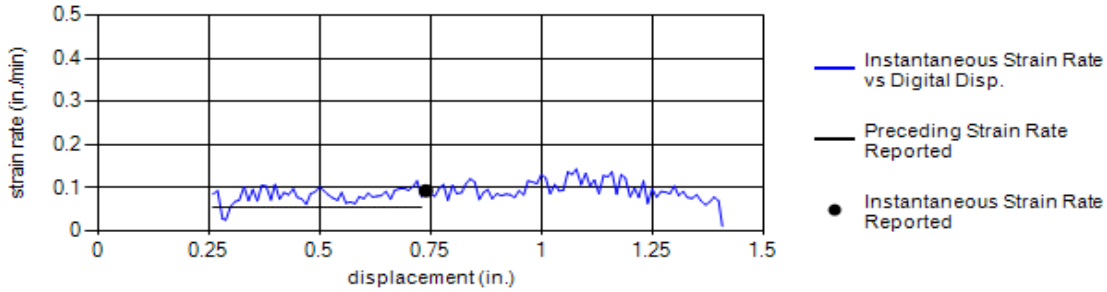
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5245	3694	6524	5159	4424	5009	1.02	4993



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

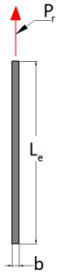
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/4/2012 1:38:00 PM
Test Identification:	TS41.20-S-L8-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

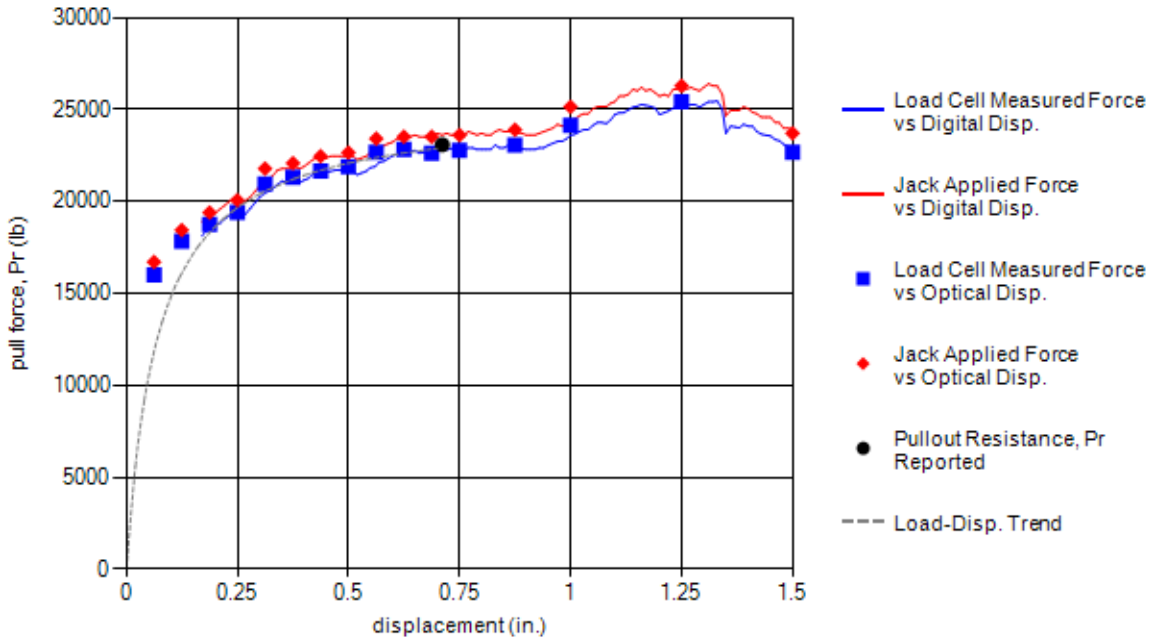
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.71	4993	23075	38.30	**1.73**

Load-Displacement Curve

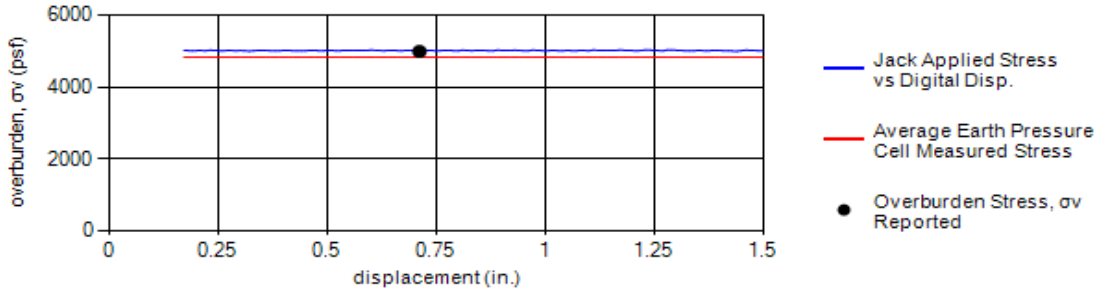


Comments

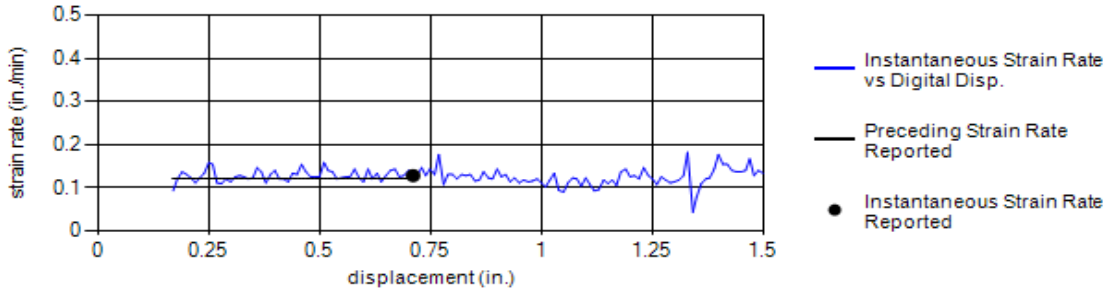
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5191	2983	6616	5155	4243	4837	1.02	5012



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.12	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

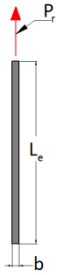
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/18/2012 4:13:00 PM
Test Identification:	TS42.13-S-L4-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

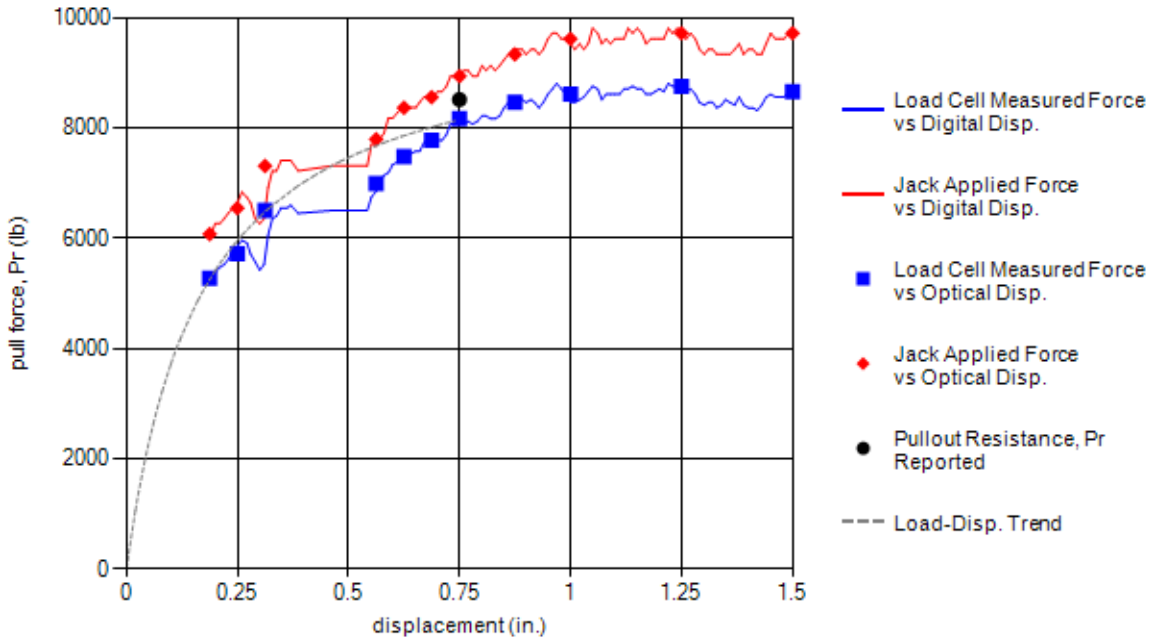
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	621	8510	5.10	**10.28**

Load-Displacement Curve



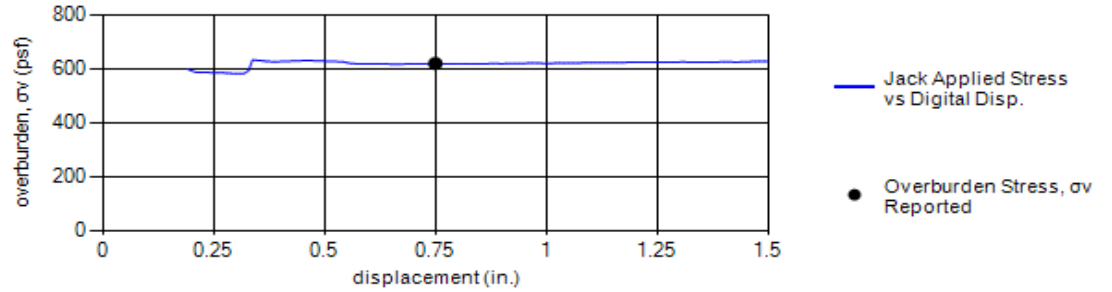
Comments

No earth pressure cell data.

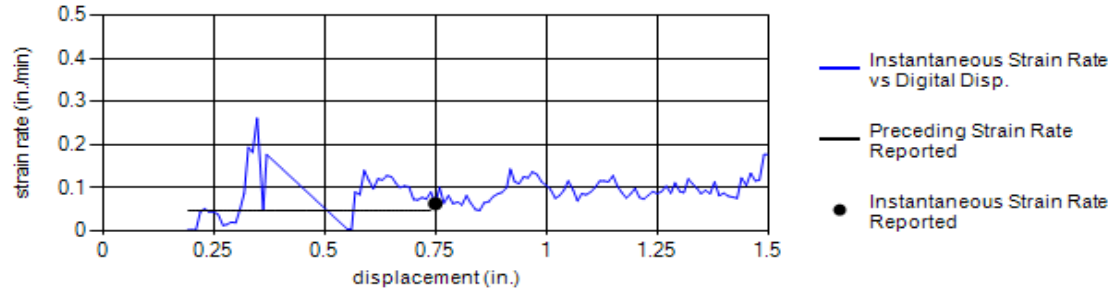
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	621



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.04	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

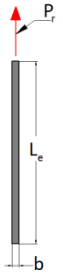
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2012 12:29:00 PM
Test Identification:	TS42.14-S-L8-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

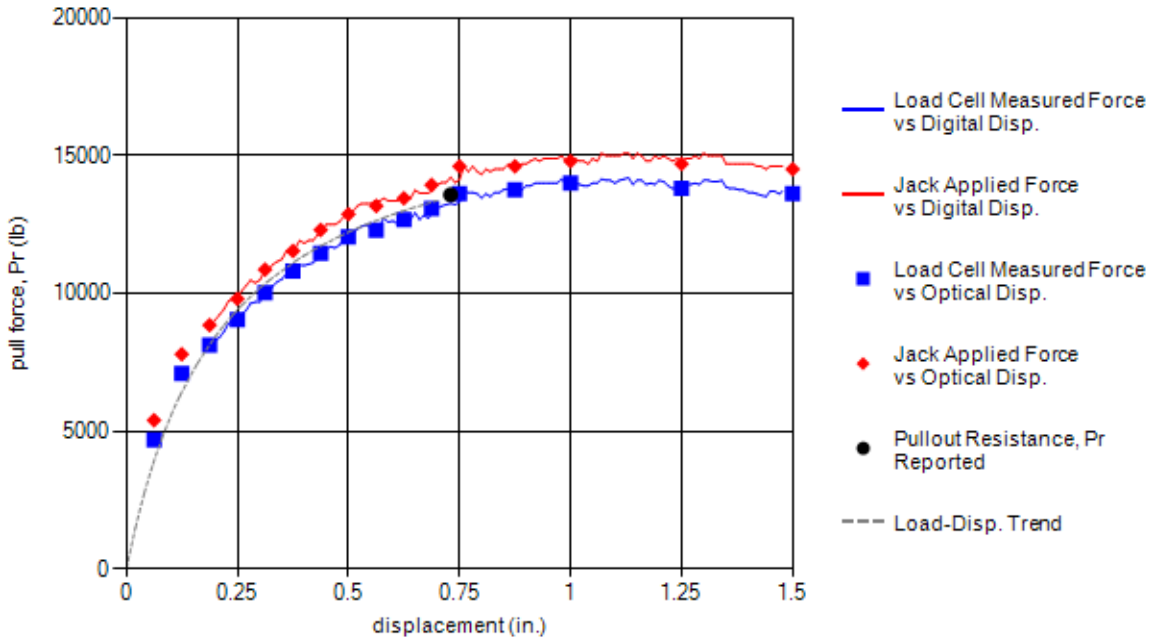
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.73	630	13568	5.20	**8.07**

Load-Displacement Curve



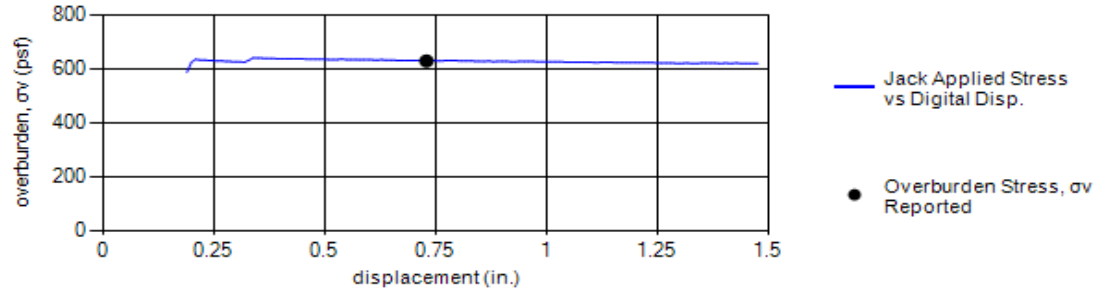
Comments

No earth pressure cell data.

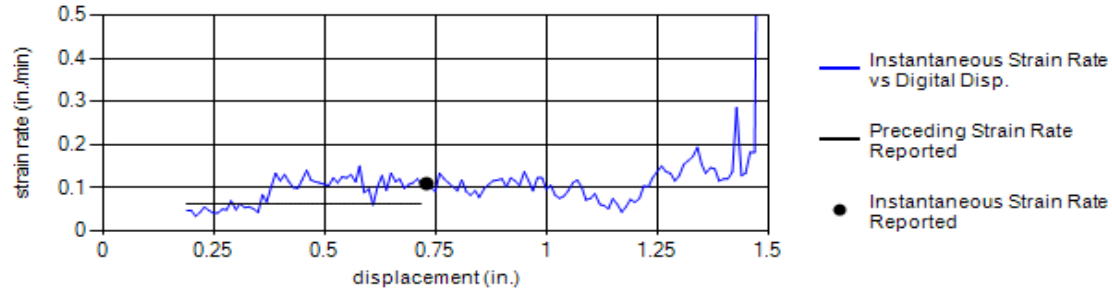
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	630



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

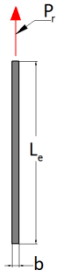
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 11:01:00 AM
Test Identification:	TS42.15-S-L8-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

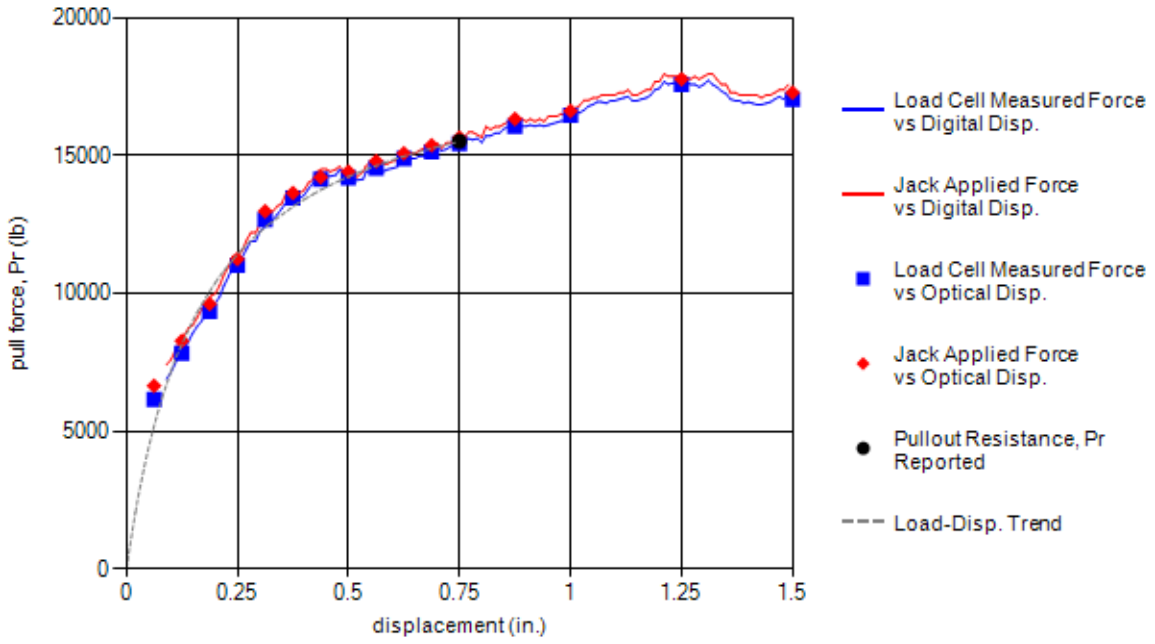
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1513	15508	12.50	**3.84**

Load-Displacement Curve



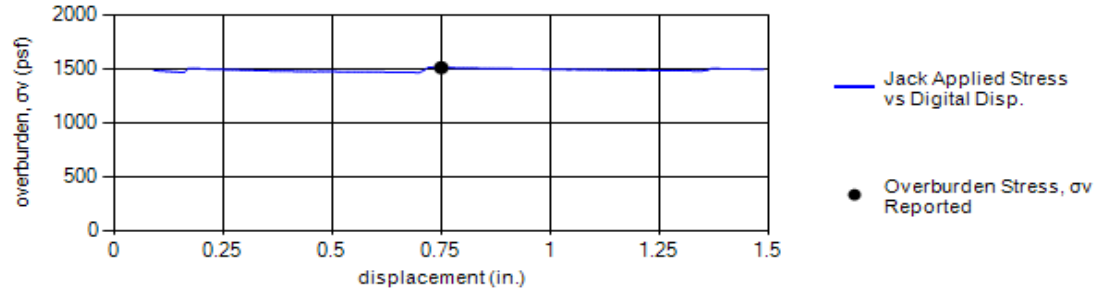
Comments

No earth pressure cell data.

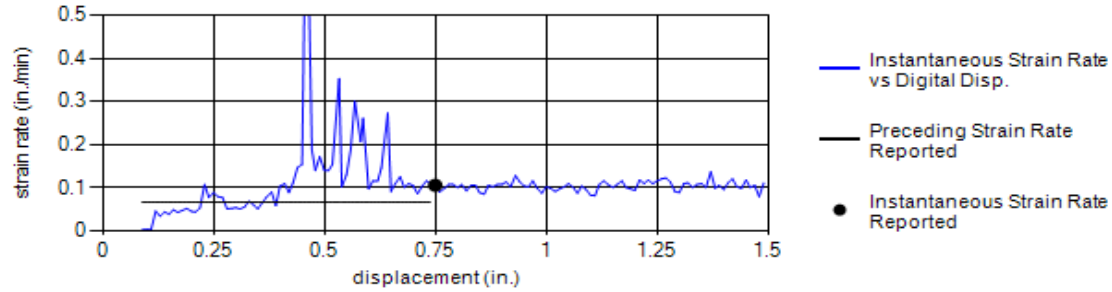
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1513



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

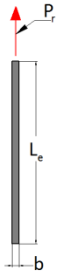
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/18/2012 1:52:00 PM
Test Identification:	TS42.16-S-L4-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

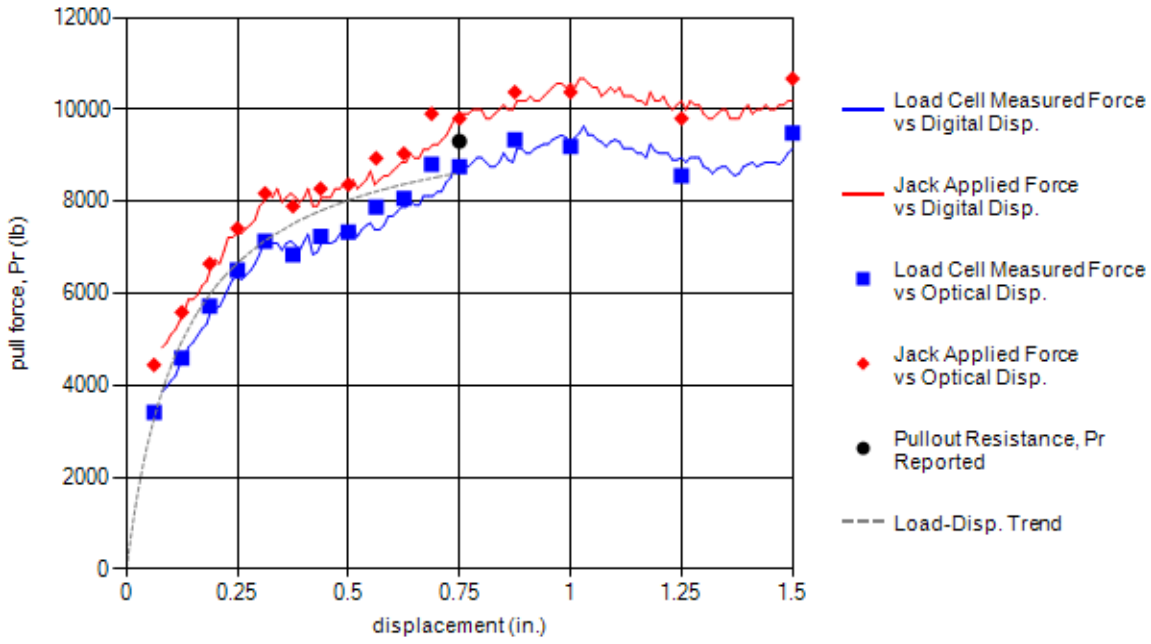
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	600	9306	4.90	**11.64**

Load-Displacement Curve



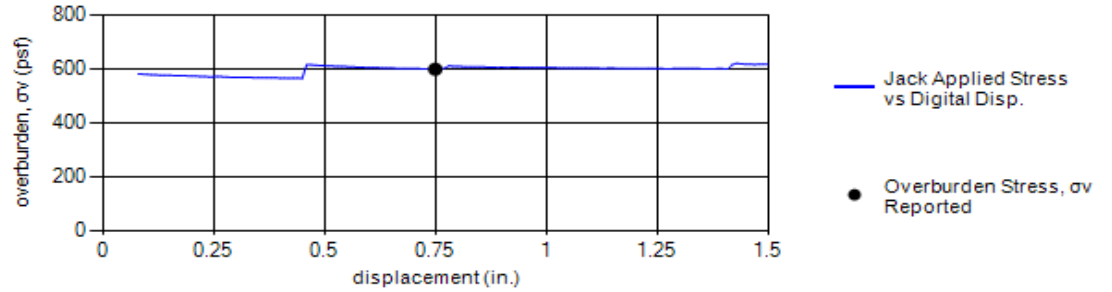
Comments

No earth pressure cell data.

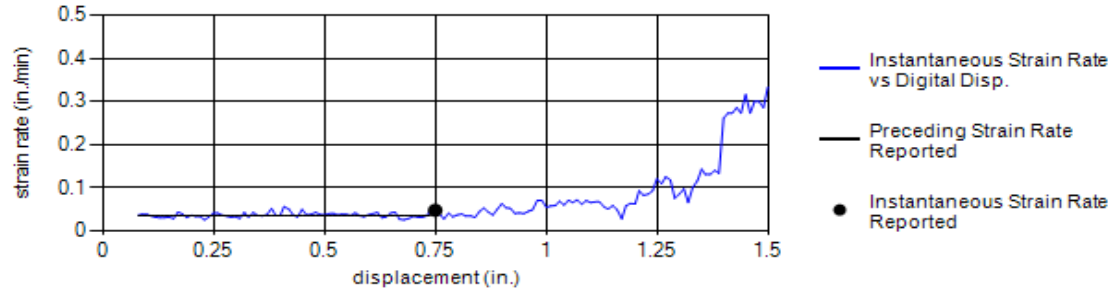
Personnel

Tested:	AJ AJ DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	600



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.04	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

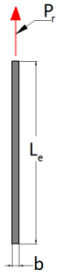
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/18/2012 3:20:00 PM
Test Identification:	TS42.17-S-L8-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

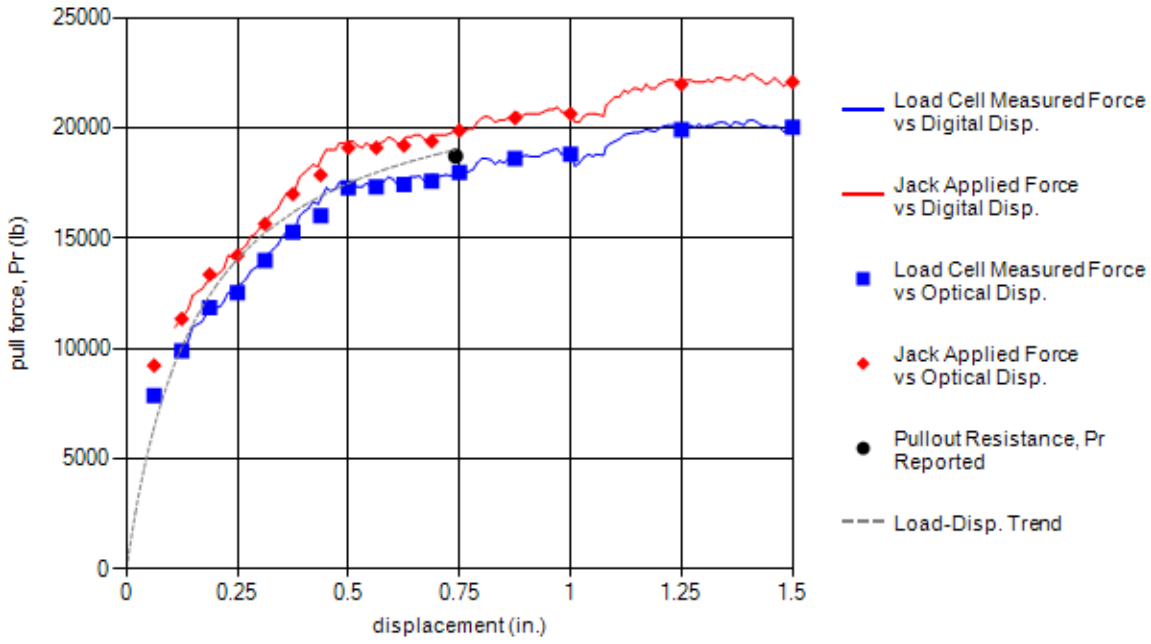
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.74	627	18716	5.20	**11.20**

Load-Displacement Curve



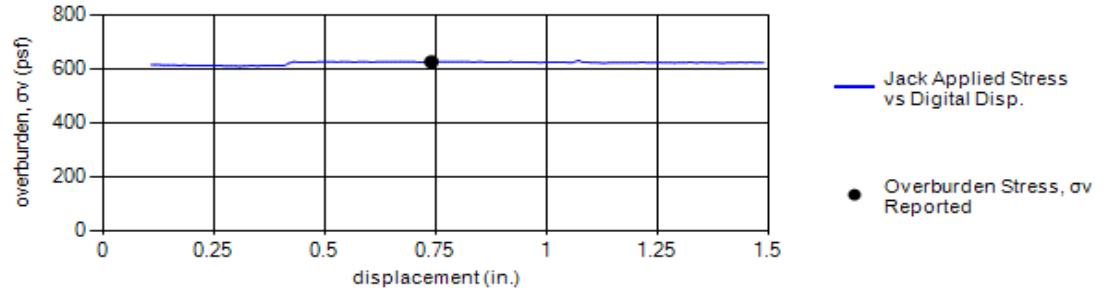
Comments

No earth pressure cell data.

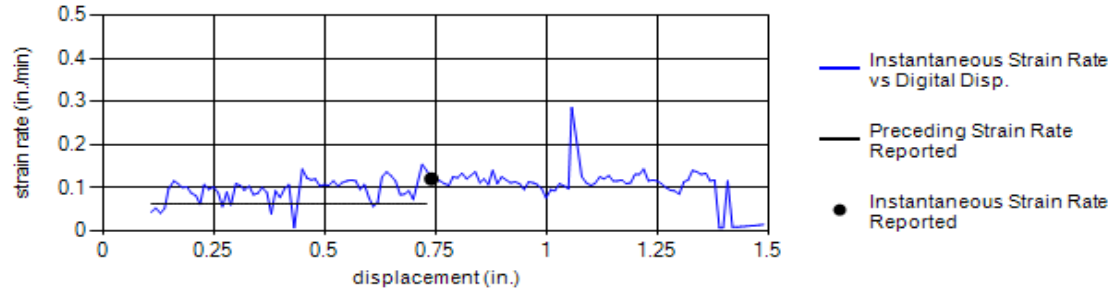
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

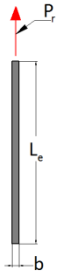
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2012 4:14:00 PM
Test Identification:	TS42.18-S-L8-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

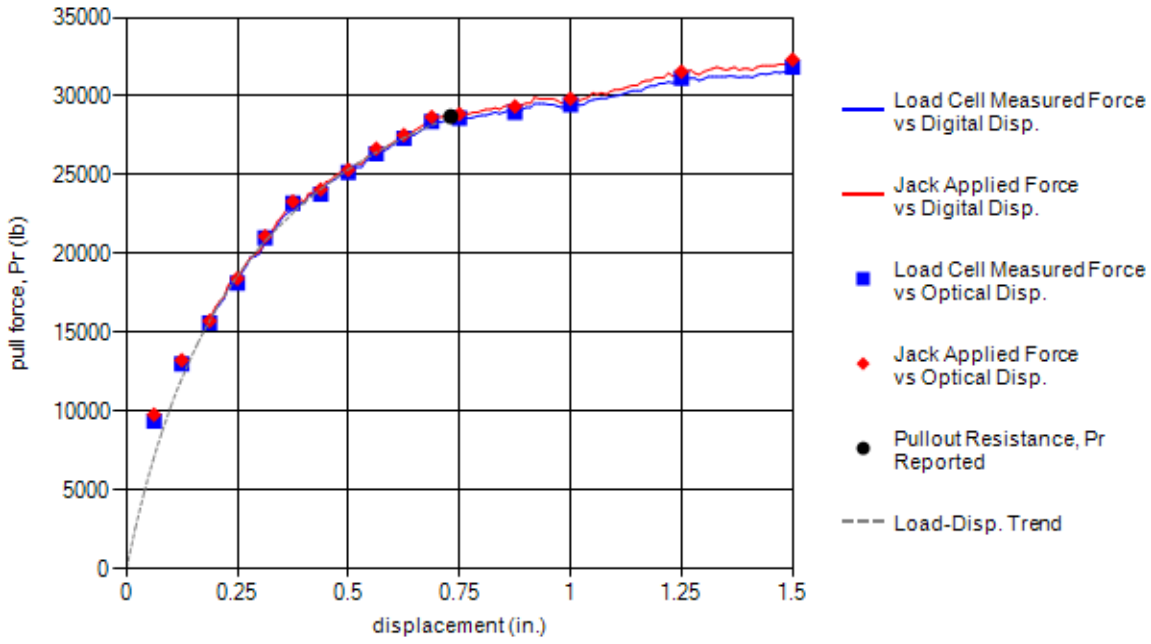
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	1497	28710	12.30	**7.19**

Load-Displacement Curve



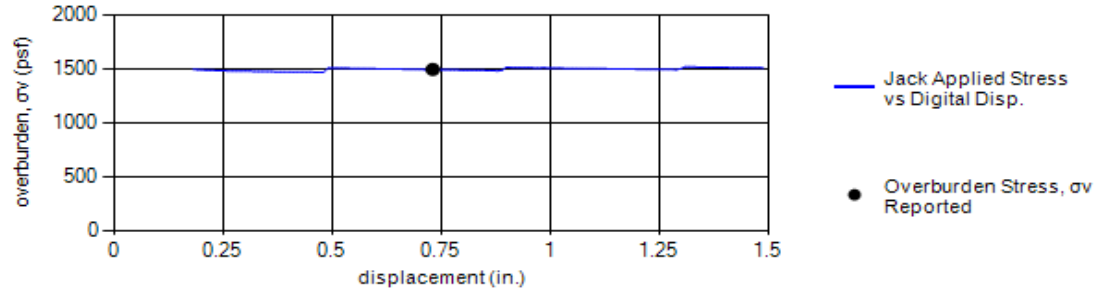
Comments

No earth pressure cell data.

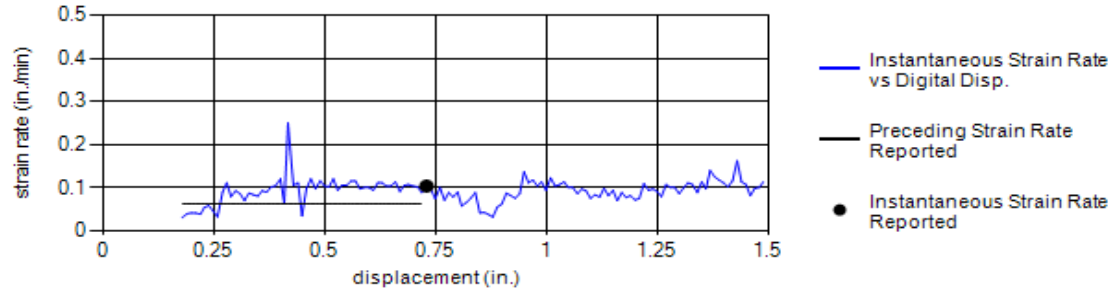
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1497



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

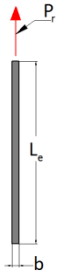
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/17/2012 3:51:00 PM
Test Identification:	TS42.19-S-L4-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

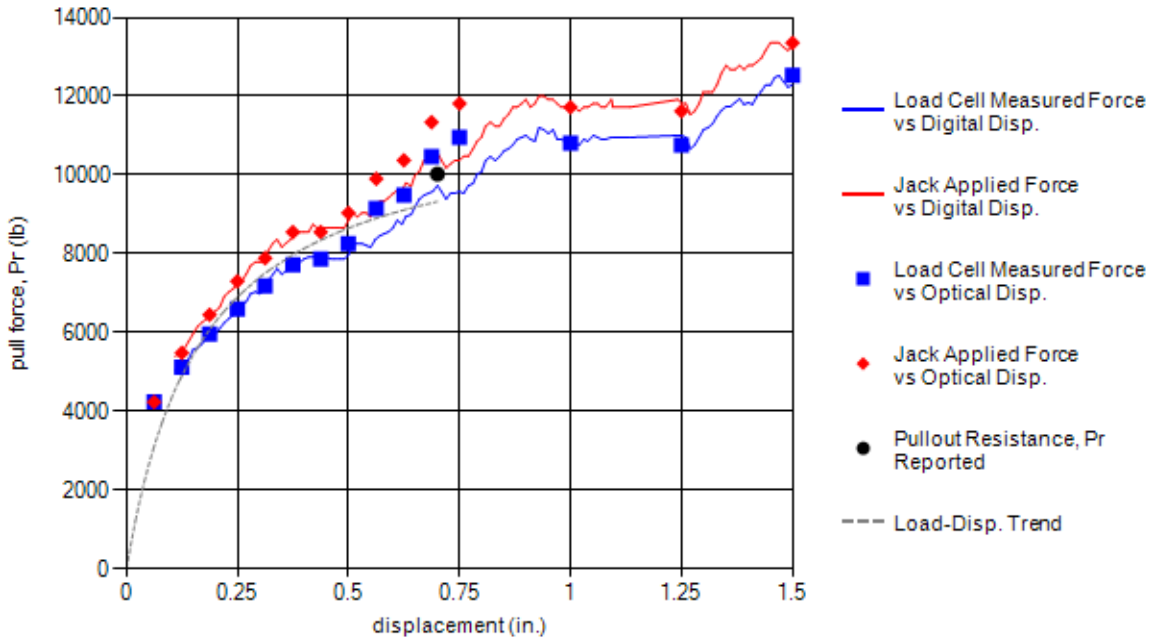
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.70	644	10025	4.80	**11.67**

Load-Displacement Curve



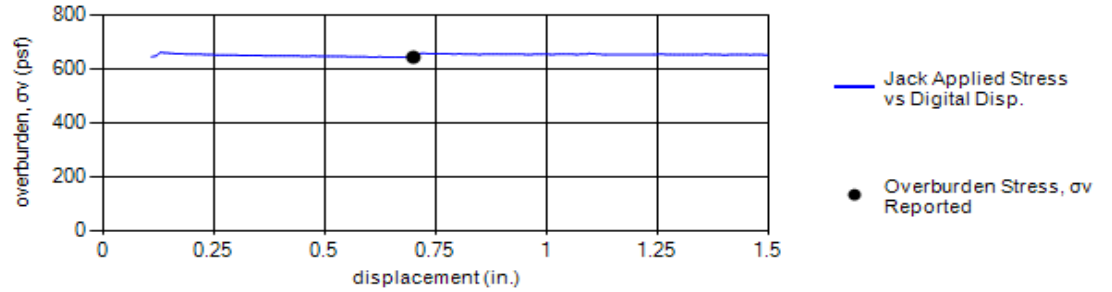
Comments

No earth pressure cell data.

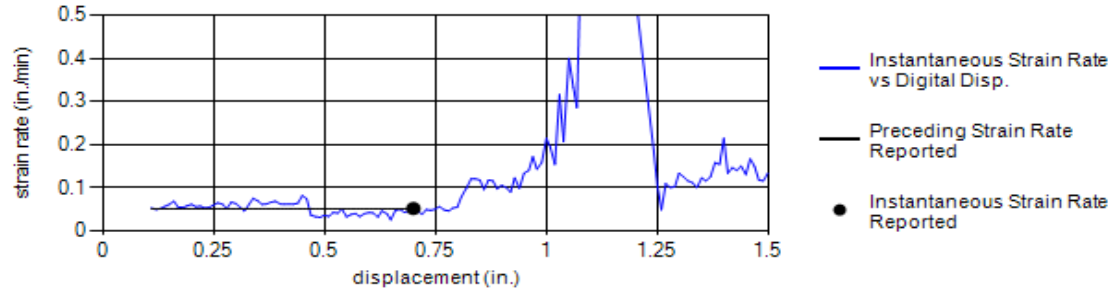
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	644



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

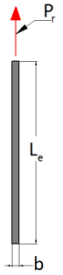
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/18/2012 12:58:00 PM
Test Identification:	TS42.20-S-L8-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

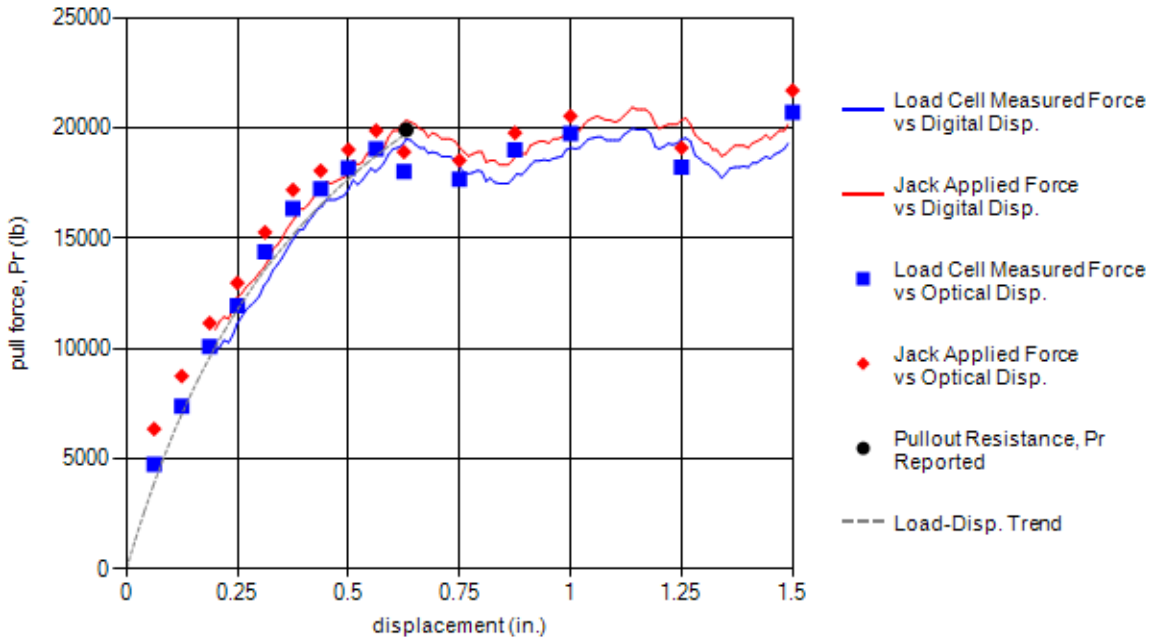
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.63	649	19910	4.90	**11.51**

Load-Displacement Curve



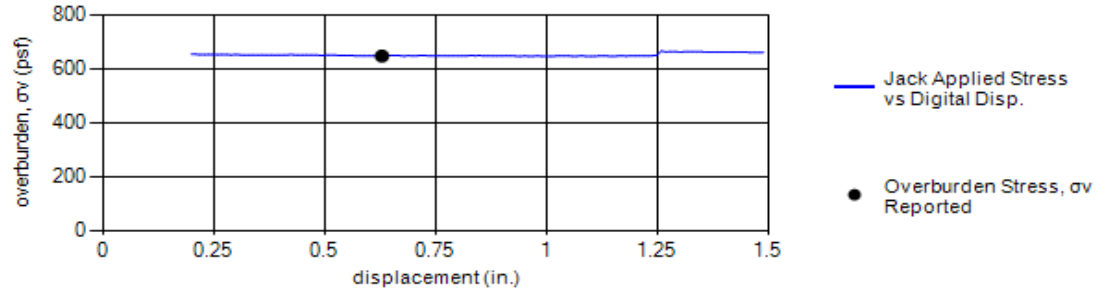
Comments

No earth pressure cell data.

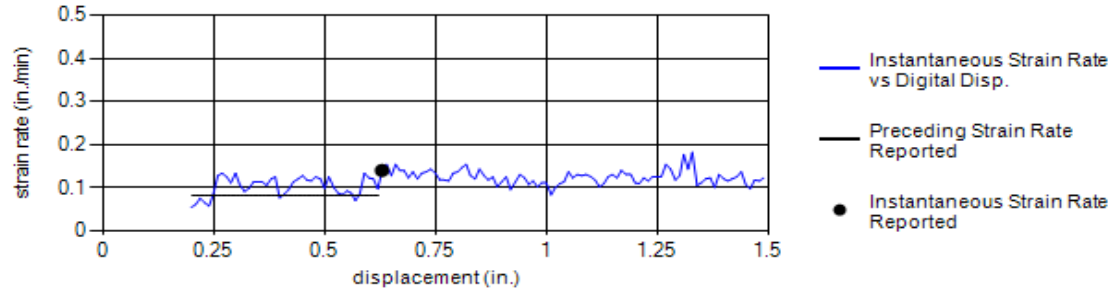
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	649



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.08	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

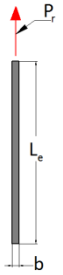
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/19/2012 2:41:00 PM
Test Identification:	TS42.21-S-L8-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

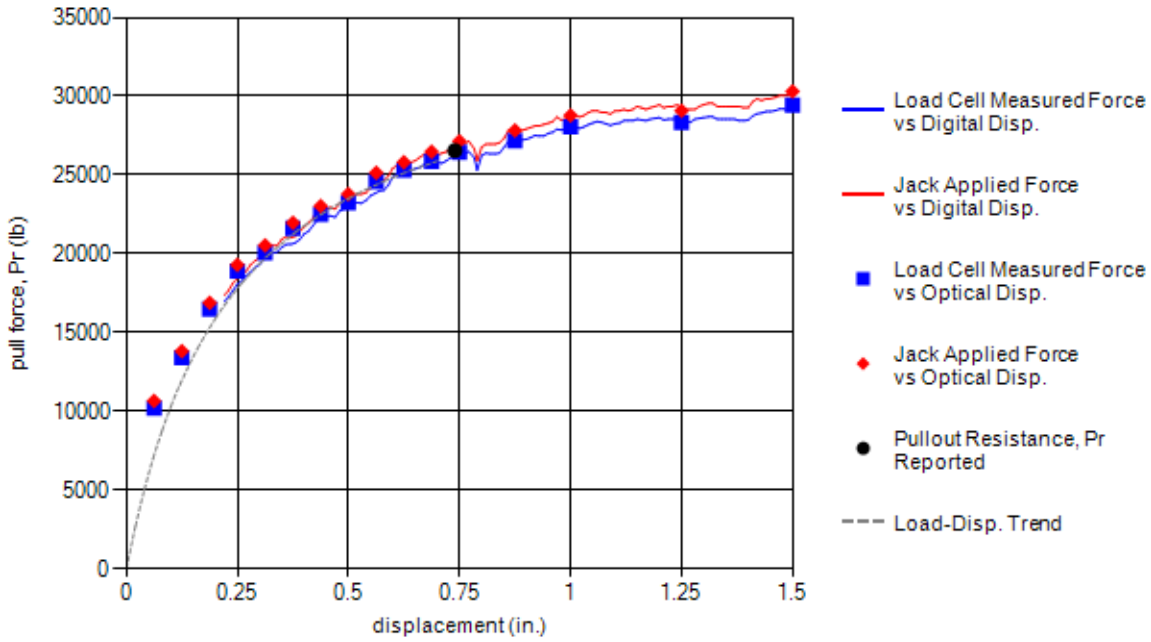
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	1499	26551	11.30	**6.64**

Load-Displacement Curve



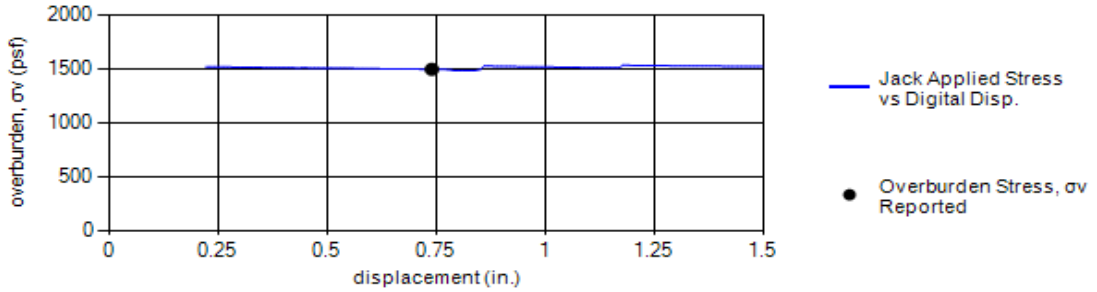
Comments

No earth pressure cell data.

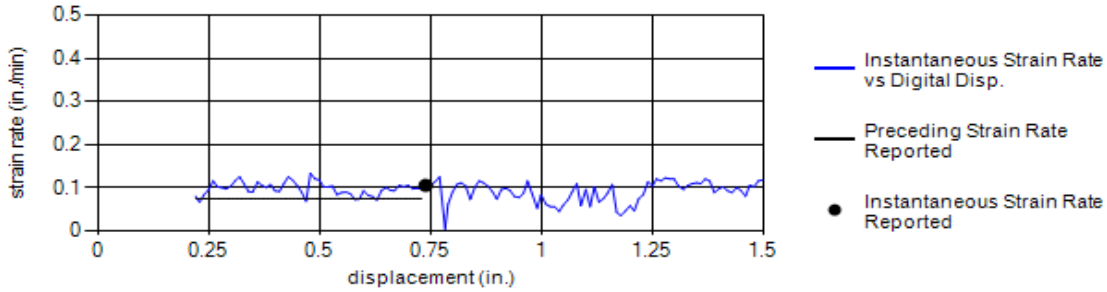
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1499



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

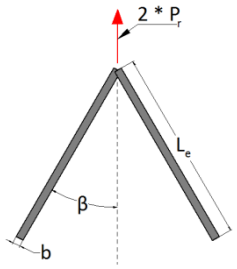
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/17/2012 1:24:00 PM
Test Identification:	TS43.13-S-L8-ß15°-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	15

Backfill Material

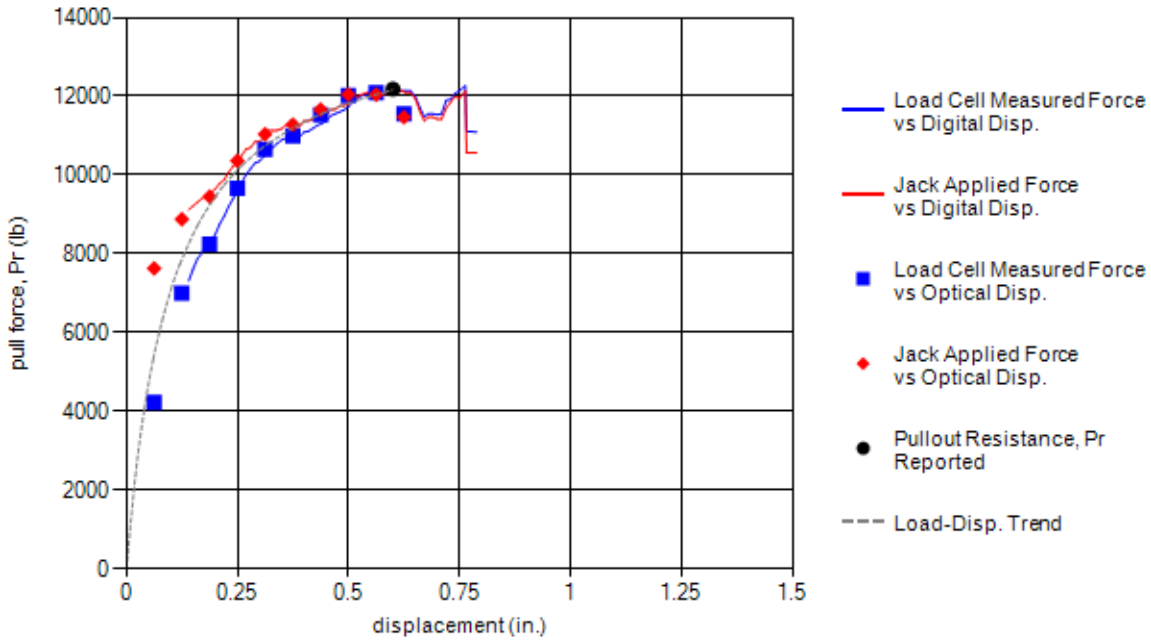
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.60	607	12181	4.90	**7.52**

Load-Displacement Curve



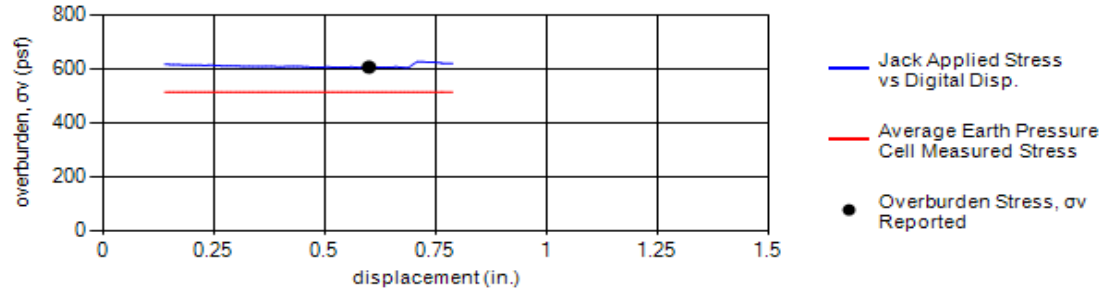
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

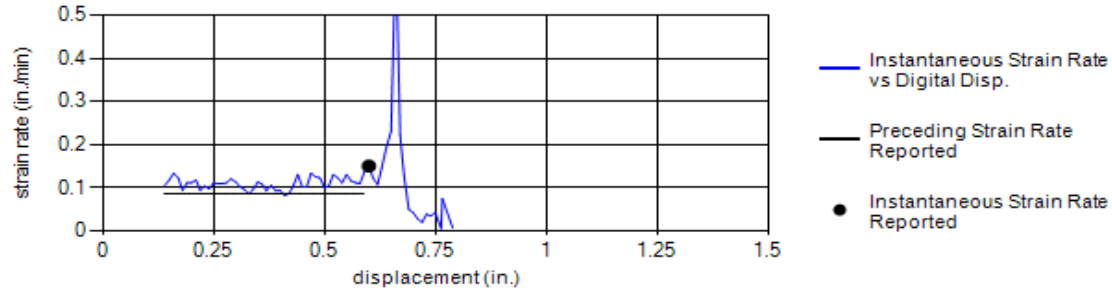
Personnel

Tested:	TW TW ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
434	628	254	474	784	515	1.73	608



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

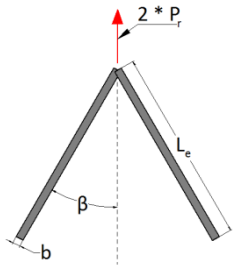
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/13/2012 1:55:00 PM
Test Identification:	TS43.16-S-L8-ß15°-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

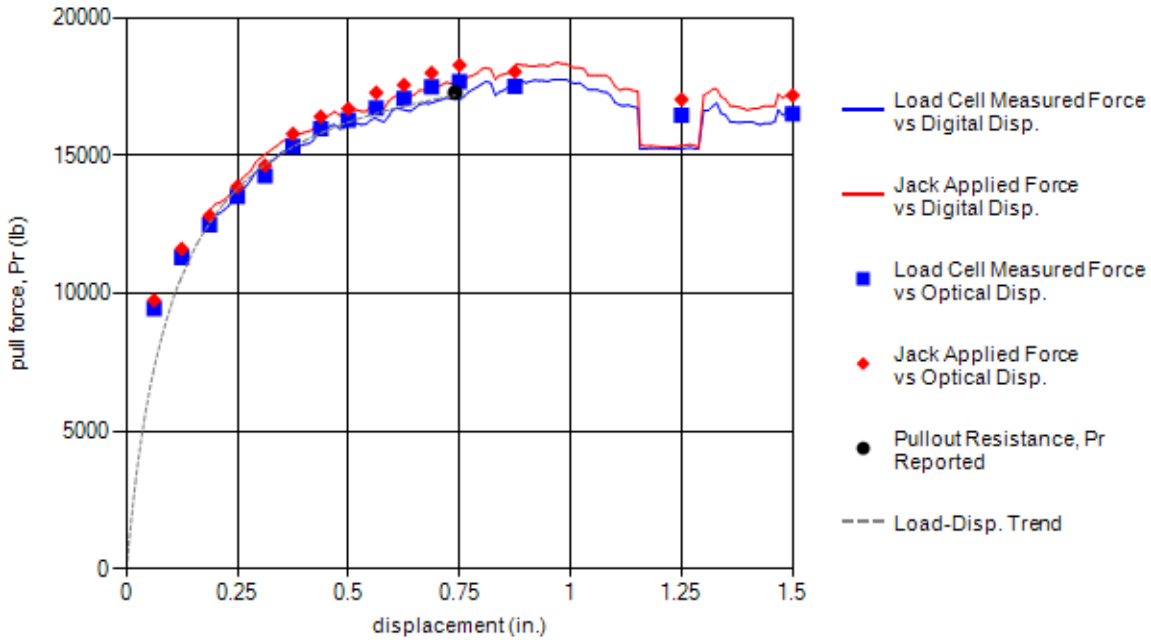
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	566	17268	4.70	**11.44**

Load-Displacement Curve



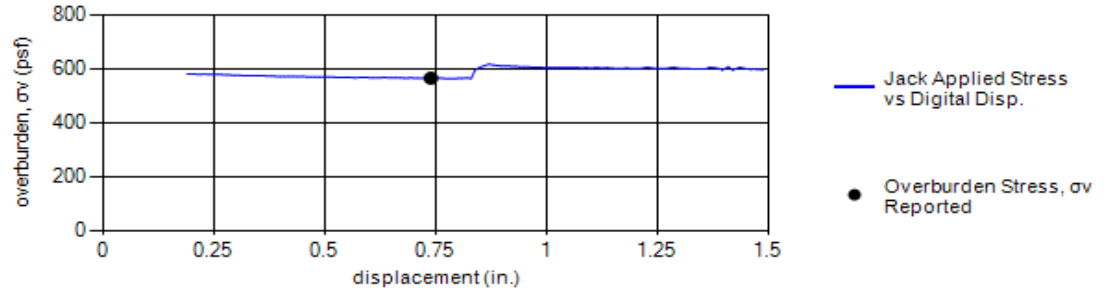
Comments

No earth pressure cell data. Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

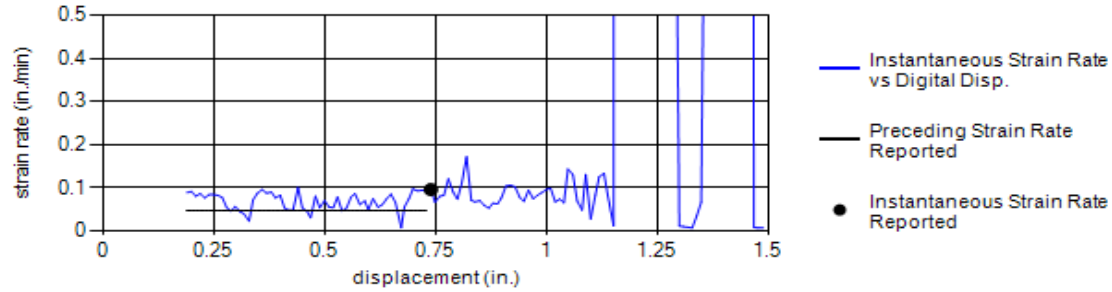
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	566



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

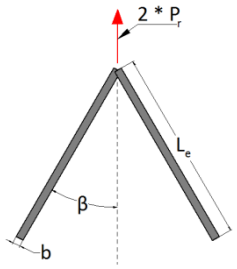
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/10/2012 4:17:00 PM
Test Identification:	TS43.19-S-L8-ß15°-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	15

Backfill Material

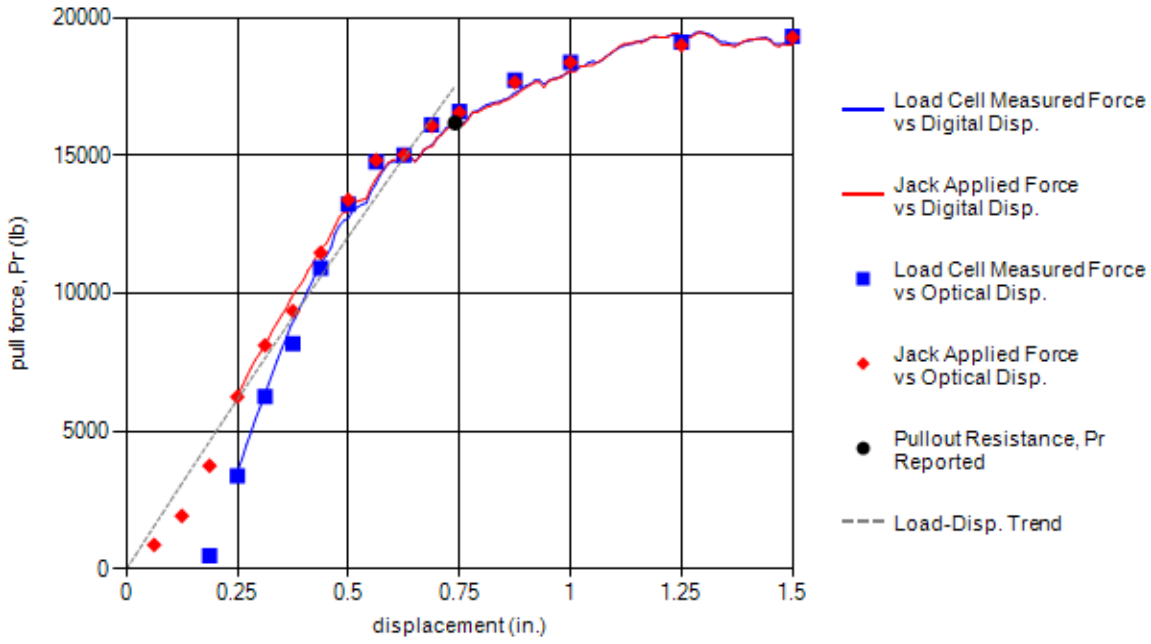
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	625	16178	4.90	**9.70**

Load-Displacement Curve



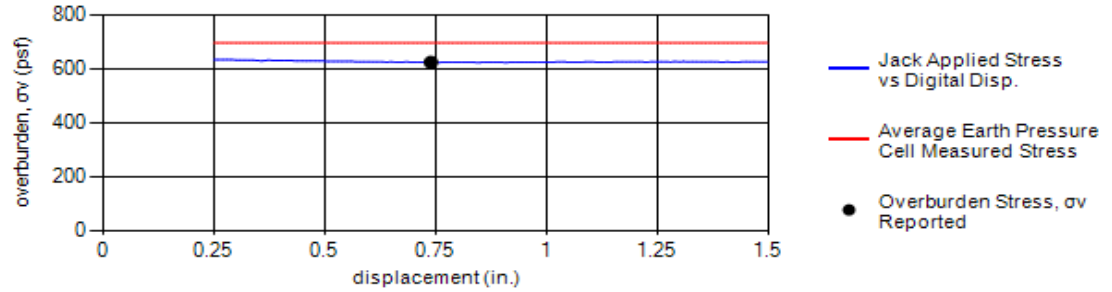
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

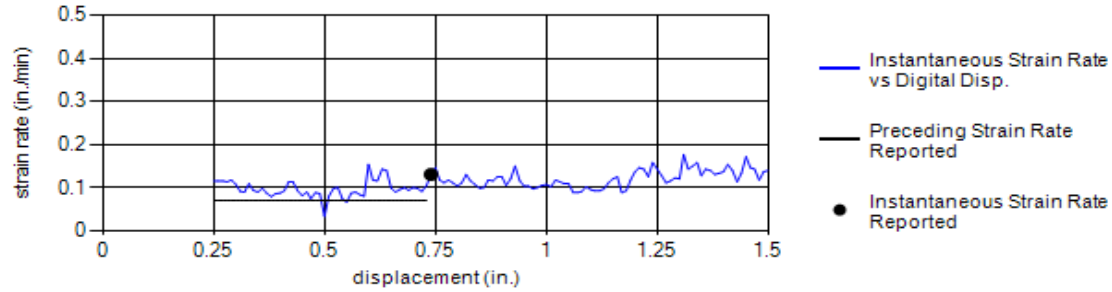
Personnel

Tested:	TW TW ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
506	830	581	568	998	697	1.60	625



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.07	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

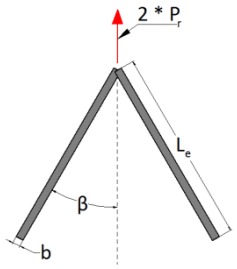
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/5/2012 4:02:00 PM
Test Identification:	TS44.13-S-L8-ß15°-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	15

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

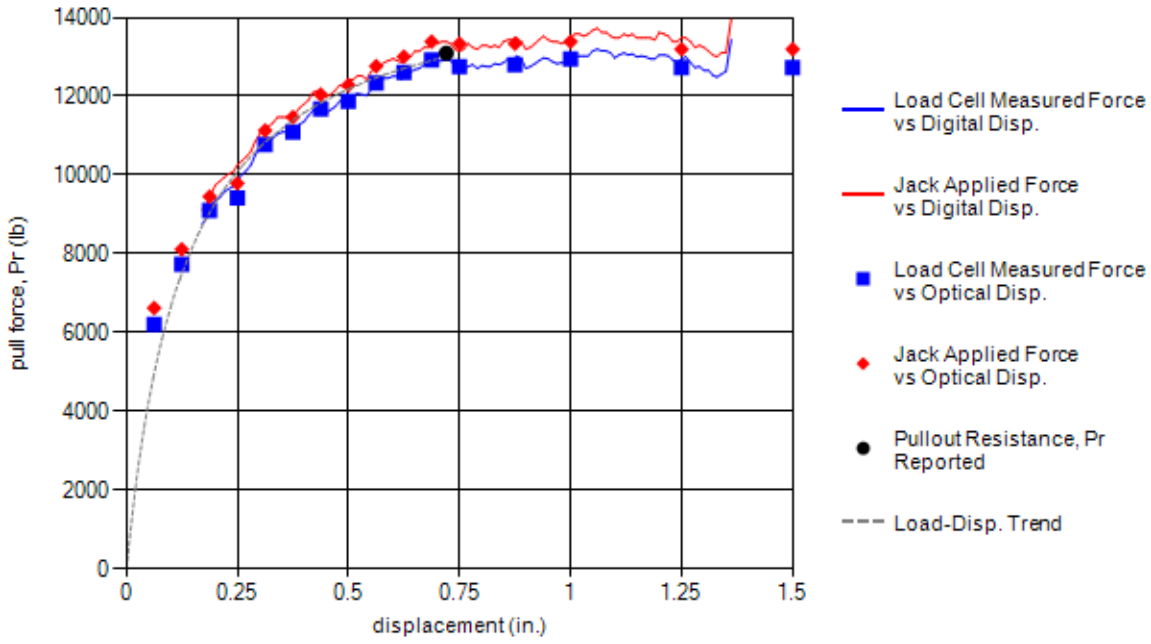
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	1509	13091	12.20	**3.25**

Load-Displacement Curve



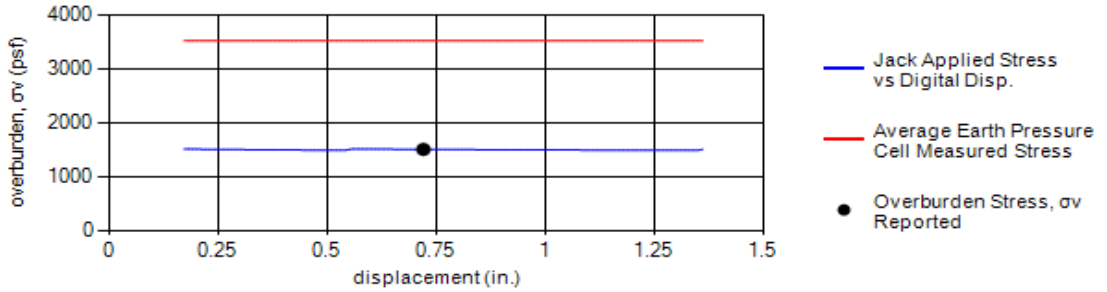
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

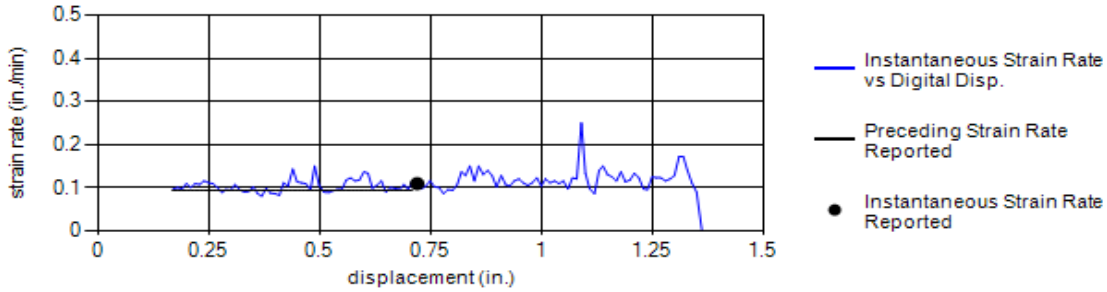
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3189	4000	3435	3407	3589	3524	2.47	1509



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

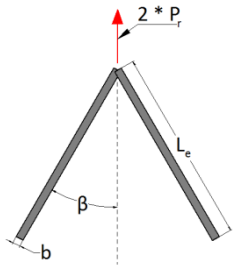
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/2/2012 3:00:00 PM
Test Identification:	TS44.16-S-L8-ß15°-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	15

Backfill Material

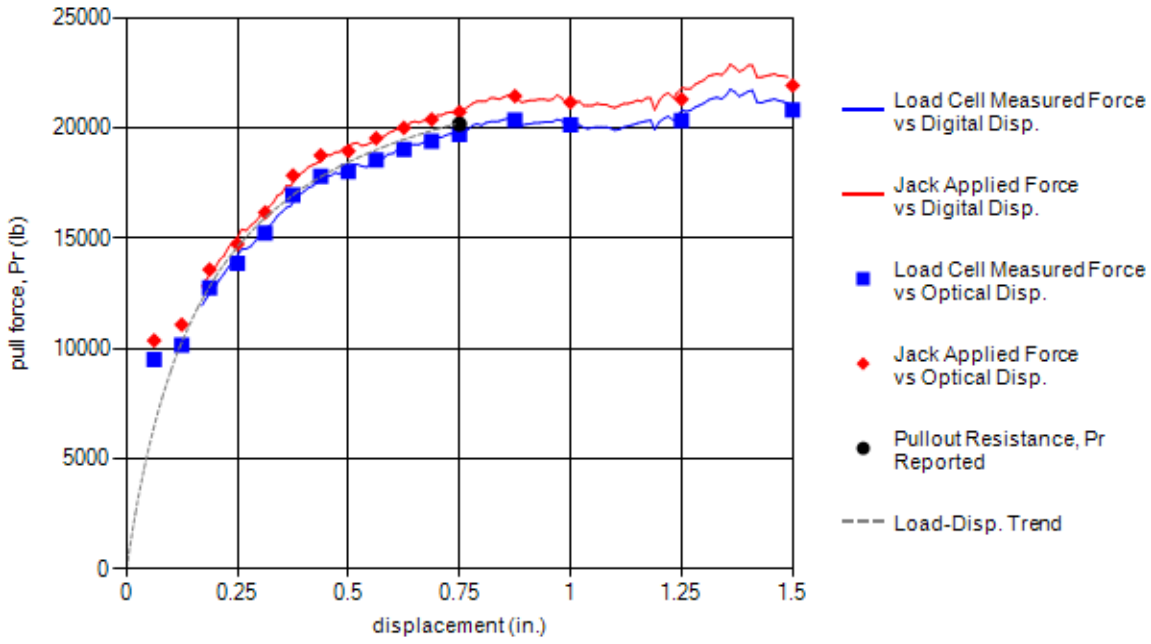
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1574	20158	12.60	**4.80**

Load-Displacement Curve



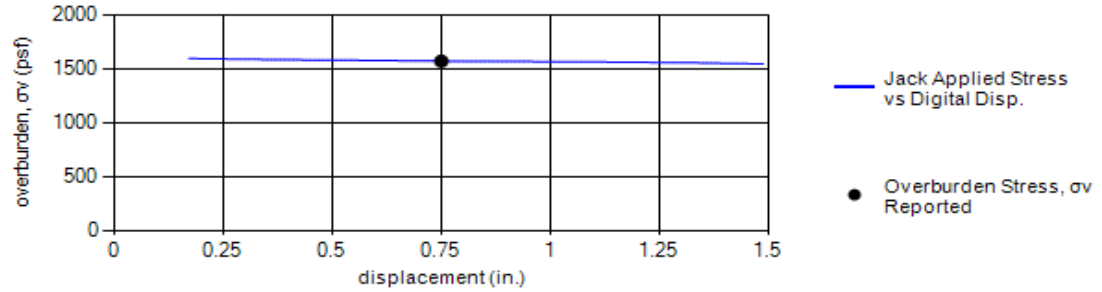
Comments

No earth pressure cell data. Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

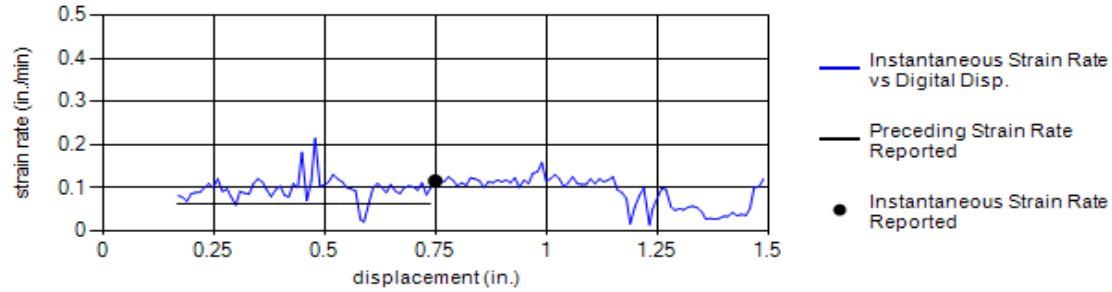
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1574



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

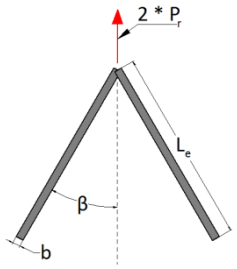
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/2/2012 1:43:00 PM
Test Identification:	TS44.19-S-L8-ß15°-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	15

Backfill Material

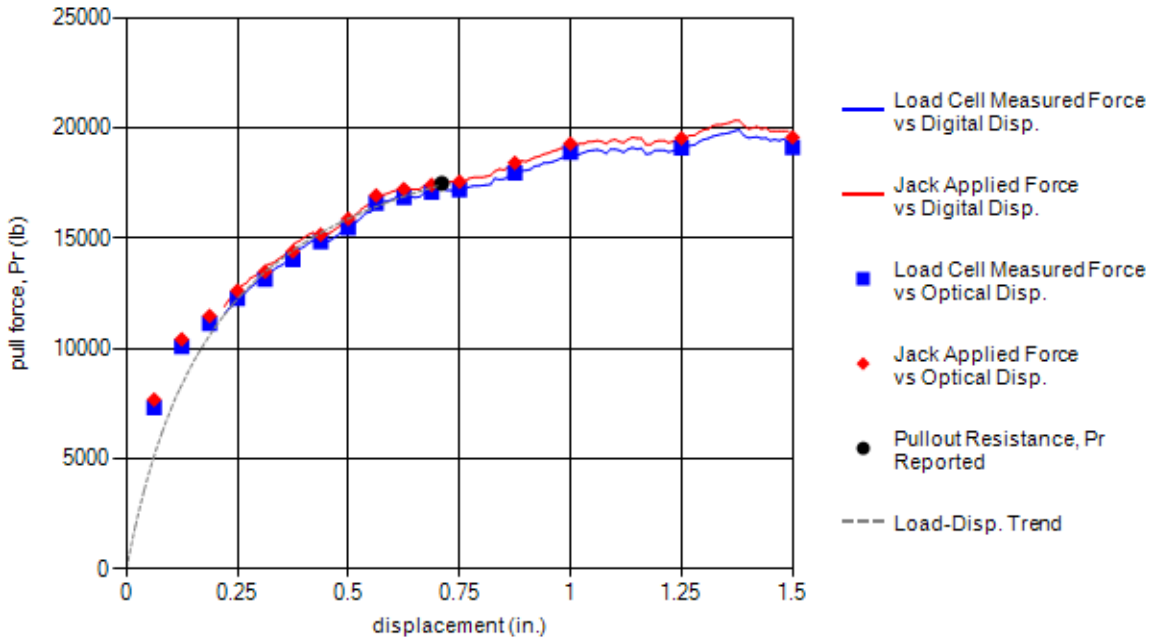
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.71	1526	17480	11.80	**4.30**

Load-Displacement Curve



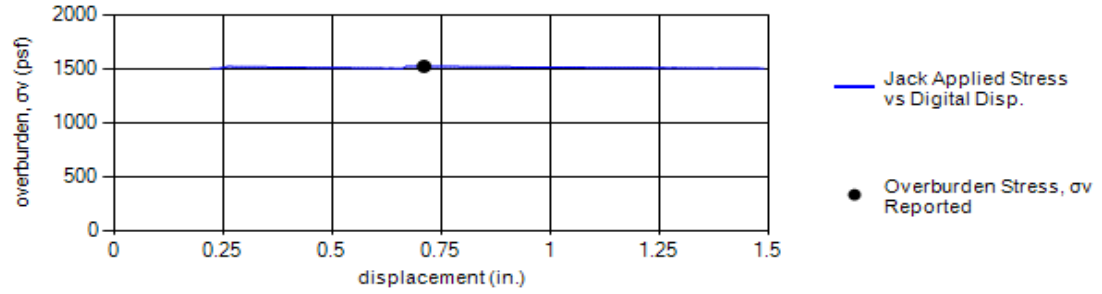
Comments

No earth pressure cell data. Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

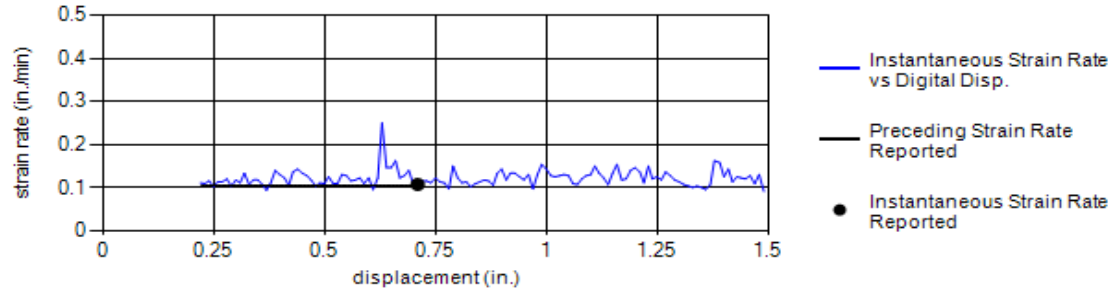
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.10	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

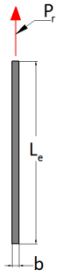
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 2:46:00 PM
Test Identification:	TS45.13-S-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

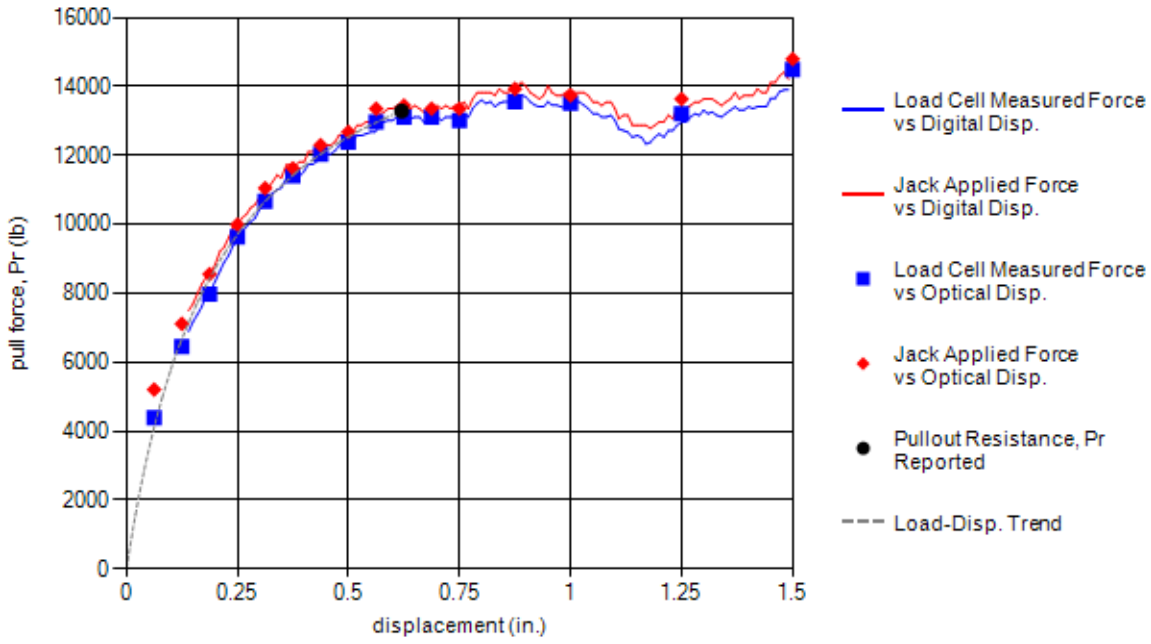
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.62	640	13281	5.30	**5.19**

Load-Displacement Curve

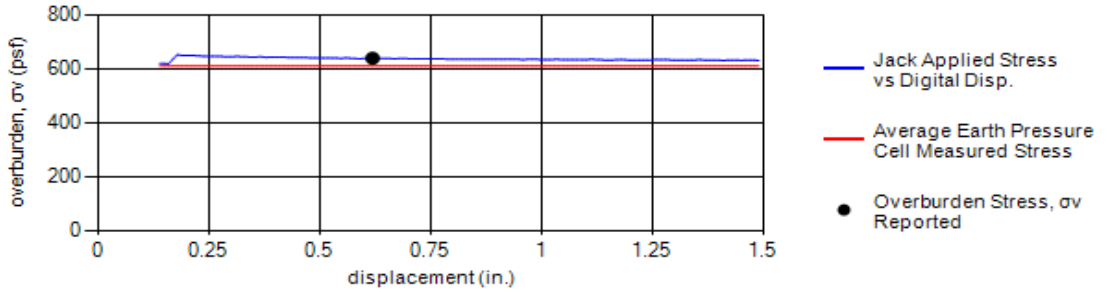


Comments

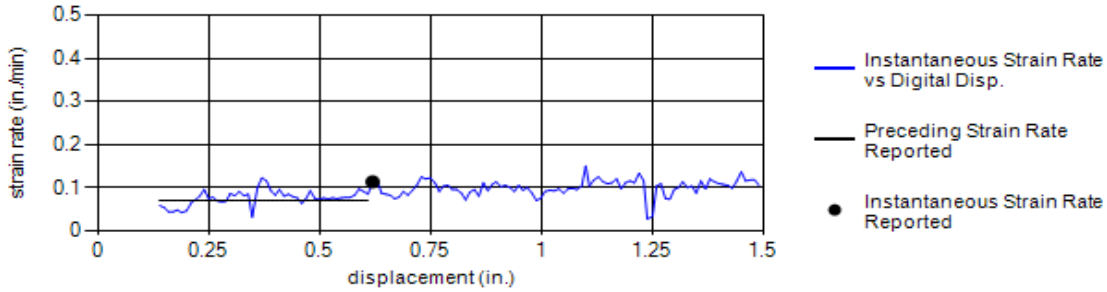
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
407	567	712	645	724	611	1.91	640



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

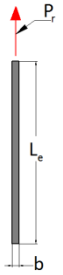
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 2:09:00 PM
Test Identification:	TS45.14-S-L12-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

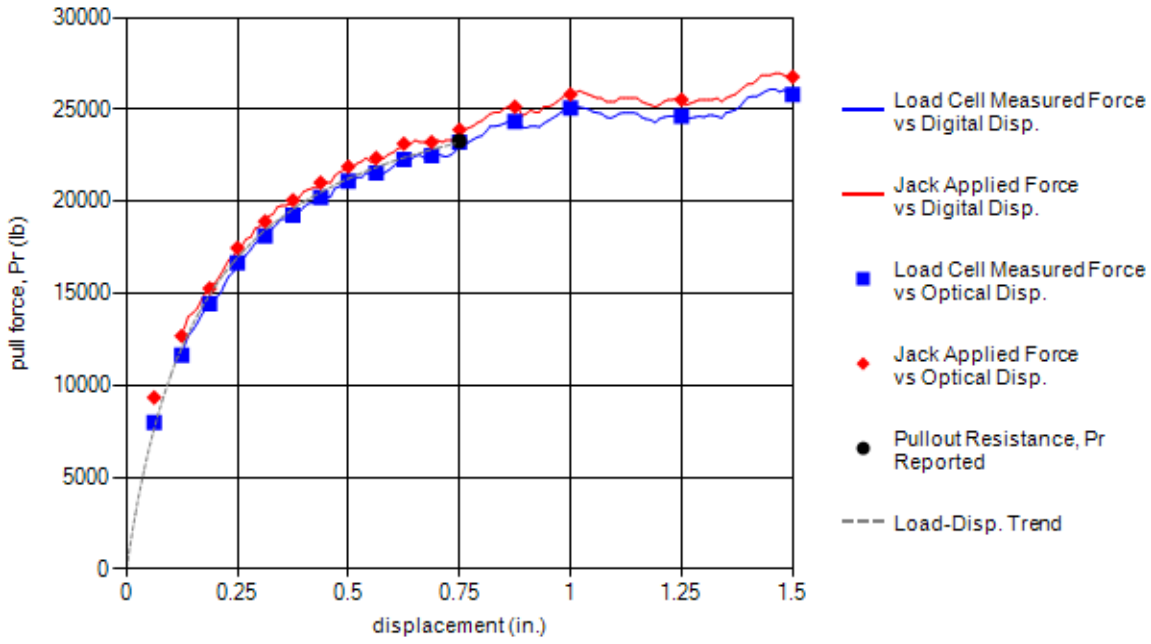
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	625	23271	5.10	**9.31**

Load-Displacement Curve

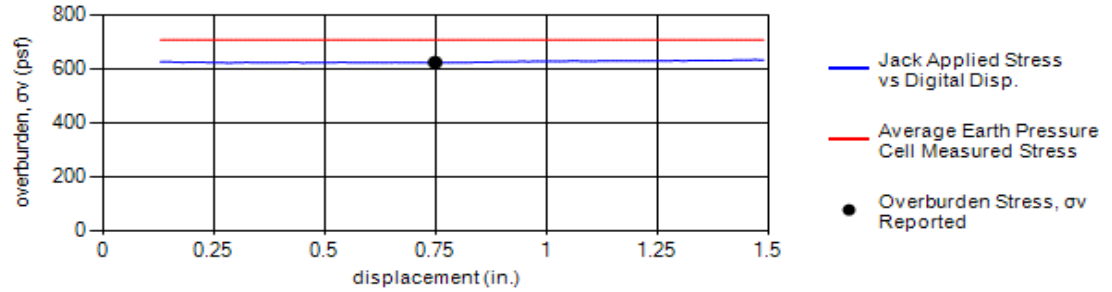


Comments

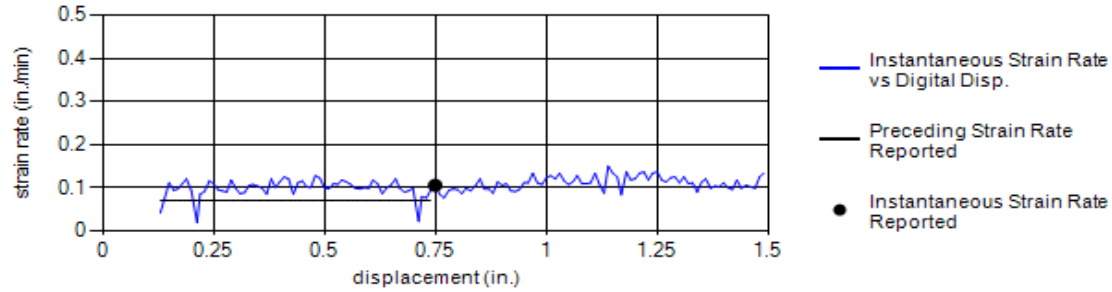
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
449	633	662	751	1048	709	2.16	625



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

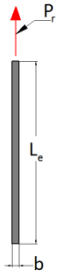
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 10:13:00 AM
Test Identification:	TS45.15-S-L12-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

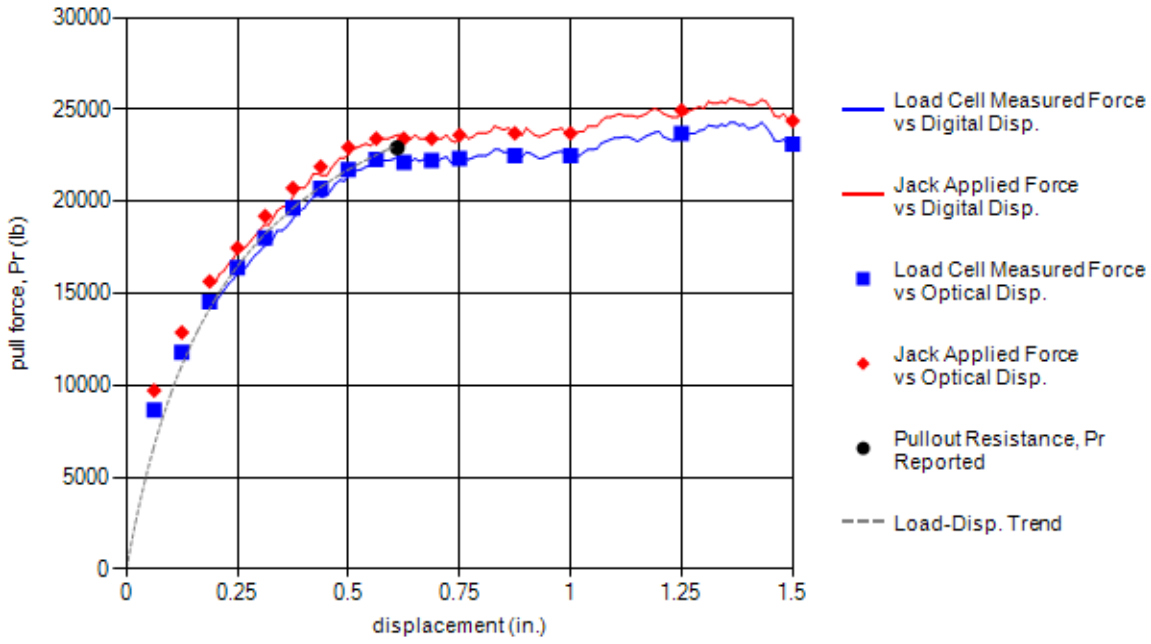
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.61	597	22908	5.10	**9.59**

Load-Displacement Curve

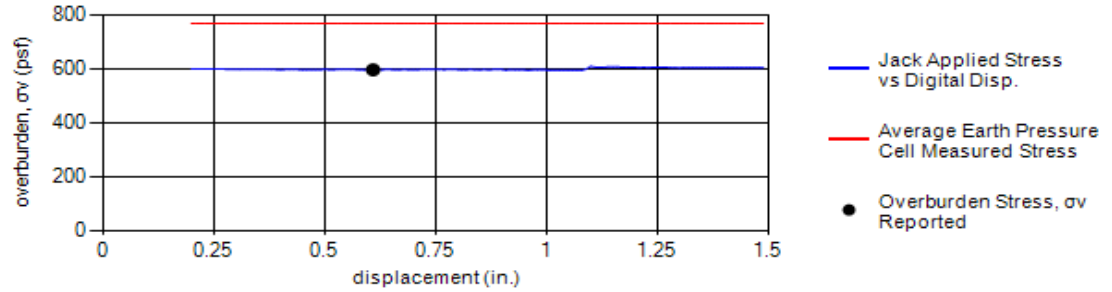


Comments

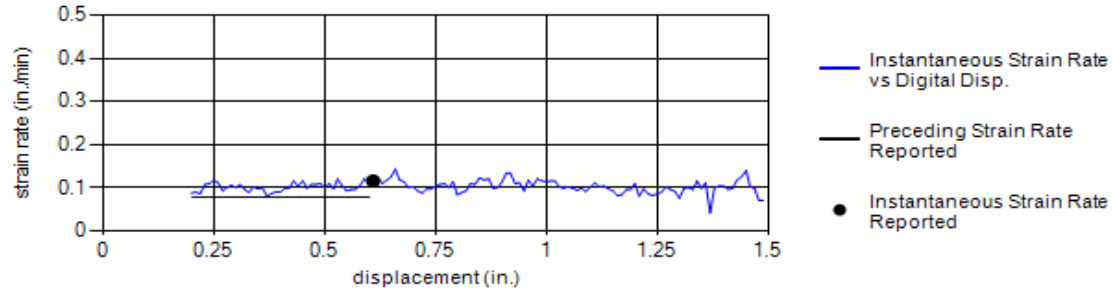
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
510	610	762	831	1136	770	1.23	597



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

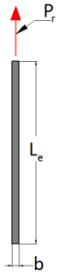
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 11:56:00 AM
Test Identification:	TS46.13-S-L4-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

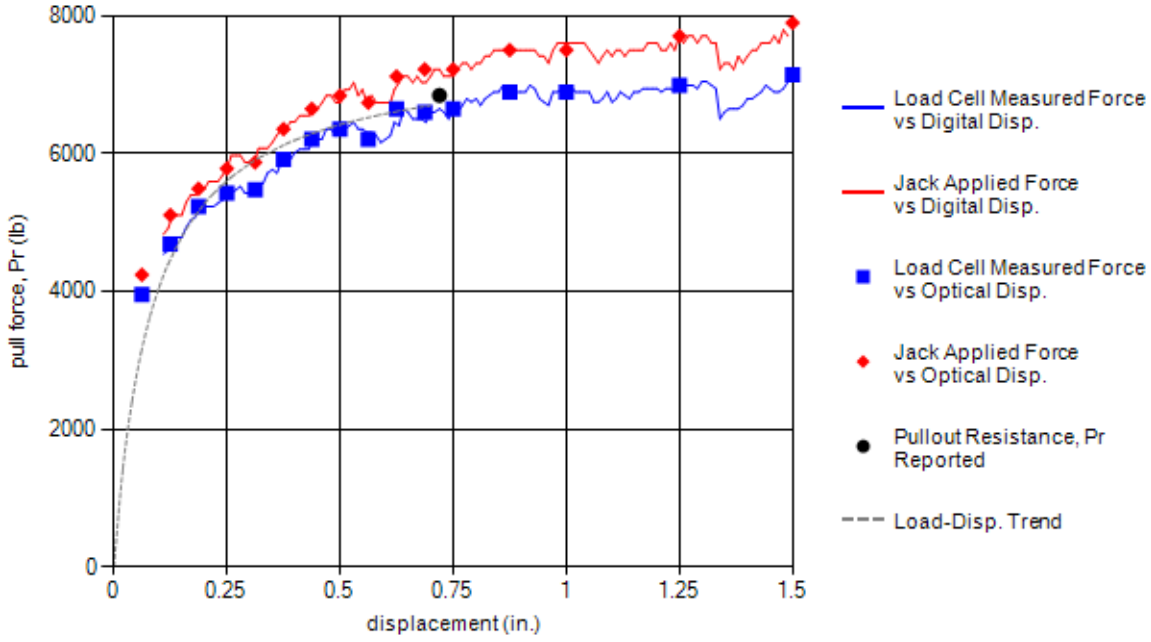
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	1459	6841	12.20	**3.52**

Load-Displacement Curve

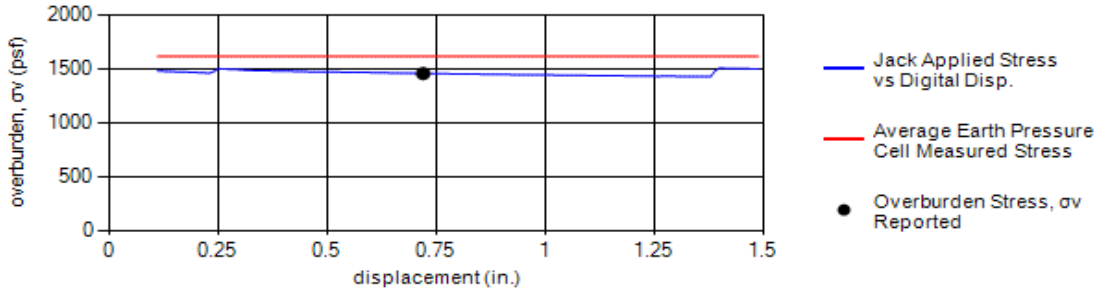


Comments

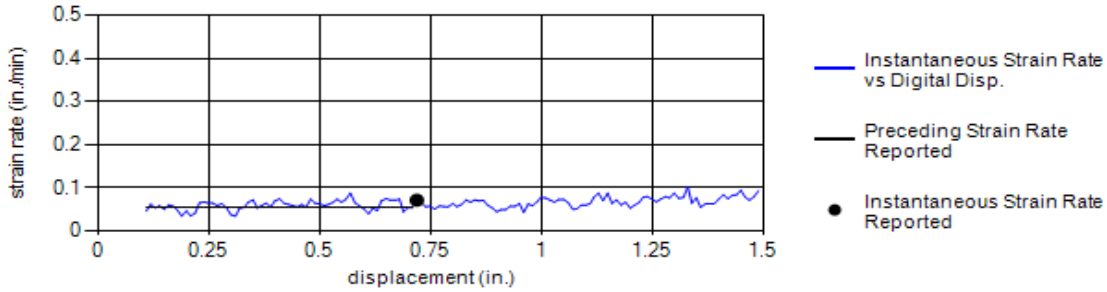
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1864	1676	1220	1670	1662	1618	1.12	1459



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

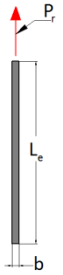
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/2/2012 10:30:00 AM
Test Identification:	TS46.14-S-L4-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

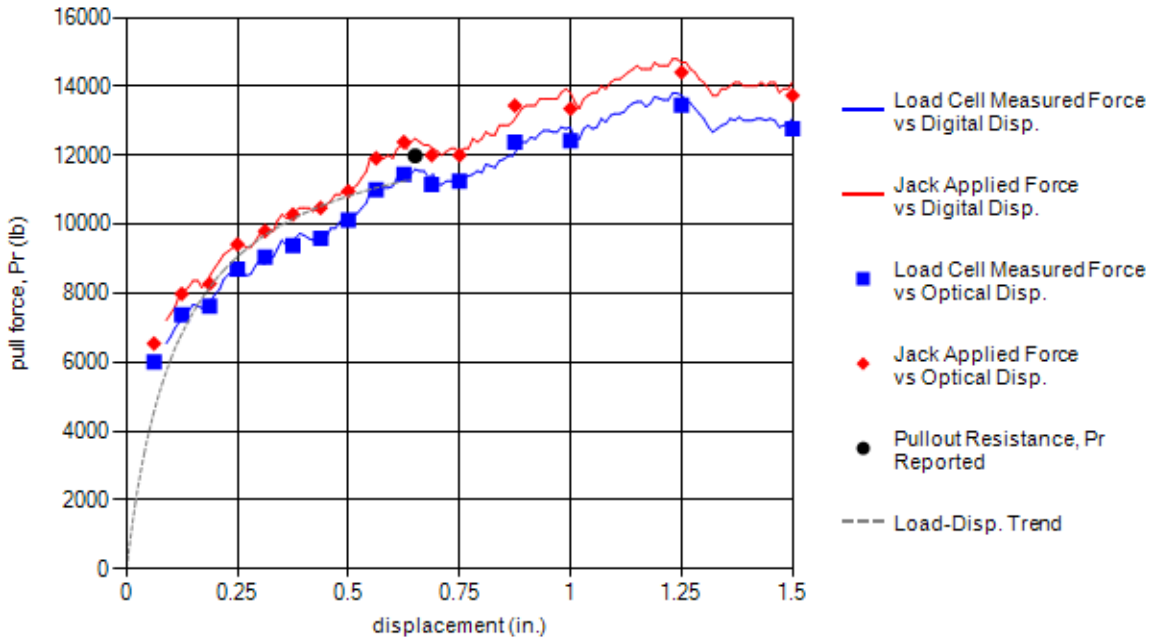
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.65	2490	11986	20.80	**3.61**

Load-Displacement Curve

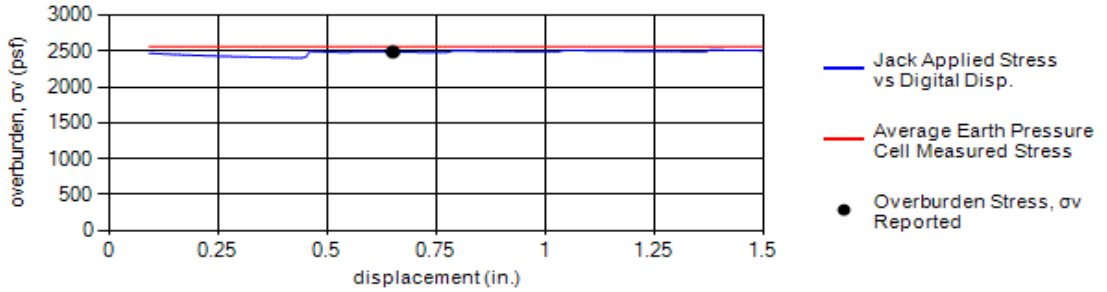


Comments

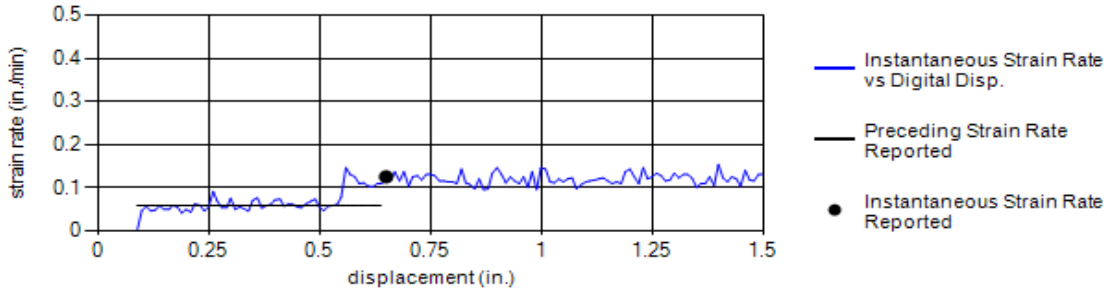
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2738	2812	2069	2610	2587	2563	1.03	2489



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

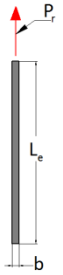
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/29/2012 2:55:00 PM
Test Identification:	TS46.19-S-L4-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

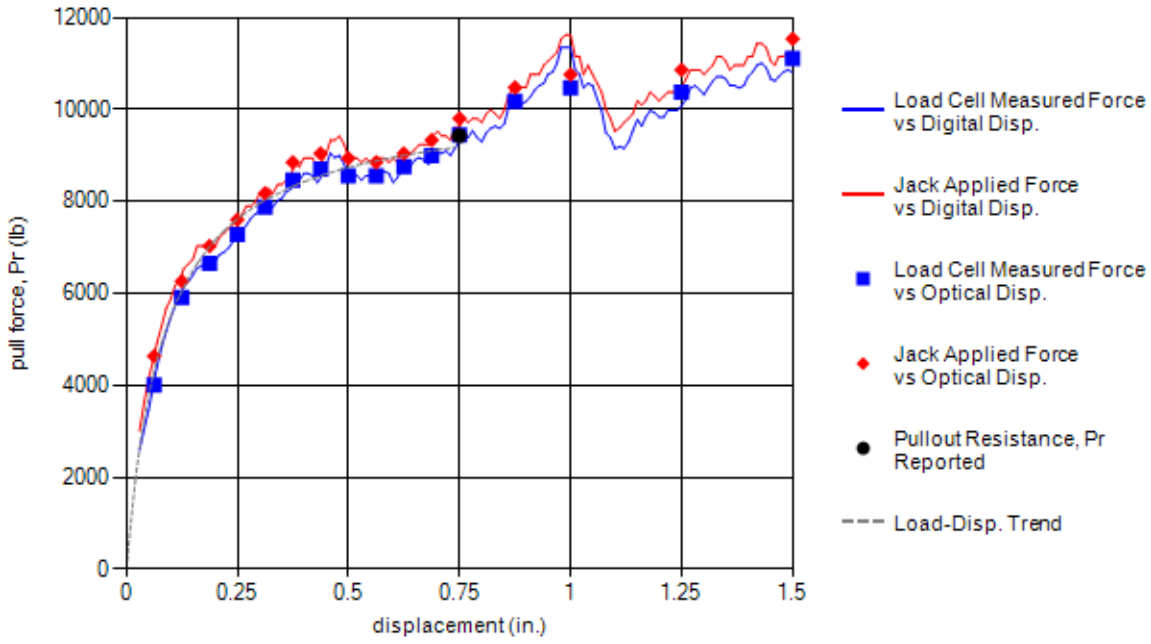
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1480	9427	12.30	**4.78**

Load-Displacement Curve

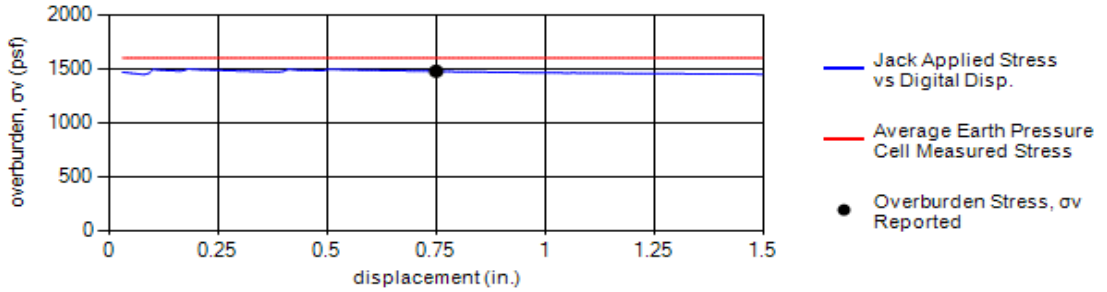


Comments

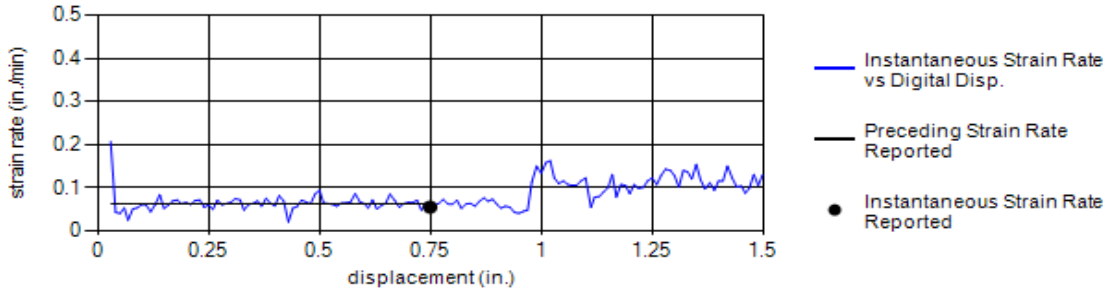
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1986	1540	1193	1688	1618	1605	1.07	1480



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

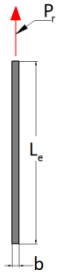
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 1:15:00 PM
Test Identification:	TS46.20-S-L4-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

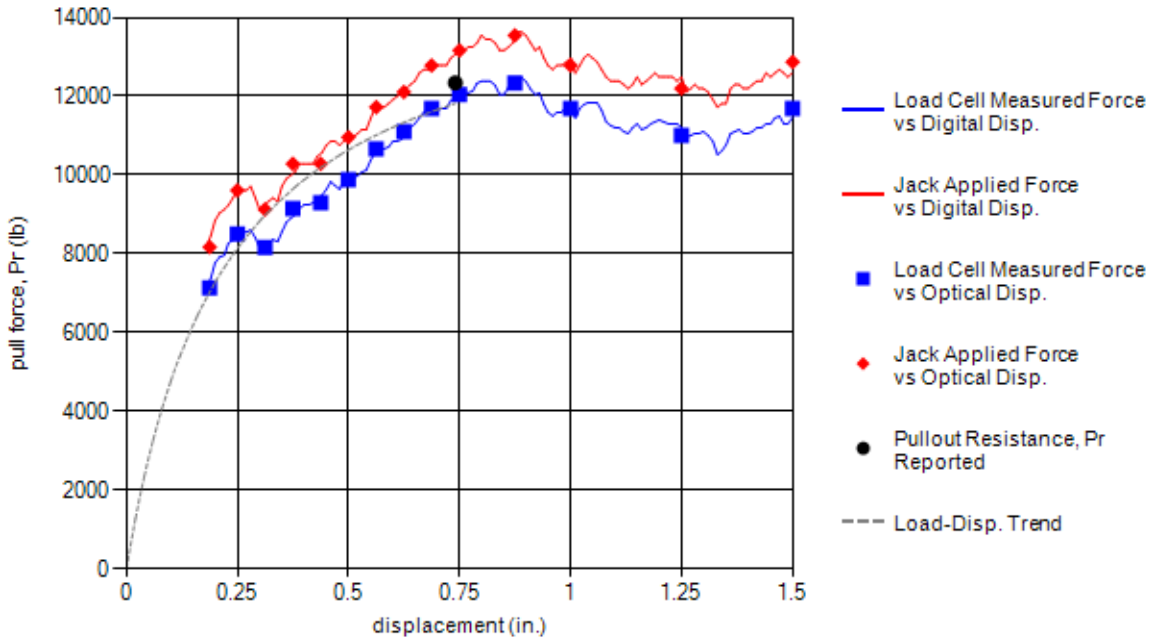
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2448	12340	20.40	**3.78**

Load-Displacement Curve

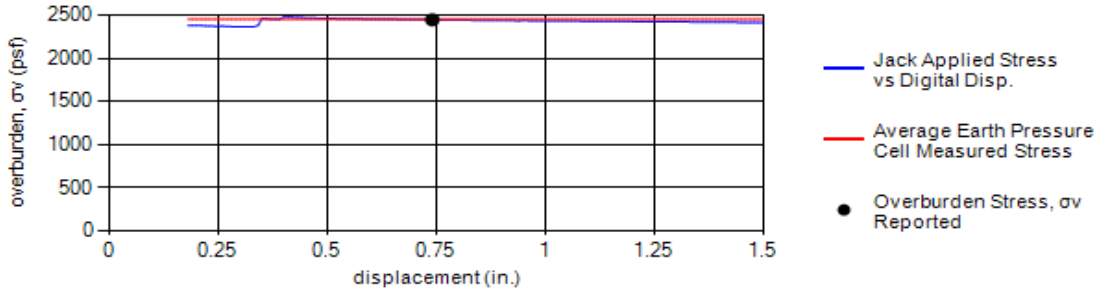


Comments

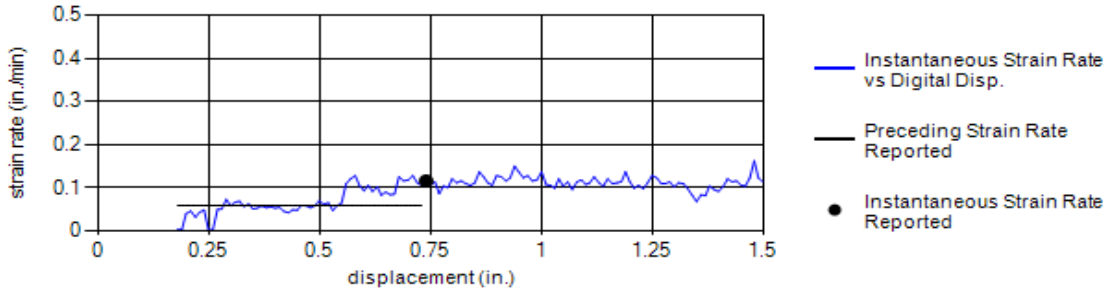
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2769	2507	2040	2542	2418	2455	1.05	2448



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

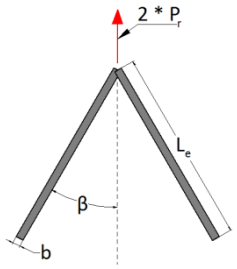
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 4:00:00 PM
Test Identification:	TS47.13-S-L8-ß30°-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	30

Backfill Material

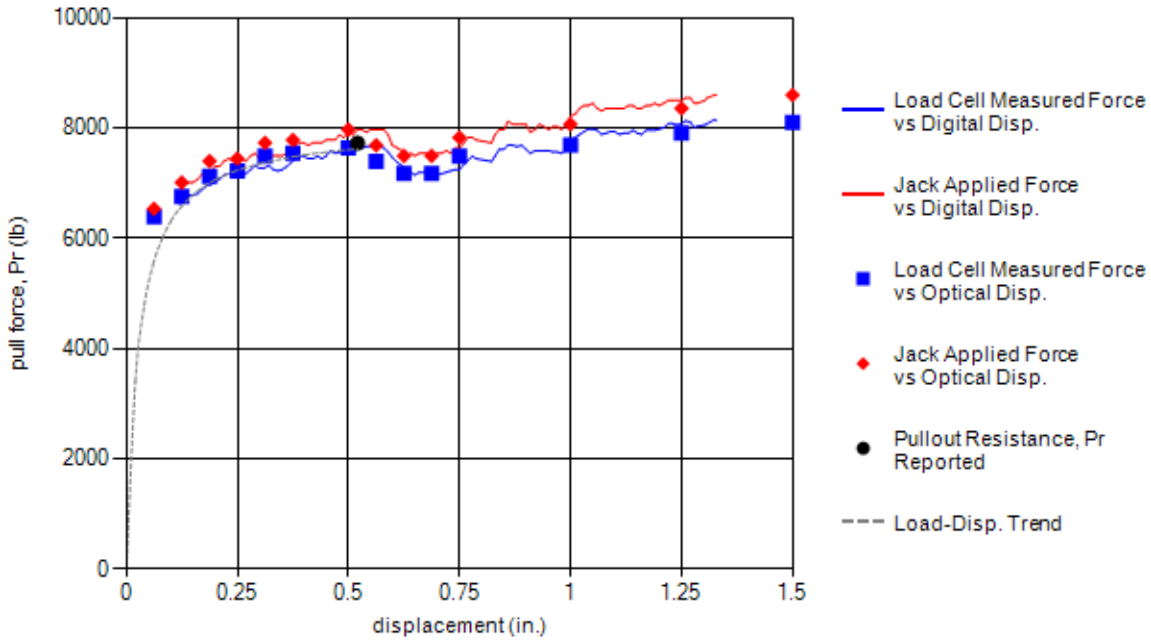
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.52	627	7722	5.20	**4.62**

Load-Displacement Curve



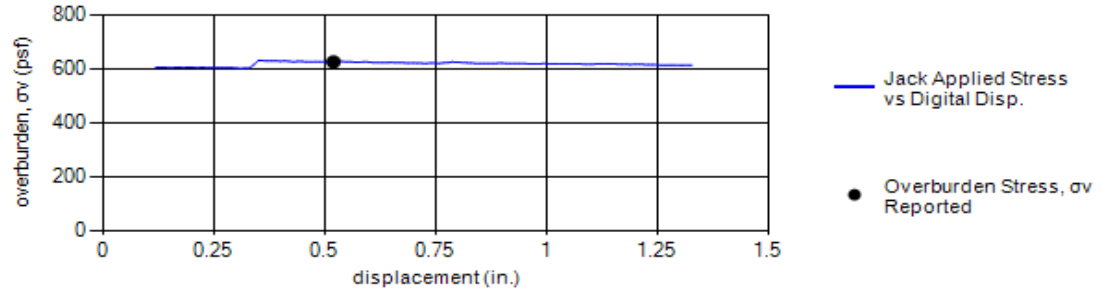
Comments

No earth pressure cell data. Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

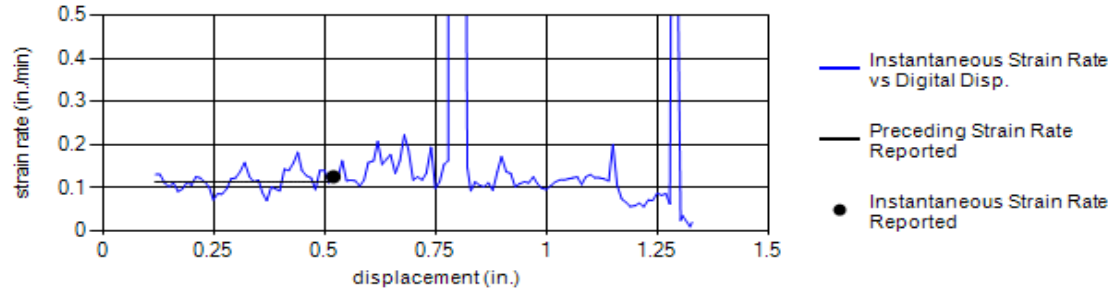
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.37	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.11	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

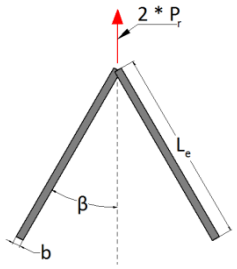
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/18/2012 2:24:00 PM
Test Identification:	TS47.14-S-L8-ß30°-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, ß (°):	30

Backfill Material

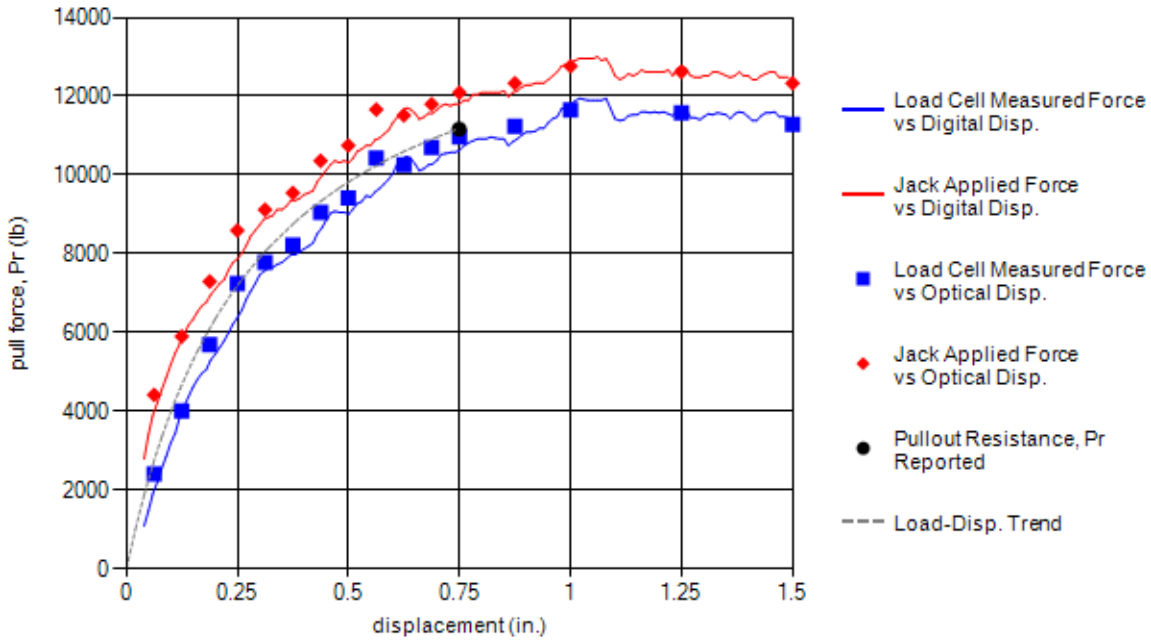
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	565	11164	4.70	**7.40**

Load-Displacement Curve



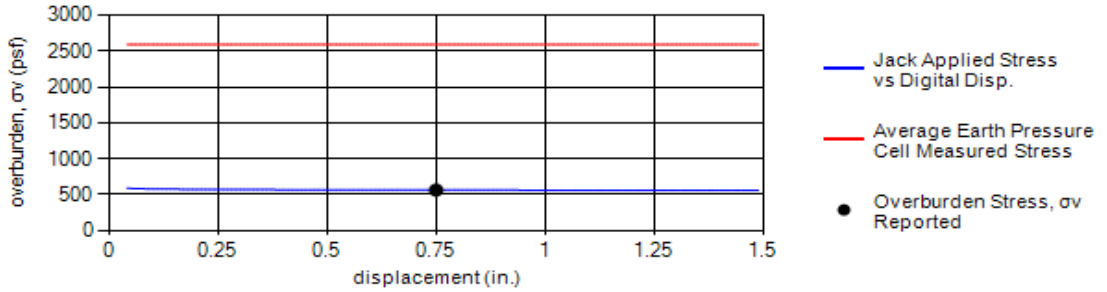
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

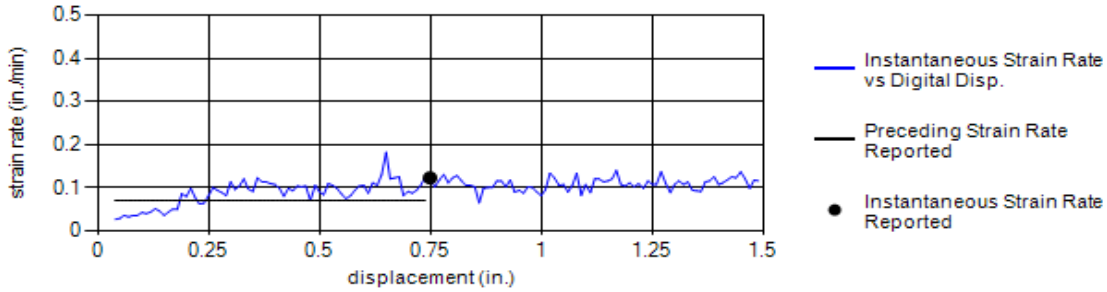
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2708	3009	2344	2271	2632	2593	1.03	565



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

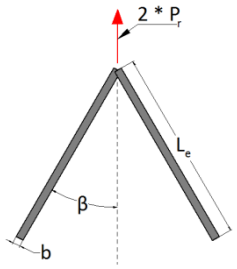
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/18/2012 1:11:00 PM
Test Identification:	TS47.15-S-L8-ß30°-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	30

Backfill Material

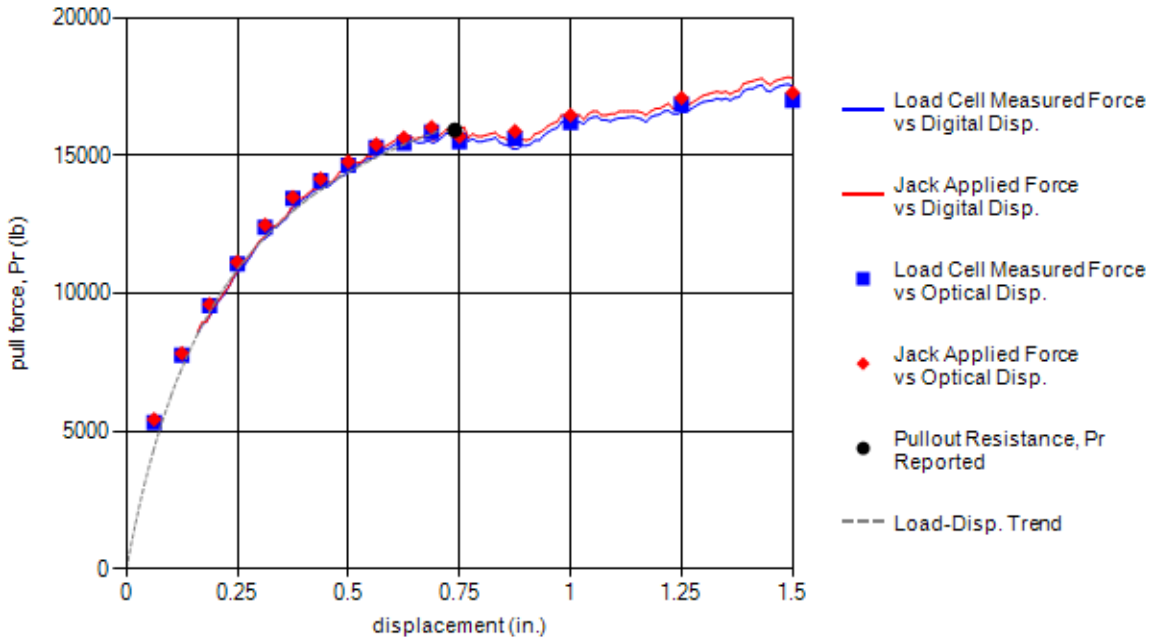
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	653	15914	5.30	**9.14**

Load-Displacement Curve



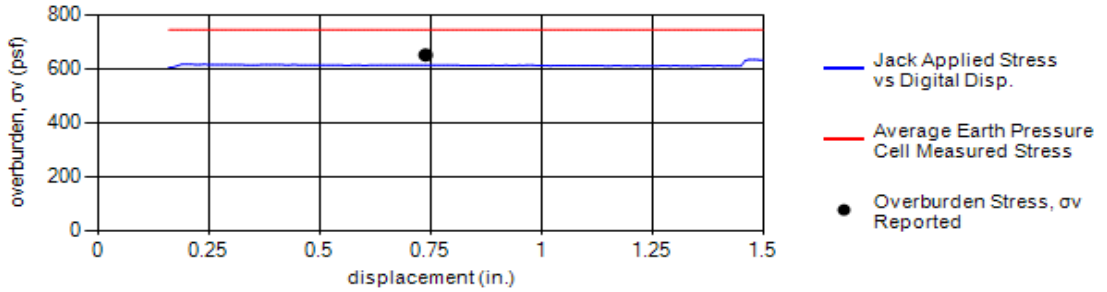
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

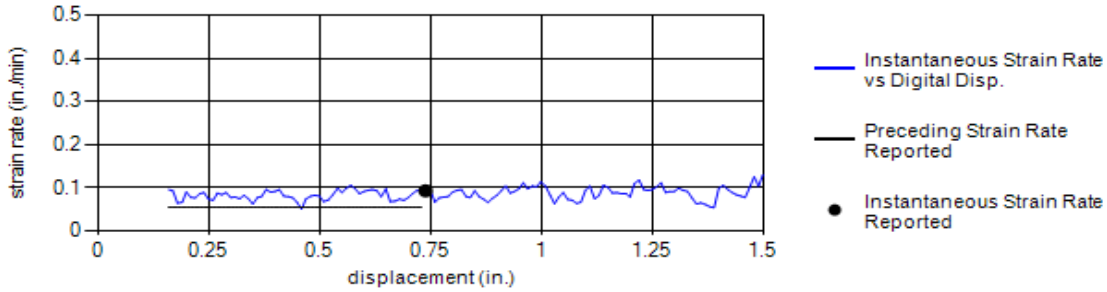
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
648	660	625	782	1016	746	1.12	614



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

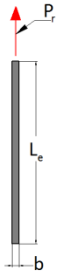
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 3:15:00 PM
Test Identification:	TS48.13-S-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

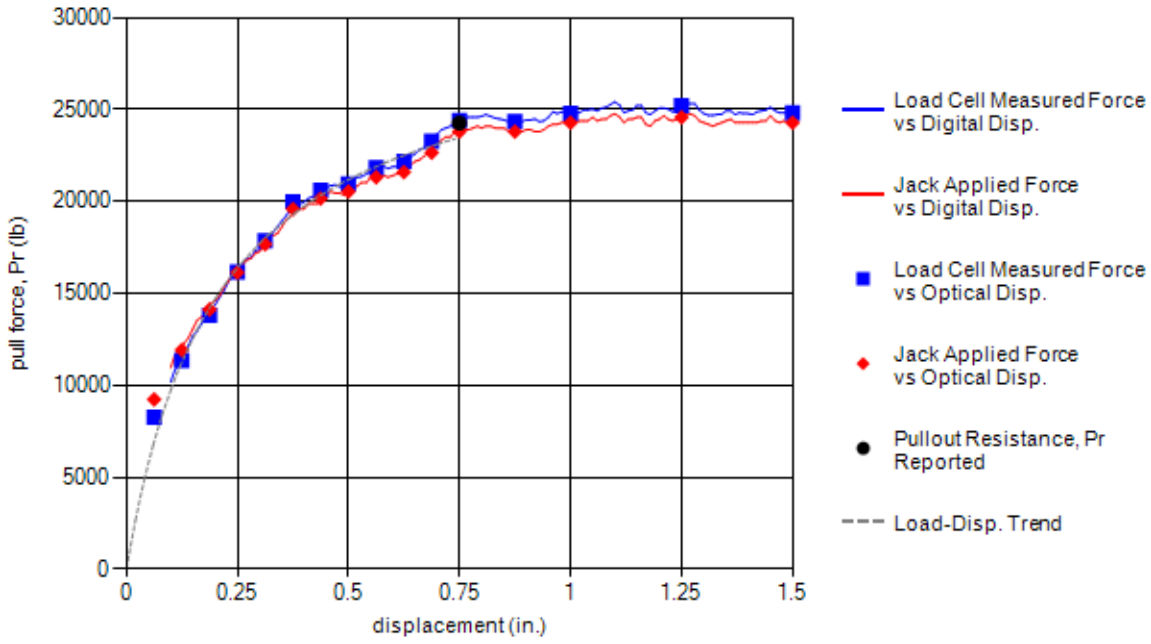
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1478	24260	11.80	**4.10**

Load-Displacement Curve



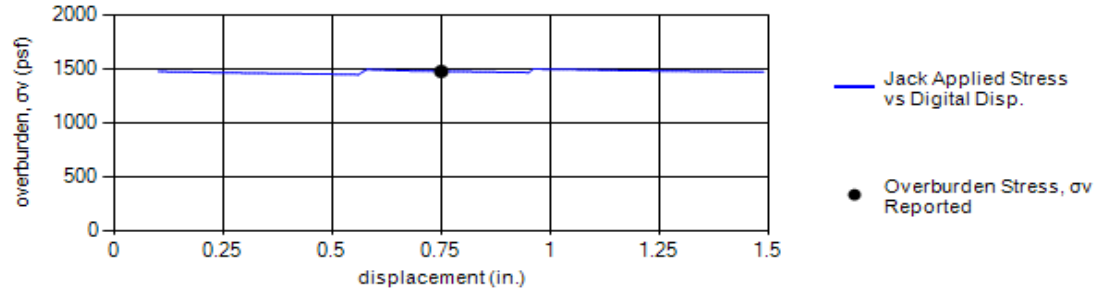
Comments

No earth pressure cell data.

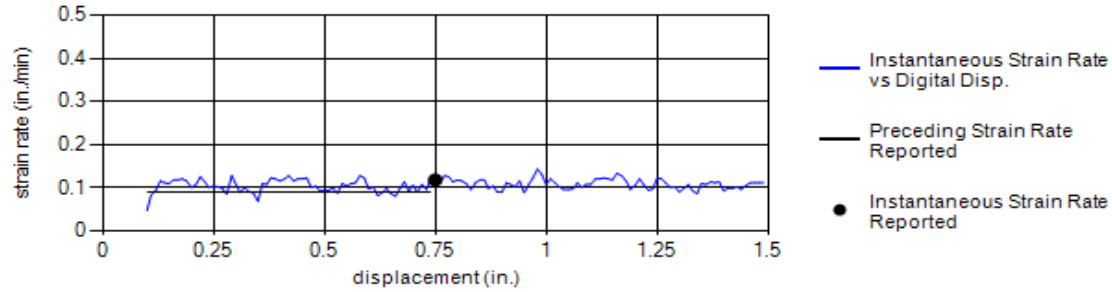
Personnel

Tested:	AJ AJ DH
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.02	1478



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

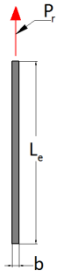
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/16/2012 8:43:00 AM
Test Identification:	TS48.14-S-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

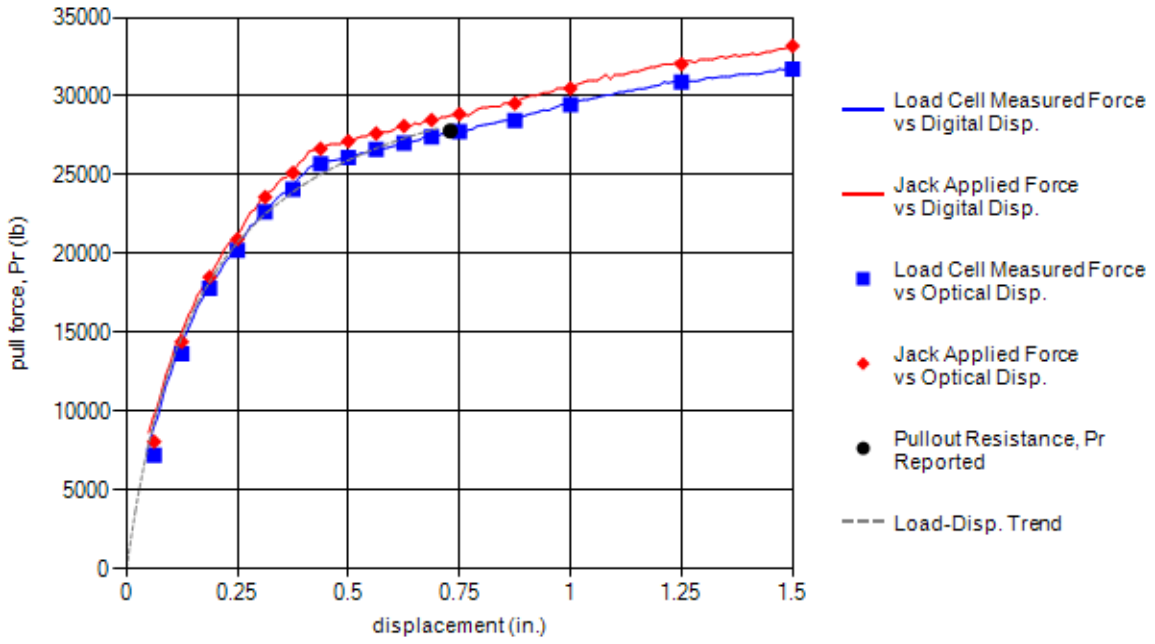
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	2475	27795	19.80	**2.81**

Load-Displacement Curve



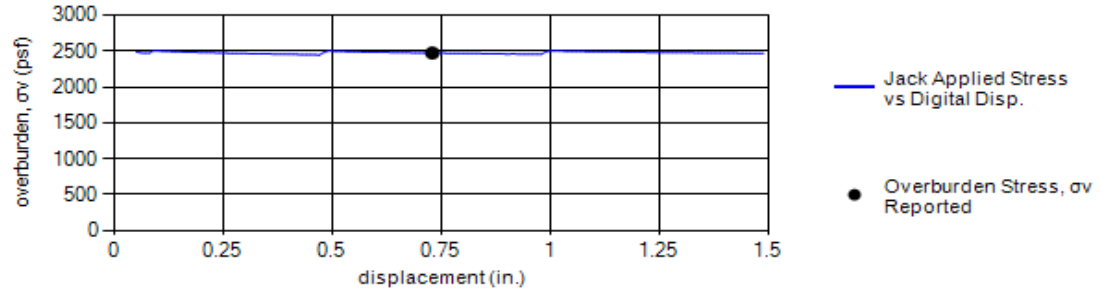
Comments

No earth pressure cell data.

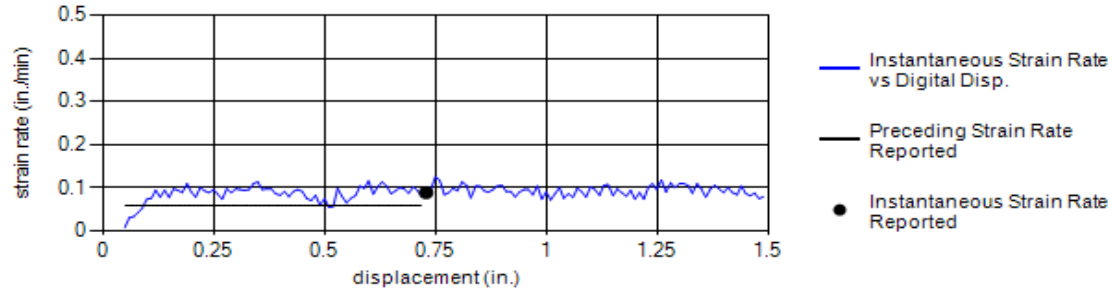
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2475



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

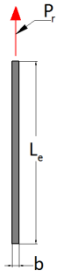
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/16/2012 9:21:00 AM
Test Identification:	TS48.15-S-L4-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

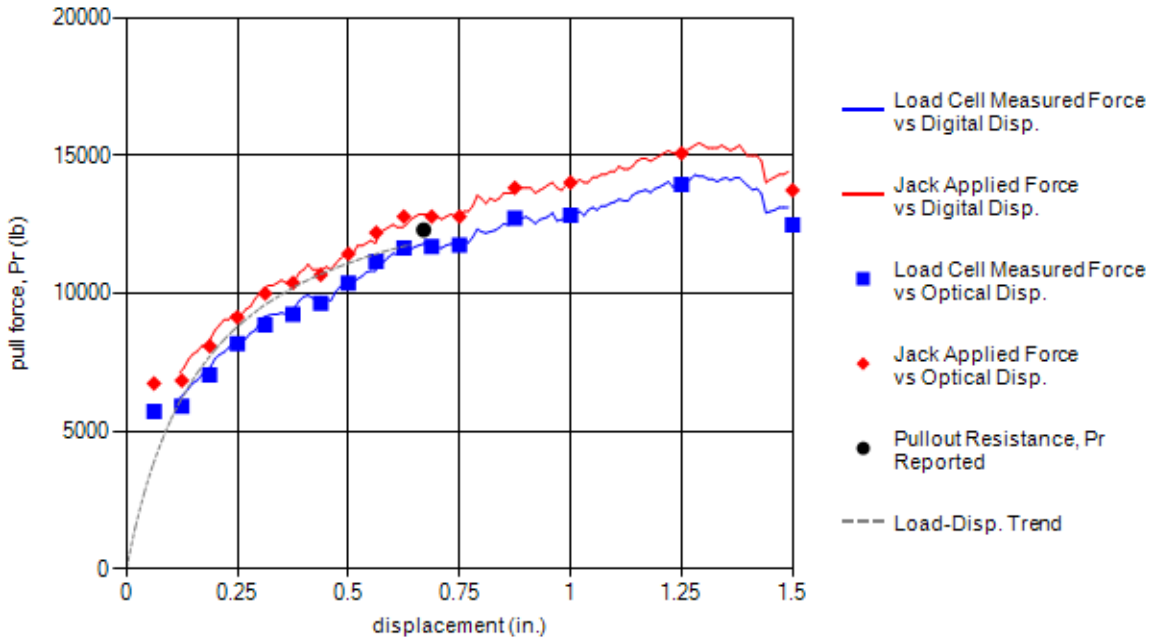
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.67	4947	12297	39.60	**1.86**

Load-Displacement Curve



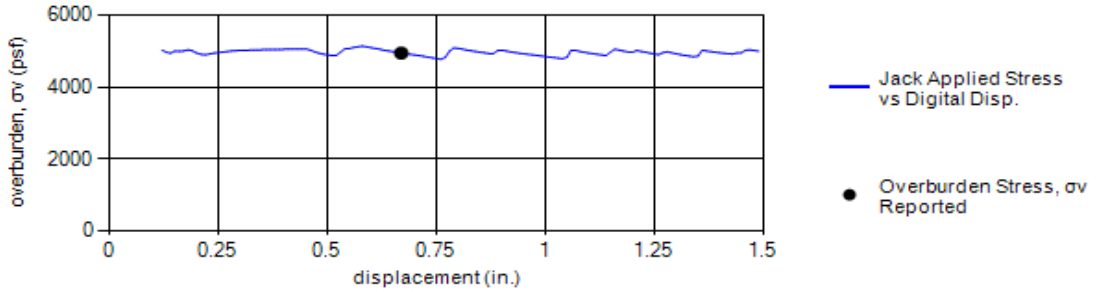
Comments

No earth pressure cell data.

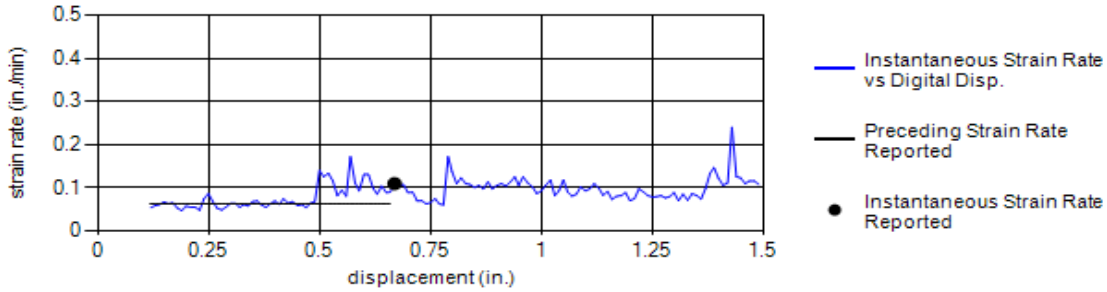
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	4947



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

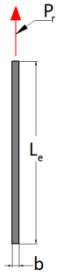
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/14/2012 3:38:00 PM
Test Identification:	TS48.17-S-L8-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

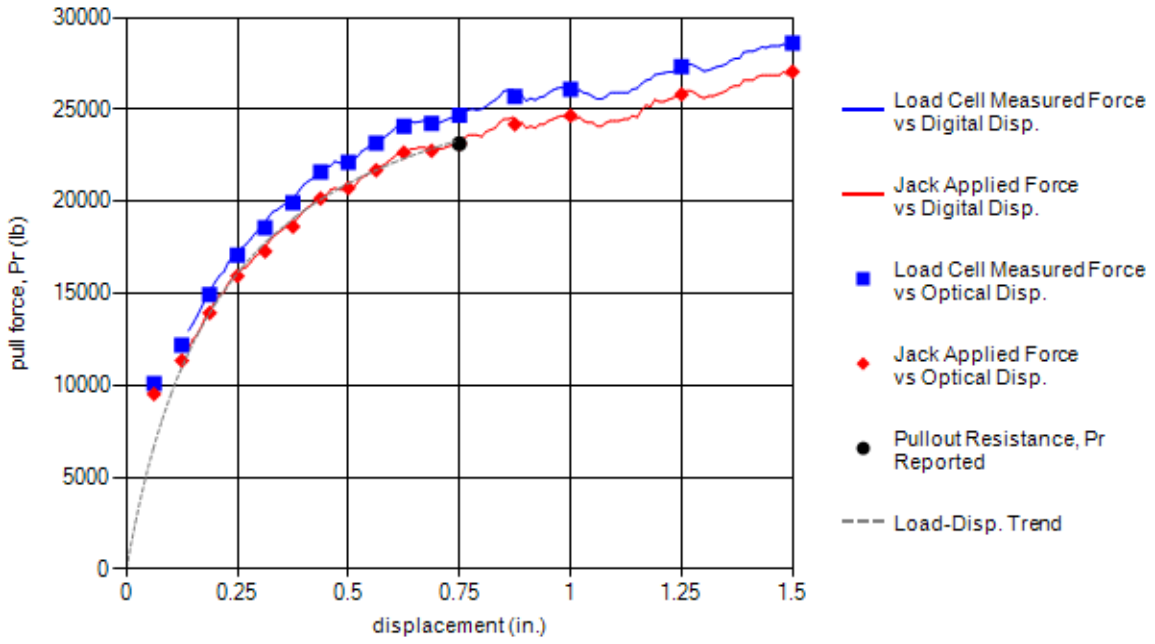
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	2484	23130	20.10	**3.49**

Load-Displacement Curve



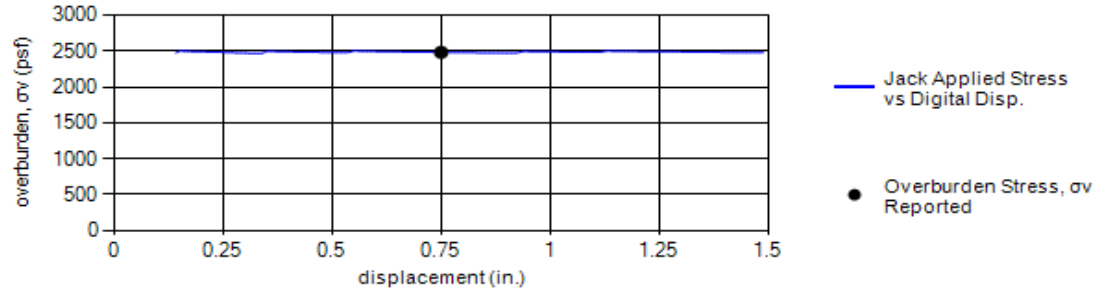
Comments

No earth pressure cell data.

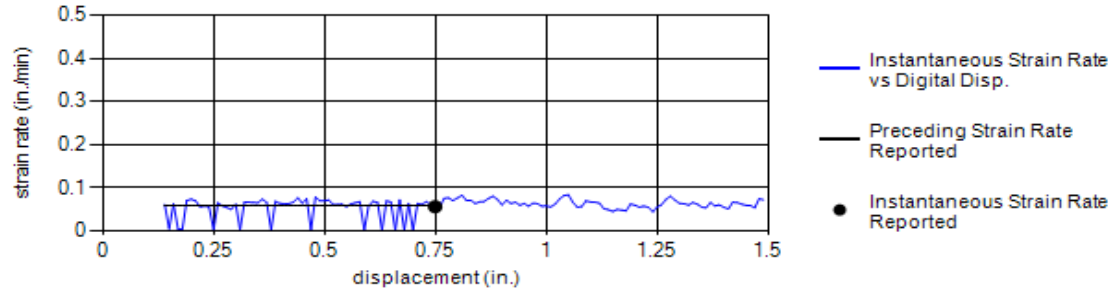
Personnel

Tested:	TW TW DH
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2484



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

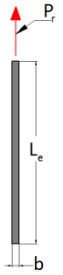
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/8/2012 2:04:00 PM
Test Identification:	TS48.18-S-L8-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

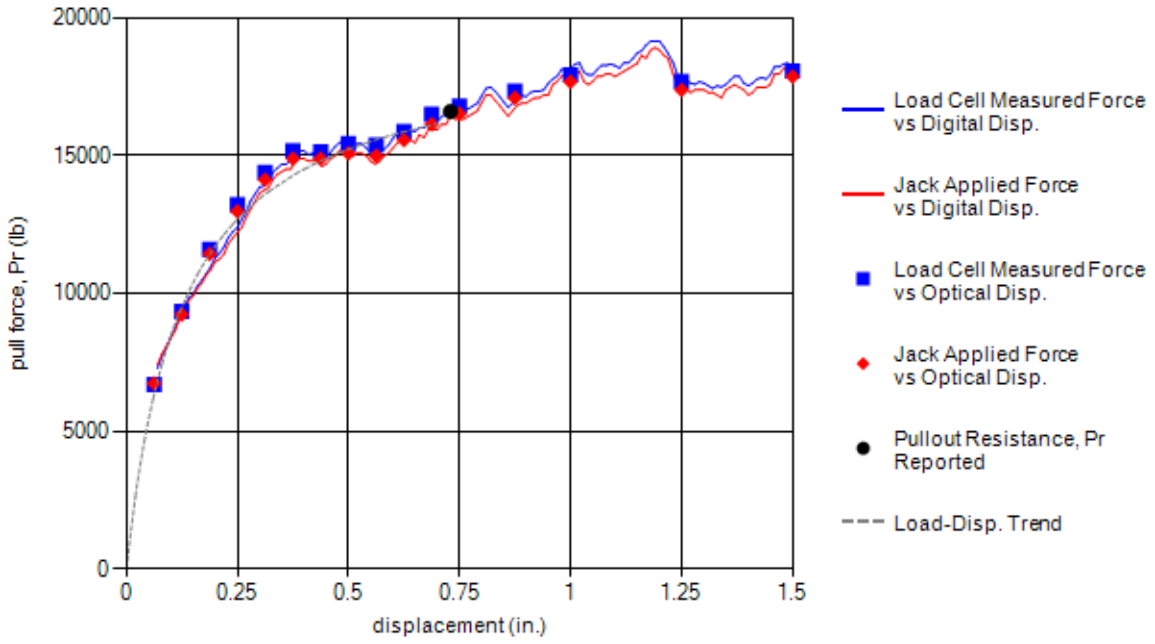
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.73	604	16591	4.90	**10.30**

Load-Displacement Curve

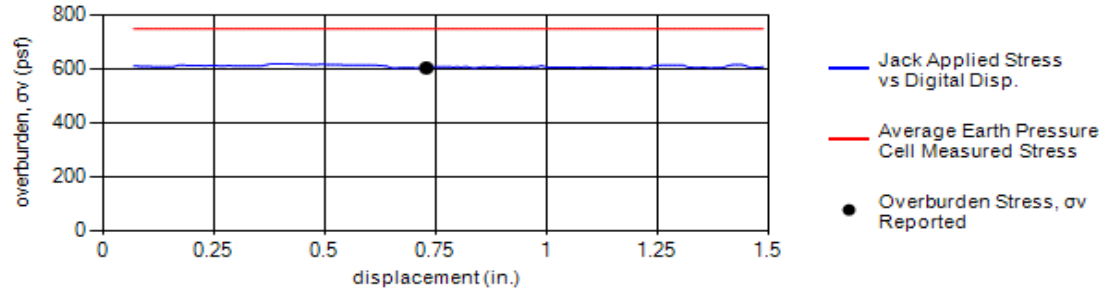


Comments

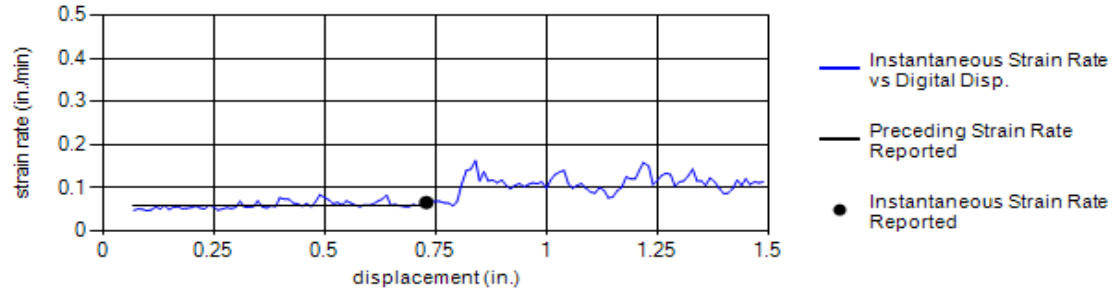
Personnel

Tested:	TW TW ET
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
870	573	589	803	914	750	1.33	604



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

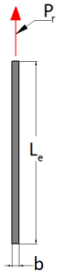
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/14/2012 2:29:00 PM
Test Identification:	TS48.19-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

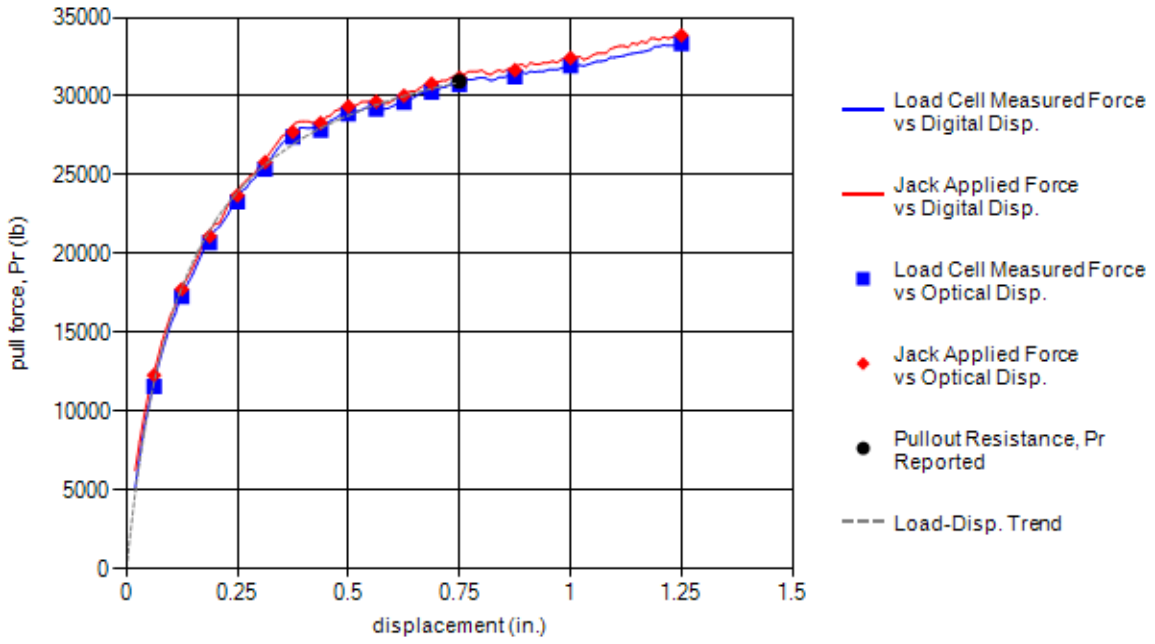
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2482	30950	20.20	**4.68**

Load-Displacement Curve



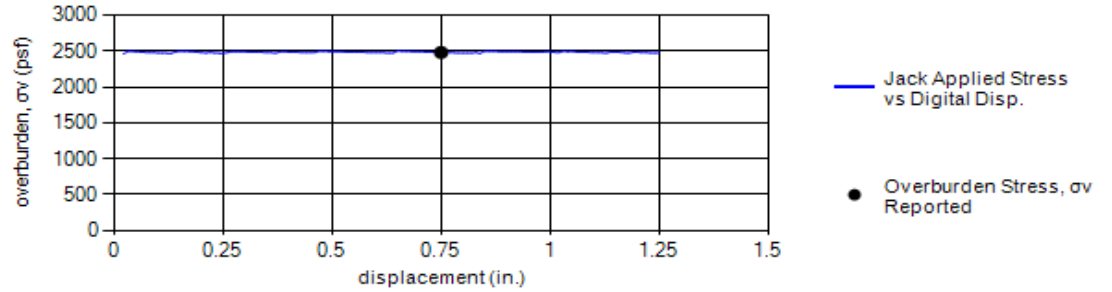
Comments

No earth pressure cell data.

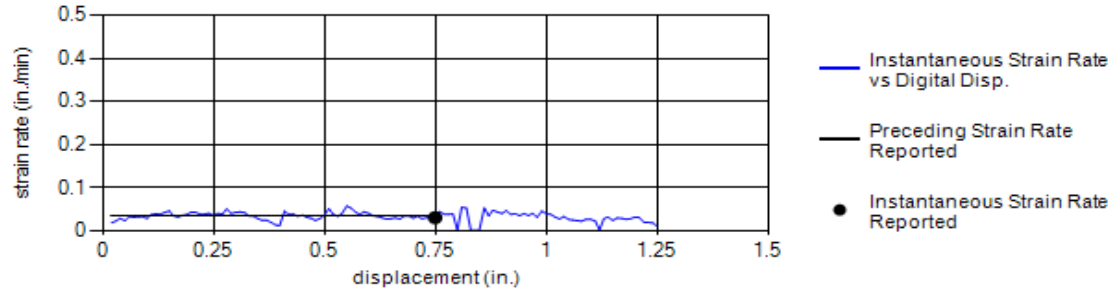
Personnel

Tested:	TW TW DH
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2482



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.03	0.03	0.03



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

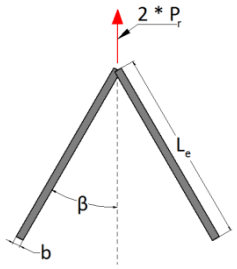
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 11:40:00 AM
Test Identification:	TS49.13-S-L4.5-ß30°-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.5
Width, b (in.):	2
Skew Angle, ß (°):	30

Backfill Material

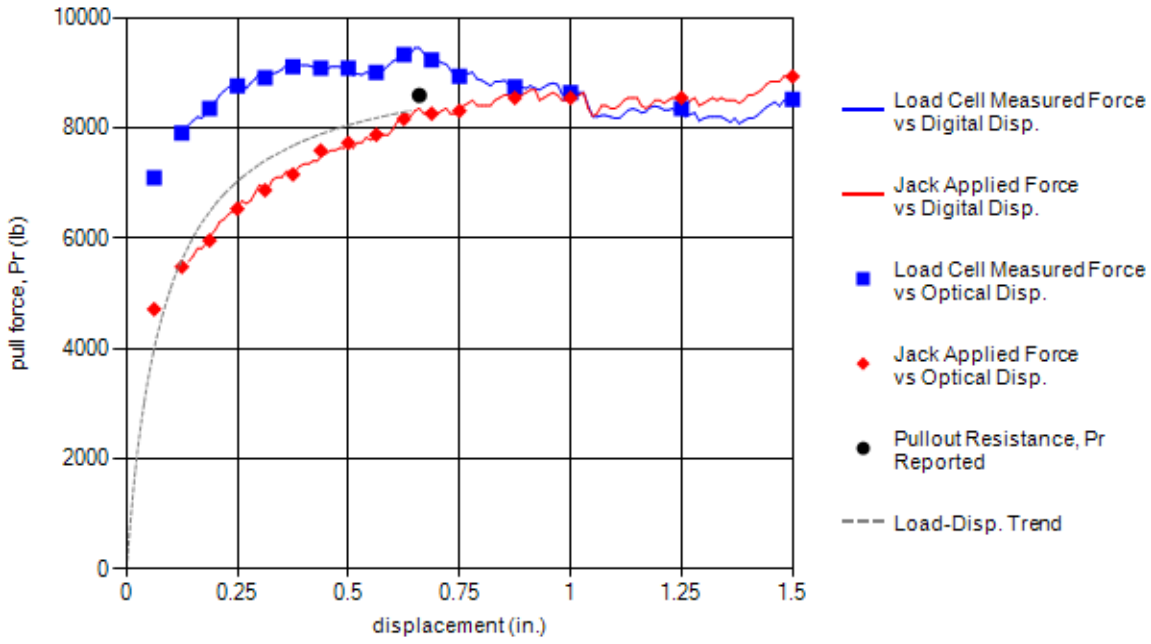
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.66	1499	8588	12.00	**3.82**

Load-Displacement Curve



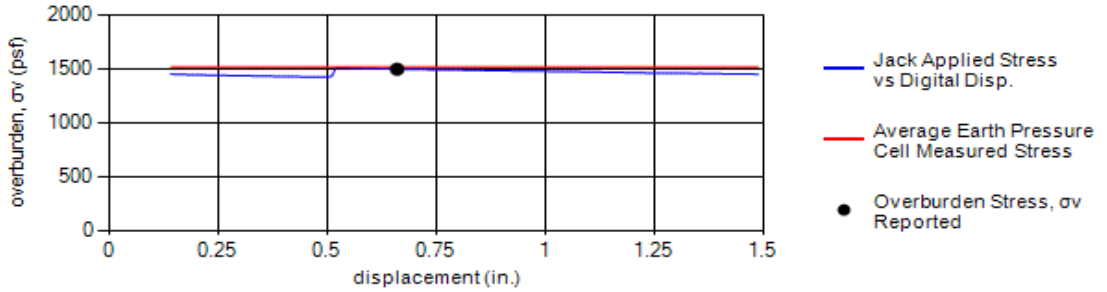
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

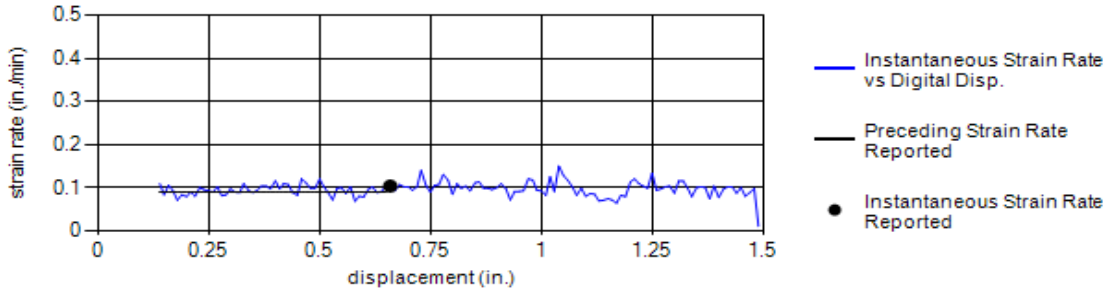
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1115	1547	1815	1737	1385	1520	1.19	1499



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

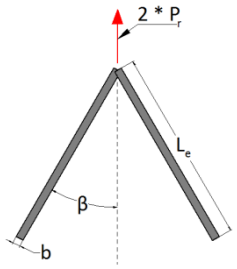
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 10:16:00 AM
Test Identification:	TS49.14-S-L4.5-ß30°-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.5
Width, b (in.):	2
Skew Angle, ß (°):	30

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

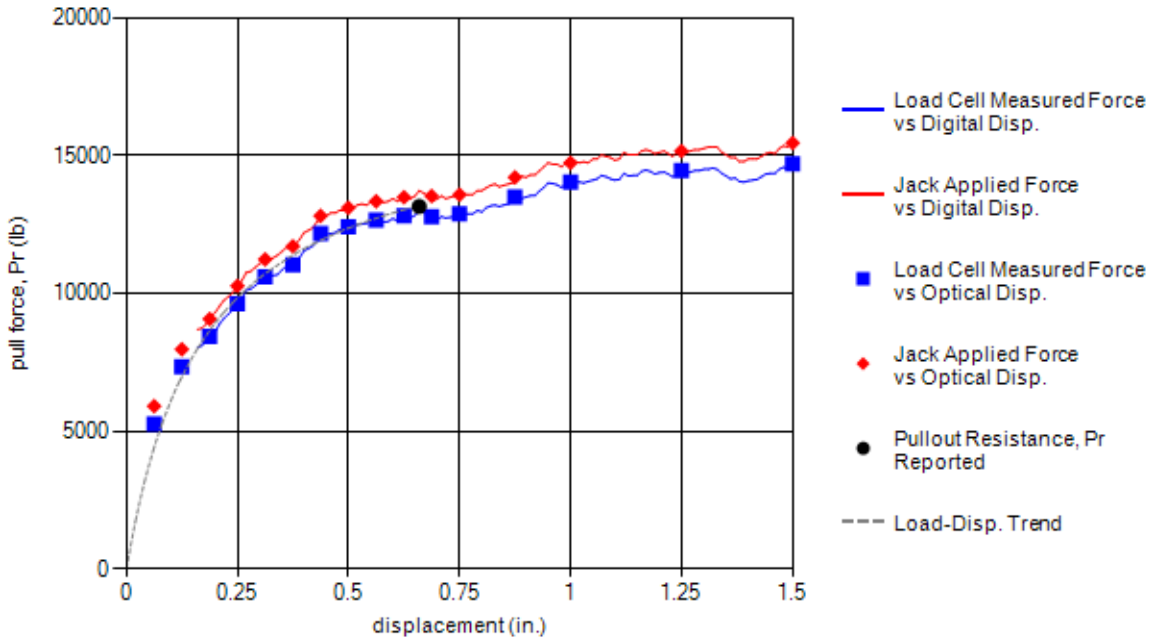
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.66	1557	13148	12.30	**5.63**

Load-Displacement Curve



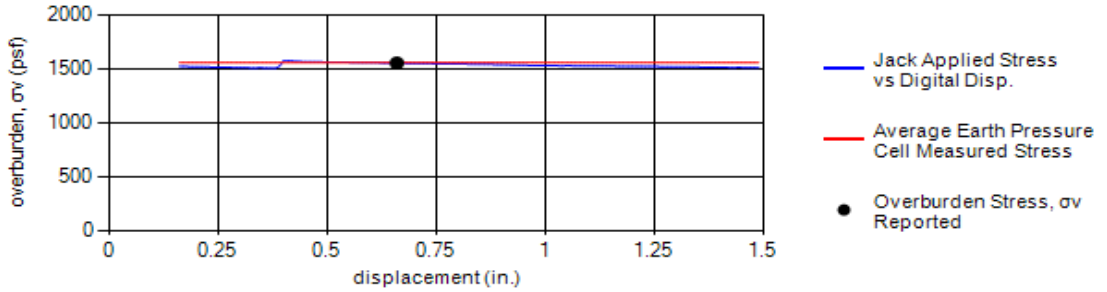
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

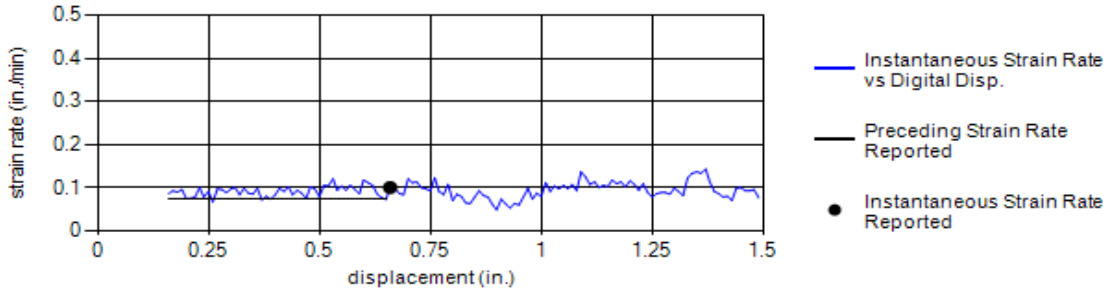
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1130	1514	1837	1752	1577	1562	1.11	1555



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

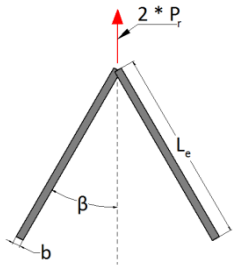
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 9:30:00 AM
Test Identification:	TS49.15-S-L4.5-ß30°-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.5
Width, b (in.):	2
Skew Angle, ß (°):	30

Backfill Material

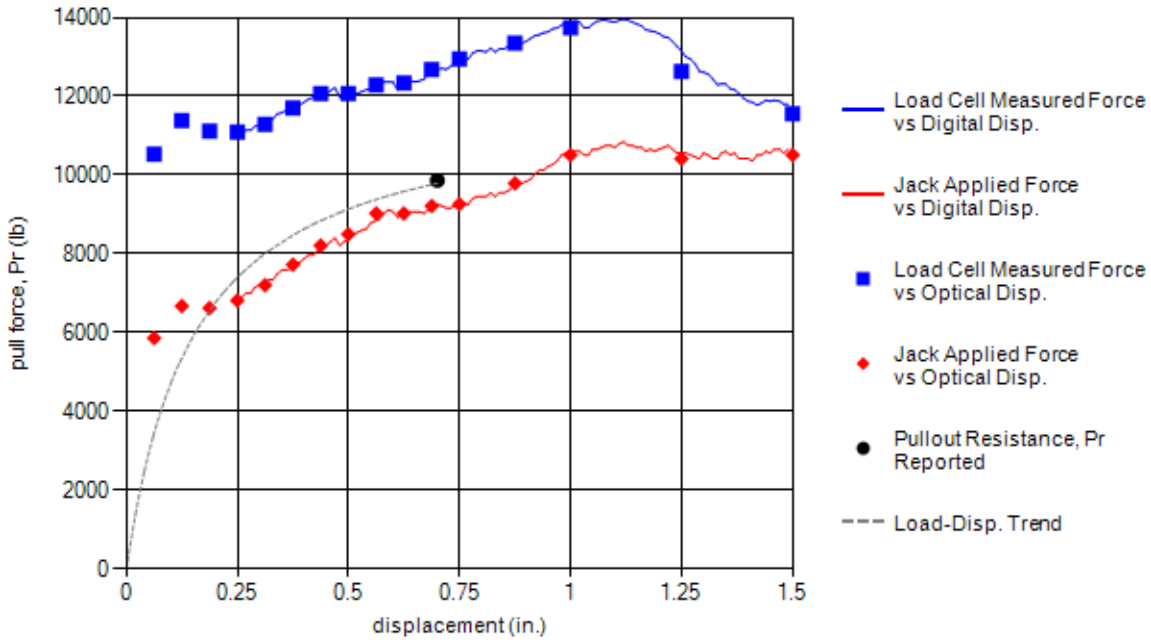
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.70	1511	9864	12.00	**4.35**

Load-Displacement Curve



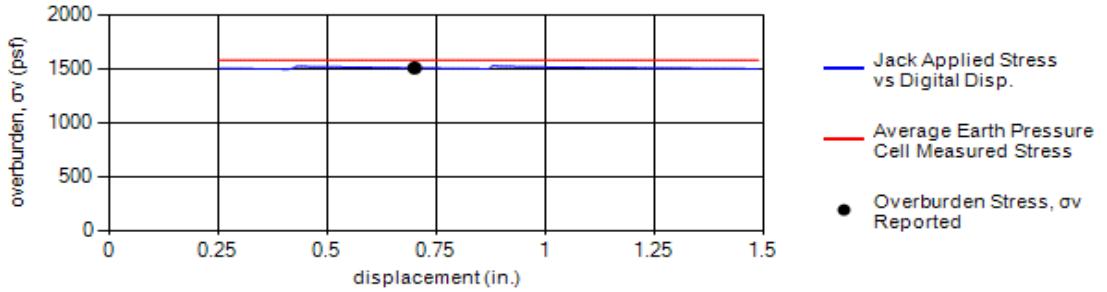
Comments

Pullout force was measured for two reinforcements pulled in tandem. Reported pullout force, Pr, is half the measured pullout force; i.e. for a single, skewed strip.

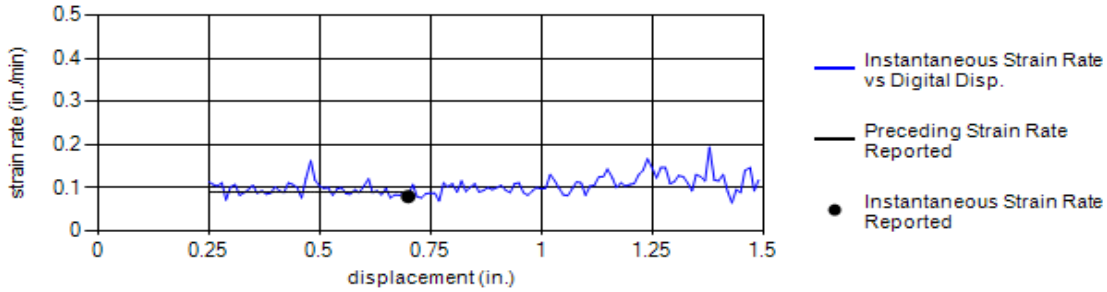
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1144	1487	1829	1800	1663	1584	1.06	1511



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

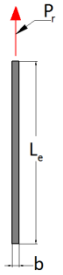
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 11:47:00 AM
Test Identification:	TS50.22-S-L8-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	8.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

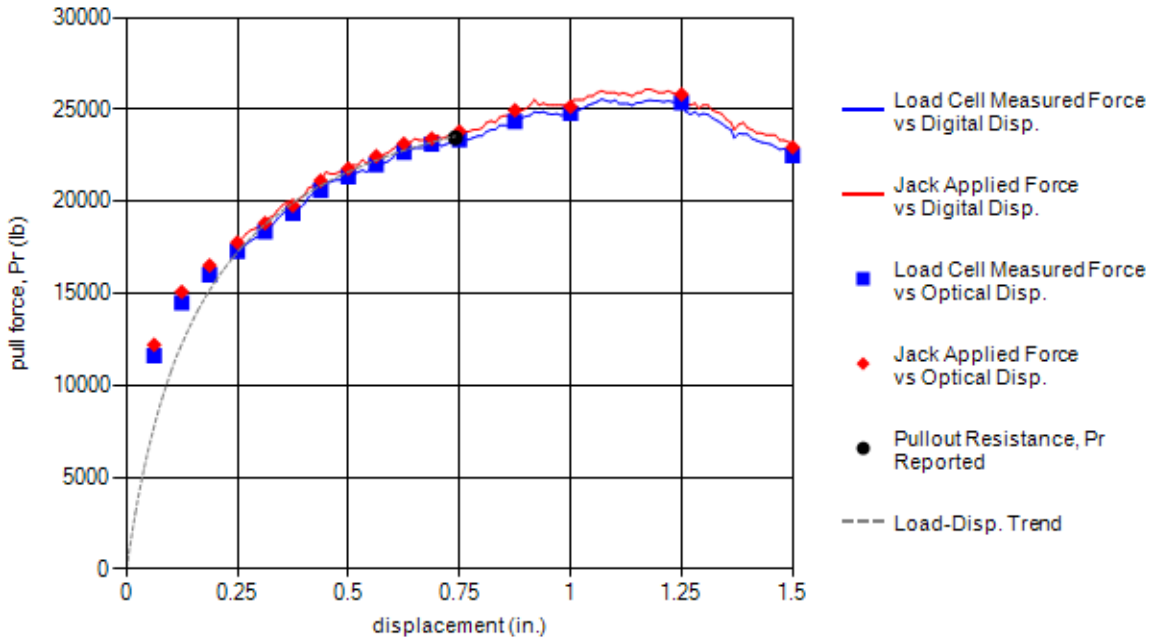
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	2468	23451	20.10	**3.56**

Load-Displacement Curve

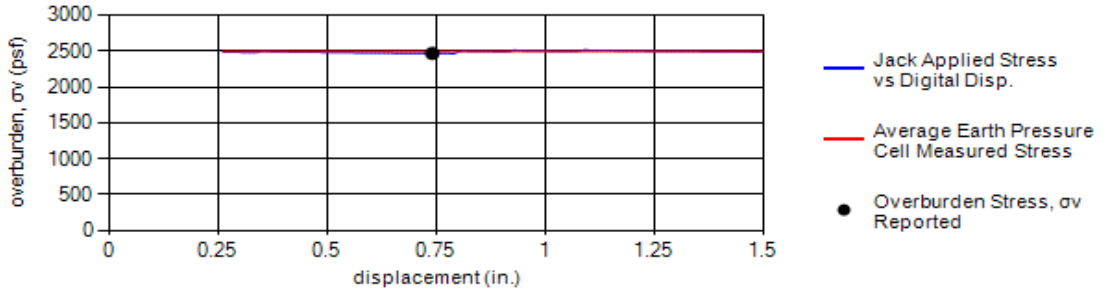


Comments

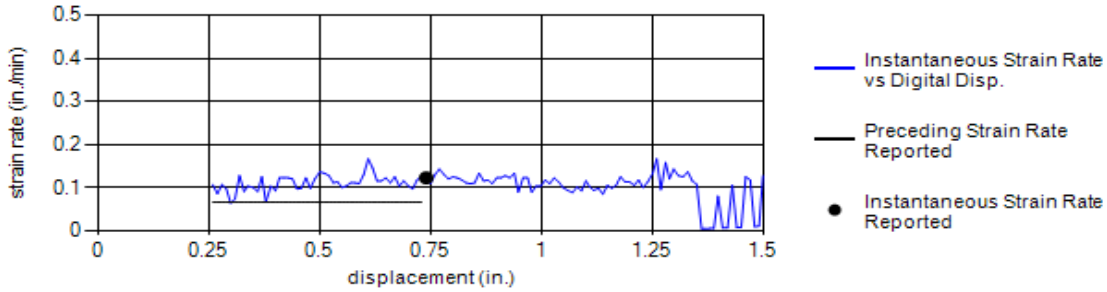
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1577	2710	2576	2442	3182	2497	1.05	2468



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

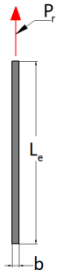
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 12:52:00 PM
Test Identification:	TS50.23-S-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)

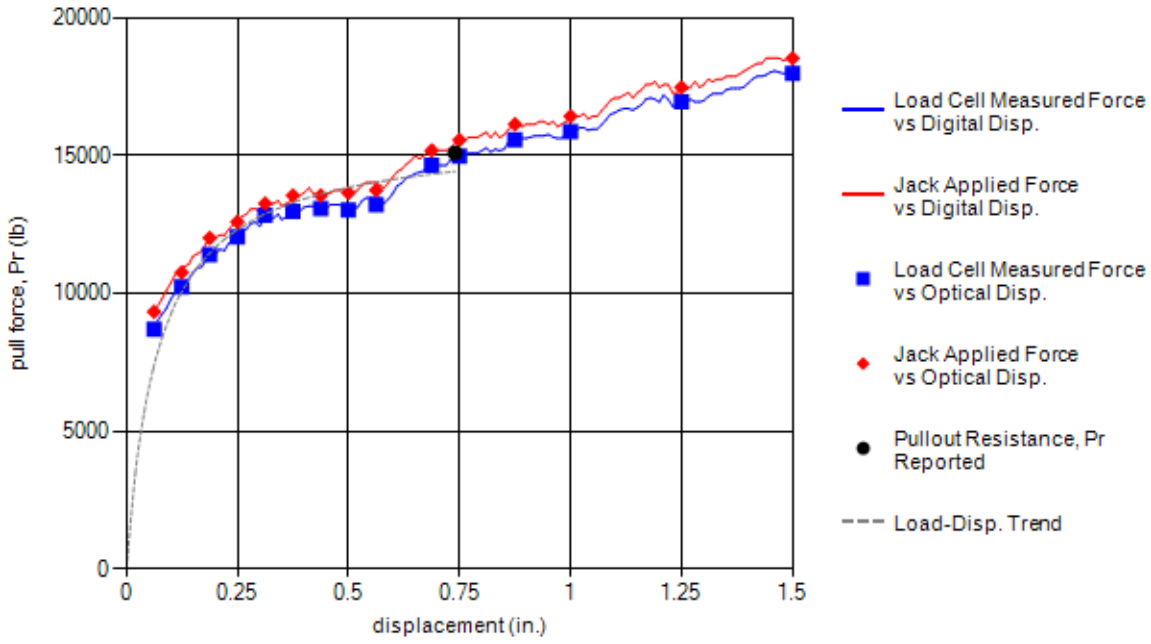
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2504	15085	20.40	**1.51**

Load-Displacement Curve

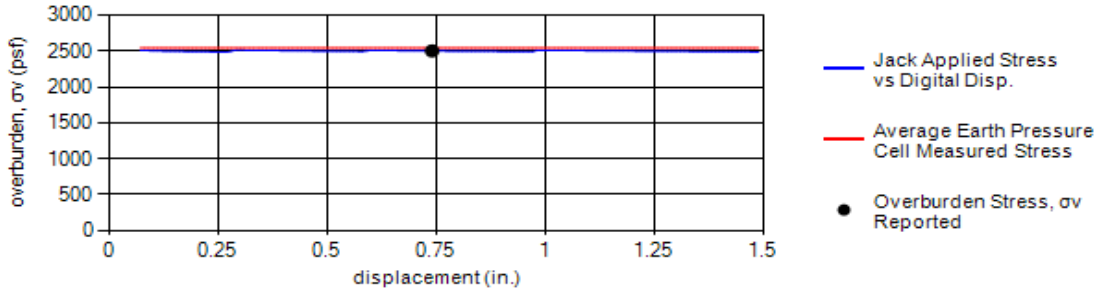


Comments

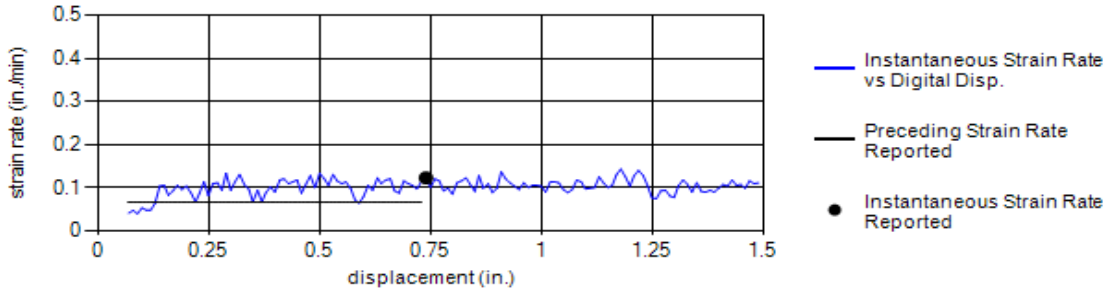
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1608	2751	2667	2484	3216	2545	1.04	2504



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

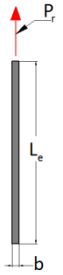
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 1:47:00 PM
Test Identification:	TS50.25-S-L4-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	4.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

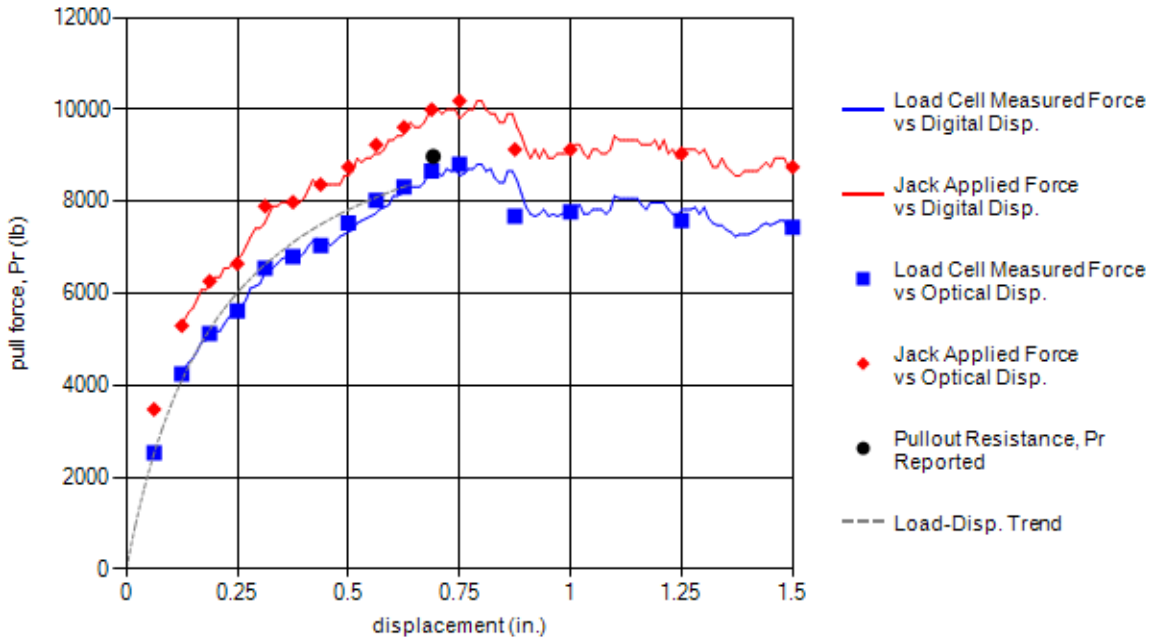
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.69	587	8975	4.70	**11.47**

Load-Displacement Curve



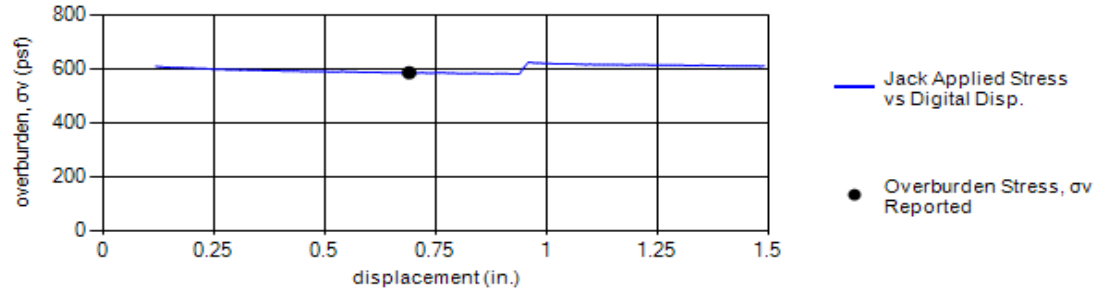
Comments

No earth pressure cell data.

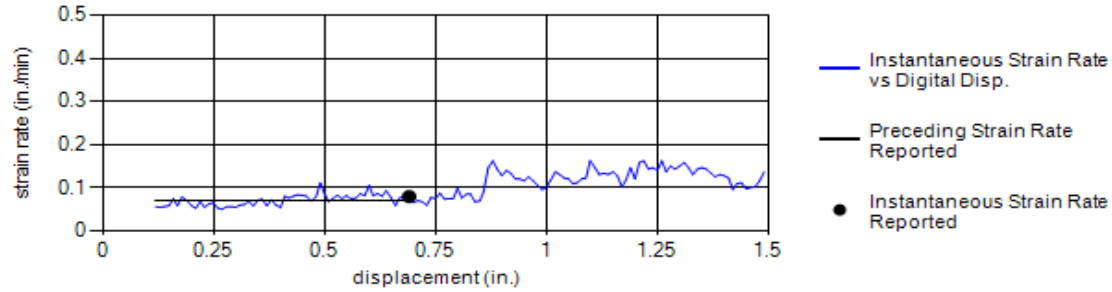
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.04	587



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

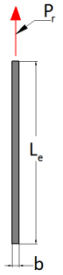
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 2:44:00 PM
Test Identification:	TS50.26-S-L12-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Ribbed Strip
Length, L_e (ft):	12.0
Width, b (in.):	2
Skew Angle, β (°):	0

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

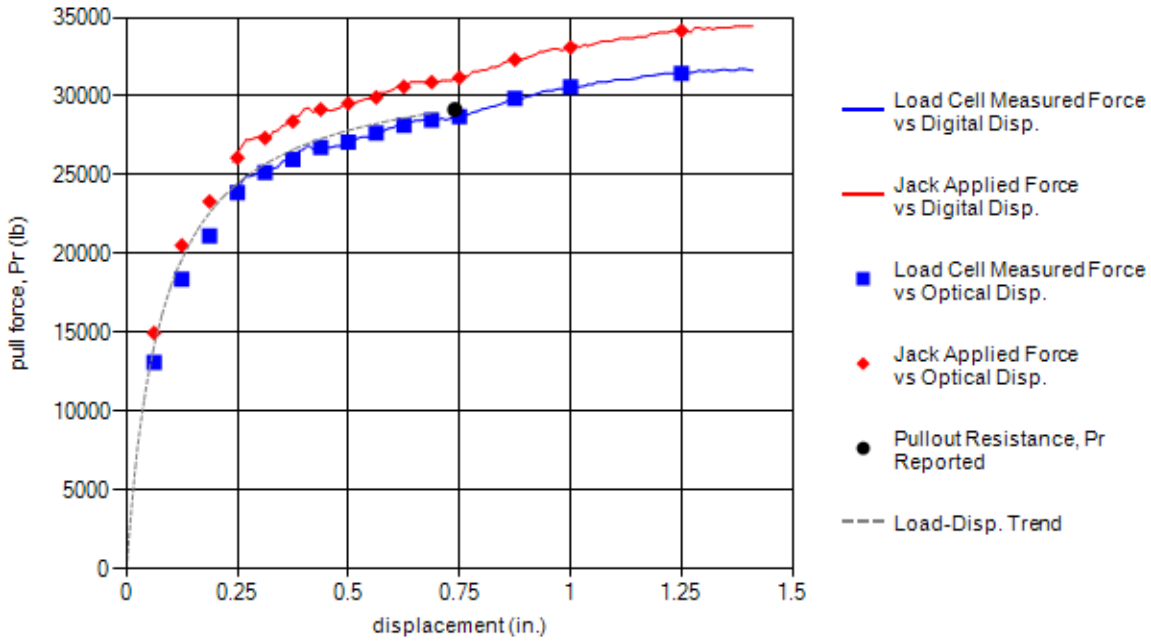
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	4956	29151	38.60	**1.47**

Load-Displacement Curve

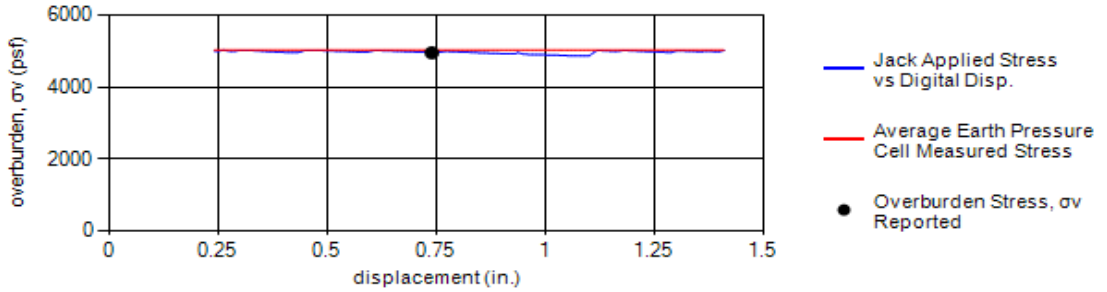


Comments

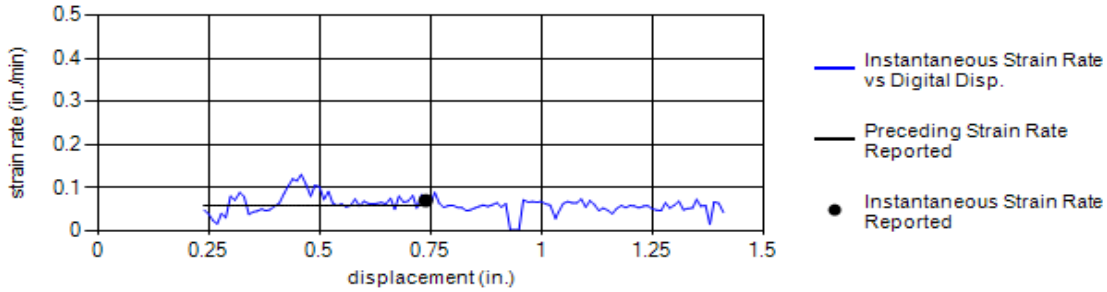
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3615	5343	5142	4939	6115	5031	1.05	4967



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

Appendix M

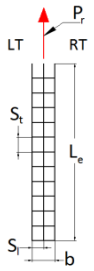
MSE Reinforcement Pullout Test Reports: Welded Steel Grids in Type A Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/15/2011 2:25:00 PM
Test Identification:	TS30.01-G-9x12-W20xW11-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	12	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

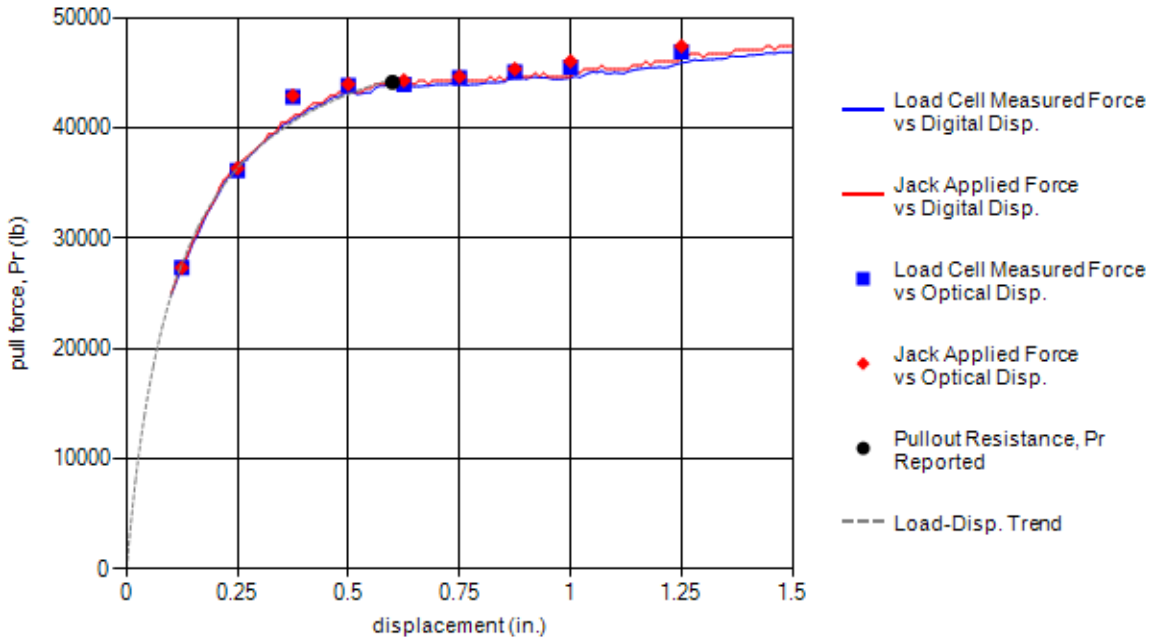
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.60	653	44122	5.40	**1.88**

Load-Displacement Curve



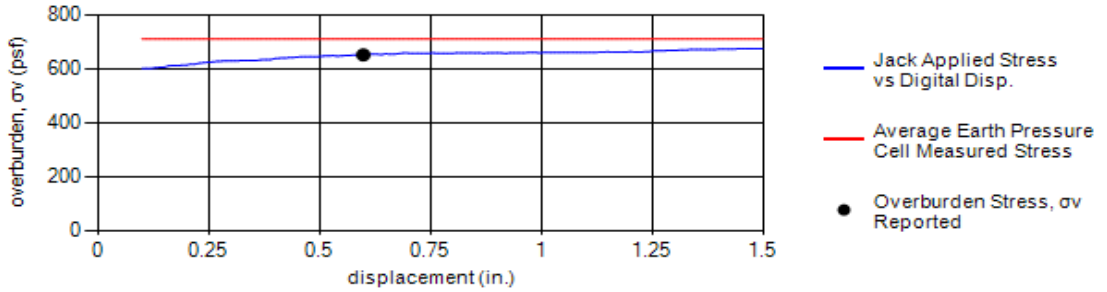
Comments

Digital displacement: pullout and elongation undifferentiated.

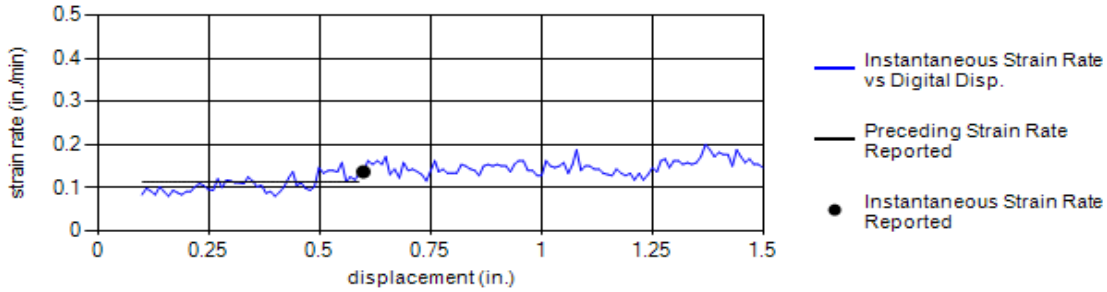
Personnel

Tested:	AJ RH DH
Prepared:	TW TW
Checked:	WL PJ

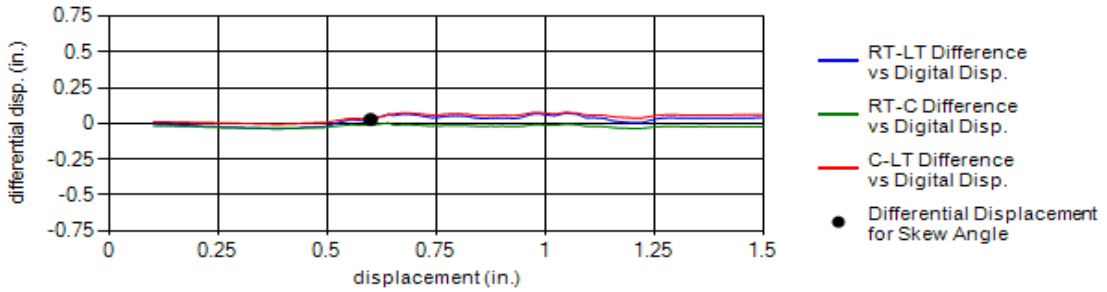
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1025	334	770	683	749	712	7.08	653



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	-0.01	0.04	No Data	0.09	CCW



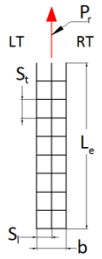
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 6:13:13 AM
Test Identification:	TS30.02-G-9x12-W20xW11-L9-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

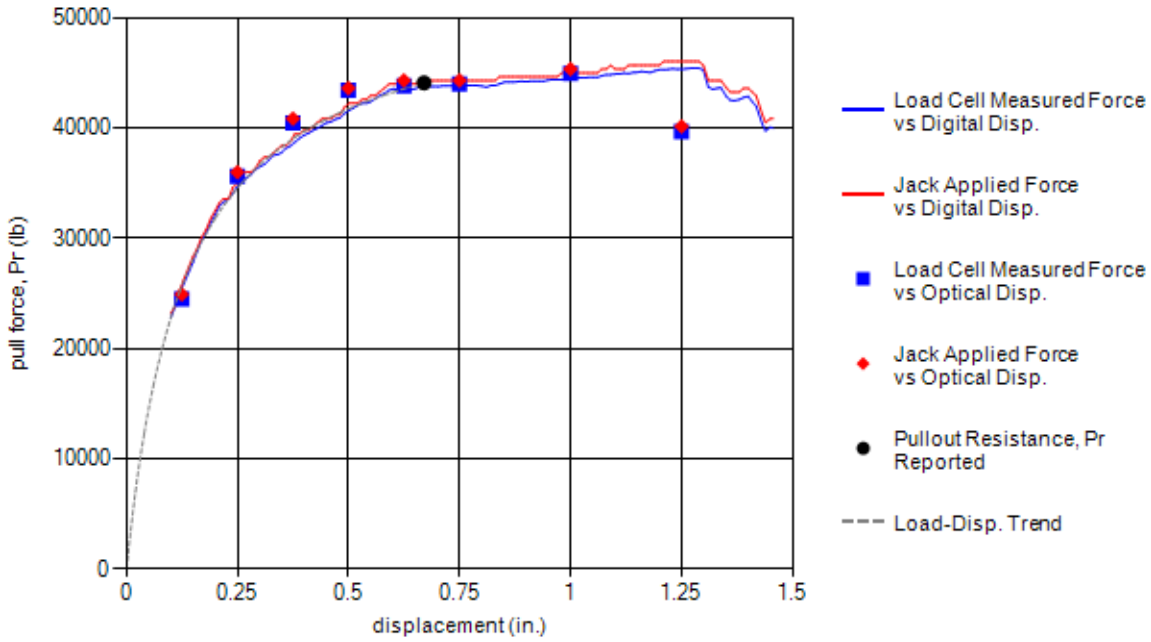
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.67	1418	44067	11.80	**1.15**

Load-Displacement Curve



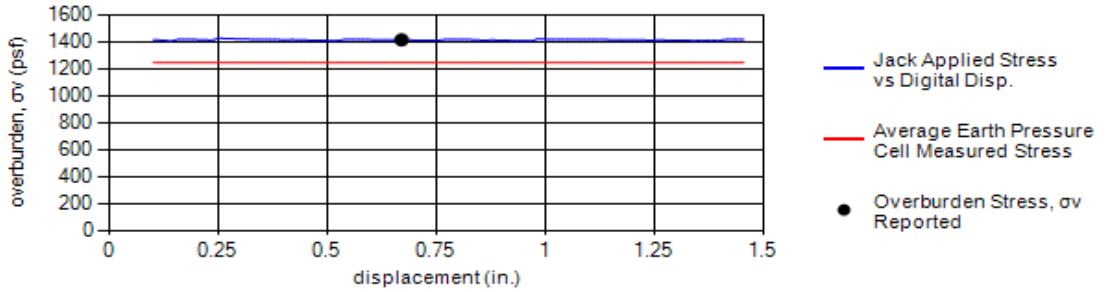
Comments

Left longitudinal bar rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

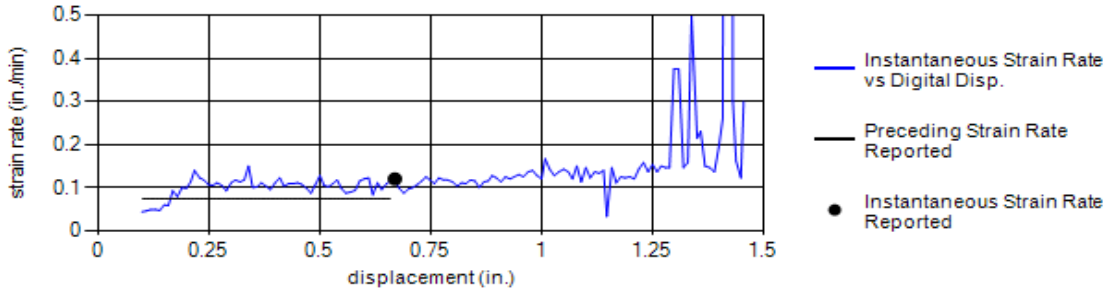
Personnel

Tested:	AJ YW DH
Prepared:	AS TW
Checked:	WL PJ

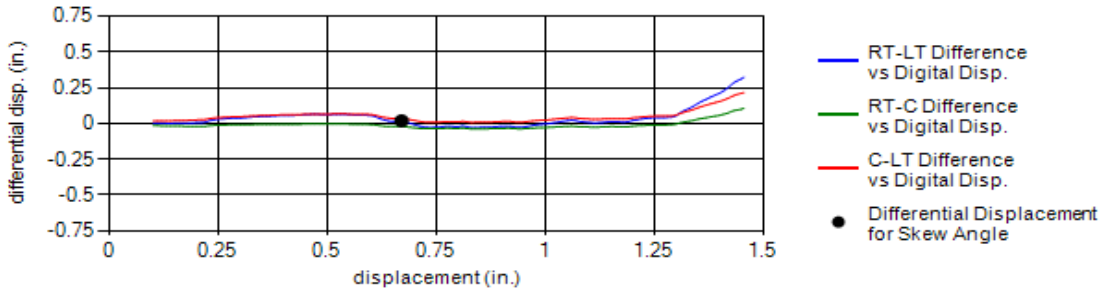
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1429	782	1476	1202	1356	1249	3.97	1418



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	-0.02	0.04	No Data	0.06	CCW



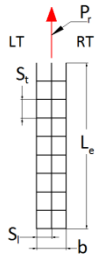
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 6:53:00 AM
Test Identification:	TS30.03-G-9x12-W20xW11-L9-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

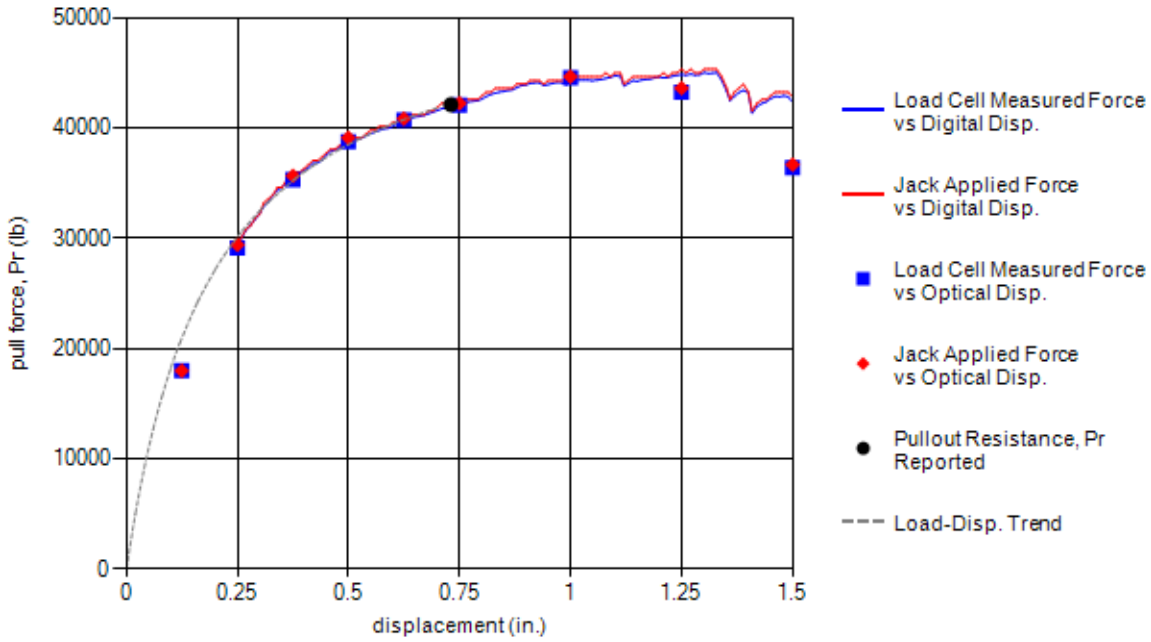
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.73	670	42099	5.60	**2.33**

Load-Displacement Curve



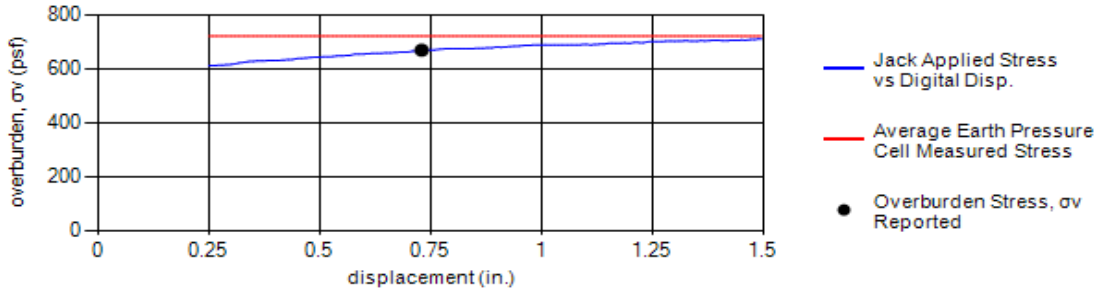
Comments

Digital displacement: pullout and elongation undifferentiated.

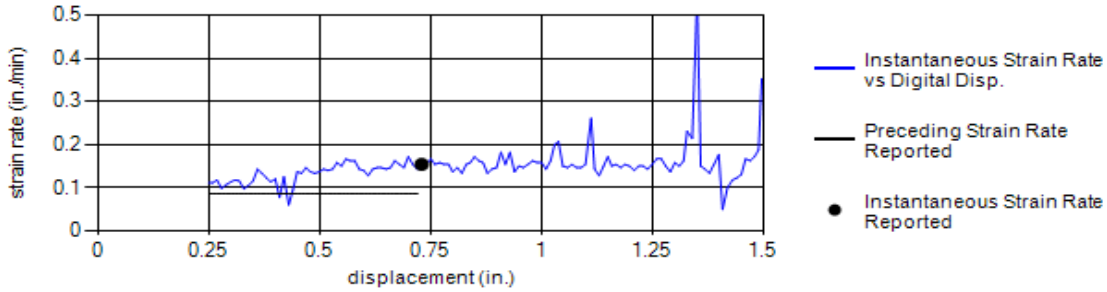
Personnel

Tested:	AJ YW DH
Prepared:	AS TW
Checked:	WL PJ

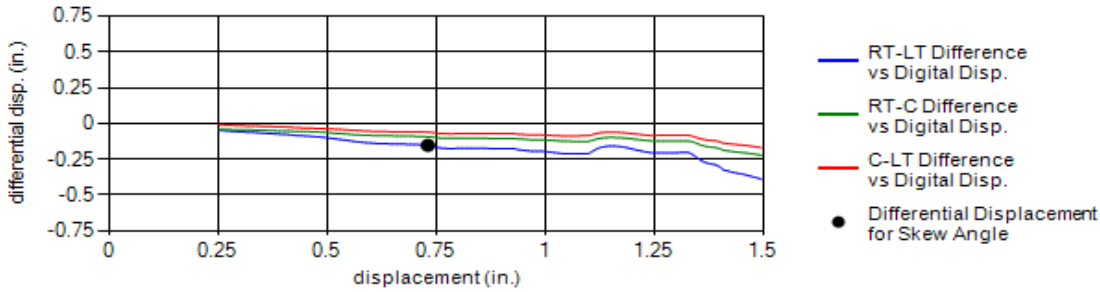
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
814	495	844	717	746	723	6.90	670



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.09	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.15	-0.09	-0.06	No Data	-0.49	CW



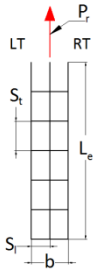
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 7:36:00 AM
Test Identification:	TS30.04-G-9x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

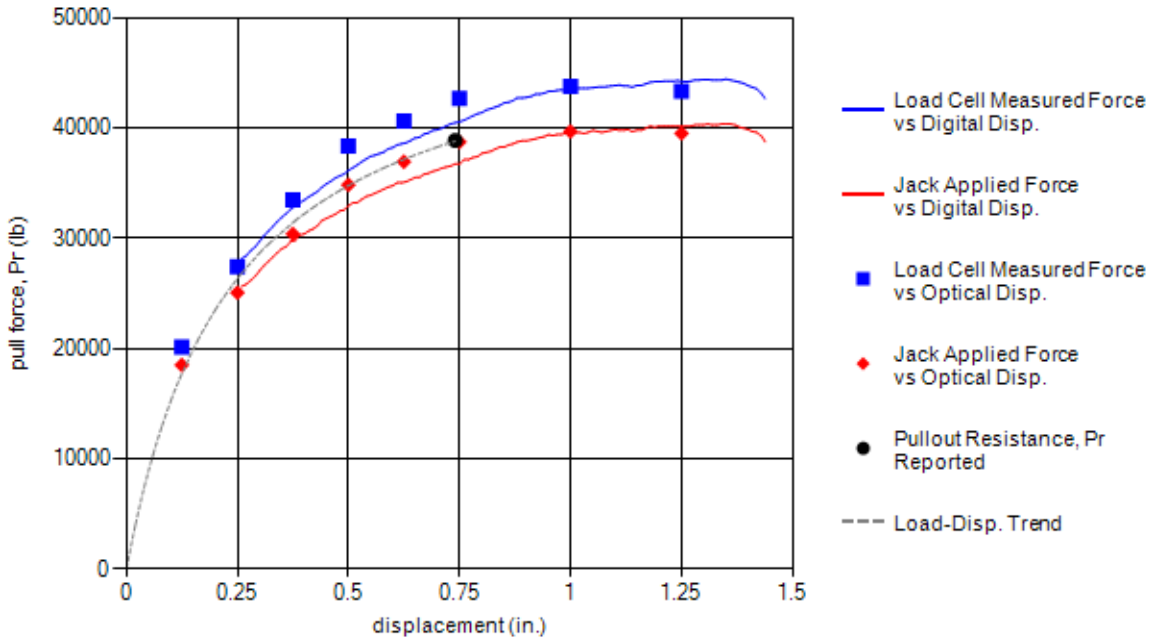
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1560	38854	13.00	**1.38**

Load-Displacement Curve



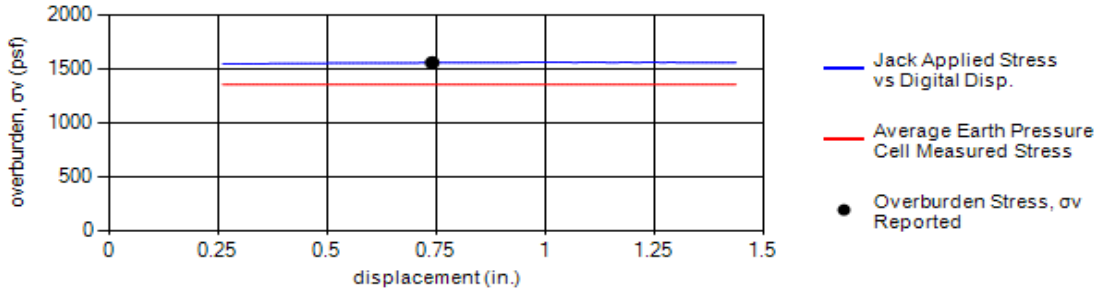
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

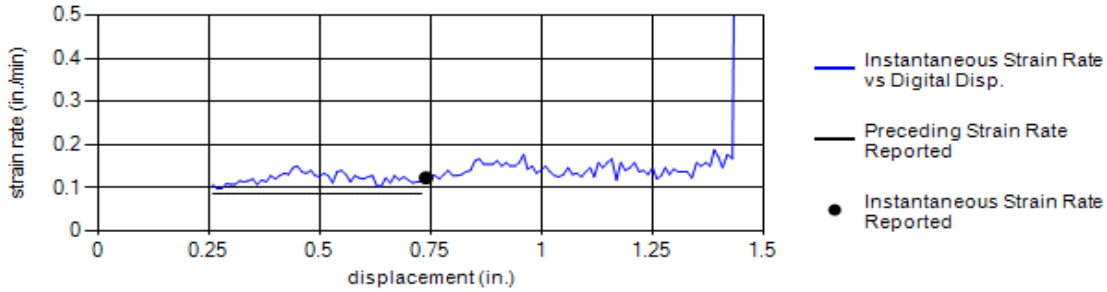
Personnel

Tested:	AJ YW DH
Prepared:	AS TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1485	1054	1468	1333	1448	1358	3.73	1560



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.08	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

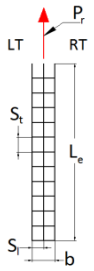
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 8:17:00 AM
Test Identification:	TS30.05-G-9x12-W20xW11-L12-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	12	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

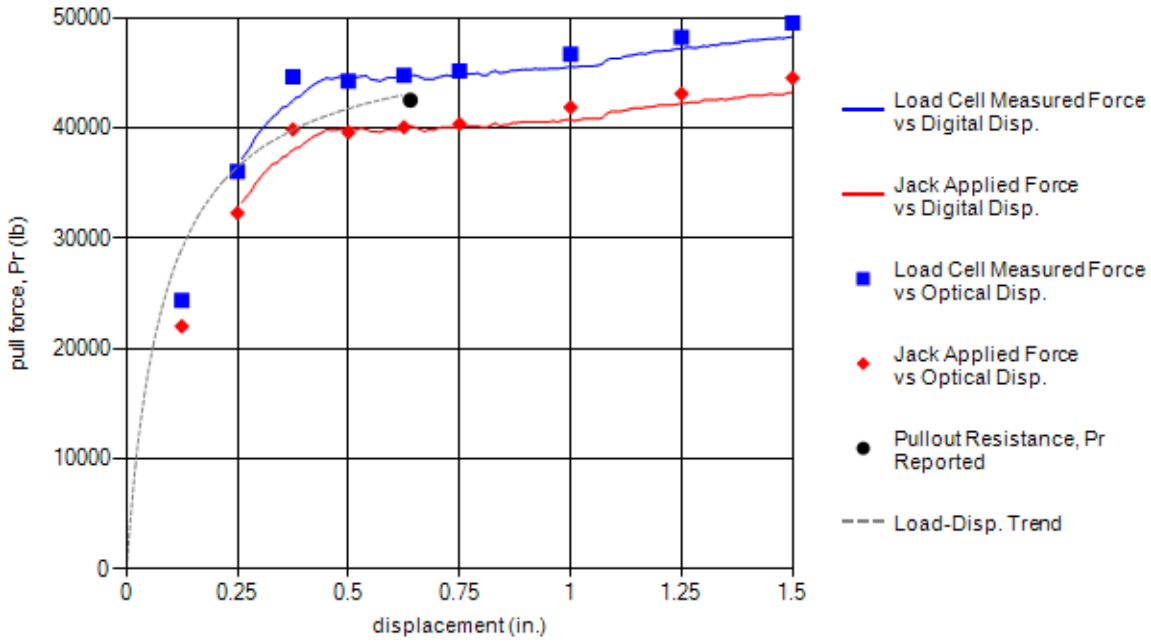
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.64	669	42504	5.60	**1.77**

Load-Displacement Curve



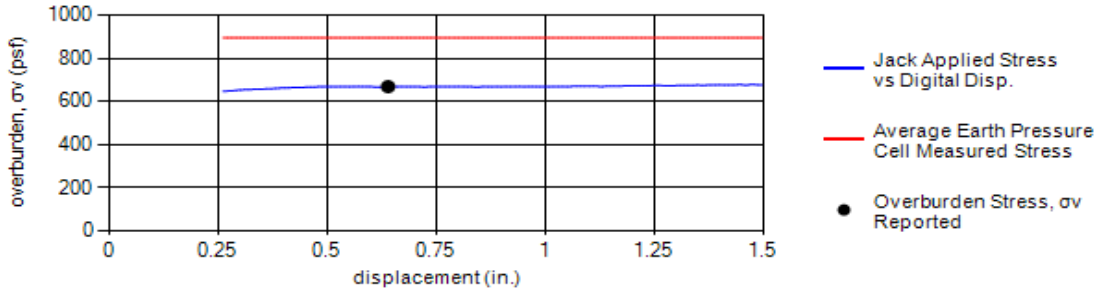
Comments

Digital displacement: pullout and elongation undifferentiated.

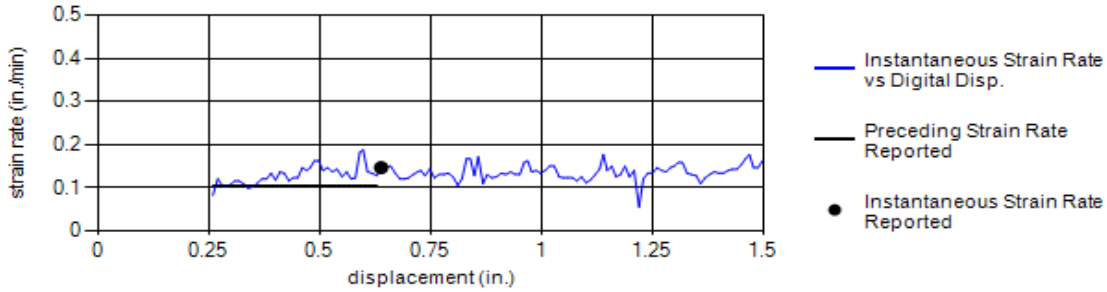
Personnel

Tested:	AS AJ YW
Prepared:	AS TW
Checked:	WL PJ

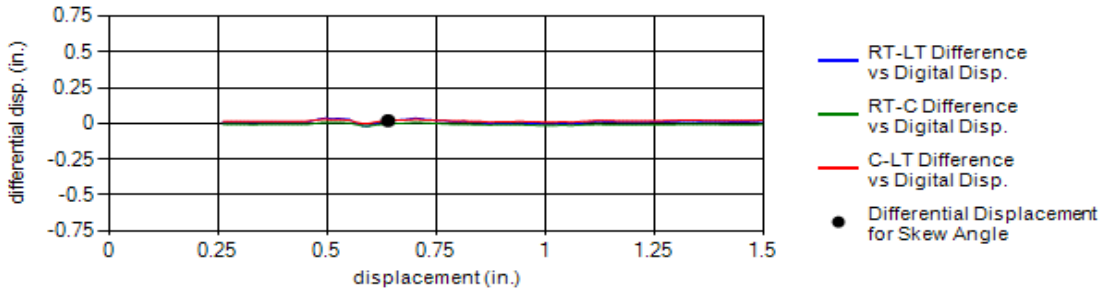
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1287	681	701	993	818	896	7.09	669



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.10	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	0.00	0.02	No Data	0.06	CCW



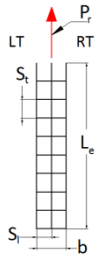
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 8:48:00 AM
Test Identification:	TS30.06-G-9x12-W20xW11-L9-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

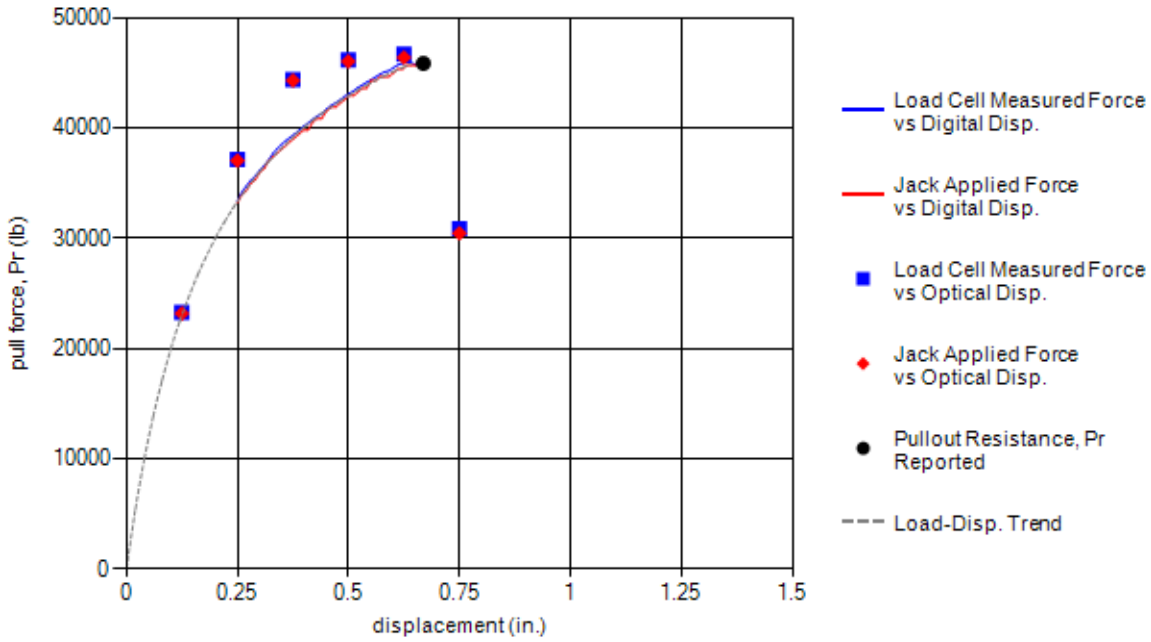
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.67	1424	45836	11.90	**1.19**

Load-Displacement Curve



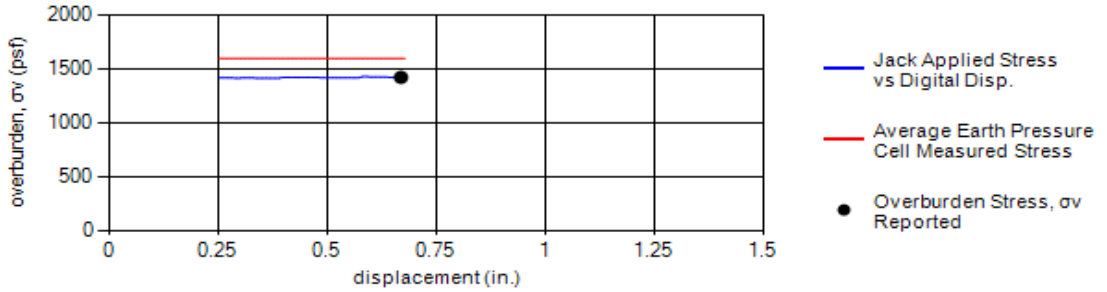
Comments

Single bar rupture at 0.67in. Digital displacement: pullout and elongation undifferentiated.

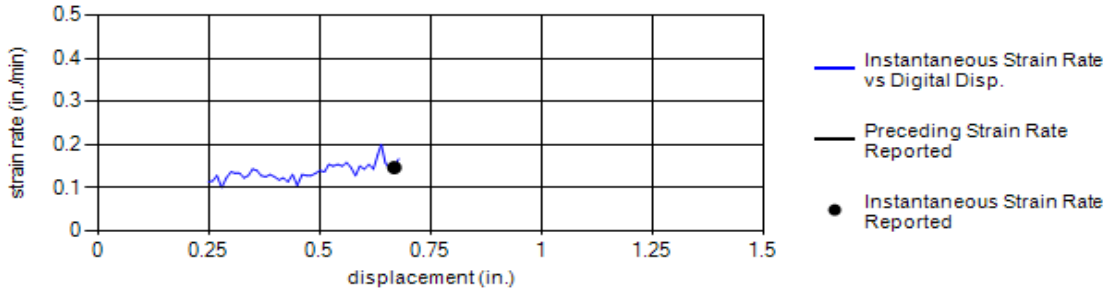
Personnel

Tested:	AS AJ YW
Prepared:	AS TW
Checked:	WL PJ

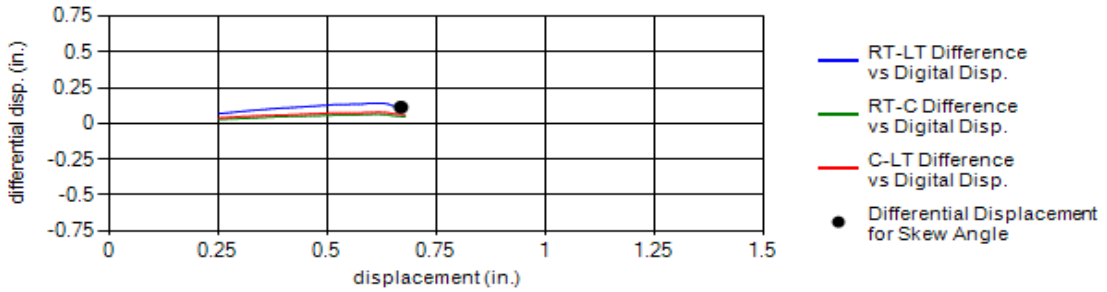
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1794	1171	1741	1615	1670	1598	3.34	1424



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.10	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.11	0.05	0.06	No Data	0.36	CCW



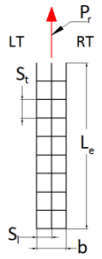
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 9:14:00 AM
Test Identification:	TS30.07-G-9x12-W20xW11-L9-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

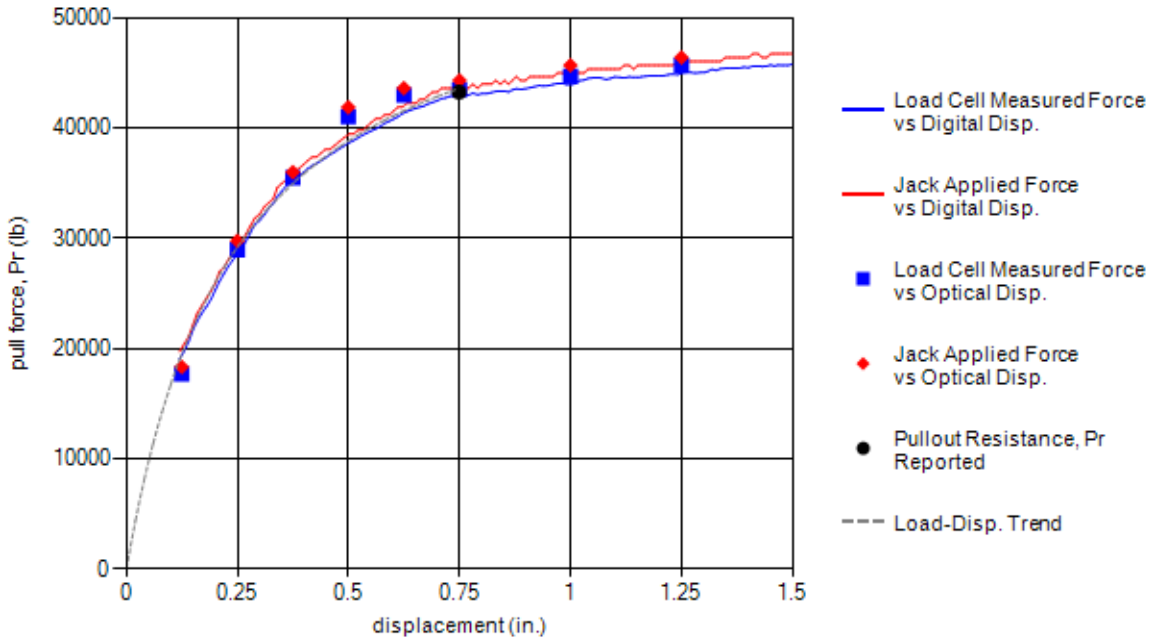
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	650	43226	5.40	**2.46**

Load-Displacement Curve



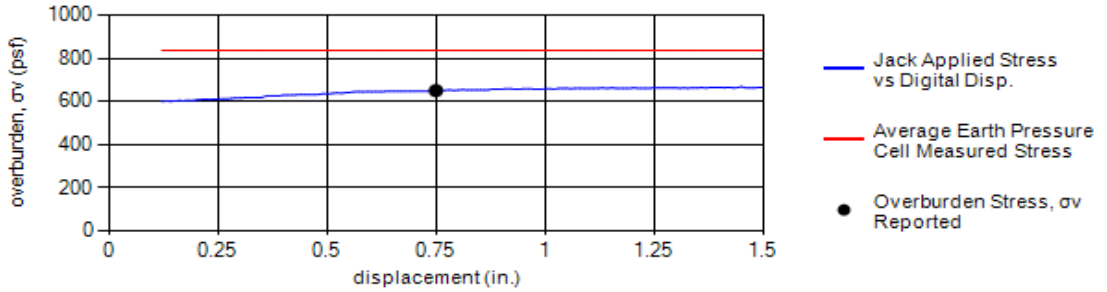
Comments

Digital displacement: pullout and elongation undifferentiated.

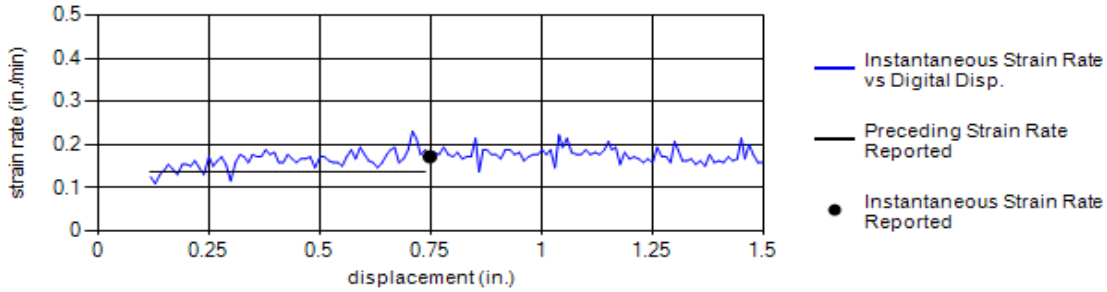
Personnel

Tested:	AS AJ YW
Prepared:	AS TW
Checked:	WL PJ

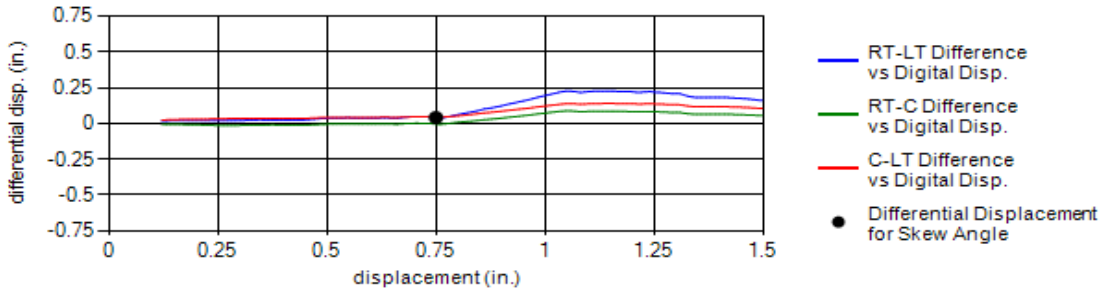
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
913	671	967	852	779	836	7.29	649



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.14	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.00	0.04	No Data	0.13	CCW



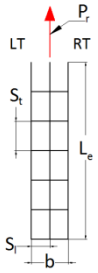
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 9:51:00 AM
Test Identification:	TS30.08-G-9x12-W20xW11-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

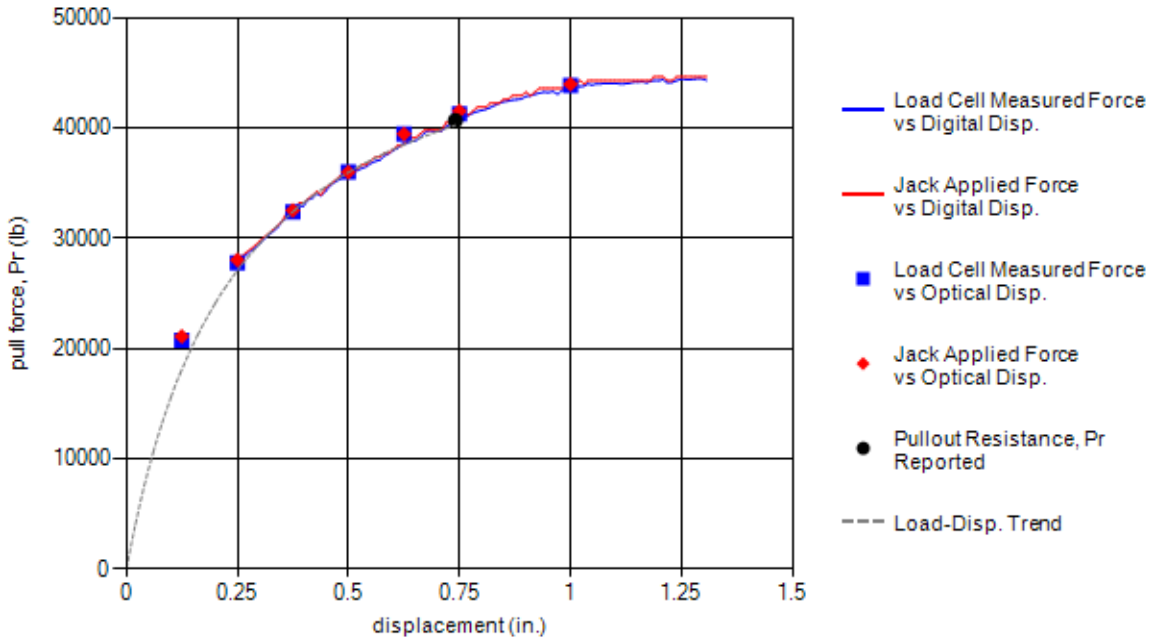
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	1423	40657	11.90	**1.59**

Load-Displacement Curve



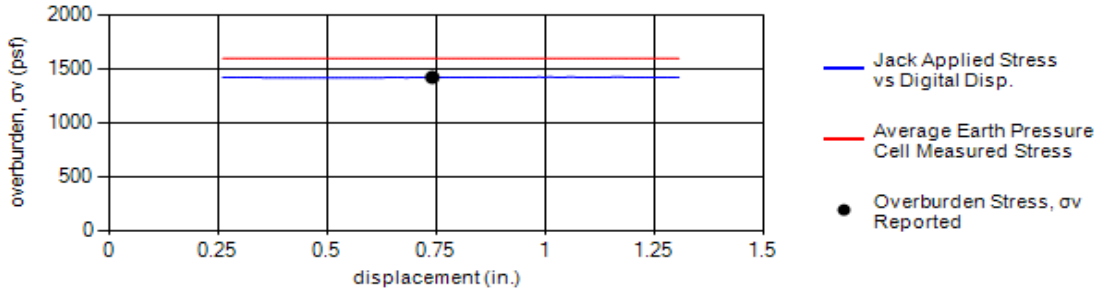
Comments

Center and right longitudinal bars rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

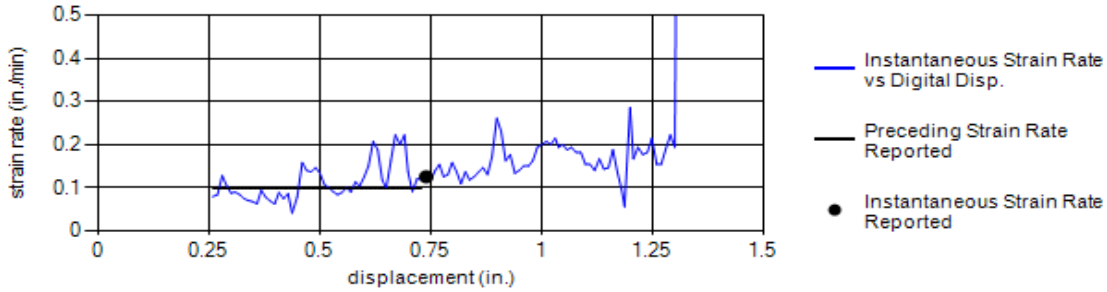
Personnel

Tested:	AS YW AJ
Prepared:	AS TW
Checked:	WL PJ

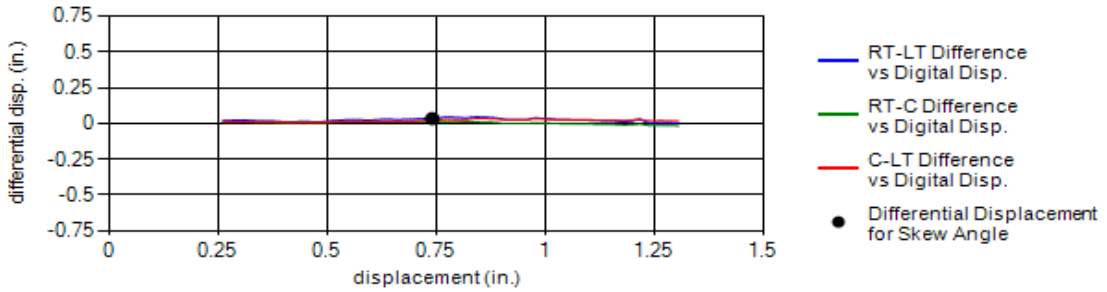
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1762	1438	1536	1625	1628	1598	3.33	1423



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.10	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	0.01	0.02	No Data	0.11	CCW



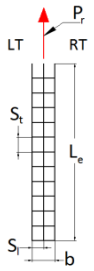
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 11:17:00 AM
Test Identification:	TS30.09-G-9x12-W20xW11-L12-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	12	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

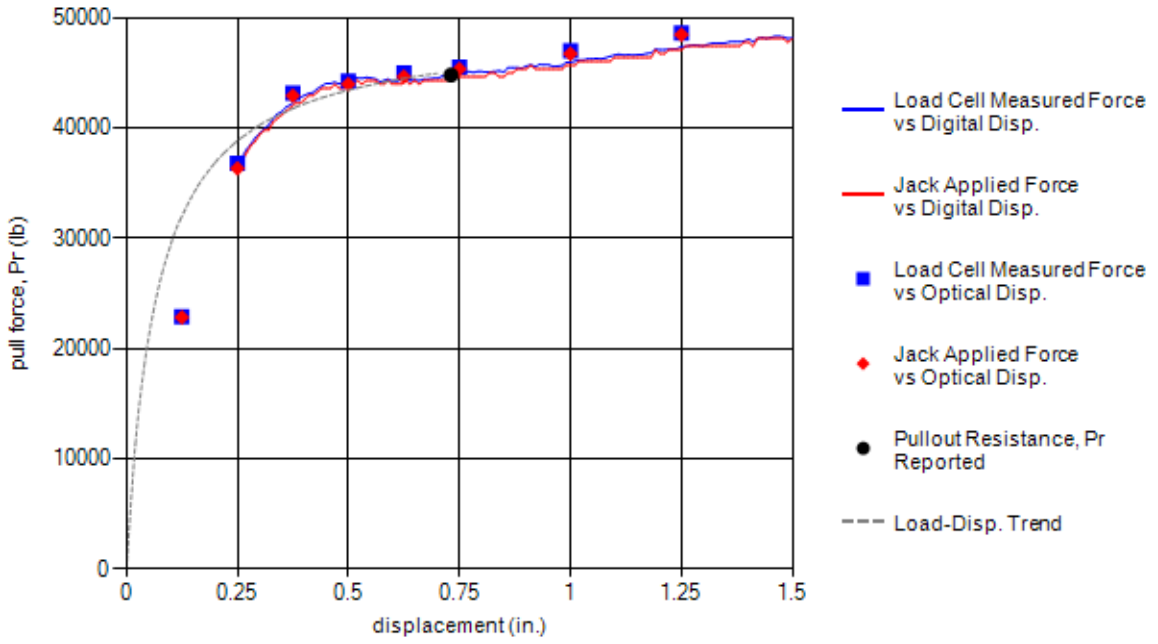
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	636	44779	5.30	**1.96**

Load-Displacement Curve



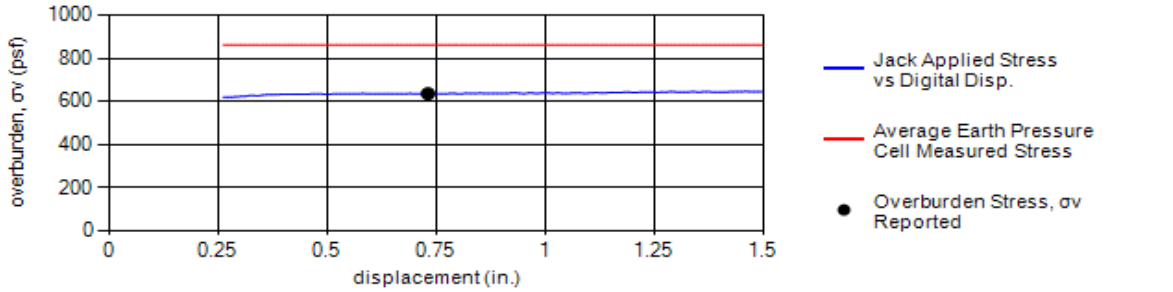
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

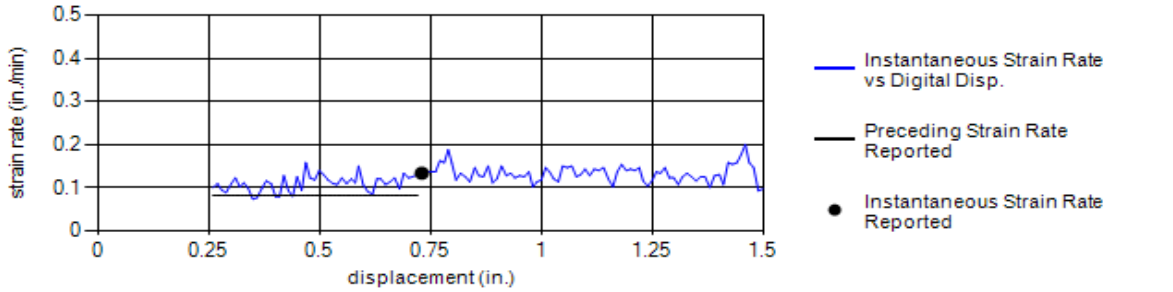
Personnel

Tested:	AS AJ RH
Prepared:	AS TW
Checked:	WL PJ

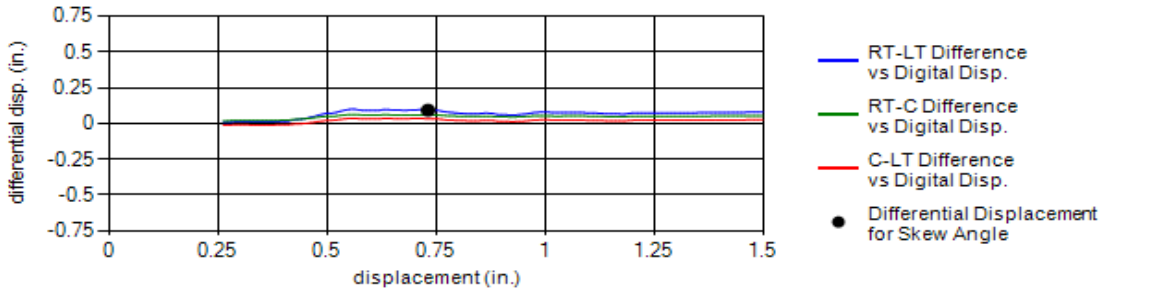
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1032	655	684	1119	827	863	7.64	636



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.08	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.09	0.06	0.03	No Data	0.30	CCW



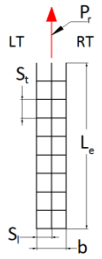
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 11:50:00 AM
Test Identification:	TS30.10-G-9x12-W20xW11-L9-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

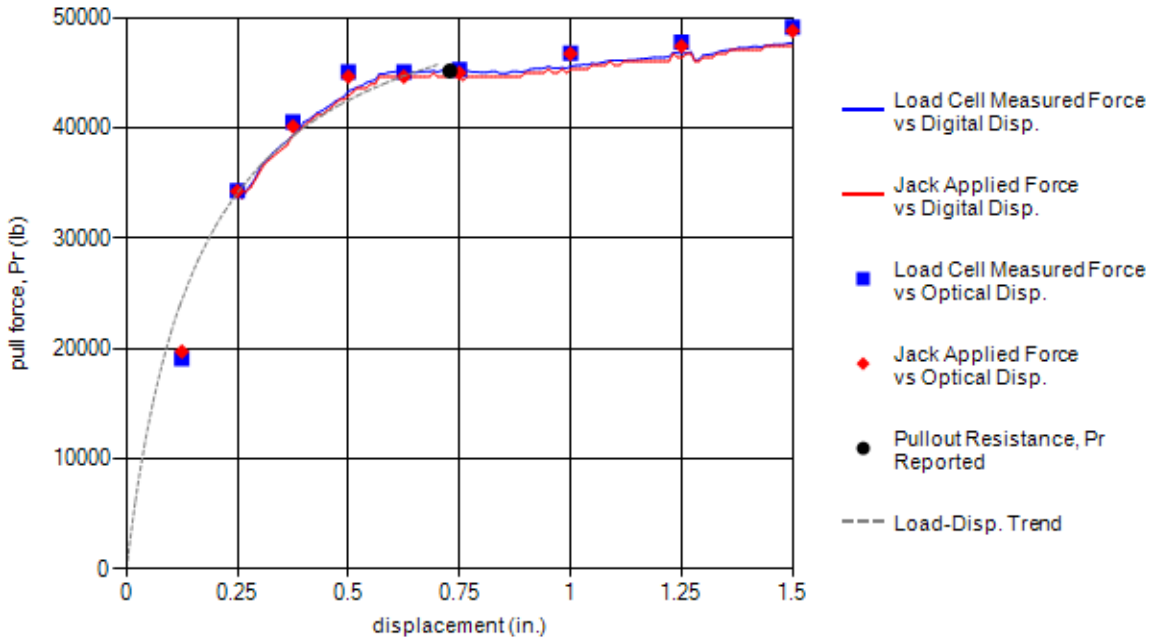
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.73	1433	45142	11.90	**1.17**

Load-Displacement Curve



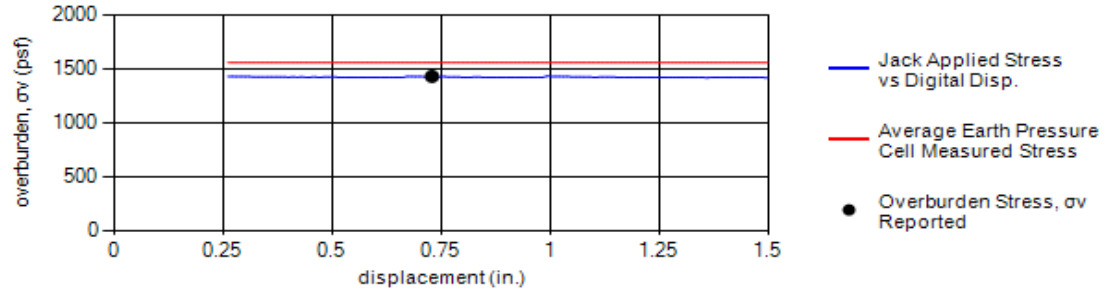
Comments

Digital displacement: pullout and elongation undifferentiated.

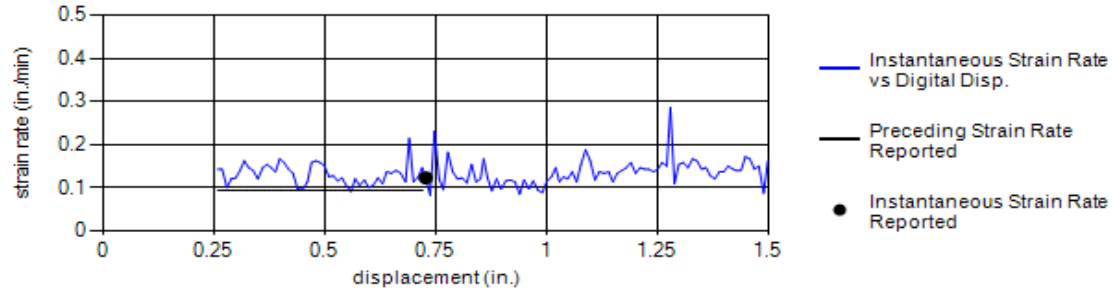
Personnel

Tested:	AS AJ RH
Prepared:	AS TW
Checked:	WL PJ

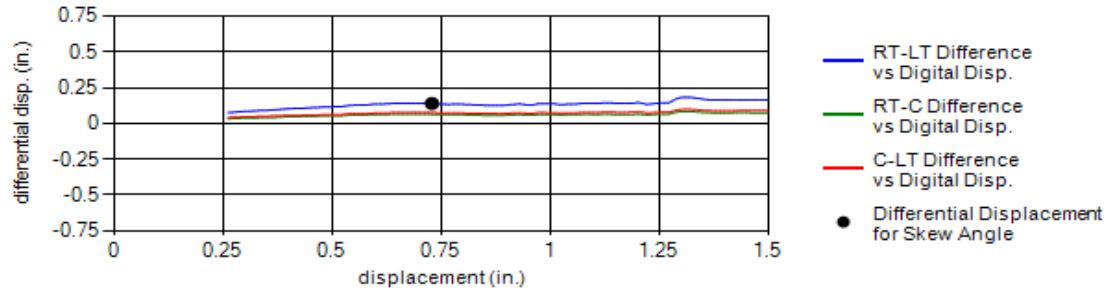
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1669	1126	1637	1707	1669	1562	3.39	1433



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.09	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.14	0.06	0.08	No Data	0.45	CCW



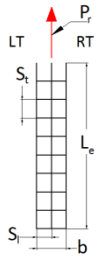
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 12:23:00 PM
Test Identification:	TS30.11-G-9x12-W20xW11-L9-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	9	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

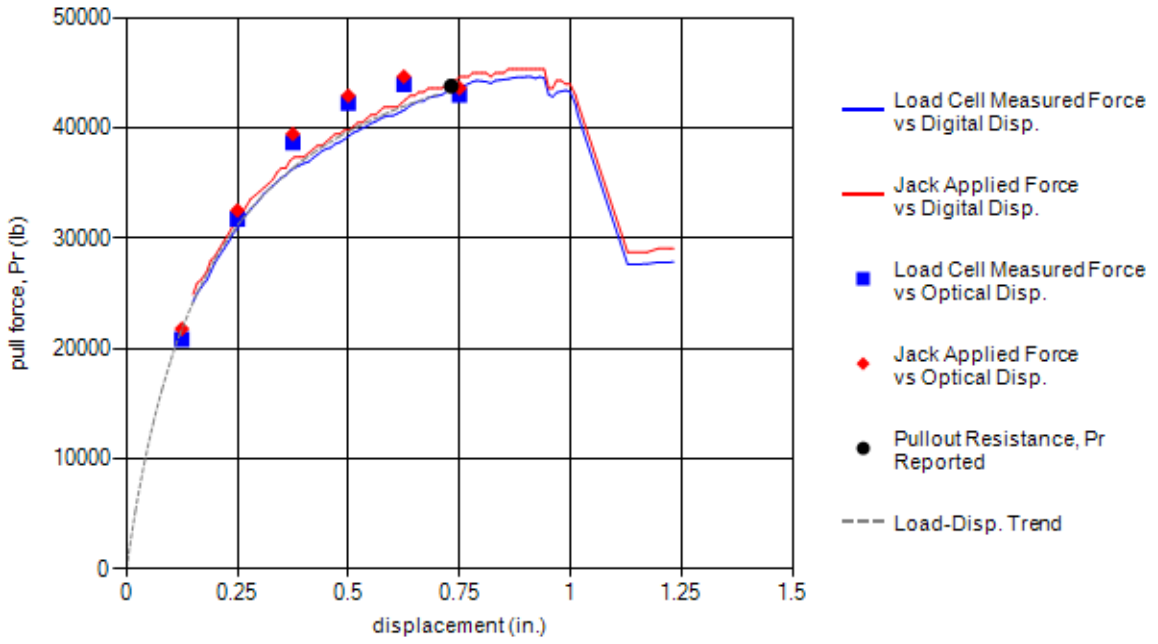
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	647	43780	5.40	**2.50**

Load-Displacement Curve



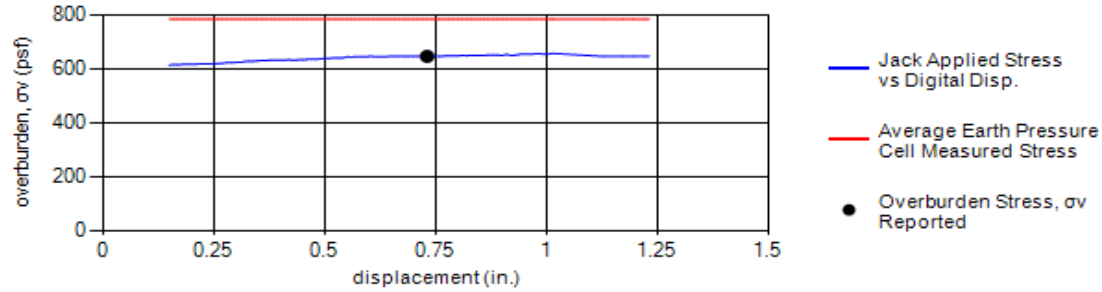
Comments

Left longitudinal bar rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

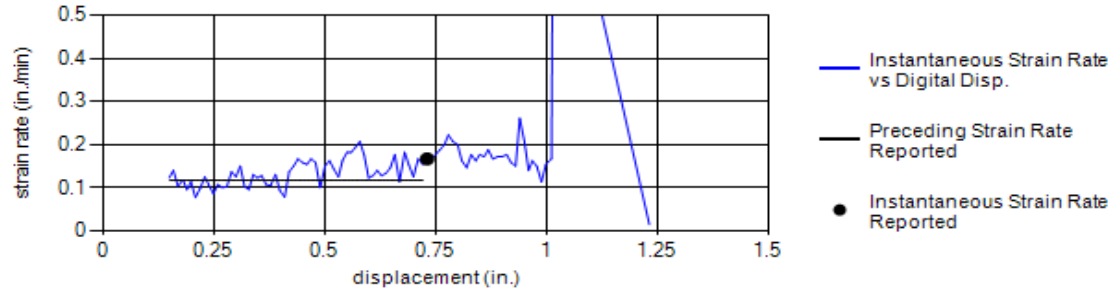
Personnel

Tested:	AS AJ RH
Prepared:	AS TW
Checked:	WL PJ

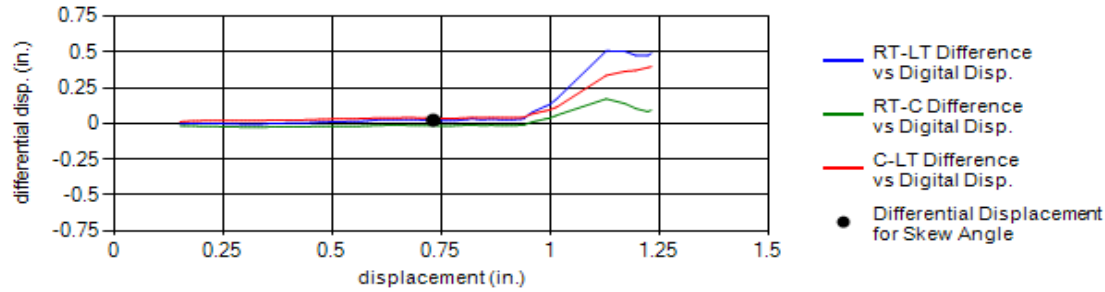
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
825	563	862	887	794	786	7.51	647



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.12	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	-0.01	0.04	No Data	0.08	CCW



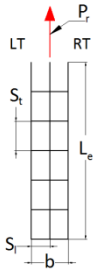
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/18/2011 12:53:00 PM
Test Identification:	TS30.12-G-9x12-W20xW11-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

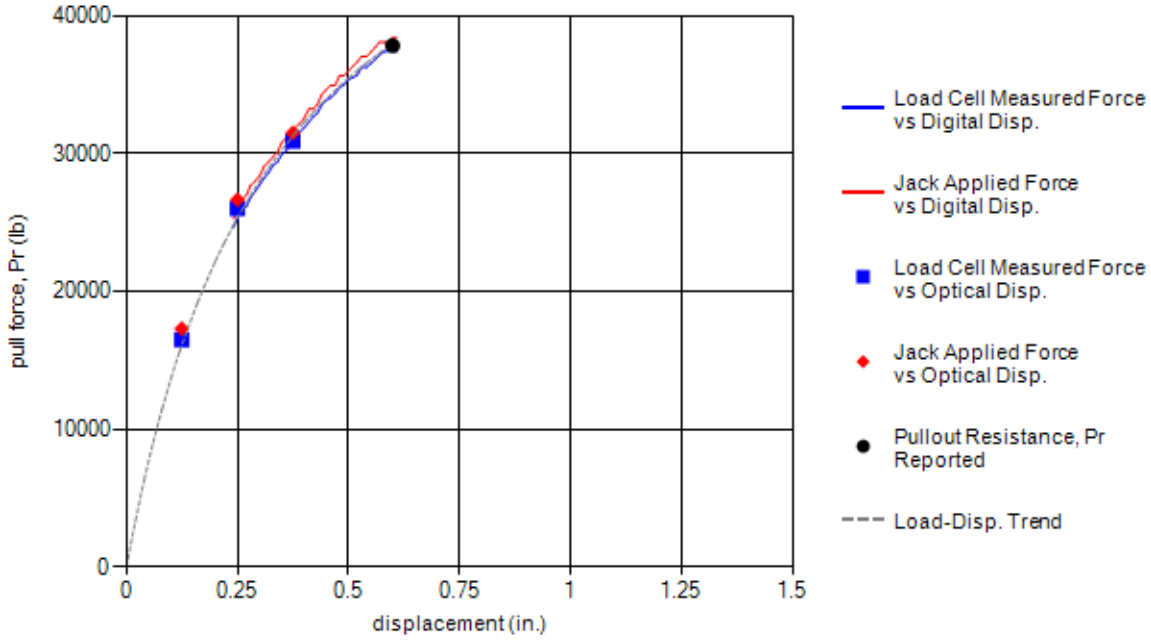
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.60	1432	37806	11.90	**1.47**

Load-Displacement Curve



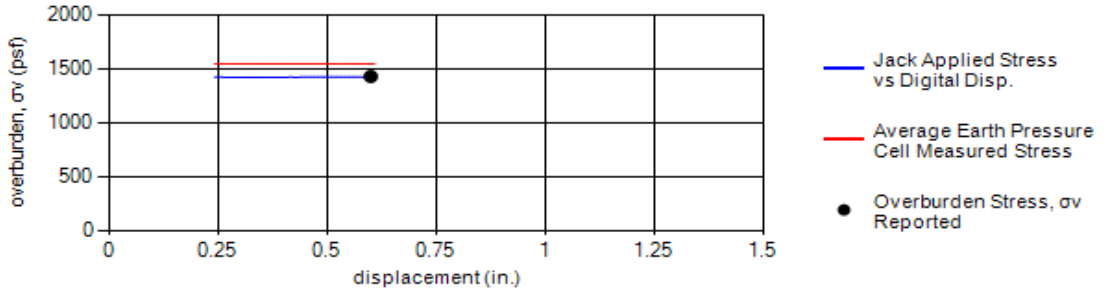
Comments

Single bar rupture at 0.60in. Digital displacement: pullout and elongation undifferentiated.

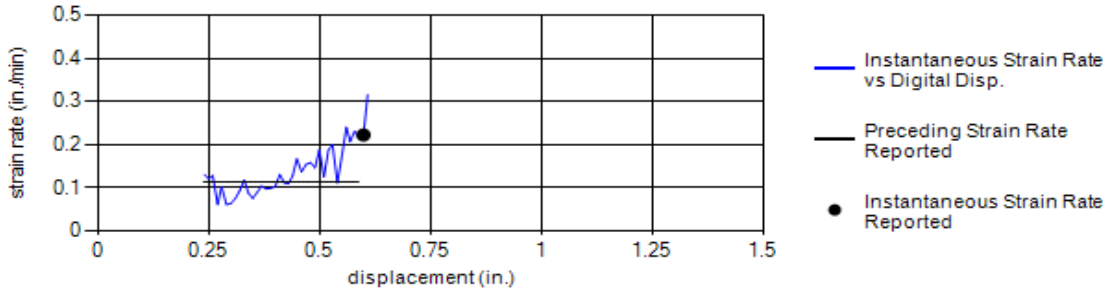
Personnel

Tested:	AS AJ RH
Prepared:	ET TW
Checked:	WL PJ

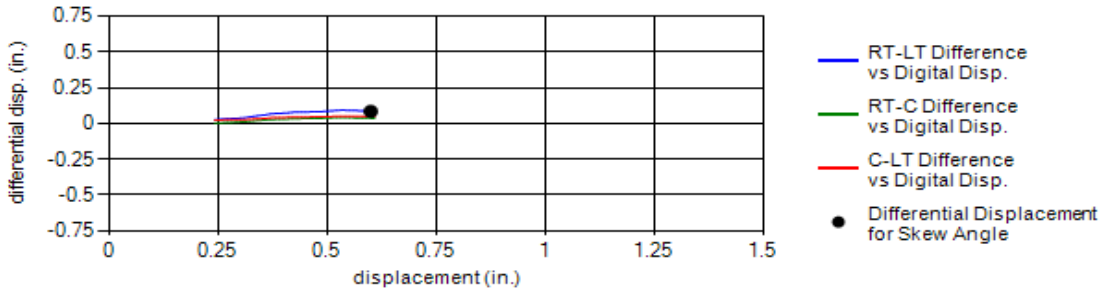
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1789	1136	1432	1719	1666	1548	3.39	1432



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.11	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.09	0.04	0.05	No Data	0.27	CCW



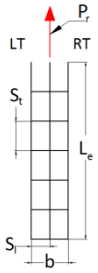
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 9:59:00 AM
Test Identification:	TS31.01-G-9x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

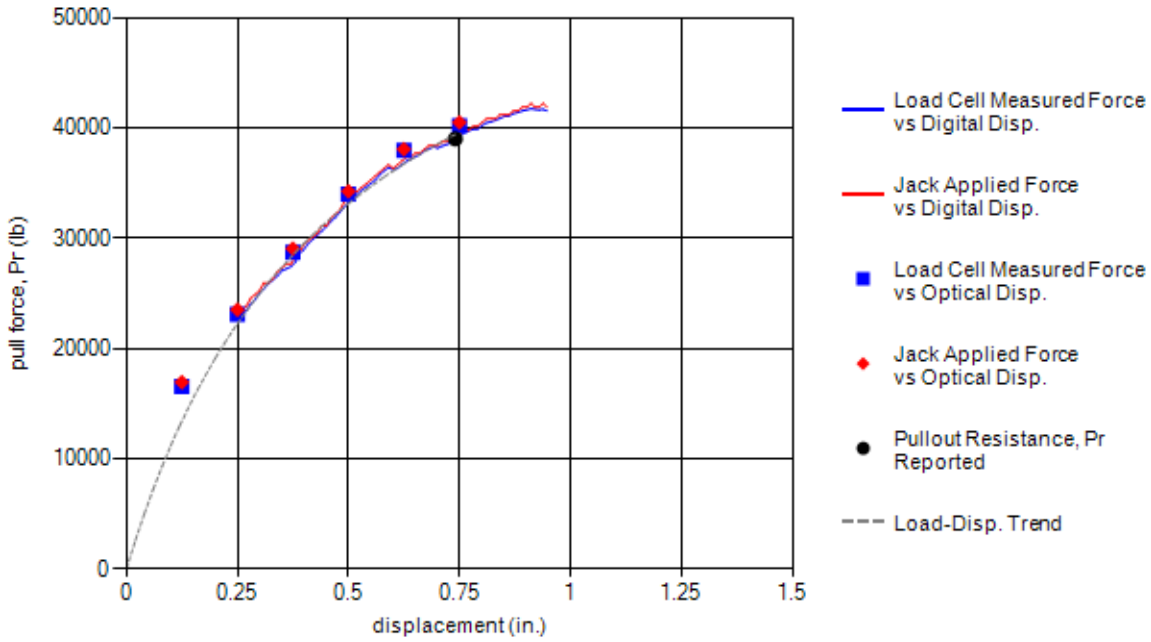
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2184	38991	18.20	**0.99**

Load-Displacement Curve



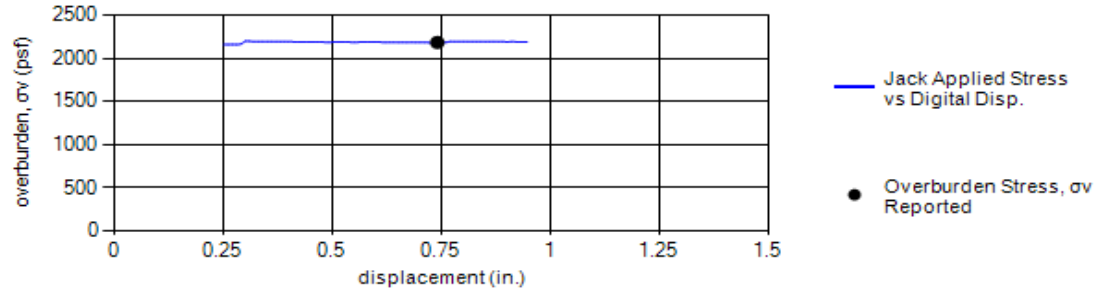
Comments

Left longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

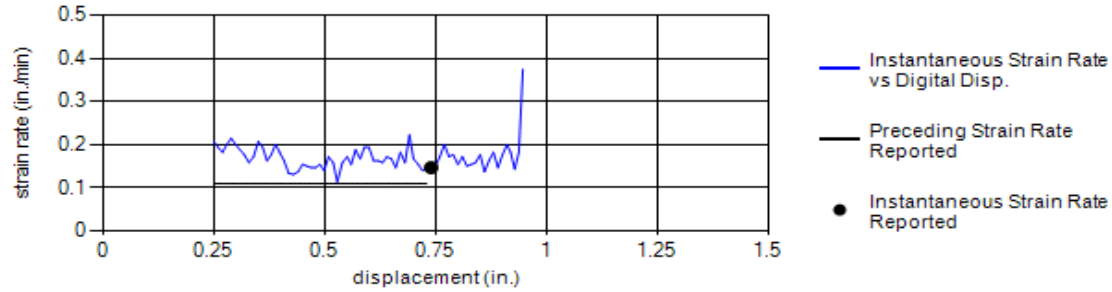
Personnel

Tested:	AJ YW DH
Prepared:	ET TW
Checked:	WL PJ

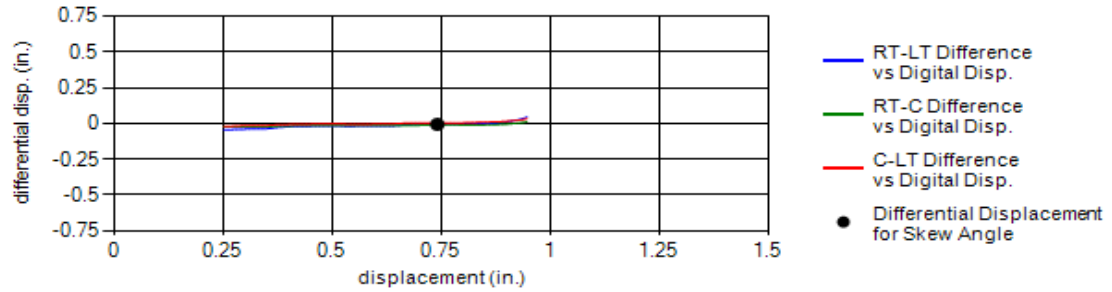
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.12	2184



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.11	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.01	-0.01	0.00	No Data	-0.02	CW



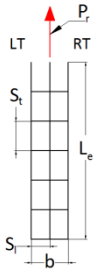
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 11:59:00 AM
Test Identification:	TS31.02-G-9x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

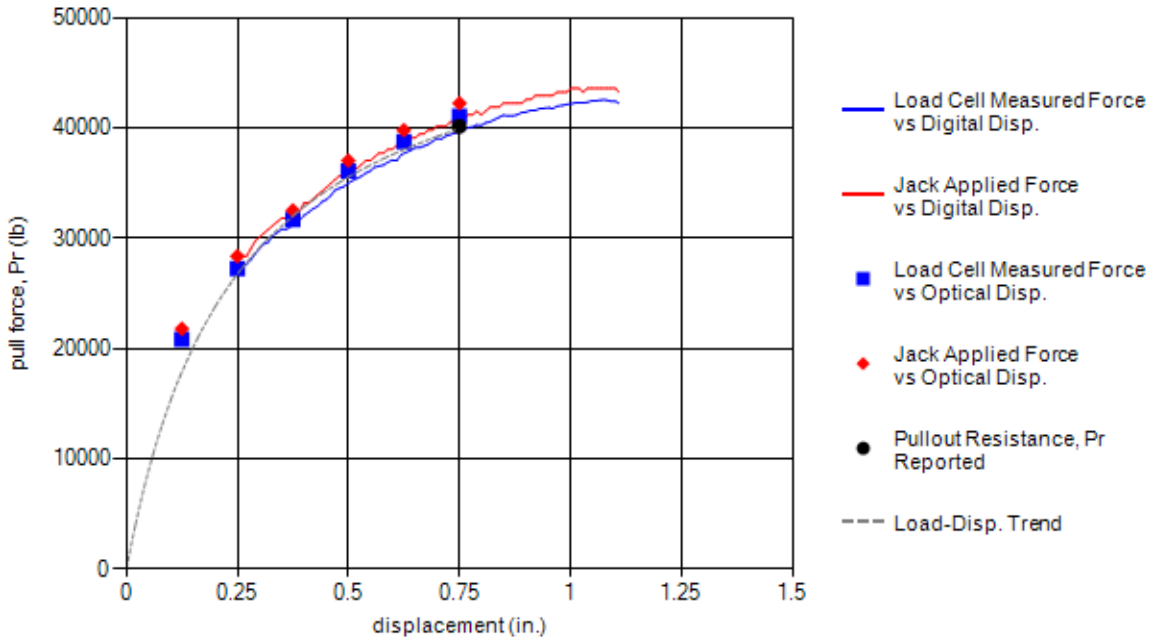
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	2153	40125	17.90	**1.04**

Load-Displacement Curve



Comments

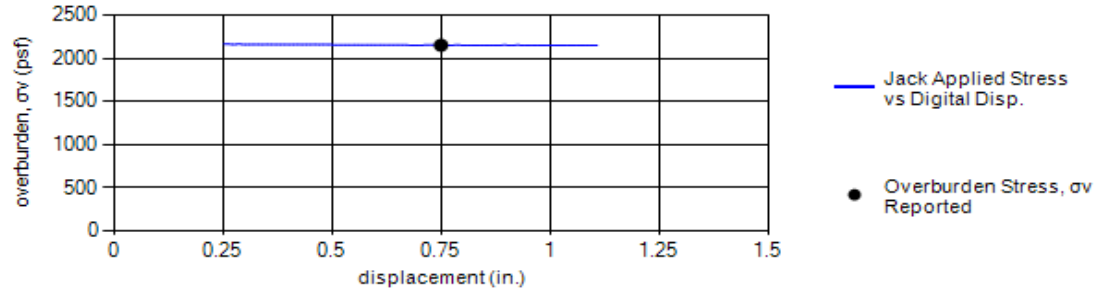
Left longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

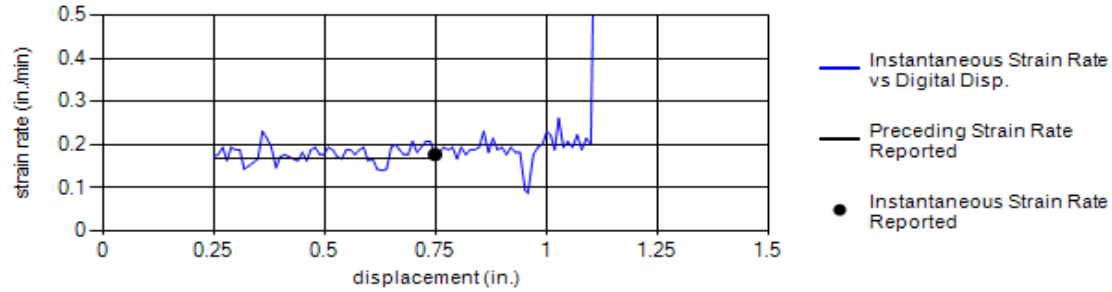
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.15	2153



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.17	0.17

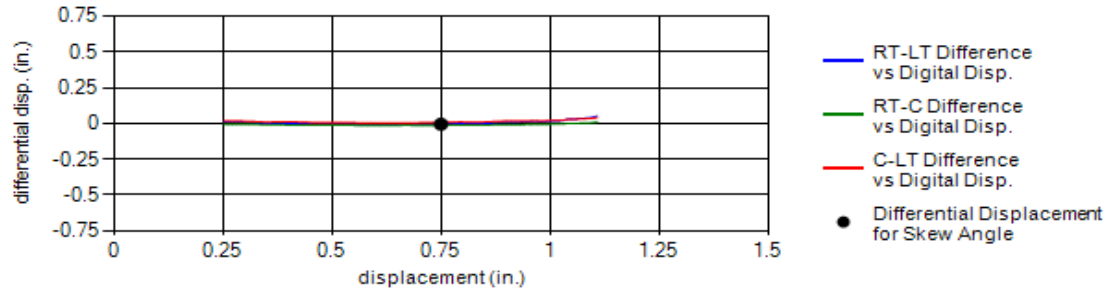


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.00	-0.01	0.01	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.01	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

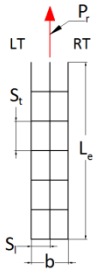
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 12:27:00 PM
Test Identification:	TS31.03-G-9x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

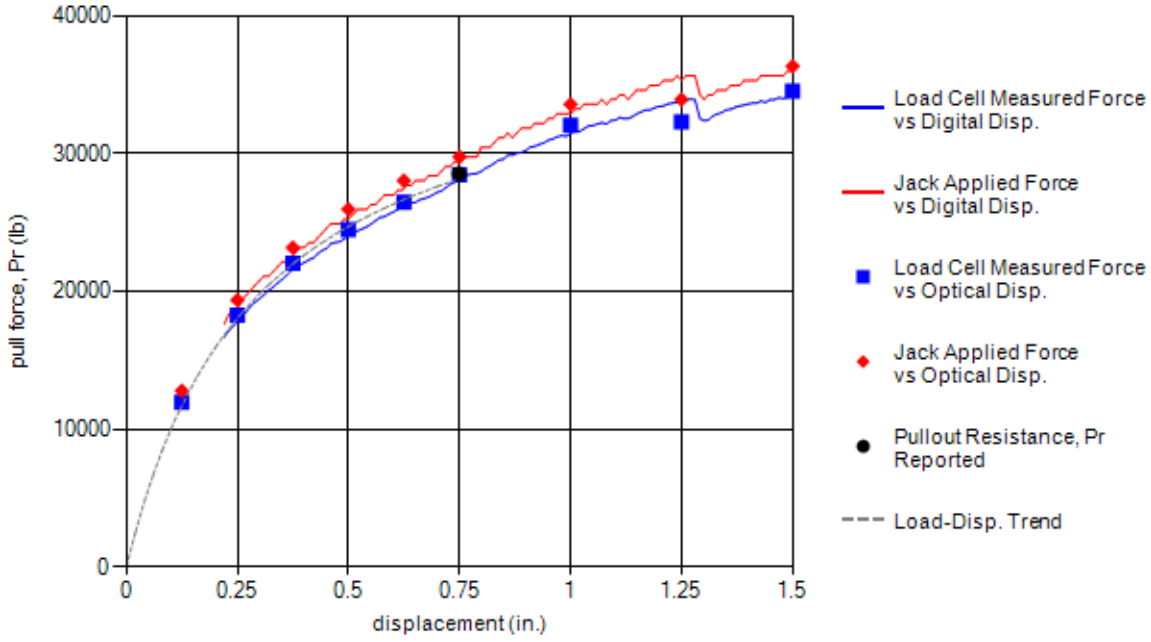
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	628	28519	5.20	**2.52**

Load-Displacement Curve



Comments

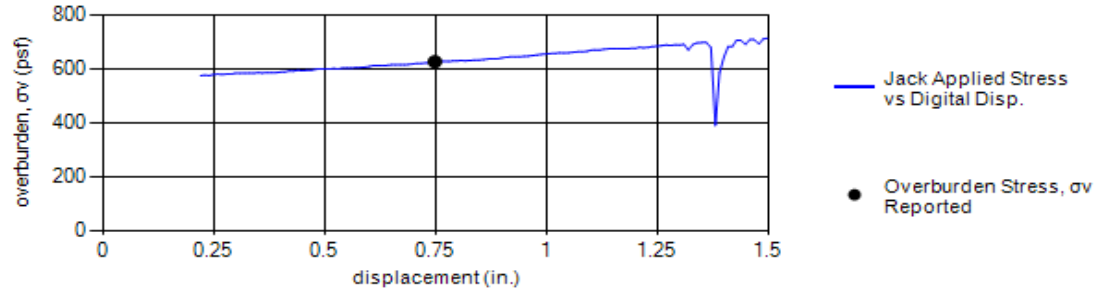
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

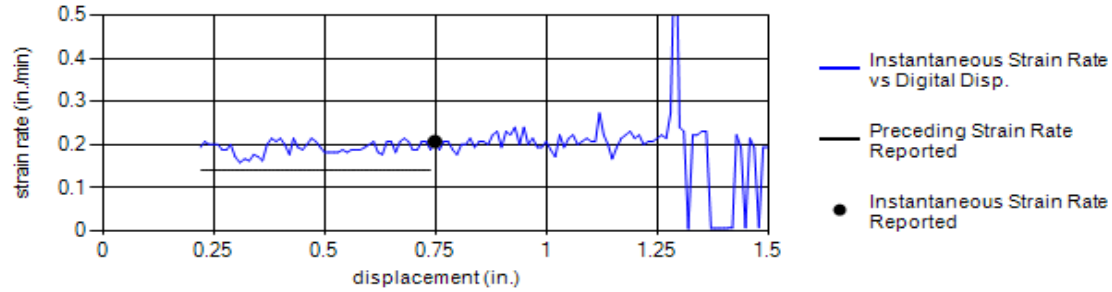
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.36	628



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.14	0.16

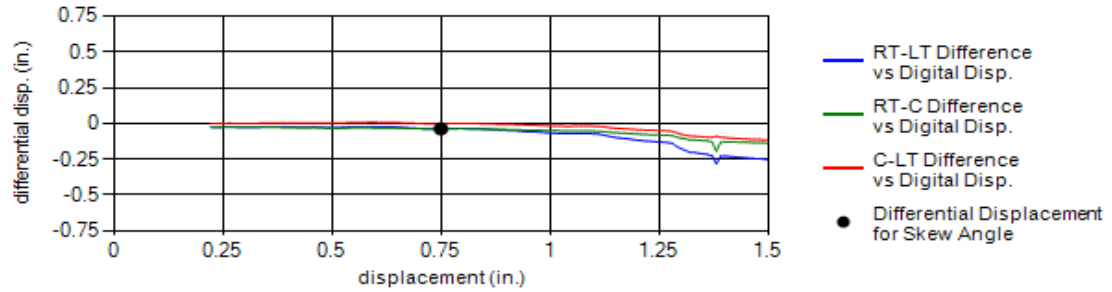


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.04	-0.04	0.00	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.12	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

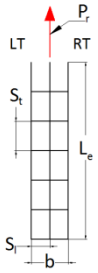
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 2:58:00 PM
Test Identification:	TS31.05-G-9x12-W20xW7.5-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

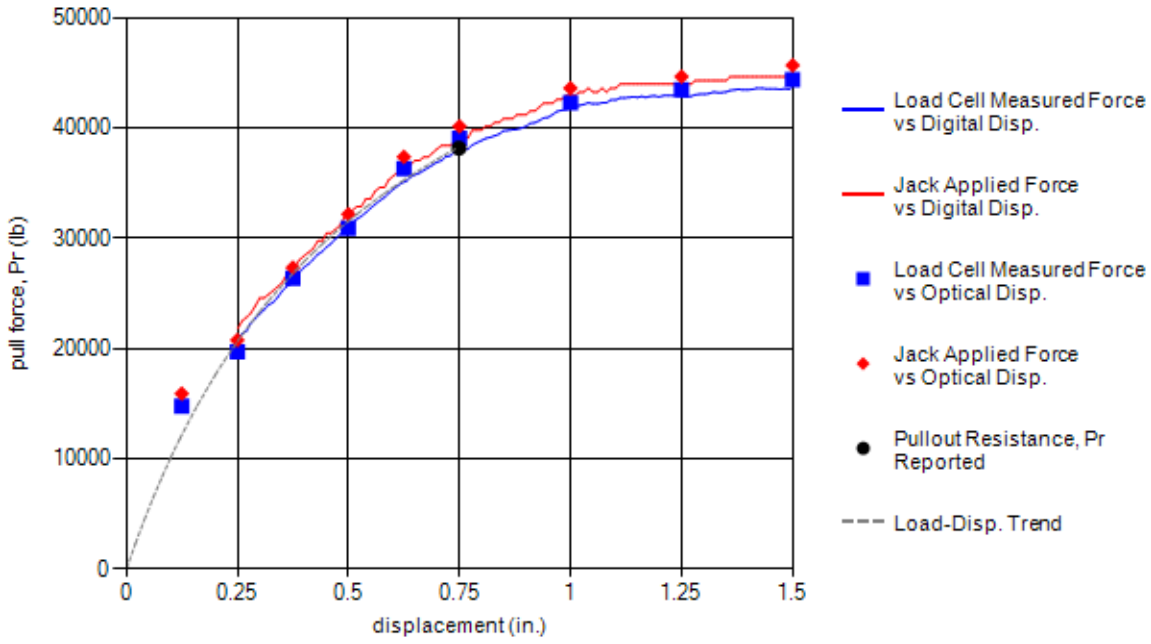
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2161	38155	18.00	**0.98**

Load-Displacement Curve



Comments

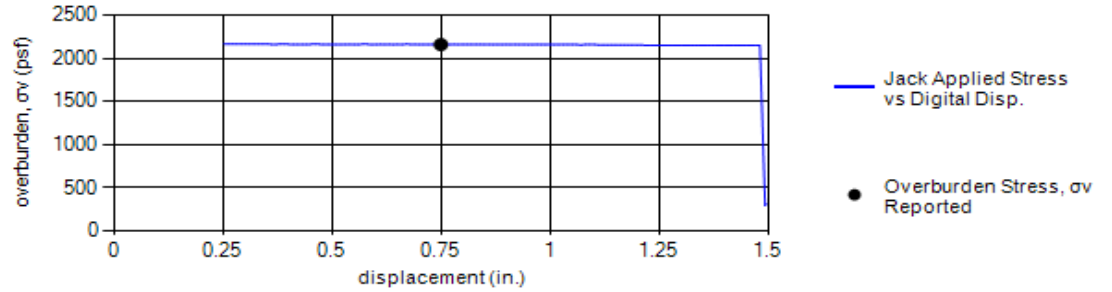
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

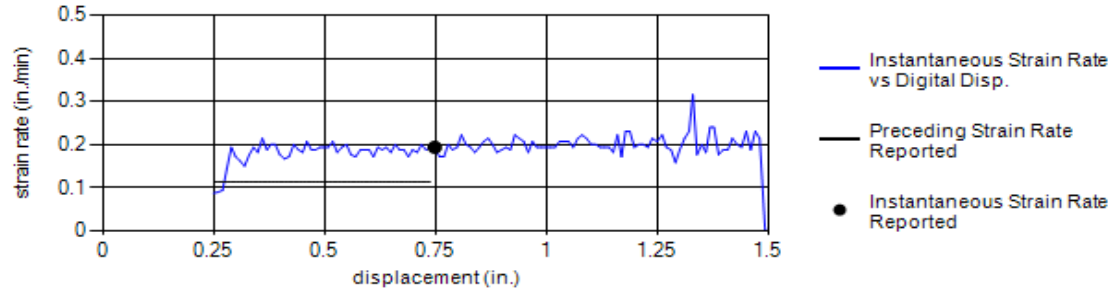
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.19	2161



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.11	0.05

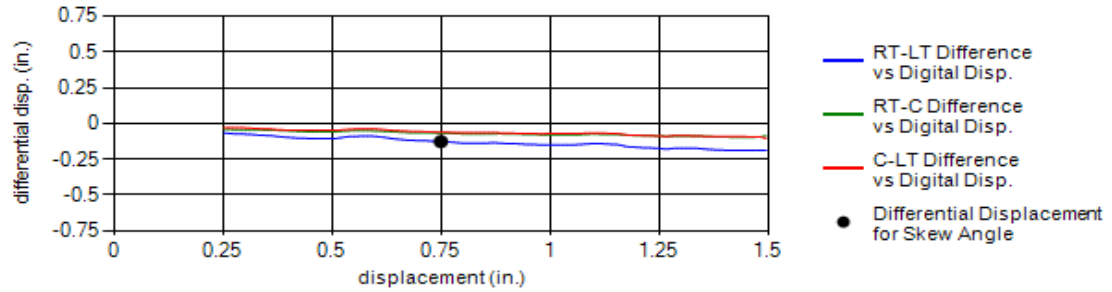


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.13	-0.07	-0.06	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.40	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

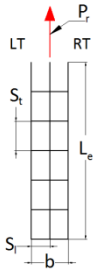
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 2:33:00 PM
Test Identification:	TS31.06-G-9x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

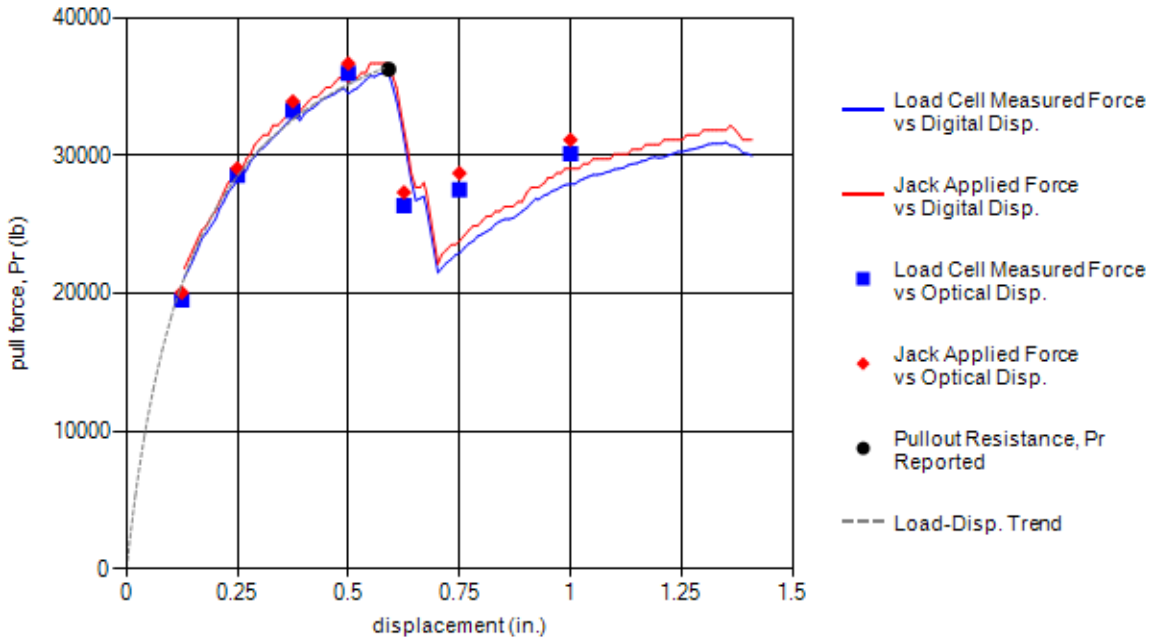
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.59	2194	36241	18.30	**0.92**

Load-Displacement Curve



Comments

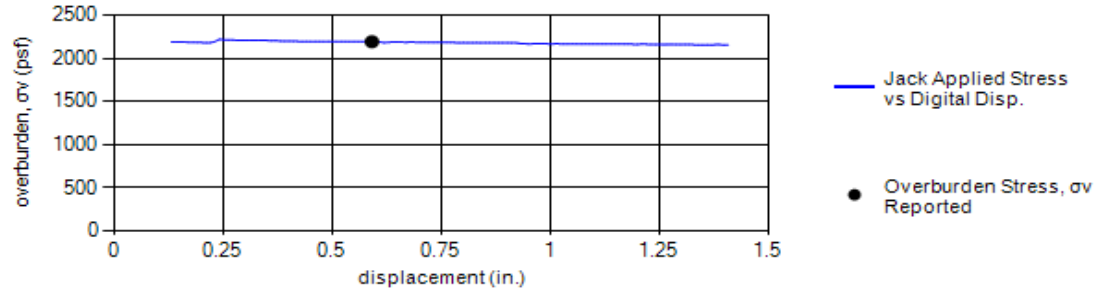
Right longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

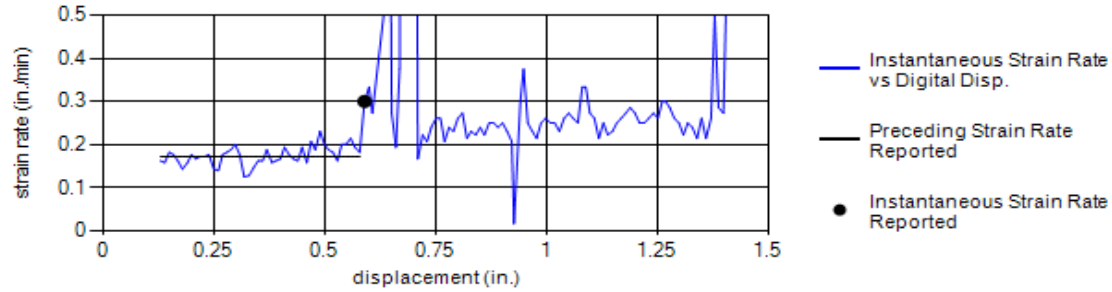
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.16	2194



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.17	0.18

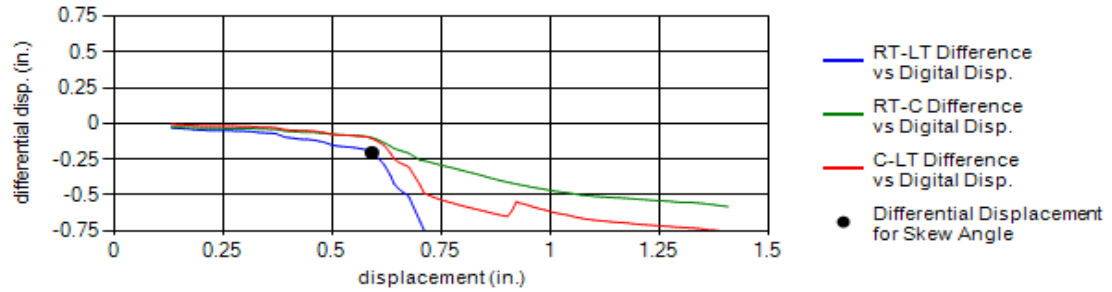


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.20	-0.10	-0.10	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.65	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

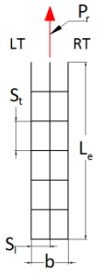
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 2:11:00 PM
Test Identification:	TS31.07-G-9x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

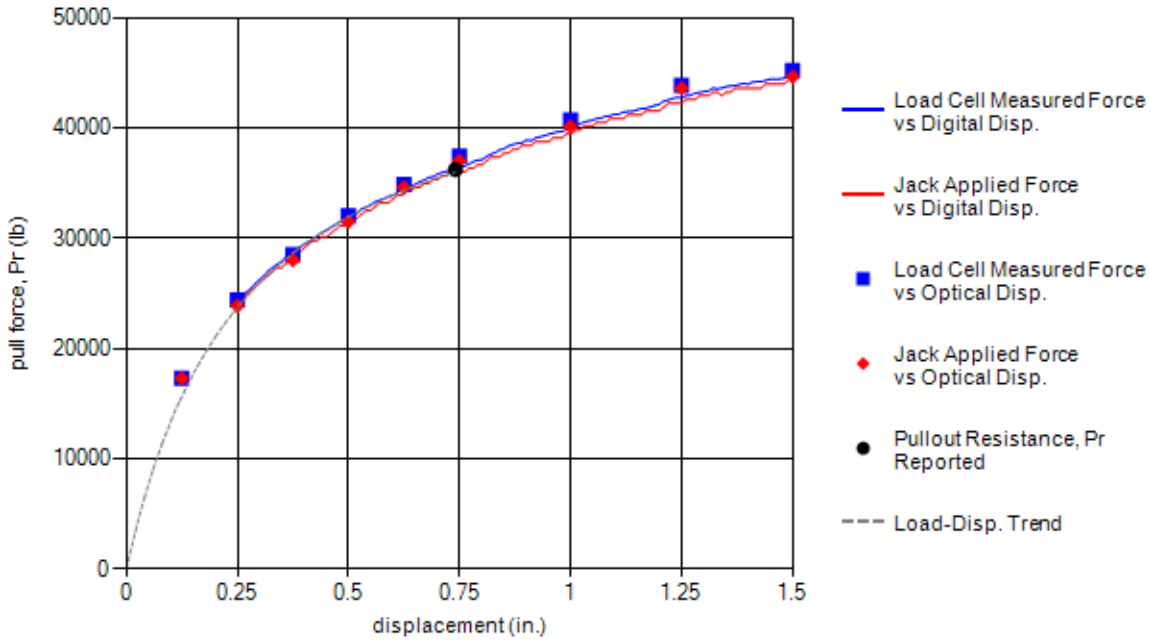
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	655	36213	5.50	**3.07**

Load-Displacement Curve



Comments

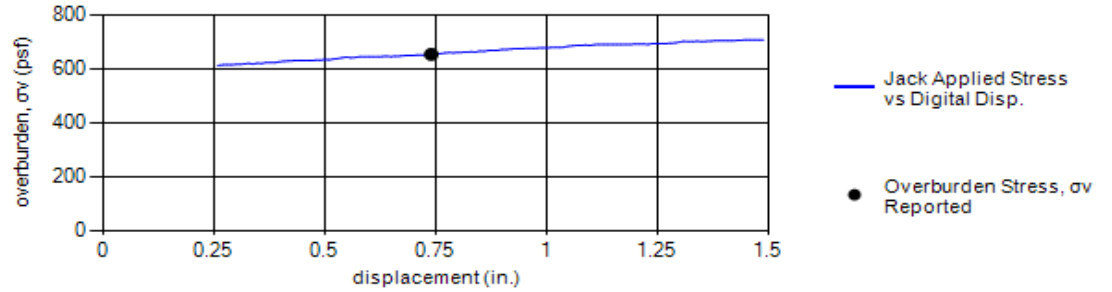
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

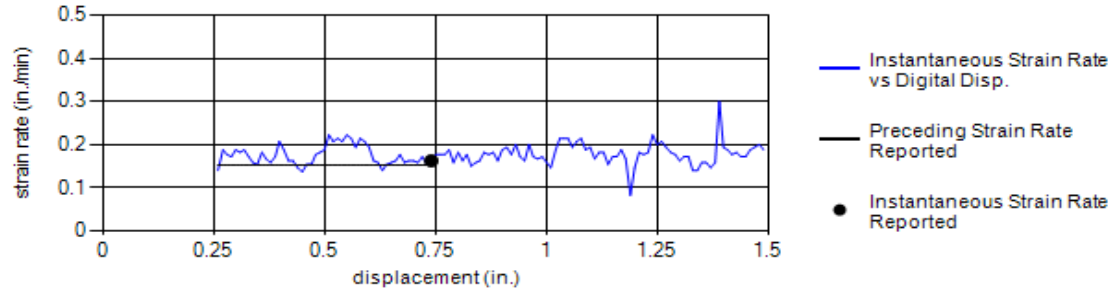
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.24	655



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.15	0.15

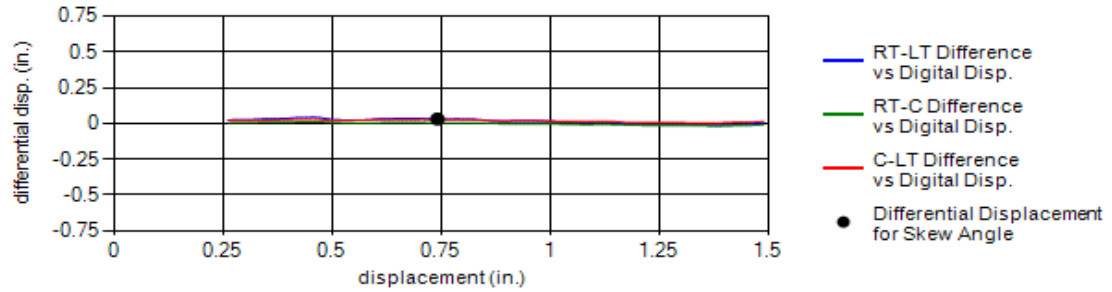


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.03	0.00	0.03	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.10	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

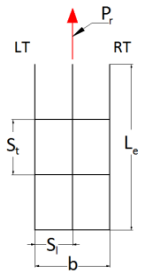
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 1:34:00 PM
Test Identification:	TS31.08-G-9x12-W20xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

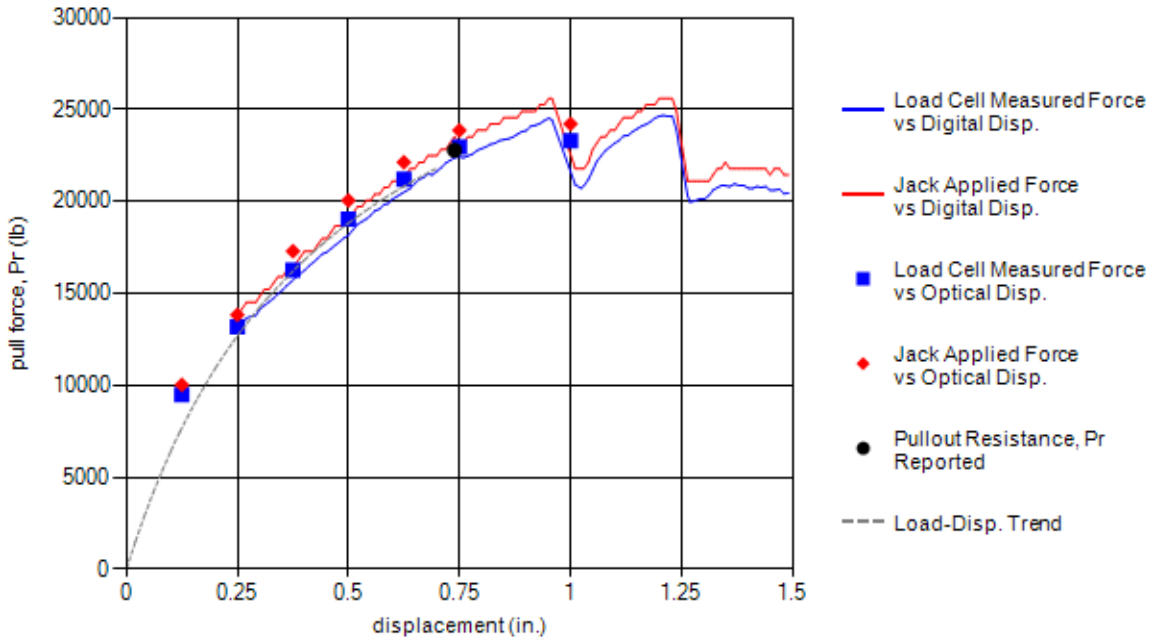
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1320	22782	11.00	**1.92**

Load-Displacement Curve



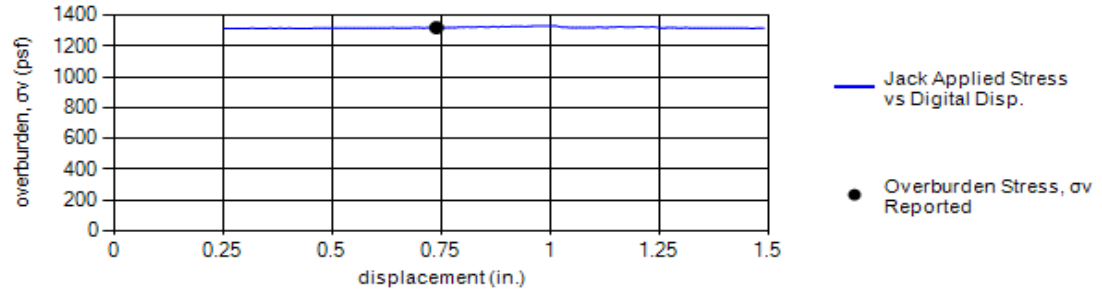
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

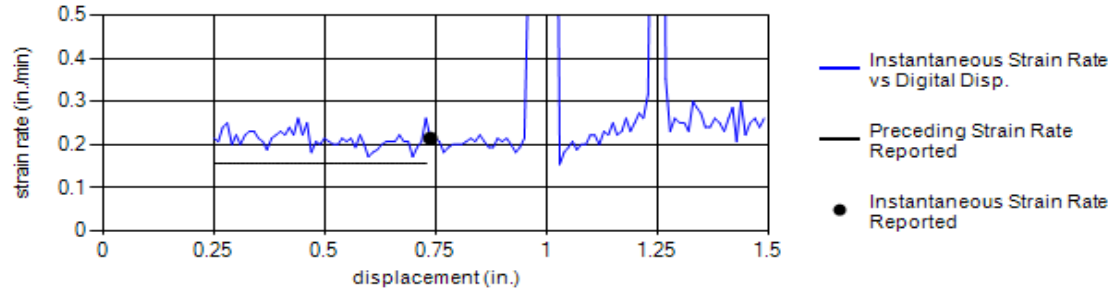
Personnel

Tested:	AJ RH DH
Prepared:	ET TW
Checked:	WL PJ

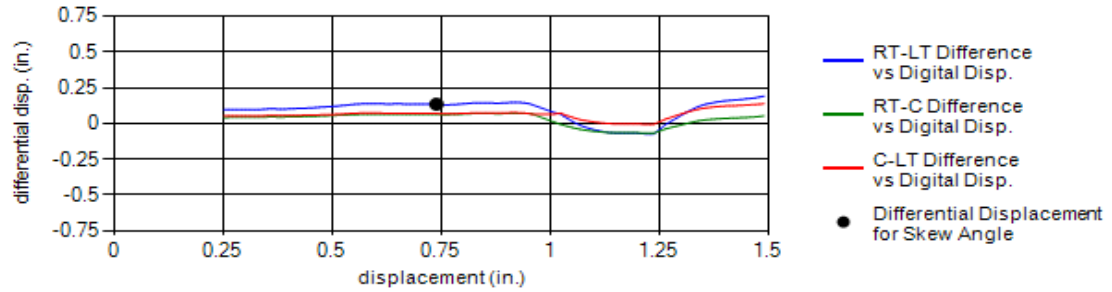
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.59	1320



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.16	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.14	0.06	0.07	No Data	0.43	CCW



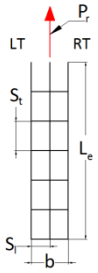
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 9:25:00 AM
Test Identification:	TS31.09-G-9x12-W20xW7.5-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

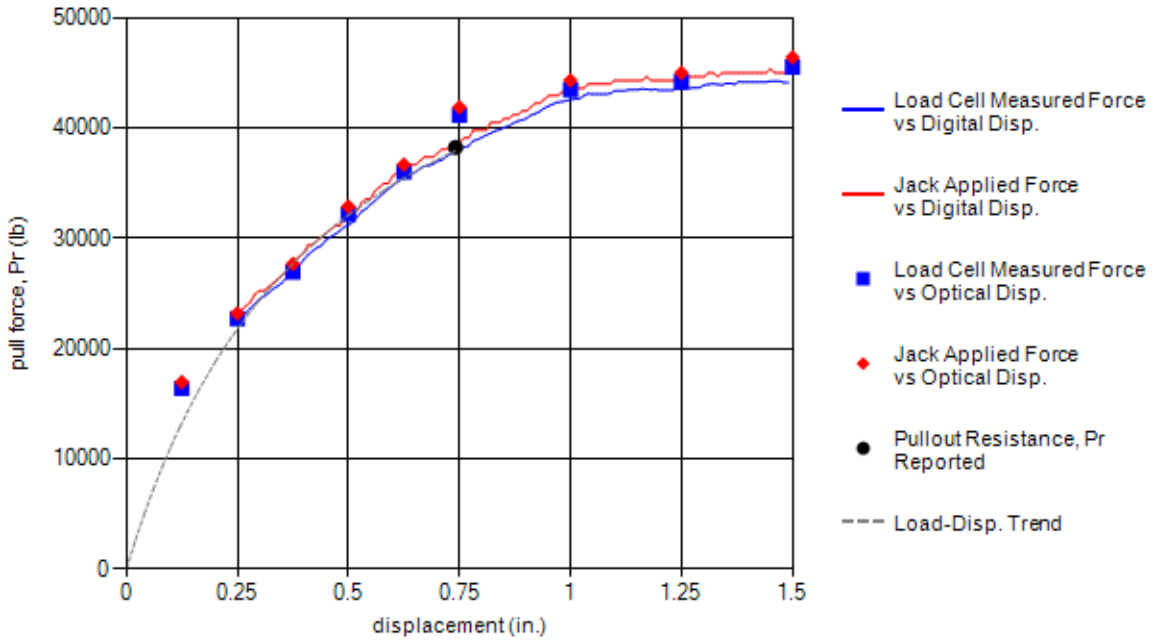
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2215	38213	18.40	**0.96**

Load-Displacement Curve



Comments

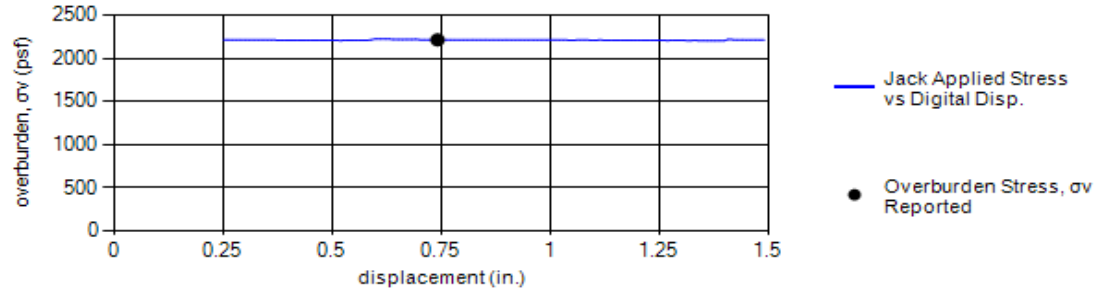
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ YW DH
Prepared:	ET TW
Checked:	WL PJ

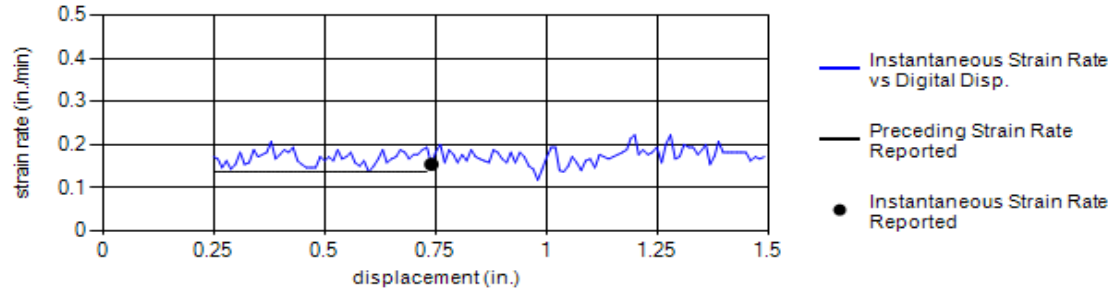
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.19	2215



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.14	0.14

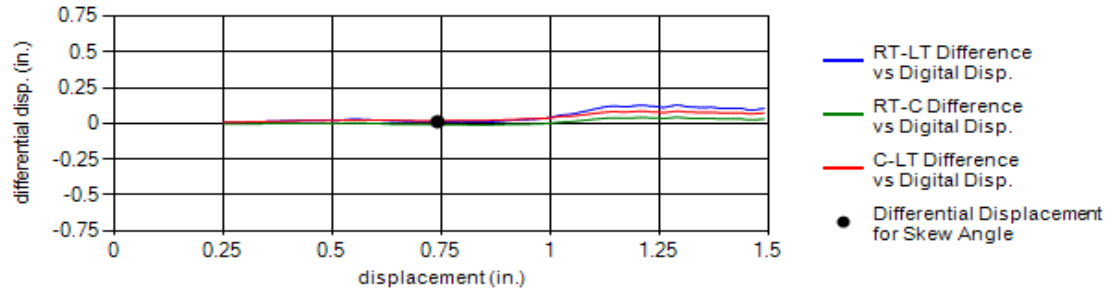


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.01	-0.01	0.02	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.04	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

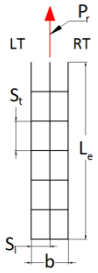
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 8:58:00 AM
Test Identification:	TS31.10-G-9x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

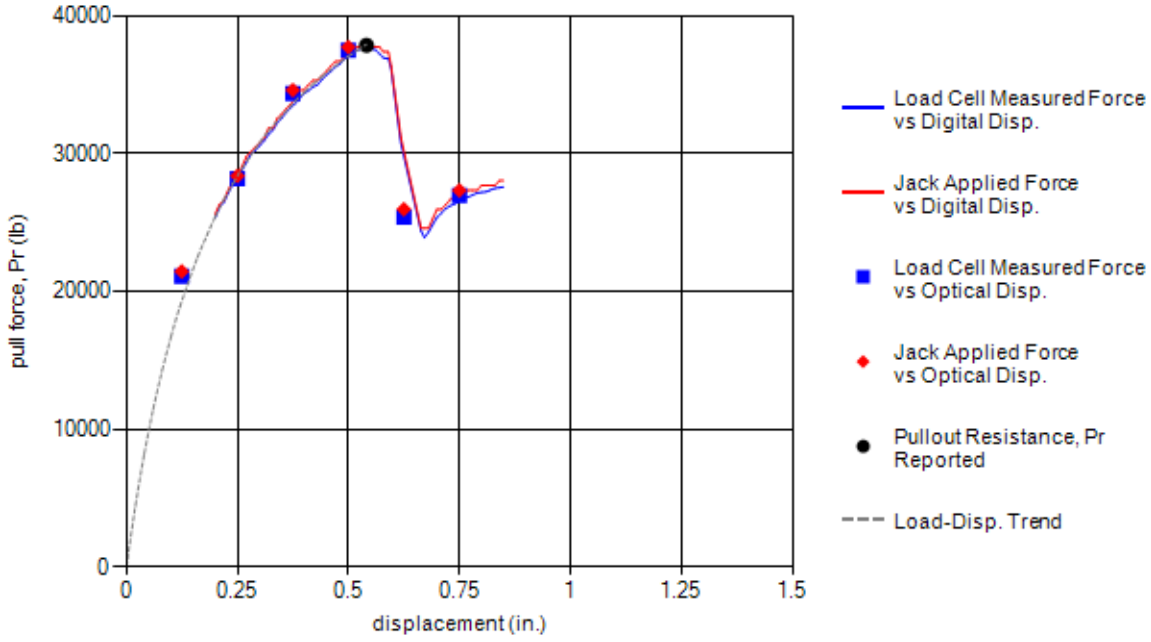
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Progressive Rupture	0.54	2185	37837	18.20	**0.96**

Load-Displacement Curve



Comments

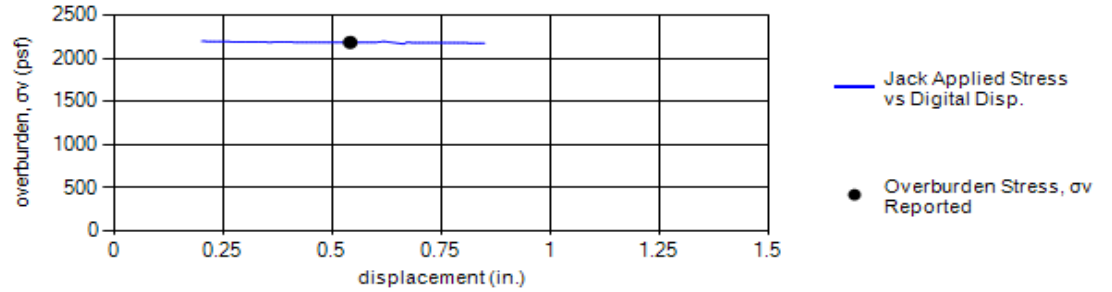
Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ YW DH
Prepared:	ET TW
Checked:	WL PJ

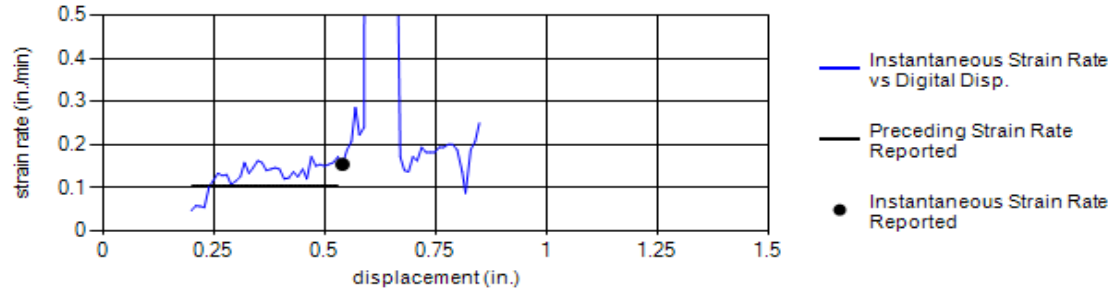
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.22	2185



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.11	0.11

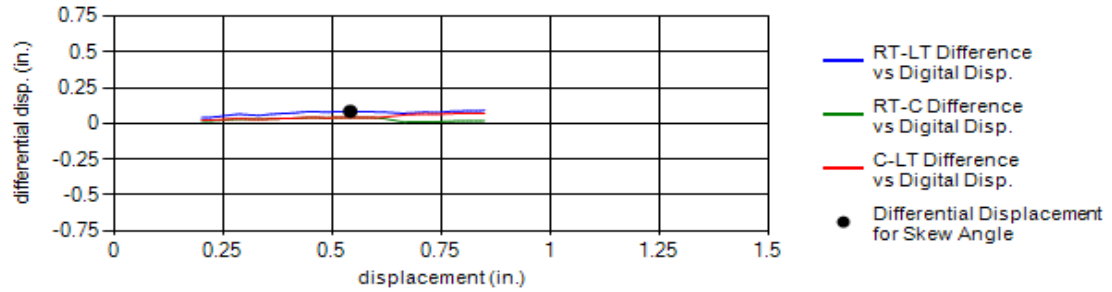


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.09	0.04	0.04	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.27	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

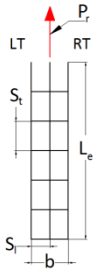
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 8:22:00 AM
Test Identification:	TS31.11-G-9x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

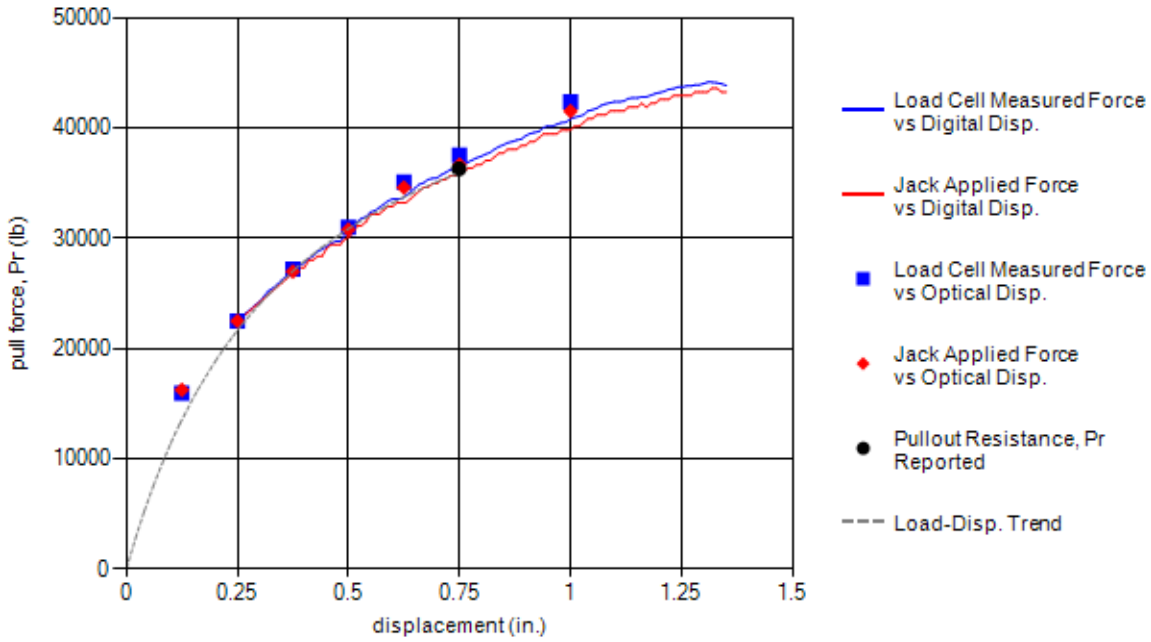
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	642	36279	5.30	**3.14**

Load-Displacement Curve



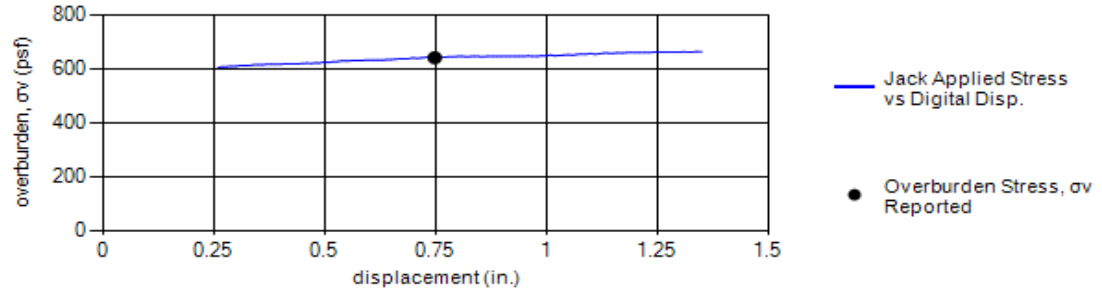
Comments

Left longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

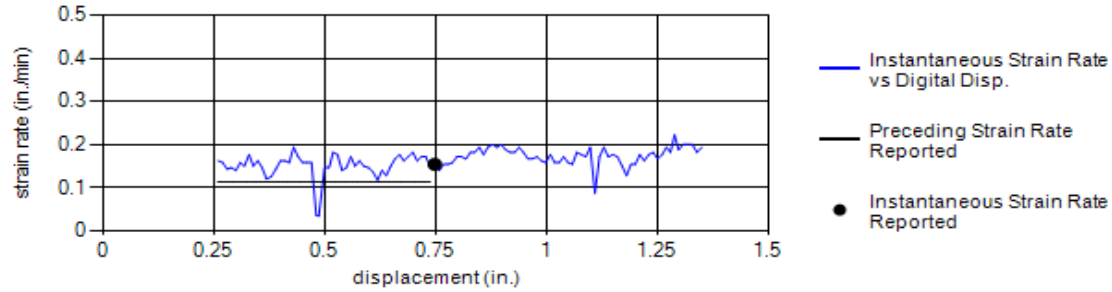
Personnel

Tested:	AJ YW DH
Prepared:	ET TW
Checked:	WL PJ

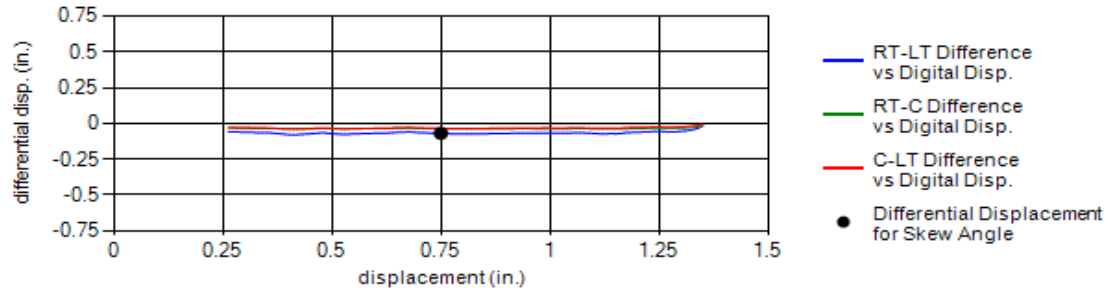
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.57	642



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.07	-0.03	-0.03	No Data	-0.22	CW



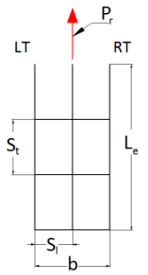
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/21/2011 7:47:00 AM
Test Identification:	TS31.12-G-9x12-W20xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

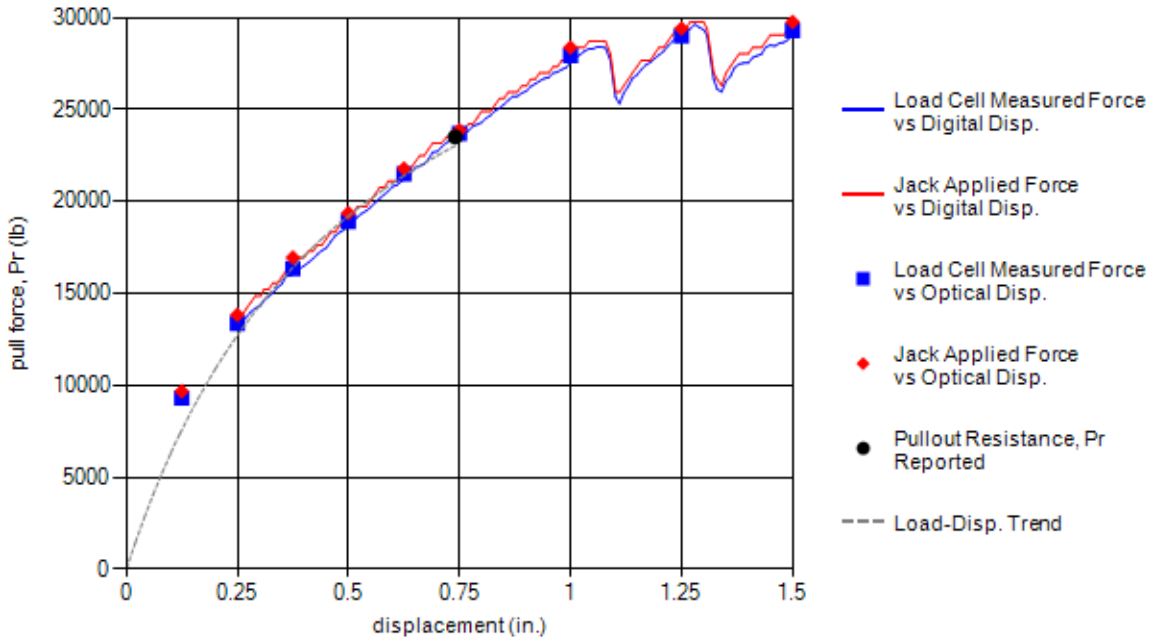
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 5 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1457	23505	12.10	**1.79**

Load-Displacement Curve



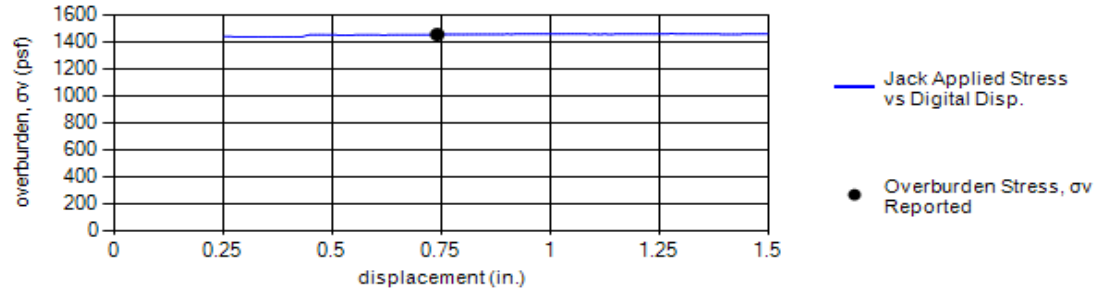
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

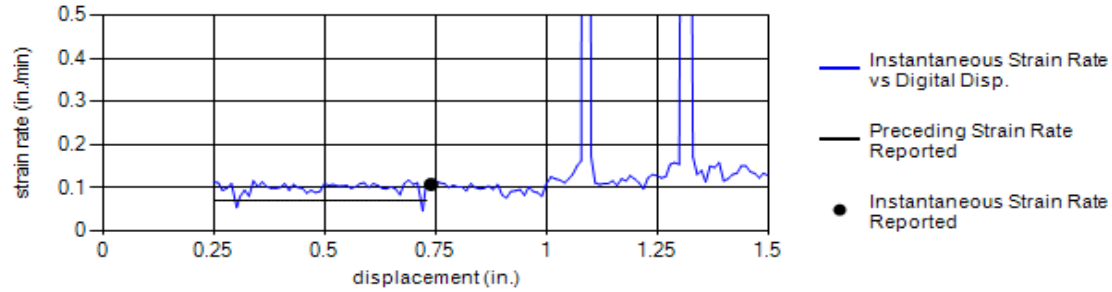
Personnel

Tested:	AJ YW DH
Prepared:	ET TW
Checked:	WL PJ

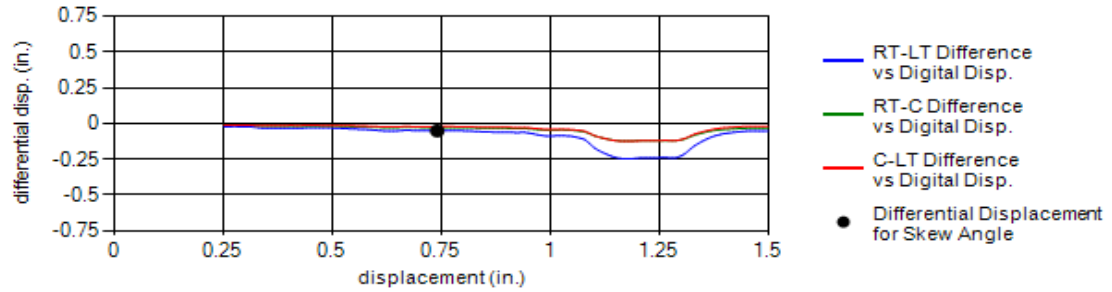
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.33	1457



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.05	-0.03	-0.02	No Data	-0.16	CW



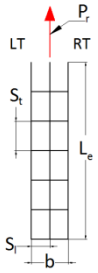
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/26/2011 1:17:00 PM
Test Identification:	TS32.01-G-9x12-W20xW7.5-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

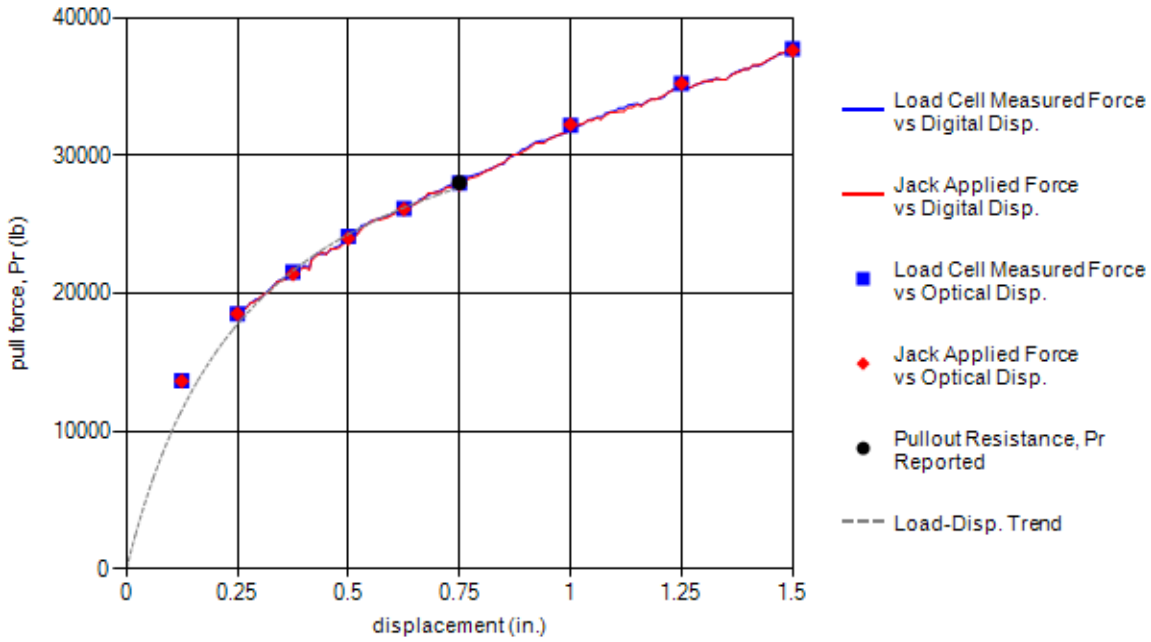
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	704	28024	5.60	**2.21**

Load-Displacement Curve



Comments

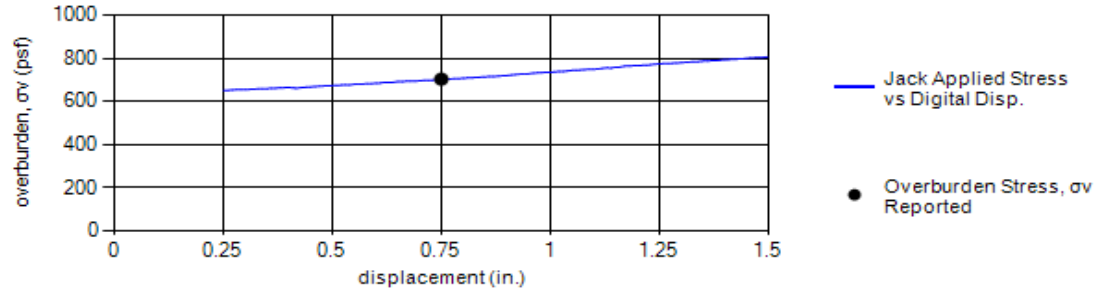
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ DH RH
Prepared:	ET TW
Checked:	WL PJ

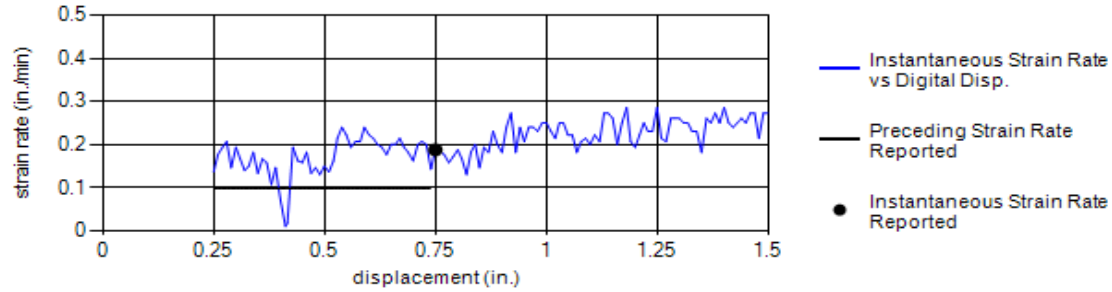
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	6.57	704



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.10	0.13

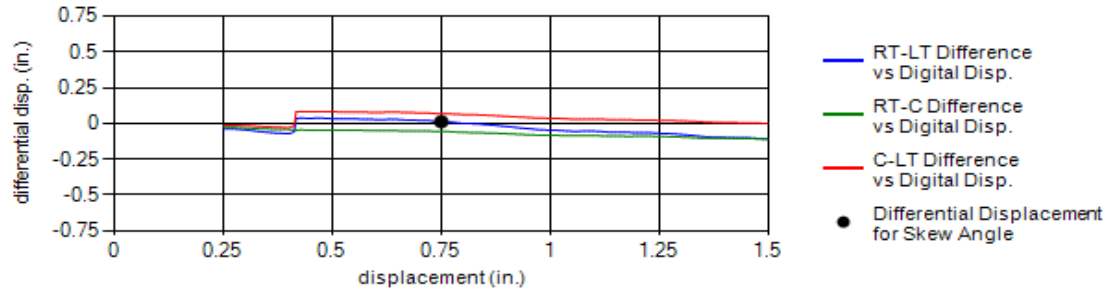


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.01	-0.06	0.07	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.04	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

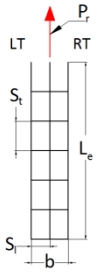
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/26/2011 1:48:00 PM
Test Identification:	TS32.02-G-9x12-W20xW7.5-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

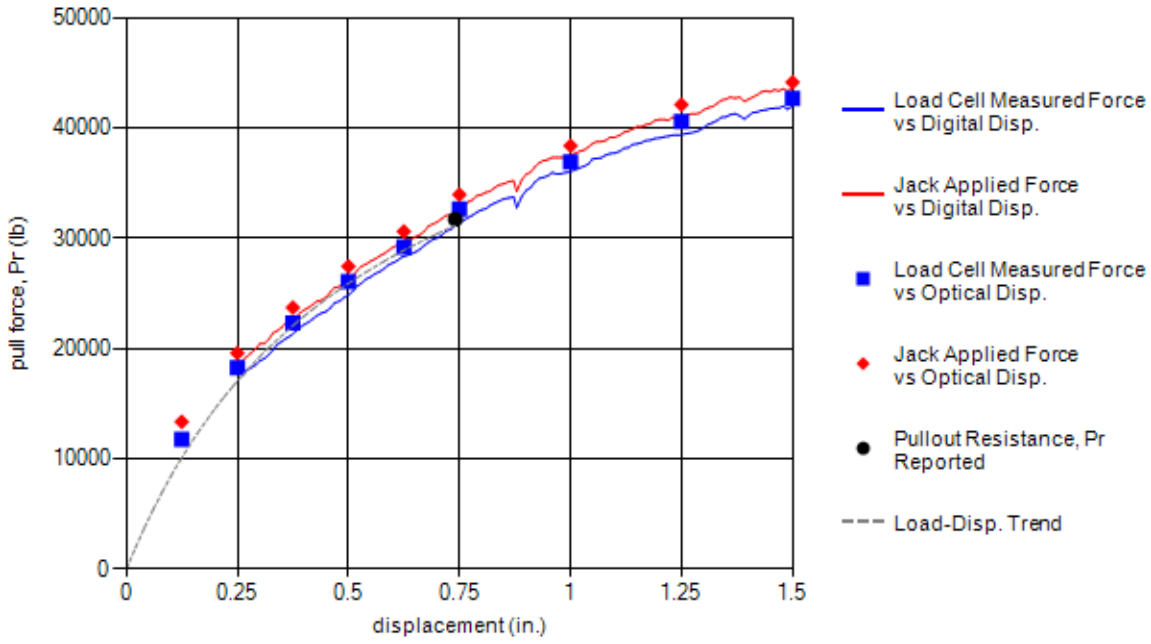
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1478	31708	11.70	**1.19**

Load-Displacement Curve



Comments

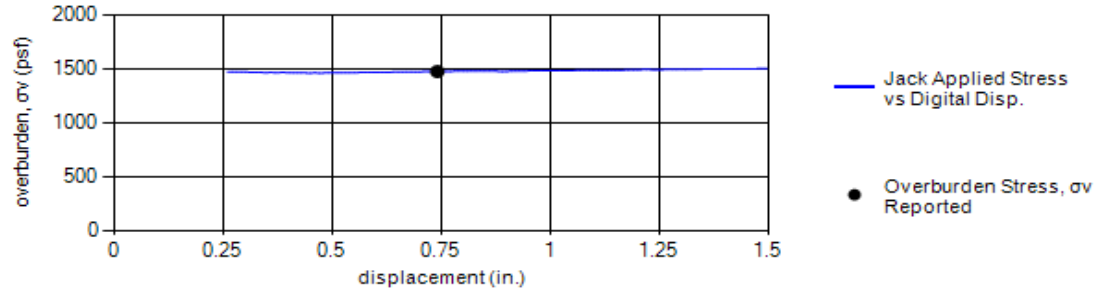
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ DH RH
Prepared:	ET TW
Checked:	WL PJ

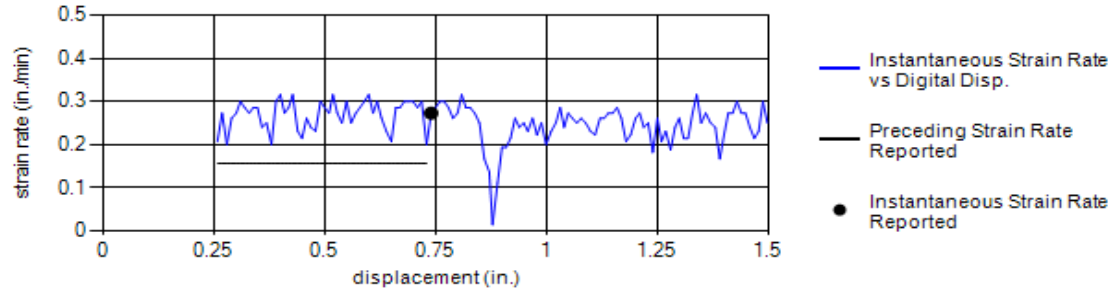
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.13	1478



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.15	0.17

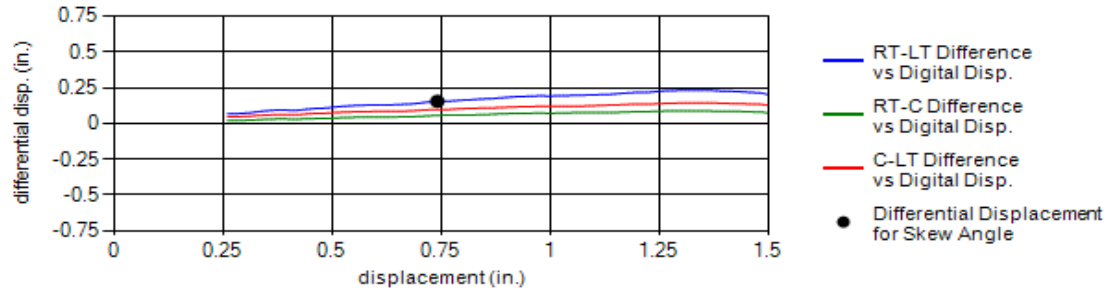


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.16	0.06	0.10	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.49	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

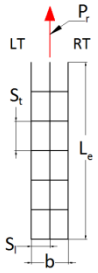
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/26/2011 2:08:00 PM
Test Identification:	TS32.03-G-9x6-W20xW7.5-L3-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

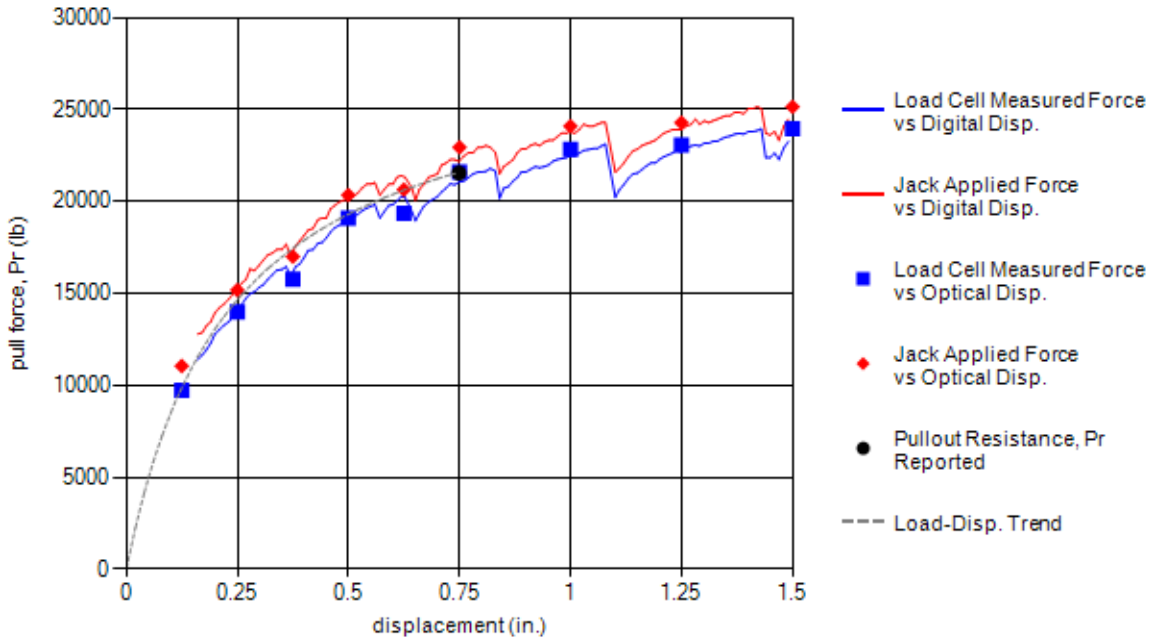
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.75	663	21541	5.30	**3.61**

Load-Displacement Curve



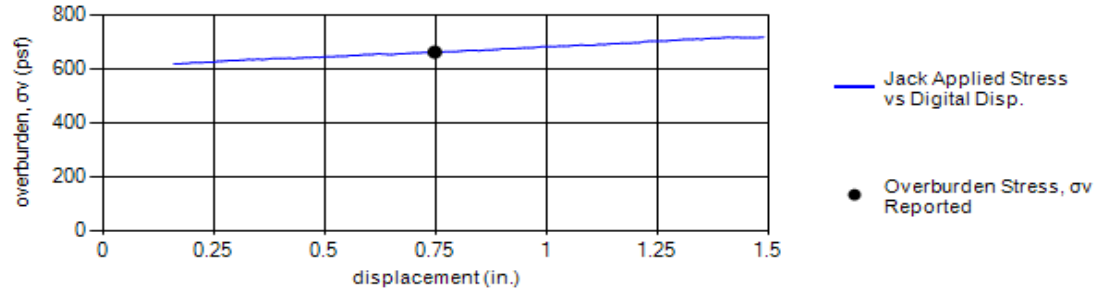
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

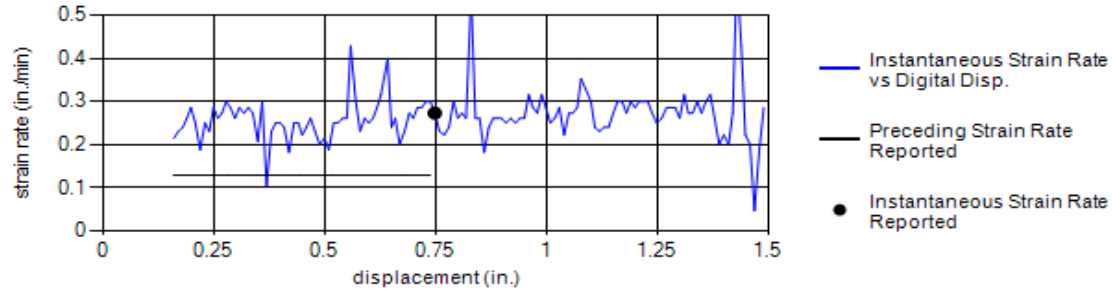
Personnel

Tested:	AJ DH RH
Prepared:	ET TW
Checked:	WL PJ

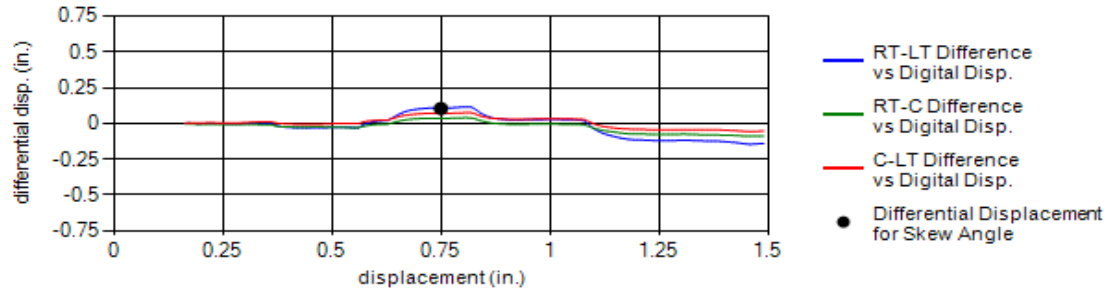
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	6.97	663



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.13	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.10	0.04	0.07	No Data	0.33	CCW



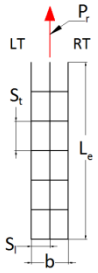
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/26/2011 2:30:00 PM
Test Identification:	TS32.04-G-9x6-W20xW7.5-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

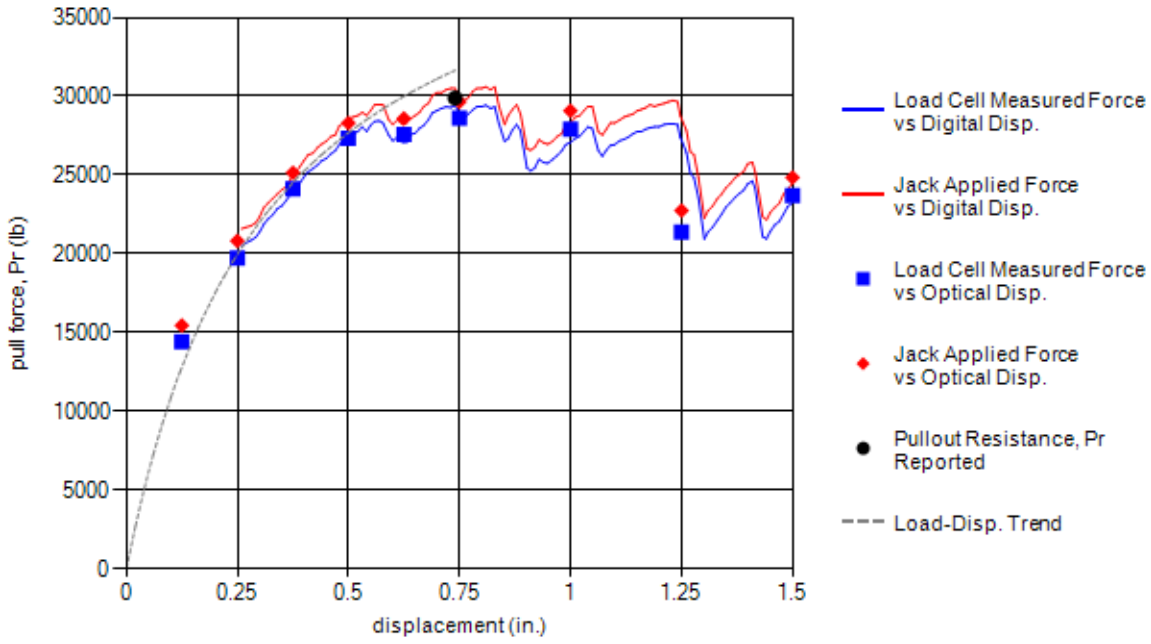
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.74	1518	29885	12.00	**2.19**

Load-Displacement Curve



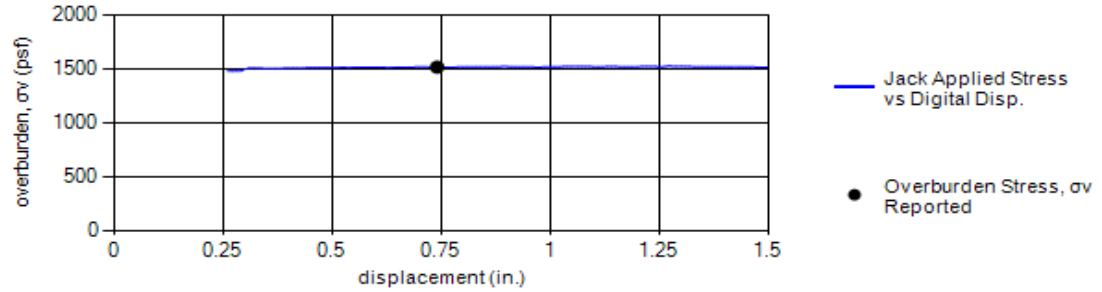
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

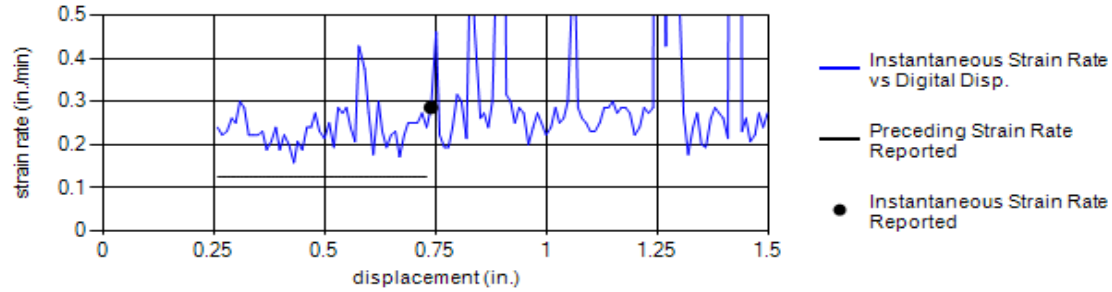
Personnel

Tested:	AJ DH RH
Prepared:	ET TW
Checked:	WL PJ

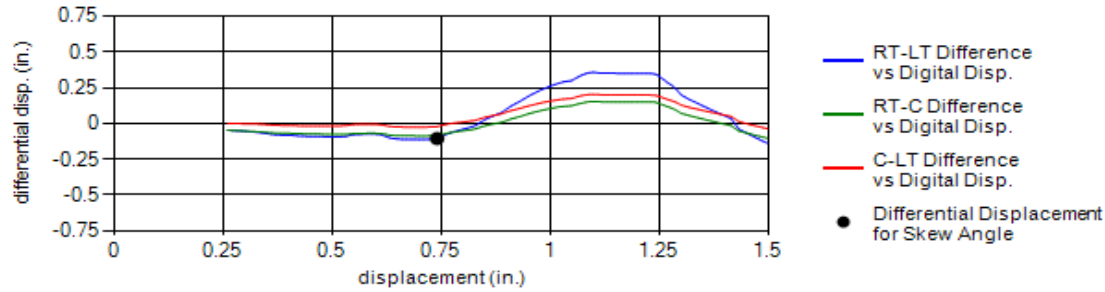
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.05	1518



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.29	0.12	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.11	-0.08	-0.02	No Data	-0.33	CW



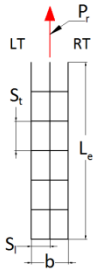
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 8:32:00 AM
Test Identification:	TS32.05-G-9x12-W20xW7.5-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

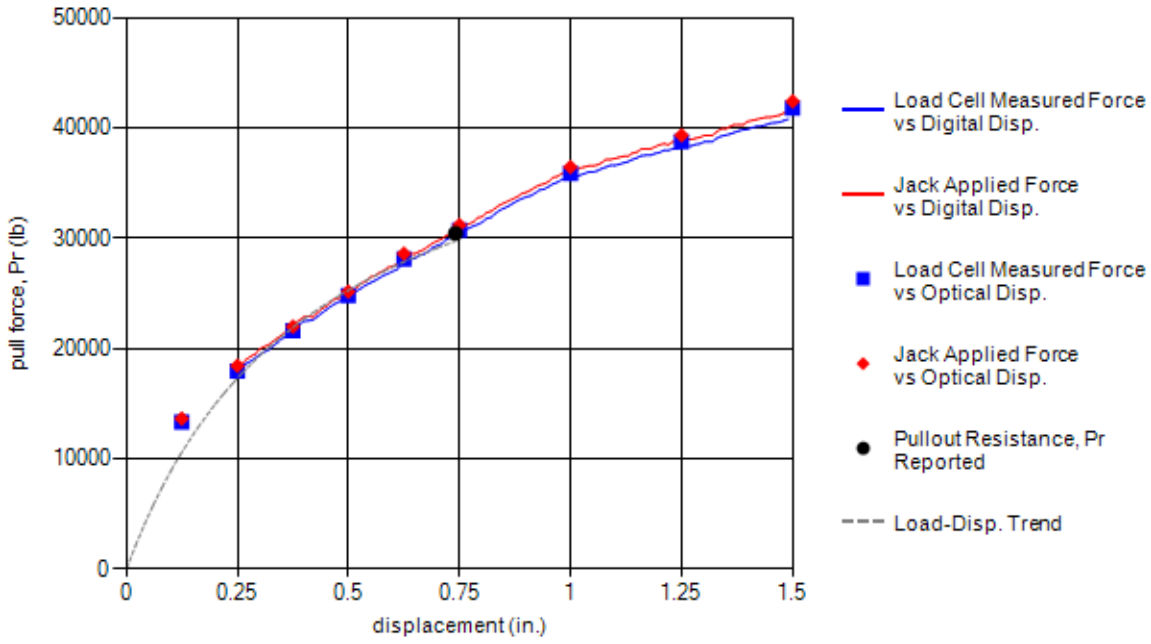
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	660	30427	5.20	**2.56**

Load-Displacement Curve



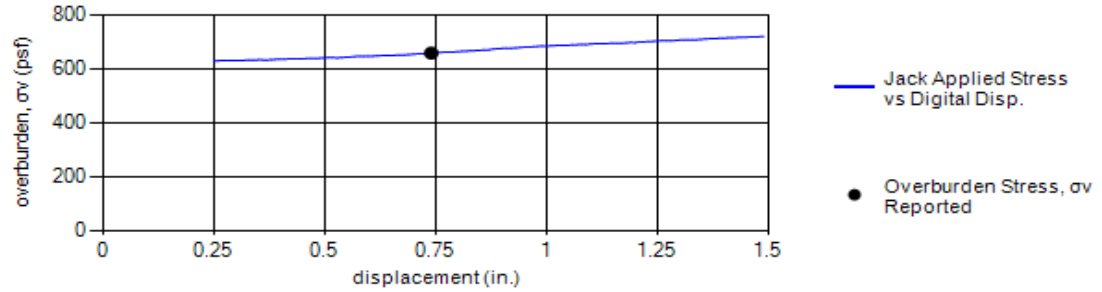
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

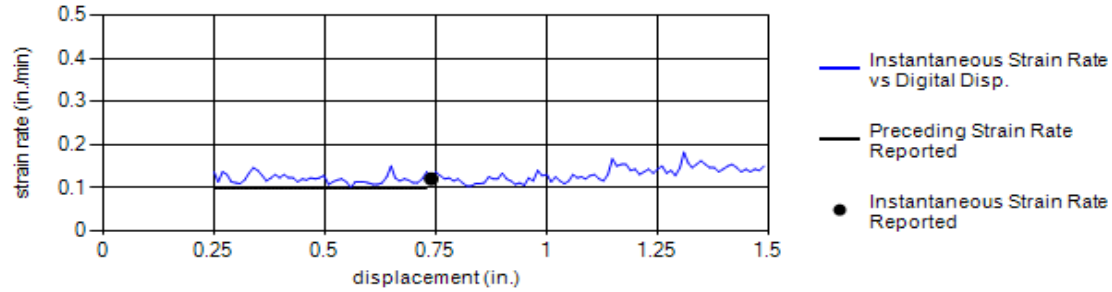
Personnel

Tested:	AJ YW AS
Prepared:	ET TW
Checked:	WL PJ

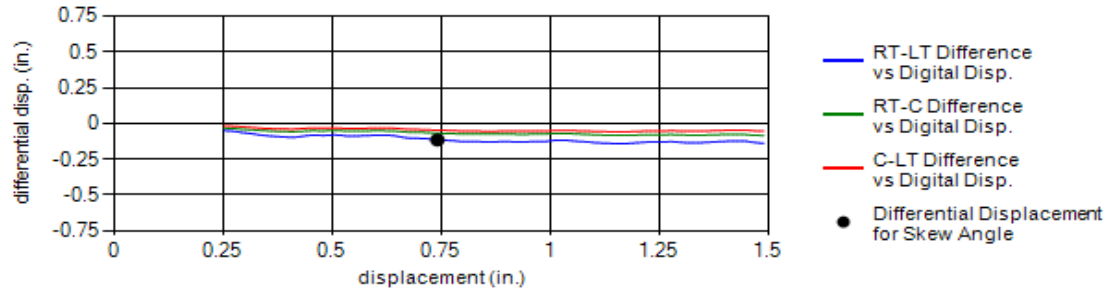
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.20	660



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.10	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.11	-0.07	-0.05	No Data	-0.36	CW



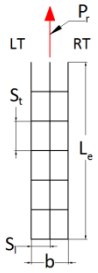
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 9:02:00 AM
Test Identification:	TS32.06-G-9x12-W20xW7.5-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

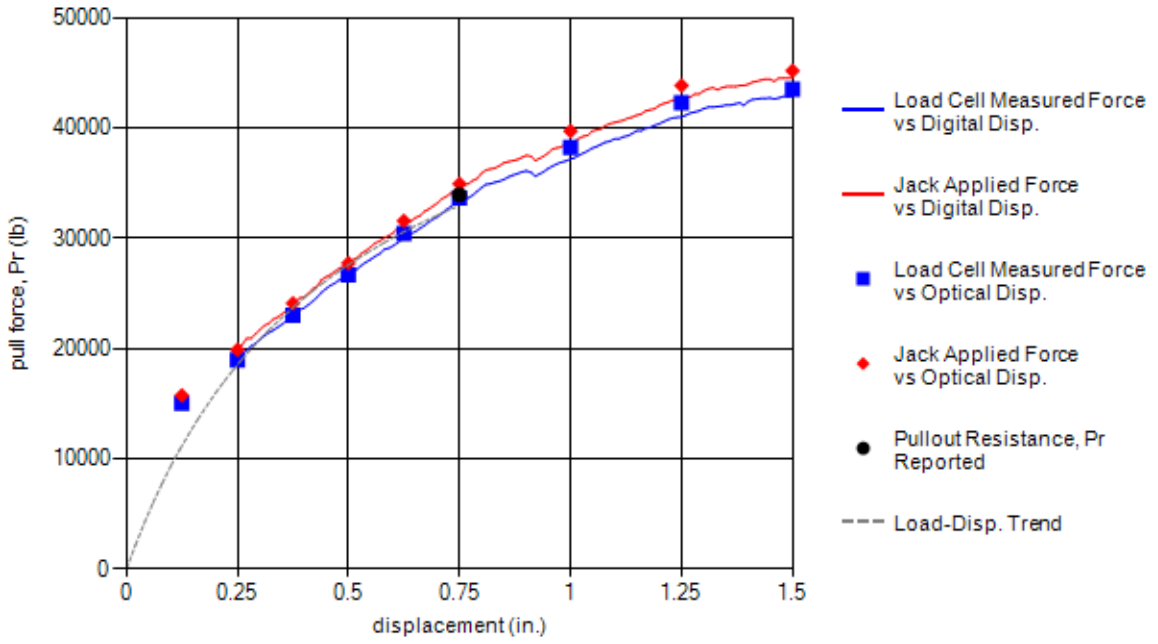
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1497	33923	11.90	**1.26**

Load-Displacement Curve



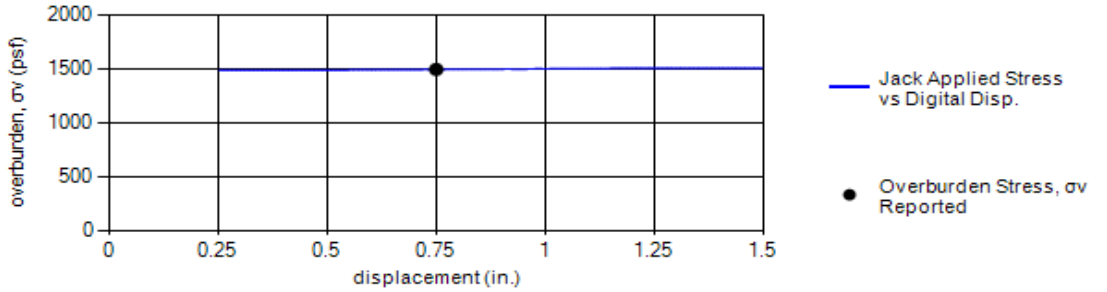
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

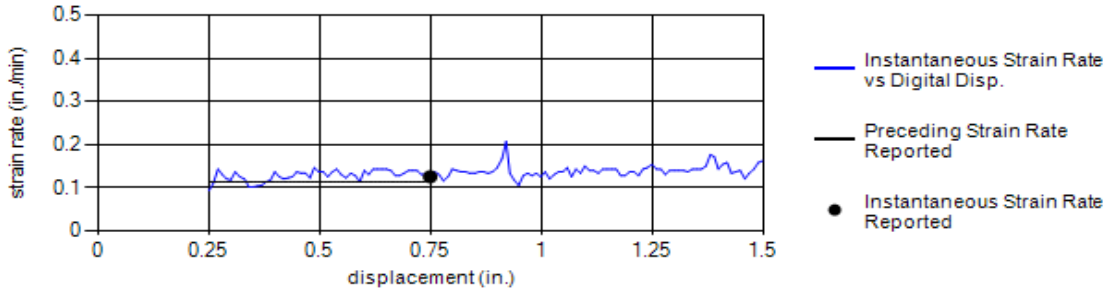
Personnel

Tested:	AJ YW AS
Prepared:	ET TW
Checked:	WL PJ

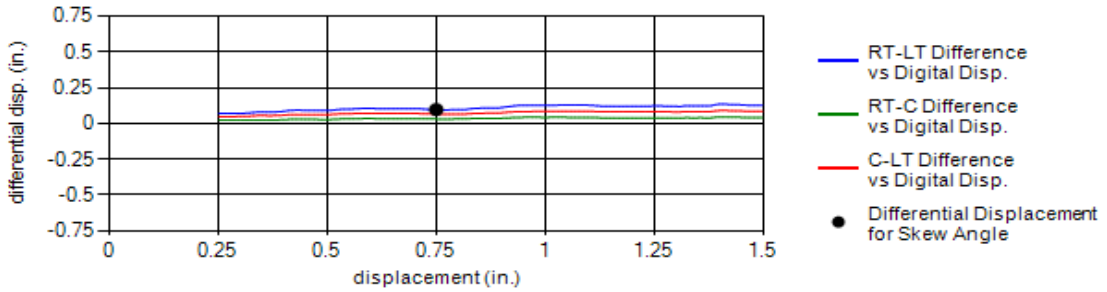
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.17	1497



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.11	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.10	0.03	0.07	No Data	0.31	CCW



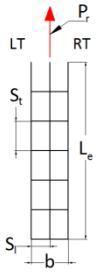
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 9:33:00 AM
Test Identification:	TS32.07-G-9x6-W20xW7.5-L3-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

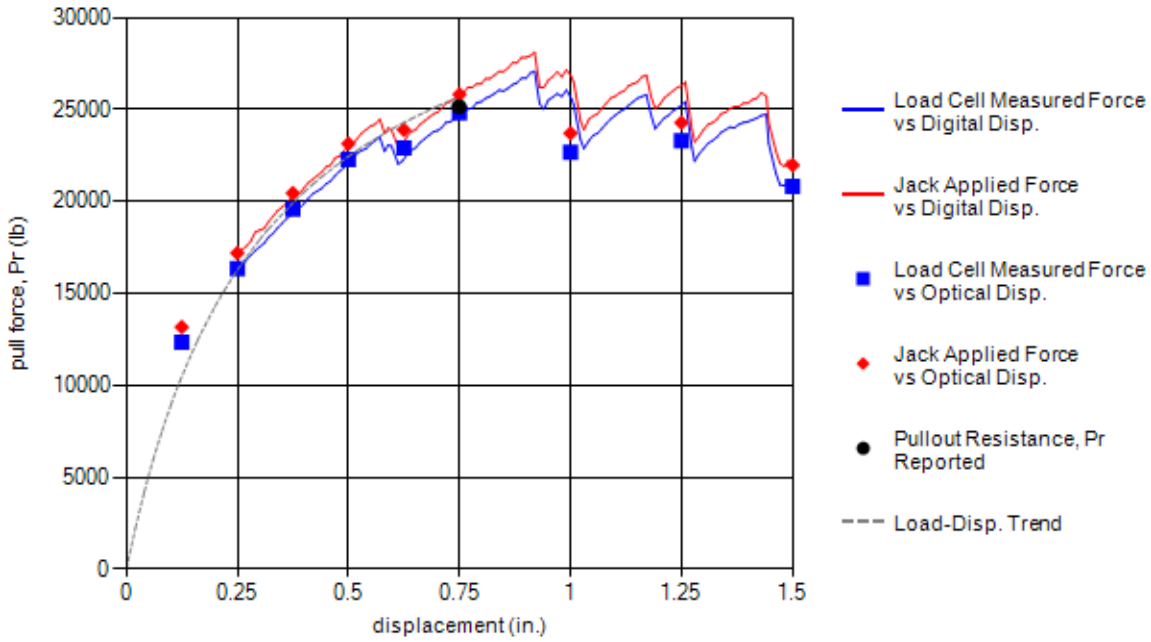
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.75	656	25141	5.20	**4.26**

Load-Displacement Curve



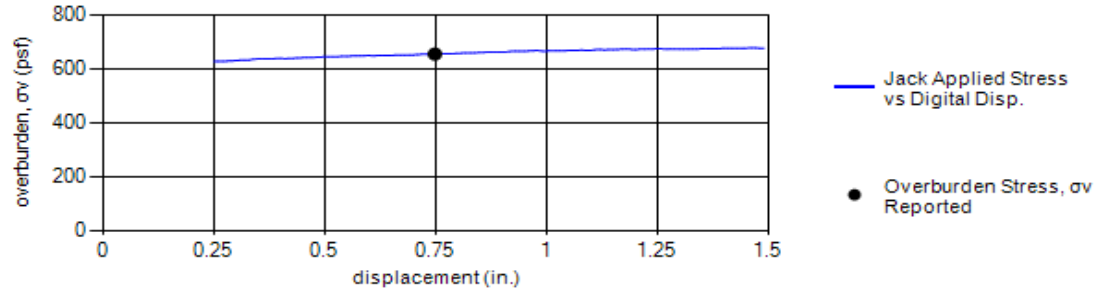
Comments

No earth pressure cell data. No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

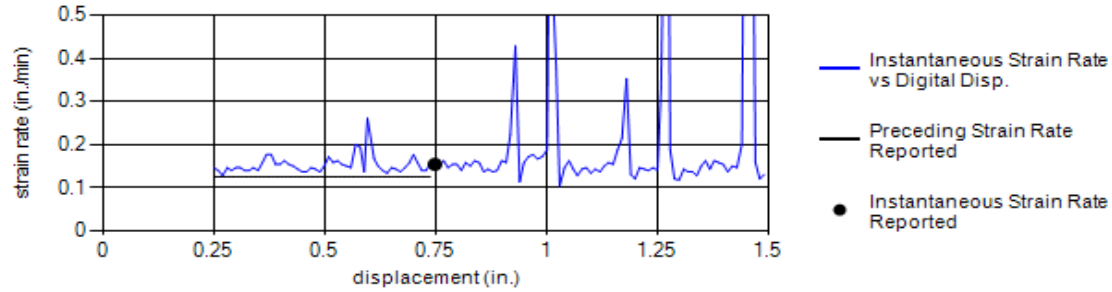
Personnel

Tested:	AJ YW AS
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.25	656



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.12	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

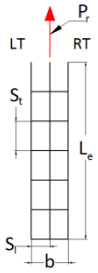
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 9:55:00 AM
Test Identification:	TS32.08-G-9x6-W20xW7.5-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

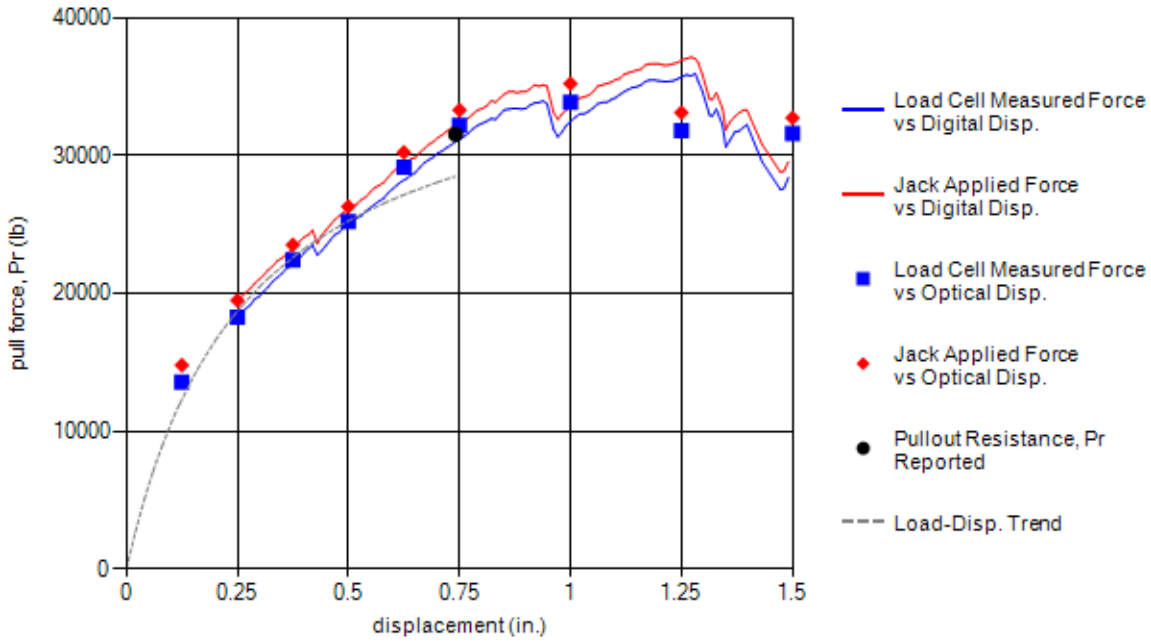
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.74	1507	31519	11.90	**2.32**

Load-Displacement Curve



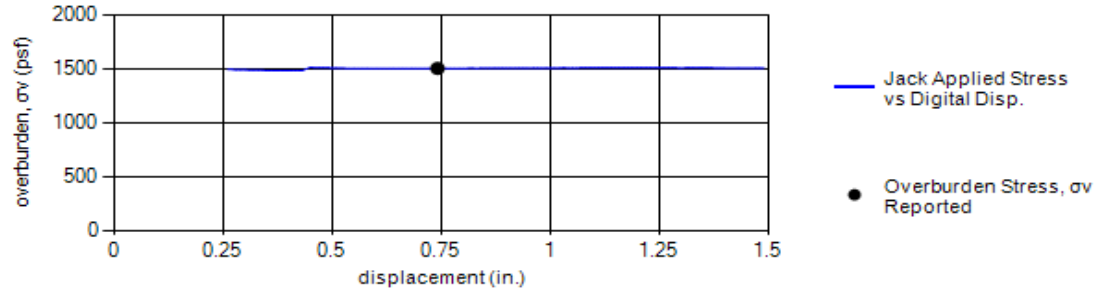
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

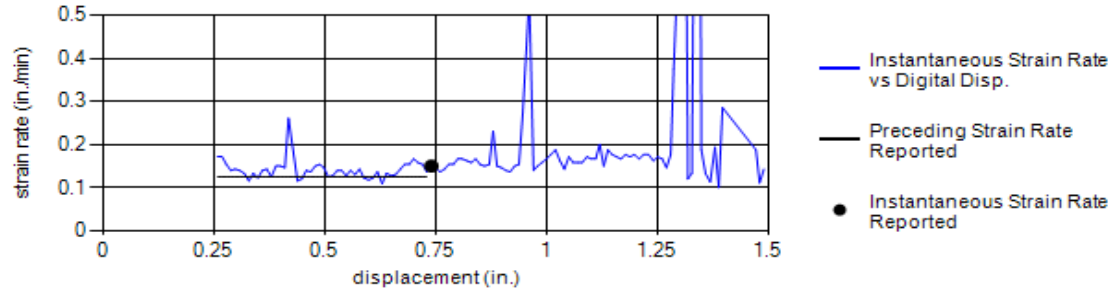
Personnel

Tested:	AJ AS YW
Prepared:	ET TW
Checked:	WL PJ

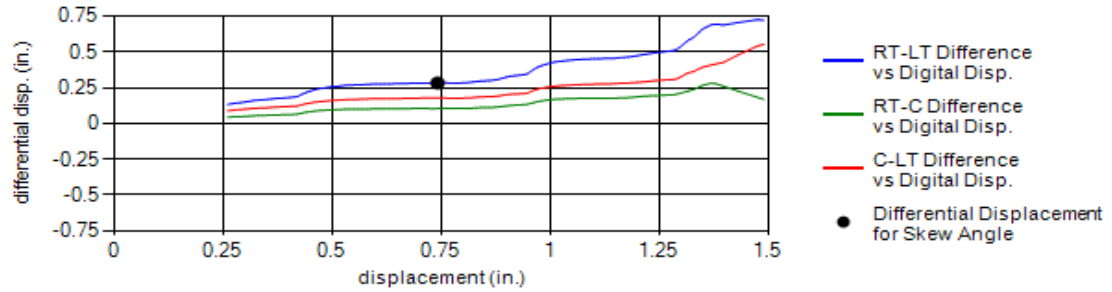
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.15	1507



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.12	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.28	0.10	0.18	No Data	0.90	CCW



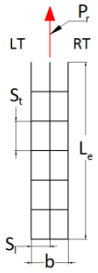
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 7:57:00 AM
Test Identification:	TS32.09-G-9x12-W20xW7.5-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

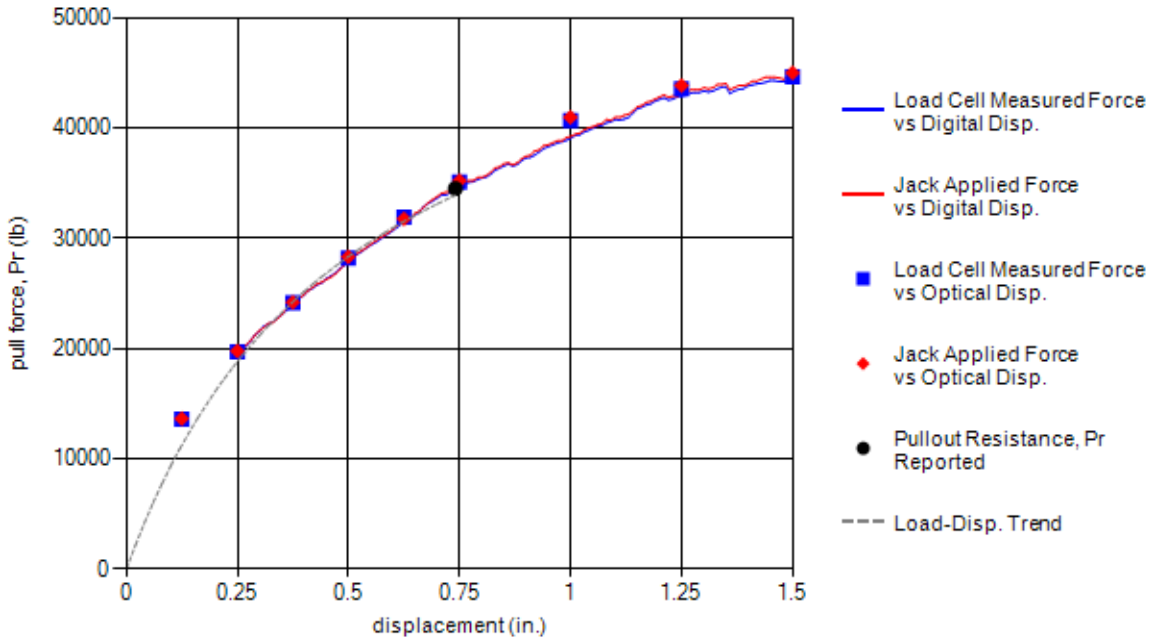
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	673	34494	5.30	**2.85**

Load-Displacement Curve



Comments

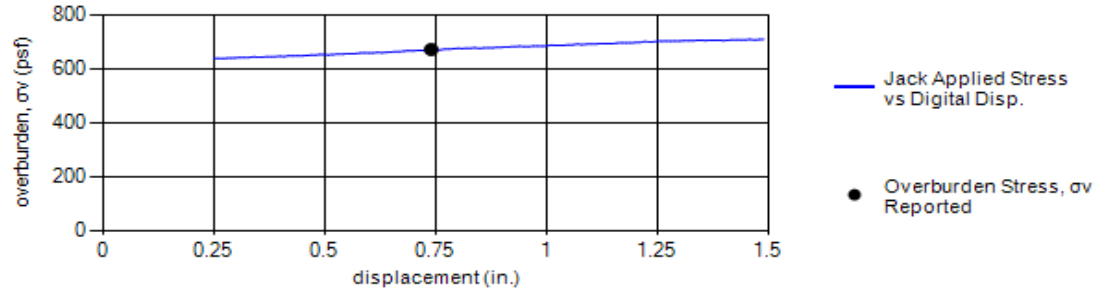
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH AJ
Prepared:	ET TW
Checked:	WL PJ

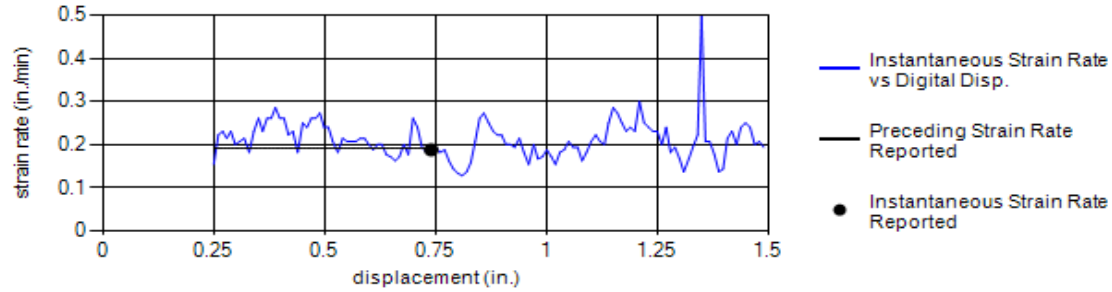
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.25	673



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.19	0.19

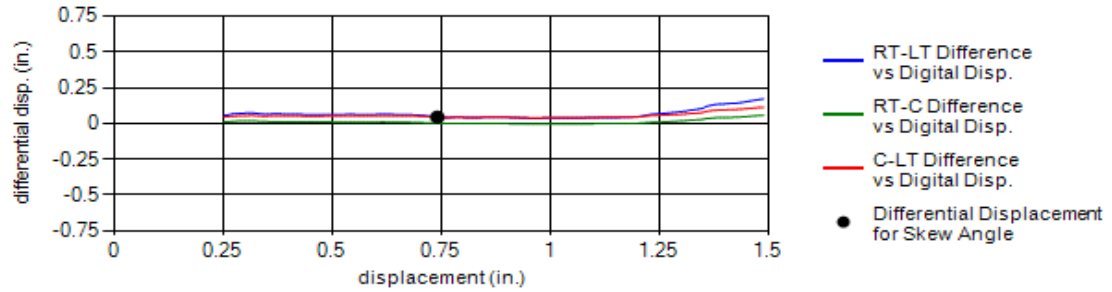


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.04	0.00	0.04	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.14	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

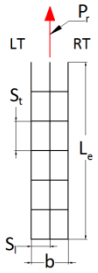
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 7:30:00 AM
Test Identification:	TS32.10-G-9x12-W20xW7.5-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

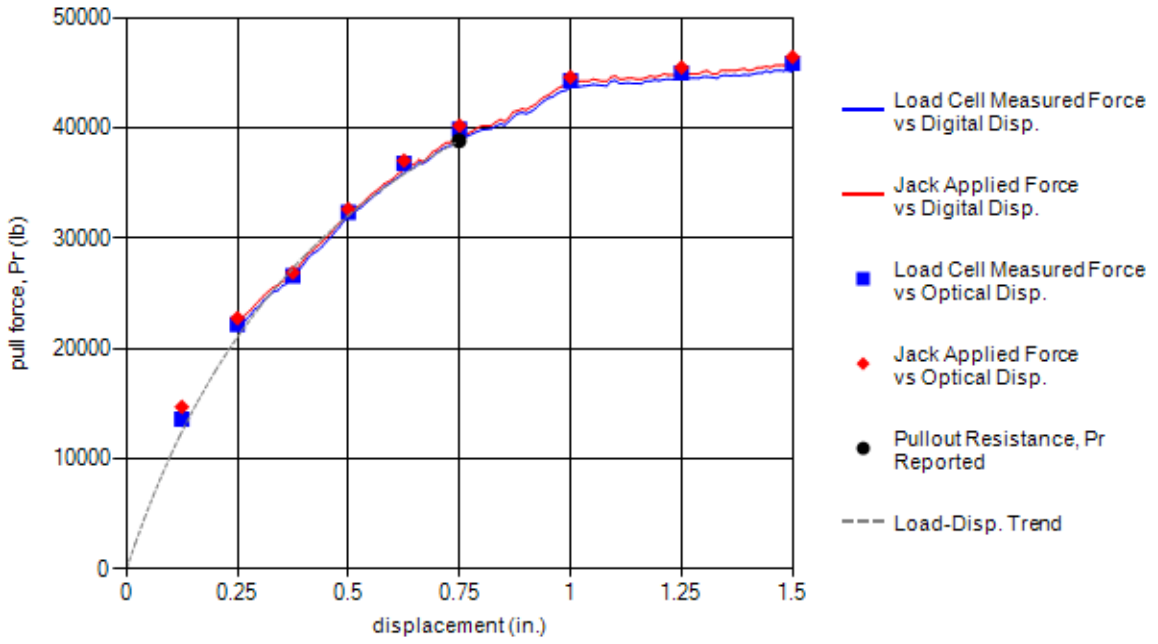
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1514	38824	12.00	**1.42**

Load-Displacement Curve



Comments

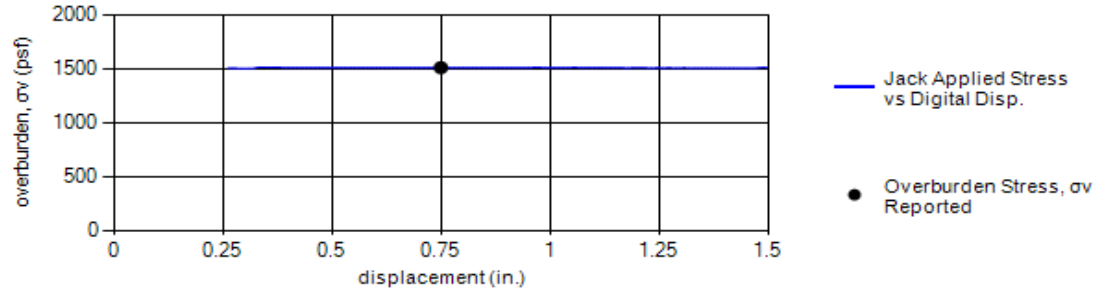
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH AJ
Prepared:	ET TW
Checked:	WL PJ

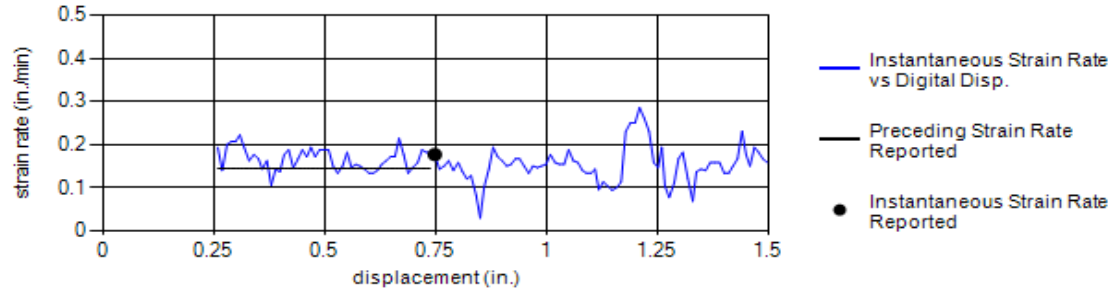
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.22	1514



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.15	0.14

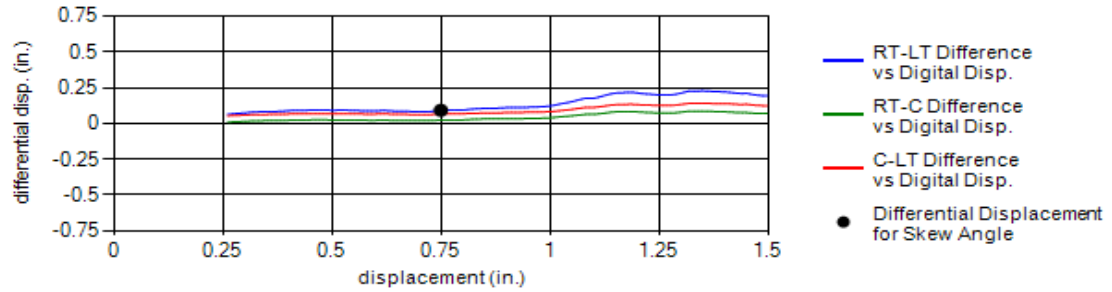


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.09	0.02	0.07	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.29	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

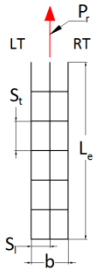
Gradation (TEX-110-E) (% Retained)			
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/27/2011 7:05:00 AM
Test Identification:	TS32.11-G-9x6-W20xW7.5-L3-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

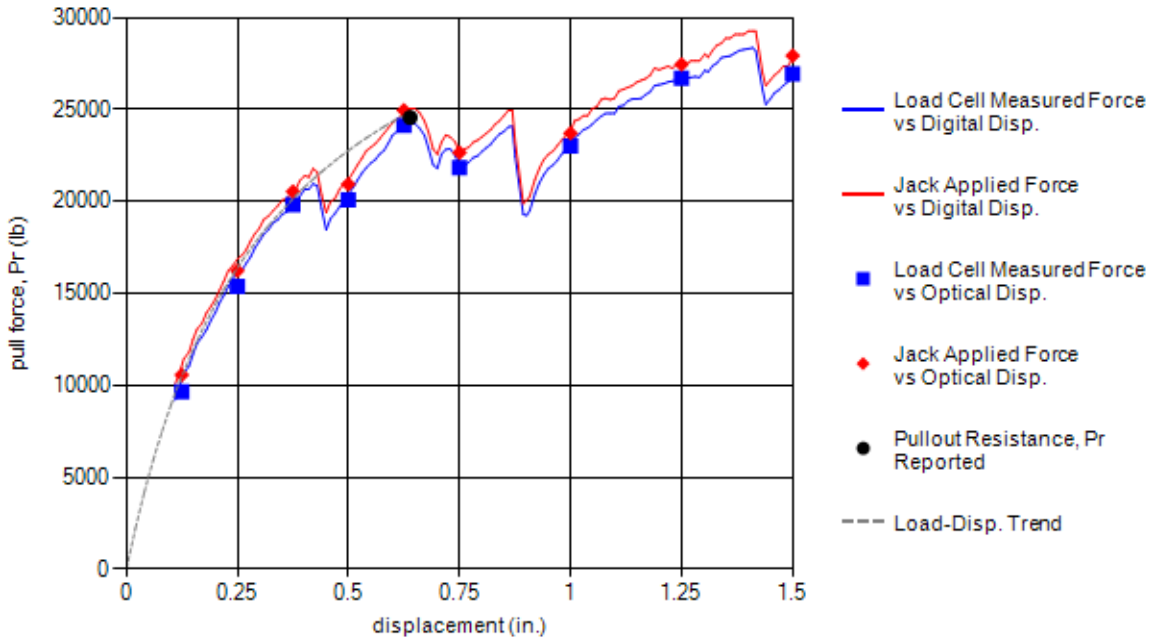
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.64	642	24557	5.10	**4.25**

Load-Displacement Curve



Comments

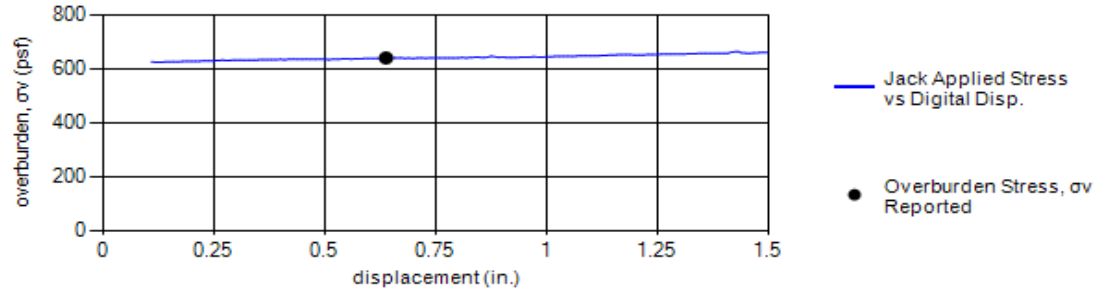
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH AJ
Prepared:	ET TW
Checked:	WL PJ

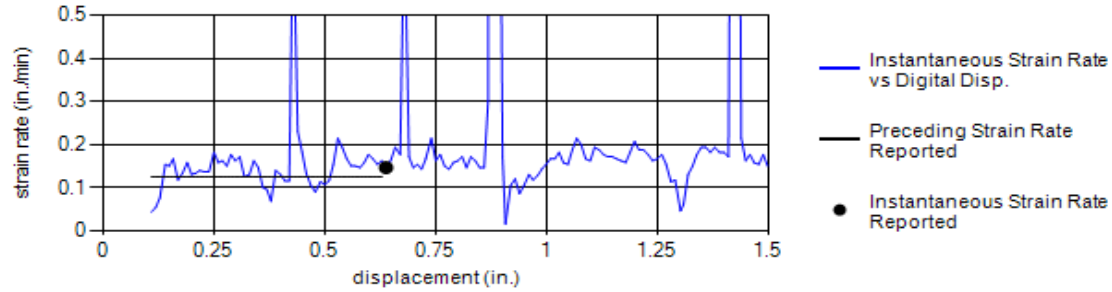
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.60	642



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.12	0.13

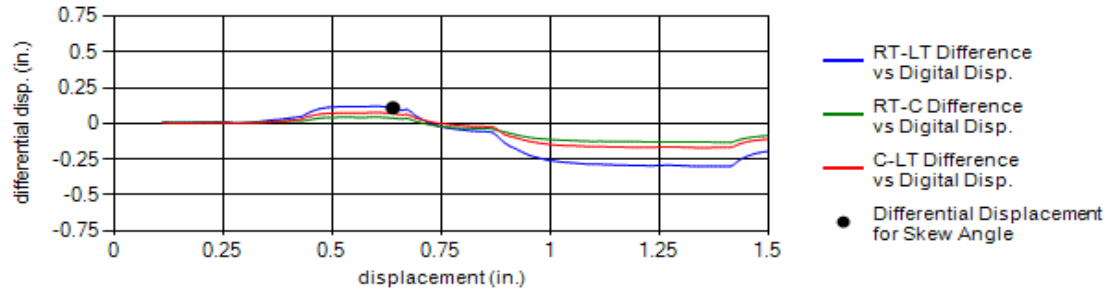


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.11	0.04	0.07	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.35	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

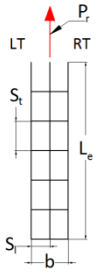
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	7/26/2011 3:02:00 PM
Test Identification:	TS32.12-G-9x6-W20xW7.5-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

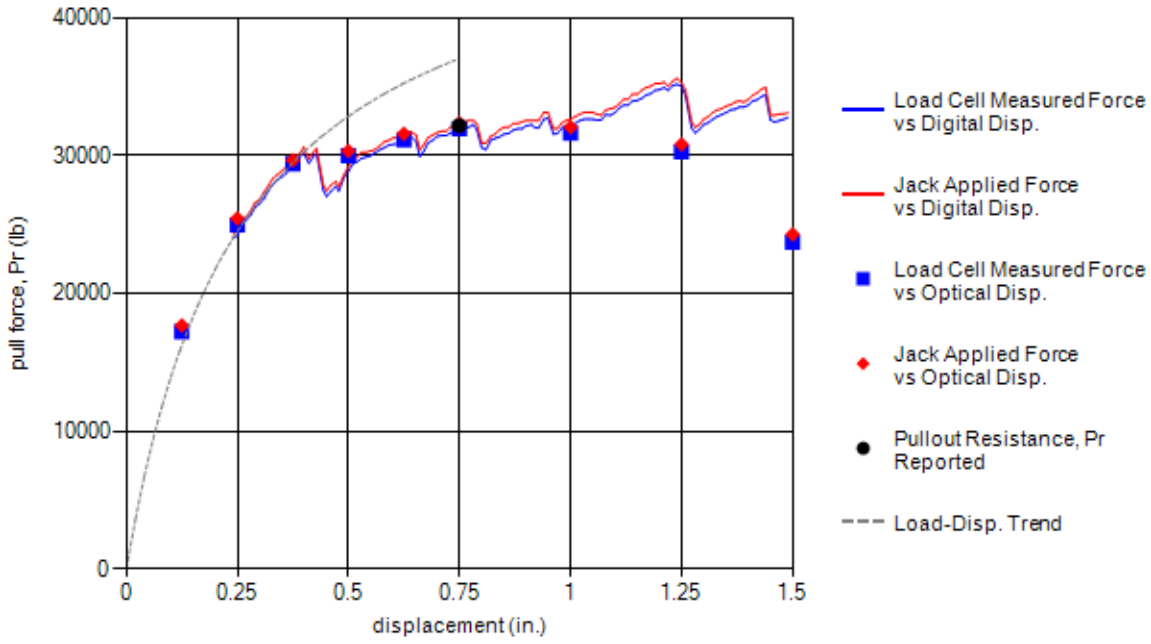
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.75	1492	32154	11.80	**2.40**

Load-Displacement Curve



Comments

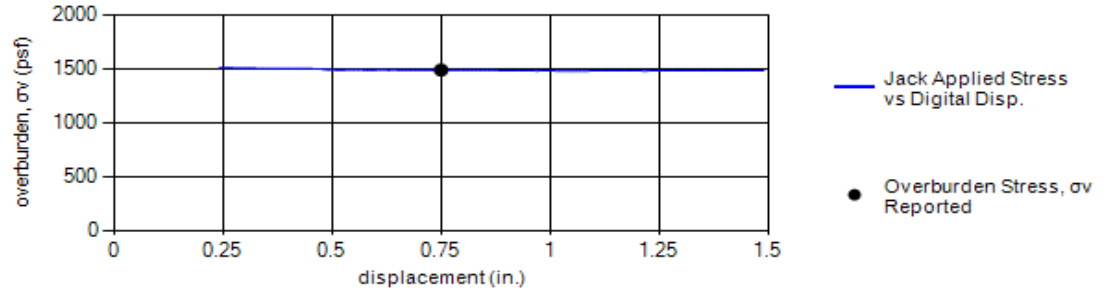
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ DH RH
Prepared:	ET TW
Checked:	WL PJ

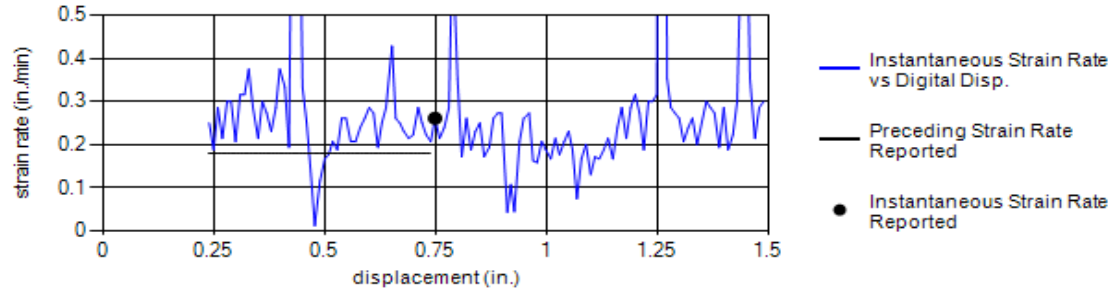
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.27	1492



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.18	0.18

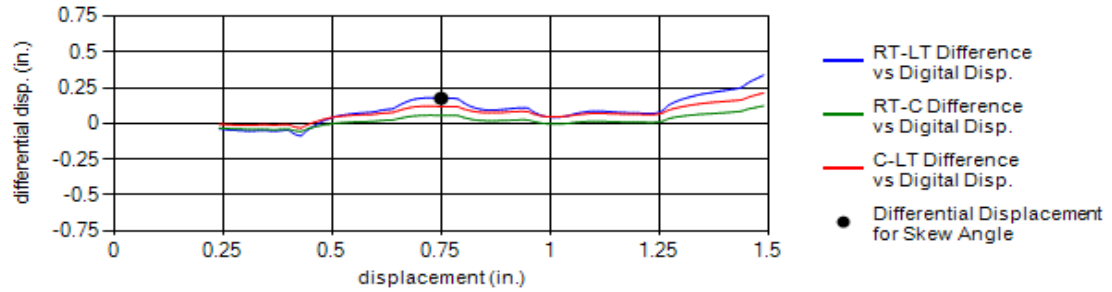


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.18	0.06	0.12	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.56	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

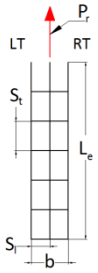
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 8:04:00 AM
Test Identification:	TS33.01-G-9x24-W20xW7.5-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

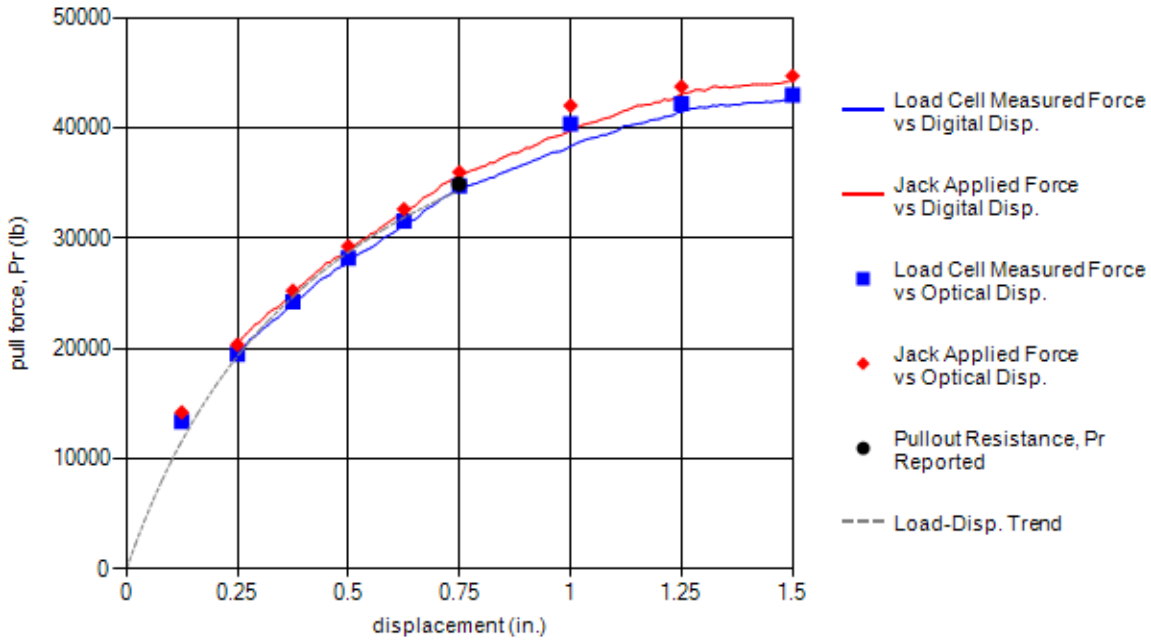
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	658	34892	5.10	**1.47**

Load-Displacement Curve



Comments

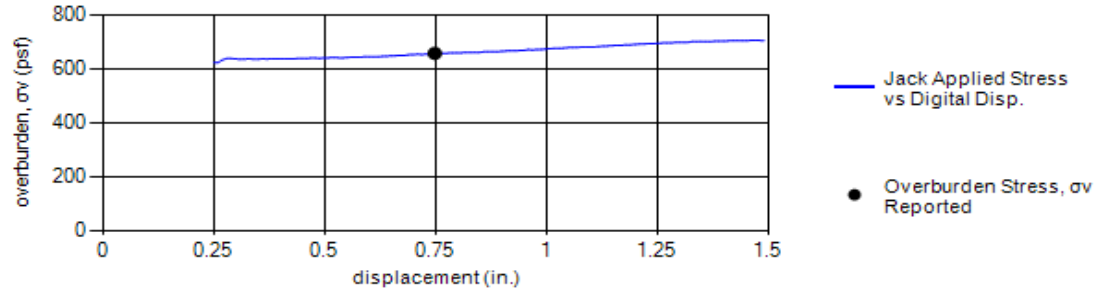
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

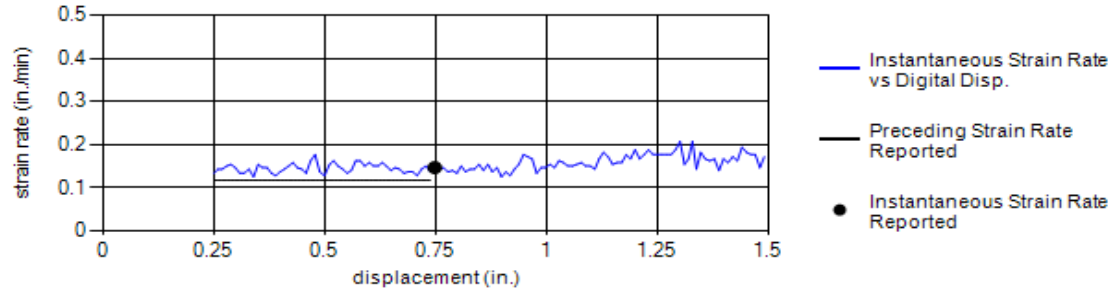
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.03	658



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.12	0.13

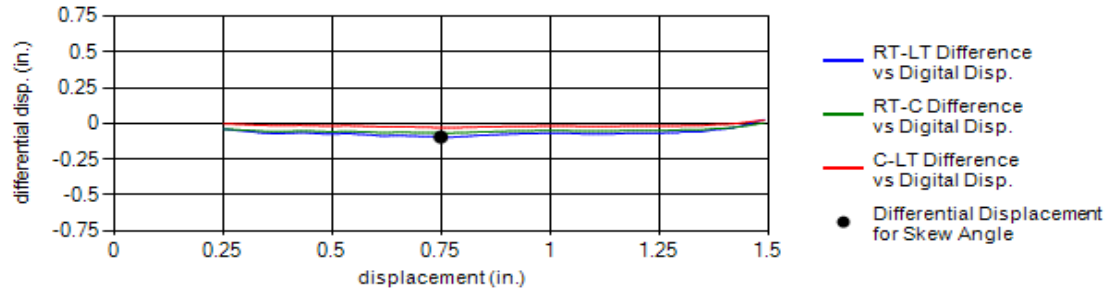


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.09	-0.07	-0.03	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.30	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

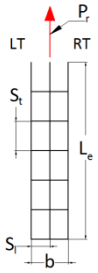
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 7:29:00 AM
Test Identification:	TS33.02-G-9x24-W20xW7.5-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

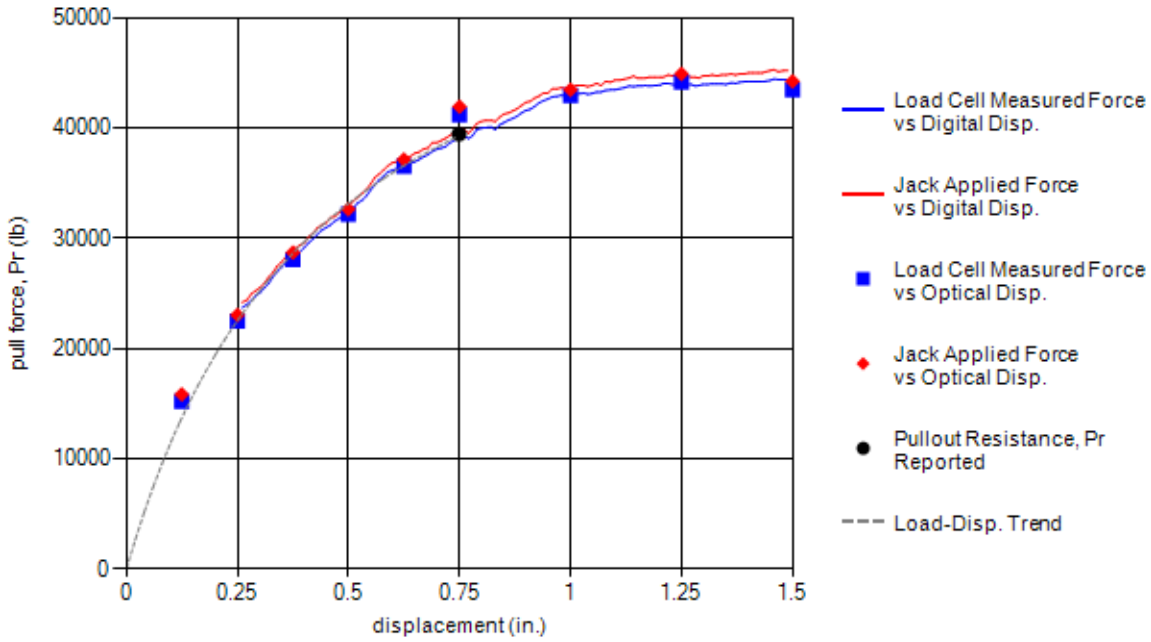
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1502	39434	11.60	**0.73**

Load-Displacement Curve



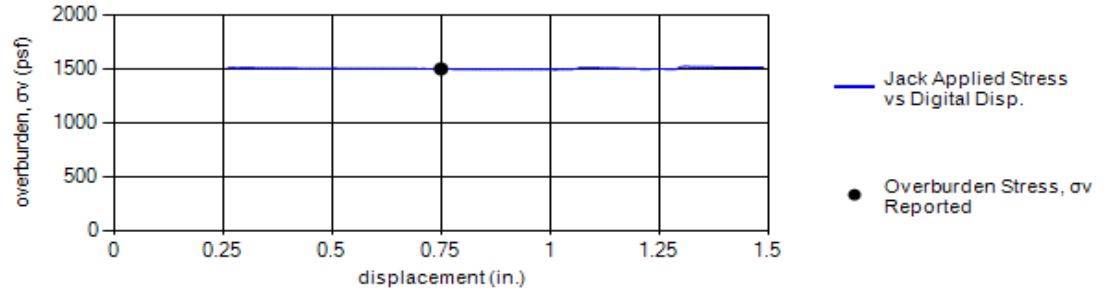
Comments

No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

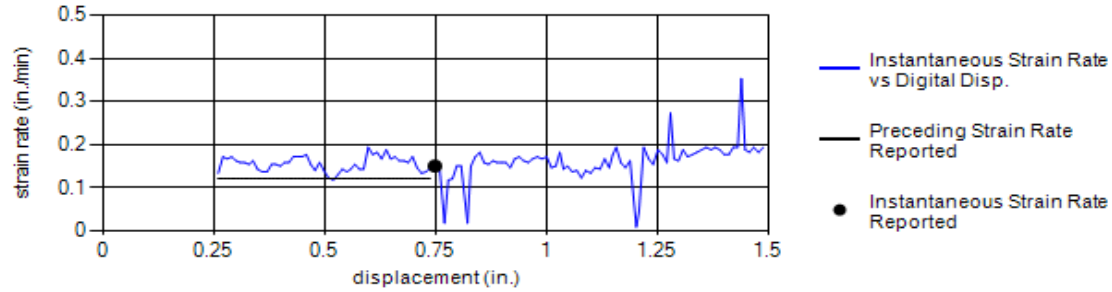
Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

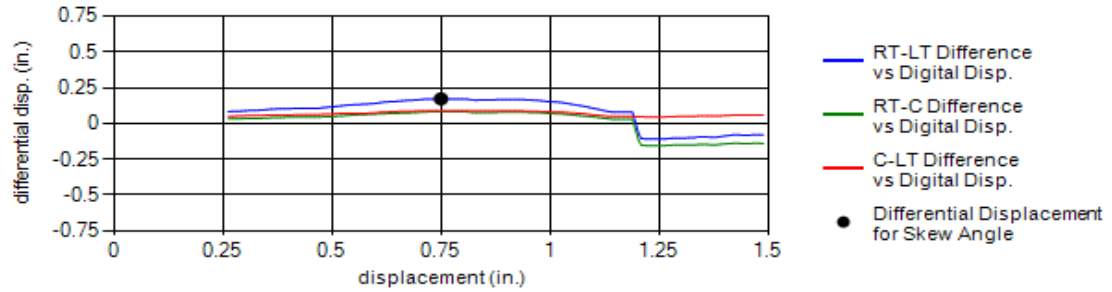
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.08	1502



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.12	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.17	0.08	0.09	No Data	0.55	CCW



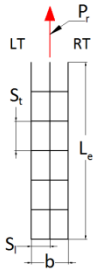
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 7:02:00 AM
Test Identification:	TS33.03-G-9x24-W20xW7.5-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

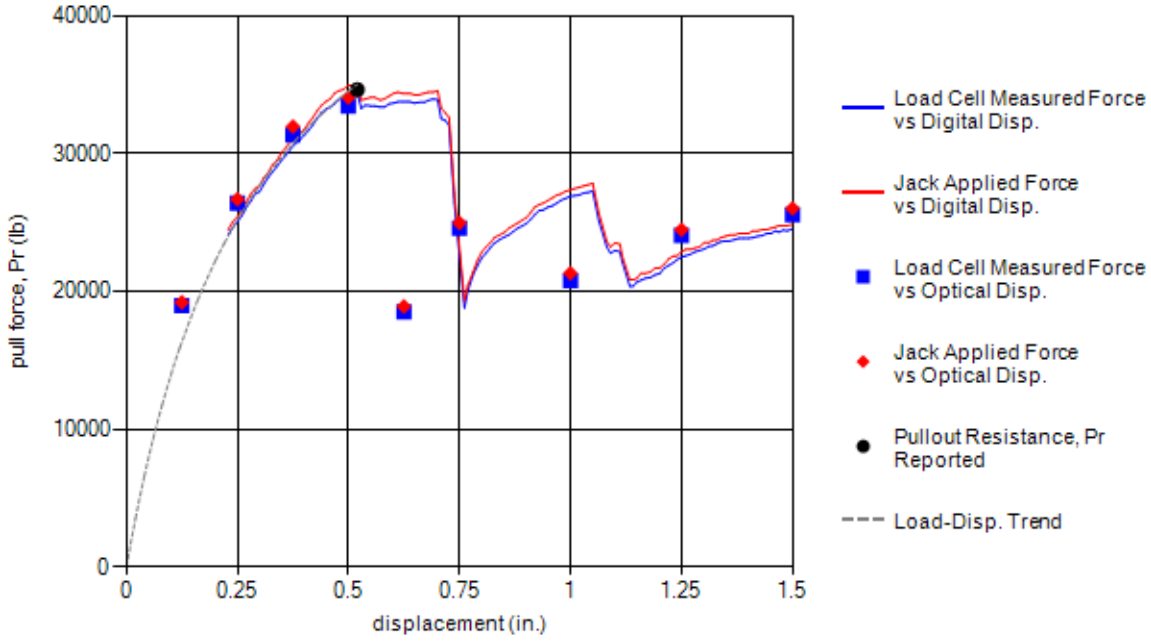
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.52	2505	34617	19.30	**0.38**

Load-Displacement Curve



Comments

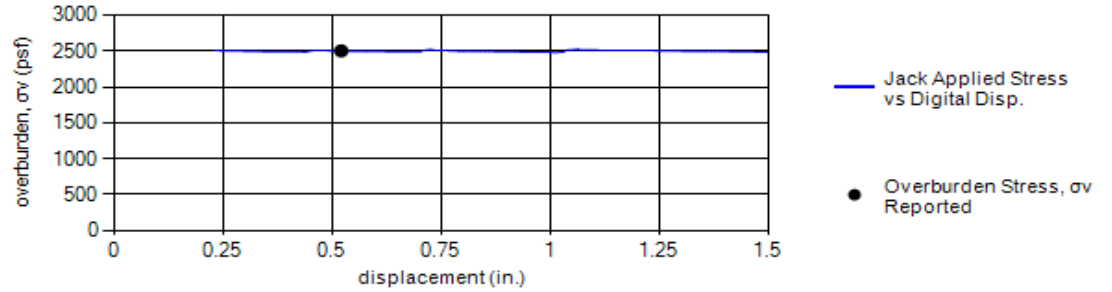
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

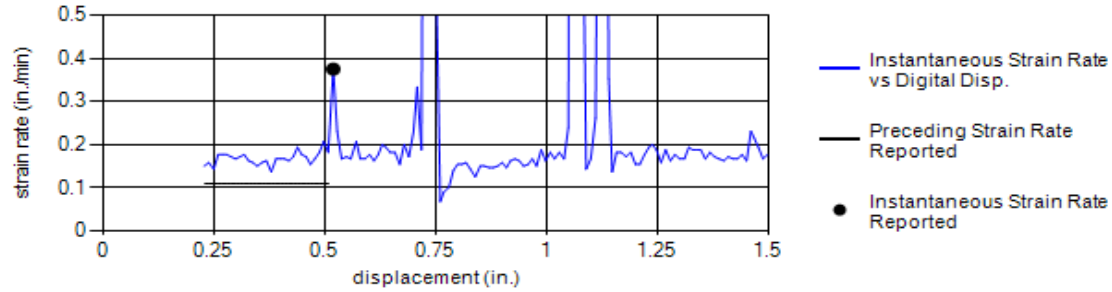
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.85	2505



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.37	0.11	0.13

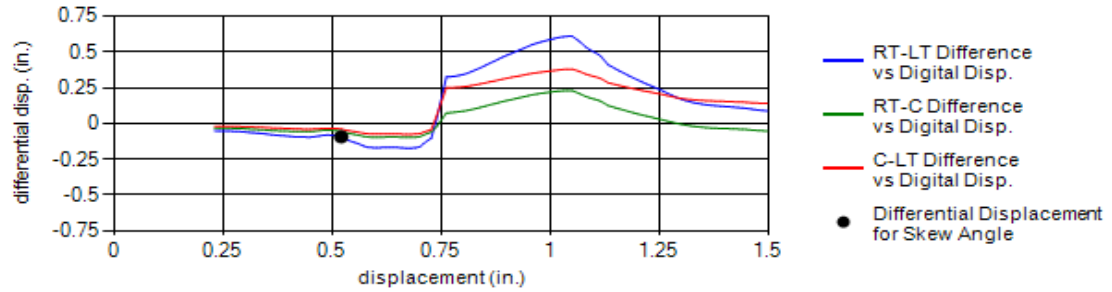


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.09	-0.05	-0.04	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.29	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

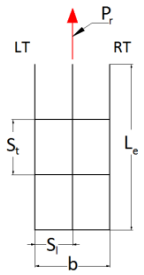
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/1/2011 6:27:00 AM
Test Identification:	TS33.04-G-9x24-W20xW7.5-L6-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

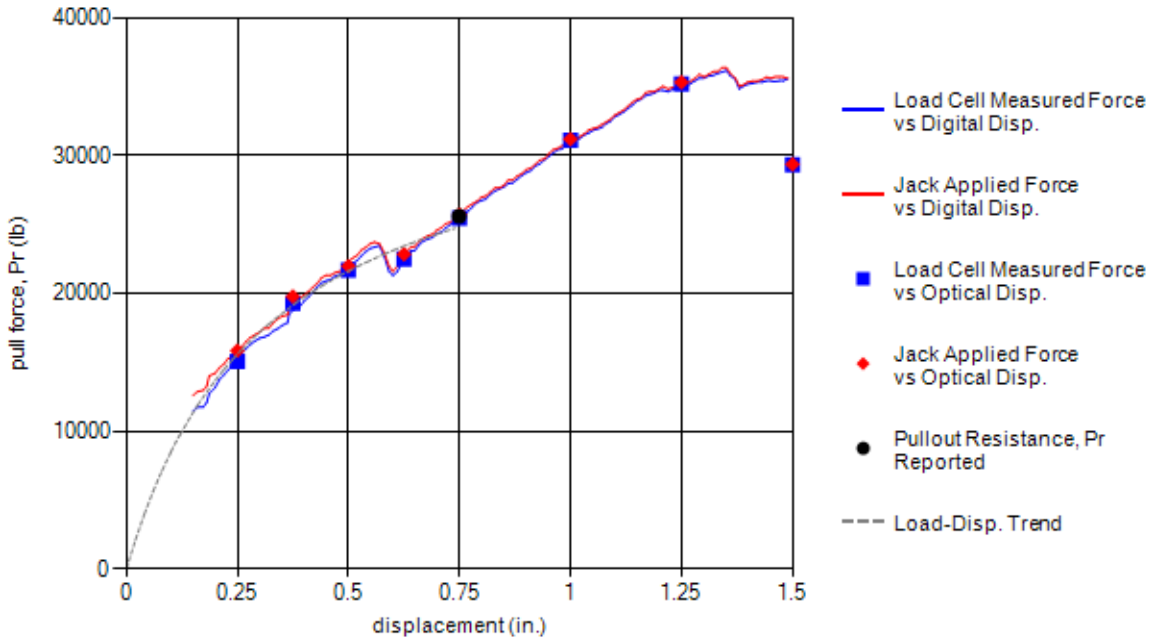
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	5022	25577	38.70	**0.28**

Load-Displacement Curve



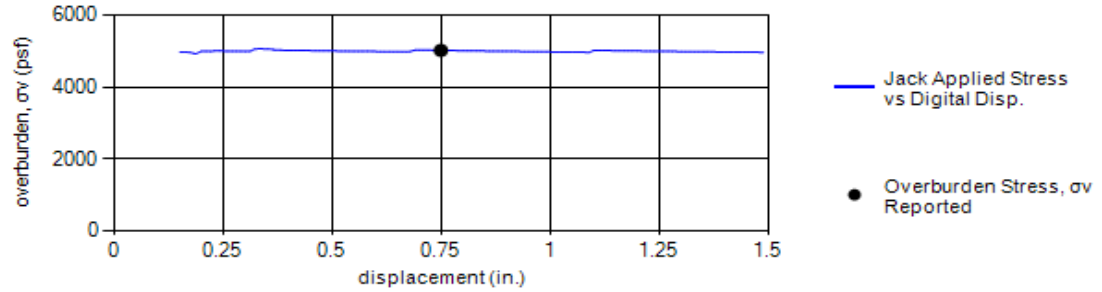
Comments

No earth pressure cell data. No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

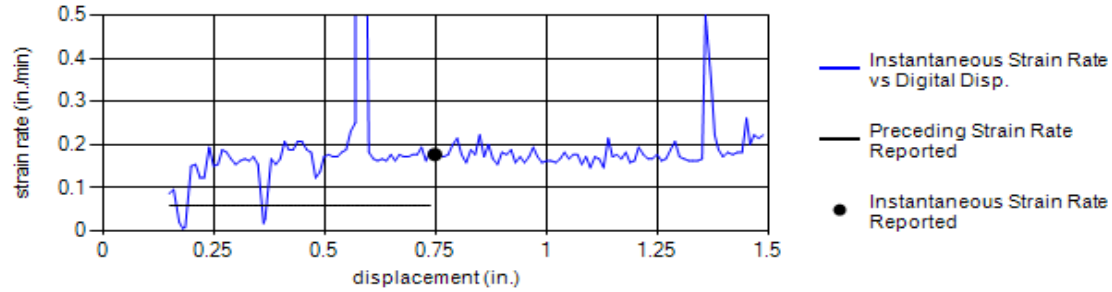
Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	No Data	5022



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.06	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

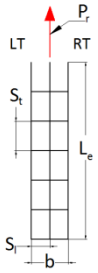
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 2:12:00 PM
Test Identification:	TS33.06-G-9x24-W20xW7.5-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

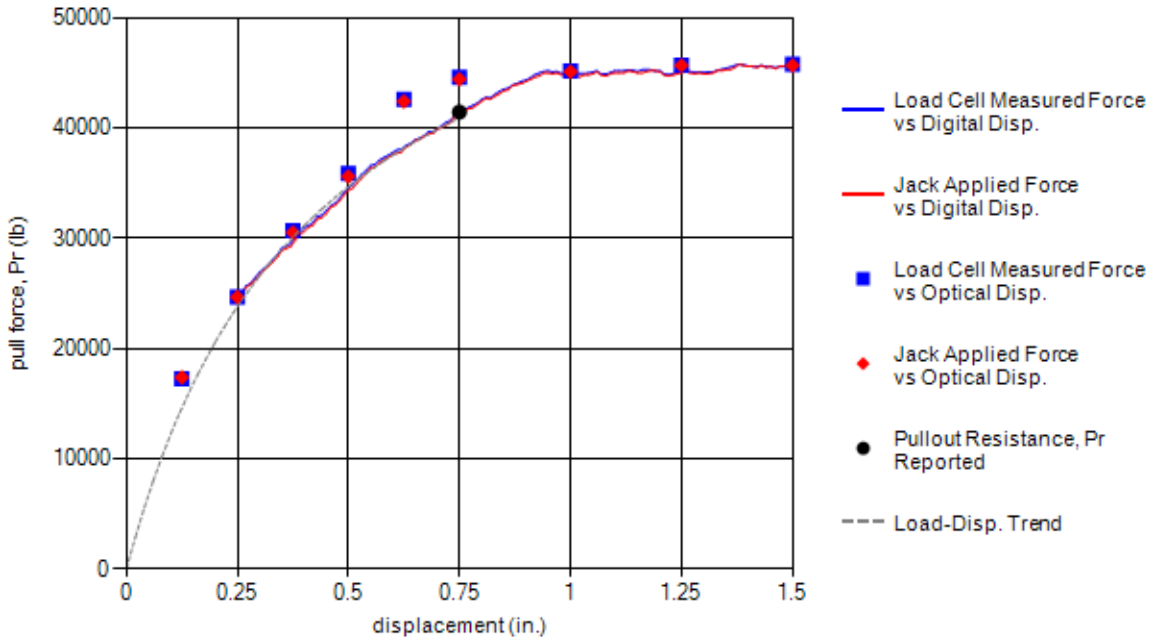
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1514	41424	11.70	**0.76**

Load-Displacement Curve



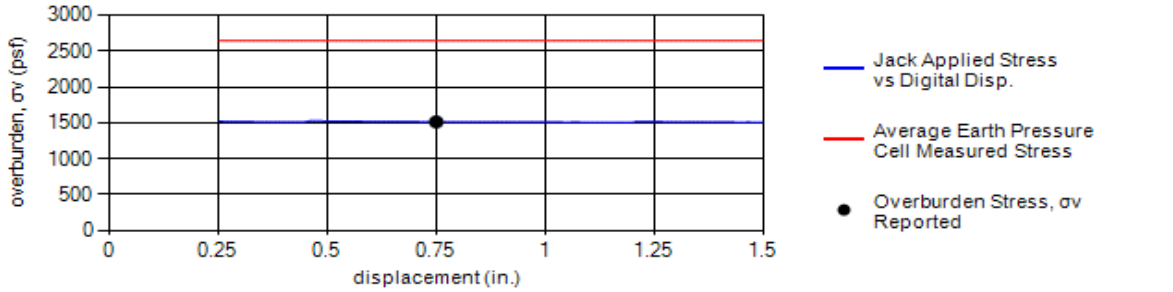
Comments

Digital displacement: pullout and elongation undifferentiated.

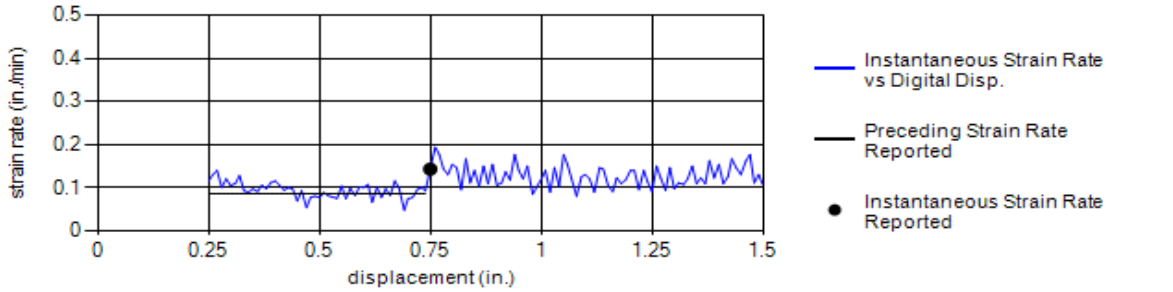
Personnel

Tested:	AS DH RH
Prepared:	ET TW
Checked:	WL PJ

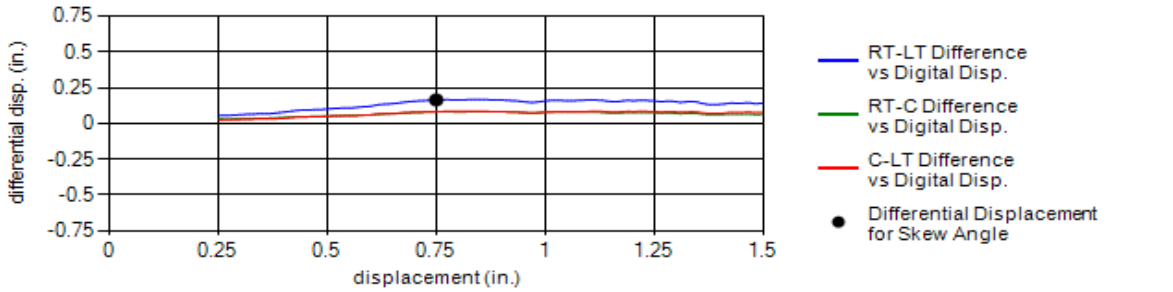
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2746	2377	2882	2426	2800	2646	3.14	1514



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.16	0.08	0.08	No Data	0.52	CCW



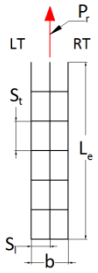
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 1:33:00 PM
Test Identification:	TS33.07-G-9x24-W20xW7.5-L12-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

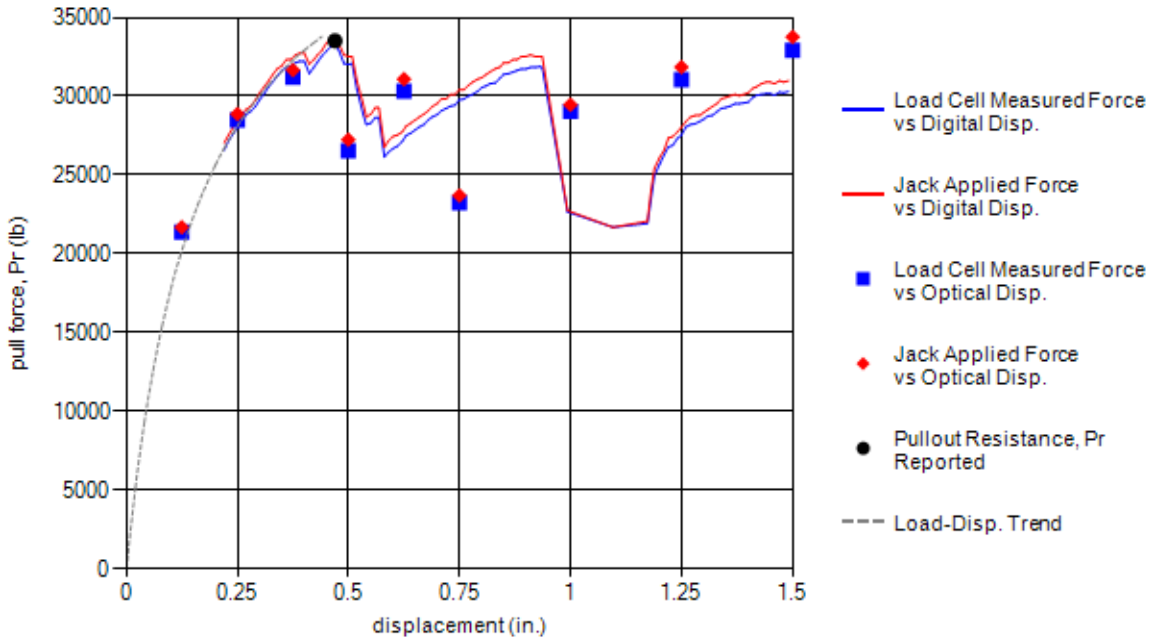
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Progressive Rupture	0.47	2533	33516	19.50	**0.37**

Load-Displacement Curve



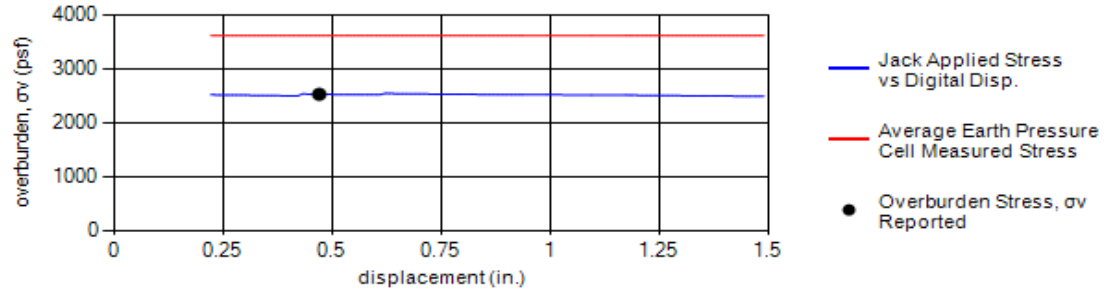
Comments

Digital displacement: pullout and elongation undifferentiated.

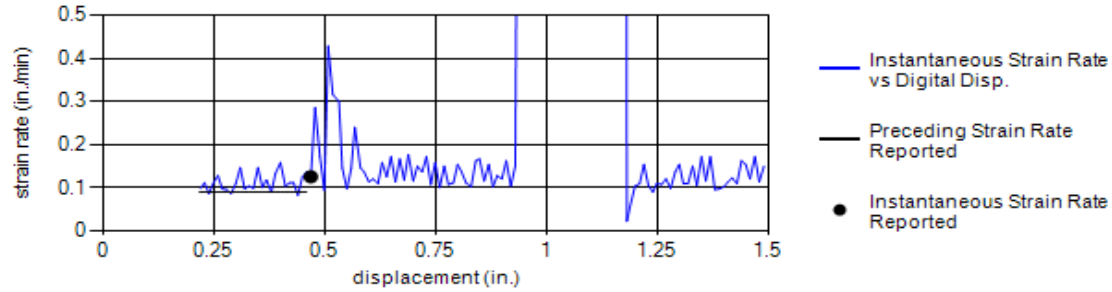
Personnel

Tested:	AS DH RH
Prepared:	ET TW
Checked:	WL PJ

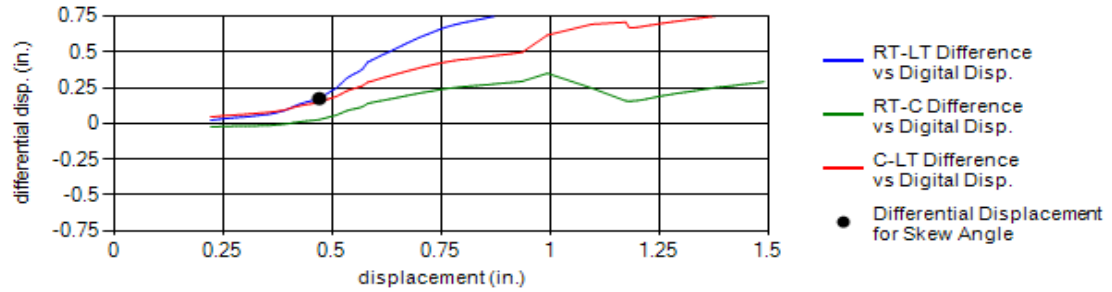
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3731	3141	4157	3264	3829	3625	1.88	2532



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.09	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.17	0.03	0.15	No Data	0.56	CCW



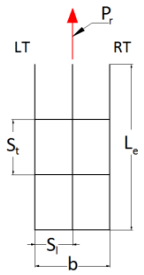
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 1:04:00 PM
Test Identification:	TS33.08-G-9x24-W20xW7.5-L6-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

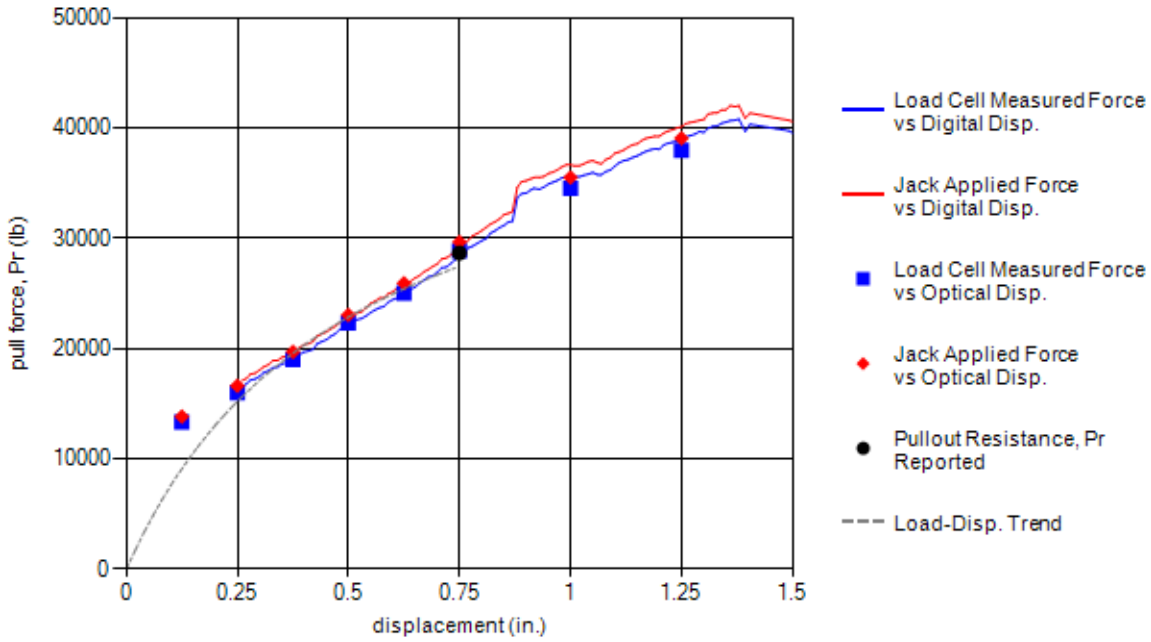
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	5028	28652	38.70	**0.32**

Load-Displacement Curve



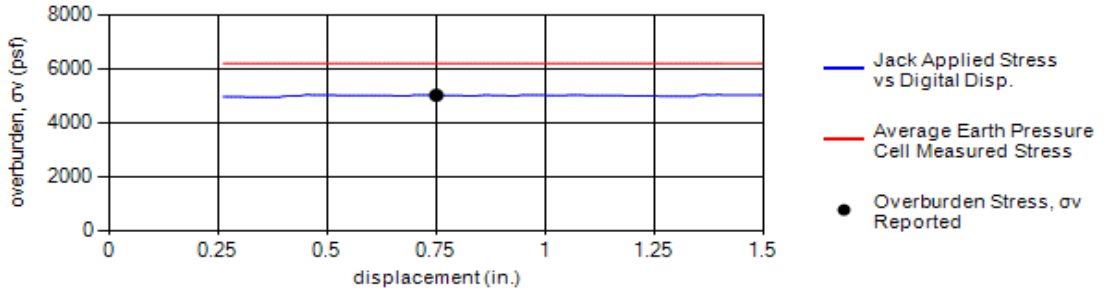
Comments

Digital displacement: pullout and elongation undifferentiated.

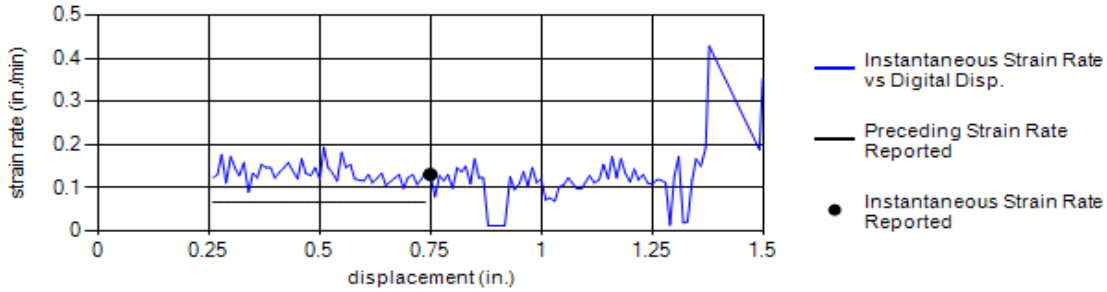
Personnel

Tested:	AS DH RH
Prepared:	ET TW
Checked:	WL PJ

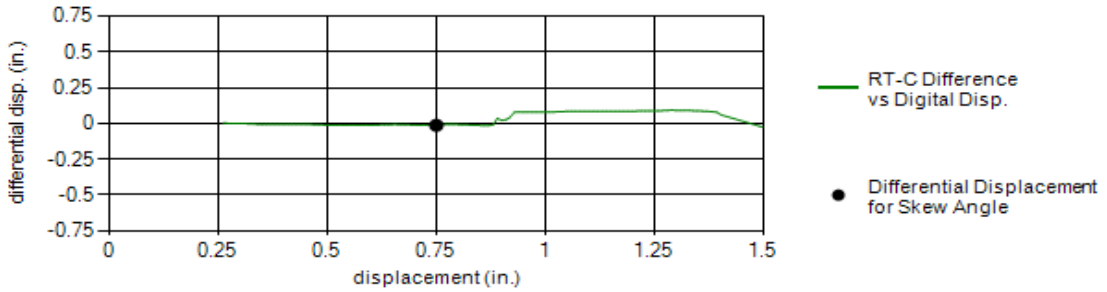
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6600	5202	7451	5376	6449	6216	1.03	5028



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.07	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	-0.01	No Data	No Data	-0.02	CW



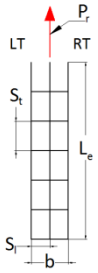
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 8:36:00 AM
Test Identification:	TS33.09-G-9x24-W20xW7.5-L12-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

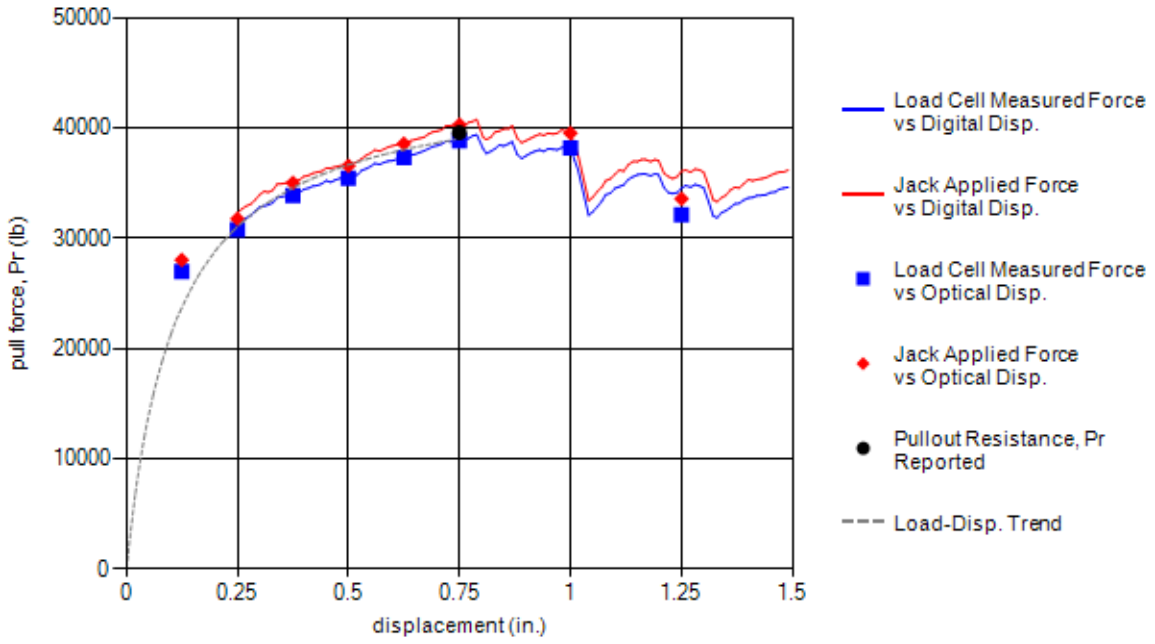
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	683	39563	5.30	**1.61**

Load-Displacement Curve



Comments

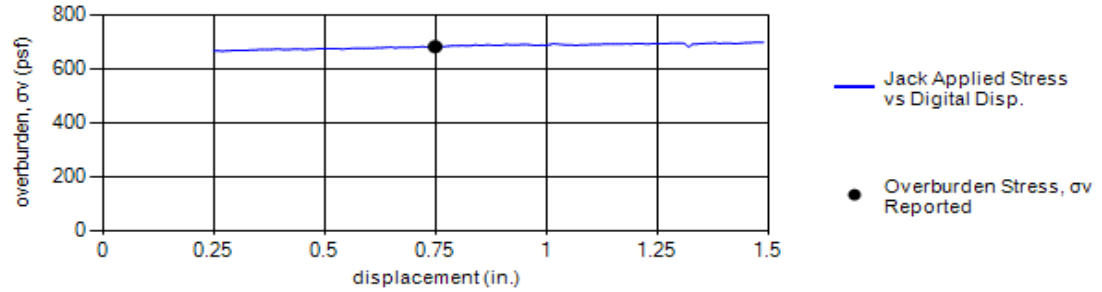
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

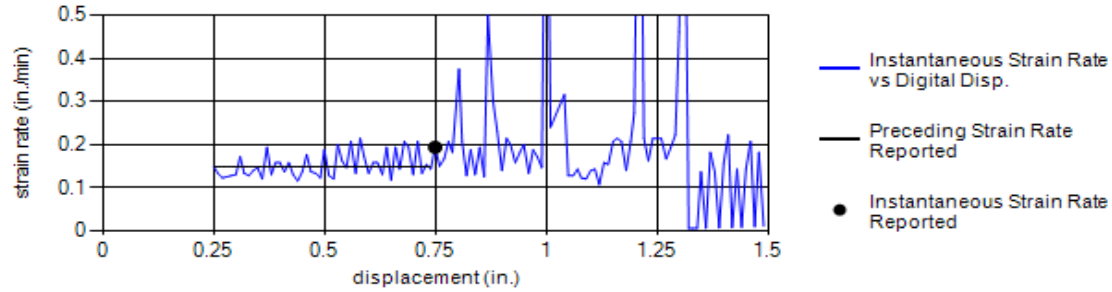
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.16	683



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.15	0.16

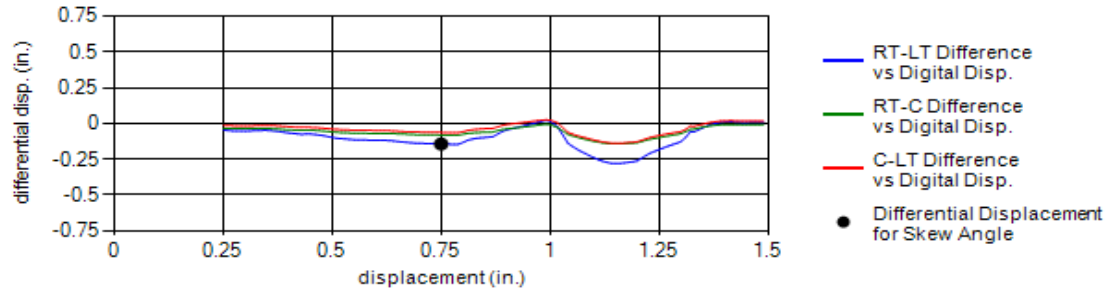


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.14	-0.08	-0.06	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.45	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

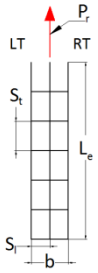
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 9:14:00 AM
Test Identification:	TS33.10-G-9x24-W20xW7.5-L12-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

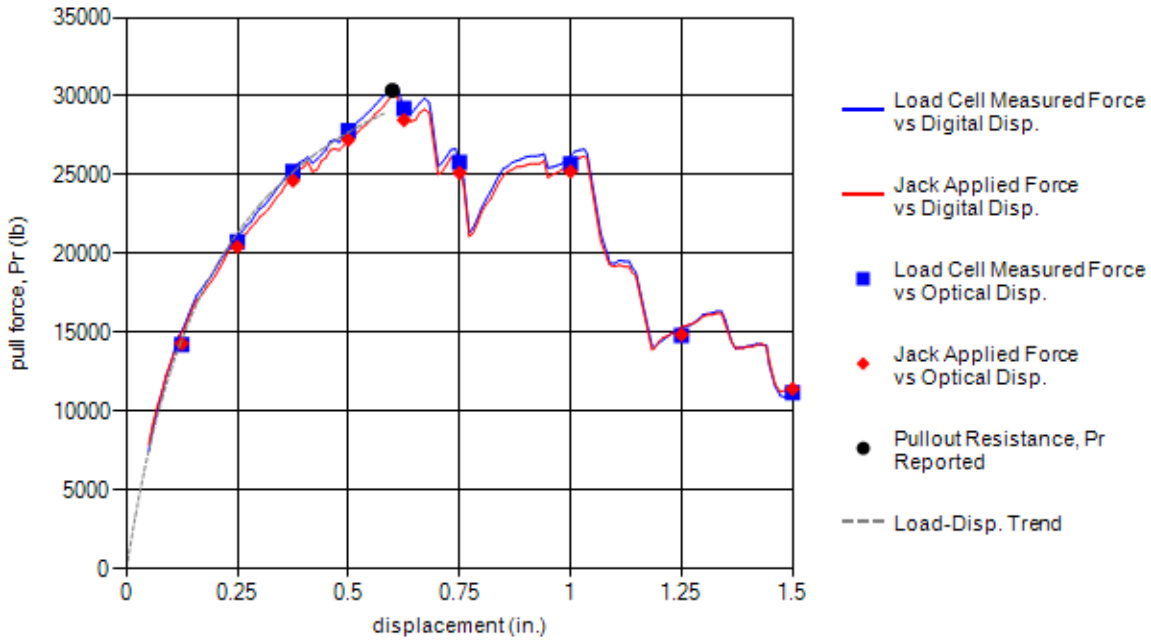
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.60	1526	30370	11.70	**0.55**

Load-Displacement Curve



Comments

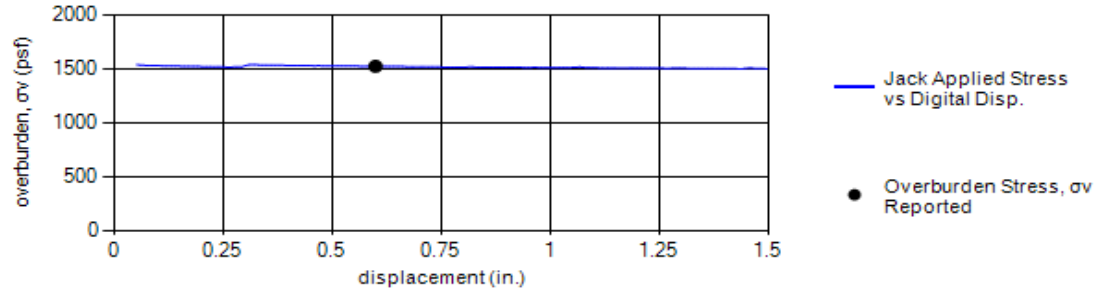
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

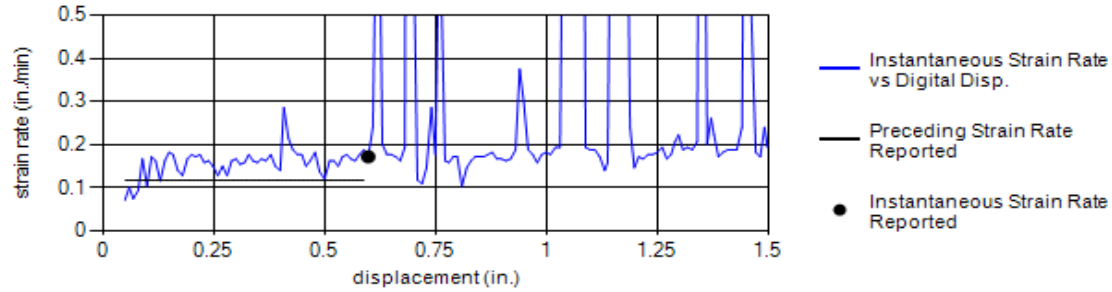
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.20	1526



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.12	0.16

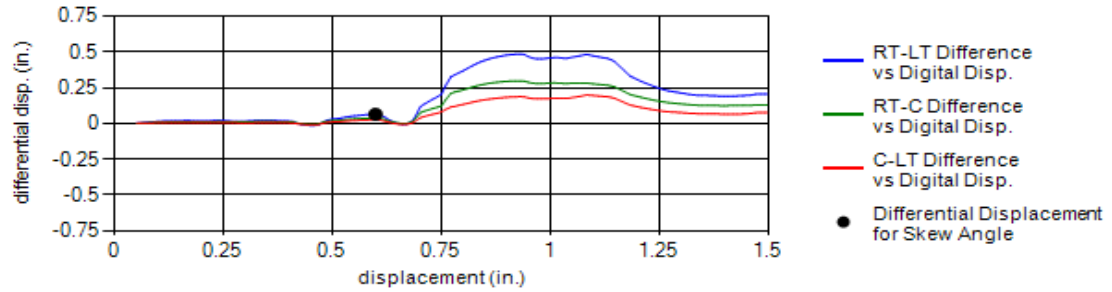


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.06	0.04	0.03	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.21	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

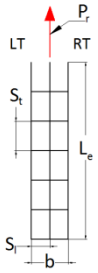
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	41	24
3/8in.		52	45
#4		71	62
#10		83	76
#40	85-100	93	87
#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 9:45:00 AM
Test Identification:	TS33.11-G-9x24-W20xW7.5-L12-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

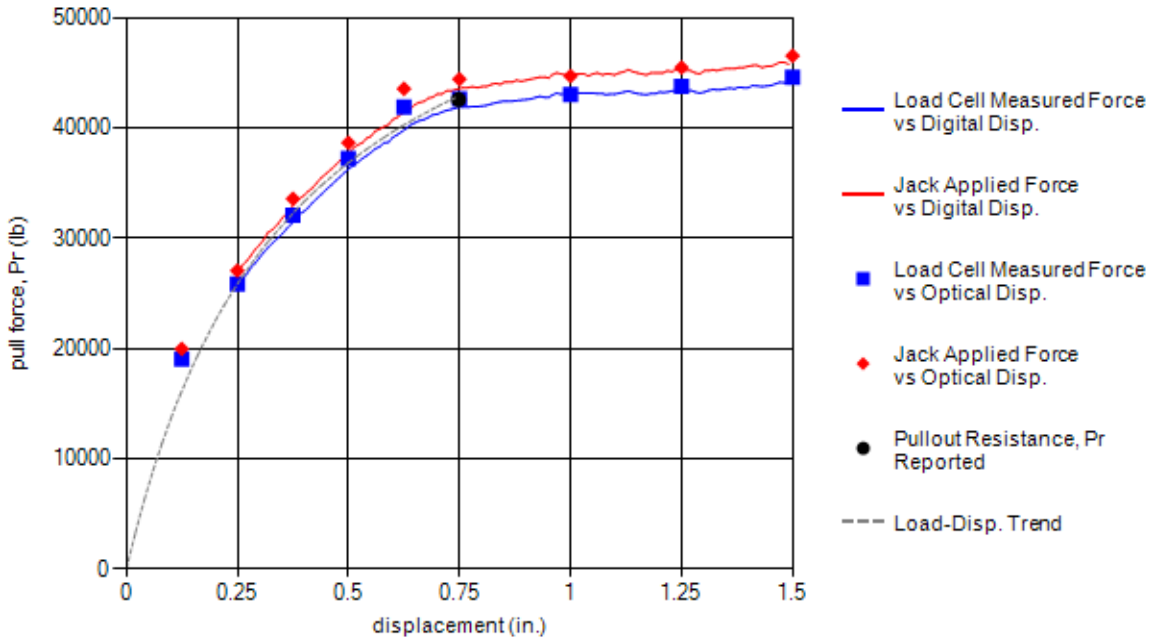
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2486	42554	19.10	**0.48**

Load-Displacement Curve



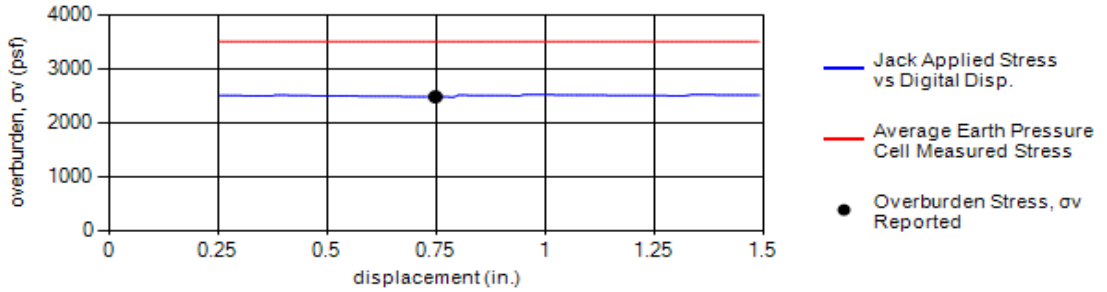
Comments

Digital displacement: pullout and elongation undifferentiated.

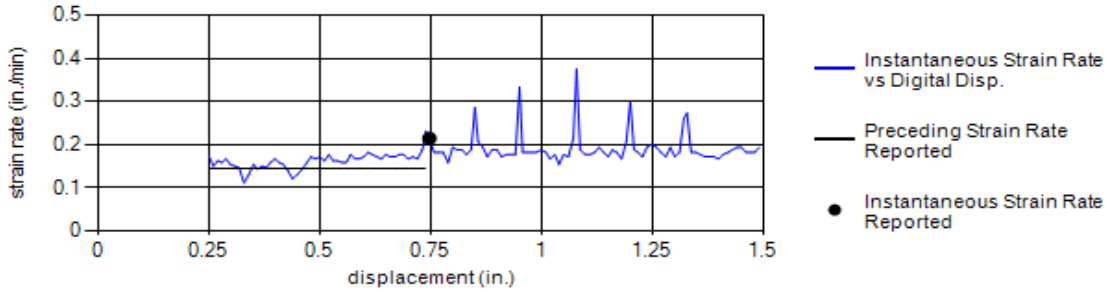
Personnel

Tested:	AS DH YW
Prepared:	ET TW
Checked:	WL PJ

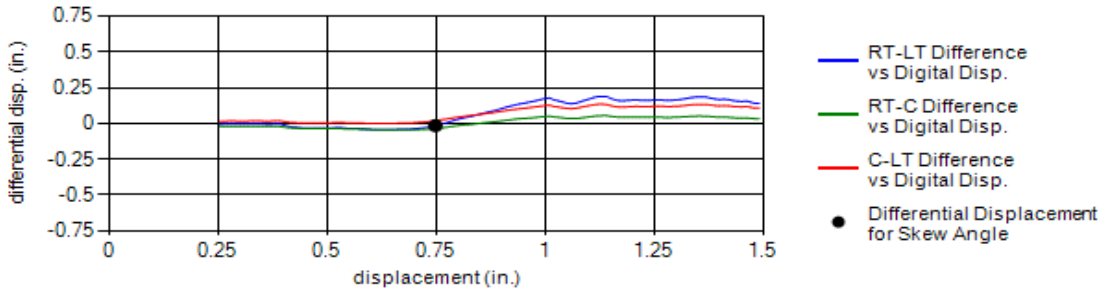
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3789	2940	3736	3585	3495	3509	1.97	2486



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.14	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.01	-0.04	0.02	No Data	-0.05	CW



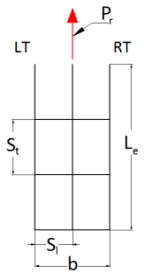
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/2/2011 12:24:00 PM
Test Identification:	TS33.12-G-9x24-W20xW7.5-L6-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

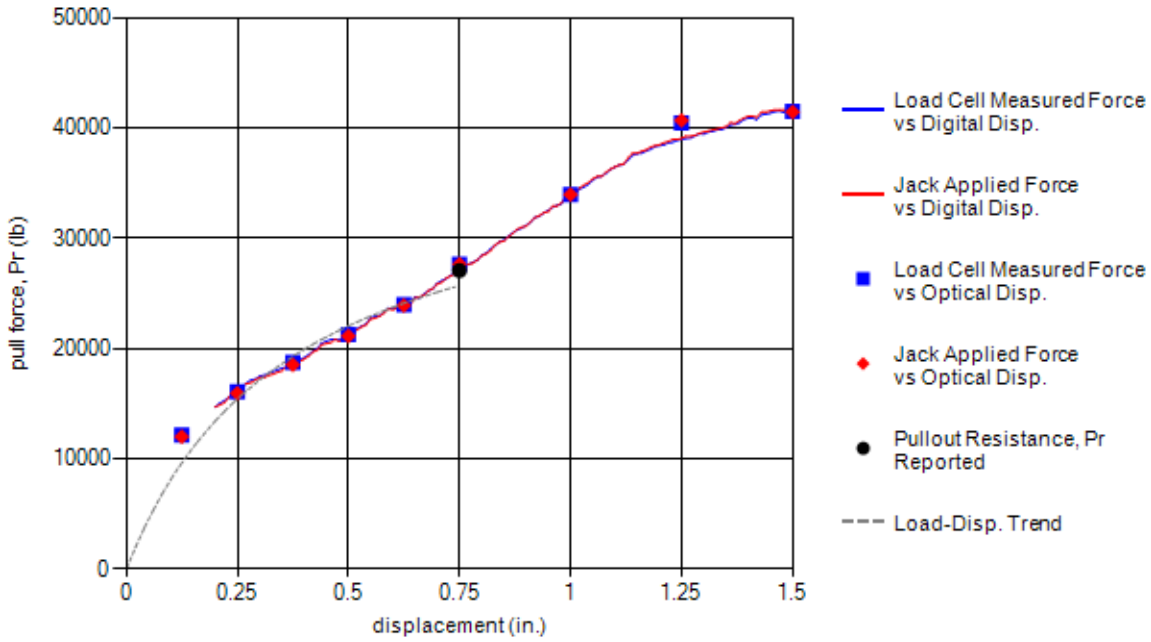
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	4910	27065	37.80	**0.31**

Load-Displacement Curve



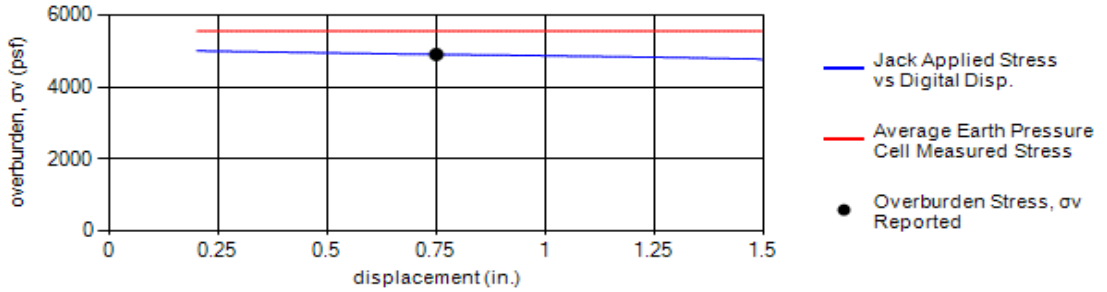
Comments

Digital displacement: pullout and elongation undifferentiated.

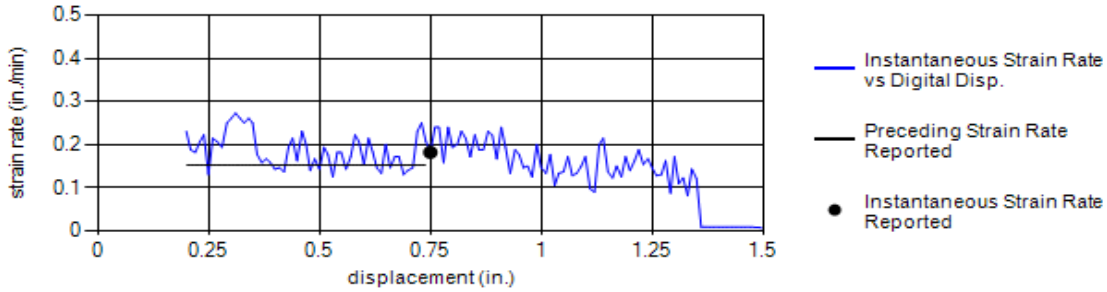
Personnel

Tested:	AS DH RH
Prepared:	ET TW
Checked:	WL PJ

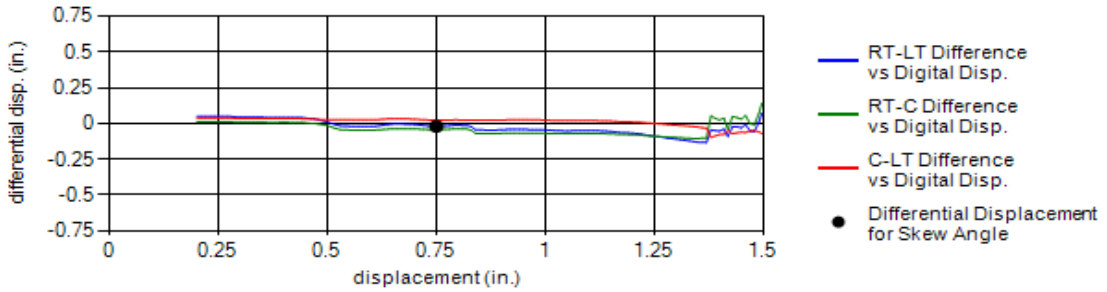
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5870	4746	6403	5027	5746	5558	1.00	4910



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.15	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.02	-0.04	0.02	No Data	-0.06	CW



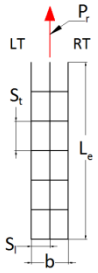
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	41	24
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		52	45
Liquid Limit, LL (%):	23	#4		71	62
Plastic Limit, PL (%):	20	#10		83	76
Plasticity Index, PI (%):	3	#40	85-100	93	87
Bar Linear Shrinkage, LS (%):	3	#200		99	96

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 2:13:00 PM
Test Identification:	TS35.01-G-9x18-W20xW11-L9-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

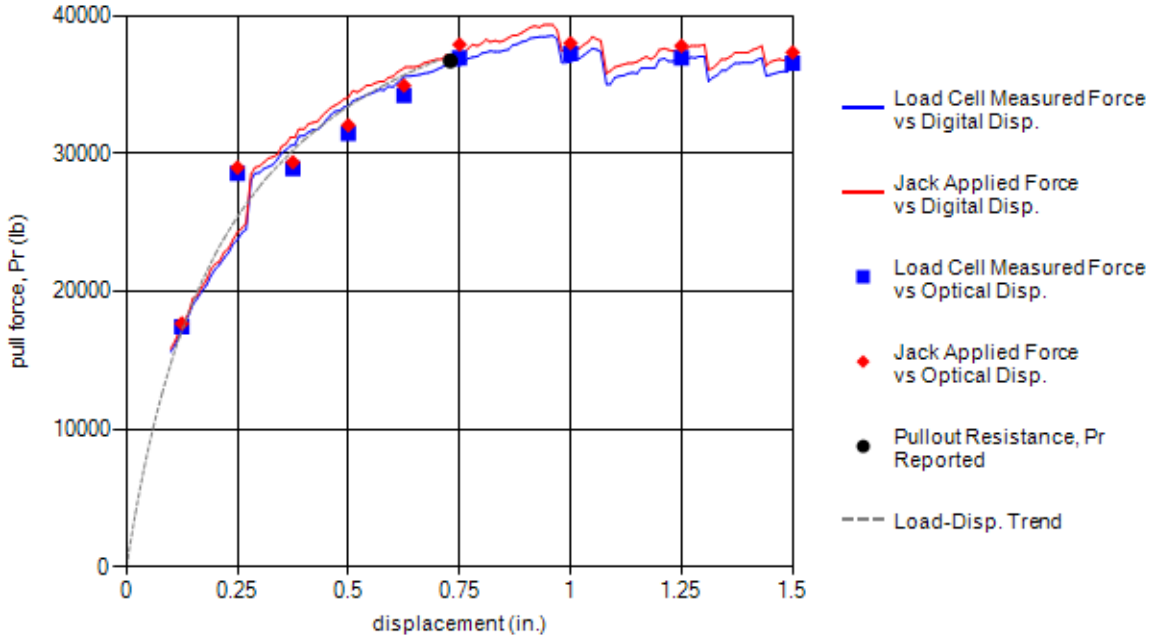
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	722	36703	5.50	**1.88**

Load-Displacement Curve



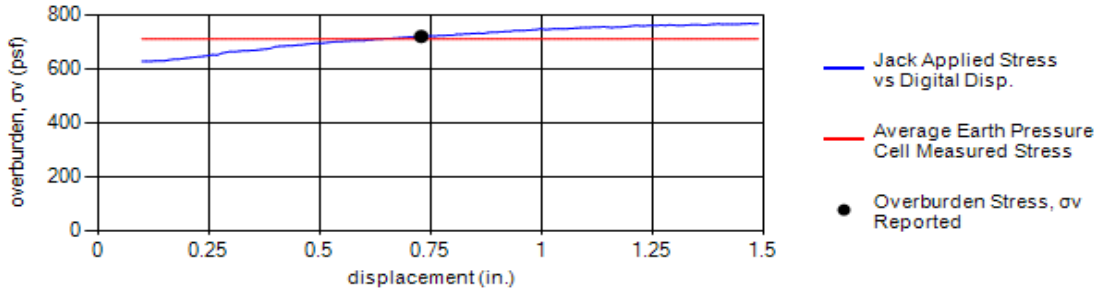
Comments

Digital displacement: pullout and elongation undifferentiated.

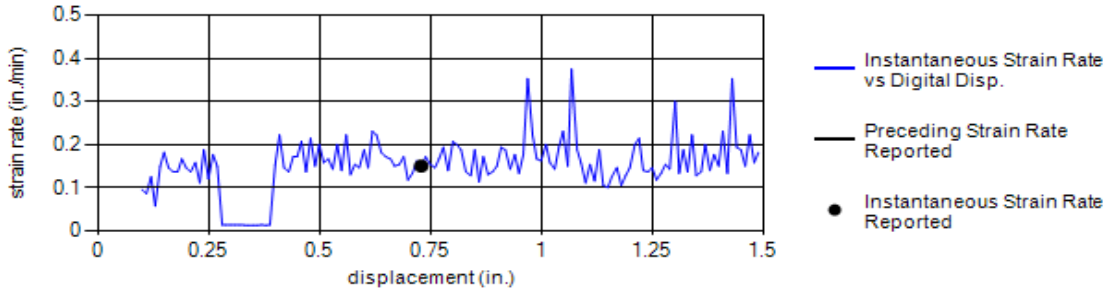
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

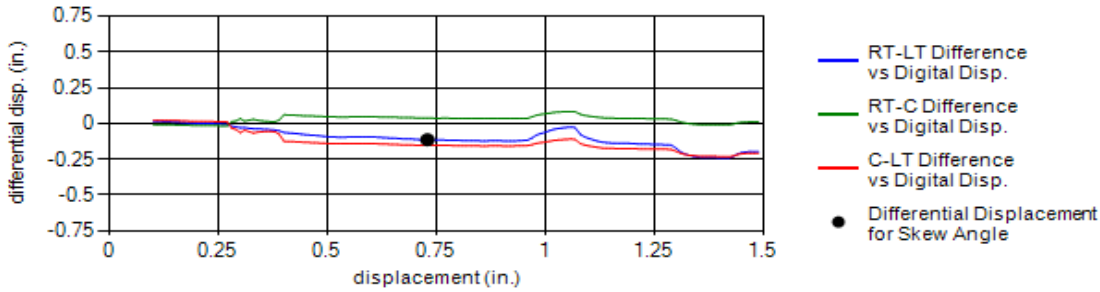
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1162	424	709	483	782	712	7.18	722



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.10	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.11	0.04	-0.15	No Data	-0.36	CW



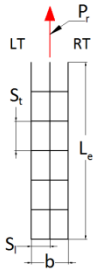
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 2:42:00 PM
Test Identification:	TS35.02-G-9x18-W20xW11-L9-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

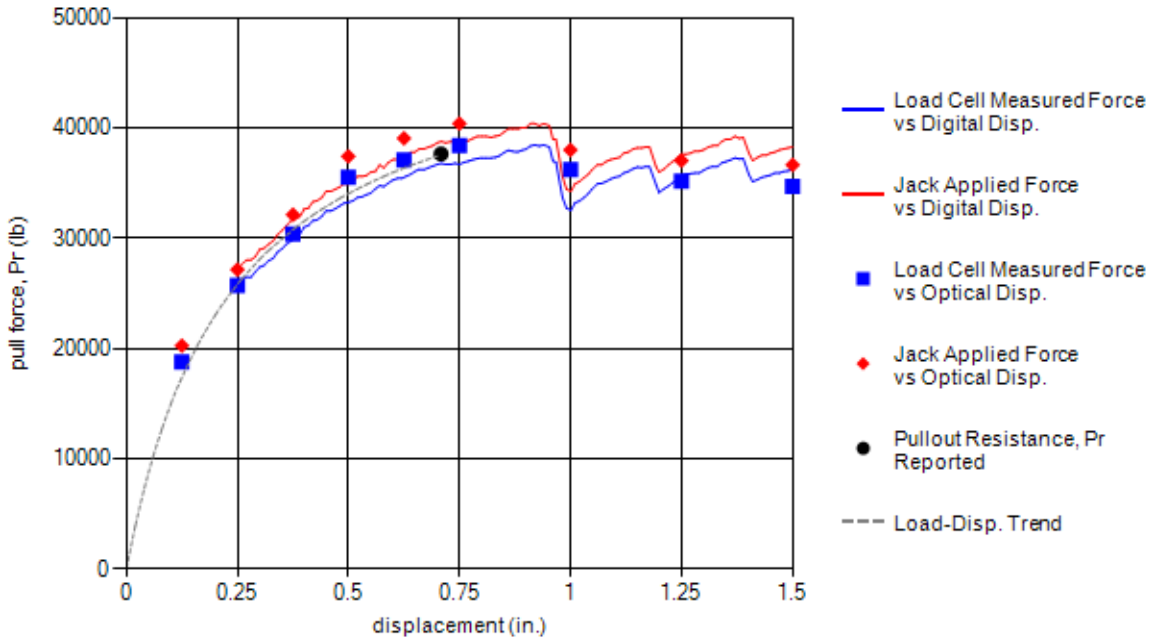
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.71	1391	37628	10.60	**1.00**

Load-Displacement Curve



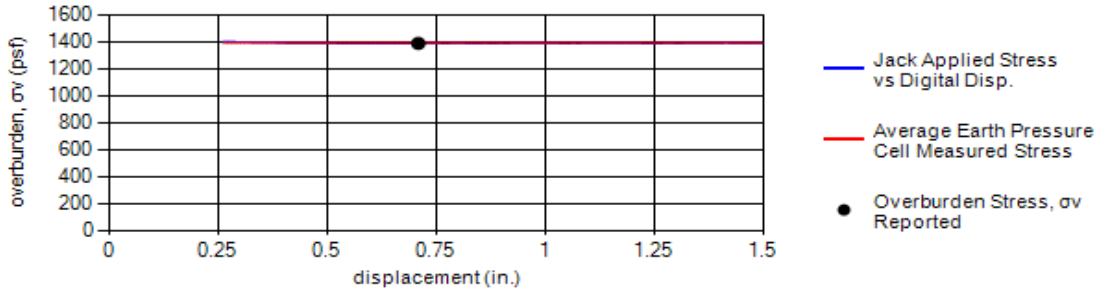
Comments

Digital displacement: pullout and elongation undifferentiated.

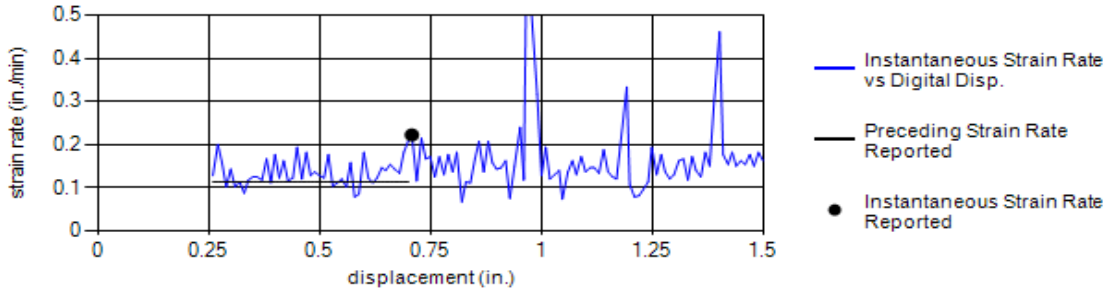
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

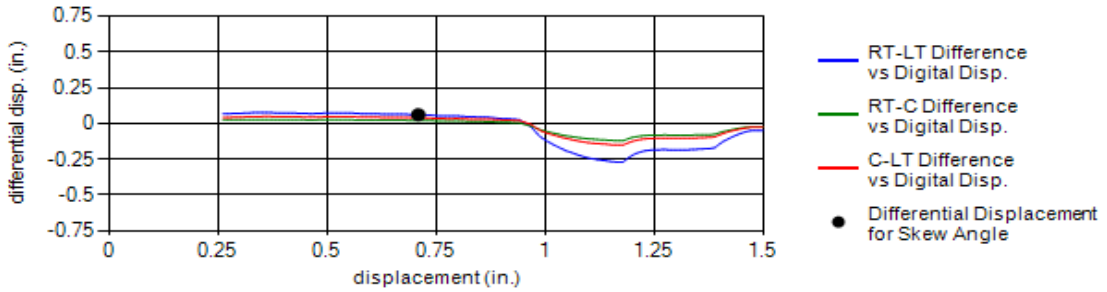
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1623	1007	1595	1248	1504	1395	3.66	1391



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	0.02	0.04	No Data	0.20	CCW



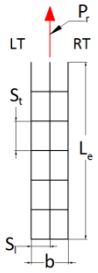
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 7:00:00 AM
Test Identification:	TS35.03-G-9x18-W20xW11-L9-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

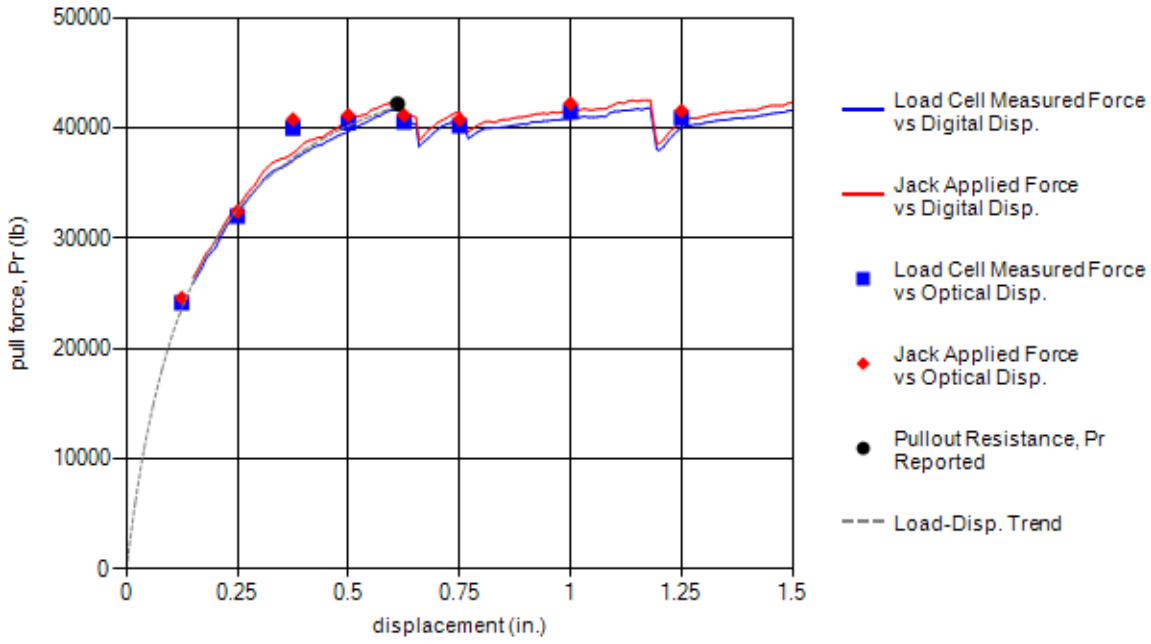
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.61	2448	42159	18.70	**0.64**

Load-Displacement Curve



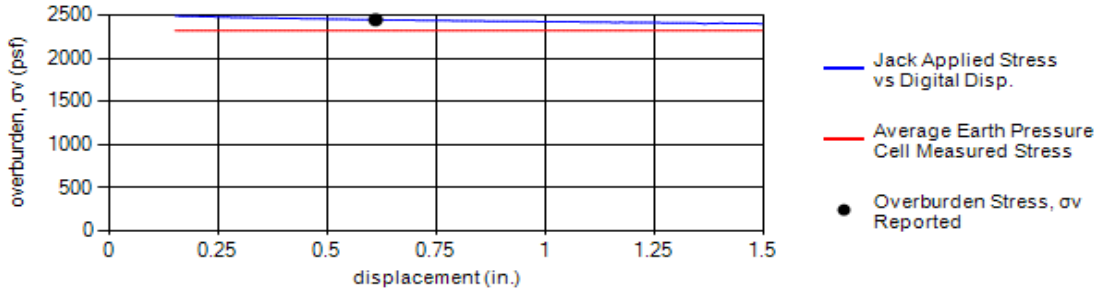
Comments

Digital displacement: pullout and elongation undifferentiated.

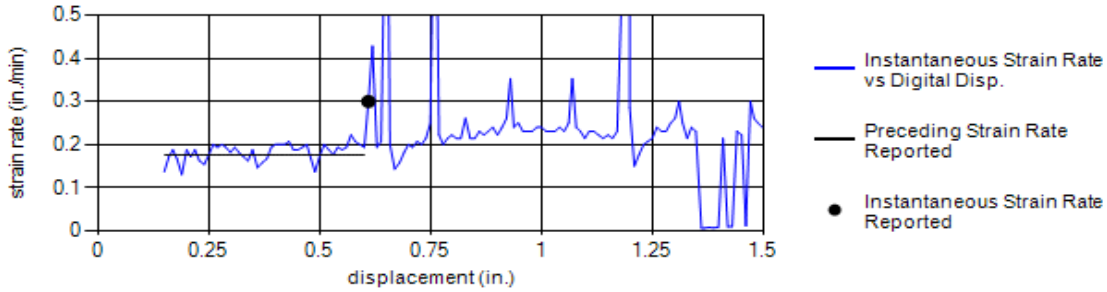
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

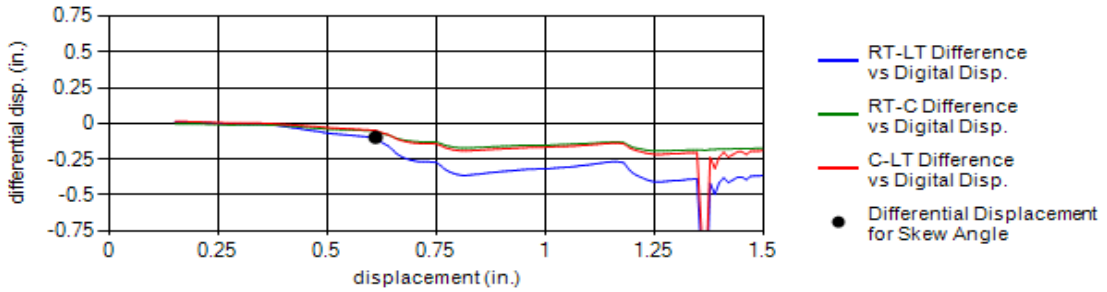
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2359	1796	2887	2140	2426	2322	2.20	2448



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.18	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.10	-0.05	-0.05	No Data	-0.31	CW



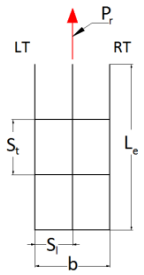
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 7:25:00 AM
Test Identification:	TS35.04-G-9x18-W20xW11-L4.5-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

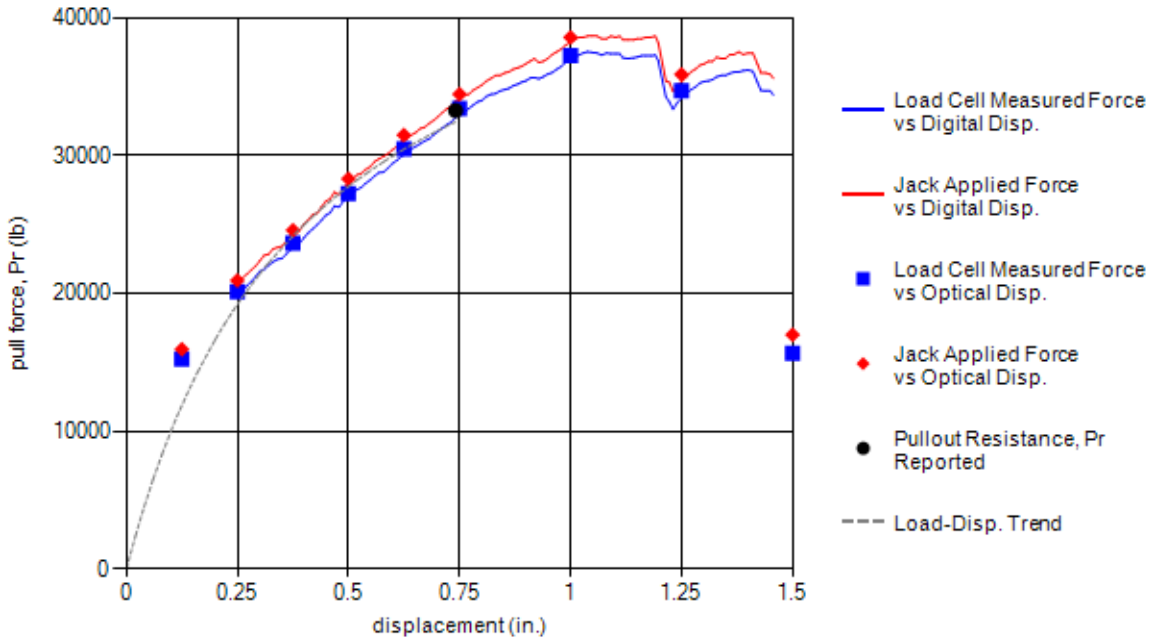
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	5002	33251	38.20	**0.49**

Load-Displacement Curve



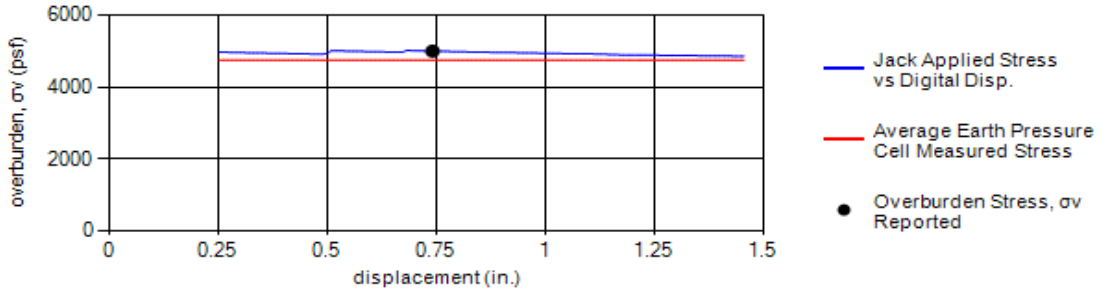
Comments

Digital displacement: pullout and elongation undifferentiated.

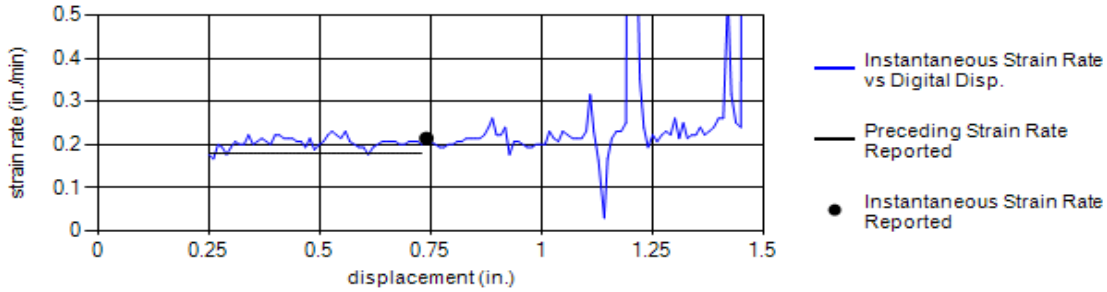
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

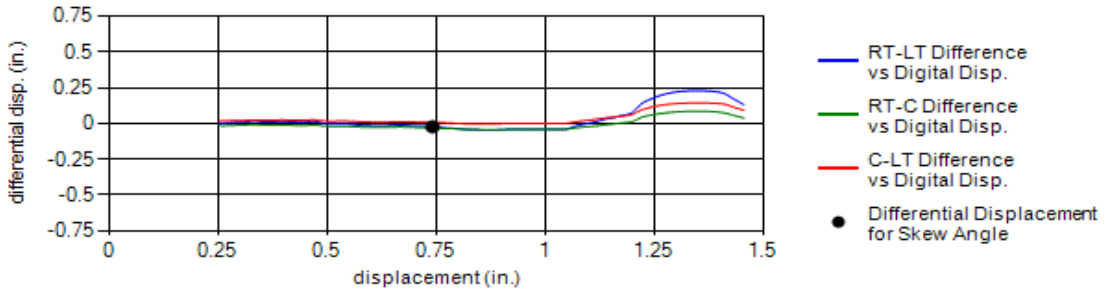
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4550	4026	6036	4315	4846	4755	1.08	5002



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.18	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.02	-0.03	0.01	No Data	-0.07	CW



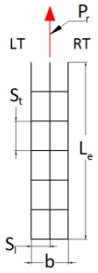
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 9:46:00 AM
Test Identification:	TS35.05-G-9x18-W20xW11-L9-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

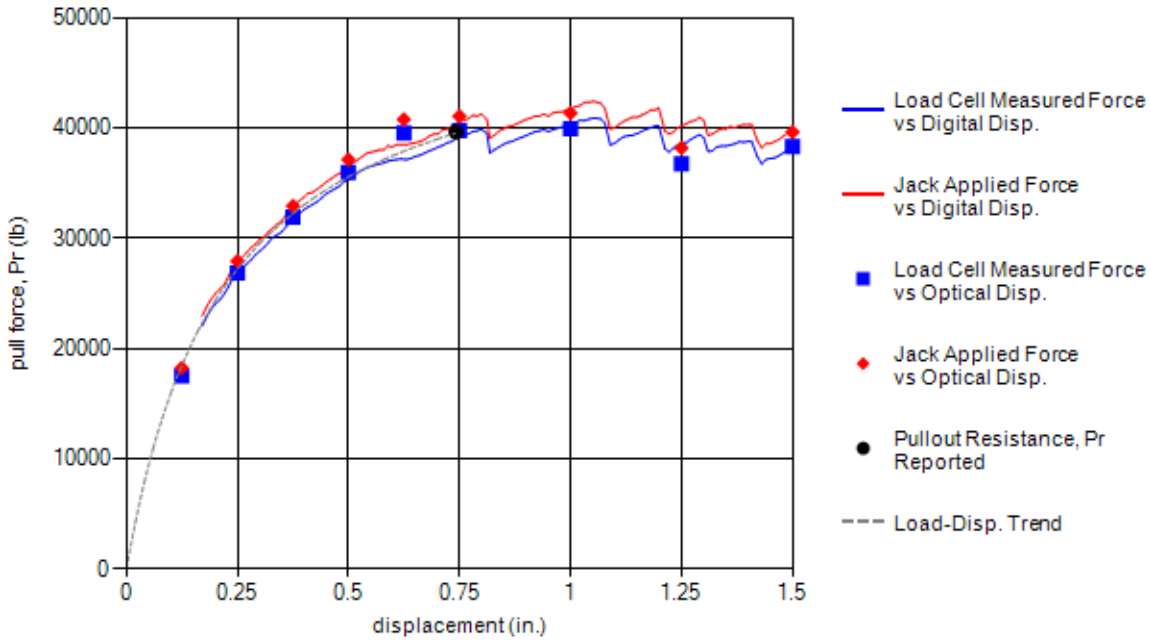
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	695	39624	5.30	**2.11**

Load-Displacement Curve



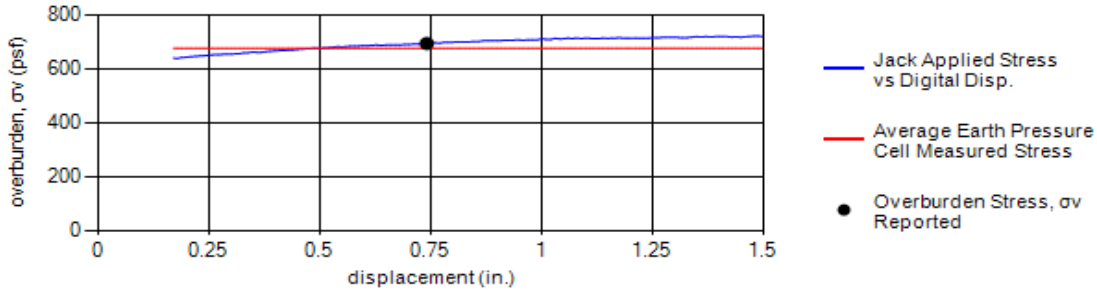
Comments

Digital displacement: pullout and elongation undifferentiated.

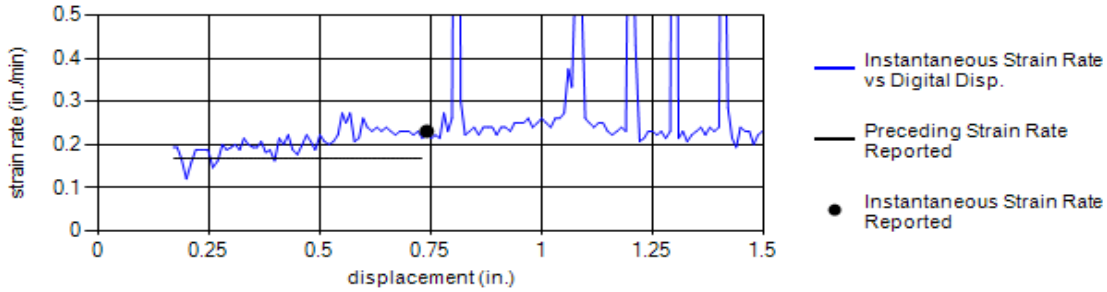
Personnel

Tested:	AJ DH YW
Prepared:	SB TW
Checked:	WL PJ

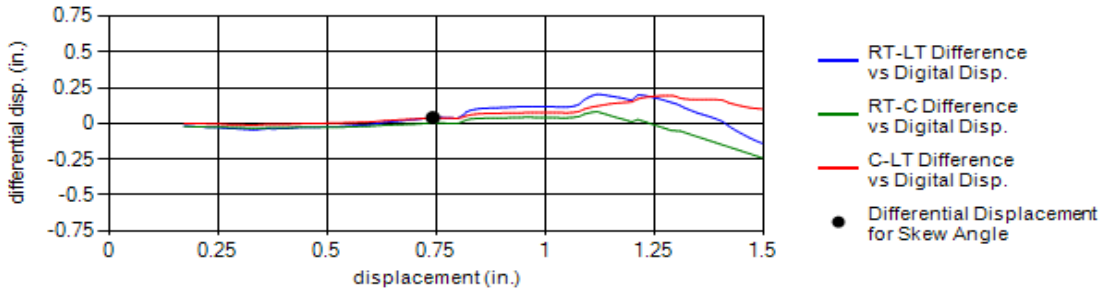
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1170	358	701	412	751	678	7.68	695



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.17	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.00	0.04	No Data	0.13	CCW



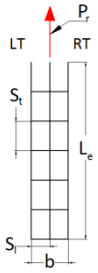
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 9:20:00 AM
Test Identification:	TS35.06-G-9x18-W20xW11-L9-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

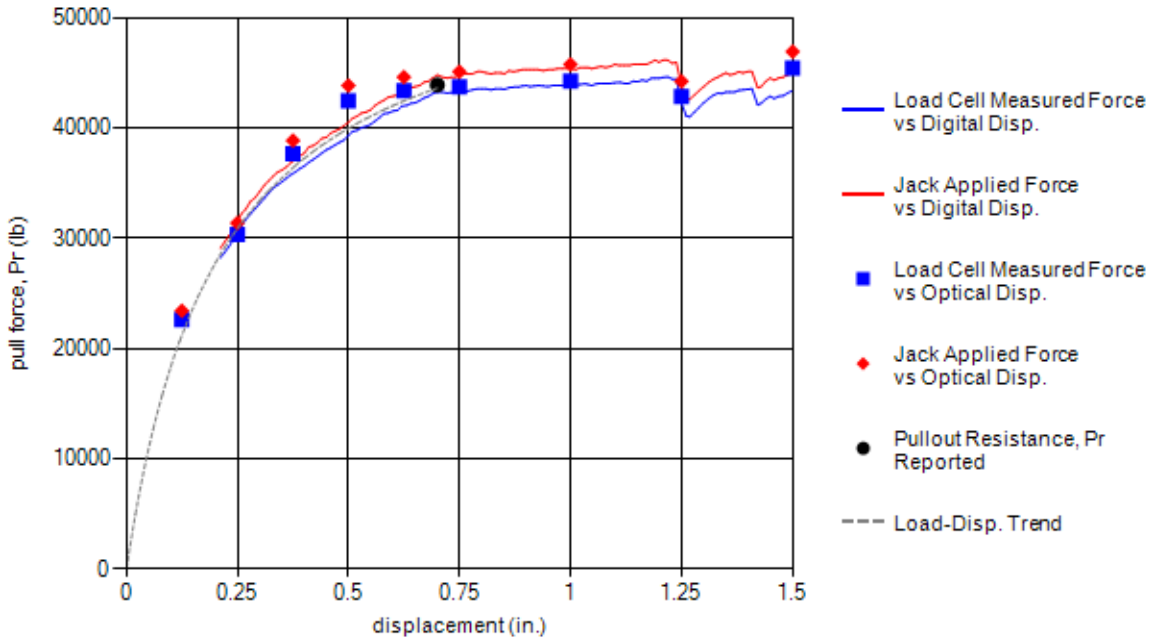
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.70	1518	43883	11.60	**1.07**

Load-Displacement Curve



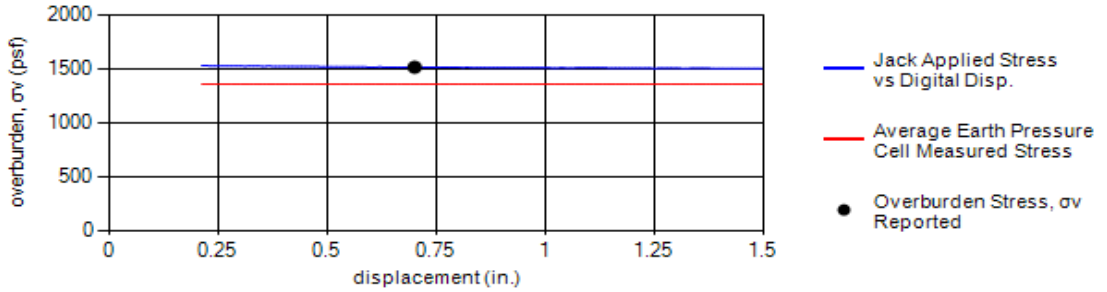
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

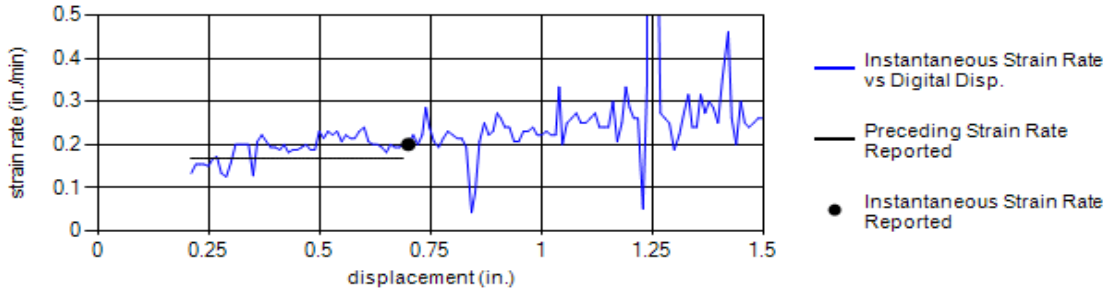
Personnel

Tested:	AJ DH YW
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1209	991	1807	1252	1537	1359	3.83	1518



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.17	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

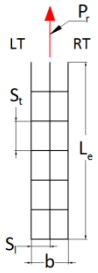
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 8:42:00 AM
Test Identification:	TS35.07-G-9x18-W20xW11-L9-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

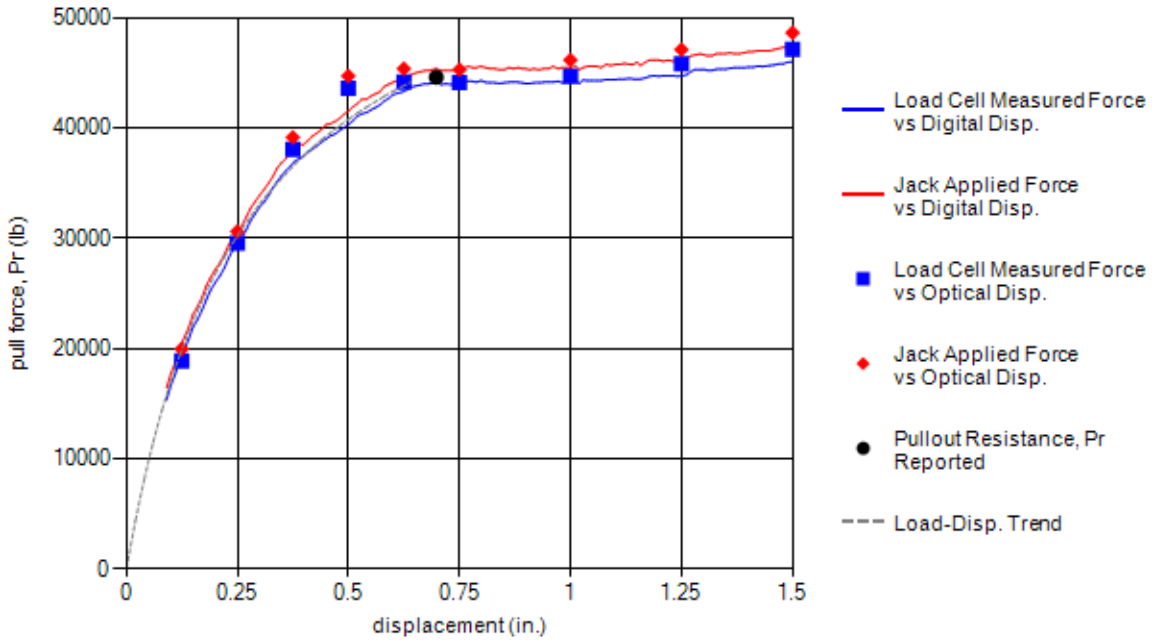
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.70	2571	44581	19.60	**0.64**

Load-Displacement Curve



Comments

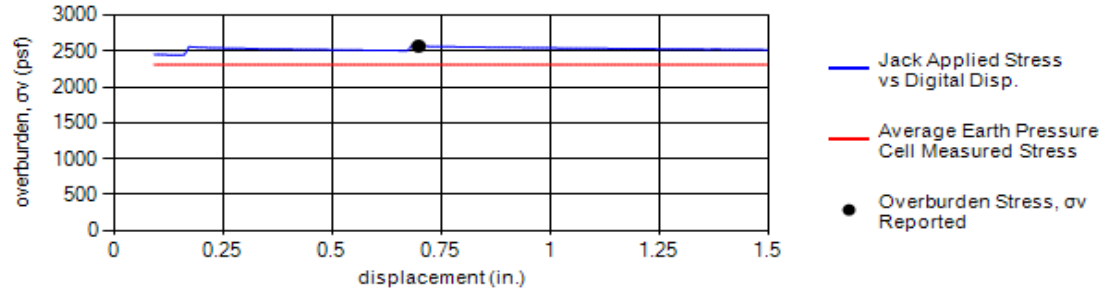
Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ DH YW
Prepared:	SB TW
Checked:	WL PJ

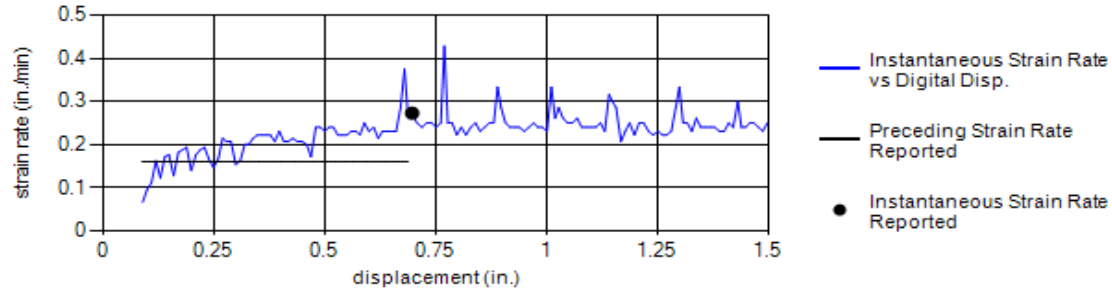
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2008	1782	3173	2146	2455	2313	2.25	2571



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.16	0.19

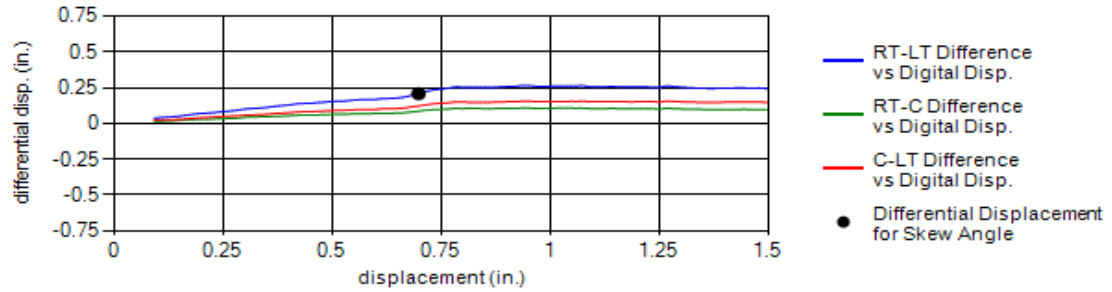


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.21	0.09	0.12	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.67	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

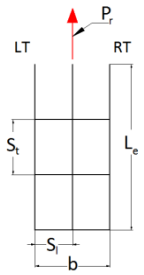
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		0	0
1/2in.	50-100	24	34
3/8in.		45	43
#4		62	59
#10		76	72
#40	85-100	87	84
#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/16/2011 8:12:00 AM
Test Identification:	TS35.08-G-9x18-W20xW11-L4.5-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

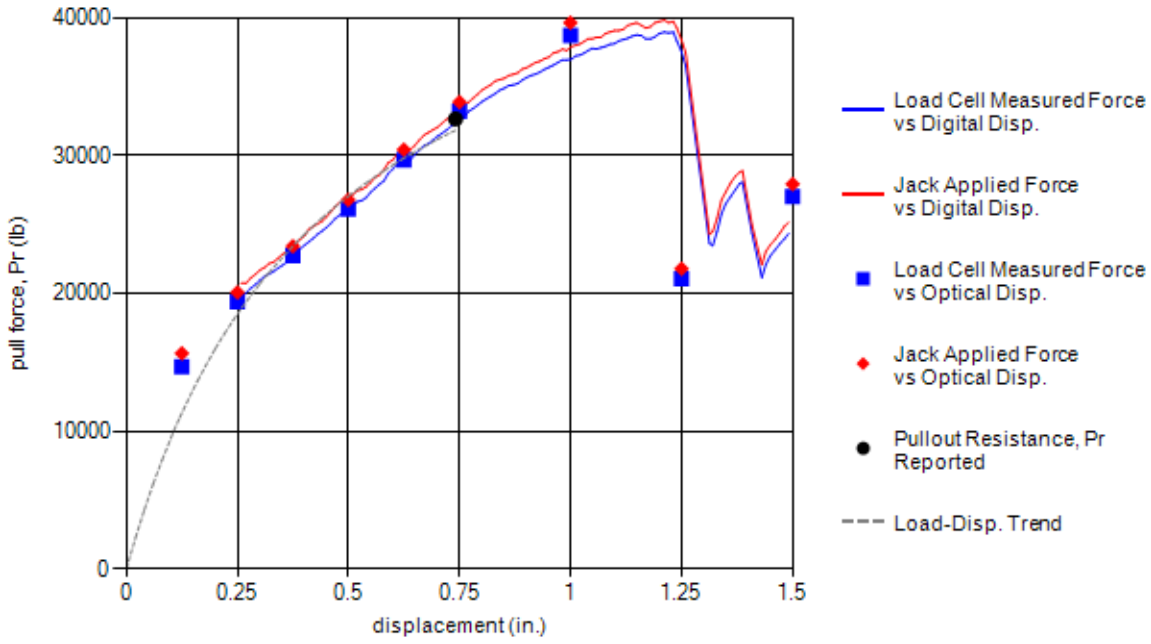
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	5010	32636	38.30	**0.48**

Load-Displacement Curve



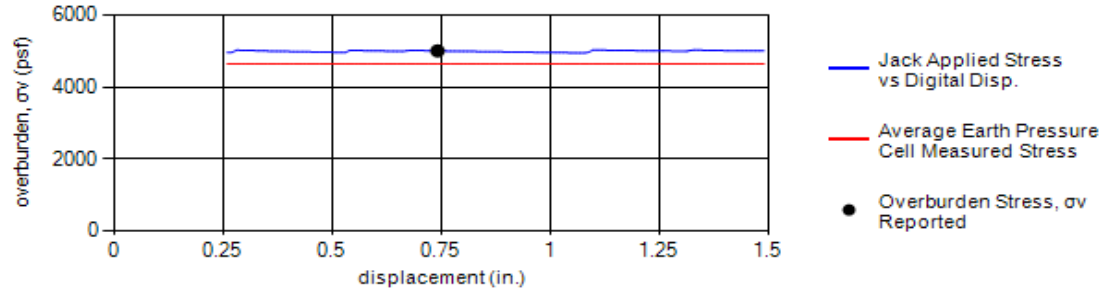
Comments

Digital displacement: pullout and elongation undifferentiated.

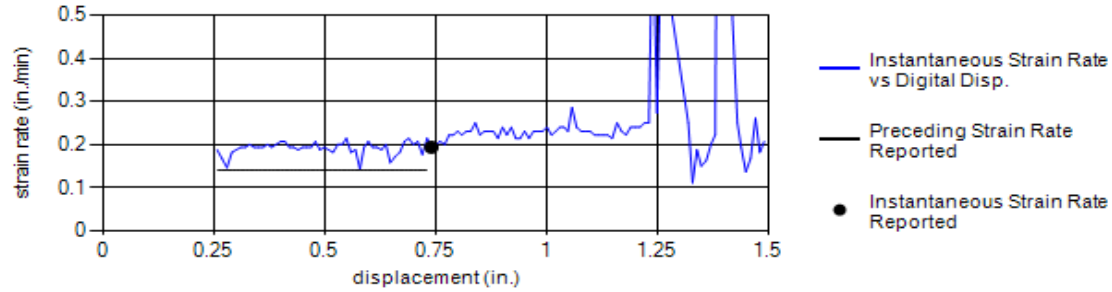
Personnel

Tested:	AJ DH YW
Prepared:	SB TW
Checked:	WL PJ

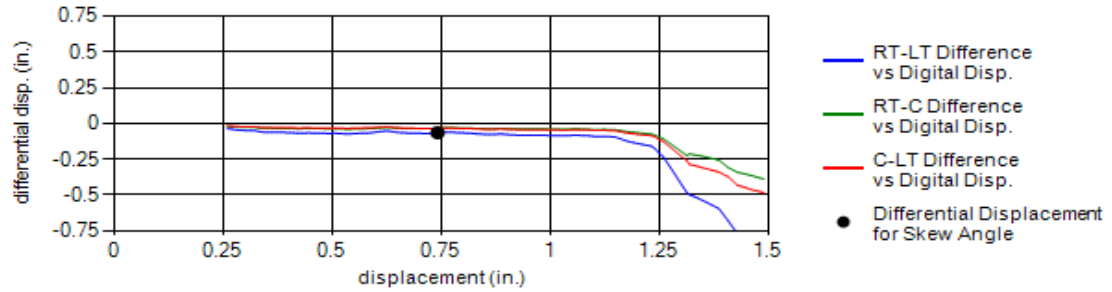
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4373	3890	6028	4191	4760	4649	1.14	5010



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.14	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.06	-0.03	-0.03	No Data	-0.20	CW



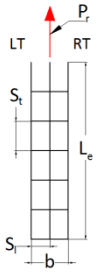
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 1:40:00 PM
Test Identification:	TS35.09-G-9x18-W20xW11-L9-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

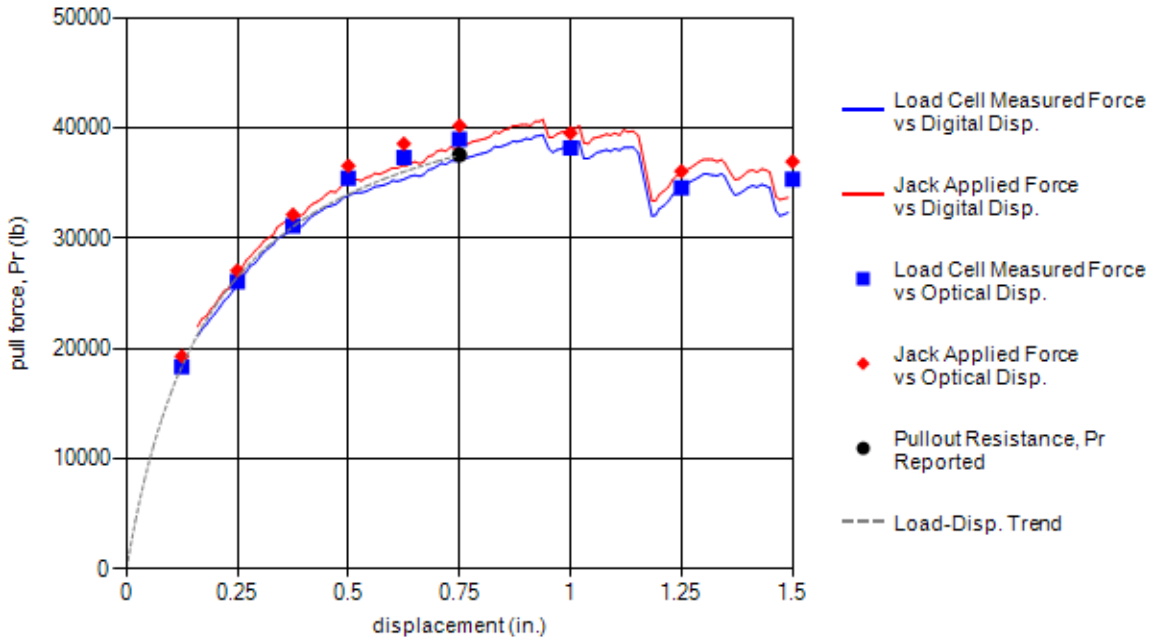
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	681	37540	5.20	**2.04**

Load-Displacement Curve



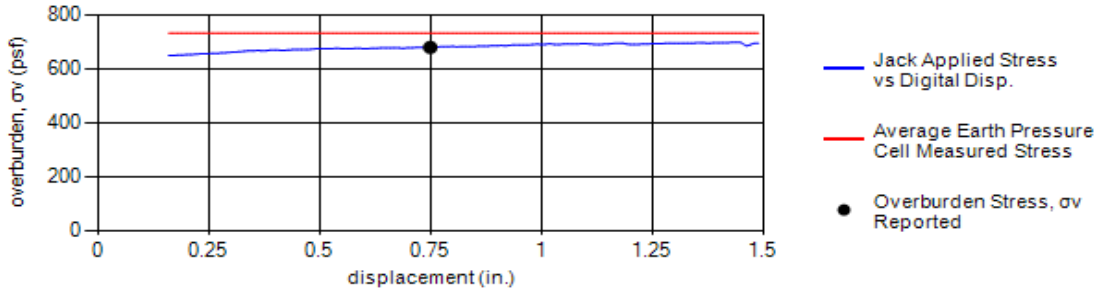
Comments

Digital displacement: pullout and elongation undifferentiated.

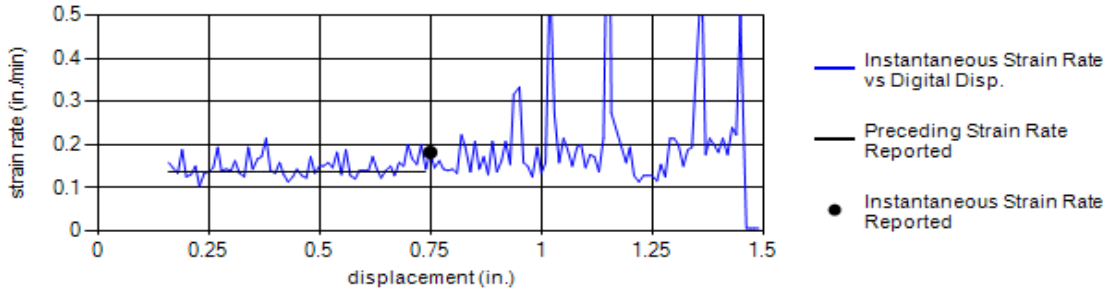
Personnel

Tested:	AJ DH RH
Prepared:	TW TW
Checked:	WL PJ

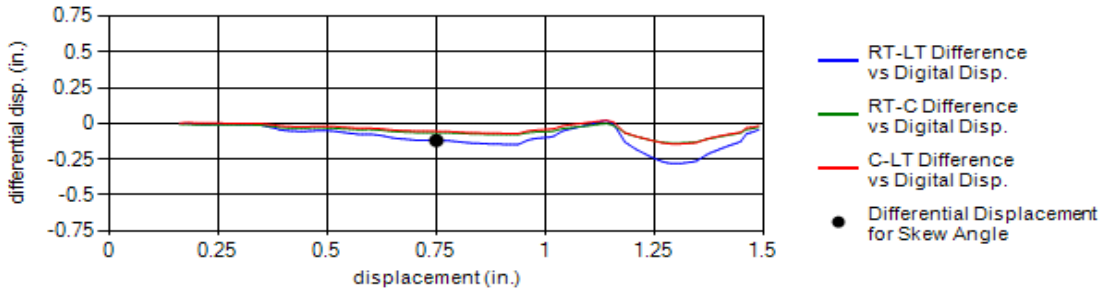
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1404	323	673	462	808	734	7.25	681



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.13	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.12	-0.06	-0.05	No Data	-0.38	CW



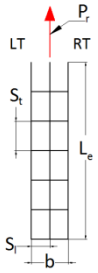
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 1:00:00 PM
Test Identification:	TS35.10-G-9x18-W20xW11-L9-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

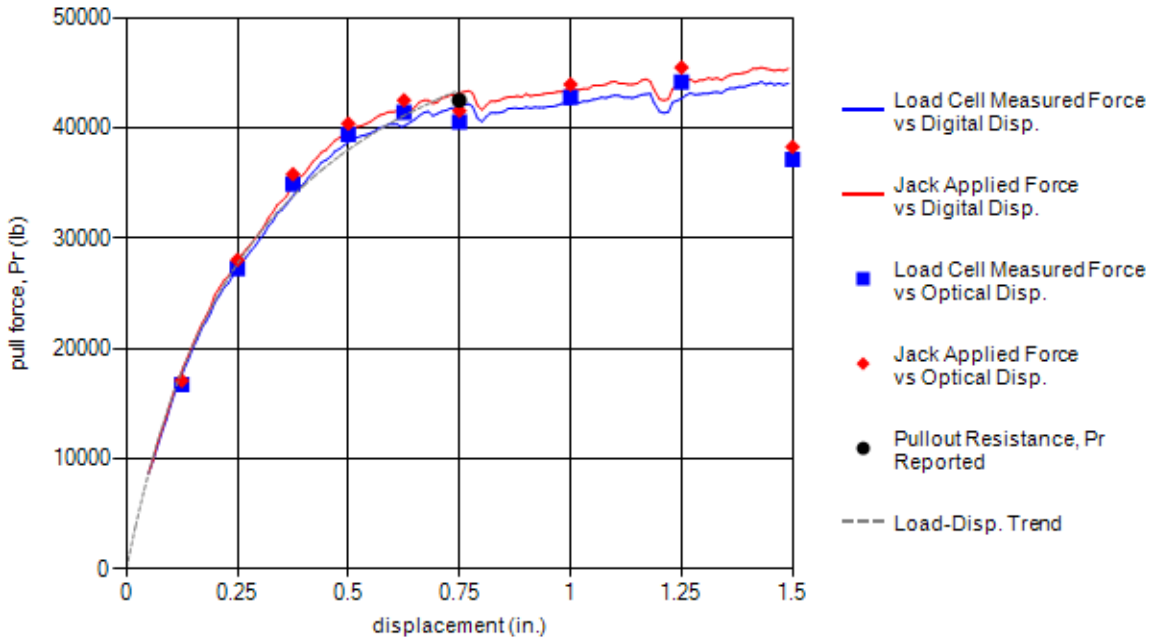
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	1516	42494	11.60	**1.04**

Load-Displacement Curve



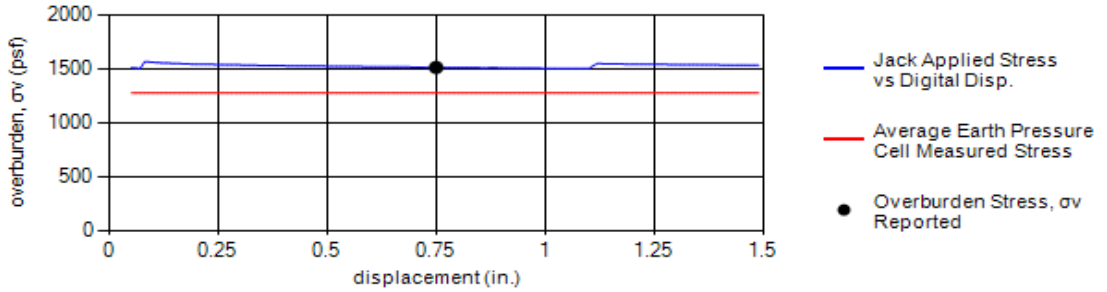
Comments

Digital displacement: pullout and elongation undifferentiated.

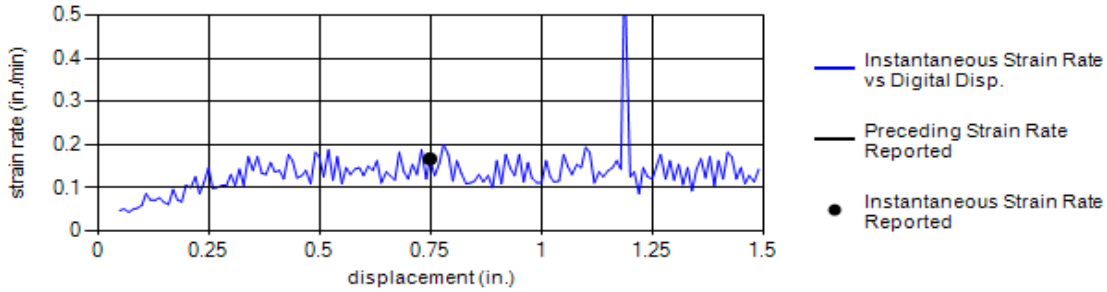
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

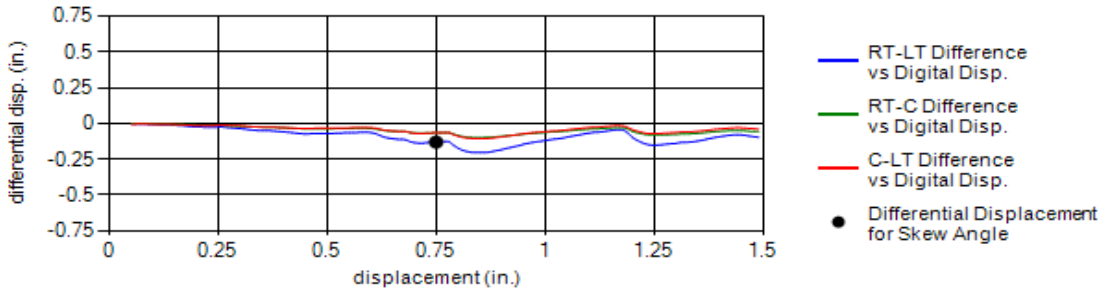
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1006	905	1705	1230	1539	1277	4.16	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.10	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.13	-0.06	-0.07	No Data	-0.41	CW



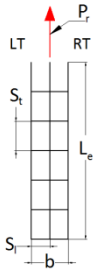
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 12:18:00 PM
Test Identification:	TS35.11-G-9x18-W20xW11-L9-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

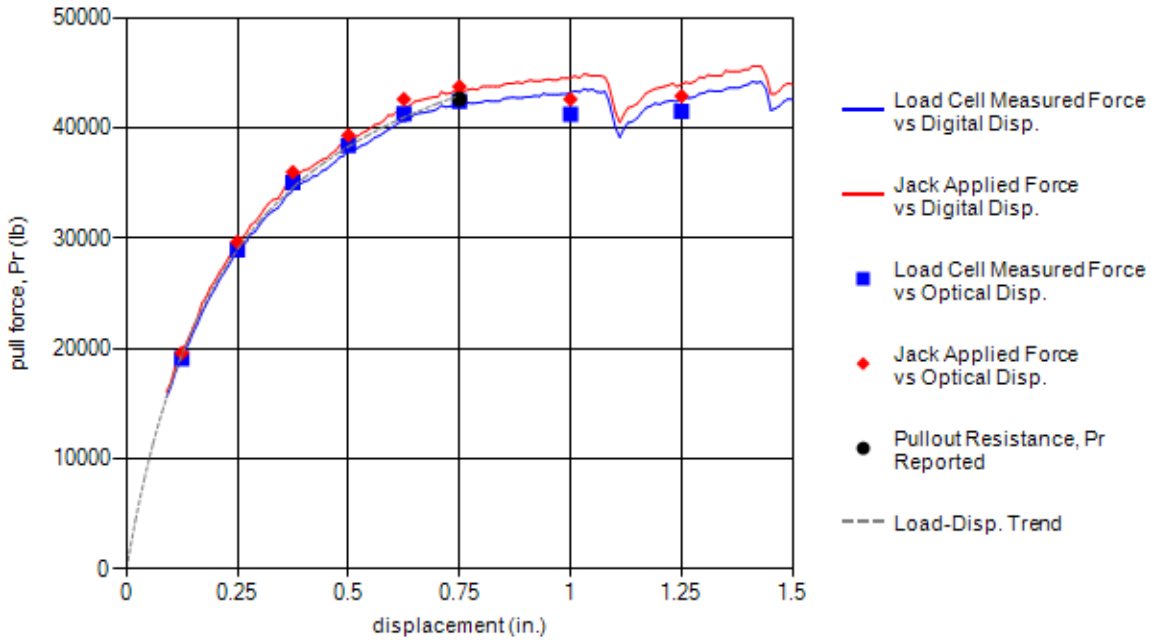
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2448	42598	18.70	**0.64**

Load-Displacement Curve



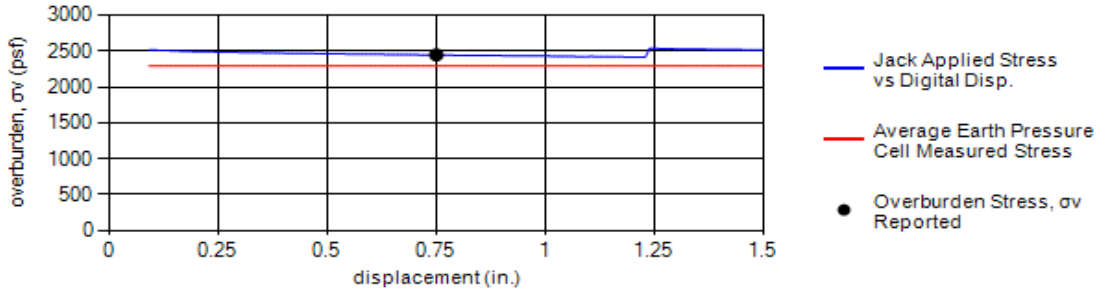
Comments

Digital displacement: pullout and elongation undifferentiated.

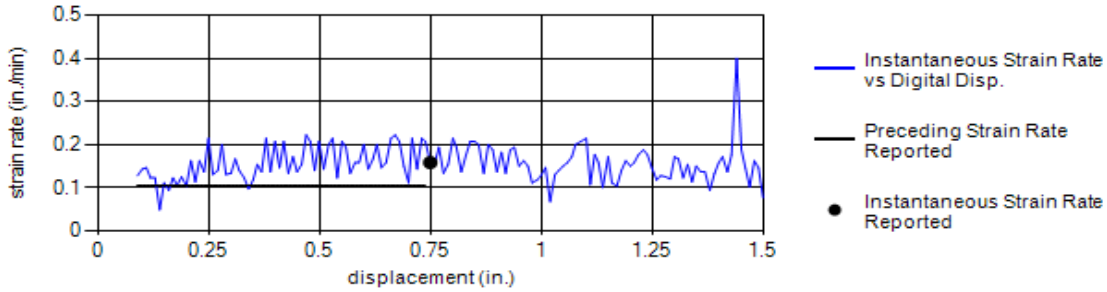
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

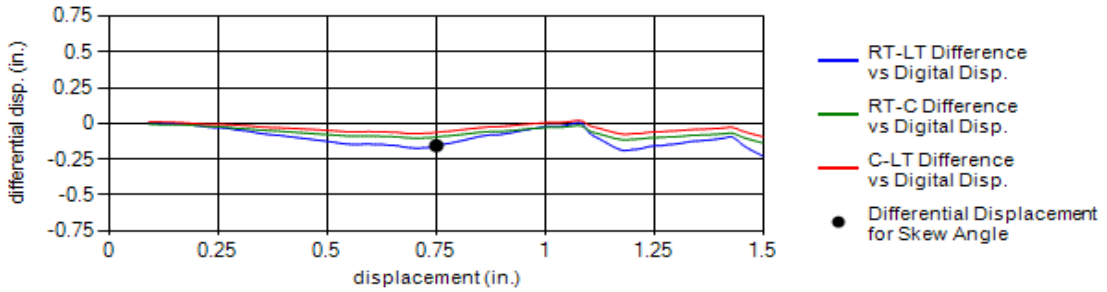
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2052	1627	3192	2118	2490	2296	2.32	2448



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.10	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.15	-0.09	-0.06	No Data	-0.49	CW



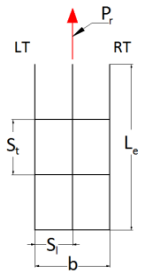
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/15/2011 11:36:00 AM
Test Identification:	TS35.12-G-9x18-W20xW11-L4.5-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

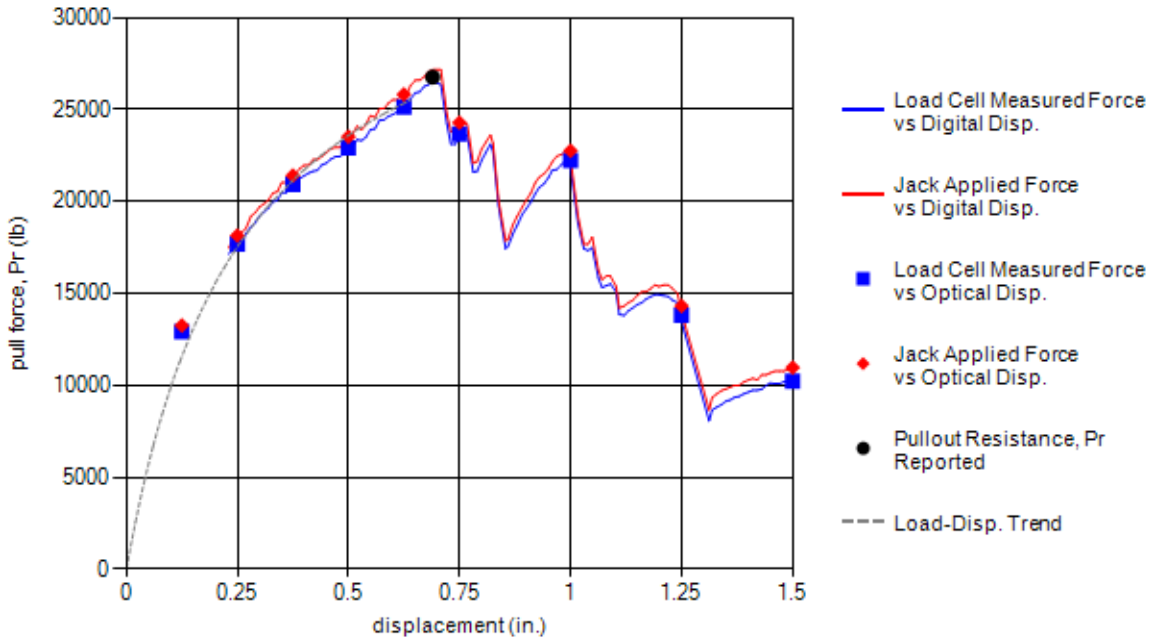
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.69	5010	26756	38.30	**0.40**

Load-Displacement Curve



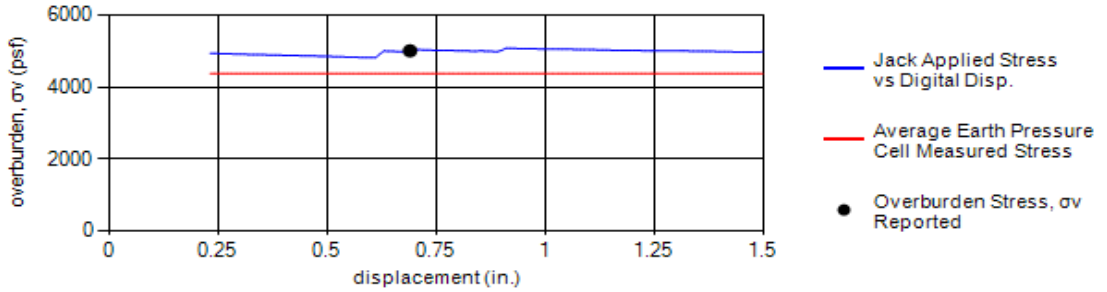
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

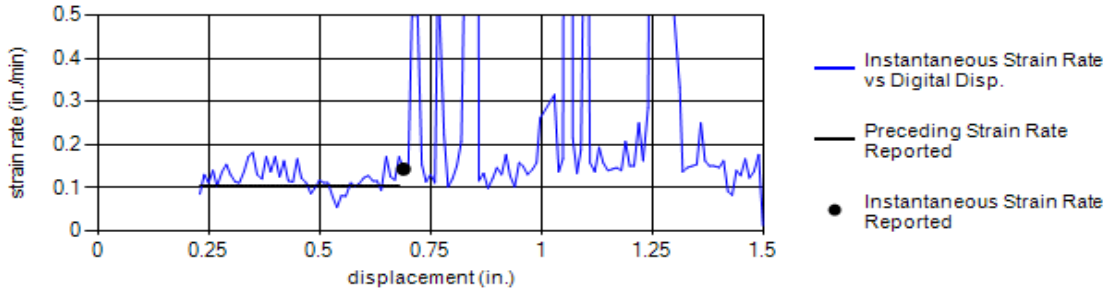
Personnel

Tested:	AJ DH RH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4308	3349	5768	3922	4550	4379	1.23	5010



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

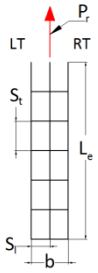
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2011 7:37:00 AM
Test Identification:	TS36.02-G-9x24-W20xW11-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

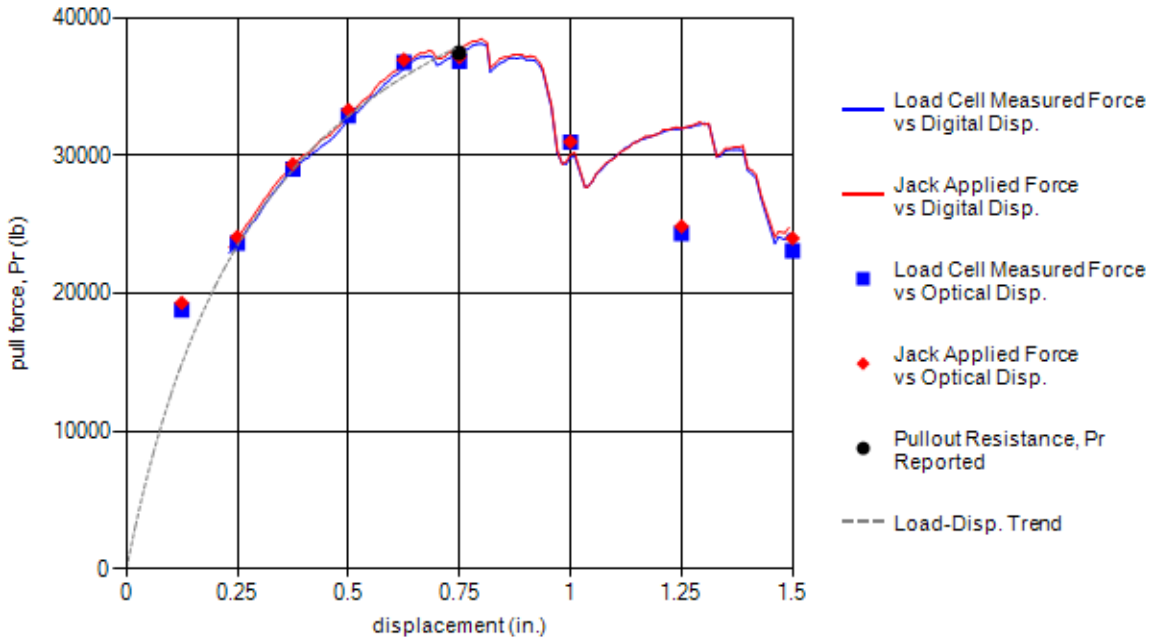
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1575	37430	12.10	**0.66**

Load-Displacement Curve



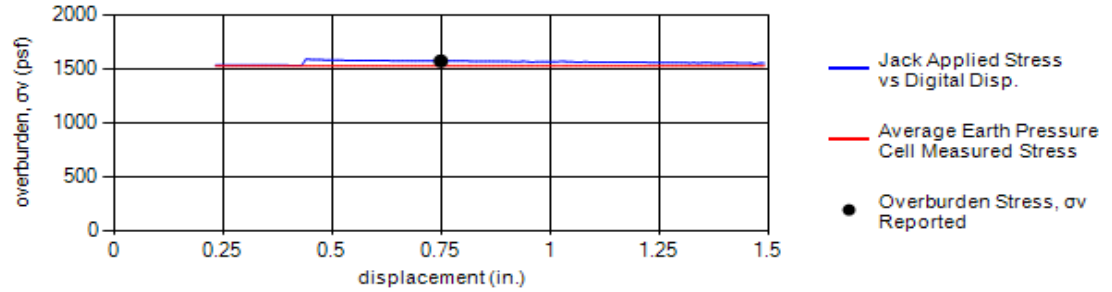
Comments

Digital displacement: pullout and elongation undifferentiated.

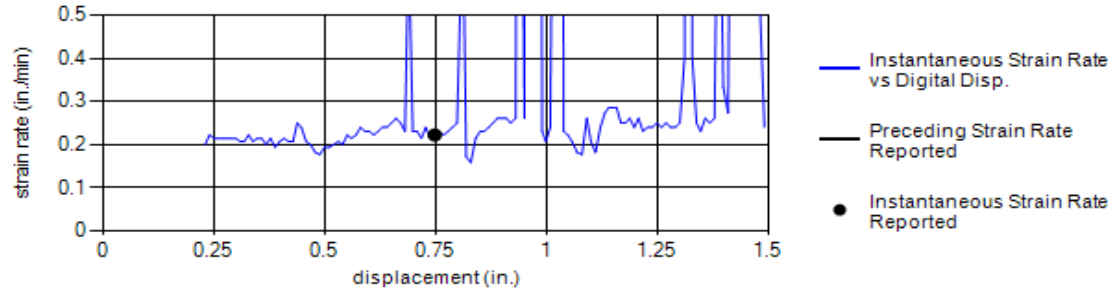
Personnel

Tested:	AJ AJ YW
Prepared:	SB TW
Checked:	WL PJ

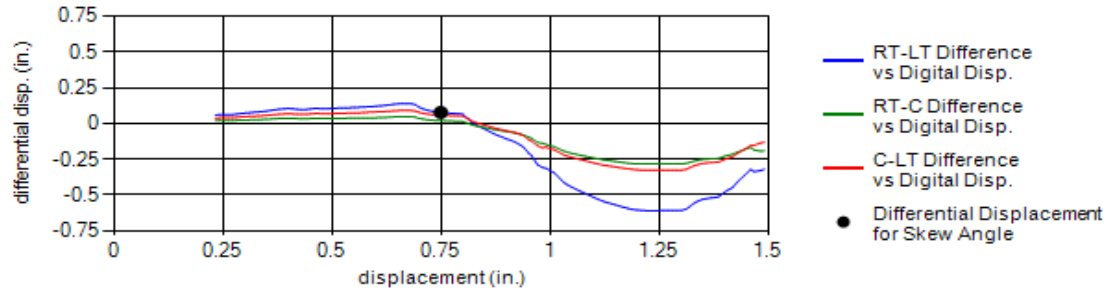
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1582	1192	1819	1464	1587	1529	3.52	1575



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.22	0.10	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.08	0.02	0.06	No Data	0.25	CCW



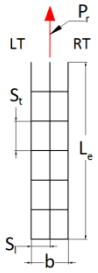
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2011 3:01:00 PM
Test Identification:	TS36.03-G-9x24-W20xW11-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

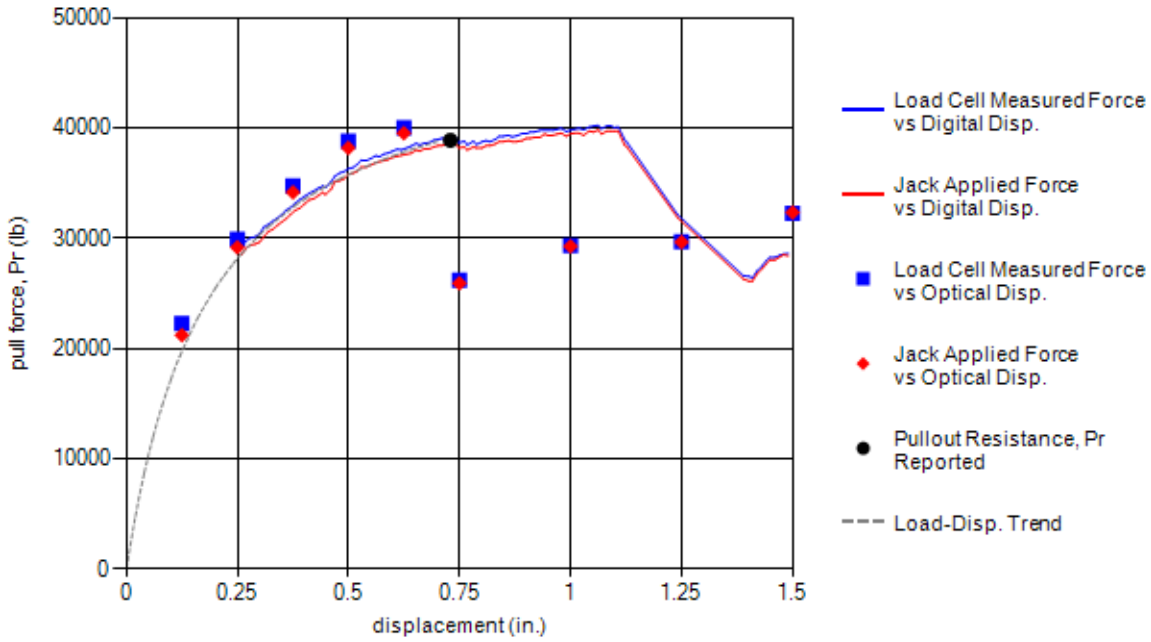
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.73	2613	38863	20.00	**0.41**

Load-Displacement Curve



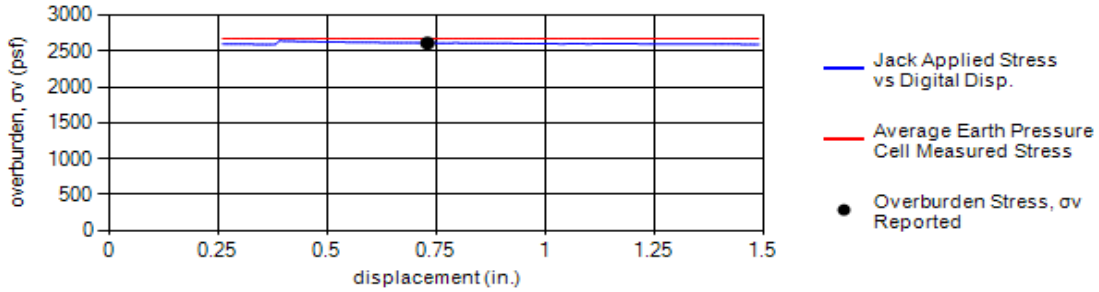
Comments

Digital displacement: pullout and elongation undifferentiated.

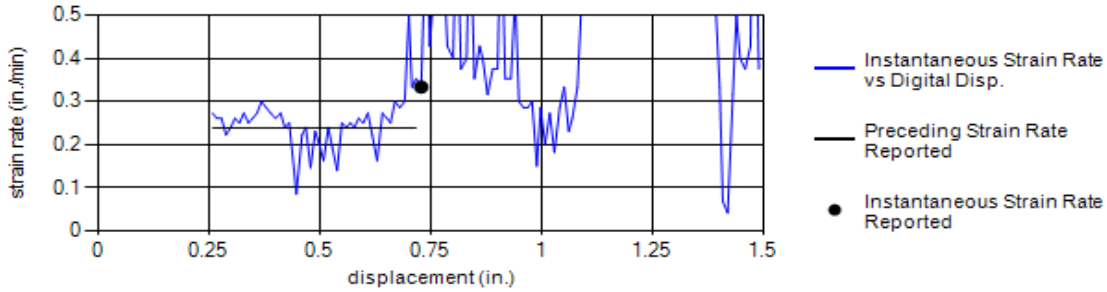
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

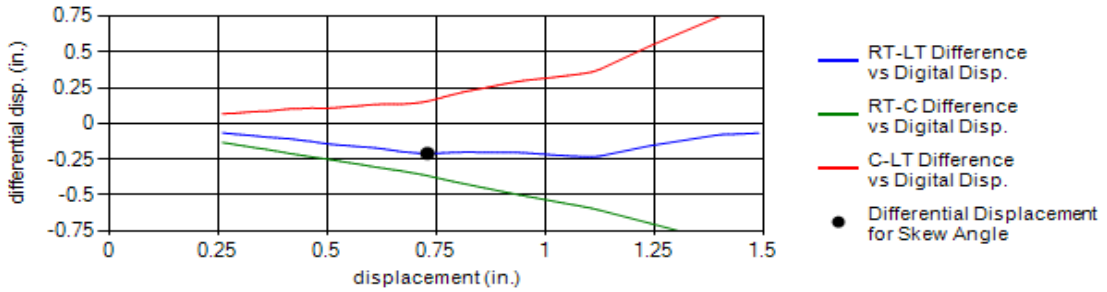
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2822	2204	3087	2414	2855	2676	2.01	2613



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.33	0.24	0.27



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.21	-0.36	0.16	No Data	-0.67	CW



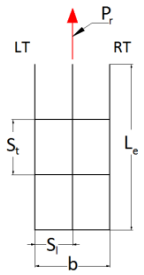
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/19/2011 3:33:00 PM
Test Identification:	TS36.04-G-9x24-W20xW11-L6-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

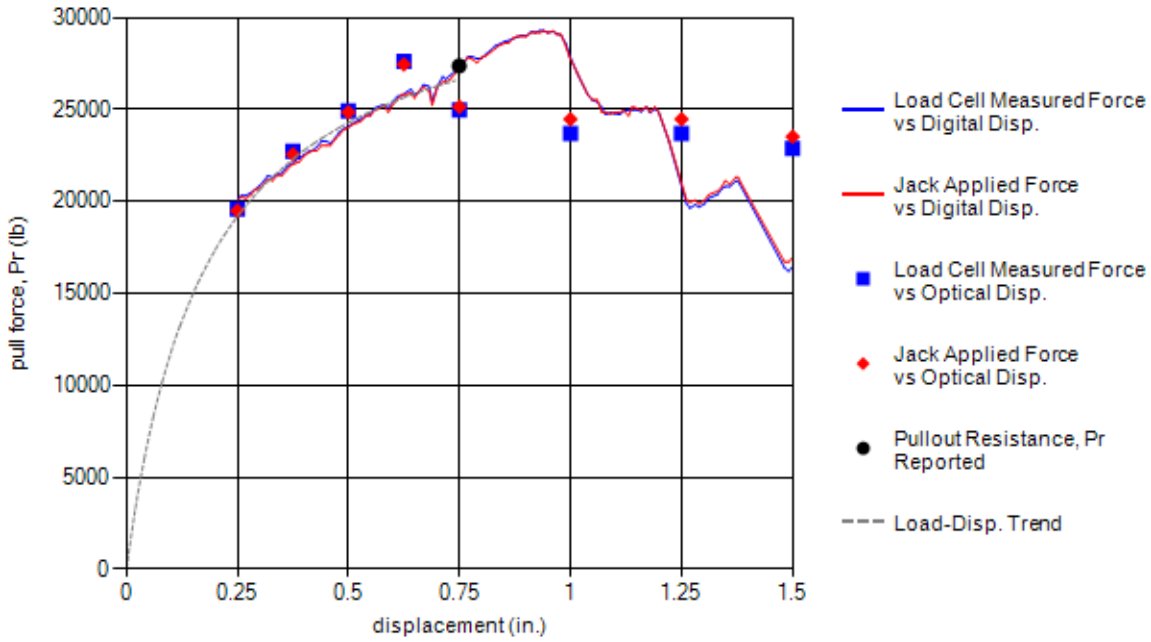
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	5203	27362	39.90	**0.29**

Load-Displacement Curve



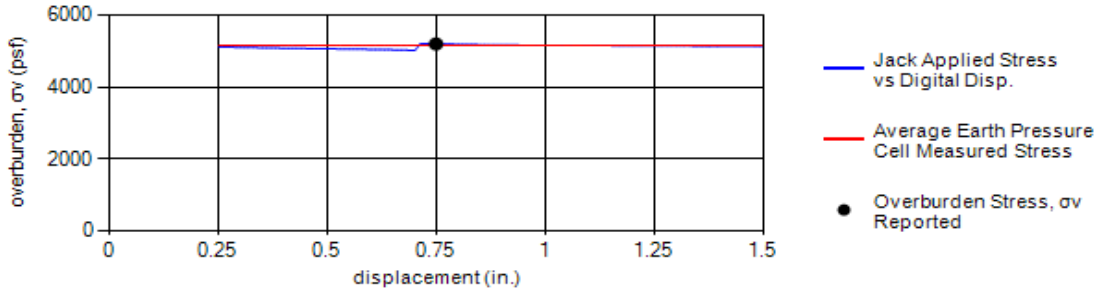
Comments

Digital displacement: pullout and elongation undifferentiated.

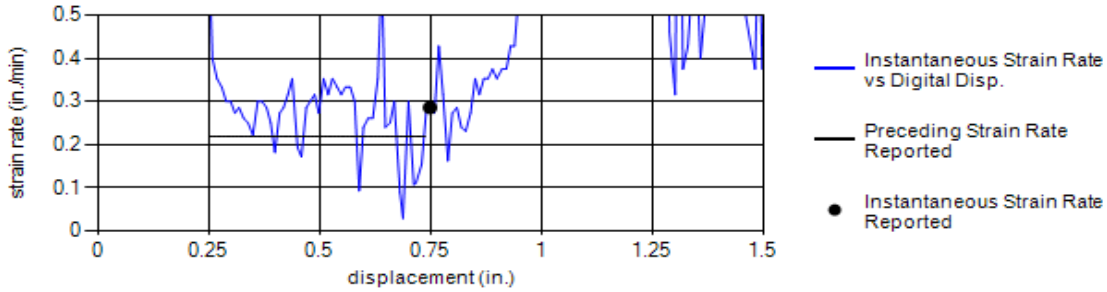
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

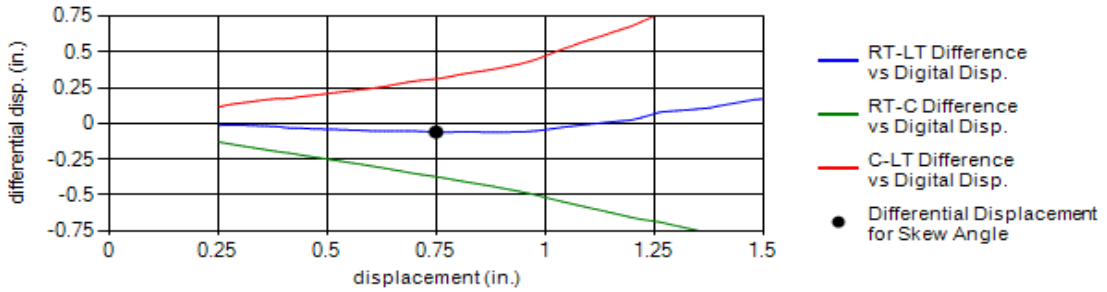
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5603	4256	5862	4509	5590	5164	1.08	5203



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.29	0.22	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.06	-0.37	0.31	No Data	-0.19	CW



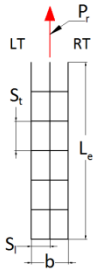
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/25/2011 12:59:00 PM
Test Identification:	TS36.05-G-9x24-W20xW11-L12-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

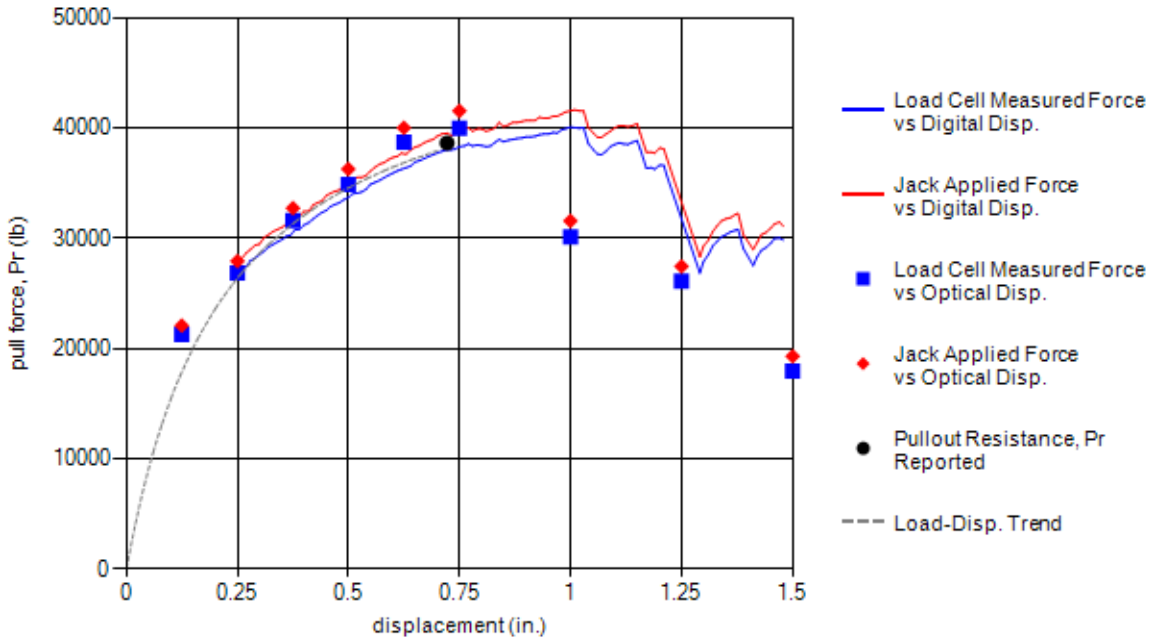
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	699	38623	5.40	**1.53**

Load-Displacement Curve



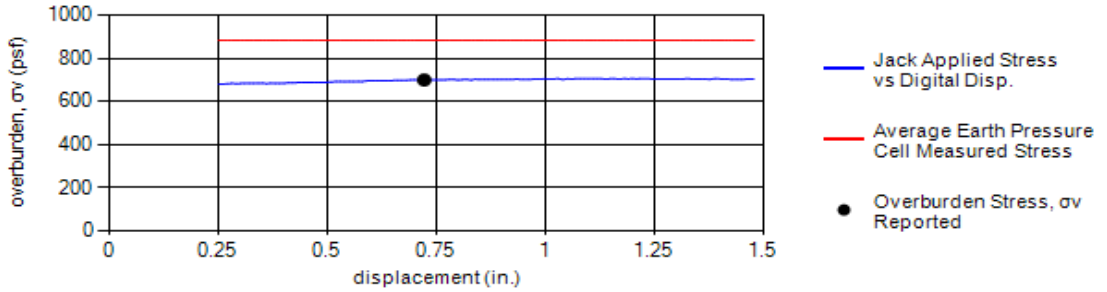
Comments

Digital displacement: pullout and elongation undifferentiated.

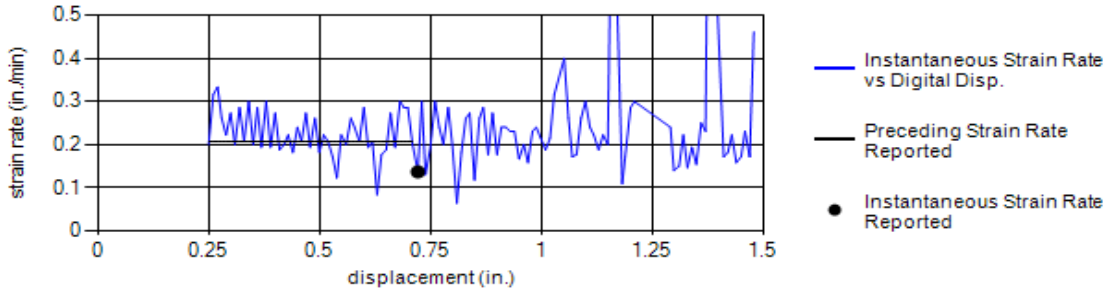
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

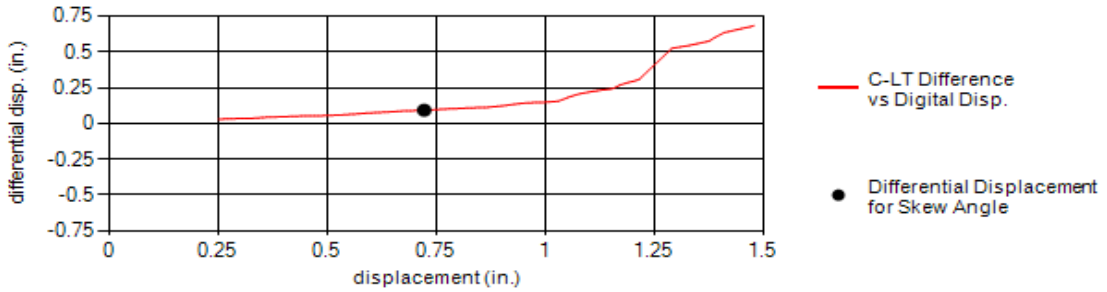
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1212	637	769	951	845	883	6.81	699



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.21	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.09	No Data	0.15	CCW



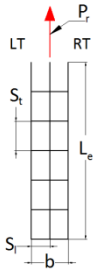
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/25/2011 12:28:00 PM
Test Identification:	TS36.06-G-9x24-W20xW11-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

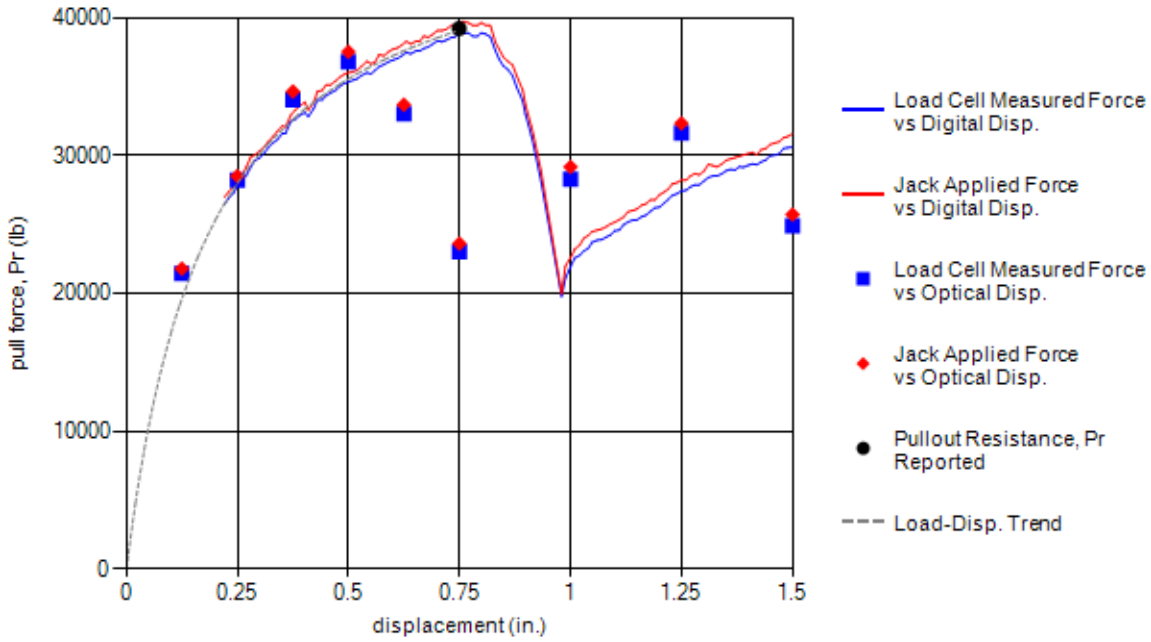
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1539	39193	11.80	**0.71**

Load-Displacement Curve



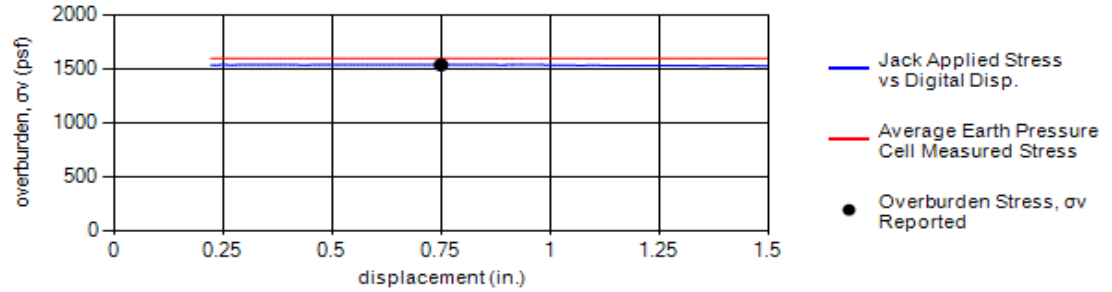
Comments

Digital displacement: pullout and elongation undifferentiated.

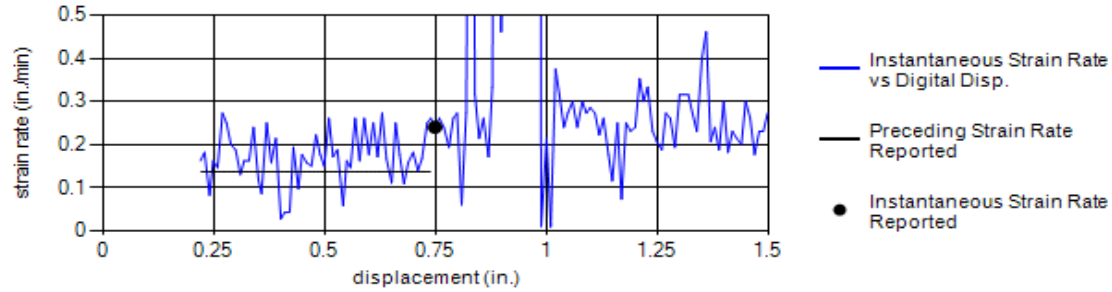
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

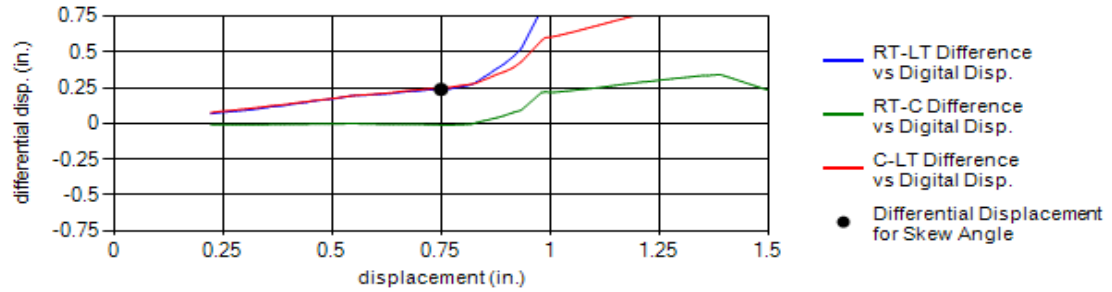
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1676	1271	1863	1437	1742	1598	3.54	1539



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.13	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.24	-0.01	0.25	No Data	0.76	CCW



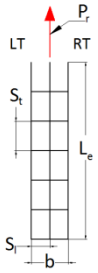
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/25/2011 11:56:00 AM
Test Identification:	TS36.07-G-9x24-W20xW11-L12-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

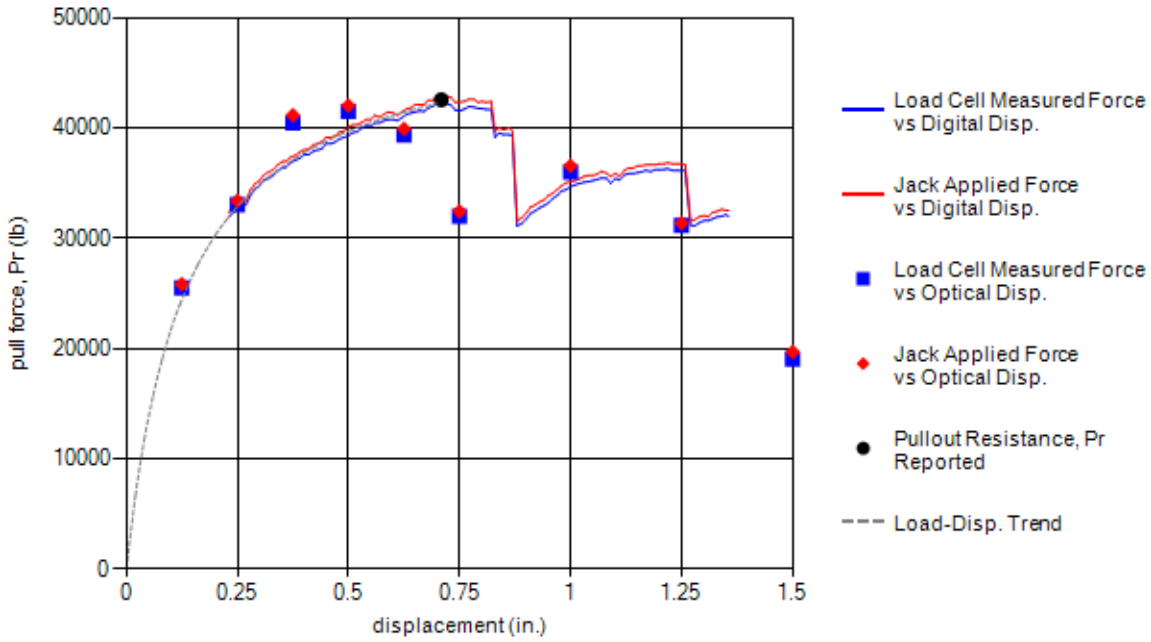
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.71	2622	42537	20.10	**0.45**

Load-Displacement Curve



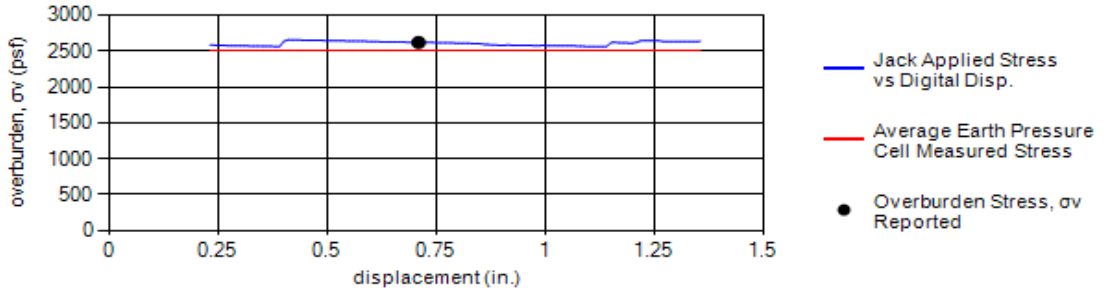
Comments

Digital displacement: pullout and elongation undifferentiated.

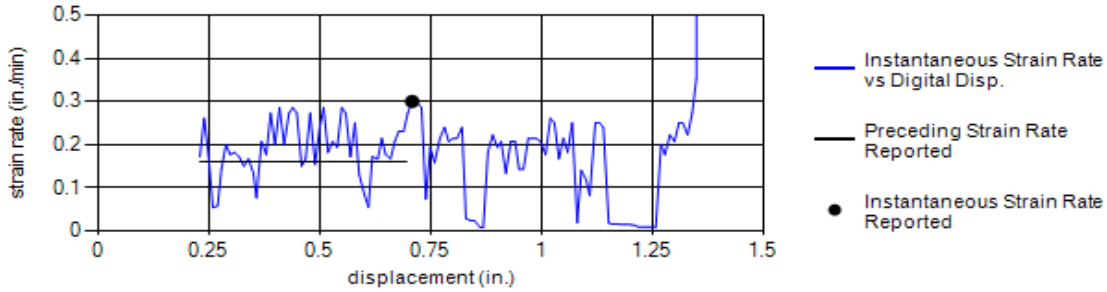
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

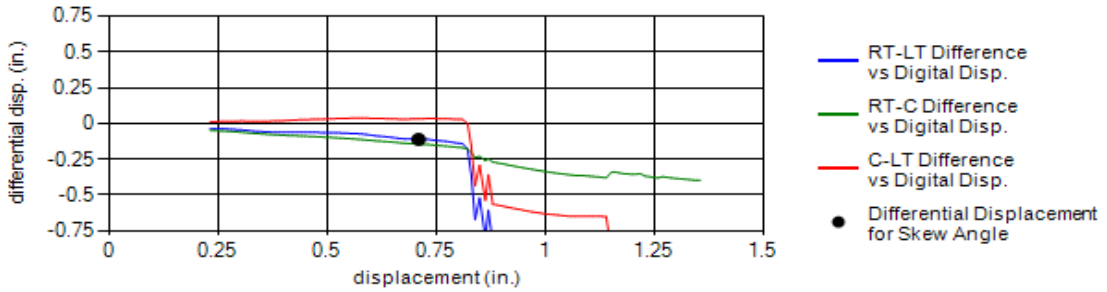
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2642	1987	2882	2267	2764	2508	2.26	2622



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.16	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.11	-0.14	0.03	No Data	-0.35	CW



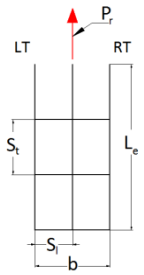
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/25/2011 9:52:00 AM
Test Identification:	TS36.08-G-9x24-W20xW11-L6-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

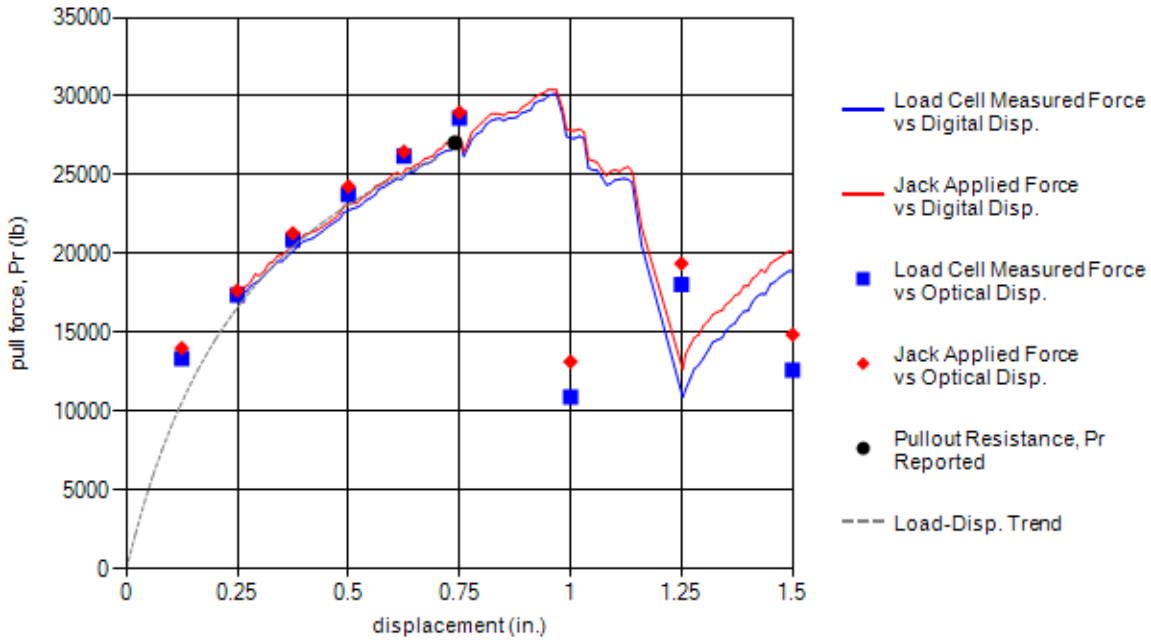
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	5036	27045	38.60	**0.30**

Load-Displacement Curve



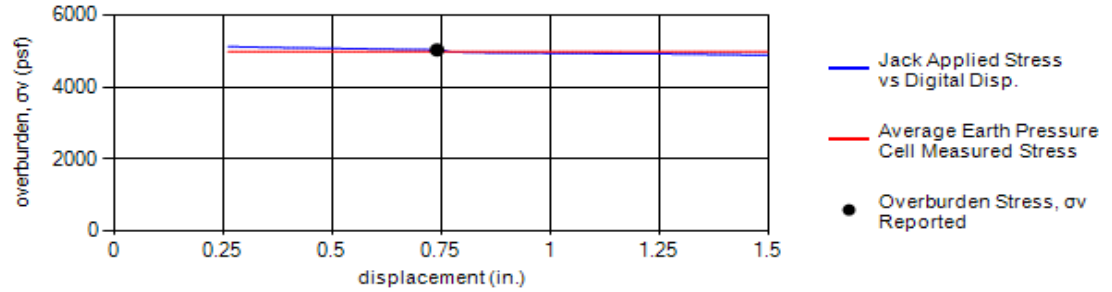
Comments

Digital displacement: pullout and elongation undifferentiated.

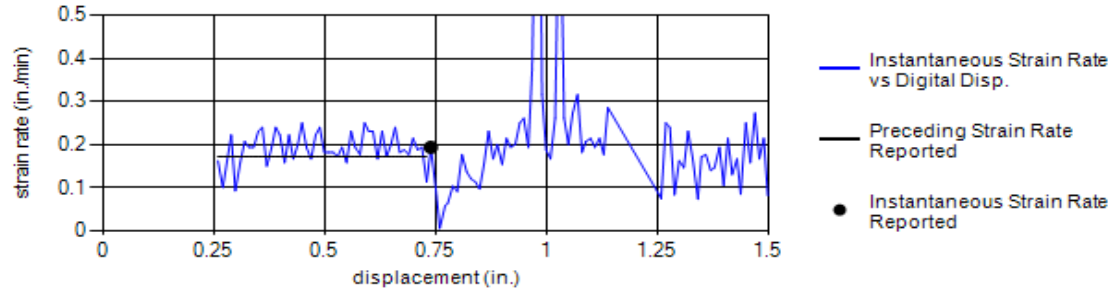
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

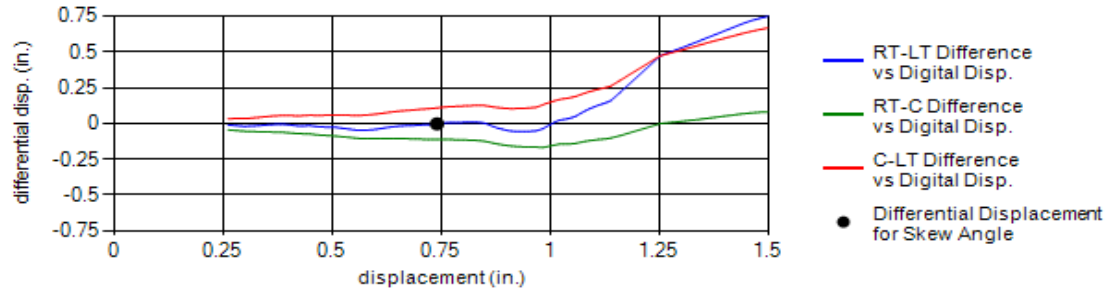
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5538	3987	5691	4314	5418	4989	1.13	5036



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.17	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	-0.11	0.11	No Data	-0.01	CW



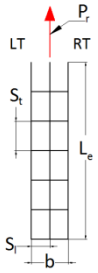
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/25/2011 1:30:00 PM
Test Identification:	TS36.09-G-9x24-W20xW11-L12-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

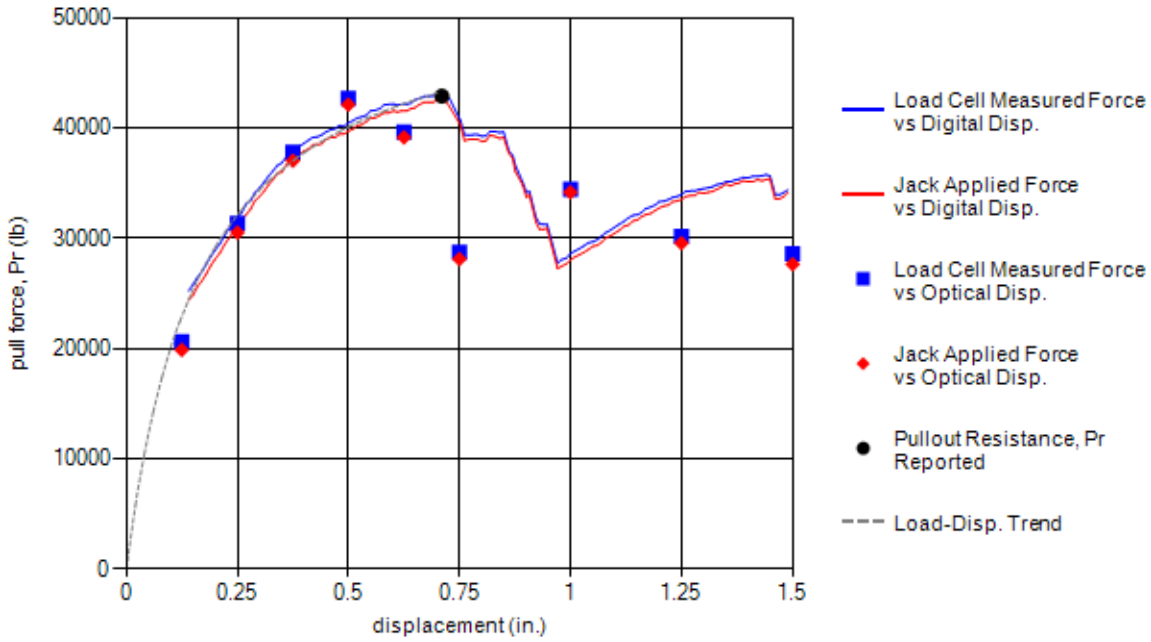
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Progressive Rupture	0.71	681	42876	5.20	**1.75**

Load-Displacement Curve



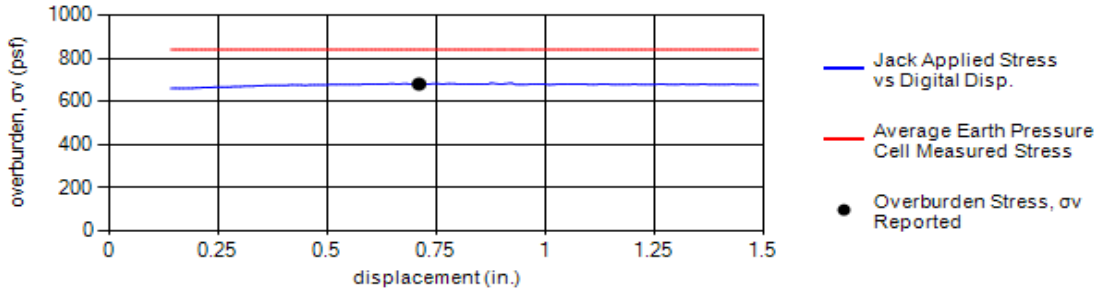
Comments

Digital displacement: pullout and elongation undifferentiated.

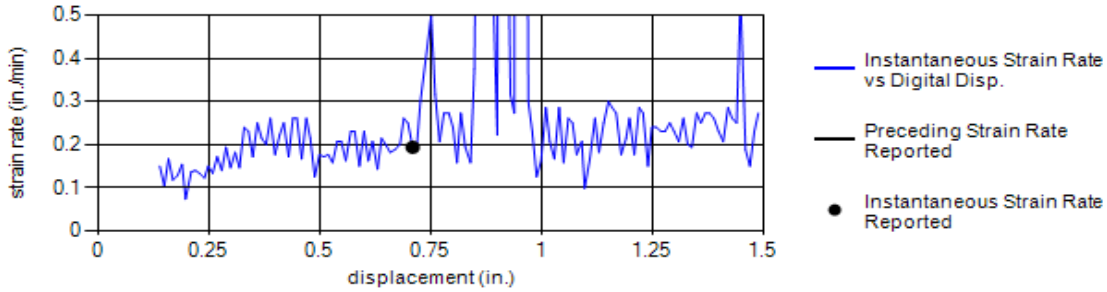
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

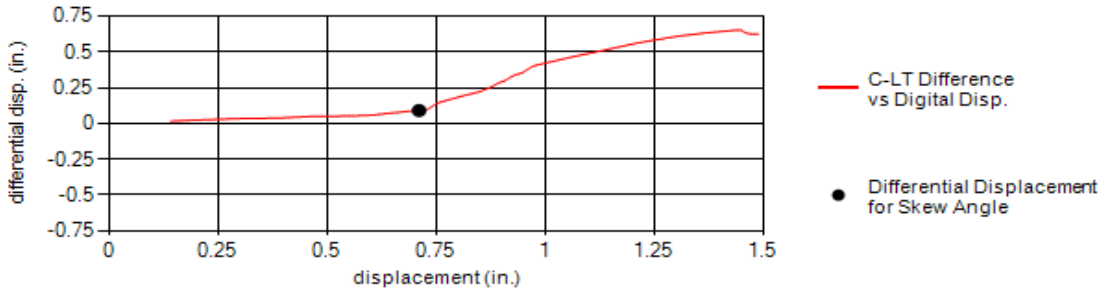
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
982	593	716	1047	866	841	7.18	681



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.10	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	0.09	No Data	0.14	CCW



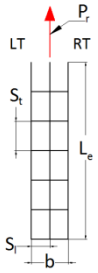
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2011 9:50:00 AM
Test Identification:	TS36.10-G-9x24-W20xW11-L12-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

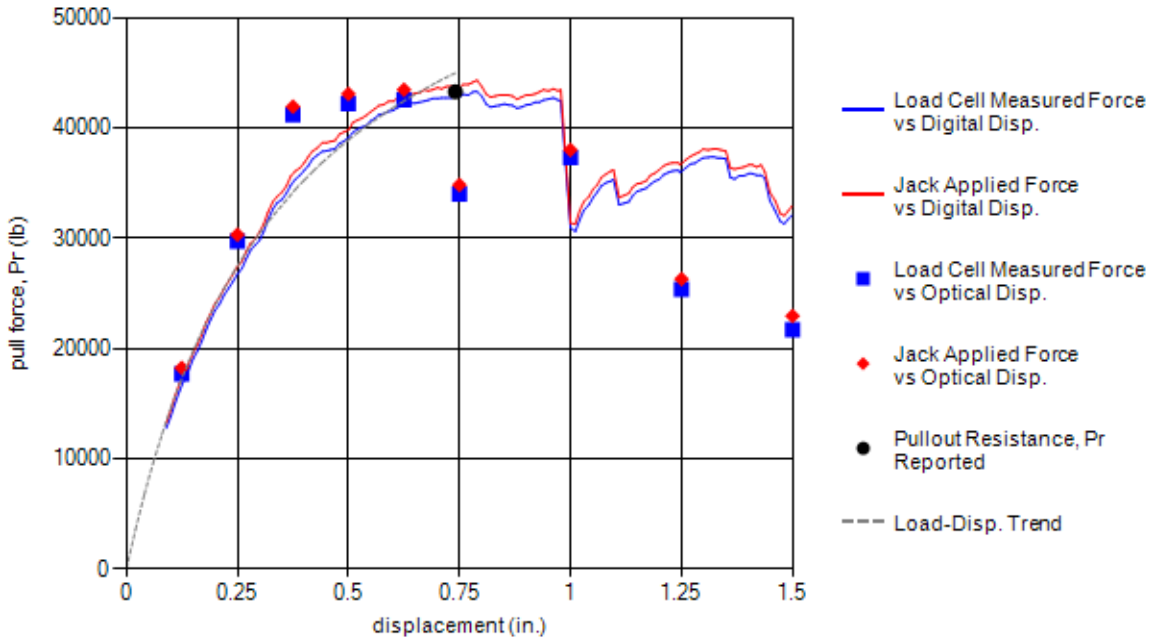
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1554	43262	11.90	**0.77**

Load-Displacement Curve



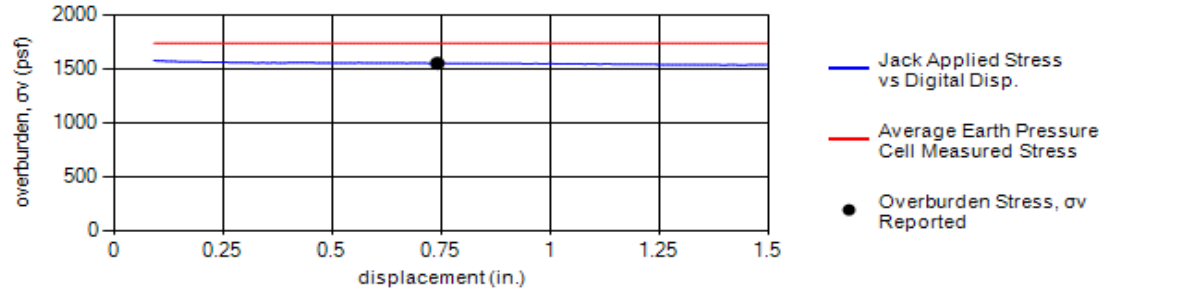
Comments

Digital displacement: pullout and elongation undifferentiated.

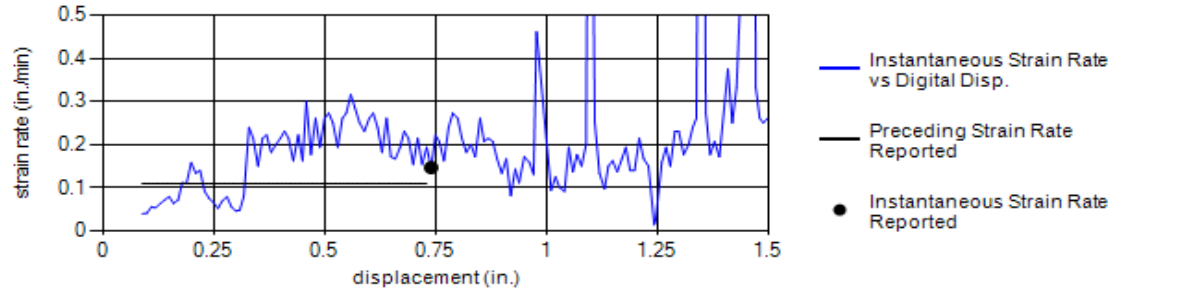
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

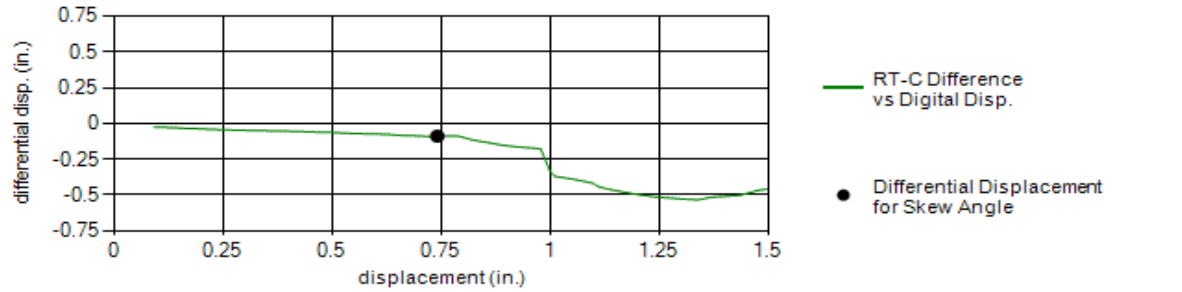
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2014	1293	1743	1855	1795	1740	3.31	1554



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.11	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	-0.09	No Data	No Data	-0.14	CW



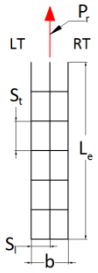
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2011 10:18:00 AM
Test Identification:	TS36.11-G-9x24-W20xW11-L12-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

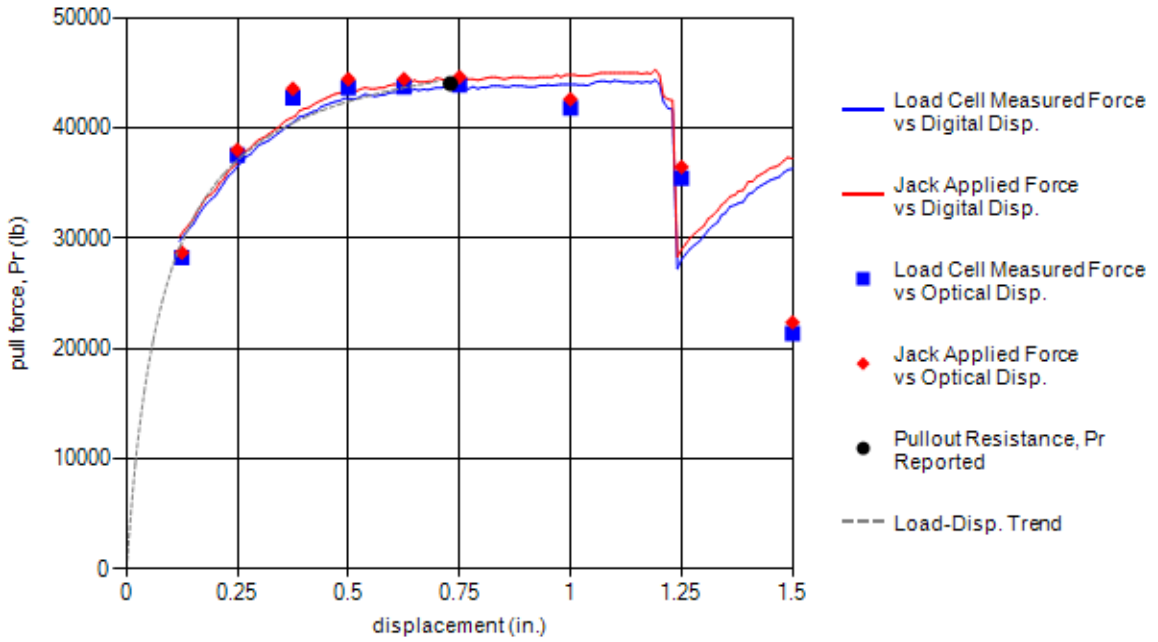
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	2624	44006	20.10	**0.47**

Load-Displacement Curve



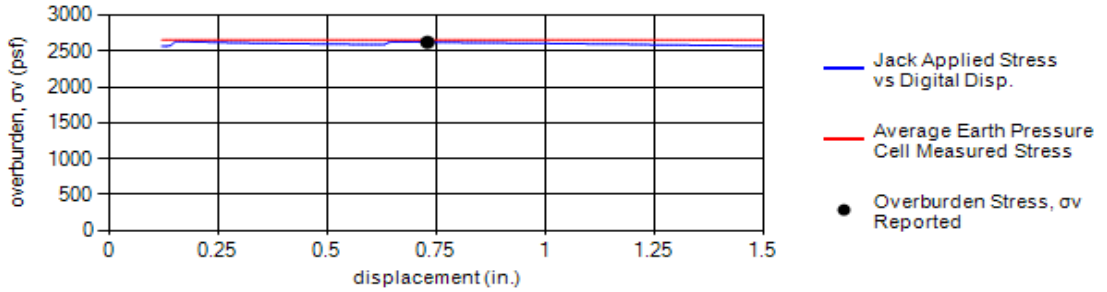
Comments

Digital displacement: pullout and elongation undifferentiated.

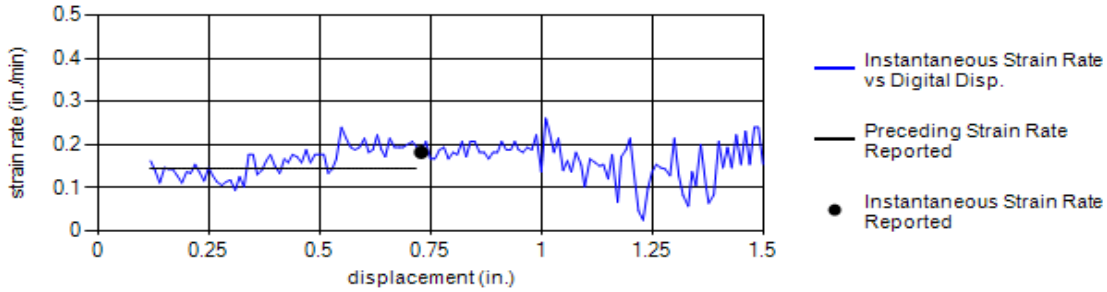
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

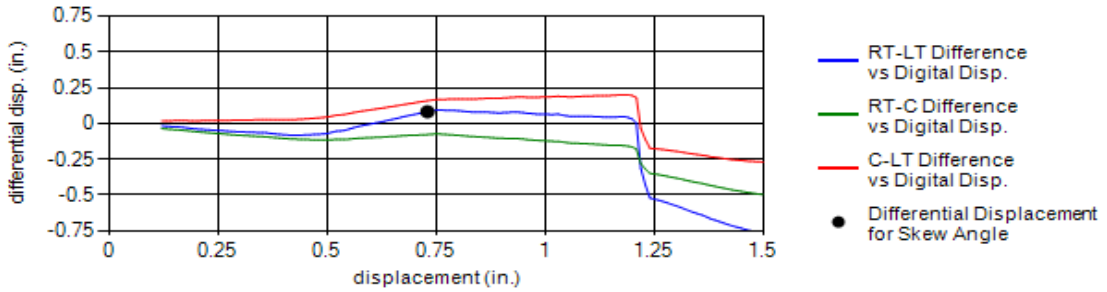
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2965	1991	2871	2657	2807	2658	2.17	2624



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.14	0.14



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.08	-0.08	0.16	No Data	0.26	CCW



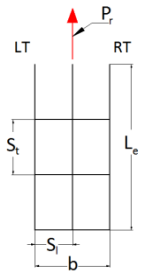
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	8/26/2011 10:45:00 AM
Test Identification:	TS36.12-G-9x24-W20xW11-L6-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

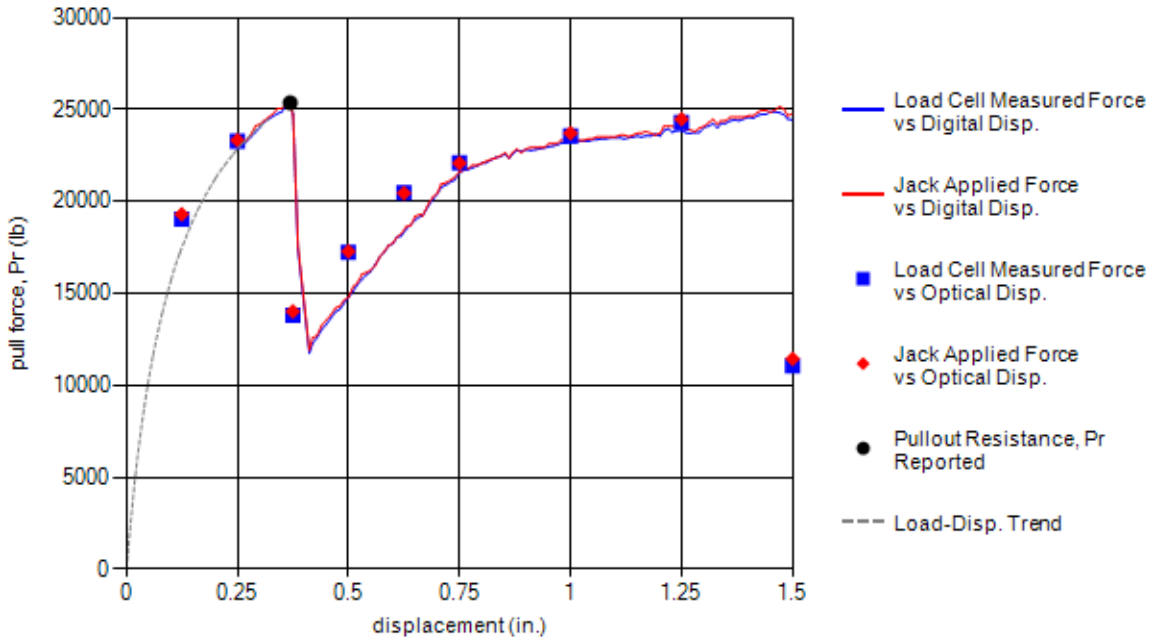
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.37	5135	25355	39.40	**0.27**

Load-Displacement Curve



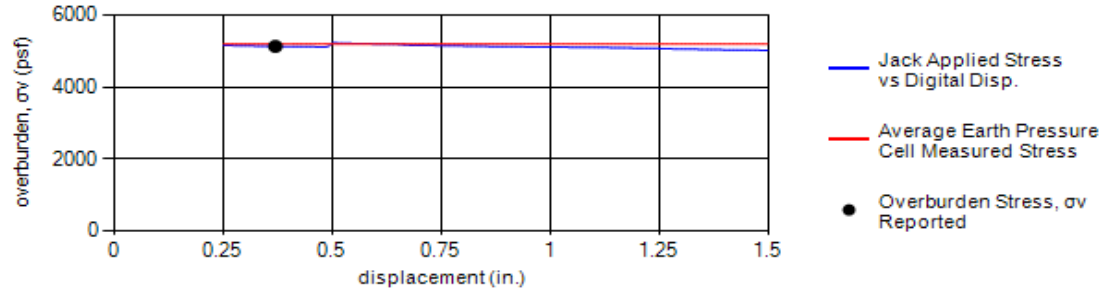
Comments

Digital displacement: pullout and elongation undifferentiated.

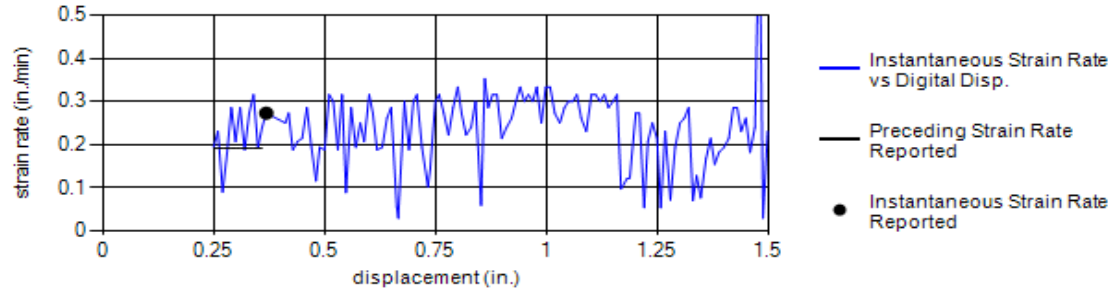
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

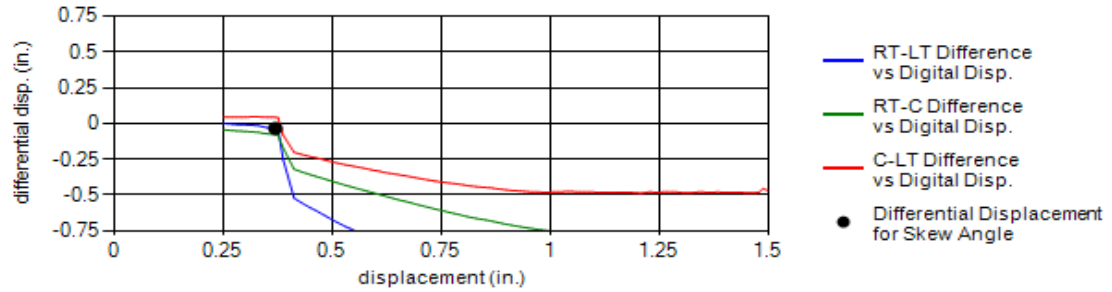
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5617	4097	5919	4639	5731	5201	1.11	5135



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.19	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.03	-0.08	0.04	No Data	-0.11	CW



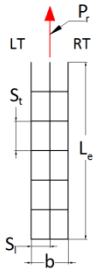
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 9:19:00 AM
Test Identification:	TS37.01-G-9x12-W20xW15-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

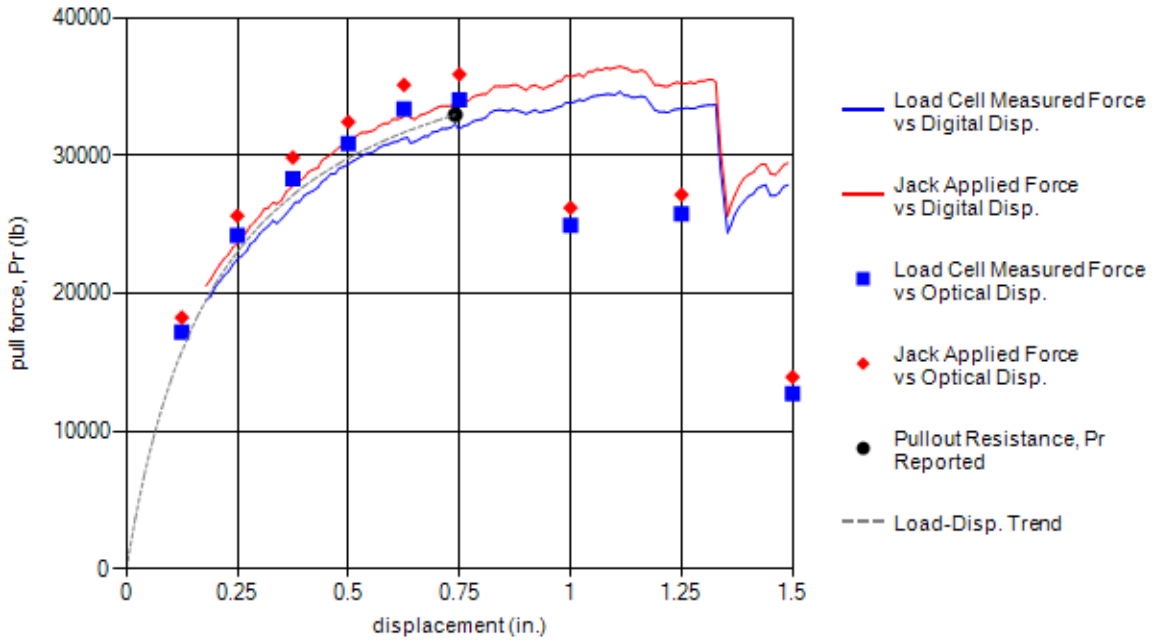
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	701	32947	5.40	**2.61**

Load-Displacement Curve



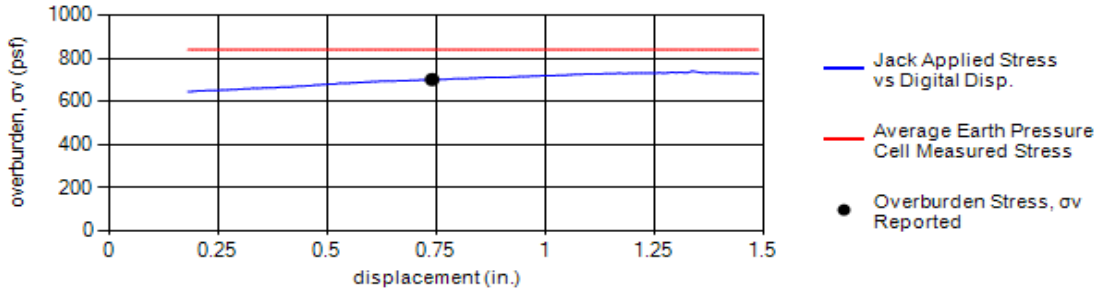
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

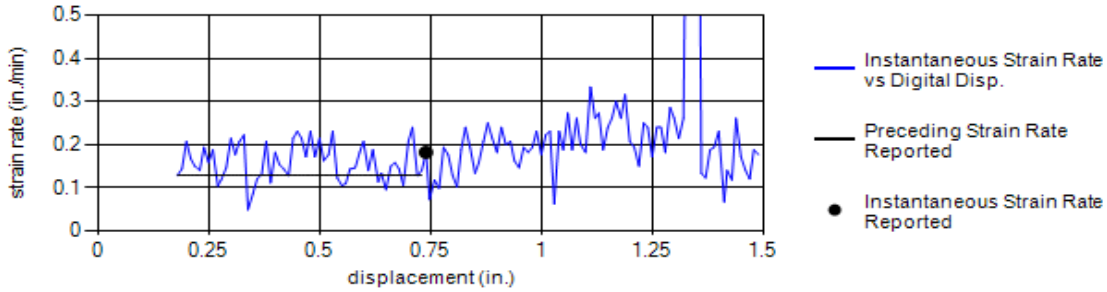
Personnel

Tested:	AJ AJ RH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1131	639	908	717	805	840	6.60	701



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.13	0.17



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

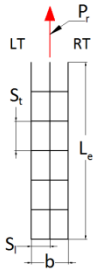
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 10:29:00 AM
Test Identification:	TS37.02-G-9x12-W20xW15-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

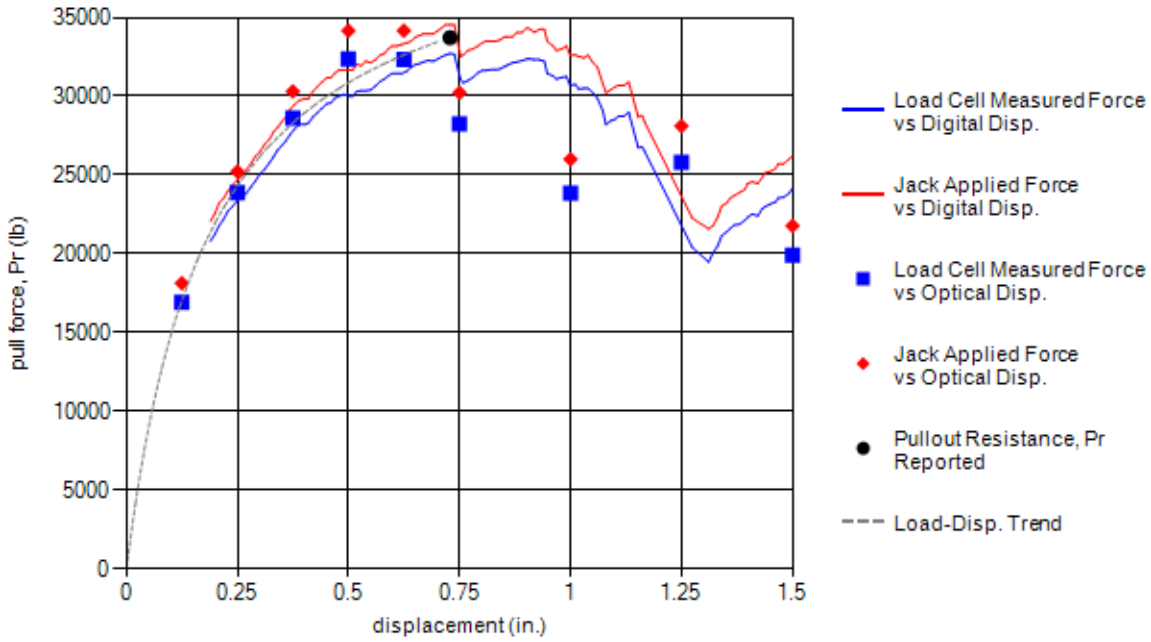
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.73	1579	33712	12.20	**1.19**

Load-Displacement Curve



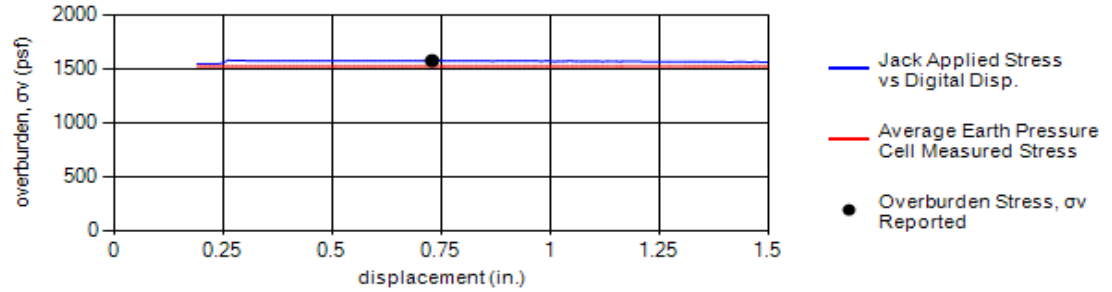
Comments

Digital displacement: pullout and elongation undifferentiated.

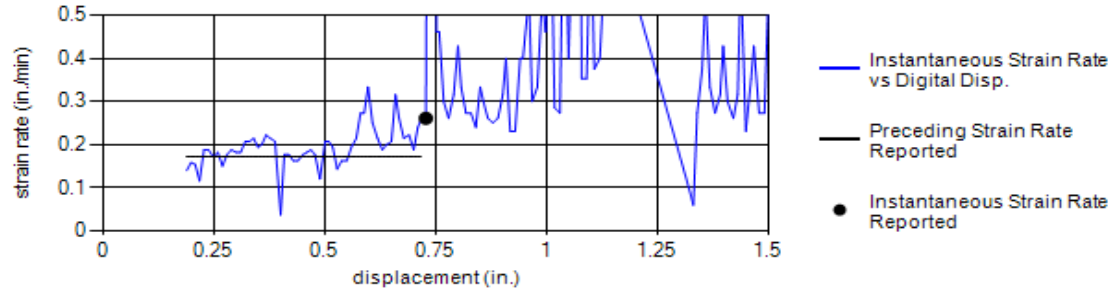
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

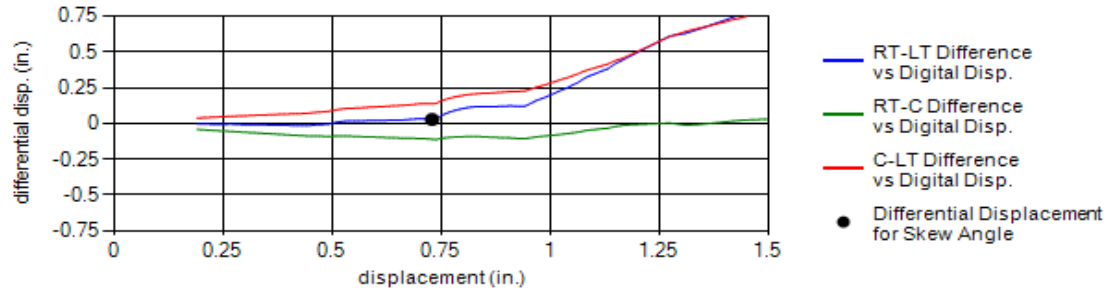
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1609	1104	2006	1413	1499	1526	3.30	1579



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.17	0.23



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	-0.11	0.14	No Data	0.09	CCW



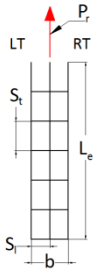
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 9:58:00 AM
Test Identification:	TS37.03-G-9x6-W20xW15-L3-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

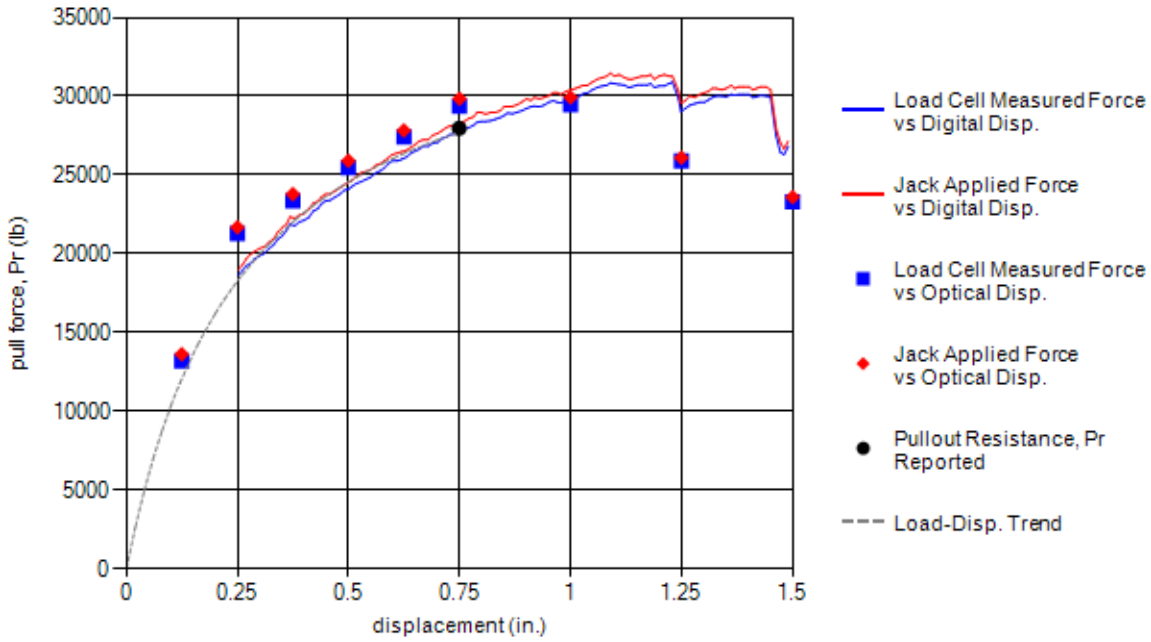
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	734	27964	5.70	**4.23**

Load-Displacement Curve



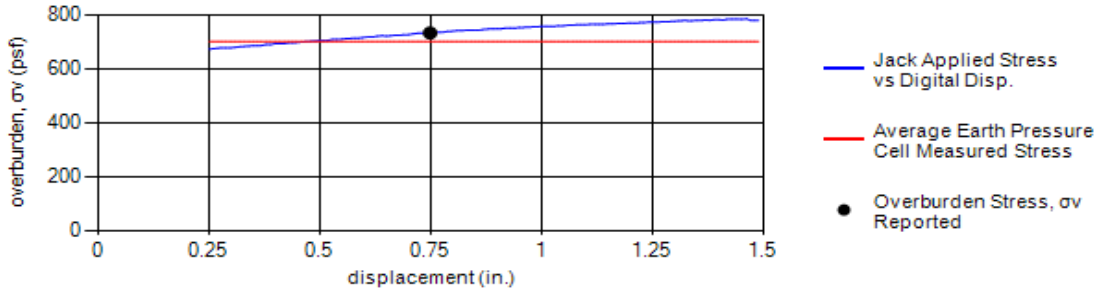
Comments

Digital displacement: pullout and elongation undifferentiated.

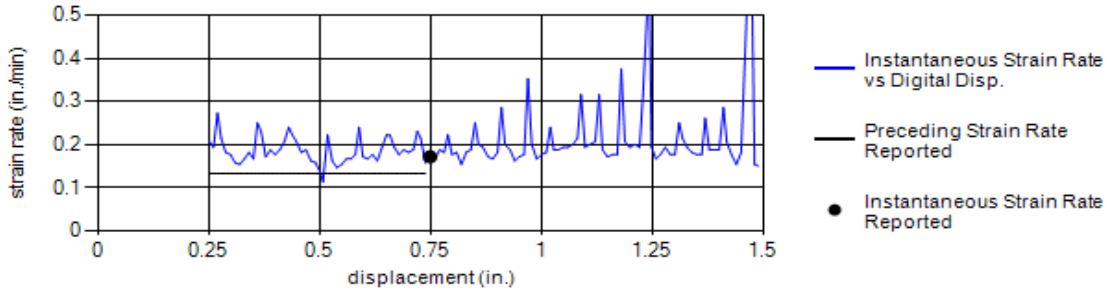
Personnel

Tested:	AJ AJ AS
Prepared:	SB TW
Checked:	WL PJ

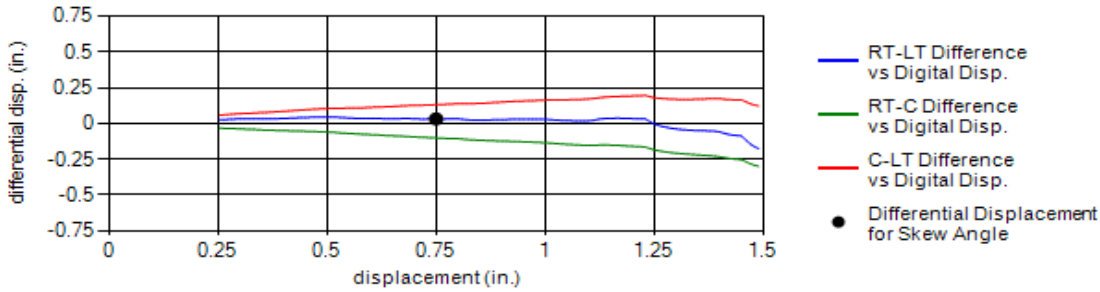
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
690	530	860	673	764	703	7.16	734



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.13	0.16



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	-0.10	0.13	No Data	0.10	CCW



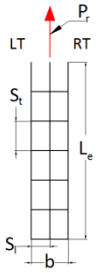
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 9:29:00 AM
Test Identification:	TS37.04-G-9x6-W20xW15-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

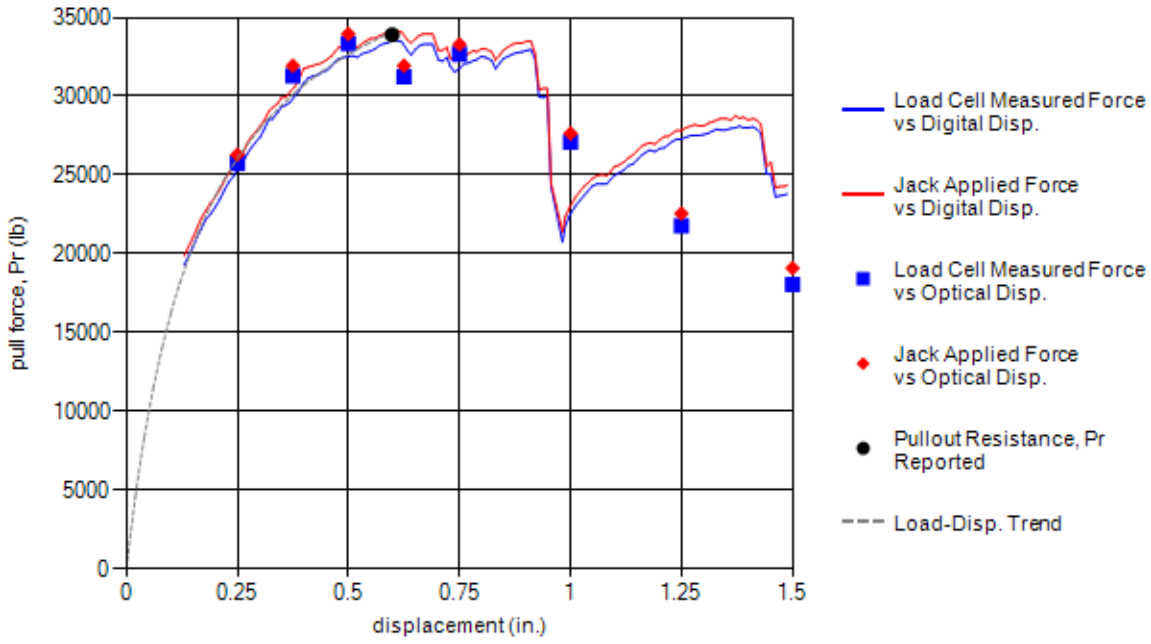
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.60	1606	33901	12.40	**2.34**

Load-Displacement Curve



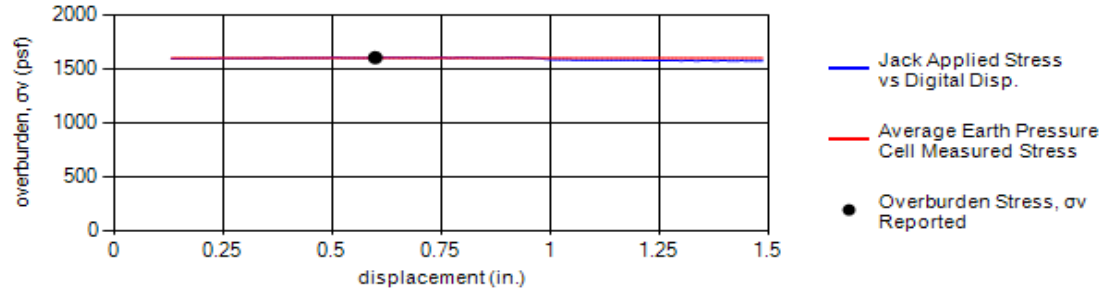
Comments

Digital displacement: pullout and elongation undifferentiated.

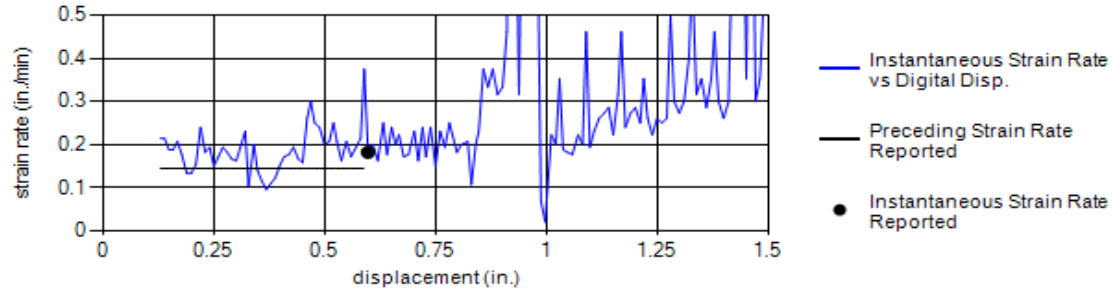
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

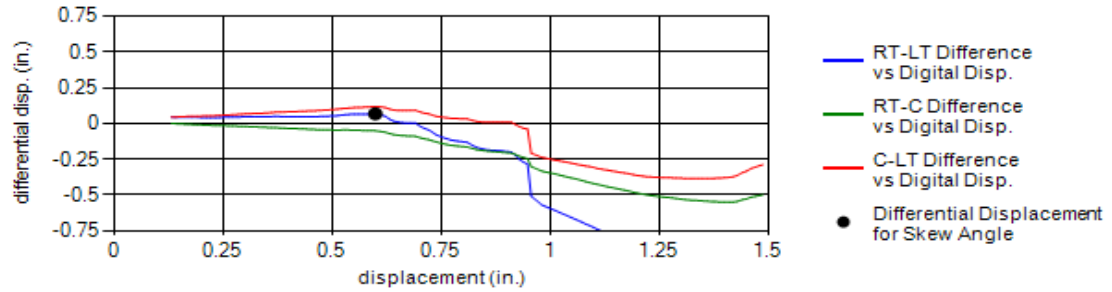
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1568	1235	2201	1469	1541	1603	3.14	1606



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.15	0.20



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.07	-0.05	0.12	No Data	0.22	CCW



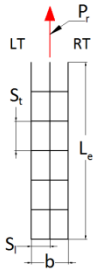
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 9:58:00 AM
Test Identification:	TS37.05-G-9x12-W20xW15-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

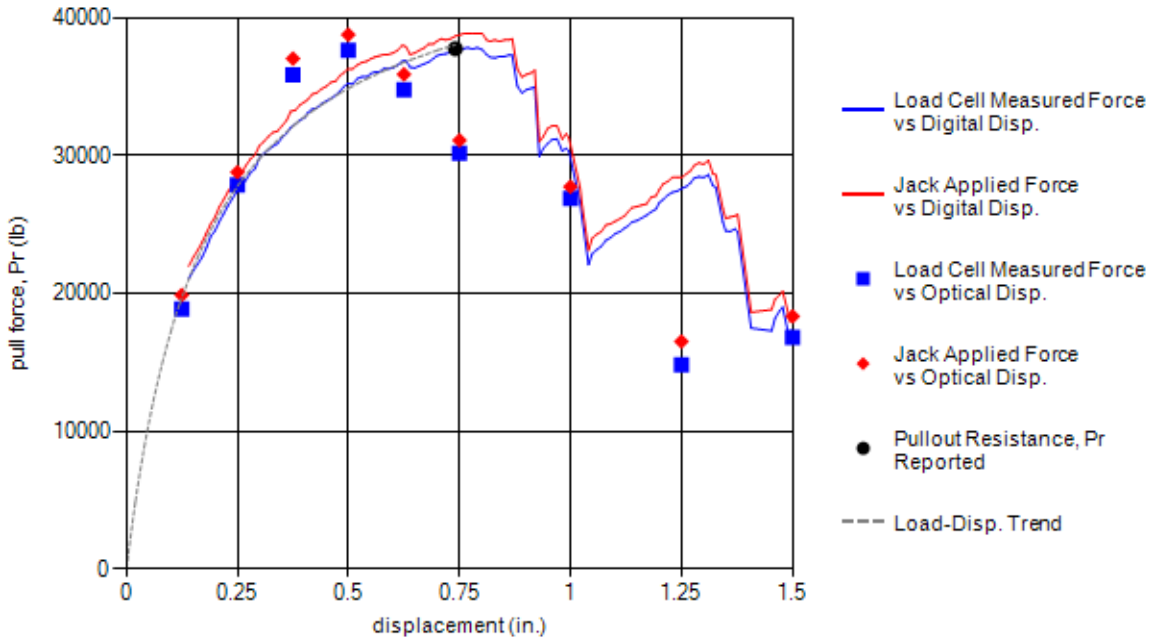
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	746	37734	5.80	**2.81**

Load-Displacement Curve



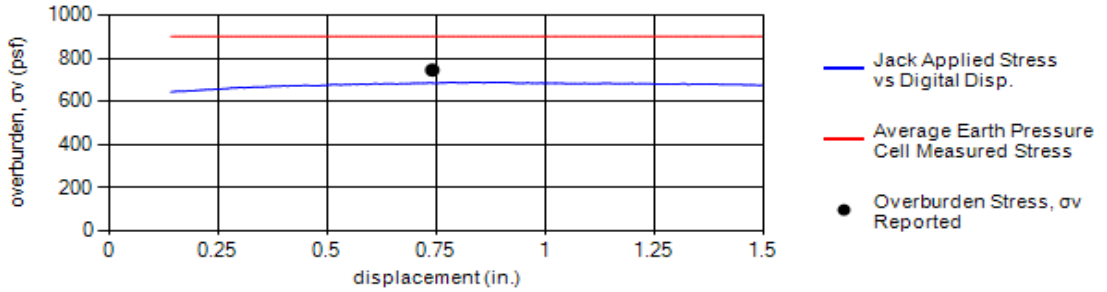
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

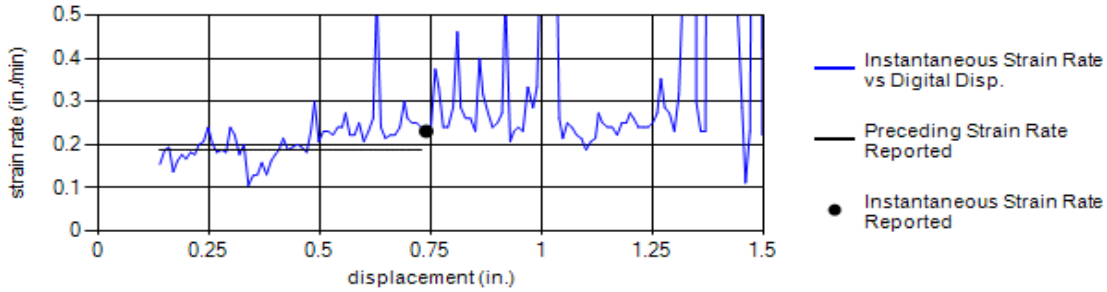
Personnel

Tested:	AJ AJ DH
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1209	706	918	790	884	902	6.38	686



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.19	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

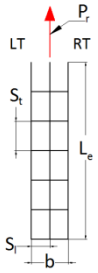
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 12:28:00 PM
Test Identification:	TS37.06-G-9x12-W20xW15-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

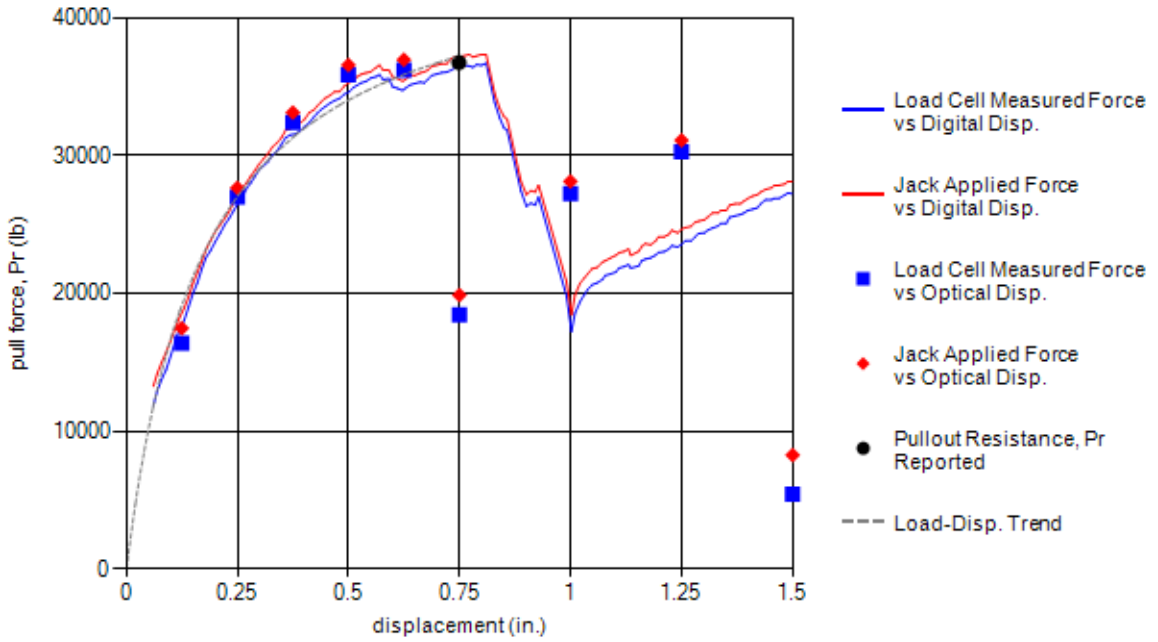
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1556	36725	12.00	**1.31**

Load-Displacement Curve



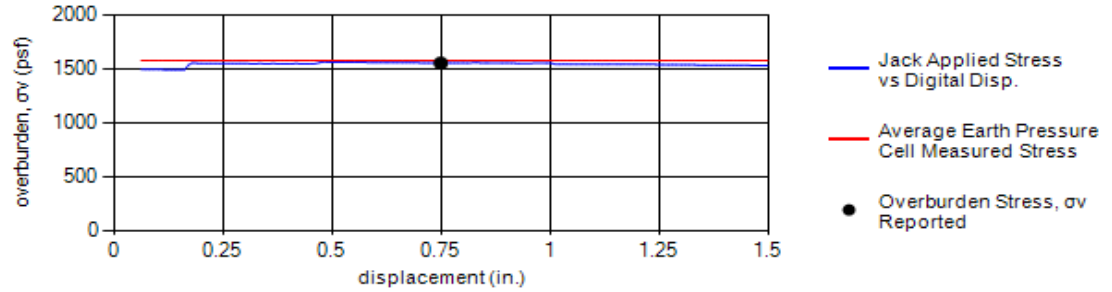
Comments

Digital displacement: pullout and elongation undifferentiated.

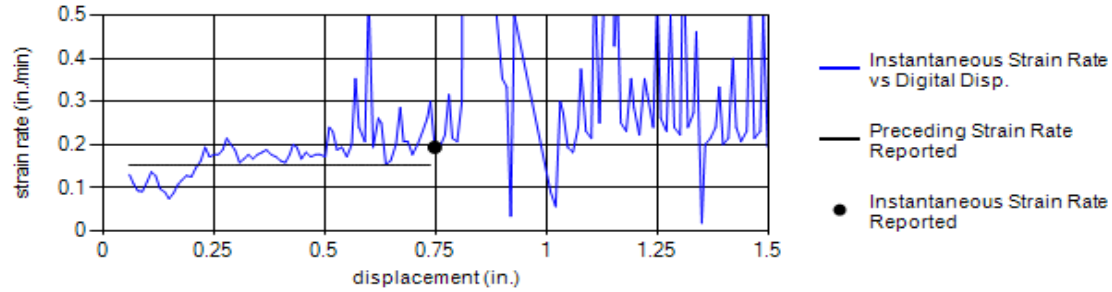
Personnel

Tested:	AJ AJ AS
Prepared:	SB TW
Checked:	WL PJ

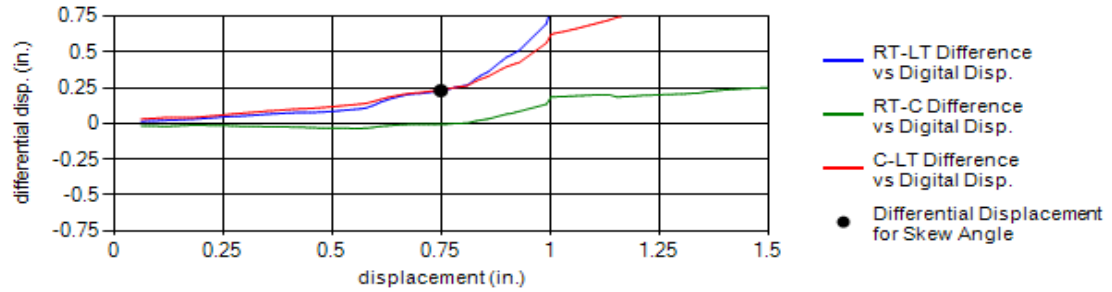
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1700	1207	1960	1493	1540	1580	3.28	1556



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.19	0.15	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.23	-0.01	0.24	No Data	0.73	CCW



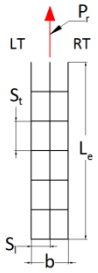
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/29/2011 1:05:00 PM
Test Identification:	TS37.07-G-9x6-W20xW15-L3-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

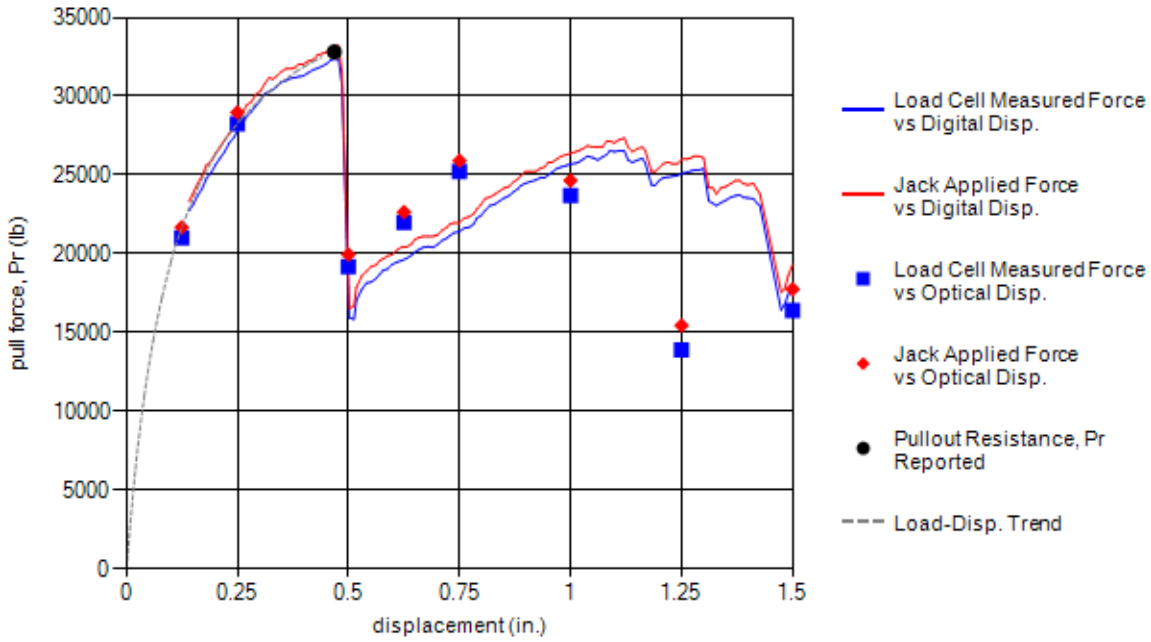
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.47	675	32813	5.20	**5.40**

Load-Displacement Curve



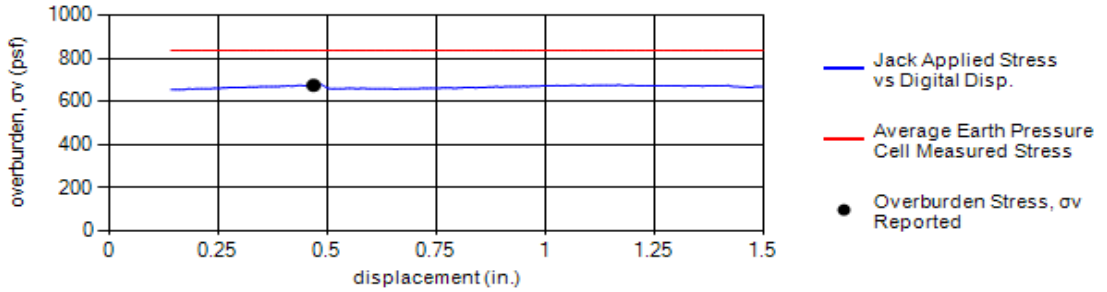
Comments

Digital displacement: pullout and elongation undifferentiated.

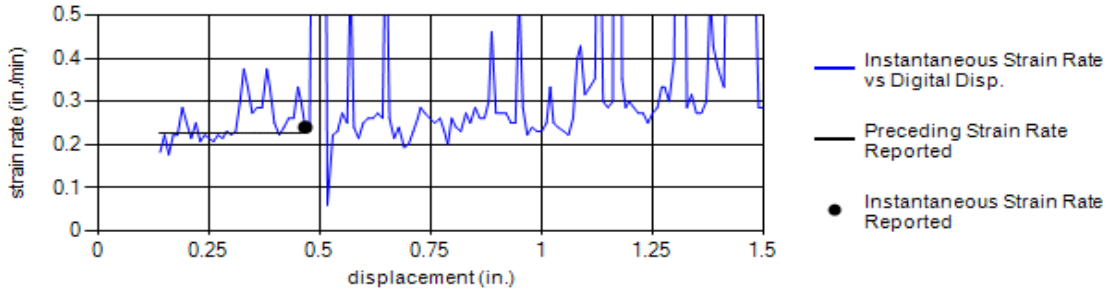
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

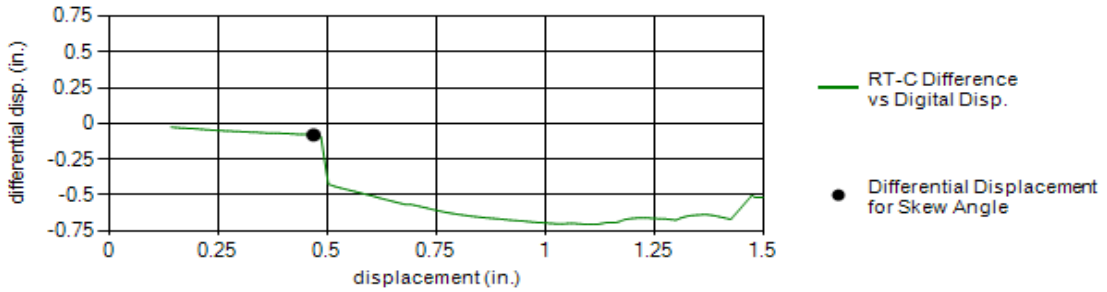
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
876	638	962	814	896	837	7.05	674



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.23	0.29



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	-0.08	No Data	No Data	-0.13	CW



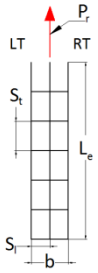
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 1:36:00 PM
Test Identification:	TS37.08-G-9x6-W20xW15-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

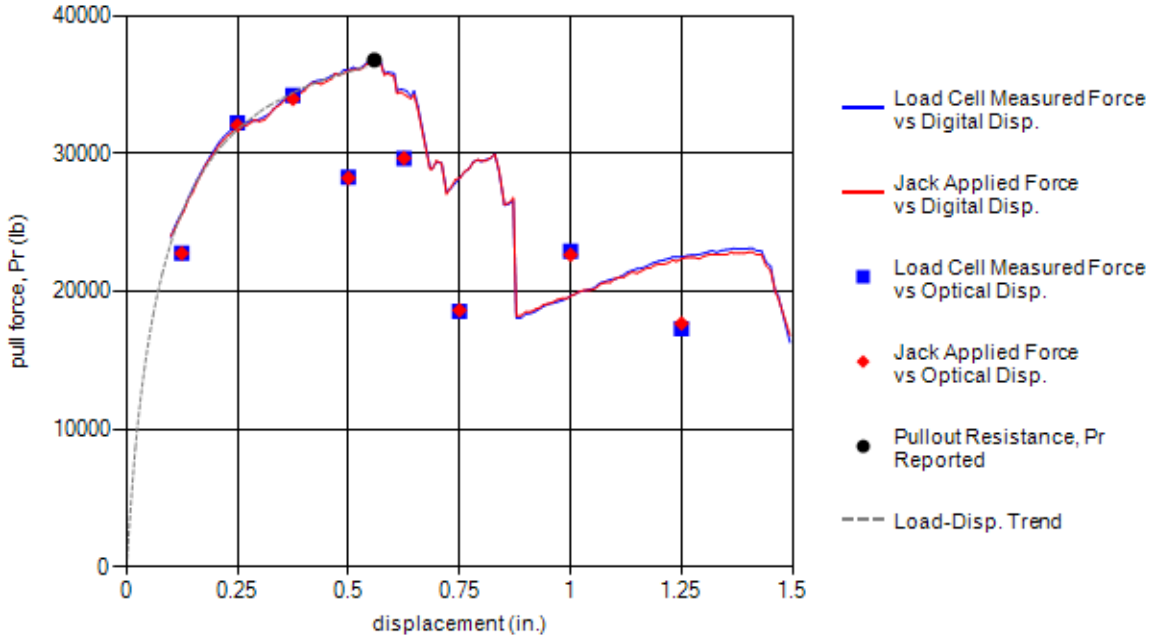
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.56	1513	36764	11.70	**2.70**

Load-Displacement Curve



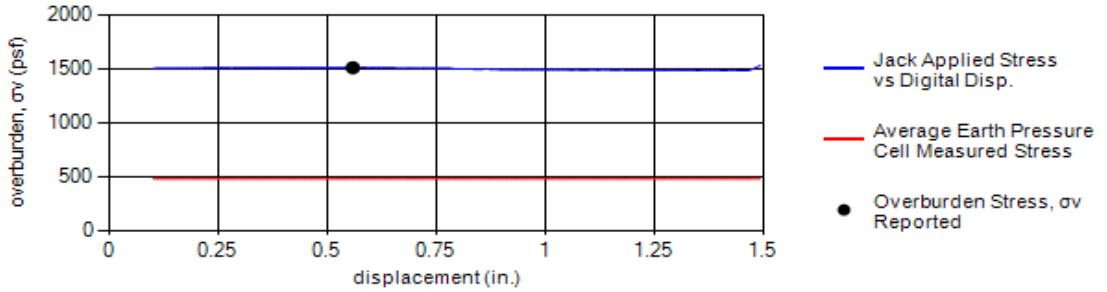
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. Digital displacement: pullout and elongation undifferentiated.

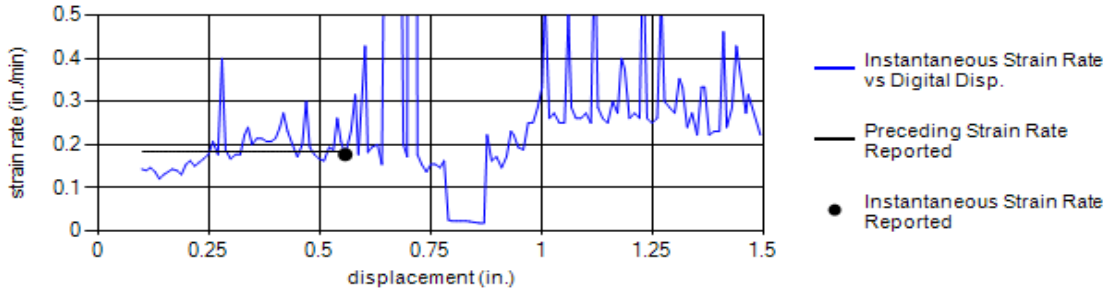
Personnel

Tested:	AJ AJ AS
Prepared:	SB TW
Checked:	WL PJ

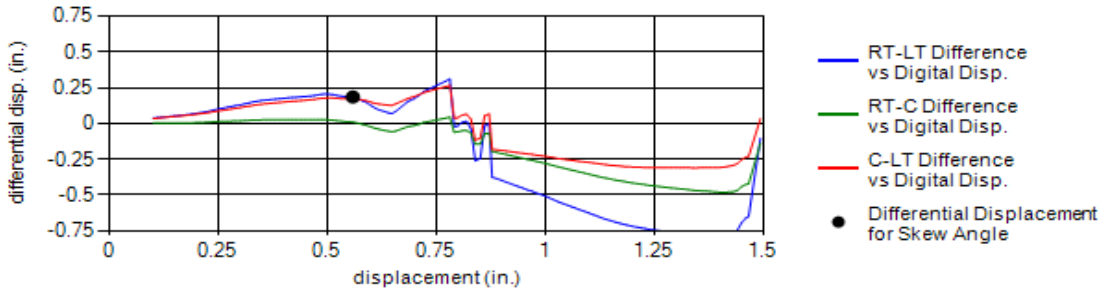
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
420	440	445	477	622	481	10.78	1516



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.18	0.21



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.19	0.01	0.18	No Data	0.59	CCW



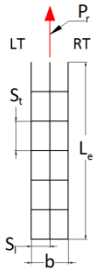
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/26/2011 10:18:00 AM
Test Identification:	TS37.09-G-9x12-W20xW15-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

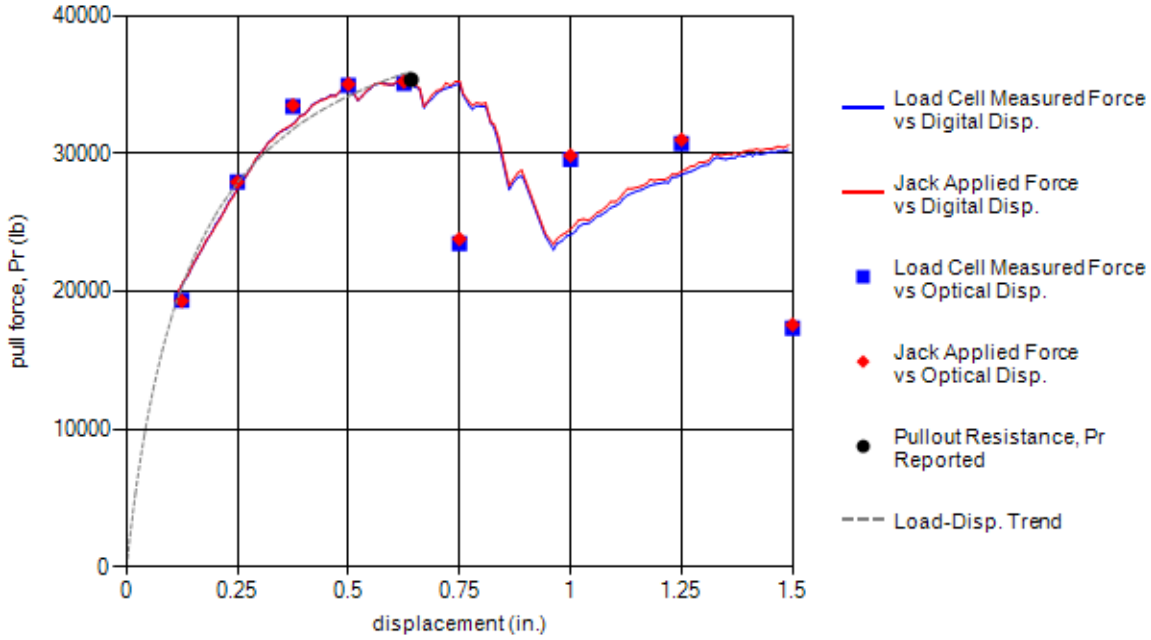
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.64	681	35343	5.30	**2.88**

Load-Displacement Curve



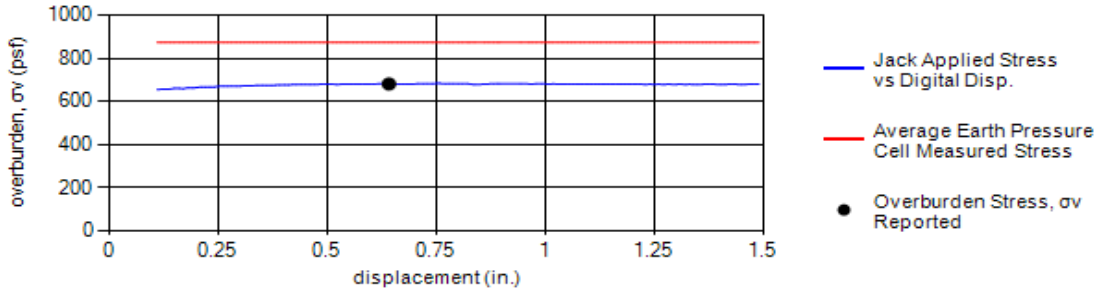
Comments

Digital displacement: pullout and elongation undifferentiated.

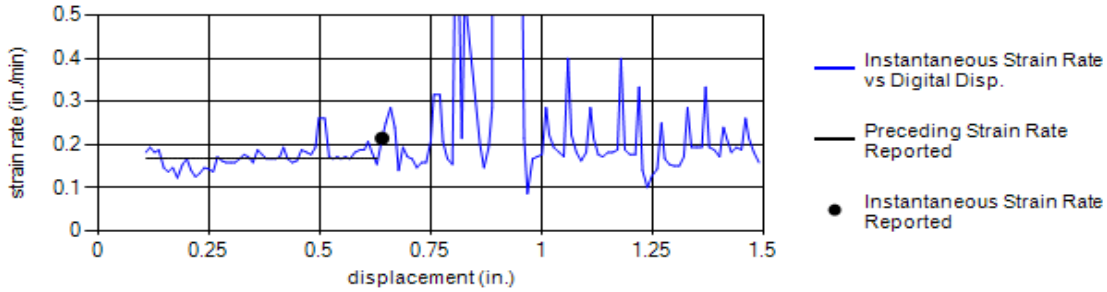
Personnel

Tested:	AJ AJ AS
Prepared:	SB TW
Checked:	WL PJ

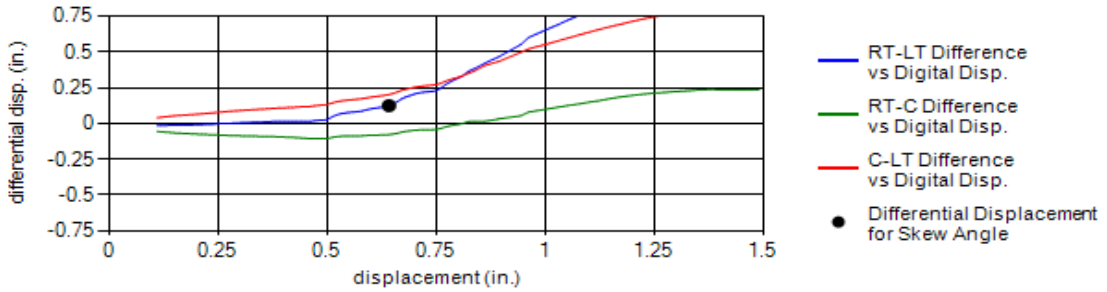
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1144	696	842	769	920	874	7.17	681



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.17	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.13	-0.08	0.20	No Data	0.40	CCW



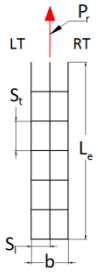
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 7:40:00 AM
Test Identification:	TS37.10-G-9x12-W20xW15-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

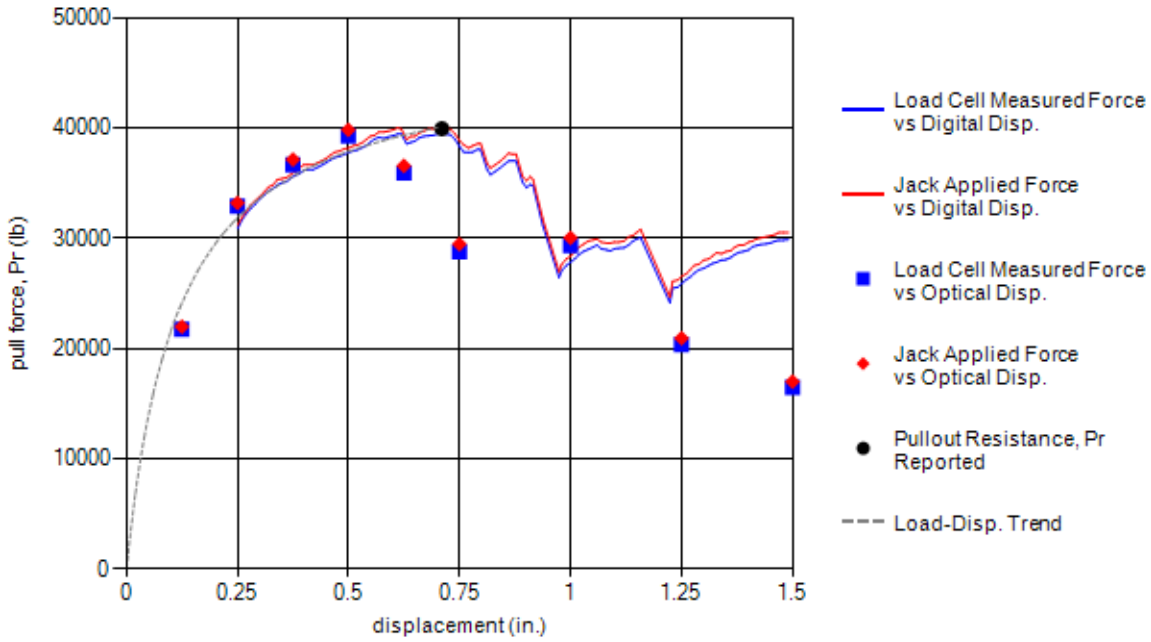
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.71	1562	39922	12.10	**1.42**

Load-Displacement Curve



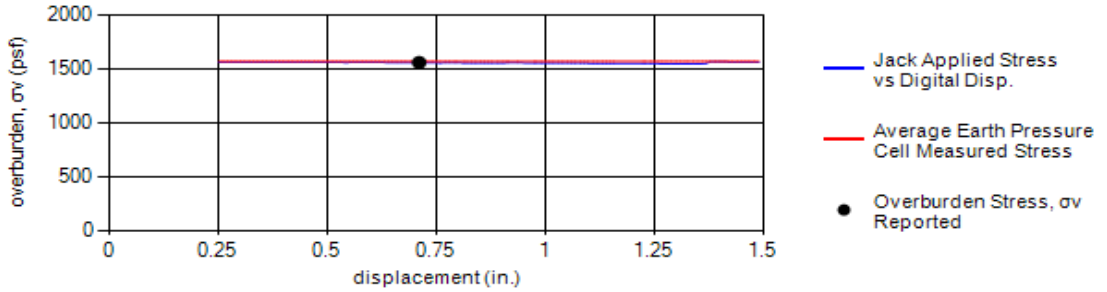
Comments

Digital displacement: pullout and elongation undifferentiated.

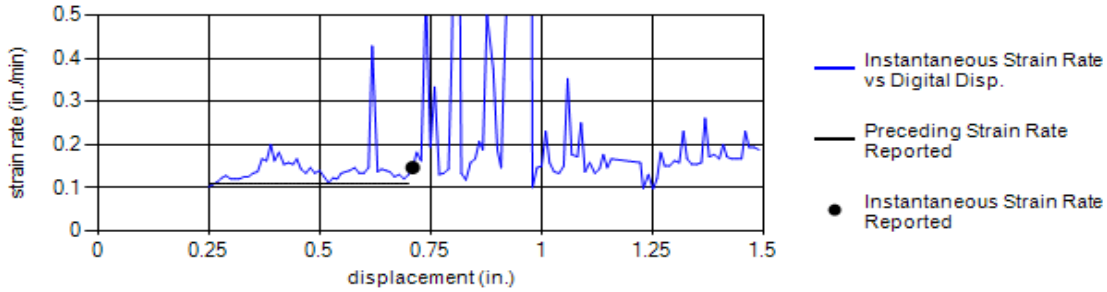
Personnel

Tested:	AS AS SH
Prepared:	TW TW
Checked:	WL PJ

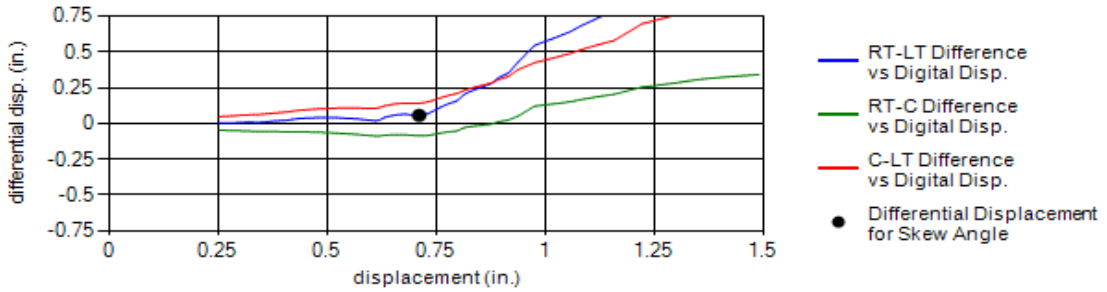
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1474	1347	1960	1505	1578	1573	3.40	1562



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.11	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	-0.09	0.14	No Data	0.18	CCW



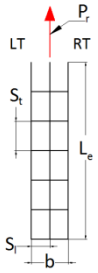
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 8:27:00 AM
Test Identification:	TS37.11-G-9x6-W20xW15-L3-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

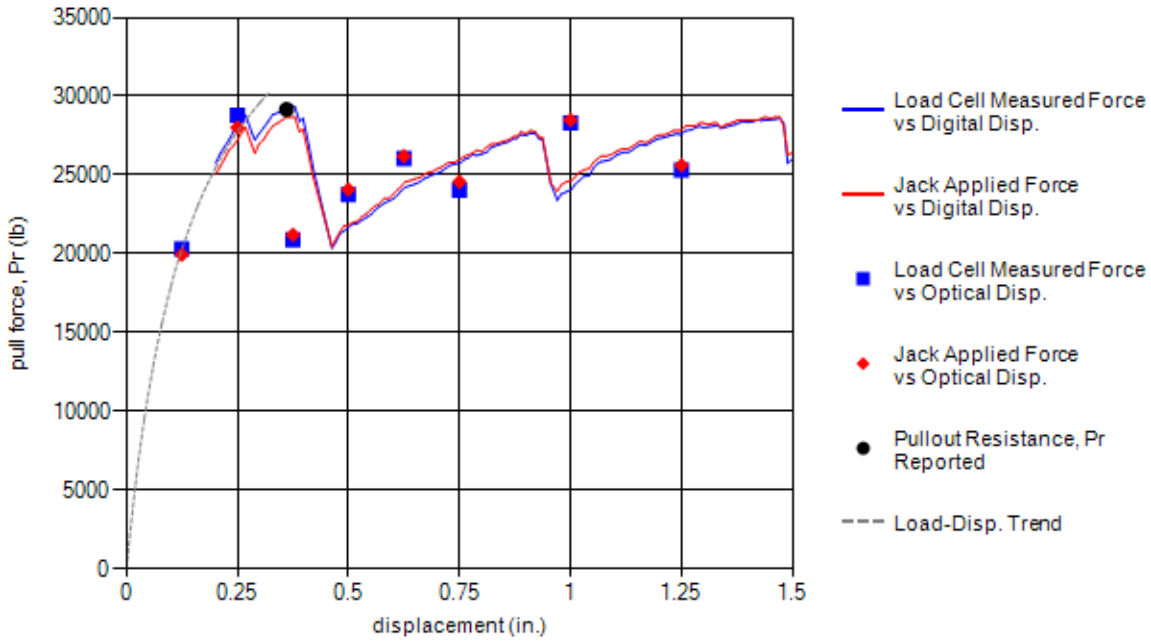
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.36	678	29166	5.20	**4.78**

Load-Displacement Curve



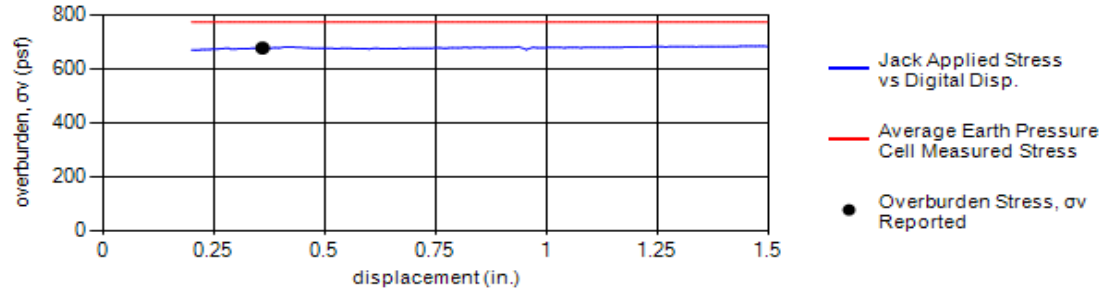
Comments

Digital displacement: pullout and elongation undifferentiated.

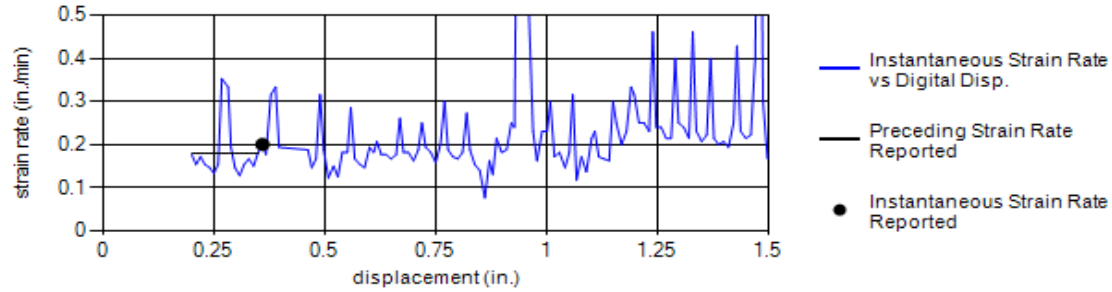
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

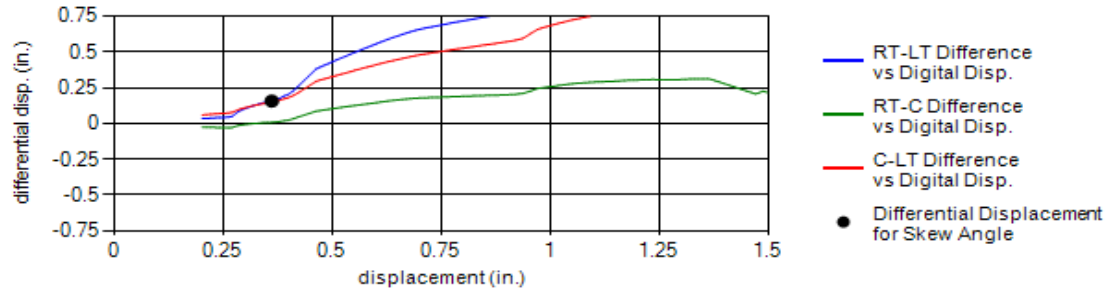
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
710	602	862	789	910	775	7.21	678



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.18	0.18



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.16	0.01	0.15	No Data	0.50	CCW



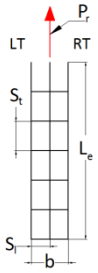
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	9/28/2011 8:53:00 AM
Test Identification:	TS37.12-G-9x6-W20xW15-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

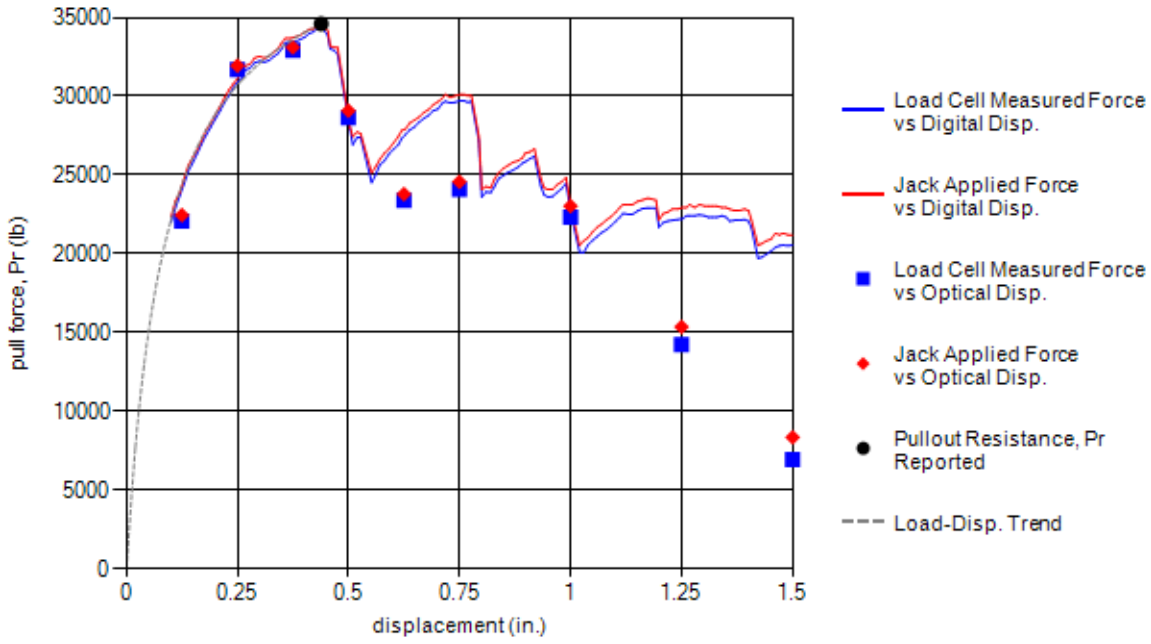
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.44	1555	34594	12.00	**2.47**

Load-Displacement Curve



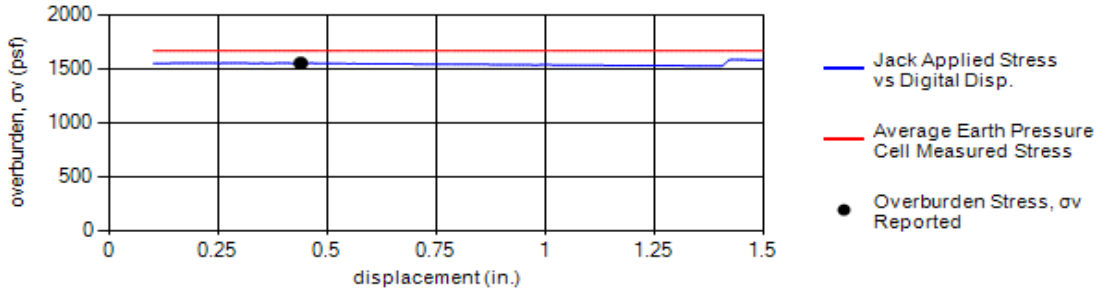
Comments

Digital displacement: pullout and elongation undifferentiated.

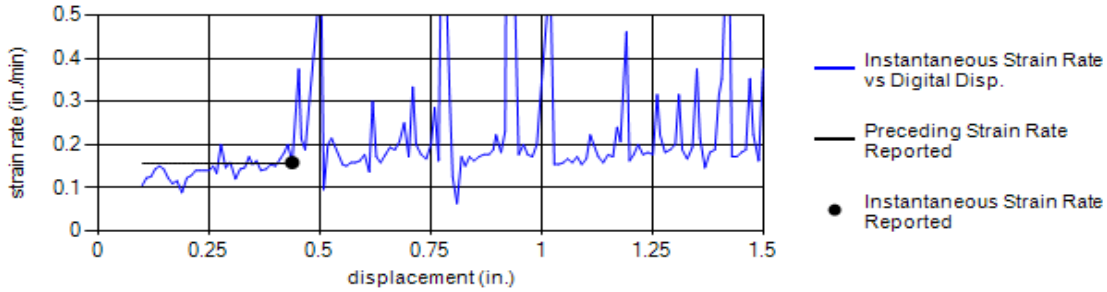
Personnel

Tested:	AS AS AJ
Prepared:	SB TW
Checked:	WL PJ

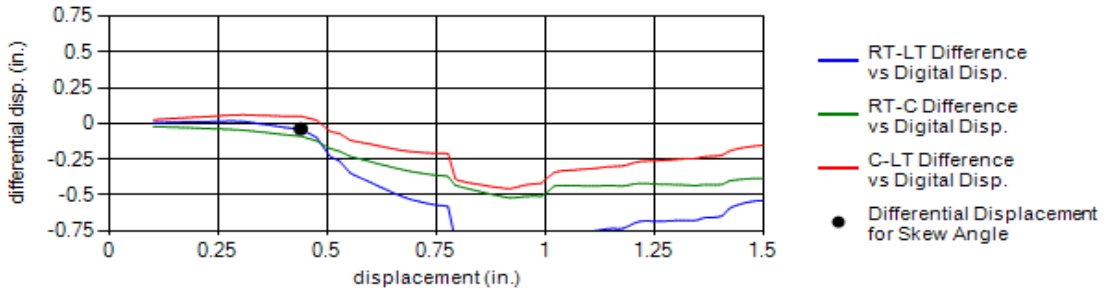
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1551	1589	2109	1510	1588	1669	3.20	1555



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.16	0.16	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.04	-0.09	0.05	No Data	-0.12	CW



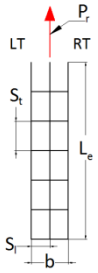
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		0	0
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	24	34
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		45	43
Liquid Limit, LL (%):	23	#4		62	59
Plastic Limit, PL (%):	20	#10		76	72
Plasticity Index, PI (%):	3	#40	85-100	87	84
Bar Linear Shrinkage, LS (%):	3	#200		96	93

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/1/2011 11:15:00 AM
Test Identification:	TS38.01-G-9x18-W20xW7.5-L9-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

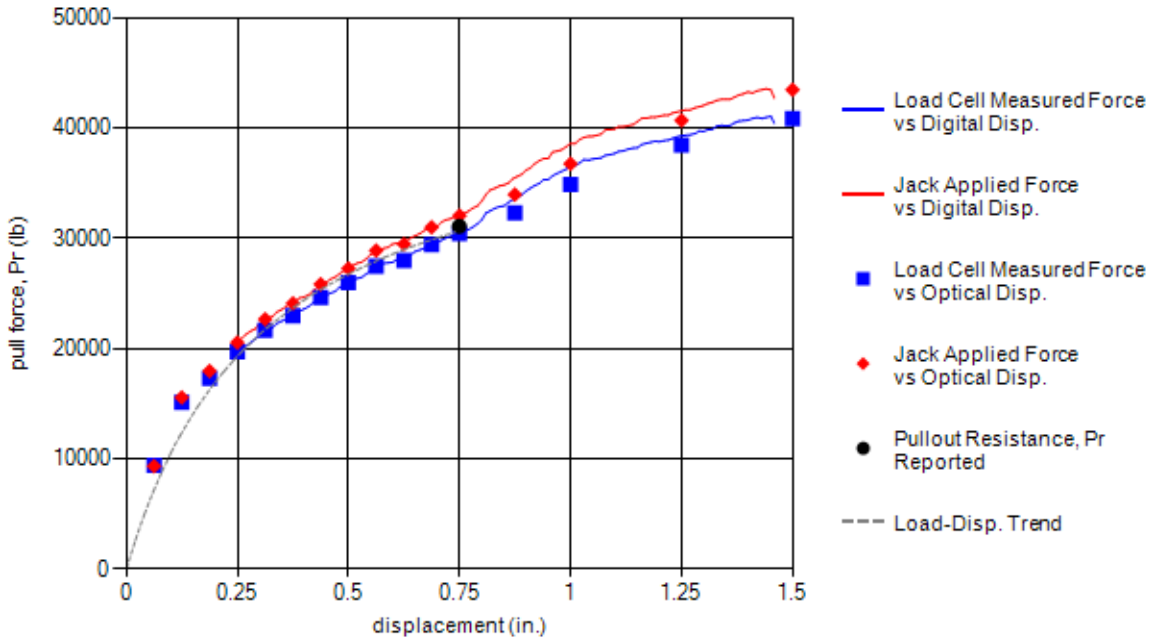
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	693	31073	5.90	**1.66**

Load-Displacement Curve



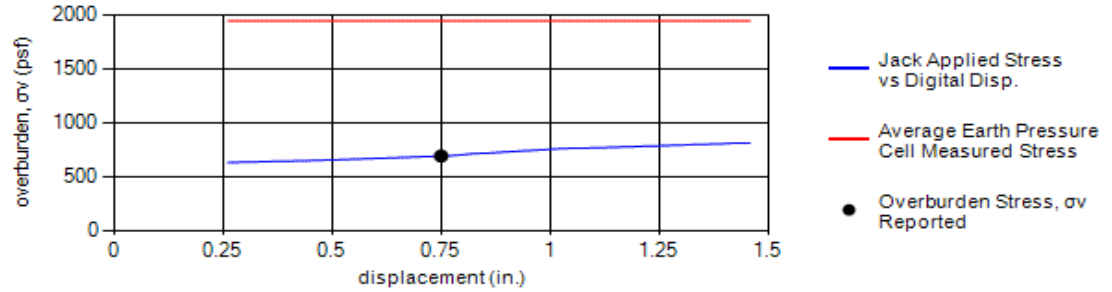
Comments

Digital displacement: pullout and elongation undifferentiated.

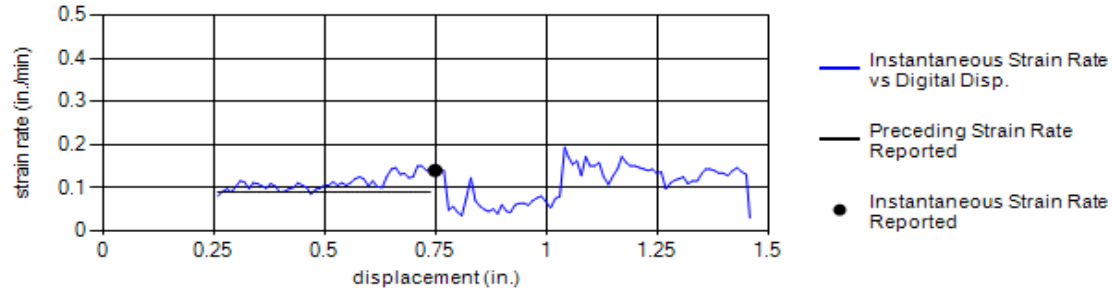
Personnel

Tested:	TW TW AS
Prepared:	SB TW
Checked:	WL PJ

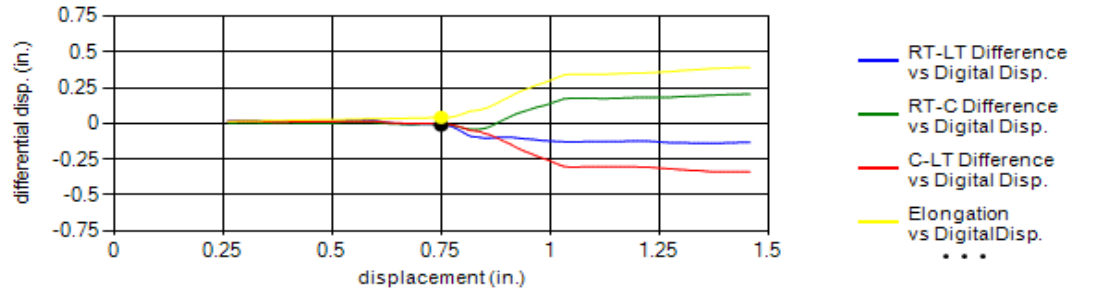
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2121	1771	2101	1828	1917	1948	1.09	692



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.01	-0.01	0.00	0.04	-0.03	CW



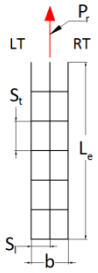
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/1/2011 12:57:00 PM
Test Identification:	TS38.02-G-9x18-W20xW7.5-L9-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

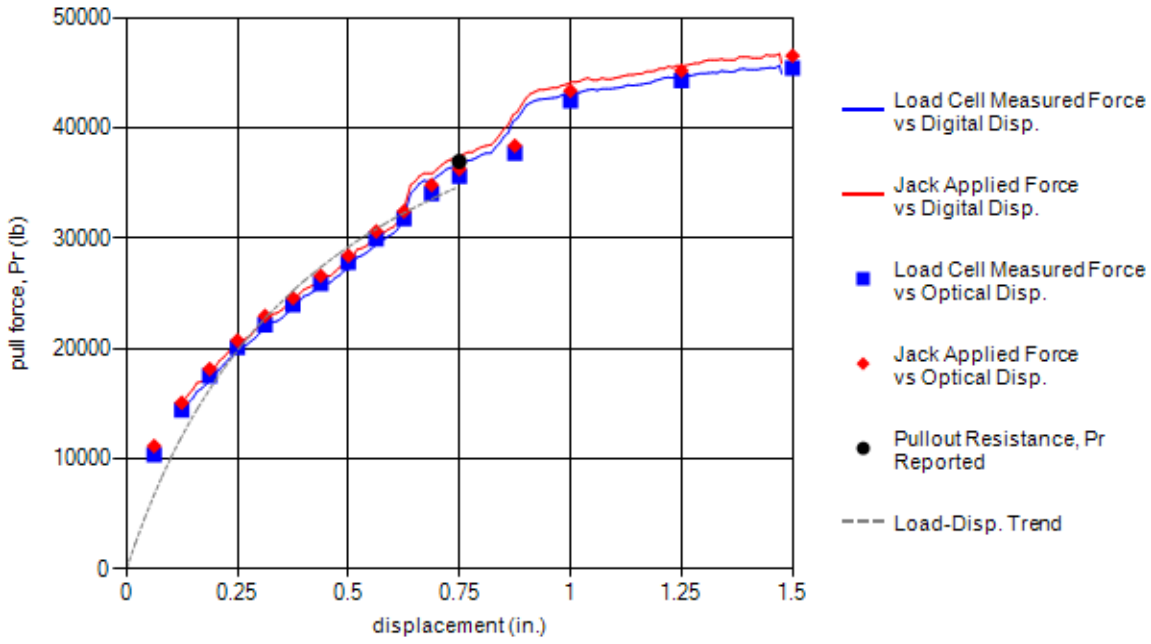
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1447	36946	12.30	**0.95**

Load-Displacement Curve



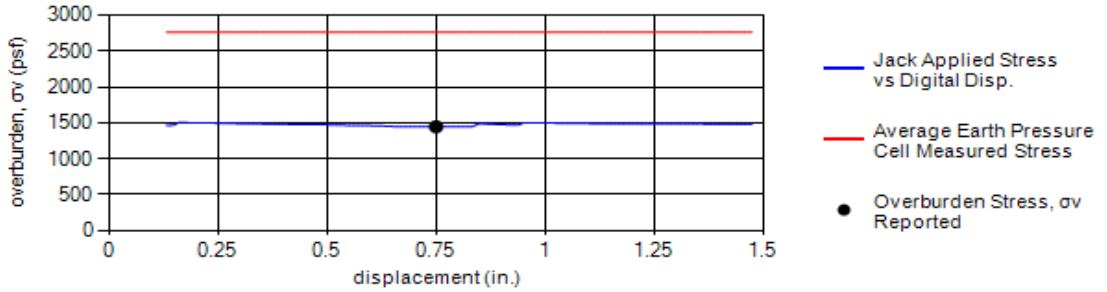
Comments

Digital displacement: pullout and elongation undifferentiated.

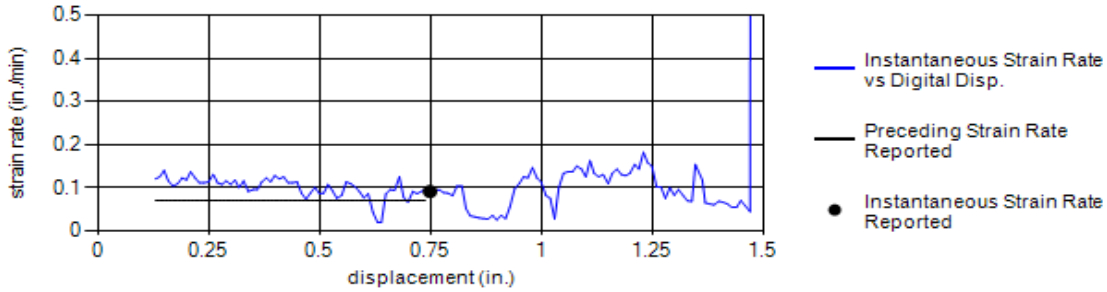
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

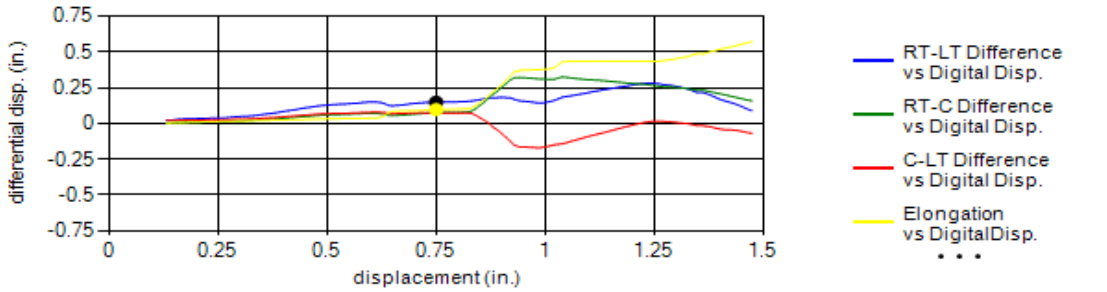
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3008	2477	3099	2675	2568	2765	1.02	1447



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.15	0.08	0.07	0.10	0.47	CCW



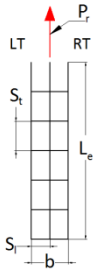
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/1/2011 1:49:00 PM
Test Identification:	TS38.03-G-9x18-W20xW7.5-L9-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

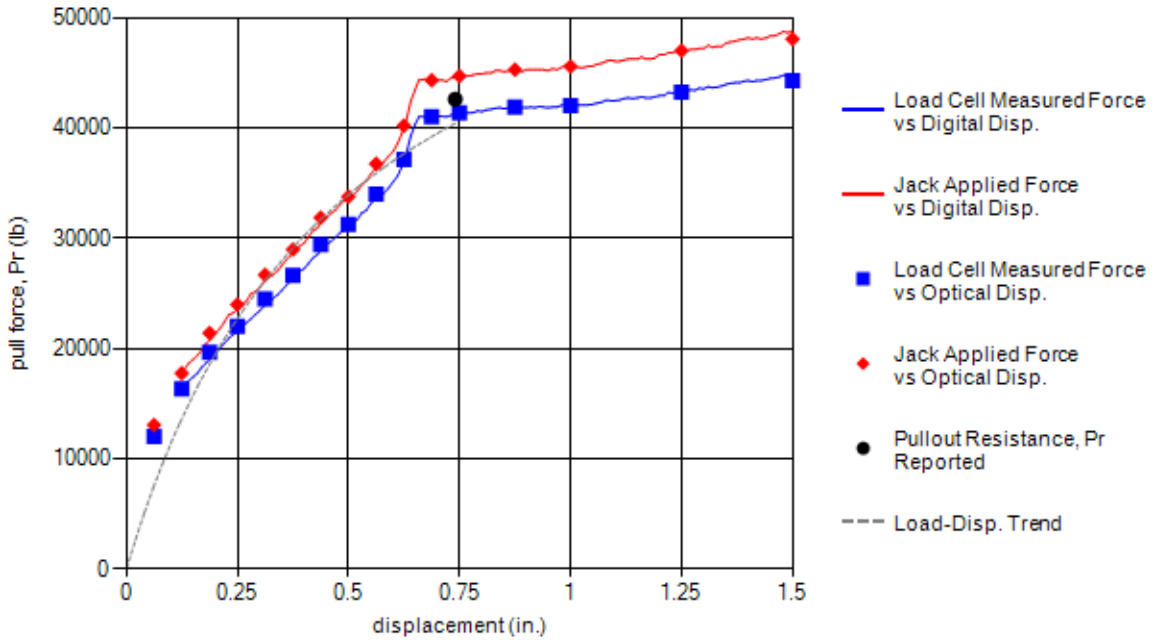
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2479	42588	21.10	**0.64**

Load-Displacement Curve



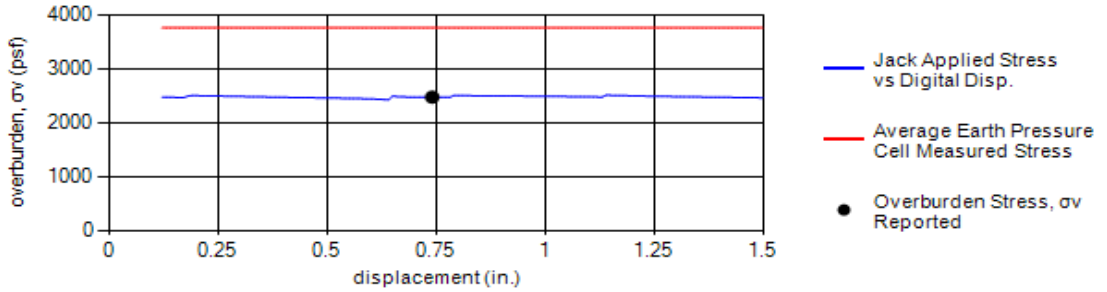
Comments

Digital displacement: pullout and elongation undifferentiated.

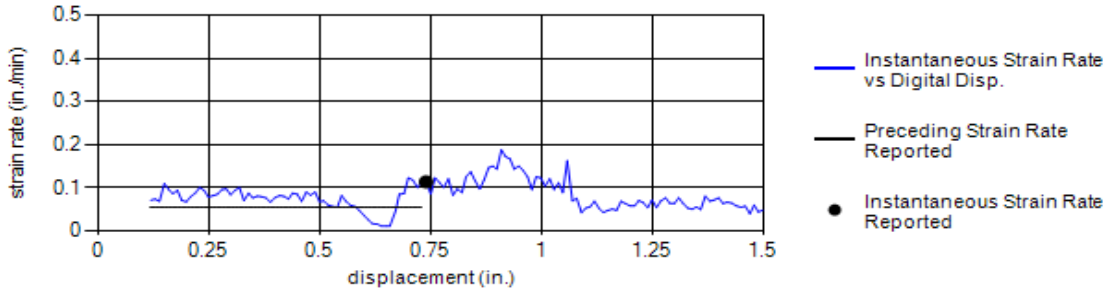
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

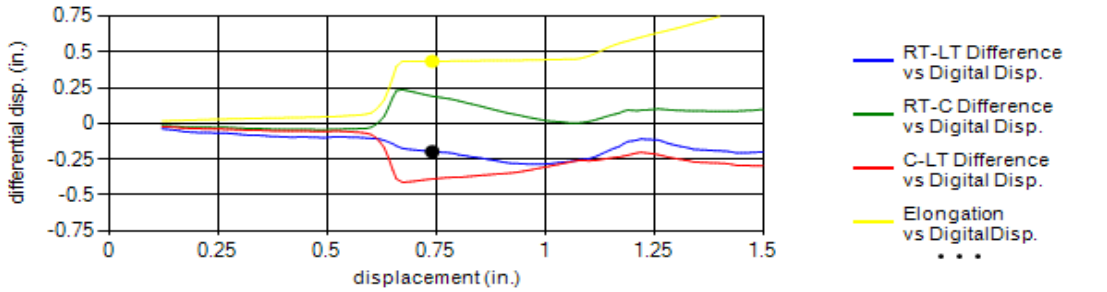
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4020	3407	4279	3664	3465	3767	1.01	2479



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.20	0.19	-0.39	0.44	-0.63	CW



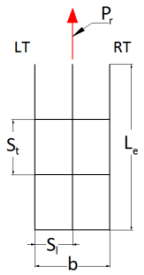
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/2/2011 9:15:00 AM
Test Identification:	TS38.04-G-9x18-W20xW7.5-L4.5-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

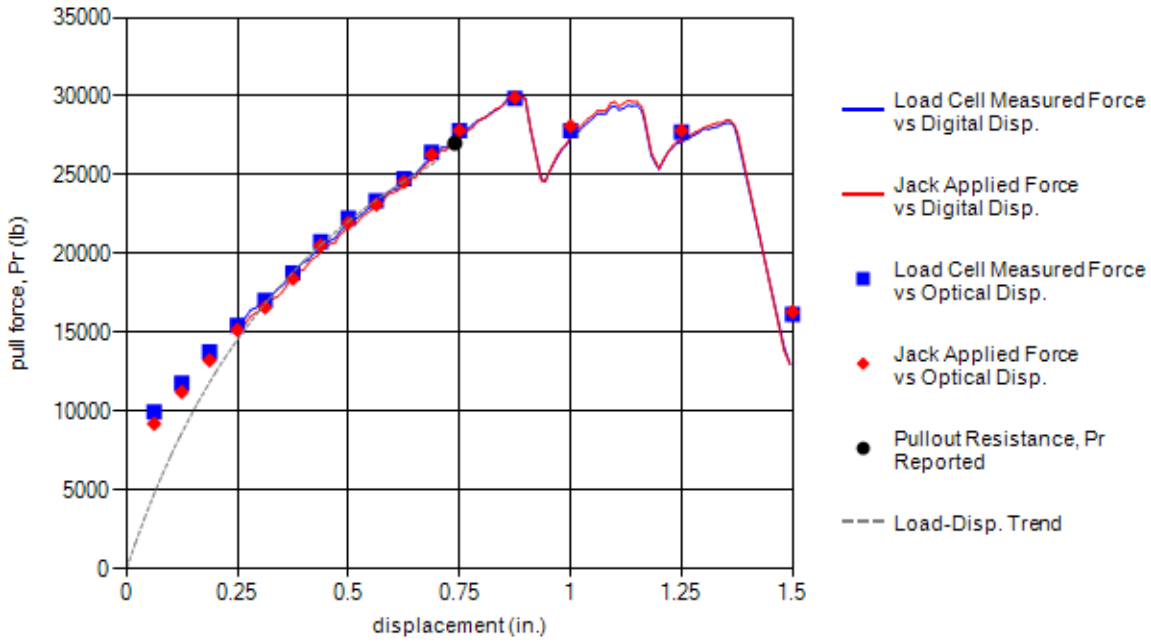
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	4994	27021	42.60	**0.40**

Load-Displacement Curve



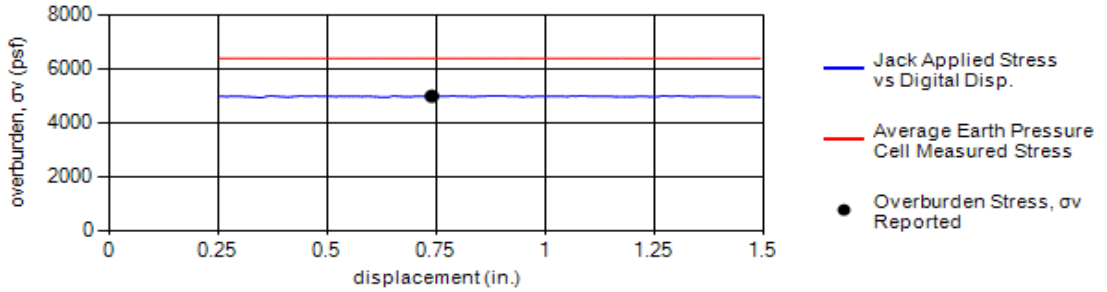
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

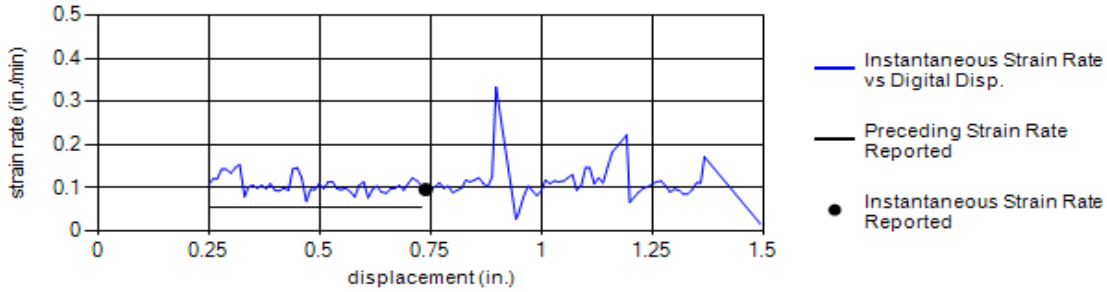
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
6907	5812	7339	6064	5839	6392	1.04	4994



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

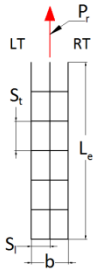
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/11/2011 11:27:00 AM
Test Identification:	TS38.05-G-9x18-W20xW7.5-L9-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

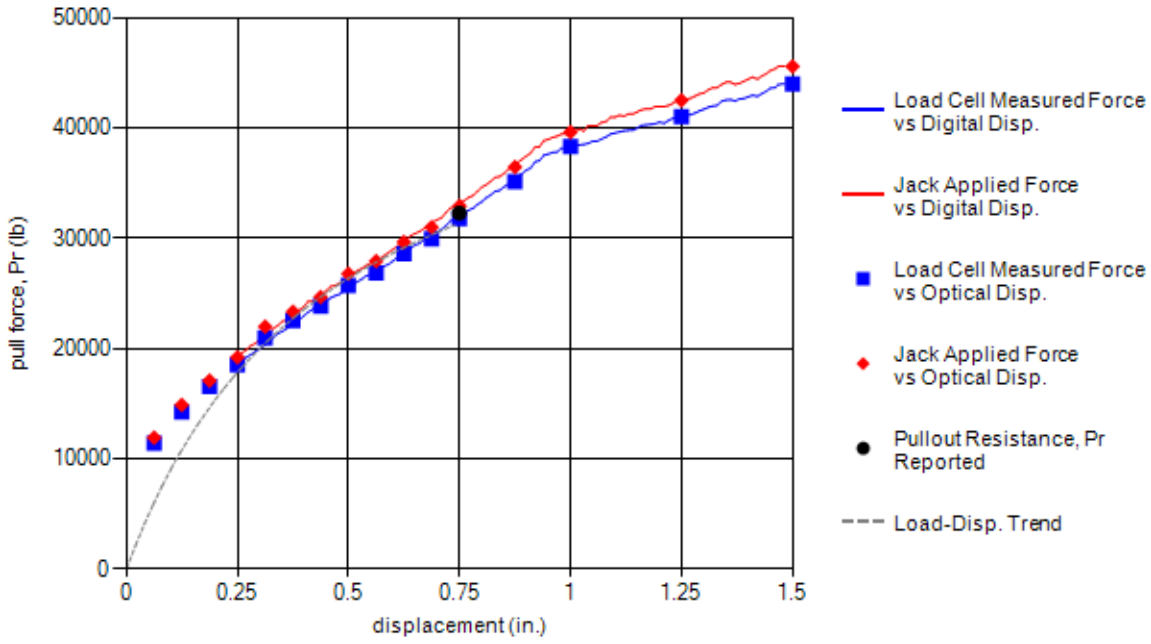
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	663	32264	5.70	**1.80**

Load-Displacement Curve



Comments

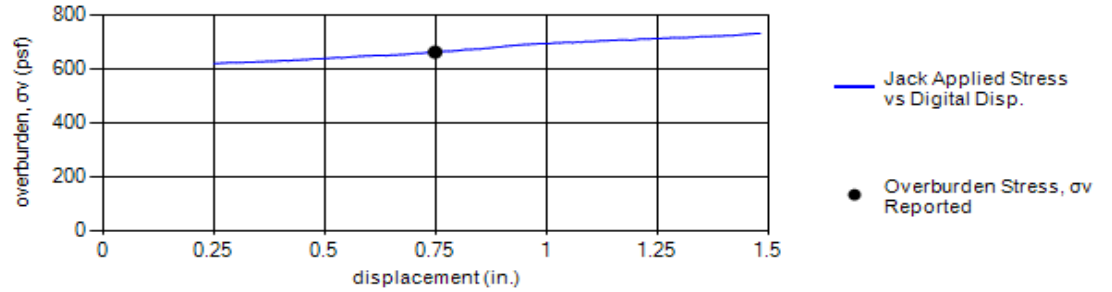
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

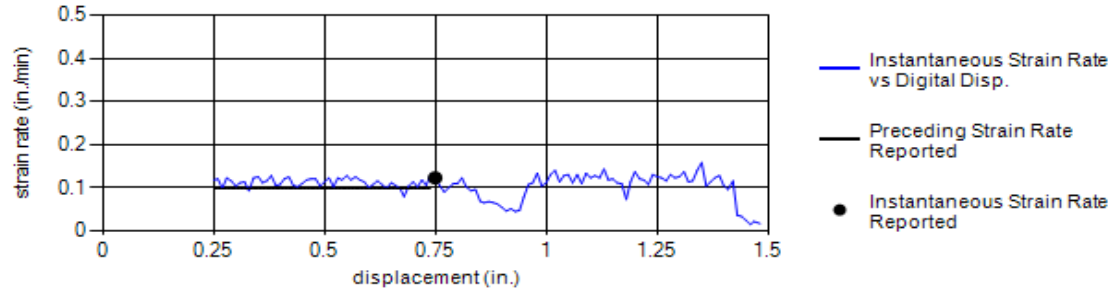
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	7.71	663



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.10	0.09

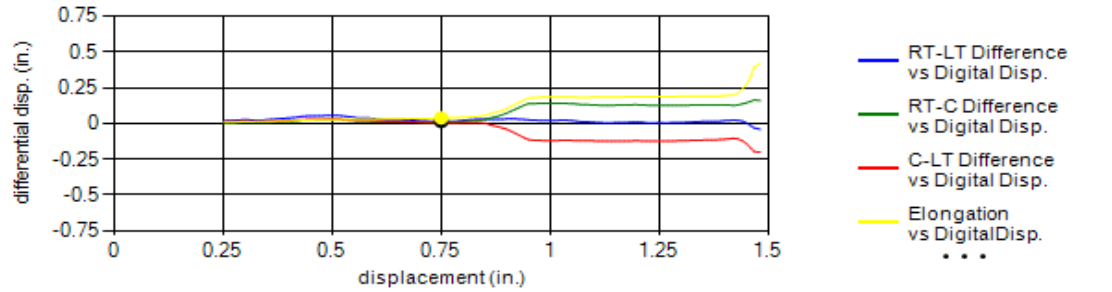


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.01	0.01	0.01	0.04

Incidental Skew

skew angle (degrees)	*skew rotation*
0.05	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

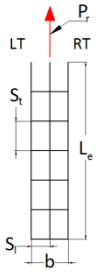
Gradation (TEX-110-E) (% Retained)			
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2011 3:16:00 PM
Test Identification:	TS38.06-G-9x18-W20xW7.5-L9-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

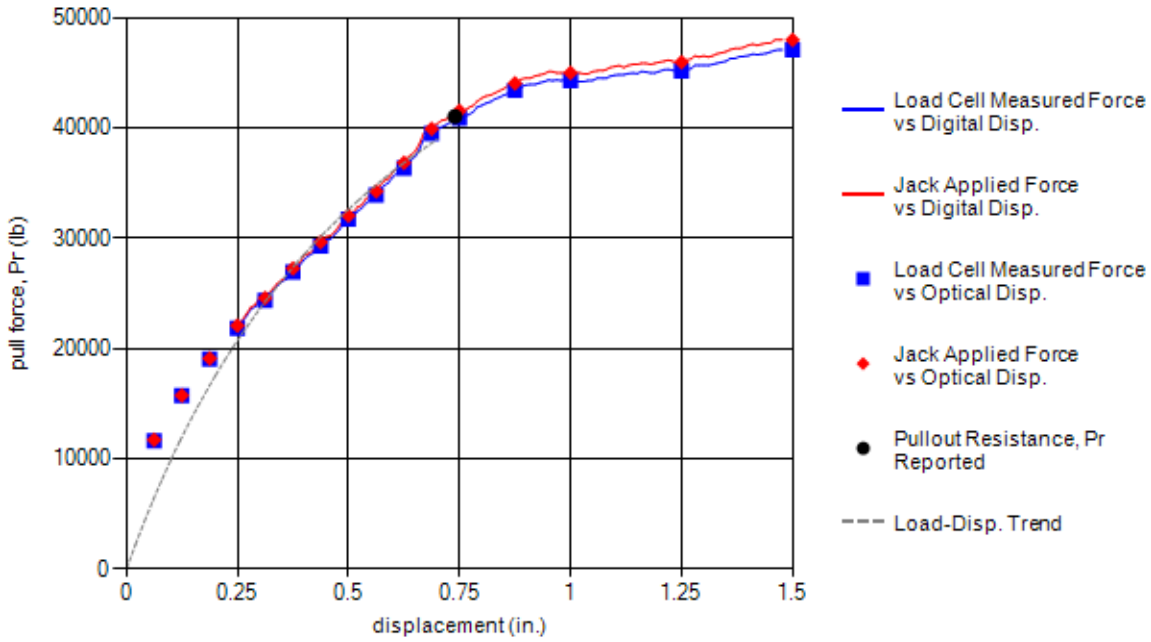
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1502	41018	12.80	**1.01**

Load-Displacement Curve



Comments

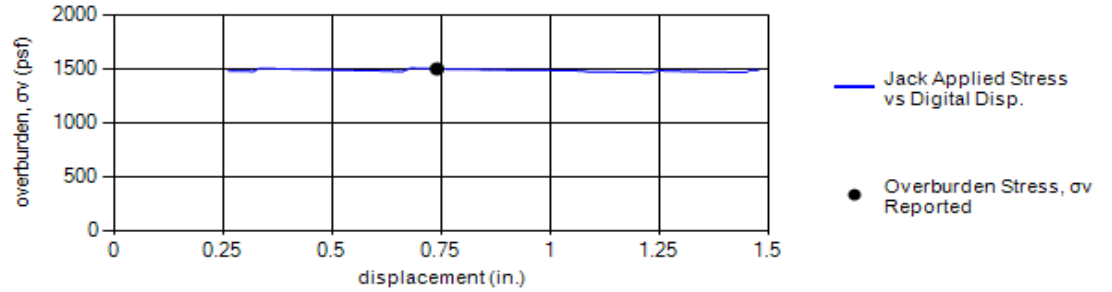
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

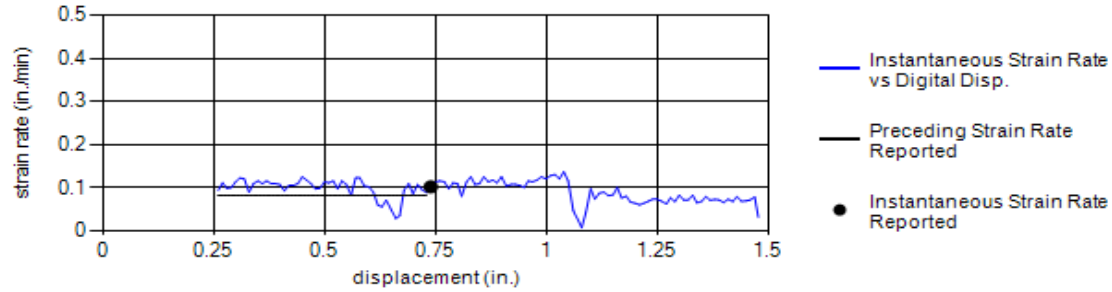
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.40	1502



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.08	0.08

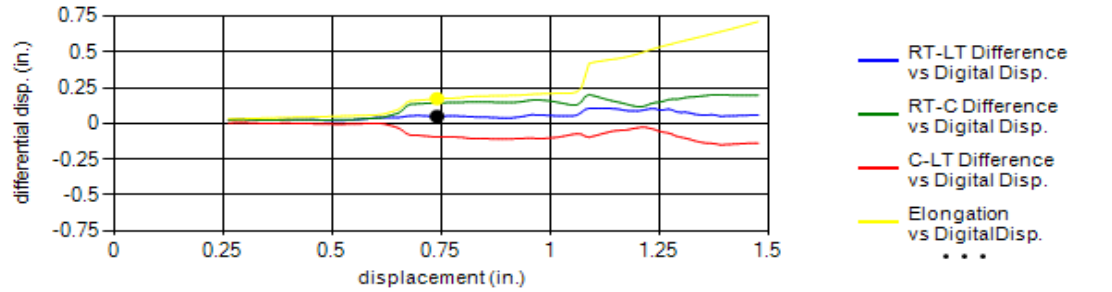


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.05	0.14	-0.09	0.17

Incidental Skew

skew angle (degrees)	*skew rotation*
0.16	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

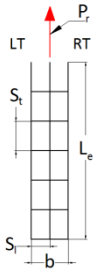
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2011 2:29:00 PM
Test Identification:	TS38.07-G-9x18-W20xW7.5-L9-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

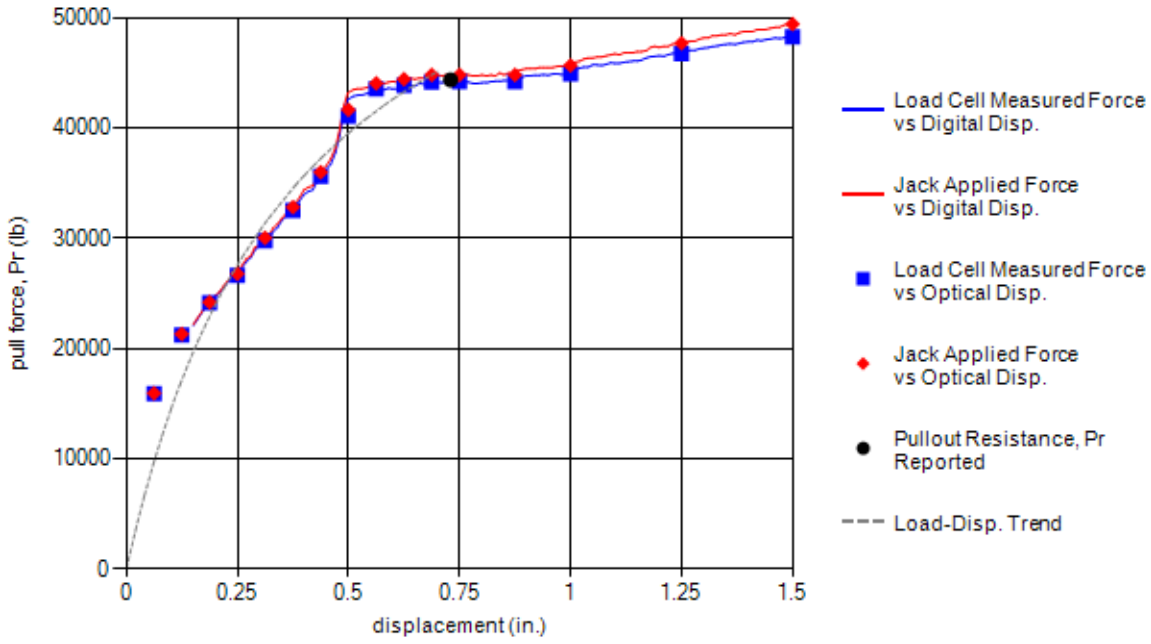
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	2483	44338	21.20	**0.66**

Load-Displacement Curve



Comments

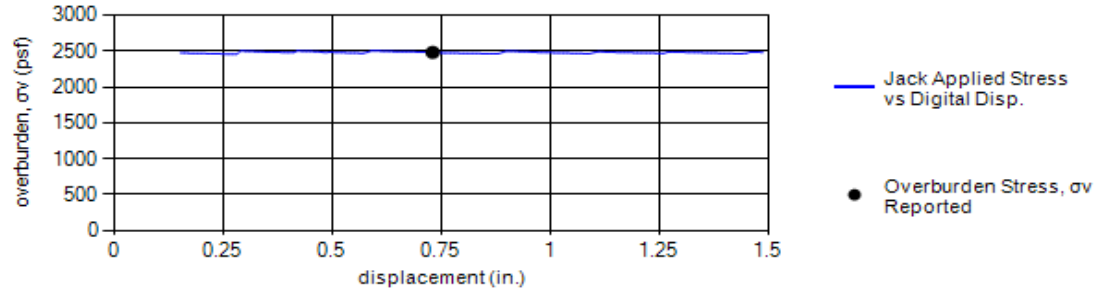
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

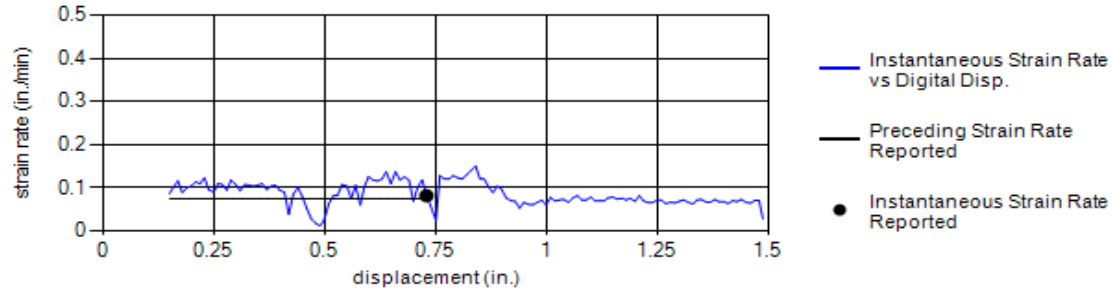
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.06	2483



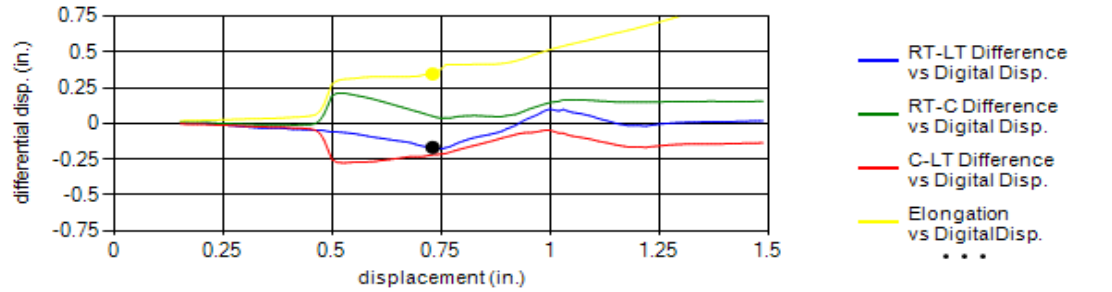
Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.08	0.07



Differential Displacement / Incidental Skew

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.17	0.05	-0.22	0.35	-0.53	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

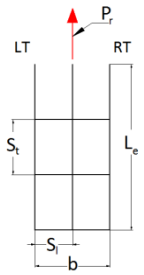
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/10/2011 1:33:00 PM
Test Identification:	TS38.08-G-9x18-W20xW7.5-L4.5-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

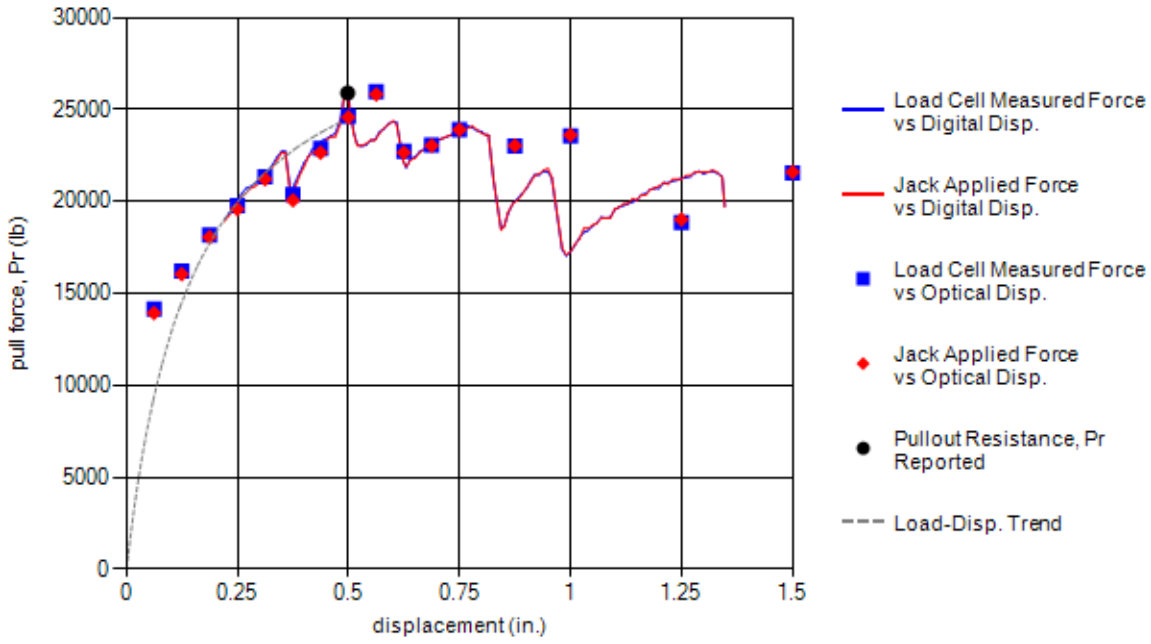
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.50	4881	25895	41.60	**0.39**

Load-Displacement Curve



Comments

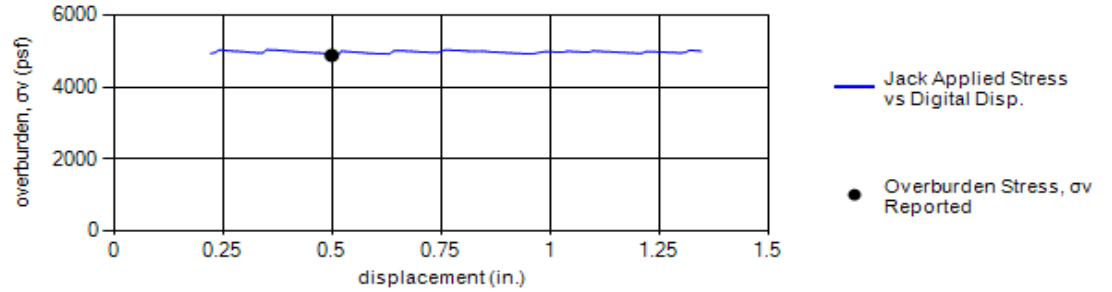
No earth pressure cell data. Digital displacement: pullout and elongation undifferentiated.

Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

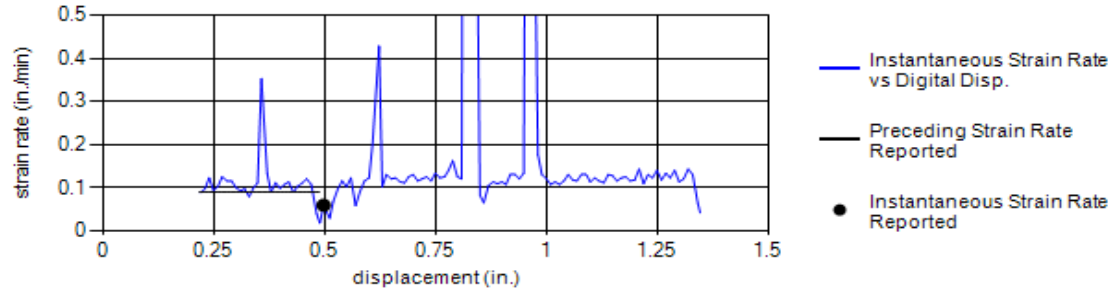
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.05	4881



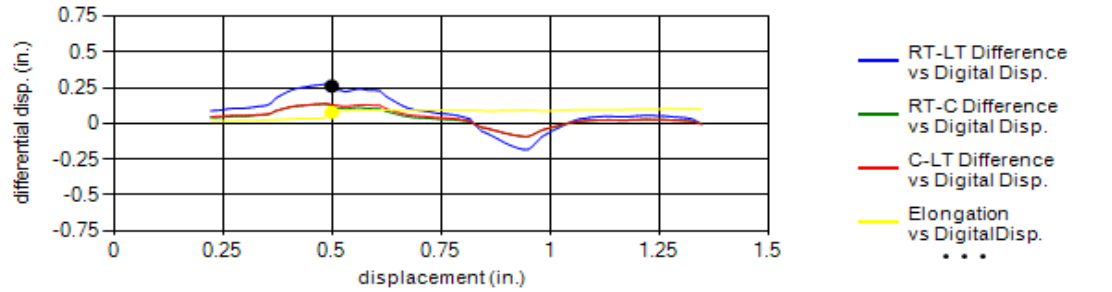
Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.09	0.10



Differential Displacement / Incidental Skew

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.26	0.13	0.13	0.08	0.83	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

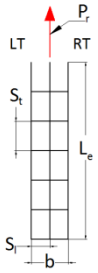
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/2/2011 10:27:00 AM
Test Identification:	TS38.09-G-9x18-W20xW7.5-L9-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

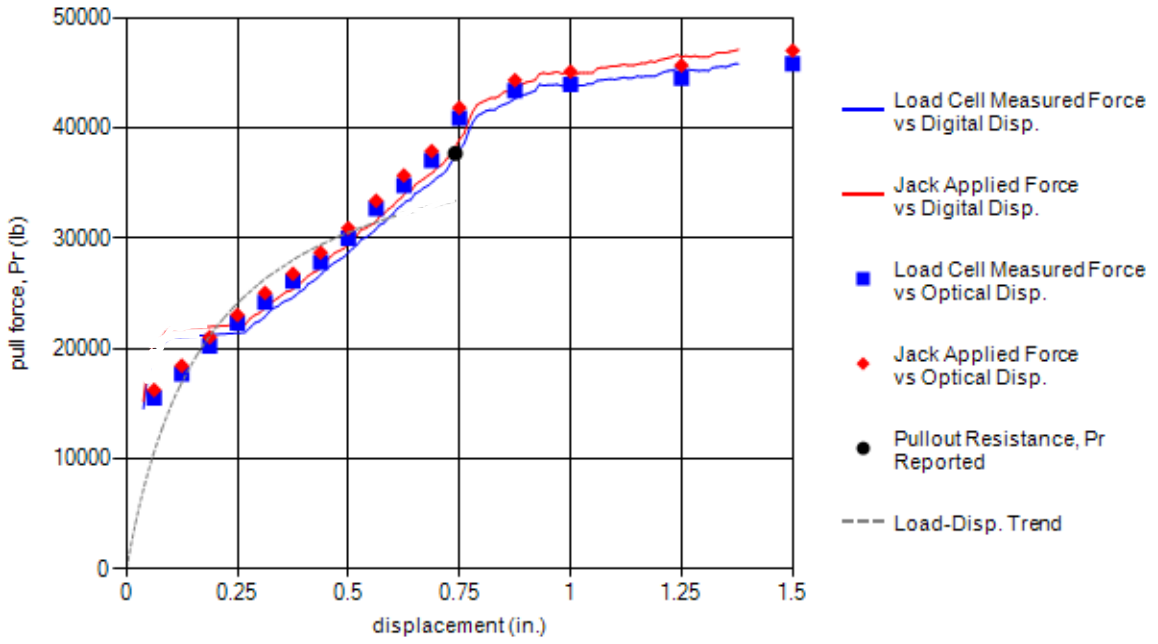
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	526	37671	4.50	**2.65**

Load-Displacement Curve



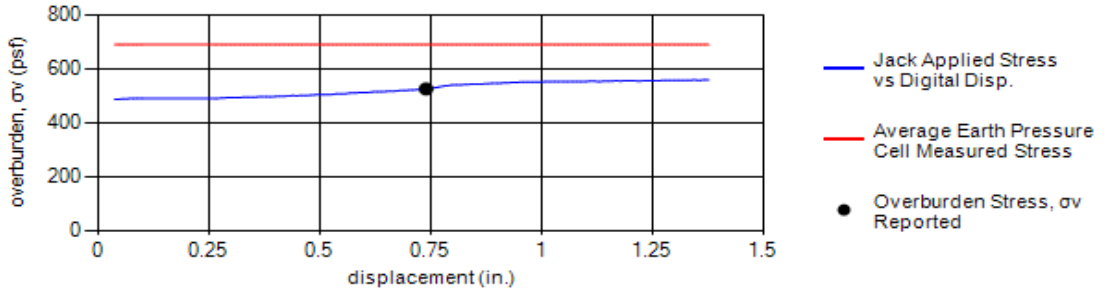
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

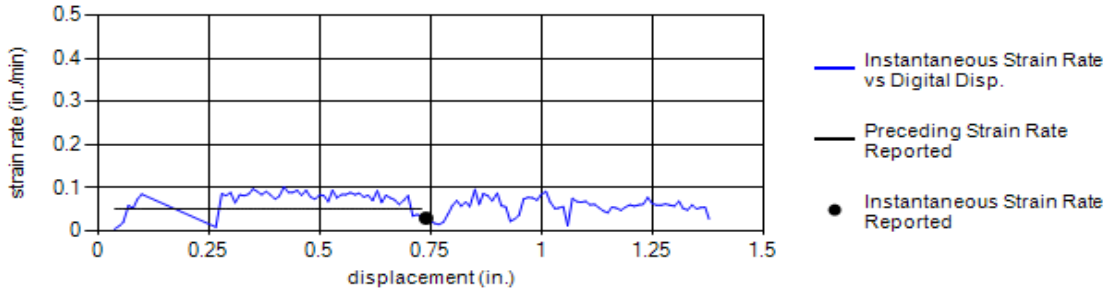
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1190	578	572	493	620	691	9.71	526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.03	0.05	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

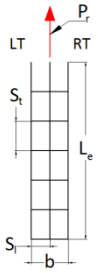
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/3/2011 1:13:00 PM
Test Identification:	TS38.10-G-9x18-W20xW7.5-L9-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

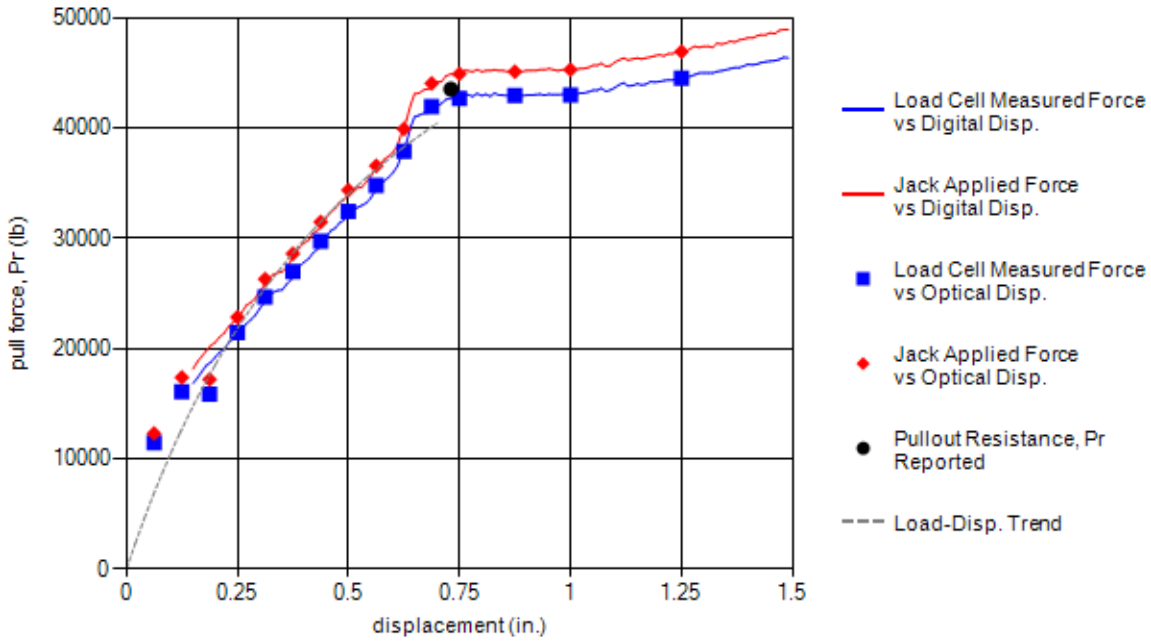
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	1484	43508	12.70	**1.09**

Load-Displacement Curve



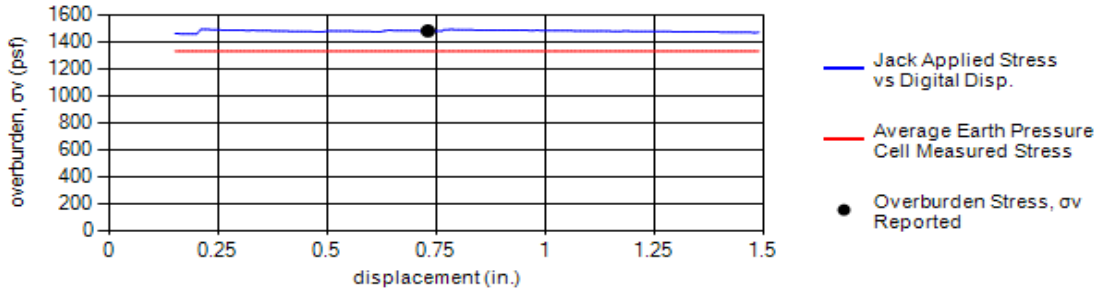
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

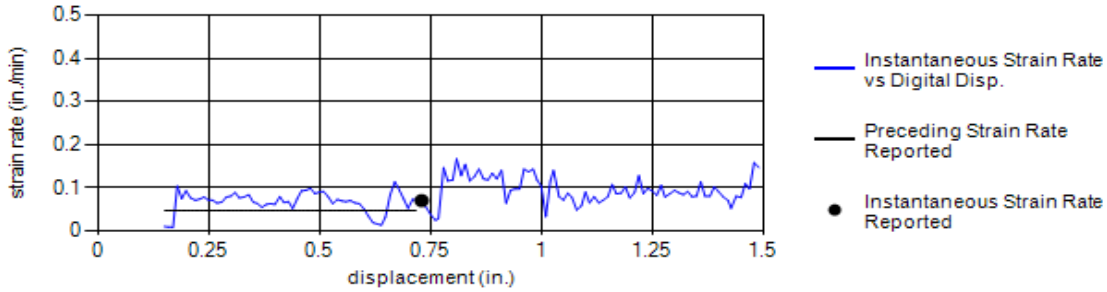
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1409	1240	1438	1372	1211	1334	4.03	1485



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.04	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

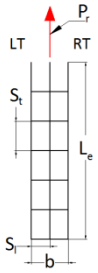
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/3/2011 2:51:00 PM
Test Identification:	TS38.11-G-9x18-W20xW7.5-L9-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

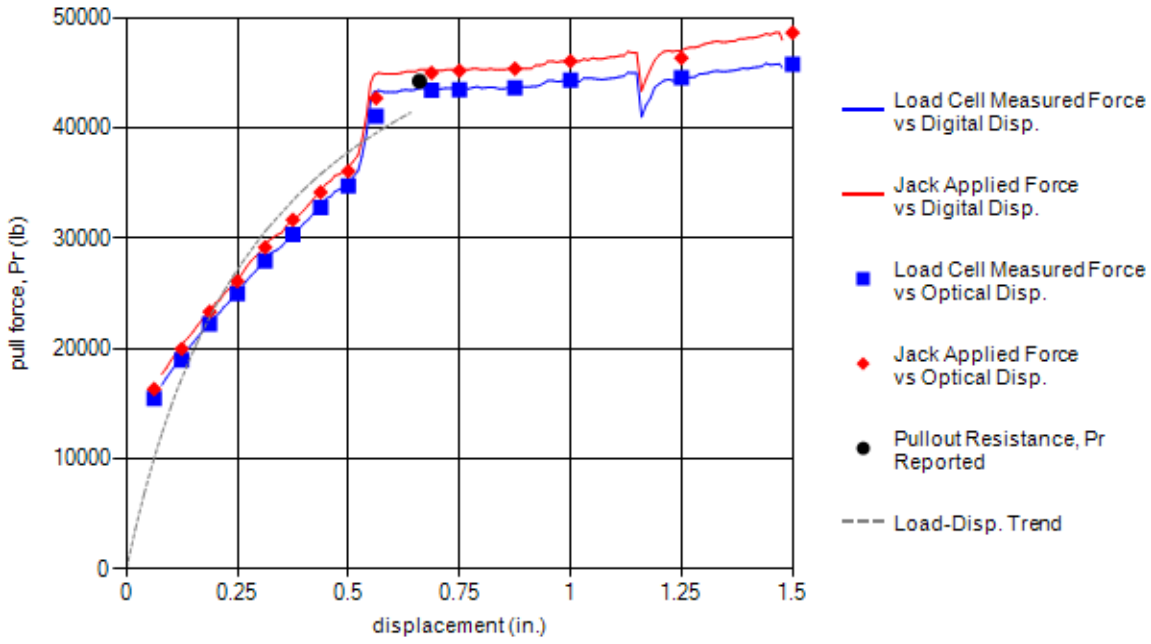
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.66	2461	44223	21.00	**0.67**

Load-Displacement Curve



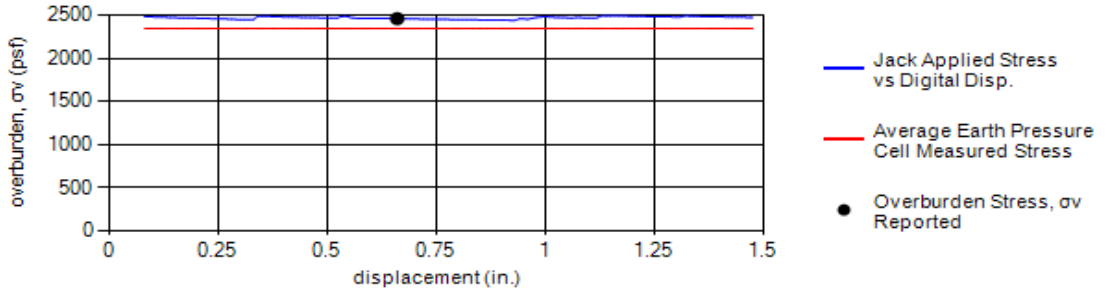
Comments

Digital displacement: pullout and elongation undifferentiated.

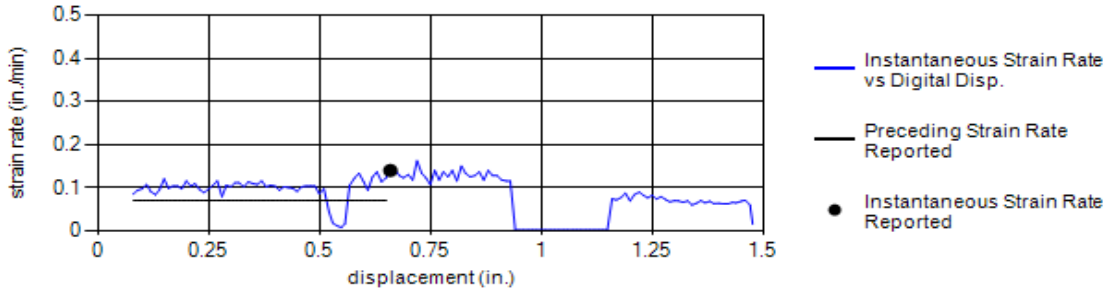
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

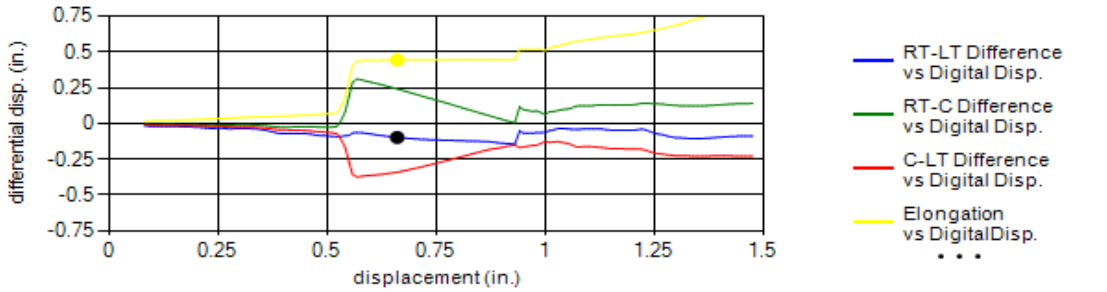
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2507	2037	2716	2366	2114	2348	2.29	2461



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.07	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.10	0.24	-0.34	0.45	-0.31	CW



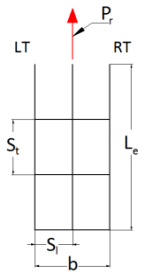
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/9/2011 10:42:00 AM
Test Identification:	TS38.12-G-9x18-W20xW7.5-L4.5-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.31	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

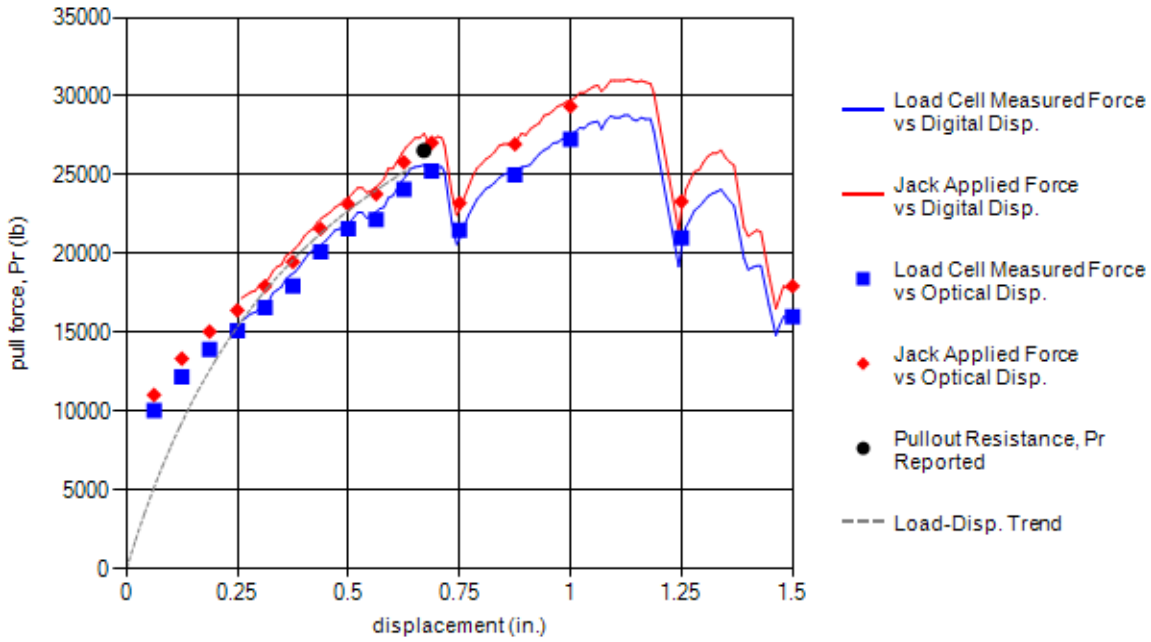
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.67	4957	26556	42.30	**0.40**

Load-Displacement Curve



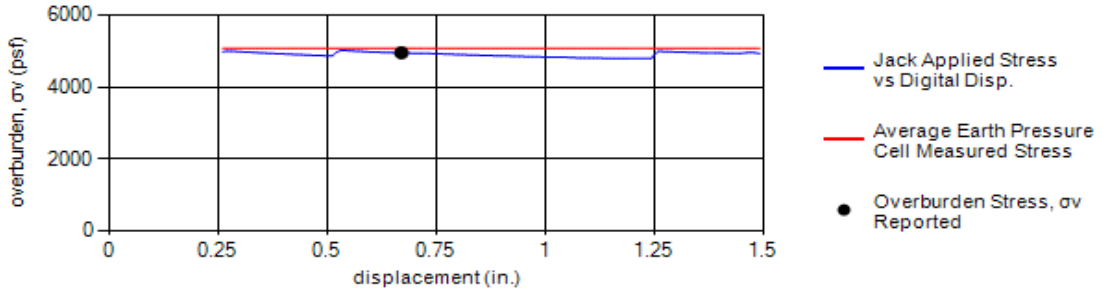
Comments

Digital displacement: pullout and elongation undifferentiated.

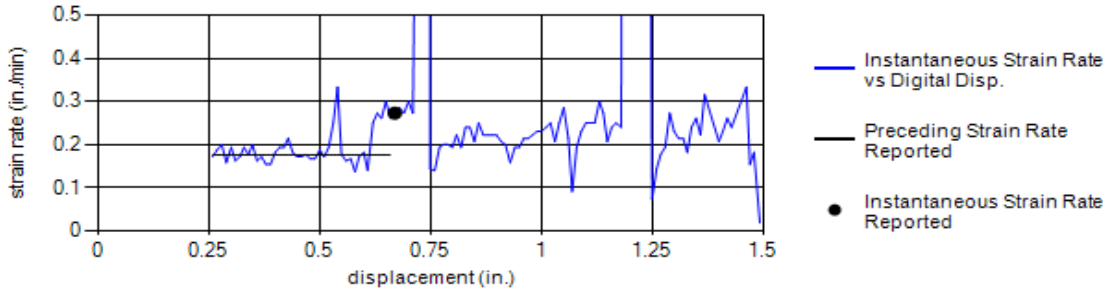
Personnel

Tested:	AS AS DH
Prepared:	SB TW
Checked:	WL PJ

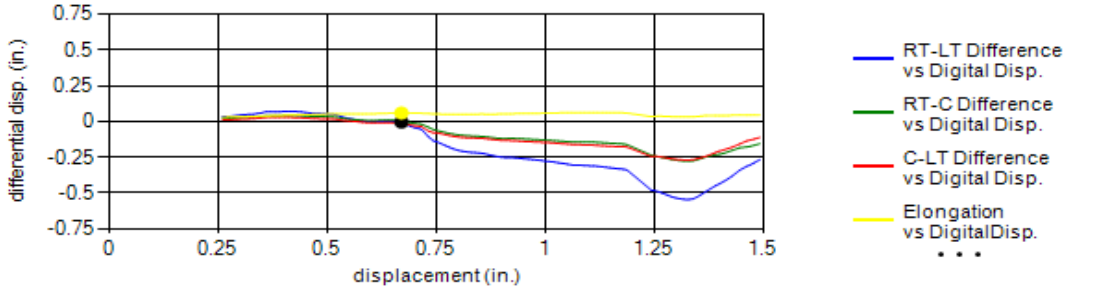
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5281	4320	5941	4978	4873	5079	1.08	4953



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.27	0.18	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	0.01	-0.01	0.06	-0.01	CW



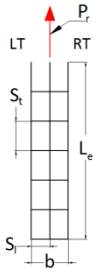
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 9:25:00 AM
Test Identification:	TS39.01-G-9x24-W20xW15-L12-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

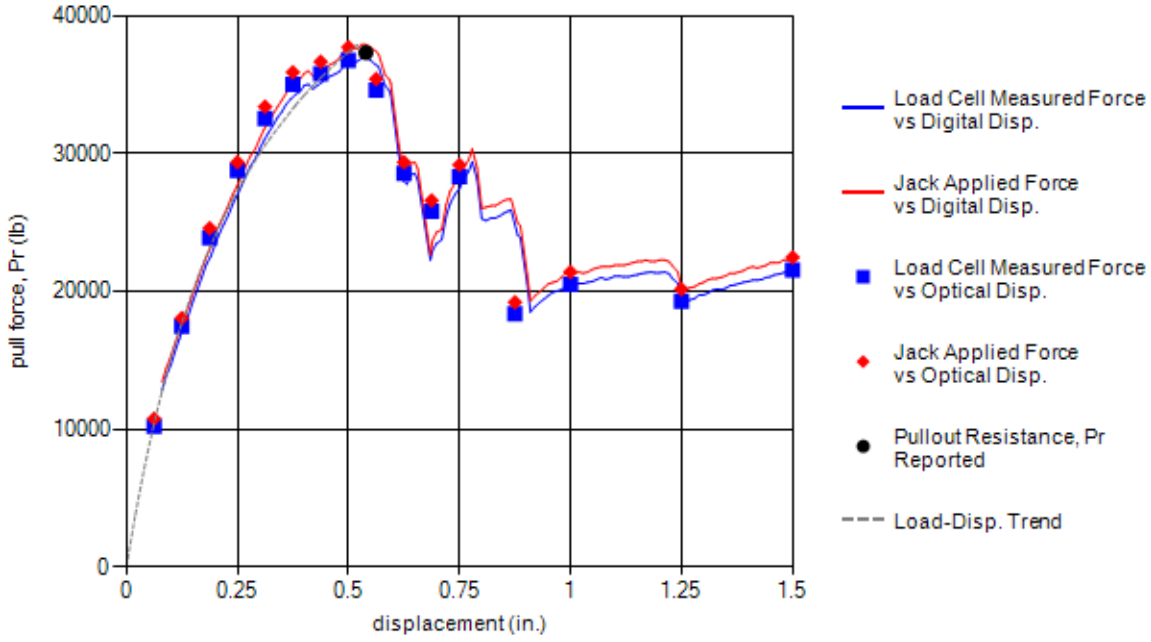
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.54	646	37301	5.40	**1.60**

Load-Displacement Curve



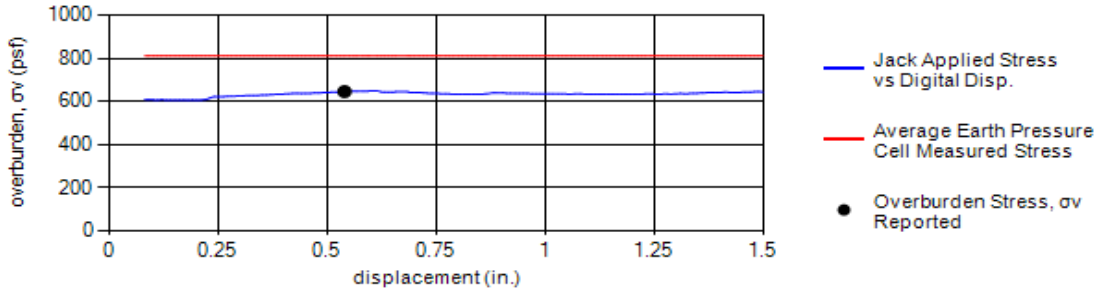
Comments

Digital displacement: pullout and elongation undifferentiated.

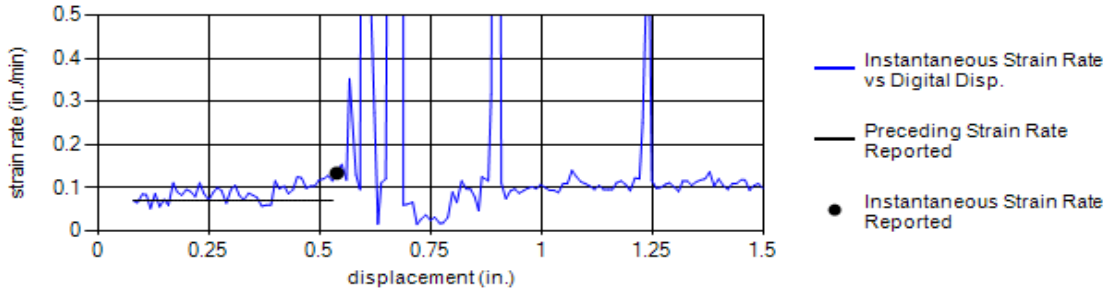
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

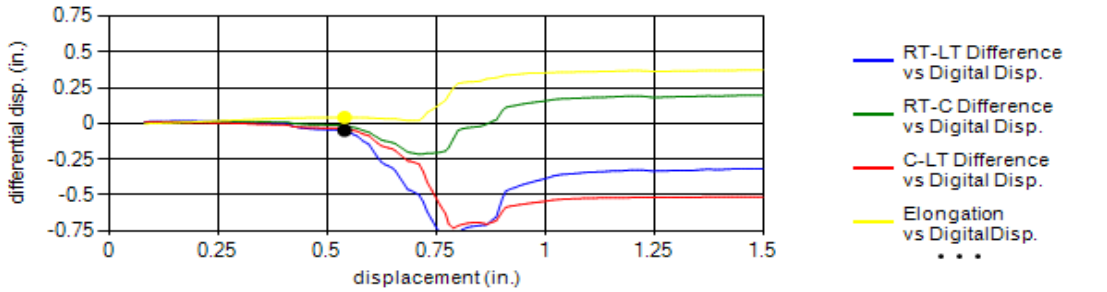
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1043	295	930	923	865	811	1.11	646



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.05	-0.01	-0.03	0.04	-0.15	CW



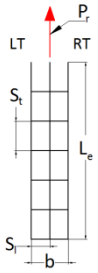
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 10:19:00 AM
Test Identification:	TS39.02-G-9x24-W20xW15-L12-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

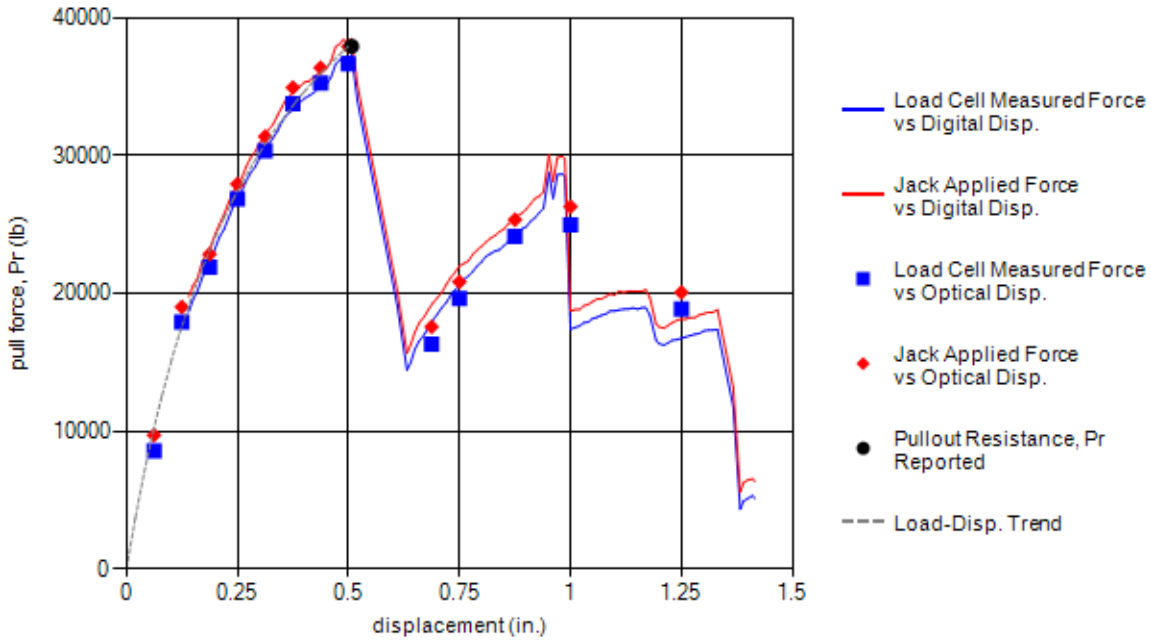
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.51	1494	37909	12.60	**0.70**

Load-Displacement Curve



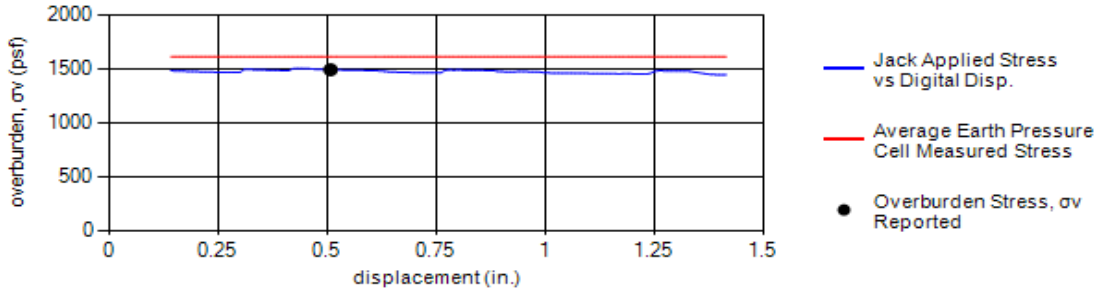
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

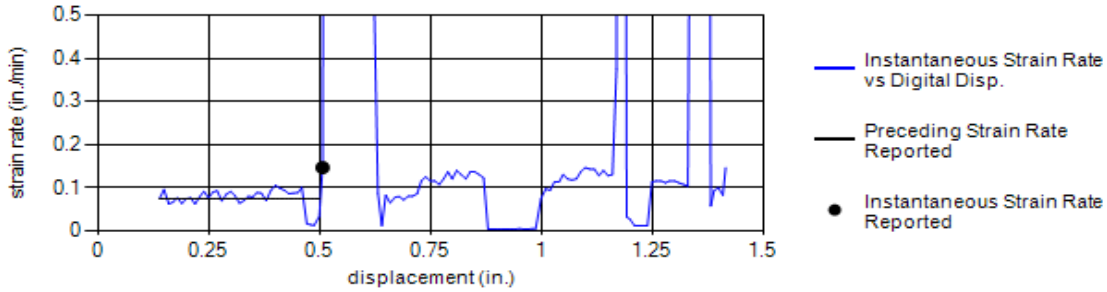
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1807	951	1895	1862	1569	1617	1.03	1494



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

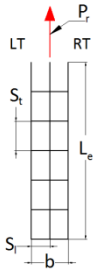
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 11:05:00 AM
Test Identification:	TS39.03-G-9x24-W20xW15-L12-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

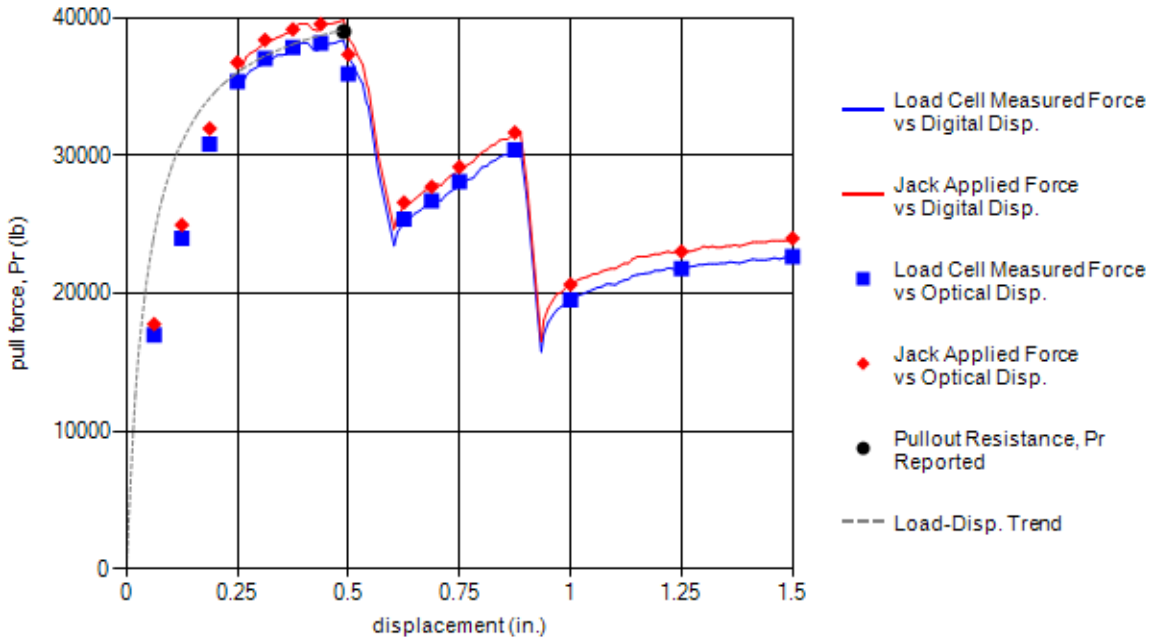
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.49	2490	38981	21.00	**0.43**

Load-Displacement Curve



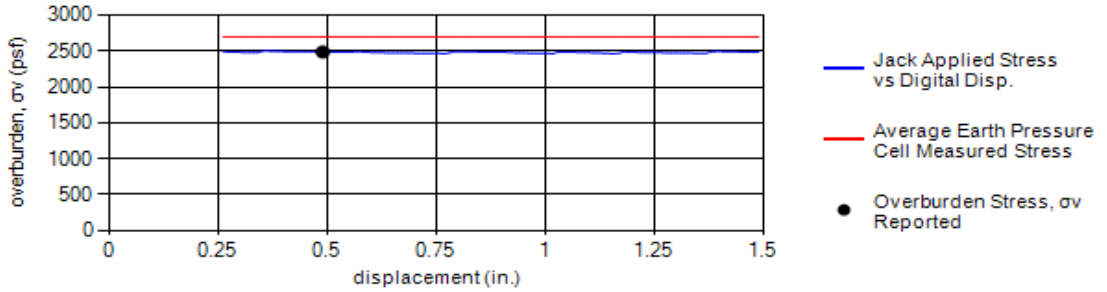
Comments

Digital displacement: pullout and elongation undifferentiated.

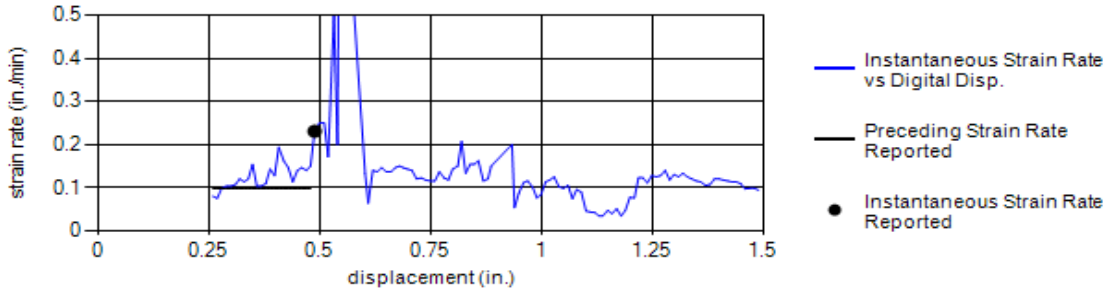
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

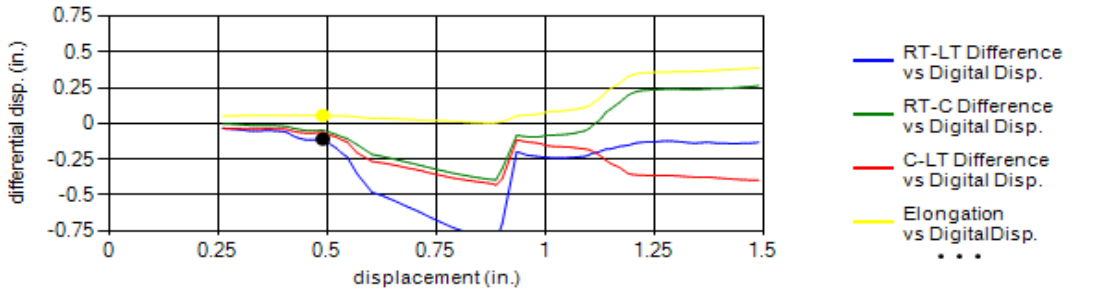
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2907	1829	3197	2932	2616	2696	1.03	2490



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.23	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.11	-0.05	-0.06	0.06	-0.35	CW



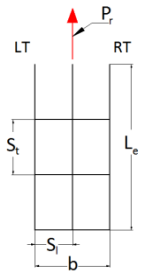
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 1:28:00 PM
Test Identification:	TS39.04-G-9x24-W20xW15-L6-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

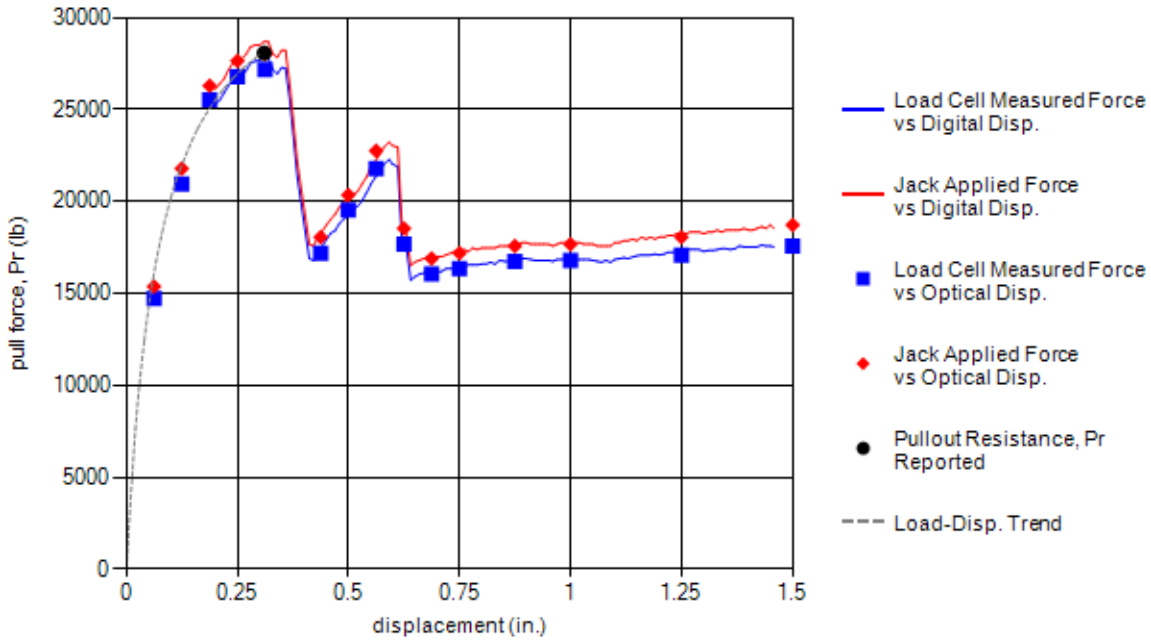
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.31	5082	28060	42.80	**0.31**

Load-Displacement Curve



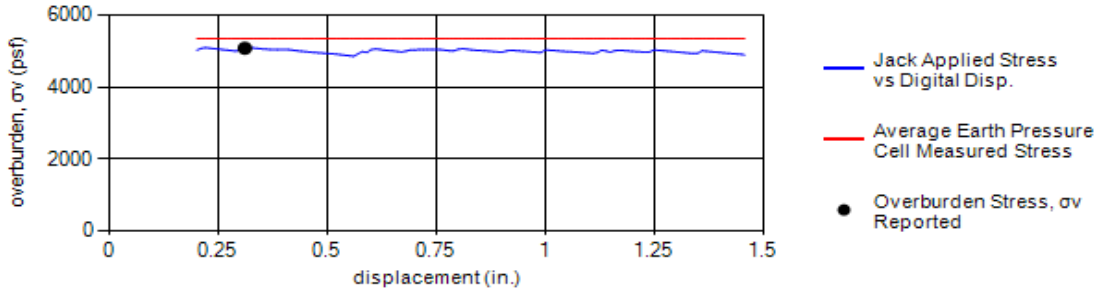
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

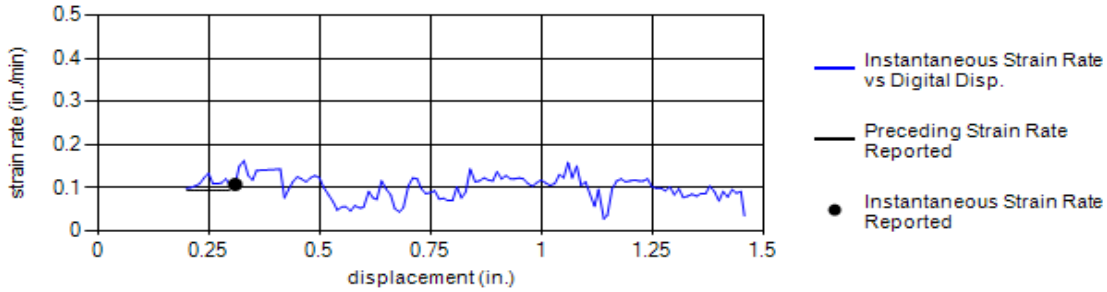
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5949	3952	6221	5505	5135	5352	1.01	5082



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

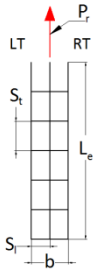
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/1/2011 2:17:00 PM
Test Identification:	TS39.05-G-9x24-W20xW15-L12-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

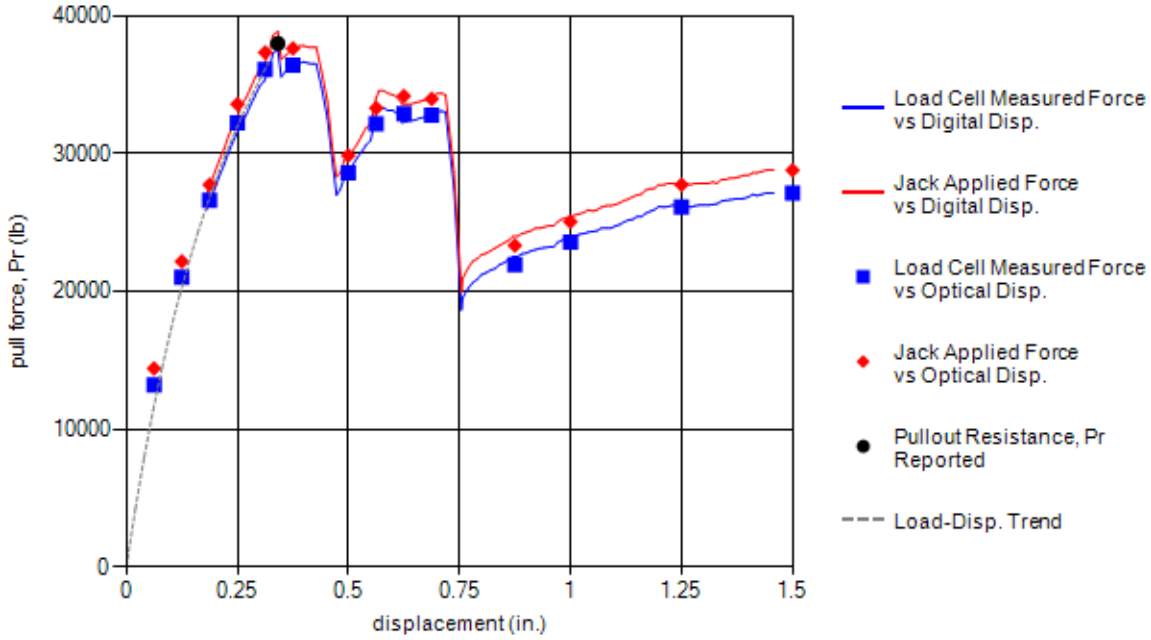
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.34	661	37964	5.60	**1.59**

Load-Displacement Curve



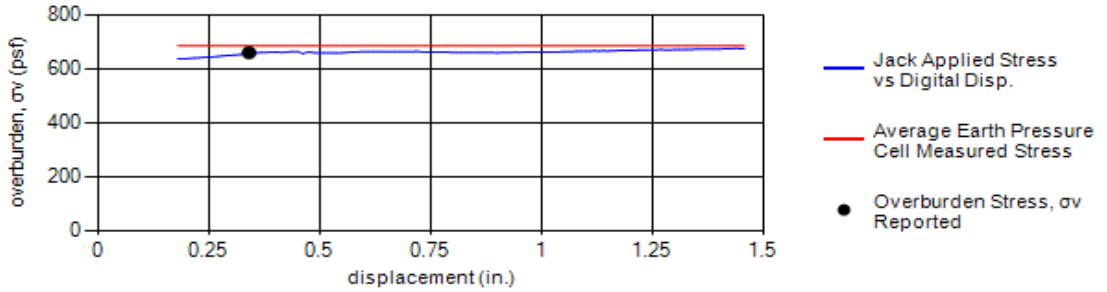
Comments

No incidental skew data. Digital displacement: pullout and elongation undifferentiated.

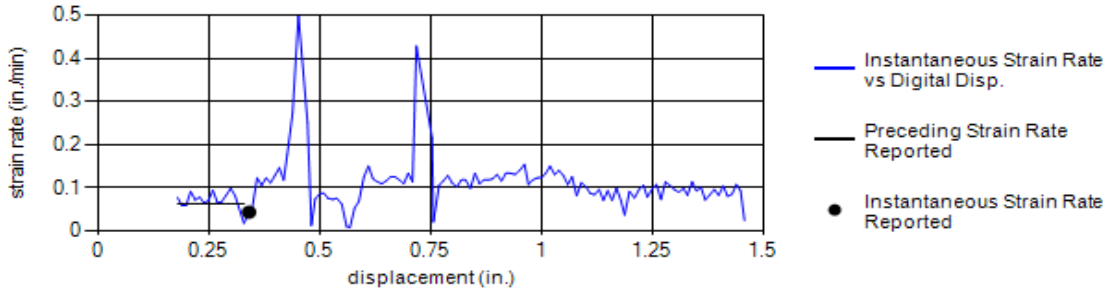
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
946	268	684	821	711	686	7.86	661



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

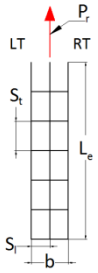
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/1/2011 1:38:00 PM
Test Identification:	TS39.06-G-9x24-W20xW15-L12-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

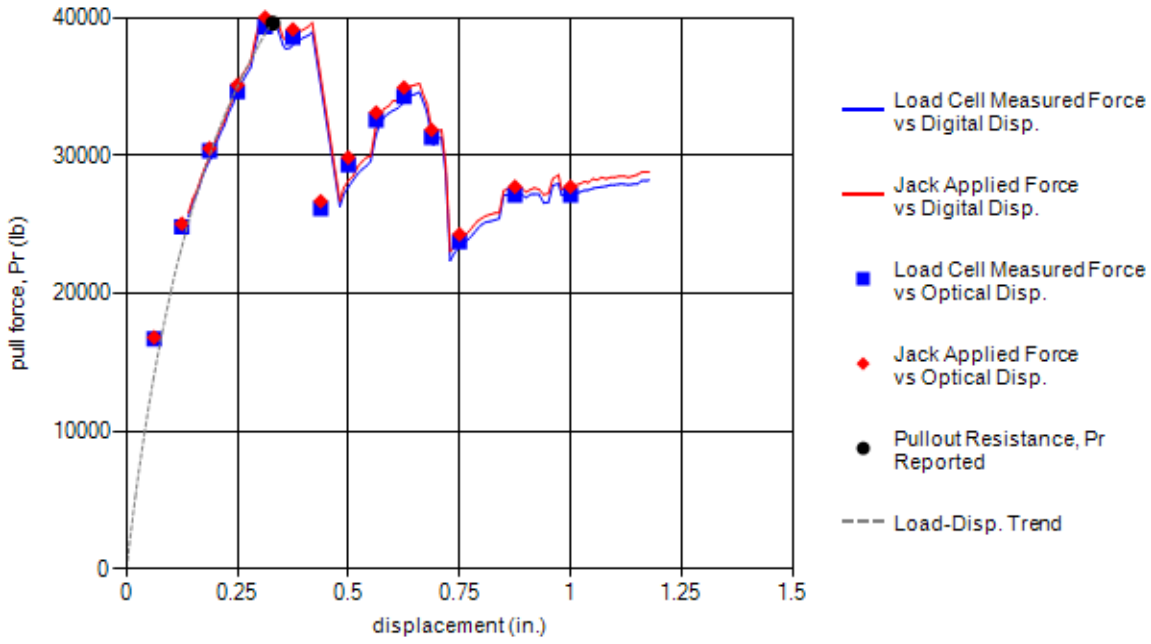
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.33	1487	39579	12.50	**0.74**

Load-Displacement Curve



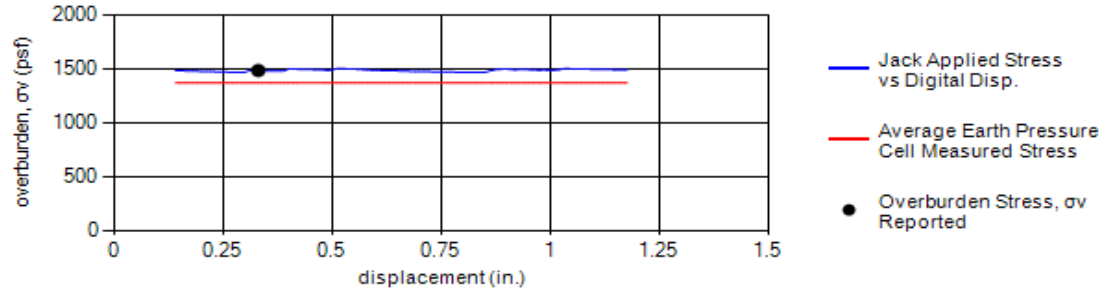
Comments

Digital displacement: pullout and elongation undifferentiated.

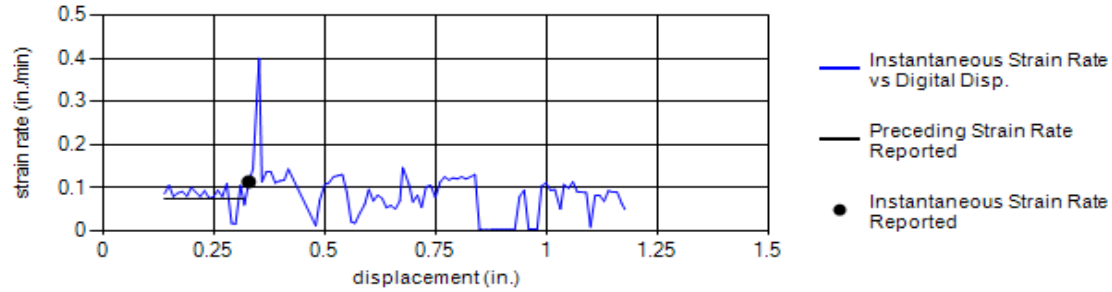
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

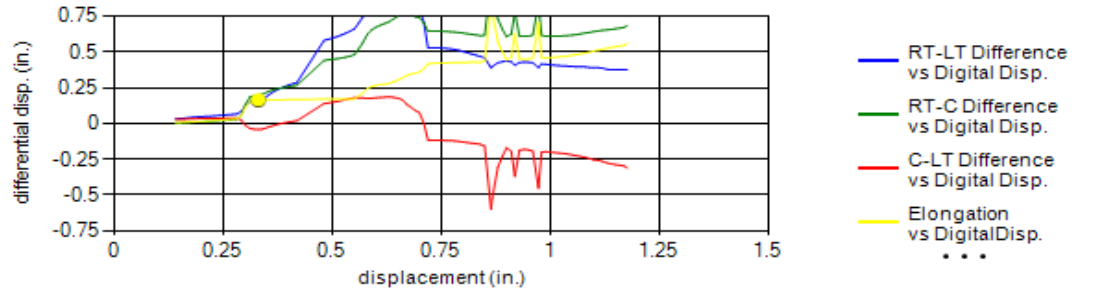
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1434	816	1680	1511	1414	1371	3.89	1487



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.16	0.20	-0.04	0.17	0.51	CCW



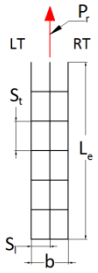
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/30/2011 3:14:00 PM
Test Identification:	TS39.07-G-9x24-W20xW15-L12-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

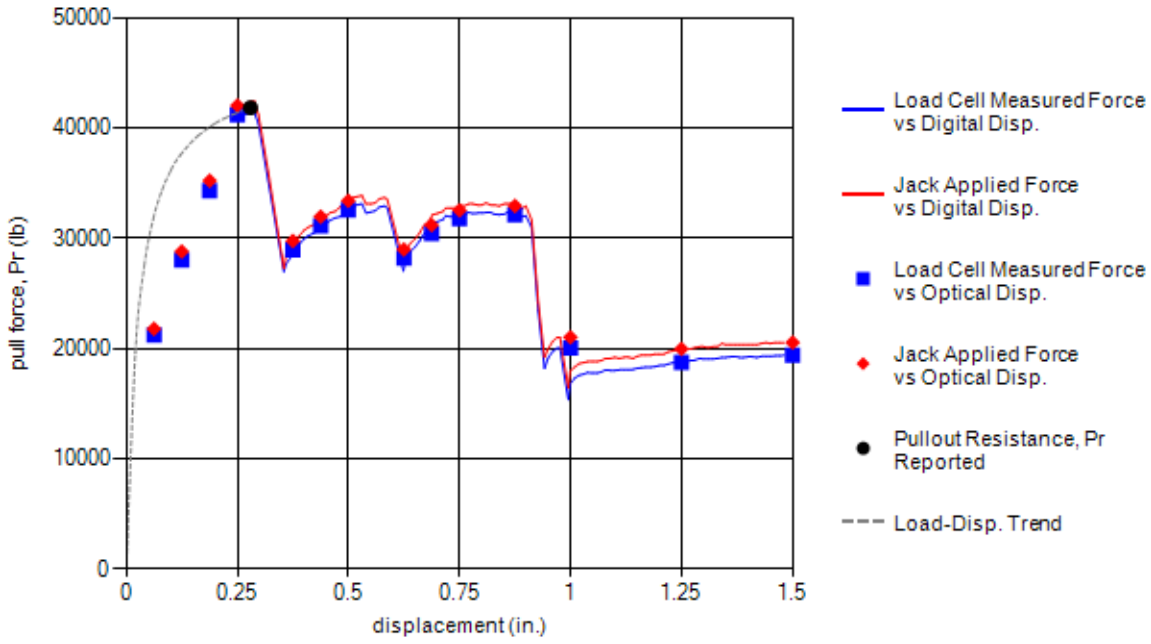
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.28	2473	41817	20.90	**0.47**

Load-Displacement Curve



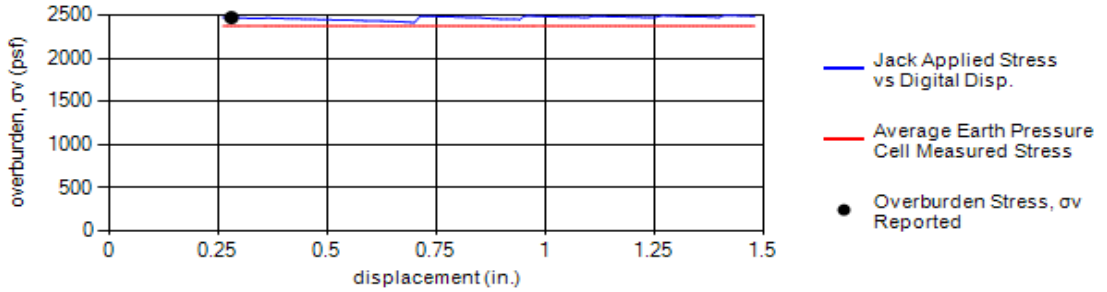
Comments

Digital displacement: pullout and elongation undifferentiated.

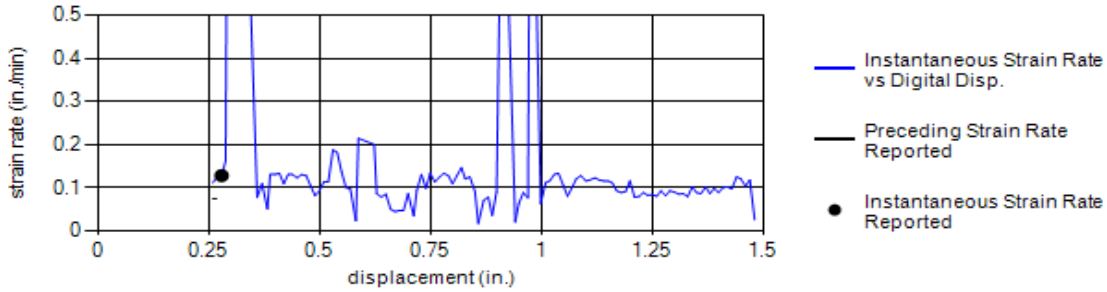
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

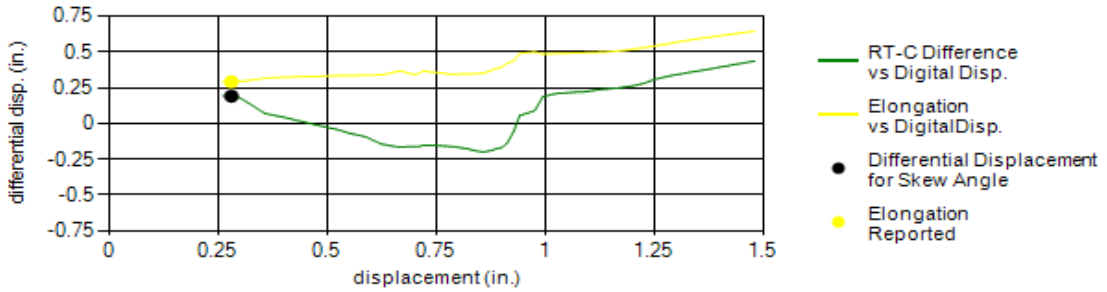
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2435	1538	2908	2572	2428	2376	2.24	2473



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	0.19	No Data	0.29	0.31	CCW



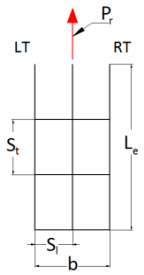
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/28/2011 10:15:00 AM
Test Identification:	TS39.08-G-9x24-W20xW15-L6-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

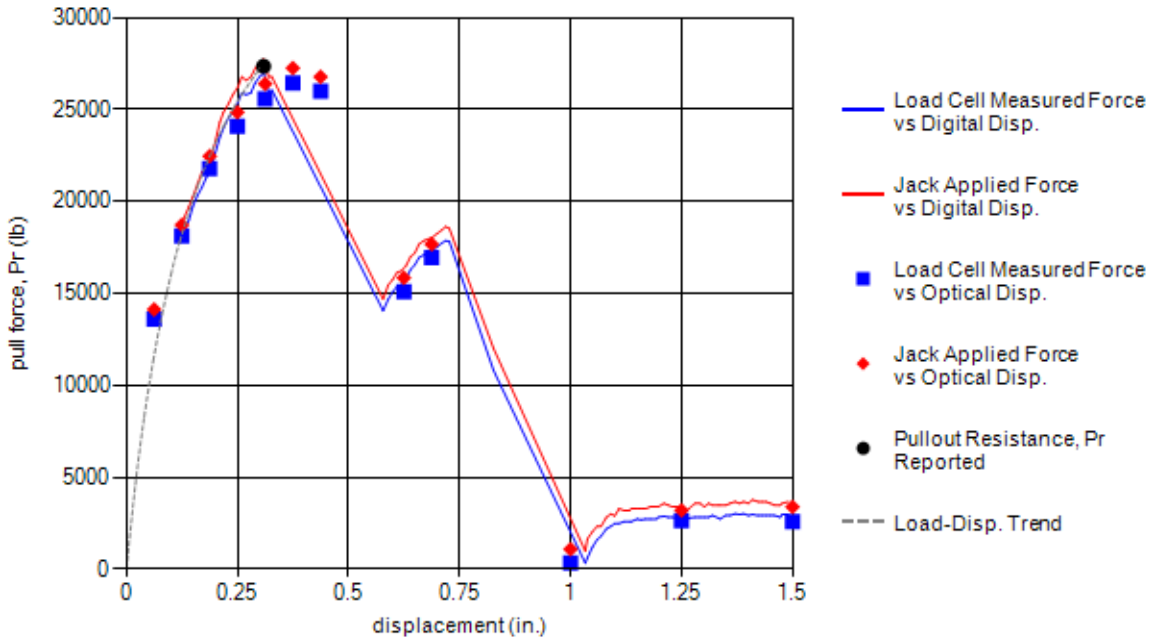
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.31	5023	27341	42.40	**0.30**

Load-Displacement Curve



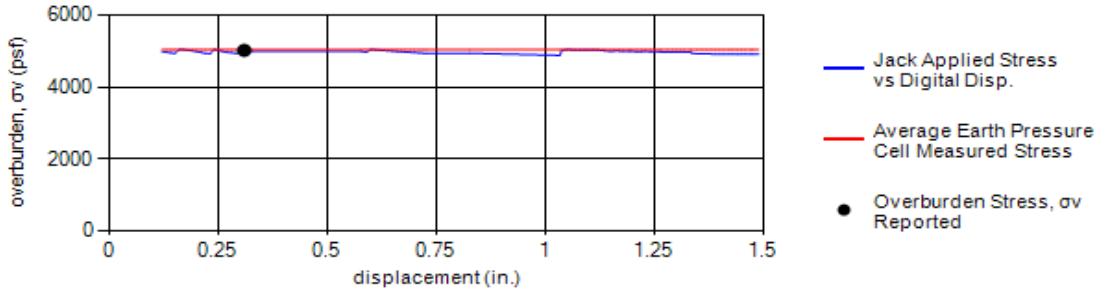
Comments

Digital displacement: pullout and elongation undifferentiated.

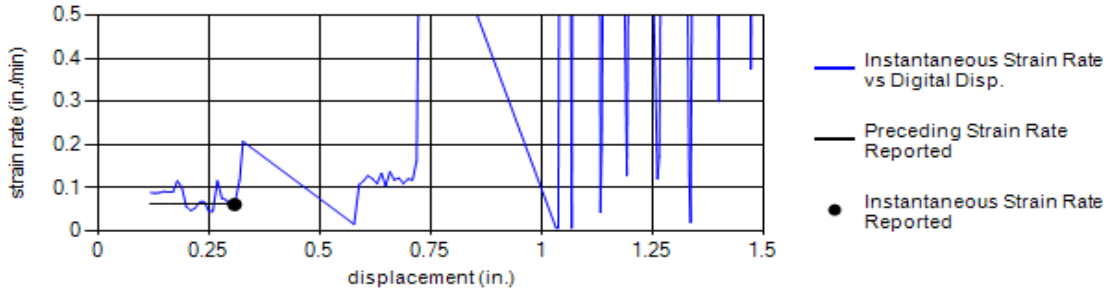
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

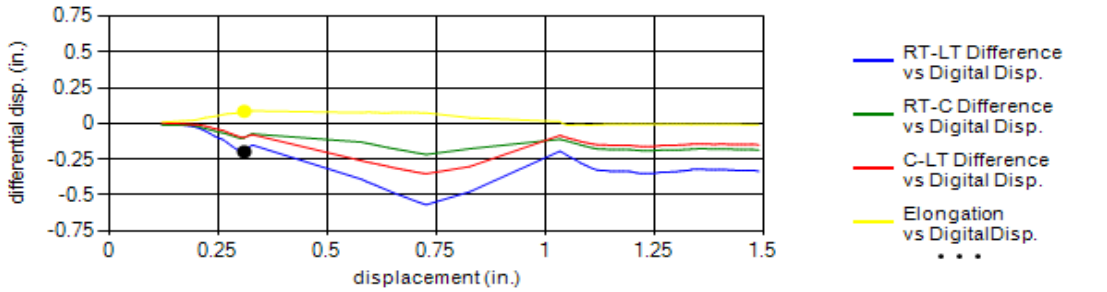
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5440	3432	6094	5199	5056	5044	1.06	5023



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.06	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.20	-0.10	-0.10	0.09	-0.63	CW



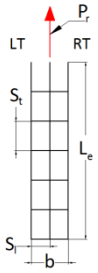
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 2:12:00 PM
Test Identification:	TS39.09-G-9x24-W20xW15-L12-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

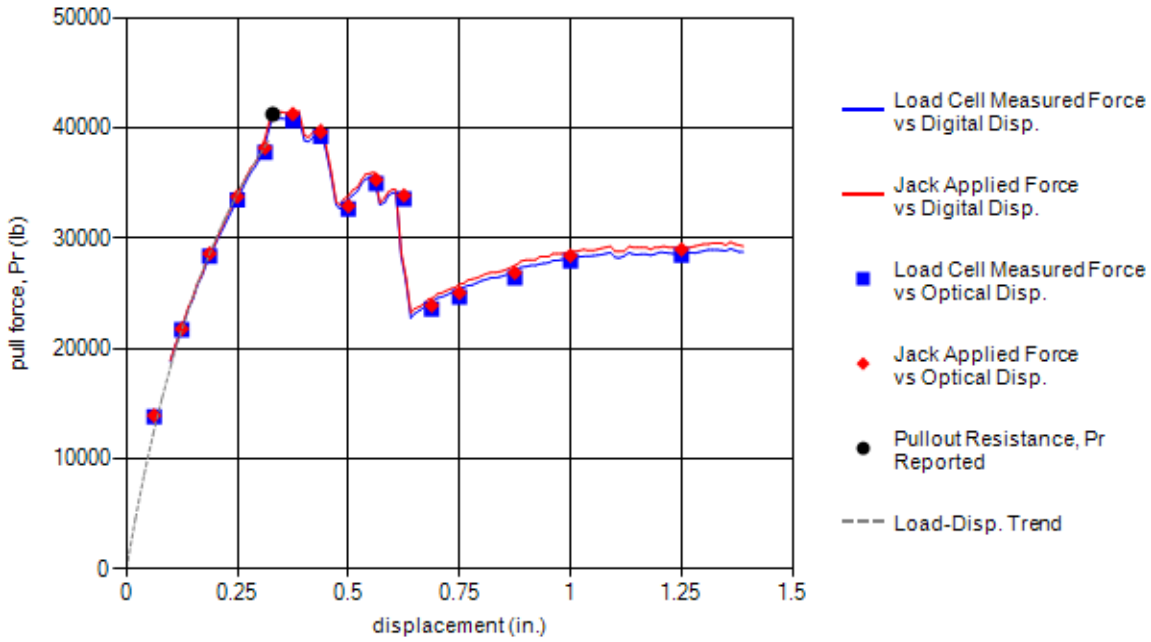
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.33	619	41224	5.20	**1.85**

Load-Displacement Curve



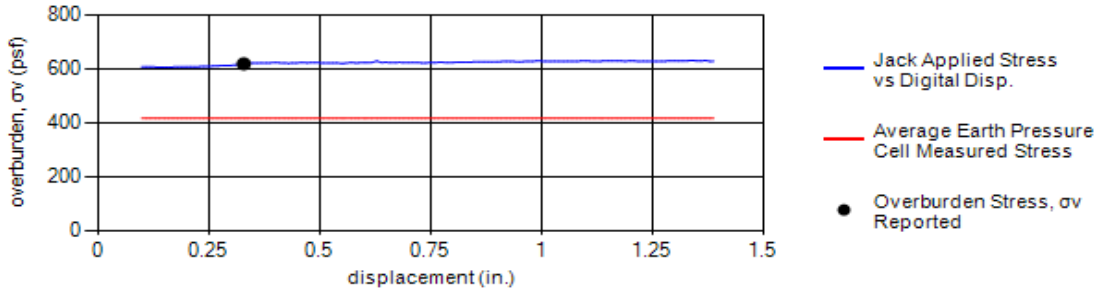
Comments

Digital displacement: pullout and elongation undifferentiated.

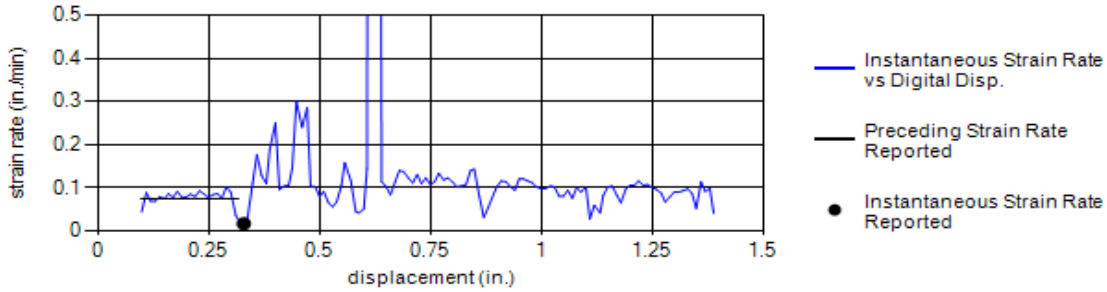
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

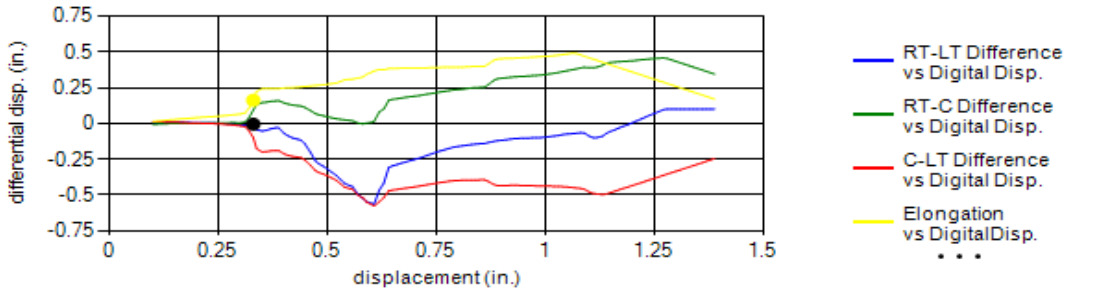
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
348	143	412	691	492	417	12.47	620



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	0.09	-0.10	0.16	-0.01	CW



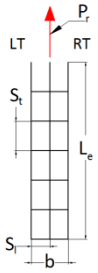
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 3:09:00 PM
Test Identification:	TS39.10-G-9x24-W20xW15-L12-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

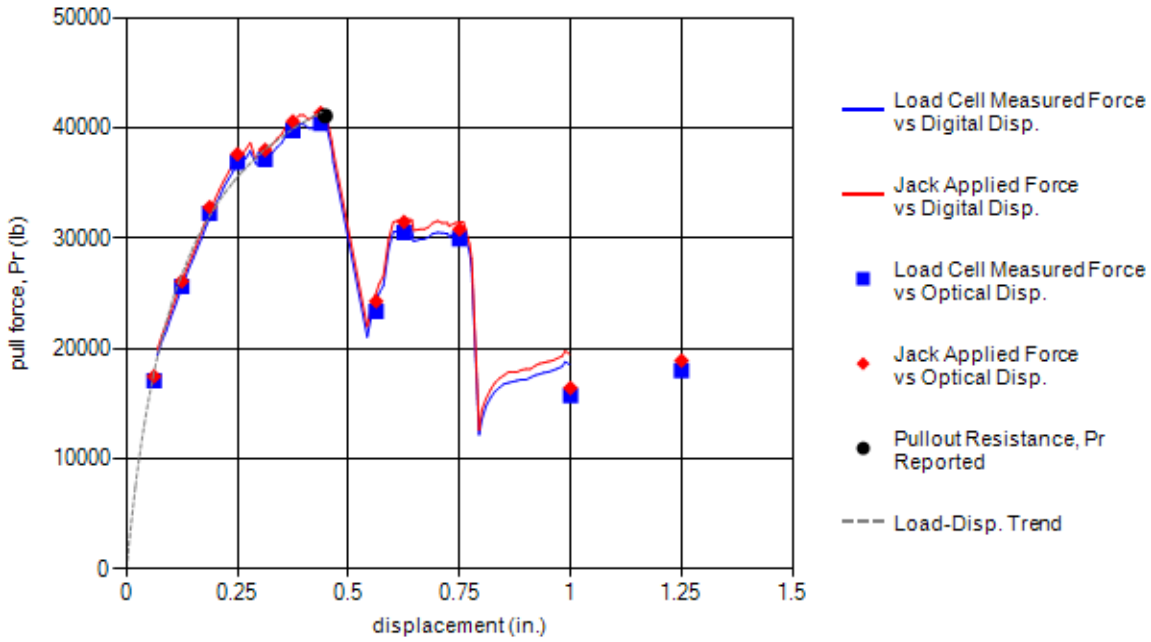
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.45	1480	41077	12.50	**0.77**

Load-Displacement Curve



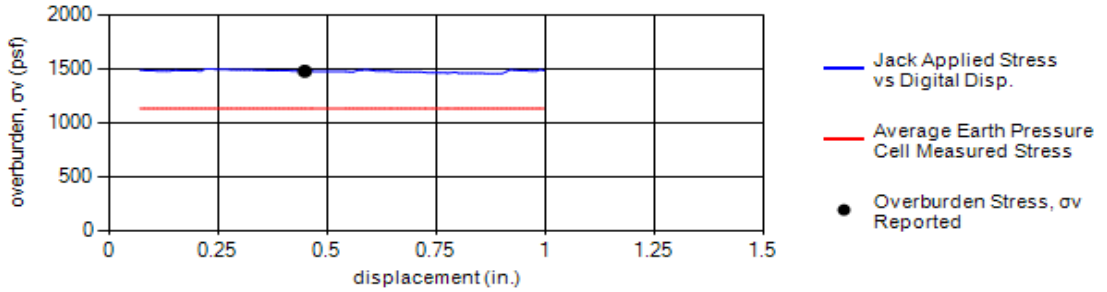
Comments

Digital displacement: pullout and elongation undifferentiated.

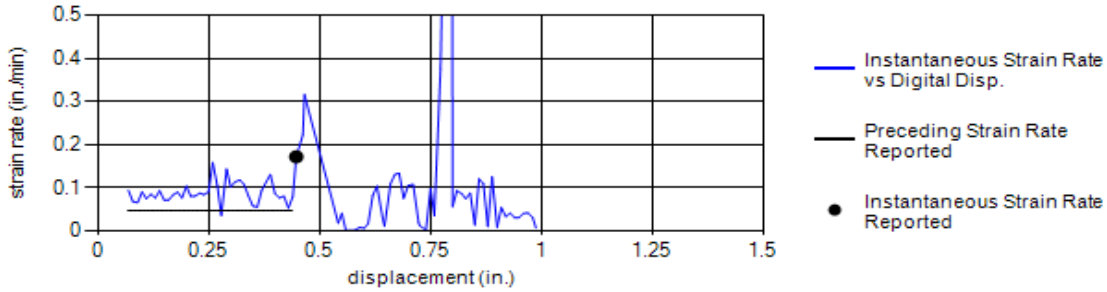
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

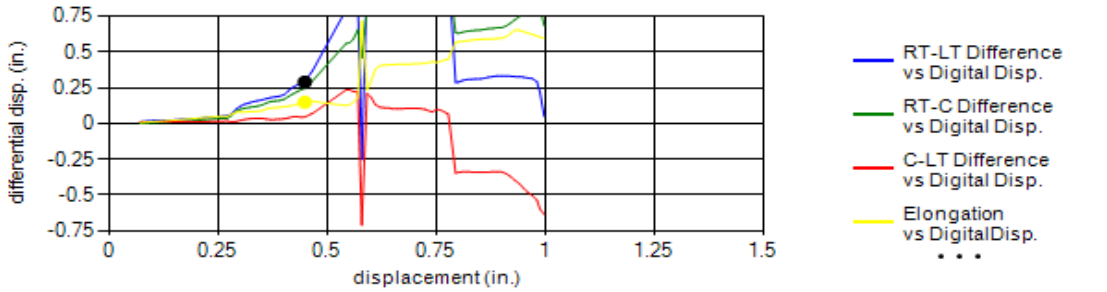
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1161	704	1266	1366	1178	1135	4.59	1480



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.04	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.29	0.24	0.05	0.15	0.92	CCW



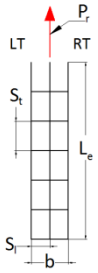
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/22/2011 3:56:00 PM
Test Identification:	TS39.11-G-9x24-W20xW15-L12-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	12.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

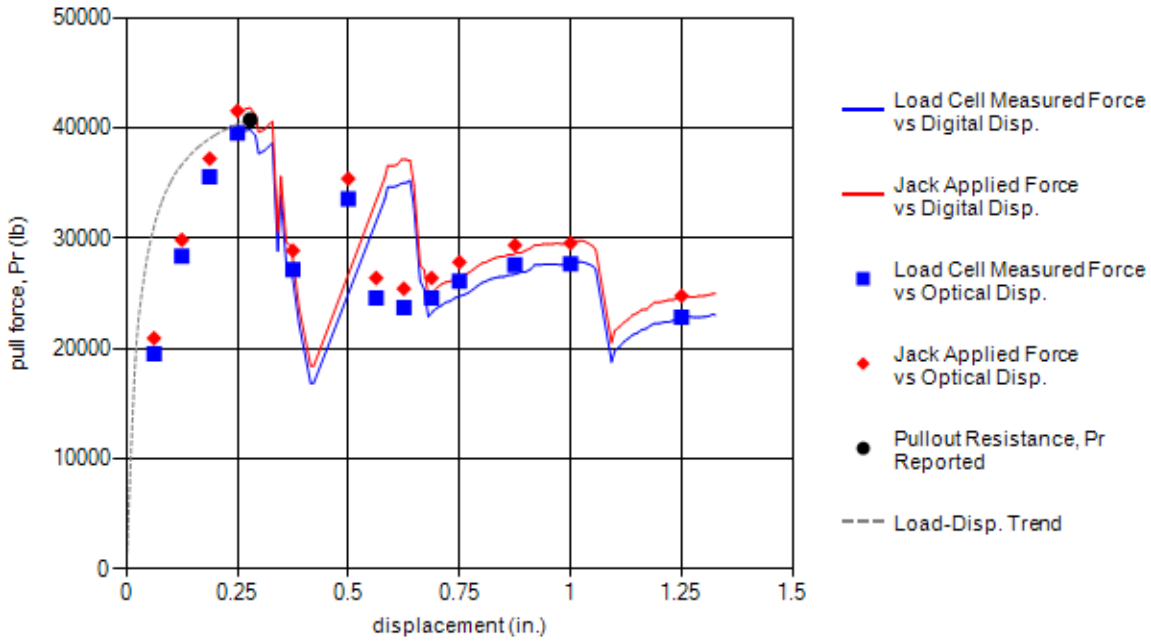
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Progressive Rupture	0.28	2460	40727	20.70	**0.46**

Load-Displacement Curve



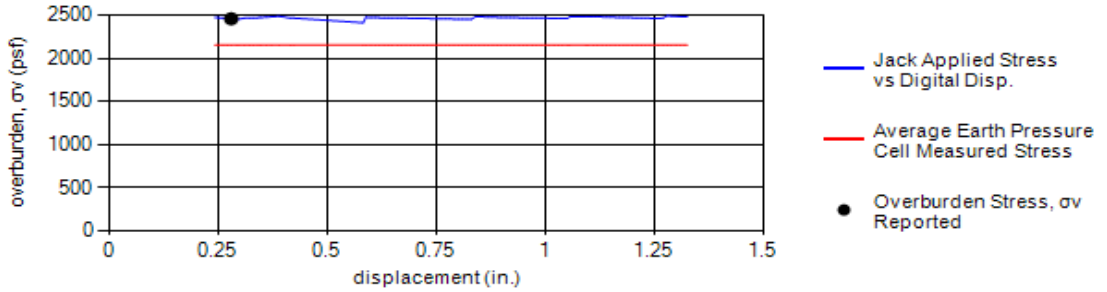
Comments

Digital displacement: pullout and elongation undifferentiated.

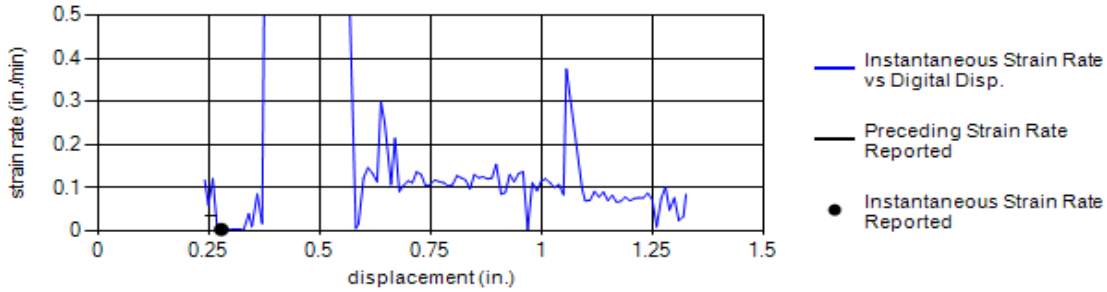
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

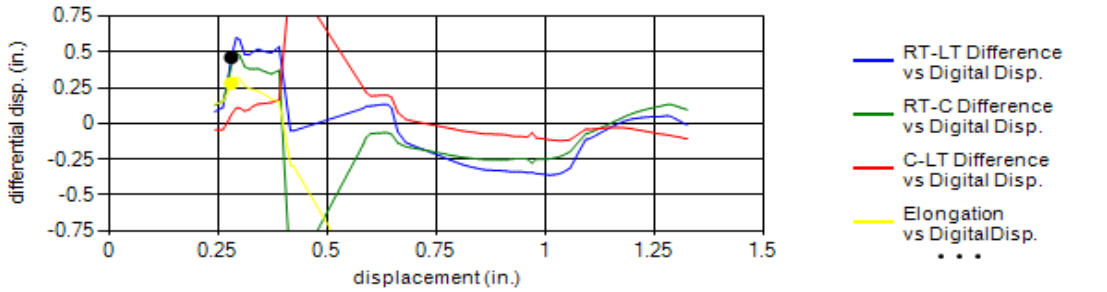
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2208	1494	2534	2387	2149	2154	2.42	2460



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.00	0.03	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.46	0.40	0.06	0.28	1.47	CCW



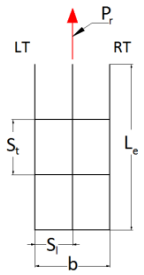
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	11/28/2011 9:07:00 AM
Test Identification:	TS39.12-G-9x24-W20xW15-L6-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

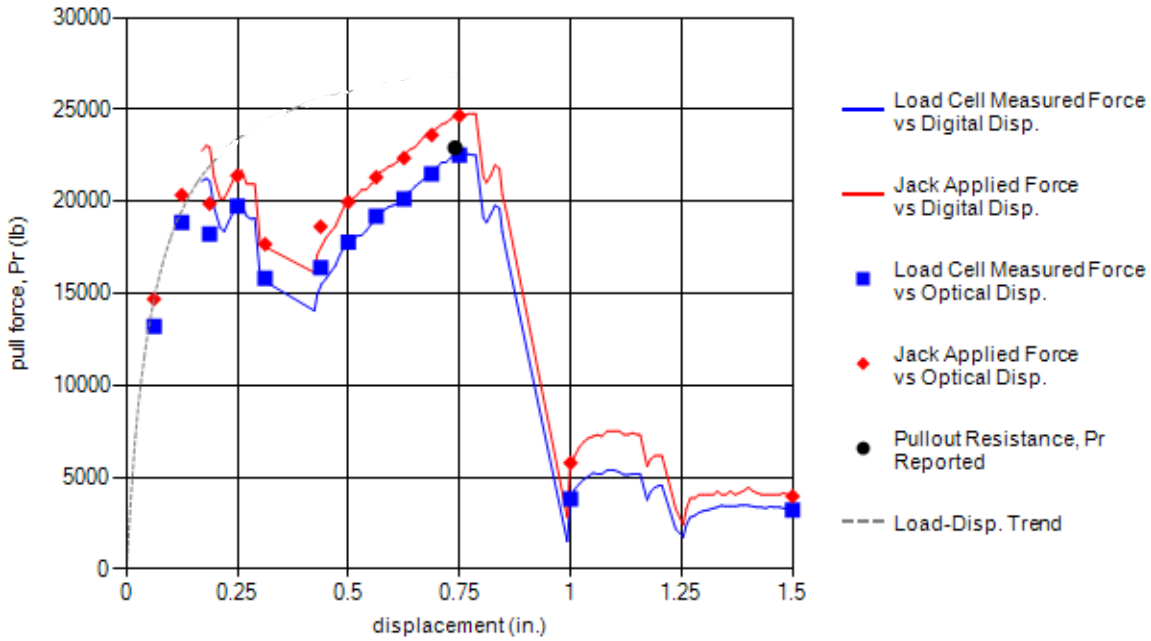
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.74	4966	22913	41.90	**0.26**

Load-Displacement Curve



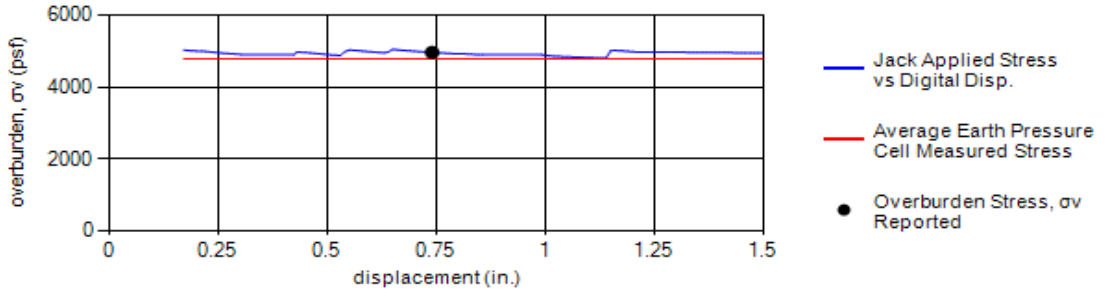
Comments

Digital displacement: pullout and elongation undifferentiated.

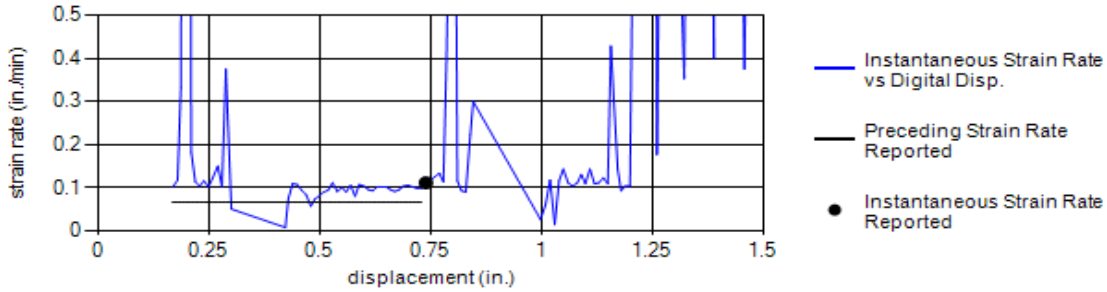
Personnel

Tested:	AS AS MN
Prepared:	SB TW
Checked:	WL PJ

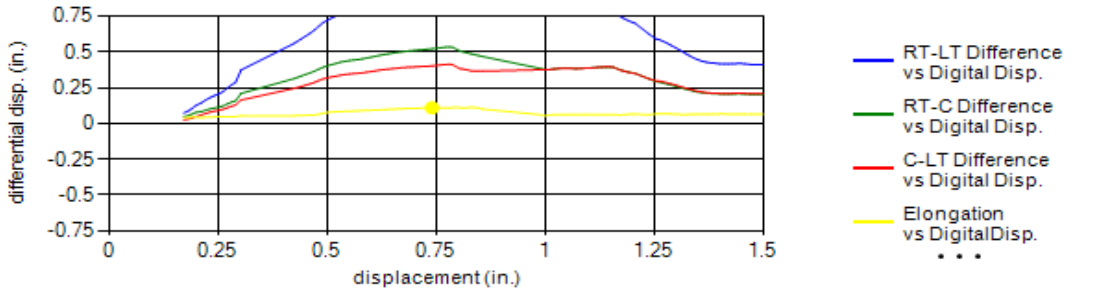
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5074	3436	5733	4925	4737	4781	1.09	4966



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.93	0.52	0.40	0.11	2.94	CCW



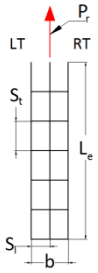
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/18/2011 7:18:00 PM
Test Identification:	TS40.01-G-2x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

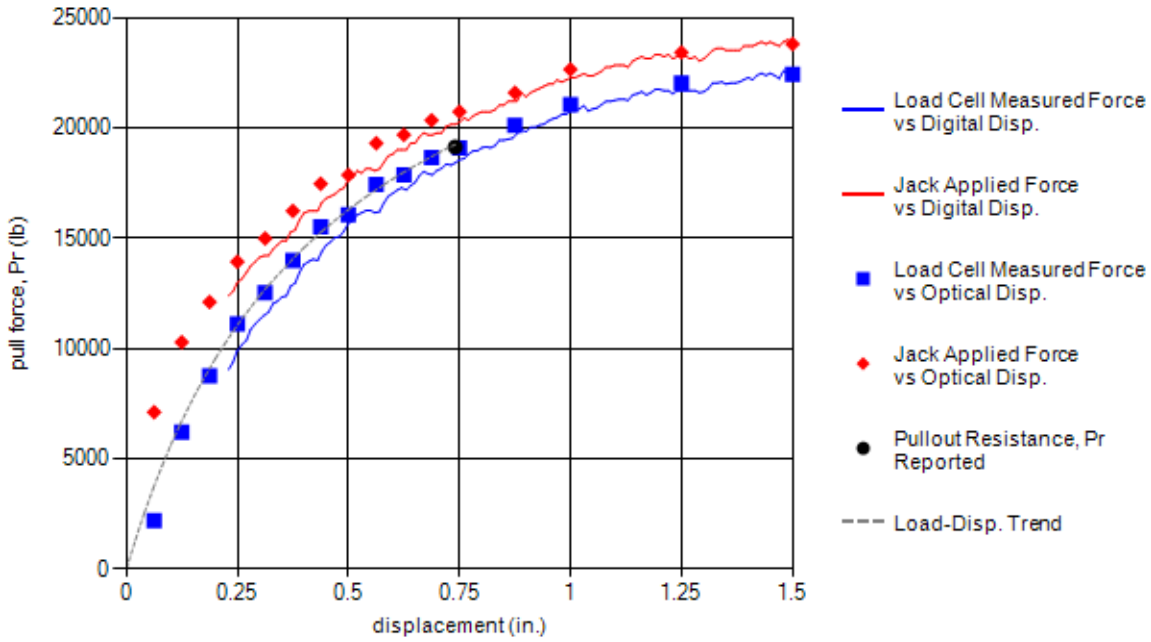
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	647	19127	5.40	**7.39**

Load-Displacement Curve

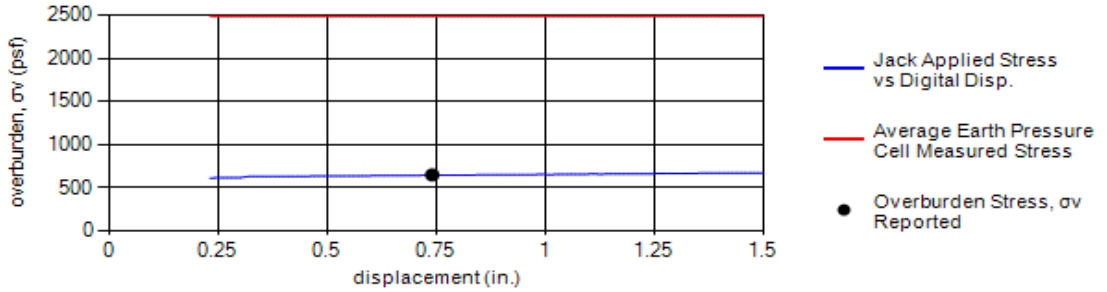


Comments

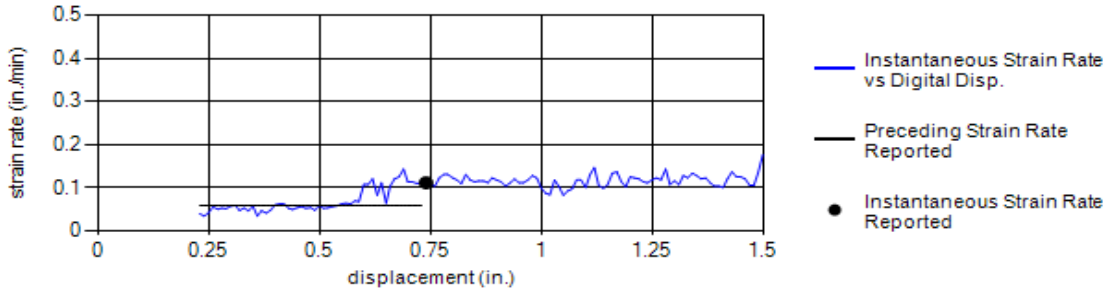
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

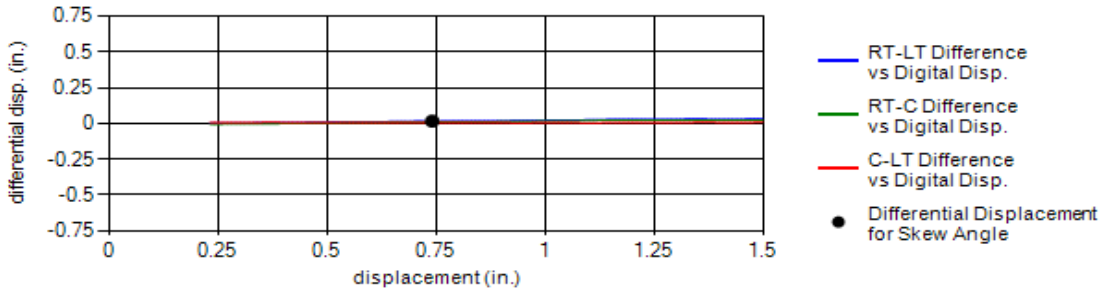
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2596	2559	2409	2407	2466	2487	3.70	643



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	0.01	0.01	No Data	0.24	CCW



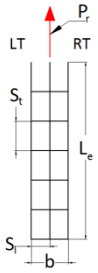
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/18/2011 8:54:00 AM
Test Identification:	TS40.02-G-12x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

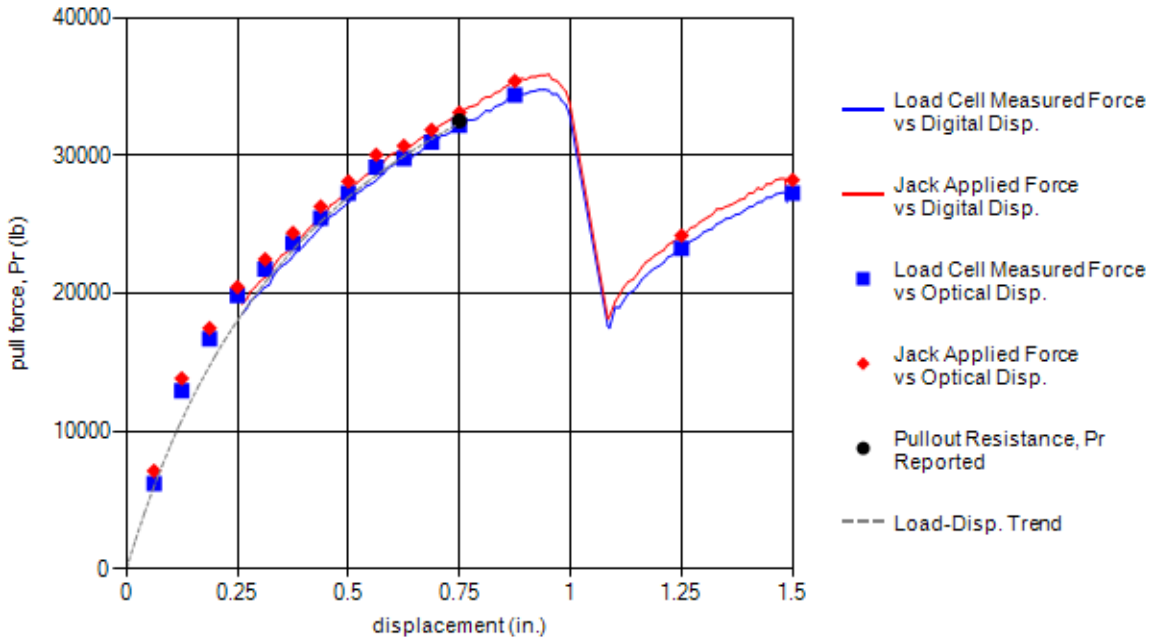
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	683	32498	5.70	**1.98**

Load-Displacement Curve

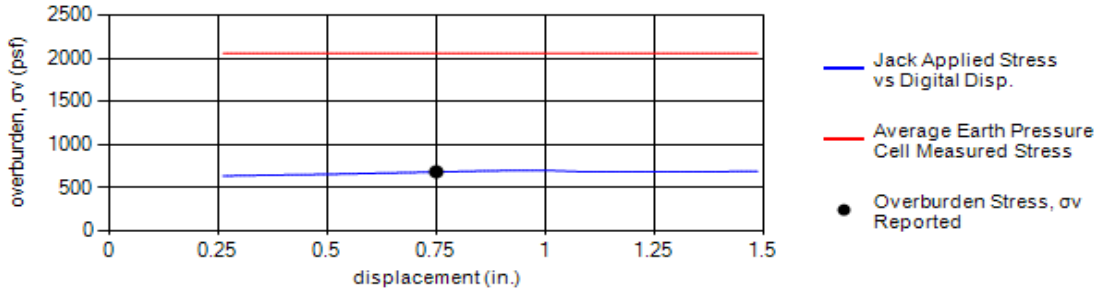


Comments

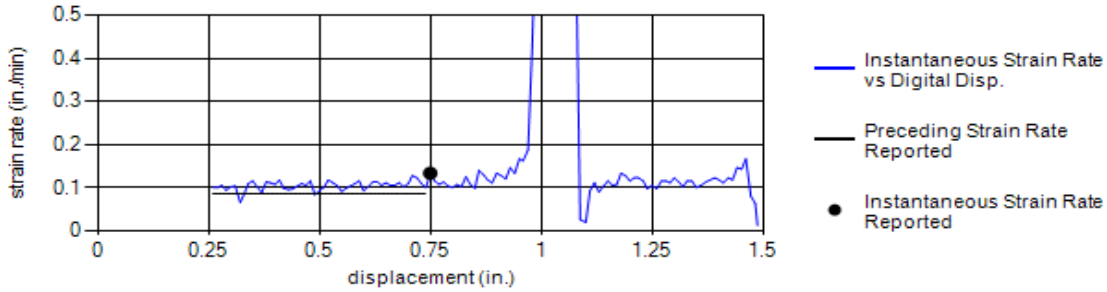
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

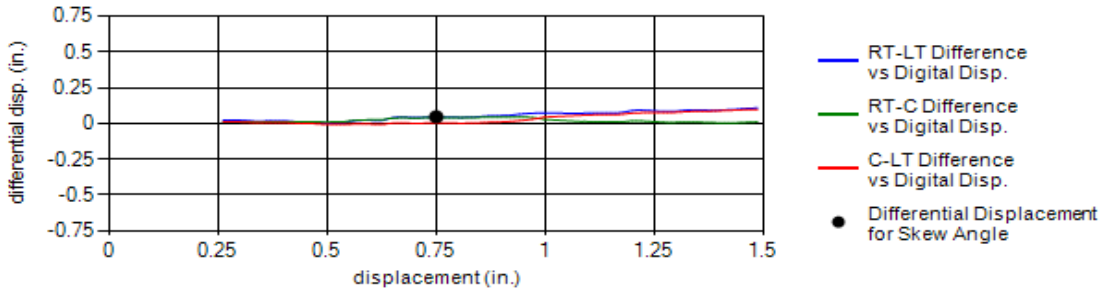
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1927	2299	1973	2017	2086	2060	3.51	682



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.04	0.00	No Data	0.11	CCW



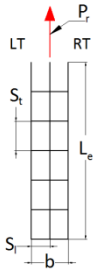
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/18/2011 8:08:00 AM
Test Identification:	TS40.03-G-2x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

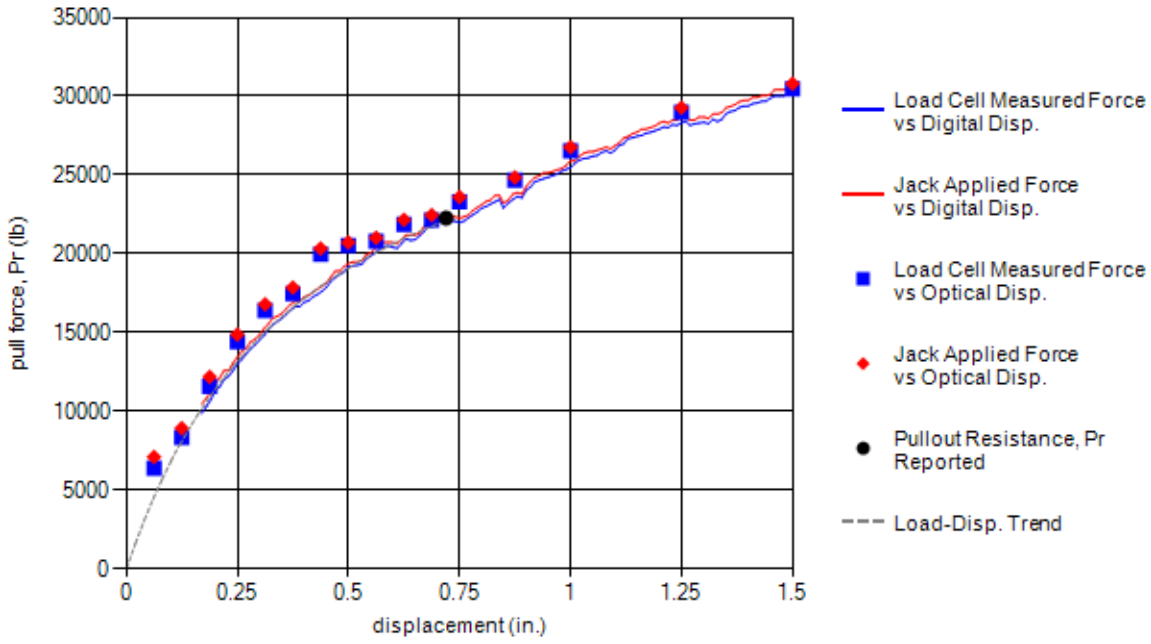
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	1456	22271	12.20	**3.82**

Load-Displacement Curve



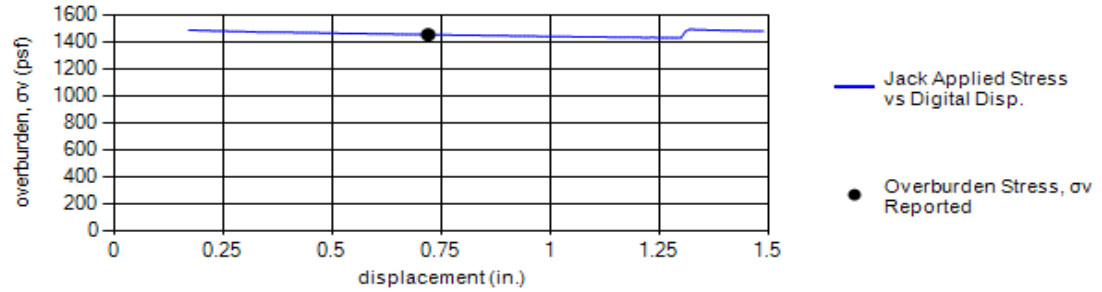
Comments

No earth pressure cell data.

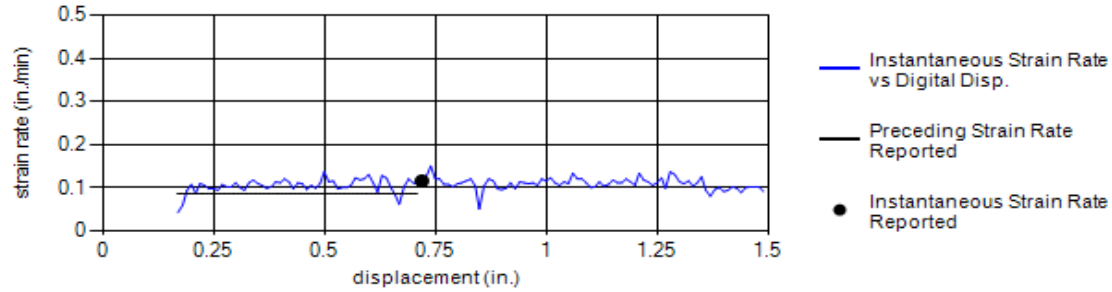
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

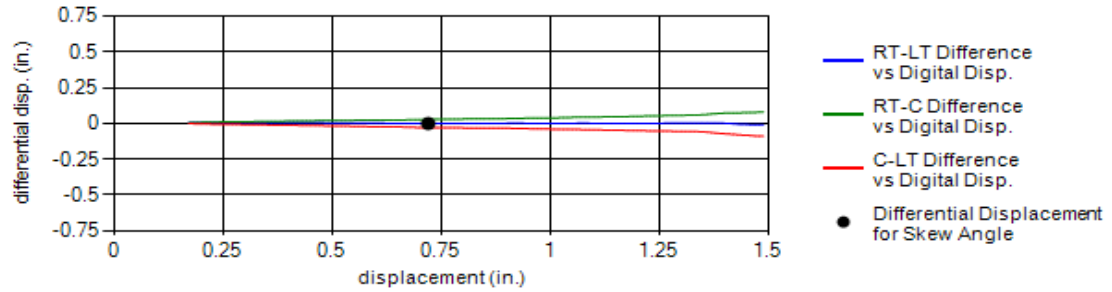
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.65	1456



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	0.03	-0.03	No Data	0.00	CW



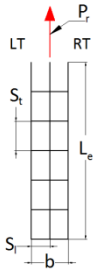
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 9:16:00 AM
Test Identification:	TS40.04-G-12x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

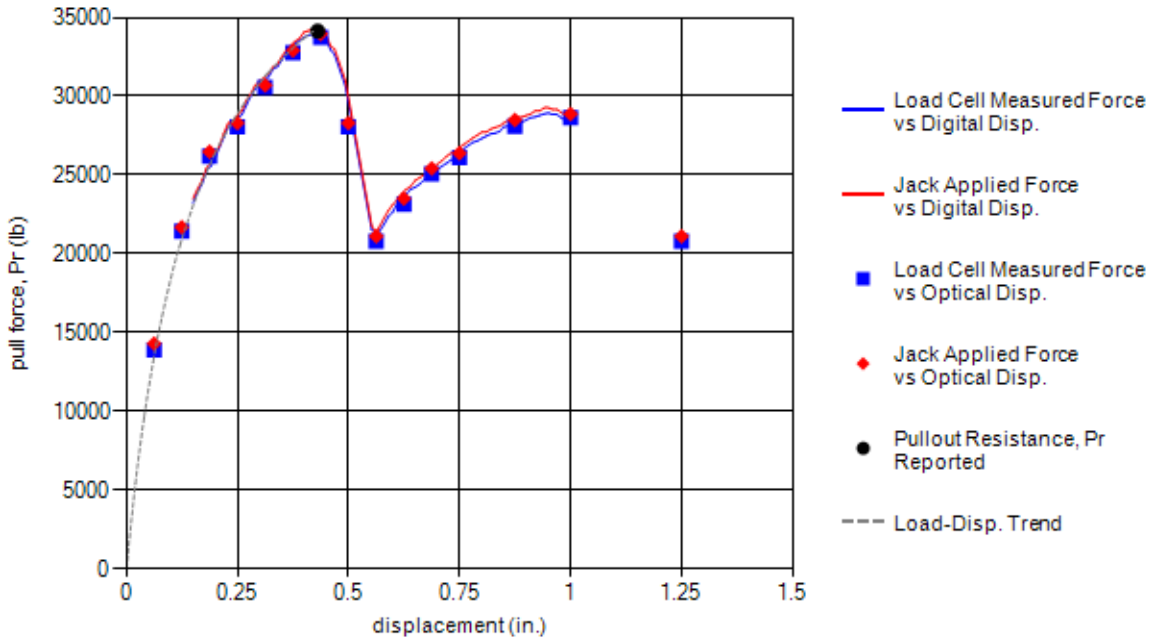
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.43	1507	34132	12.60	**0.94**

Load-Displacement Curve



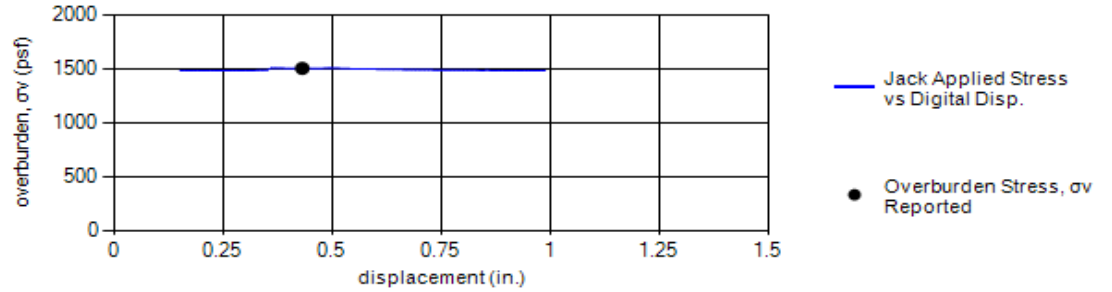
Comments

Left longitudinal bar rupture beyond 0.75in. displacement.

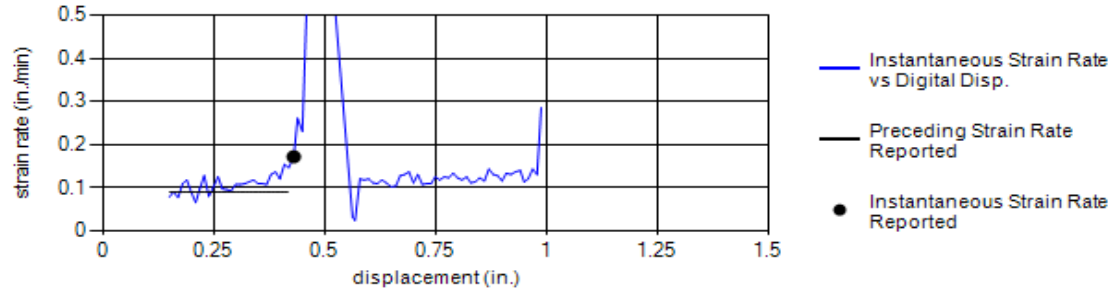
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

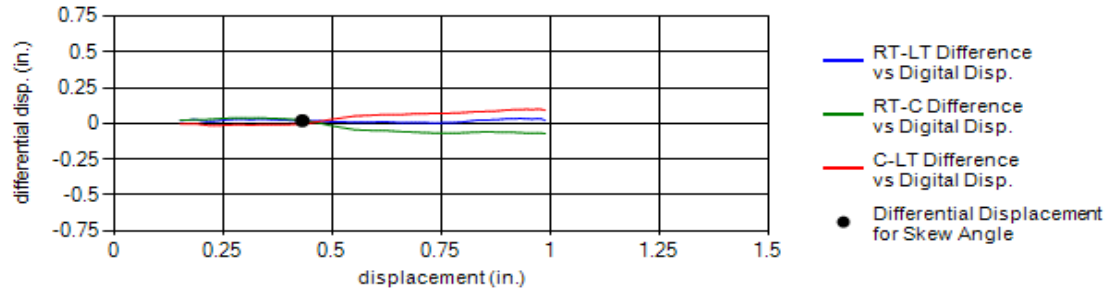
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3111	3515	3240	3348	3387	3320	2.04	1507



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	0.02	0.00	No Data	0.05	CCW



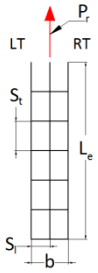
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 3:14:00 PM
Test Identification:	TS40.05-G-2x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

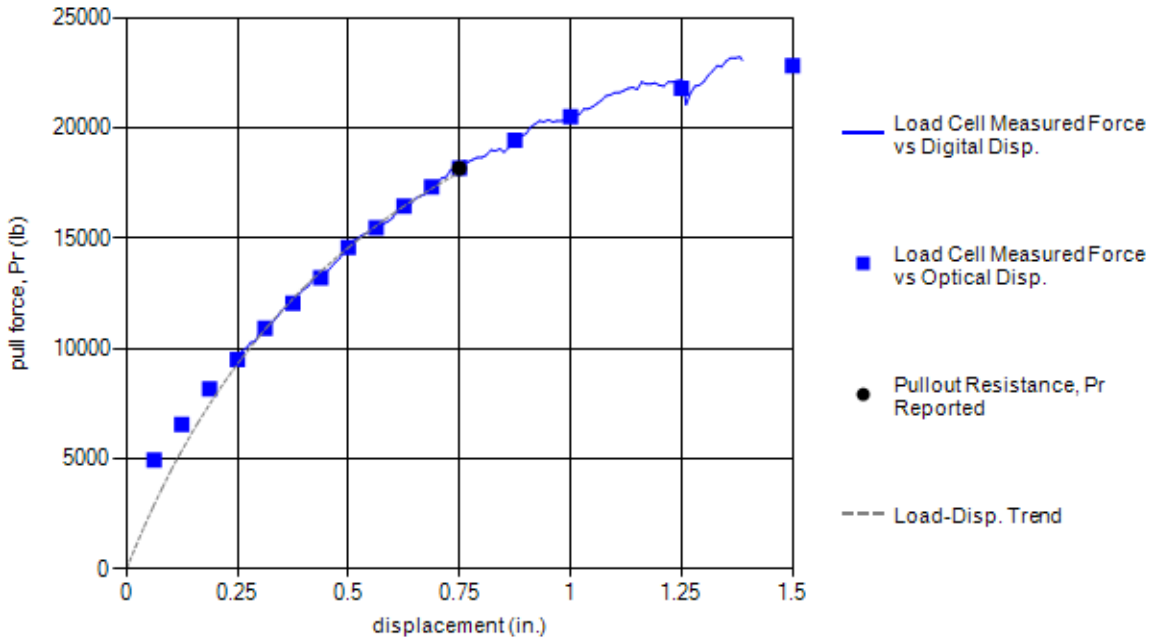
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	628	18160	5.30	**7.23**

Load-Displacement Curve



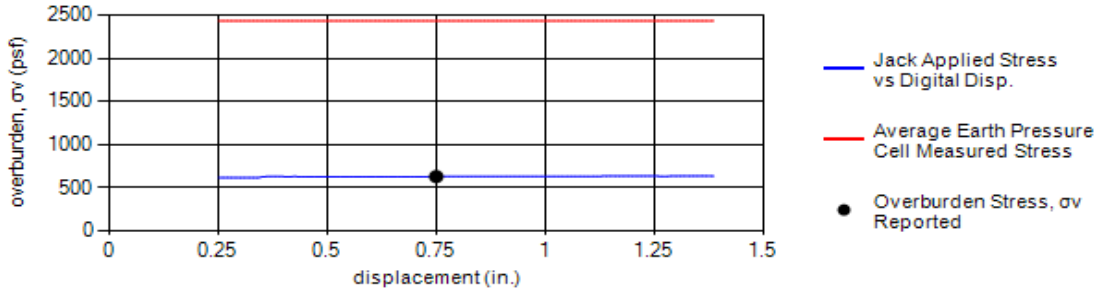
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

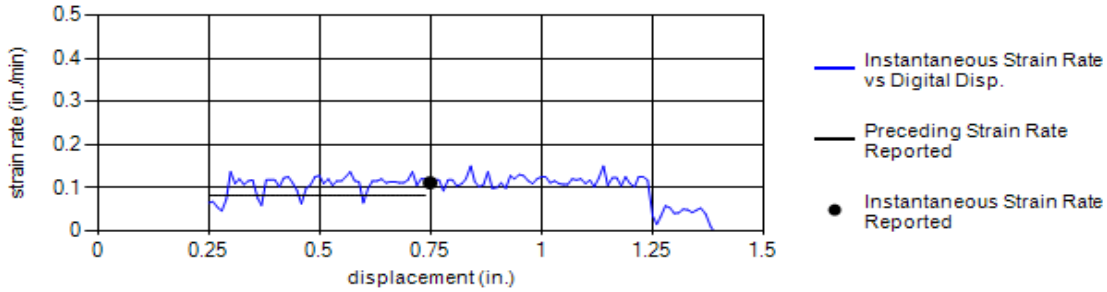
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

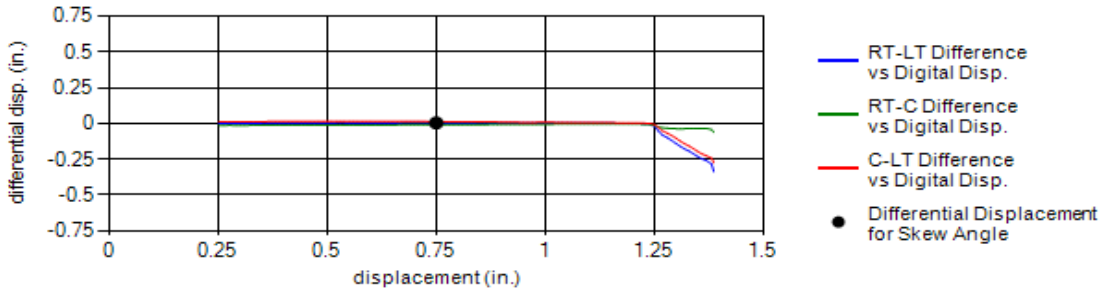
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2749	2516	2215	2323	2381	2437	5.24	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	-0.01	0.01	No Data	0.06	CCW



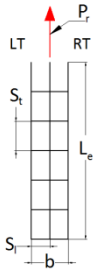
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 4:30:00 PM
Test Identification:	TS40.06-G-12x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

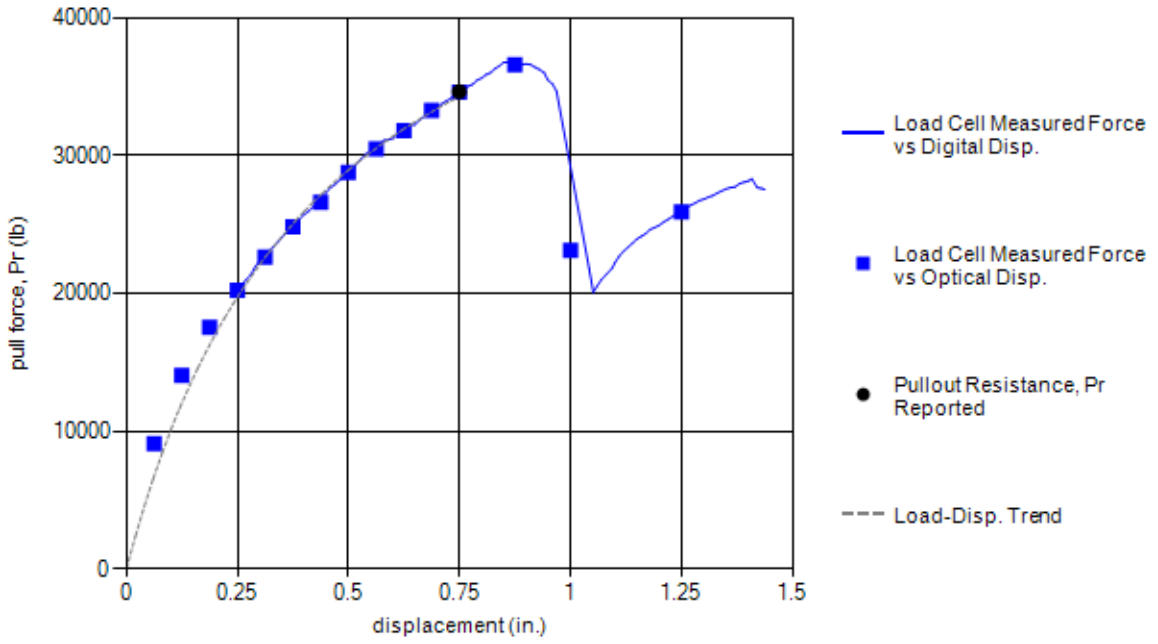
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	642	34621	5.40	**2.25**

Load-Displacement Curve



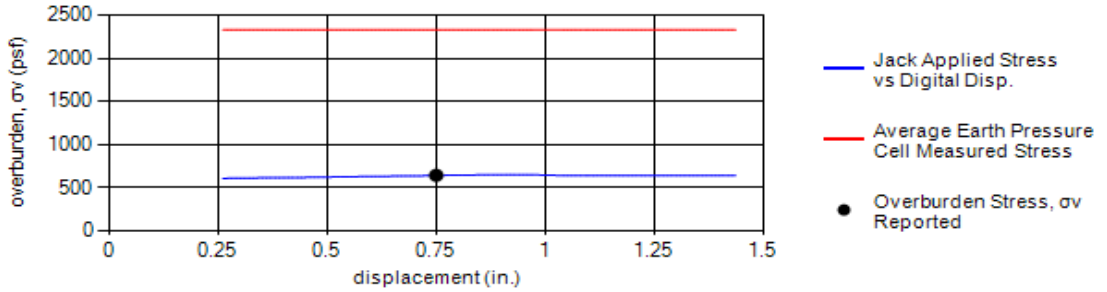
Comments

Center and left longitudinal bars rupture beyond 0.75in. displacement. Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

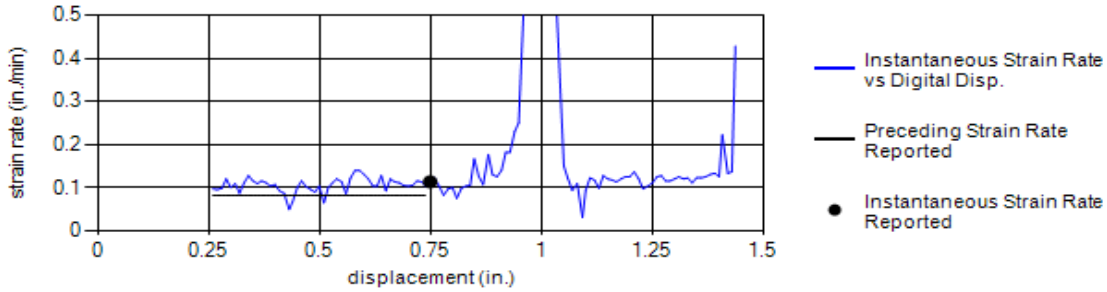
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

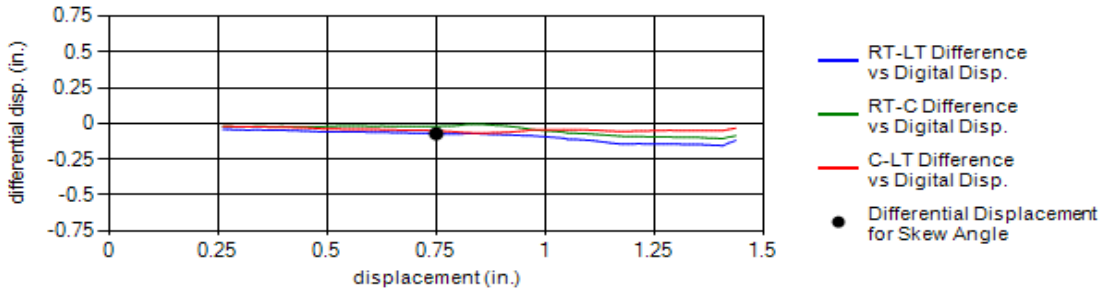
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2263	2543	2140	2330	2383	2332	5.13	640



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.07	-0.02	-0.05	No Data	-0.17	CW



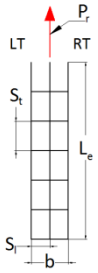
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 3:54:00 PM
Test Identification:	TS40.07-G-2x12-W20xW11-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

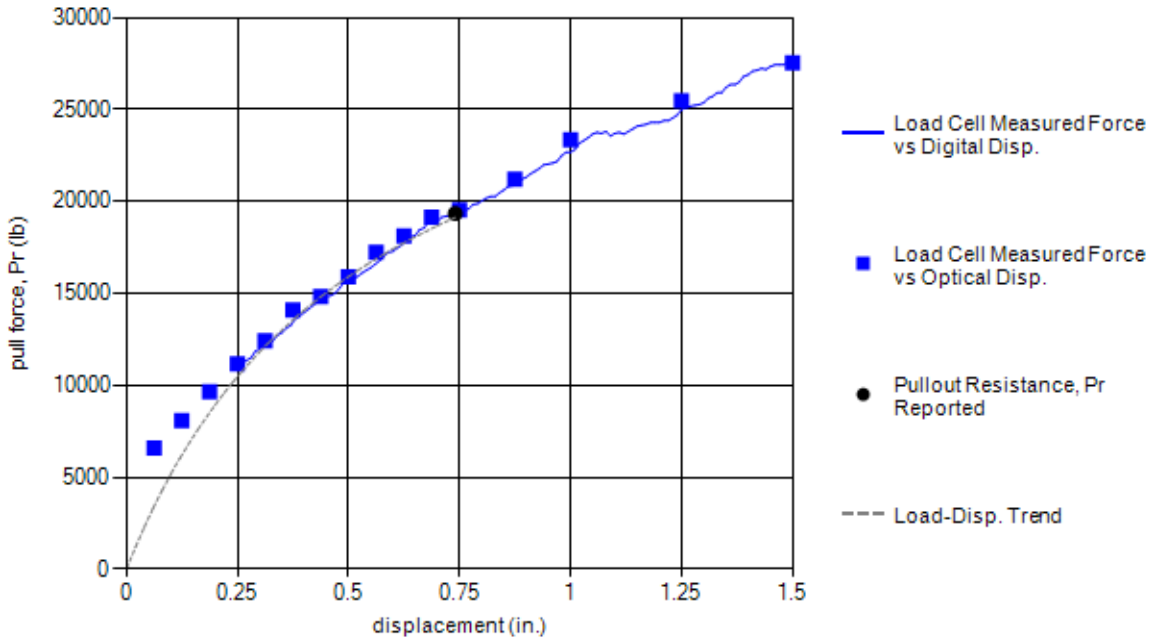
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1448	19336	12.10	**3.34**

Load-Displacement Curve



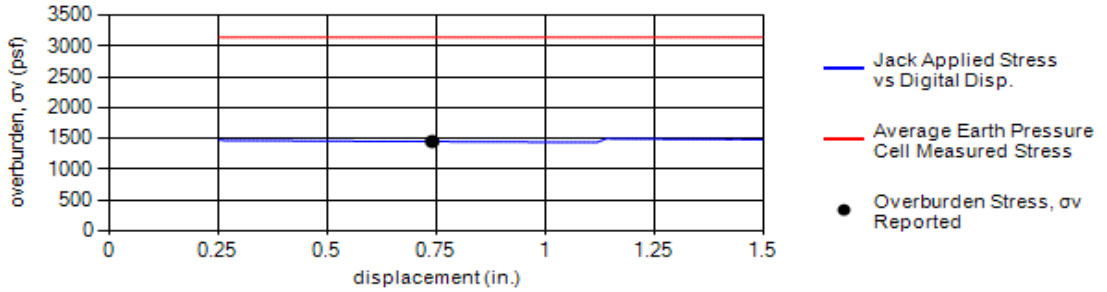
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

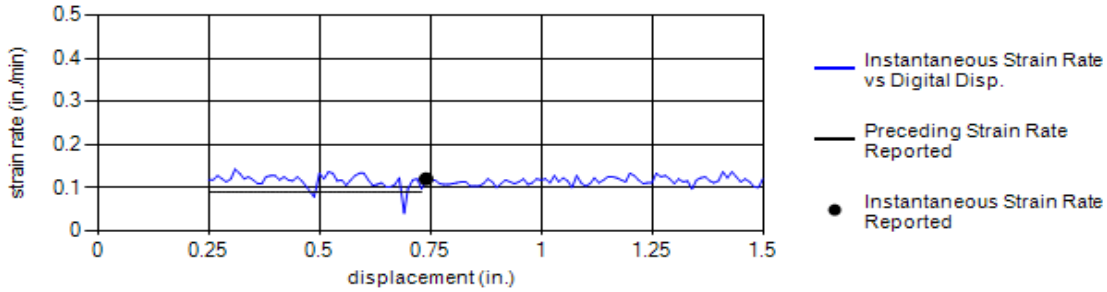
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

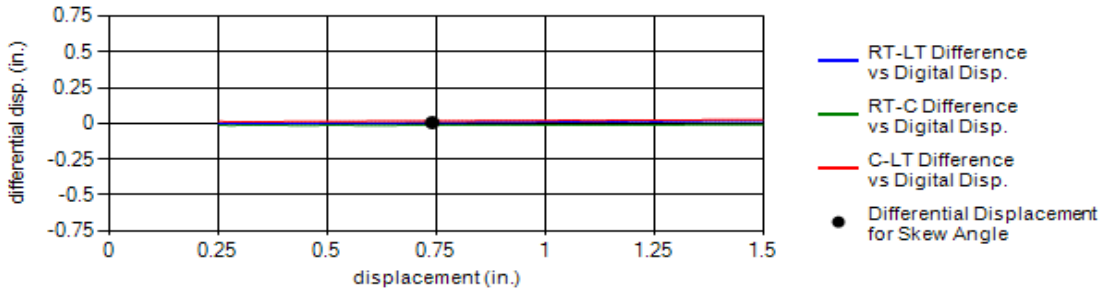
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3119	3147	3056	3145	3229	3139	2.27	1447



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	-0.01	0.02	No Data	0.09	CCW



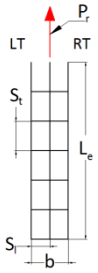
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/20/2011 7:47:00 AM
Test Identification:	TS40.08-G-12x12-W20xW11-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

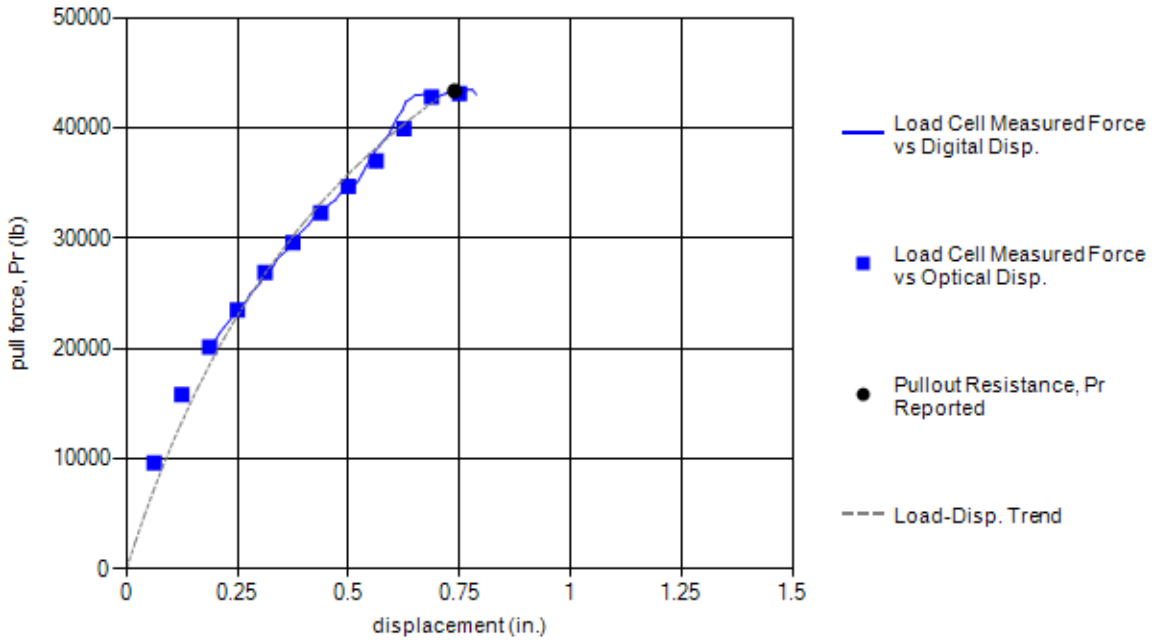
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1480	43342	12.40	**1.22**

Load-Displacement Curve



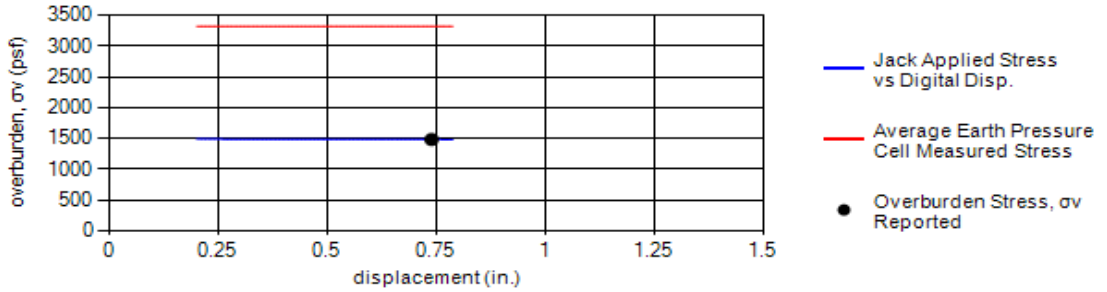
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

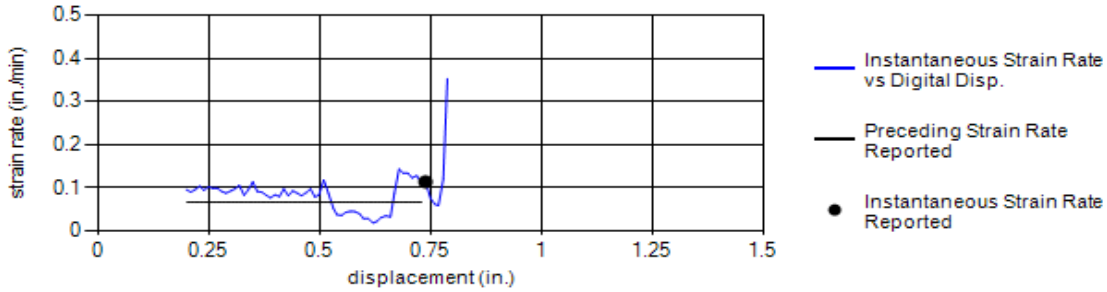
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

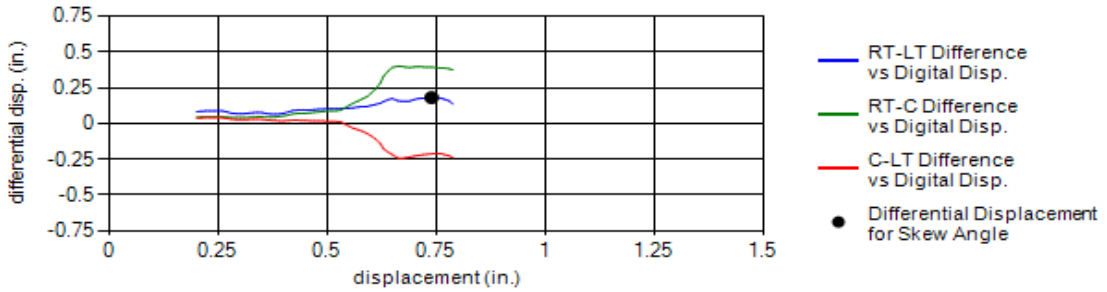
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3148	3643	3173	3296	3354	3323	2.22	1479



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.18	0.39	-0.21	No Data	0.43	CCW



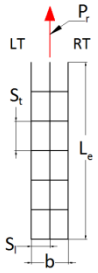
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 1:24:00 PM
Test Identification:	TS40.09-G-2x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

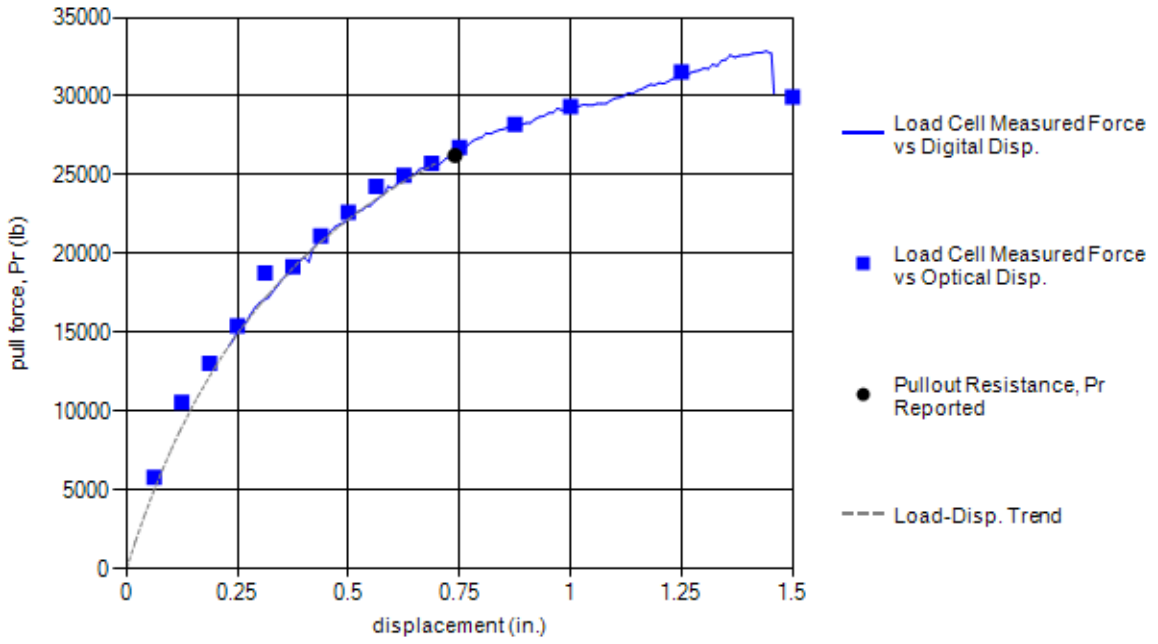
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	634	26244	5.30	**10.35**

Load-Displacement Curve



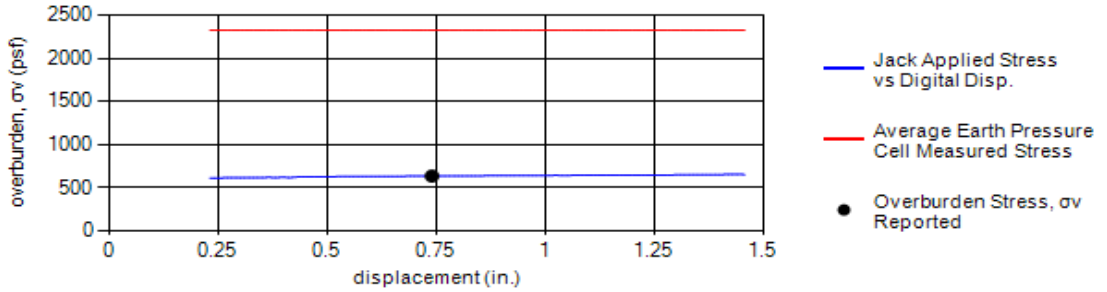
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data. No incidental skew data.

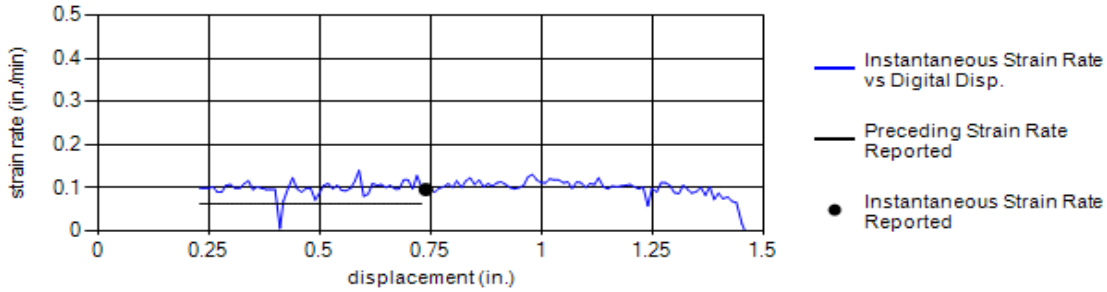
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2912	2416	2029	2107	2183	2329	5.38	634



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

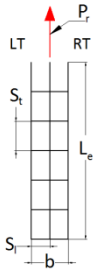
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 11:49:00 AM
Test Identification:	TS40.10-G-12x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

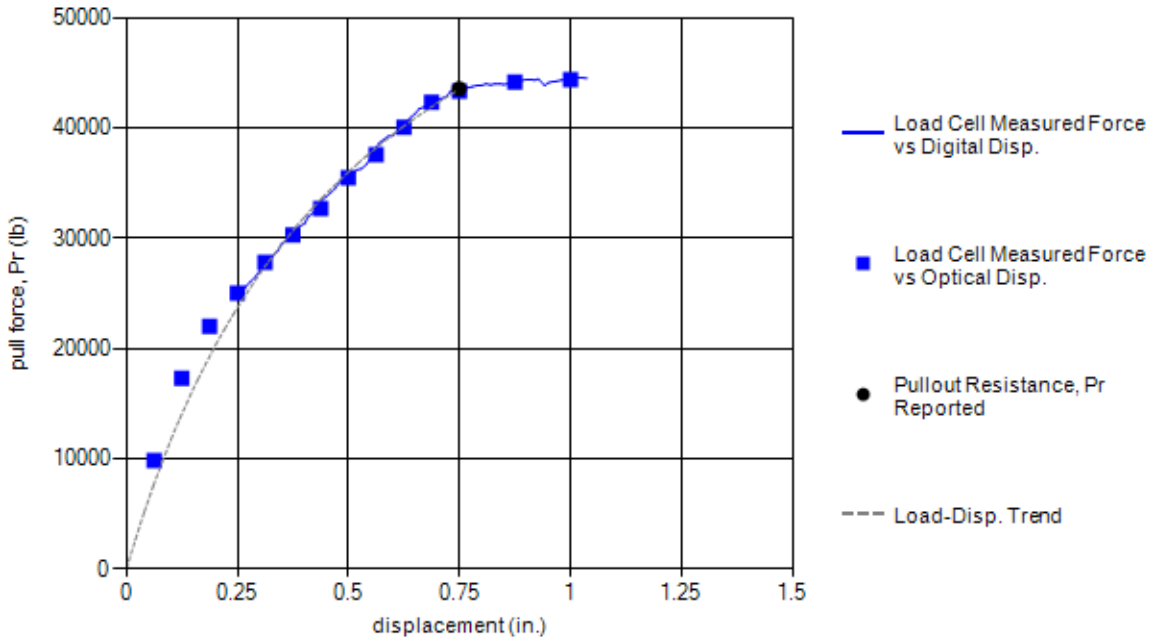
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	662	43538	5.50	**2.74**

Load-Displacement Curve



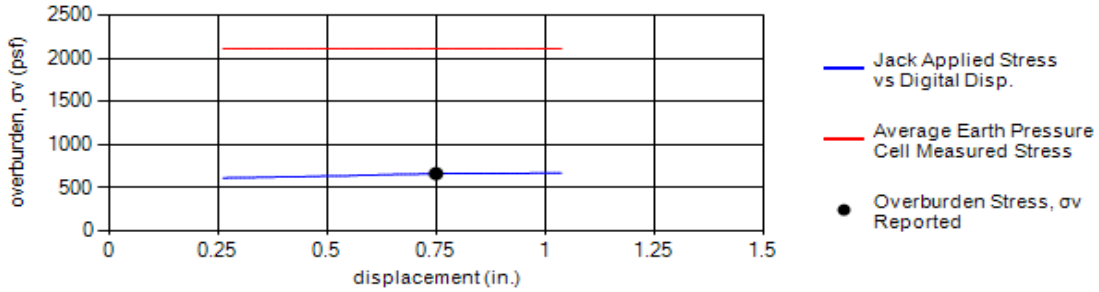
Comments

Right longitudinal bars rupture beyond 0.75in. displacement. Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

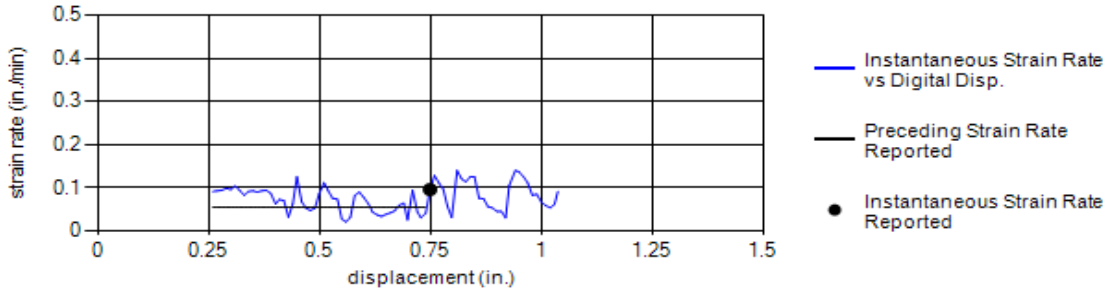
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

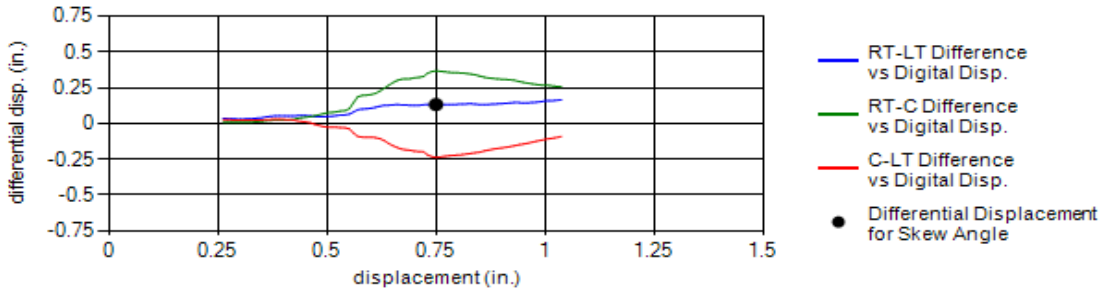
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1796	2391	1953	2182	2230	2110	5.15	661



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.13	0.37	-0.24	No Data	0.32	CCW



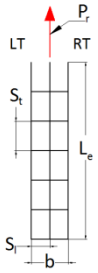
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 2:15:00 PM
Test Identification:	TS40.11-G-2x12-W20xW11-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

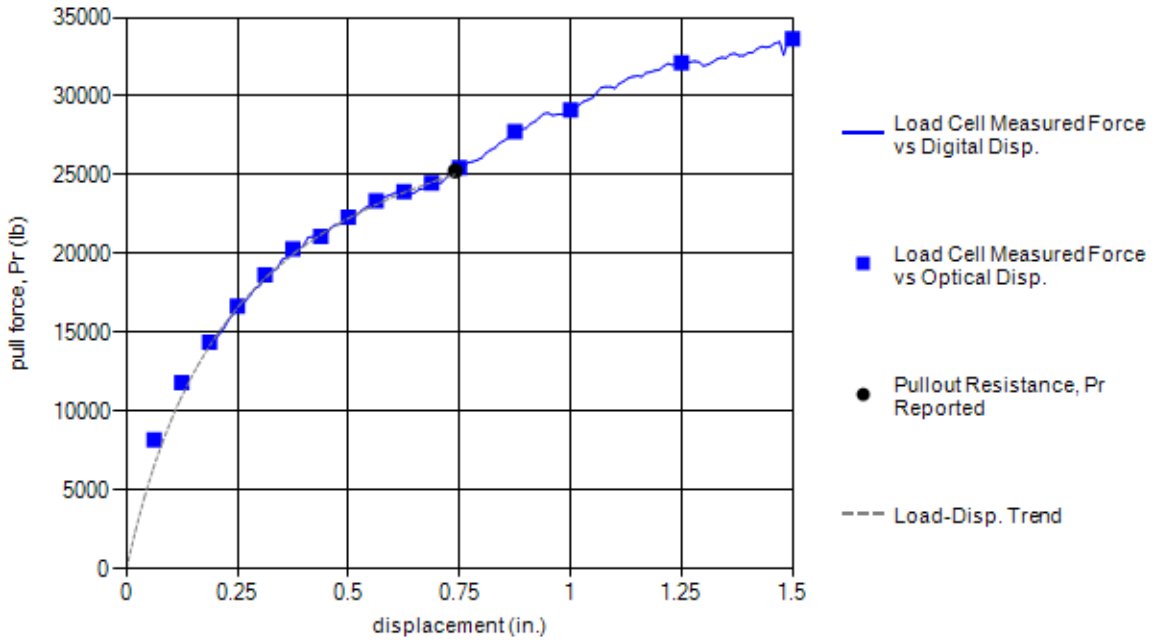
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1459	25264	12.20	**4.33**

Load-Displacement Curve



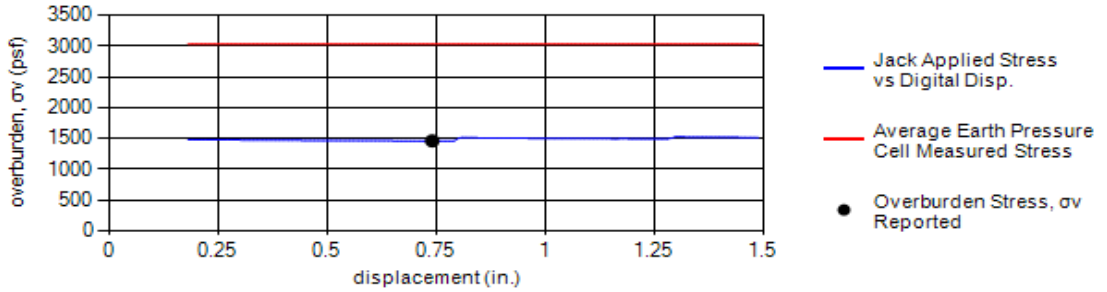
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

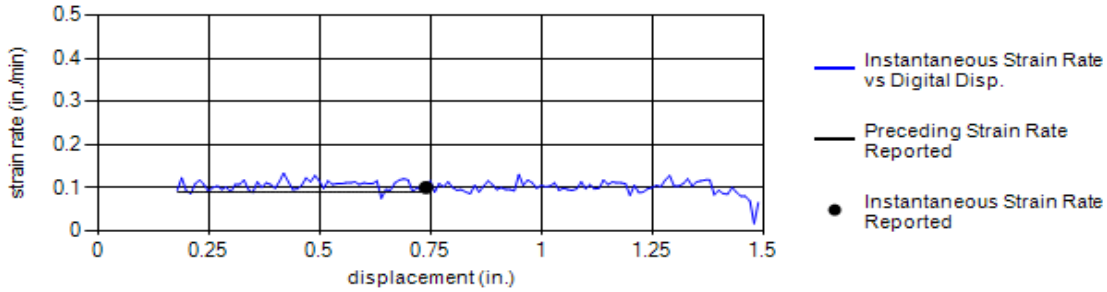
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

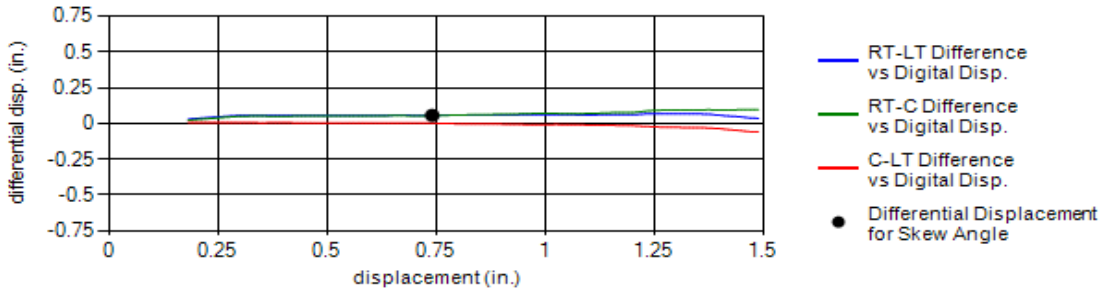
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3175	2994	2845	3043	3116	3035	2.23	1457



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	0.06	0.00	No Data	0.82	CCW



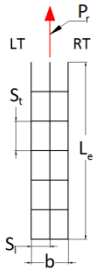
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/19/2011 10:49:00 AM
Test Identification:	TS40.12-G-12x12-W20xW11-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

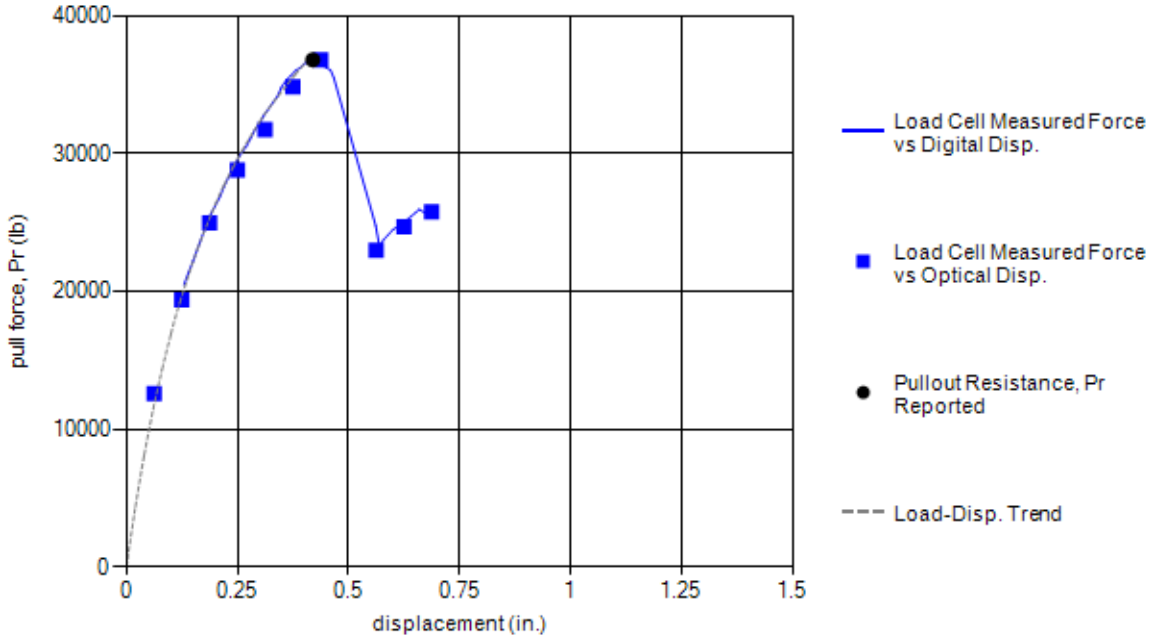
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.42	1479	36777	12.40	**1.04**

Load-Displacement Curve



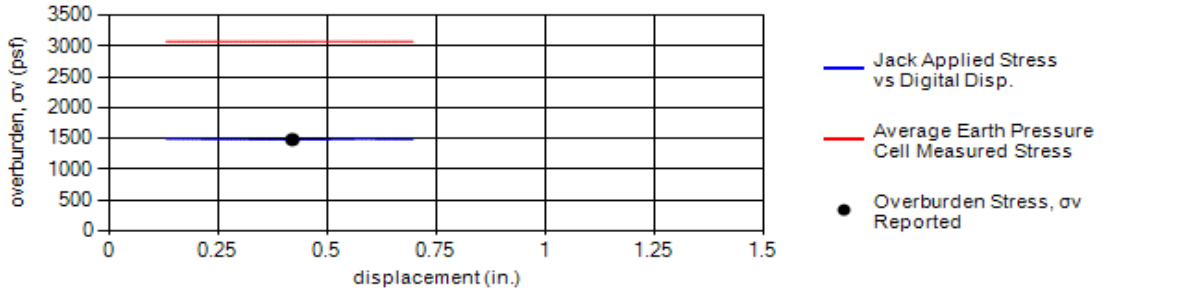
Comments

Center and left longitudinal bars rupture beyond 0.75in. displacement. Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

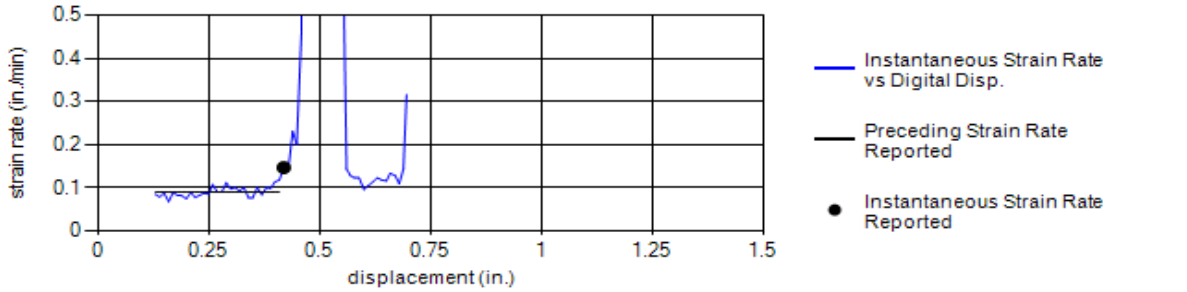
Personnel

Tested:	TW TW MN
Prepared:	SB TW
Checked:	WL PJ

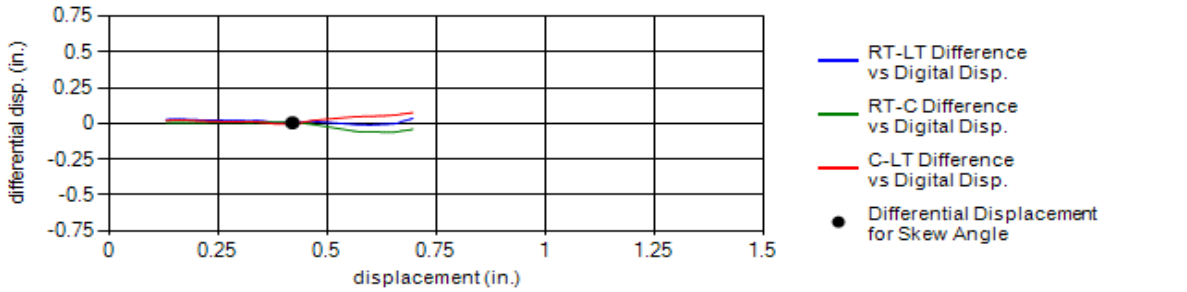
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2895	3184	3017	3100	3155	3070	2.31	1477



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	0.00	0.00	No Data	0.01	CCW



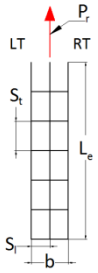
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2011 2:43:00 PM
Test Identification:	TS41.01-G-2x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

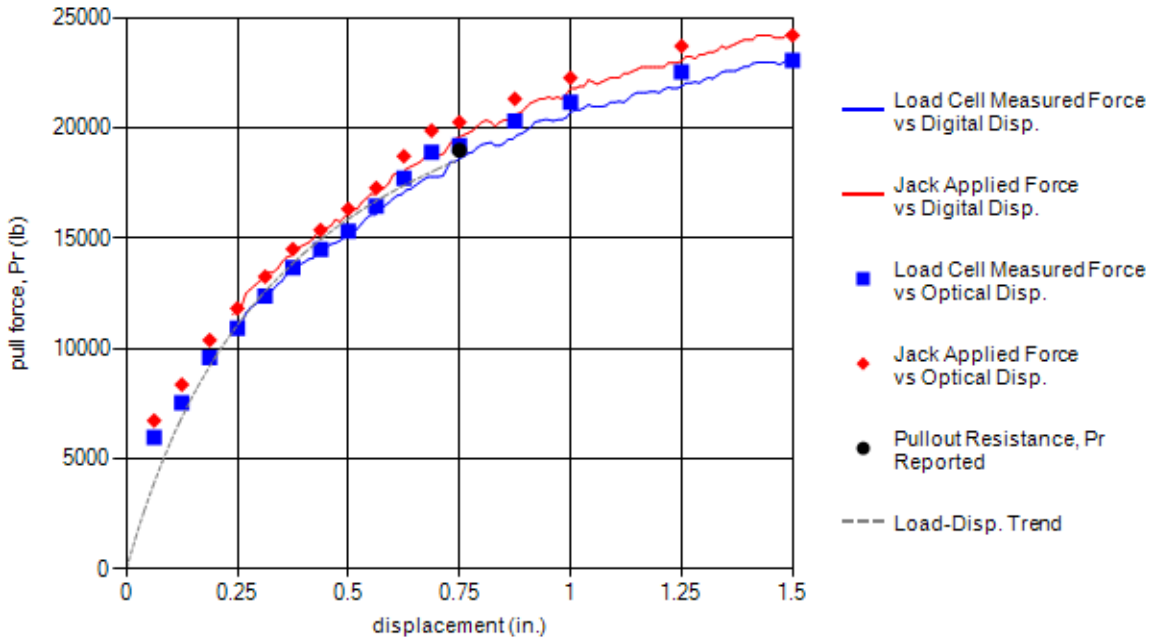
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	2457	18980	20.10	**1.93**

Load-Displacement Curve

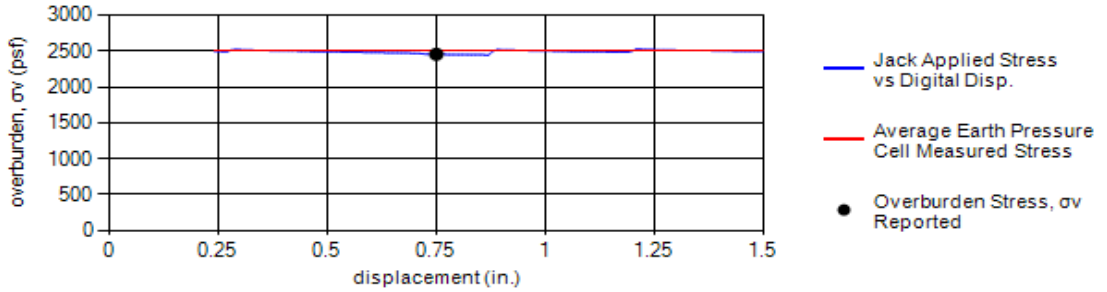


Comments

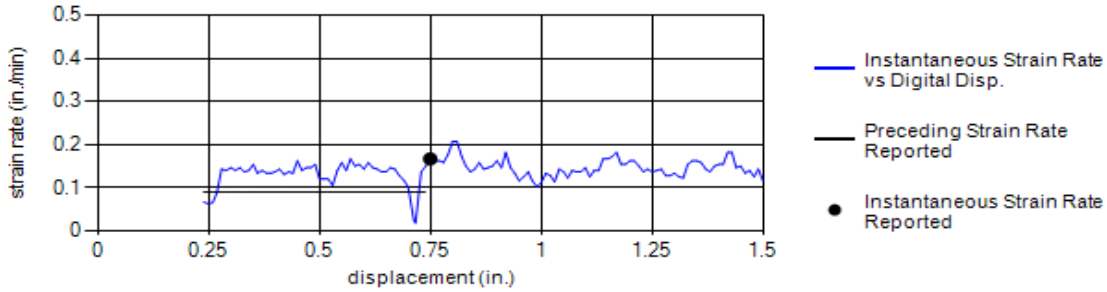
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

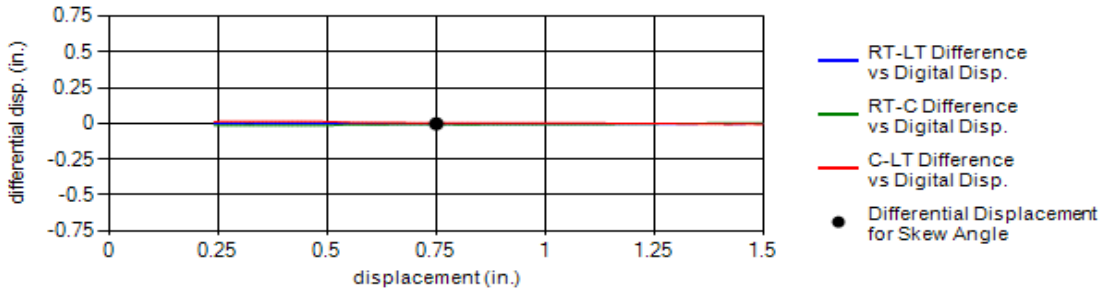
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2758	1715	3409	2621	2063	2513	1.09	2457



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.09	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	-0.01	0.00	No Data	-0.03	CW



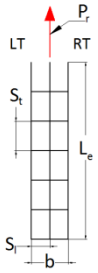
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2011 2:14:00 PM
Test Identification:	TS41.02-G-12x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

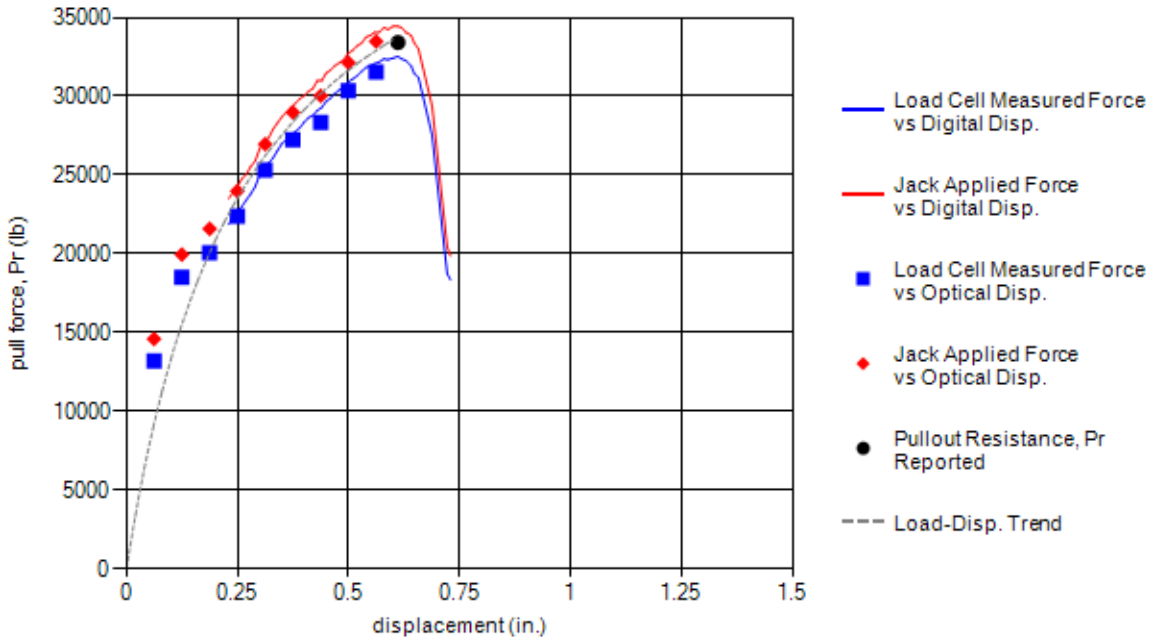
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.61	2491	33413	20.40	**0.56**

Load-Displacement Curve

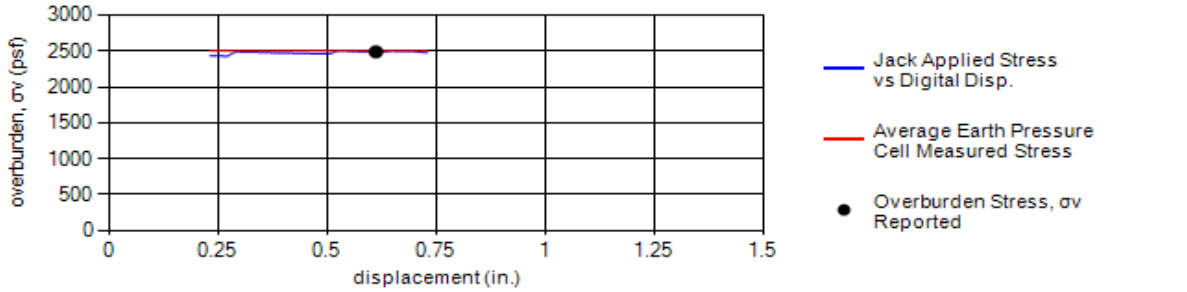


Comments

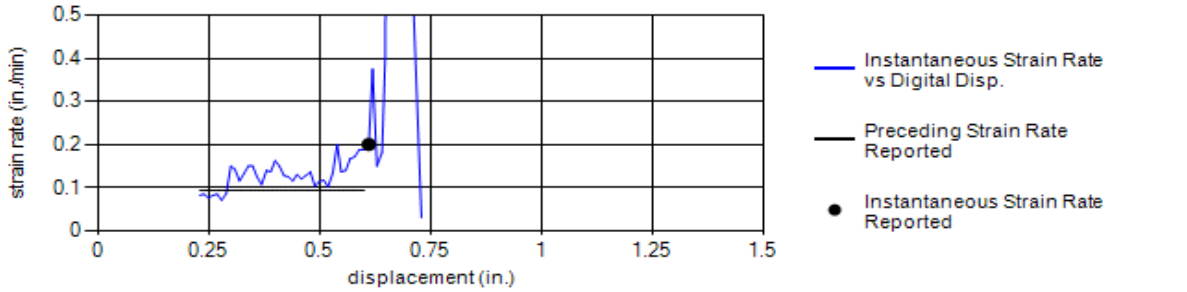
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

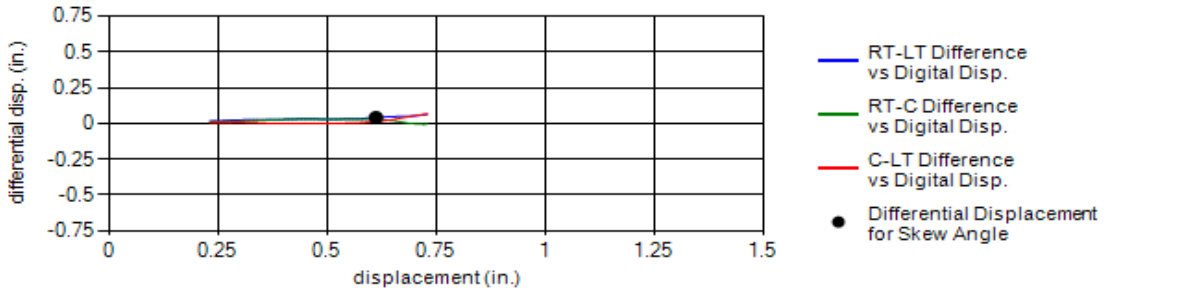
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2863	1732	3282	2609	2047	2506	1.09	2491



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.20	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.03	0.01	No Data	0.10	CCW



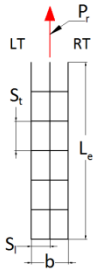
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 1:13:00 PM
Test Identification:	TS41.03-G-2x12-W20xW11-L6-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

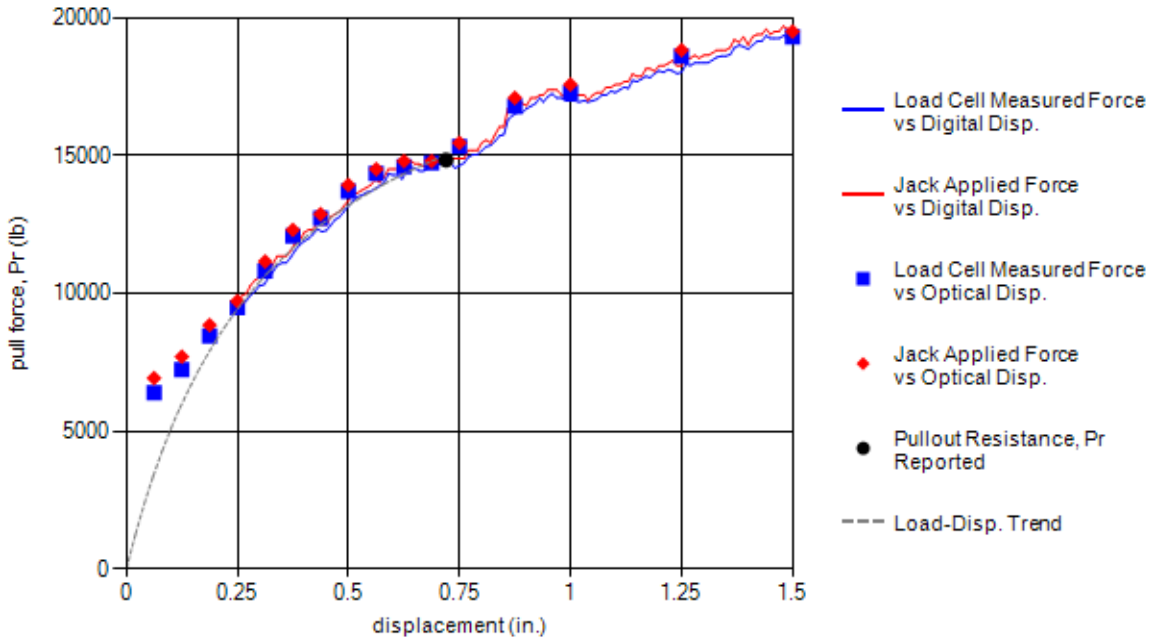
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	5021	14831	41.10	**0.74**

Load-Displacement Curve

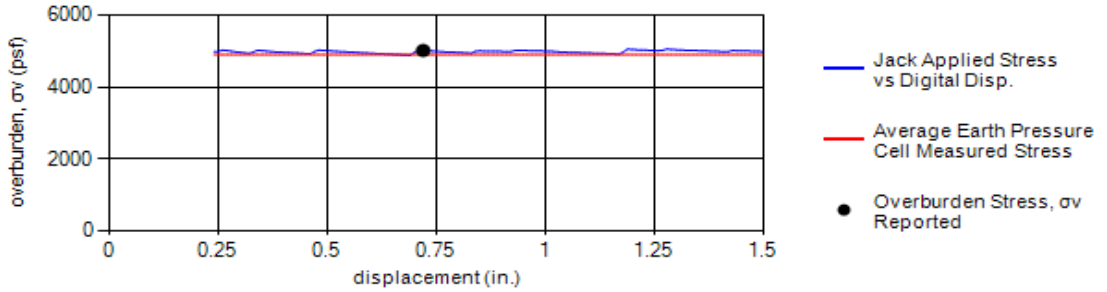


Comments

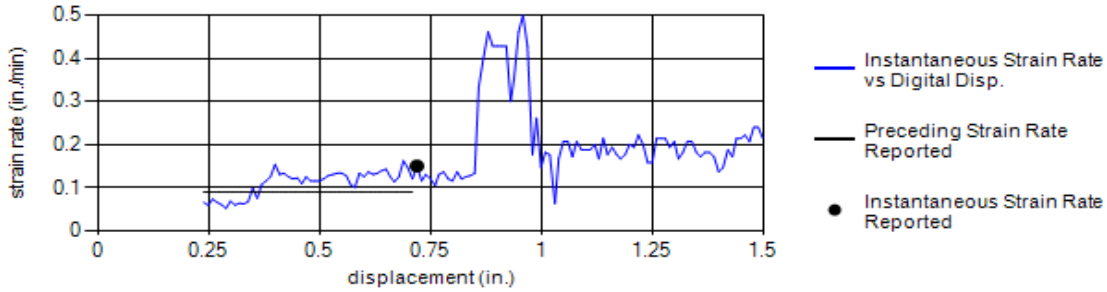
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

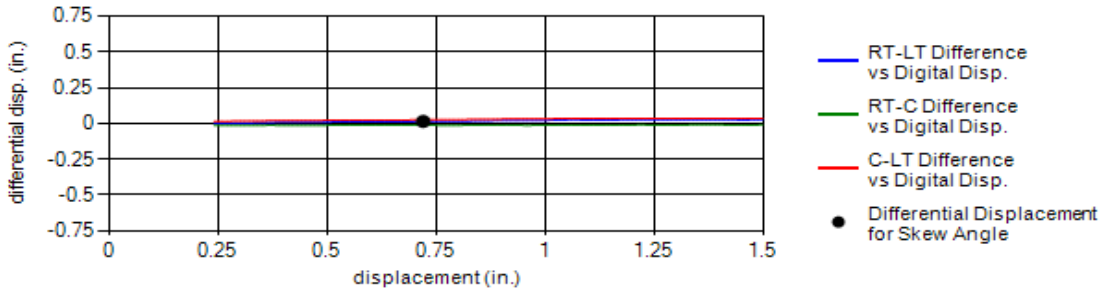
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5307	3569	6404	5109	4139	4906	1.03	5021



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.09	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	-0.01	0.03	No Data	0.21	CCW



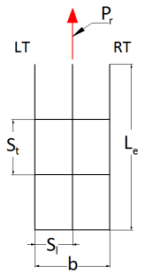
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 1:55:00 PM
Test Identification:	TS41.04-G-12x12-W20xW11-L3-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

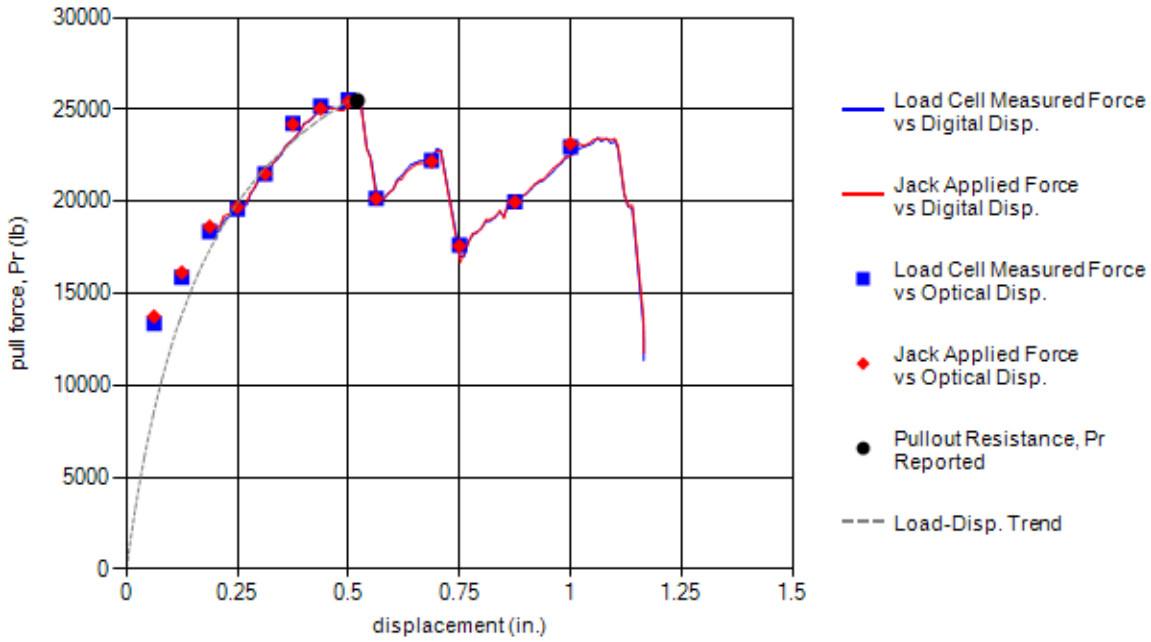
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.52	5008	25478	41.00	**0.42**

Load-Displacement Curve

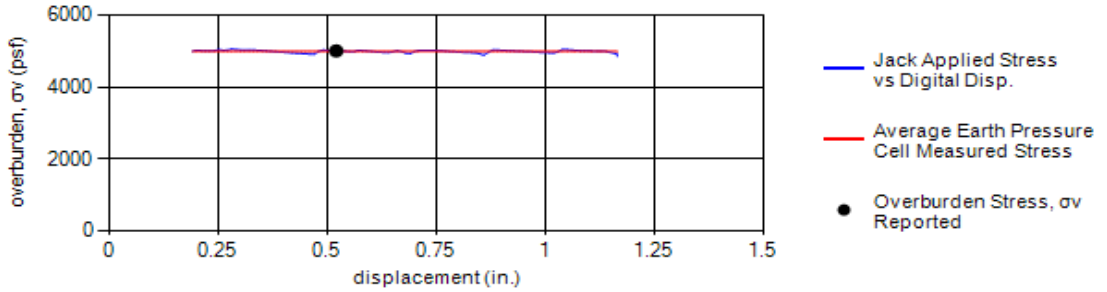


Comments

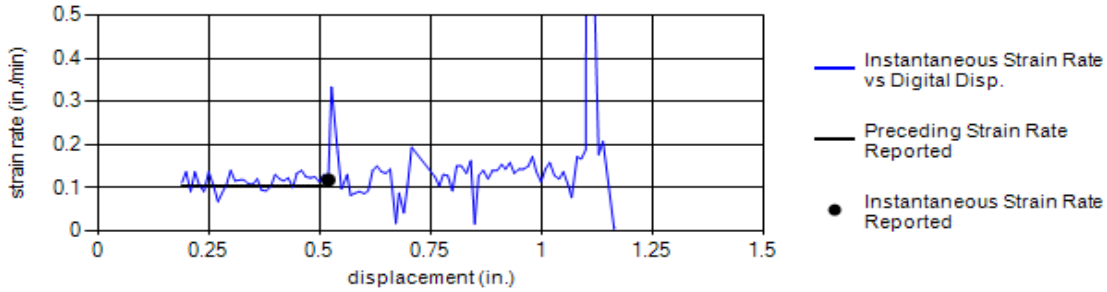
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

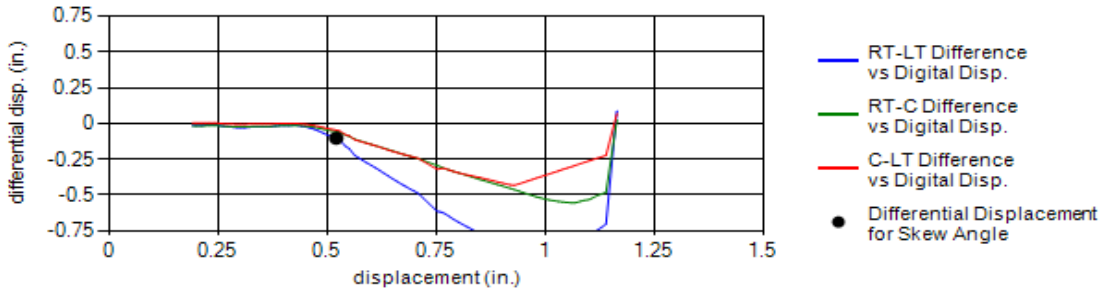
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5402	3579	6551	5210	4231	4995	1.02	5008



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.10	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.10	-0.06	-0.05	No Data	-0.25	CW



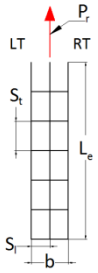
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2011 3:35:00 PM
Test Identification:	TS41.05-G-2x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

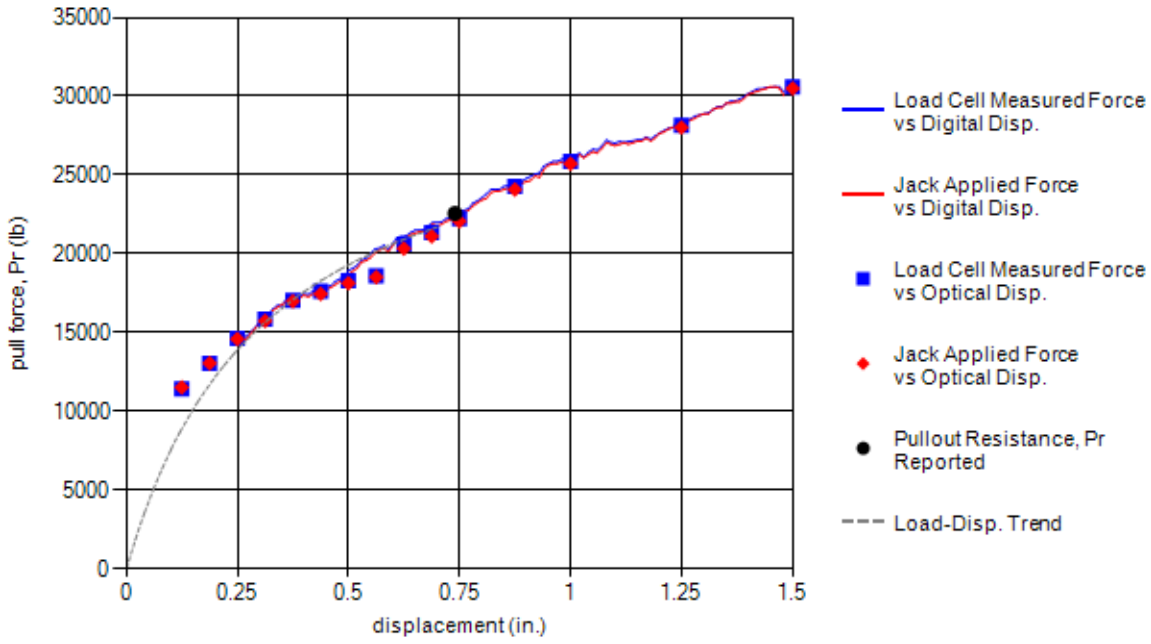
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2492	22566	20.30	**2.26**

Load-Displacement Curve

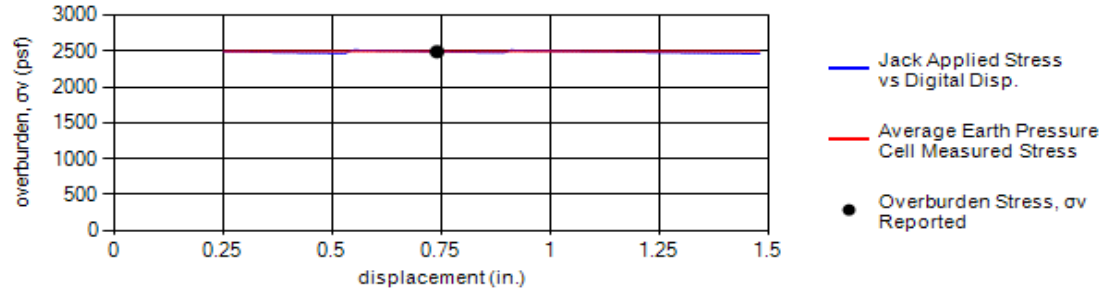


Comments

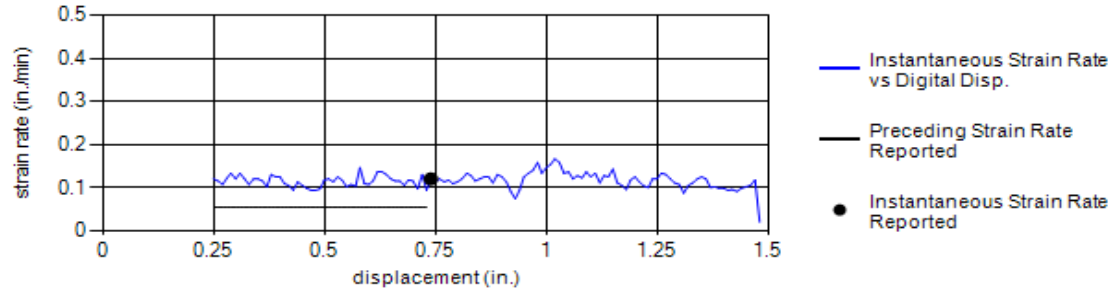
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

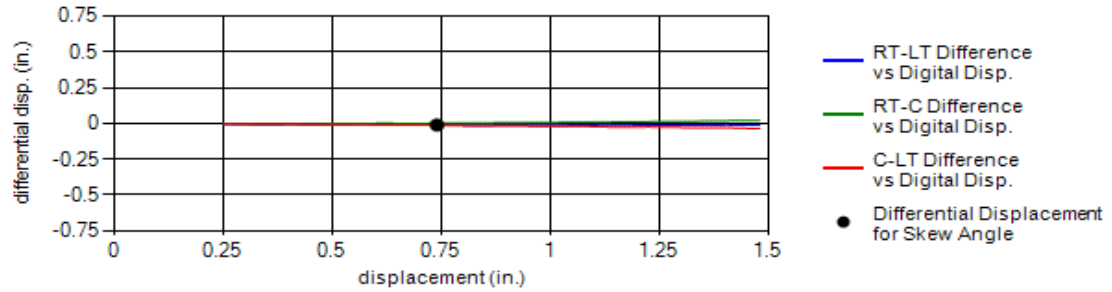
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2815	1710	3304	2616	2051	2499	1.09	2492



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.01	0.00	-0.01	No Data	-0.15	CW



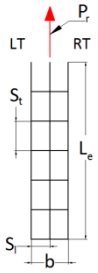
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2011 1:36:00 PM
Test Identification:	TS41.06-G-12x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

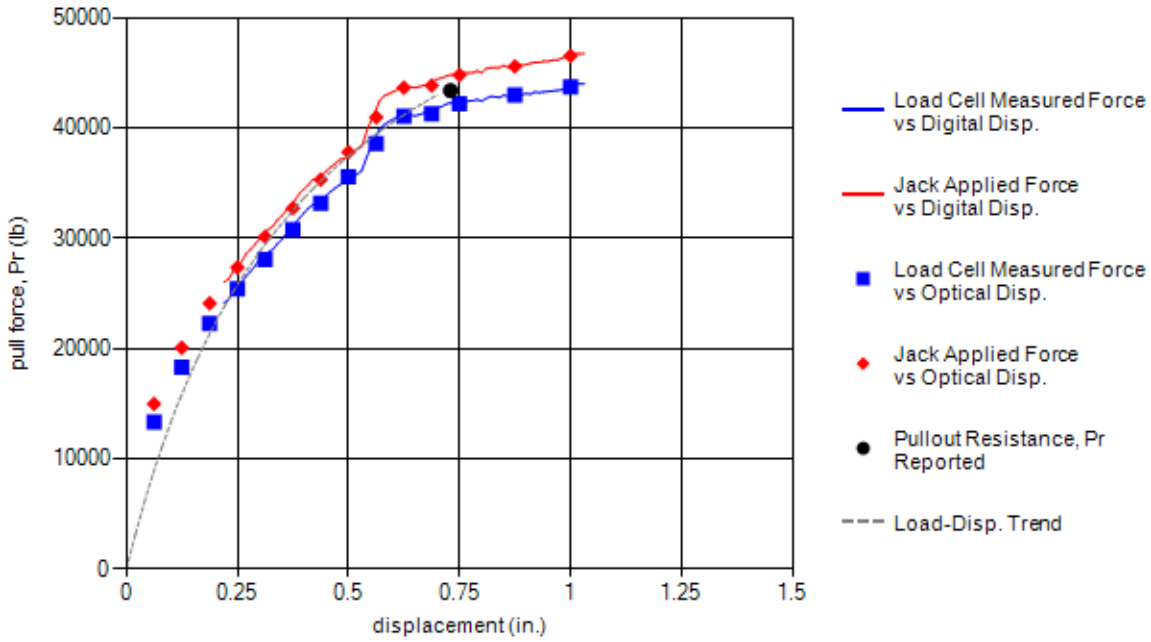
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	2486	43369	20.30	**0.73**

Load-Displacement Curve

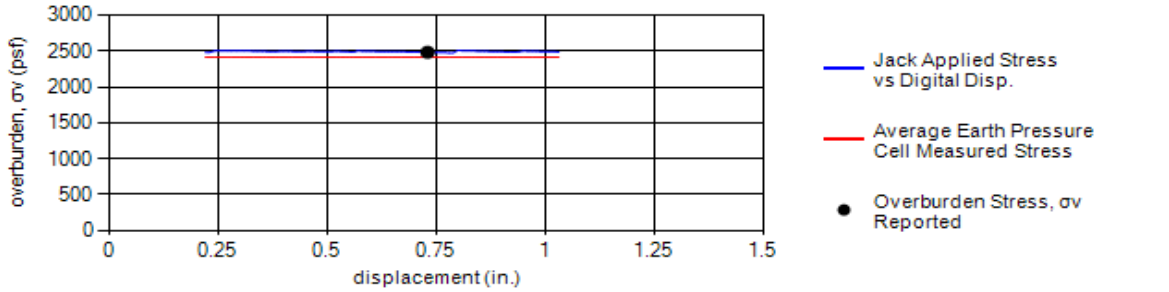


Comments

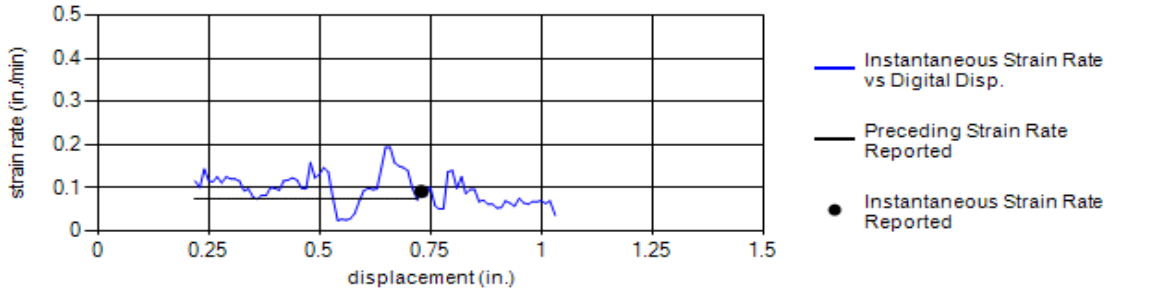
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

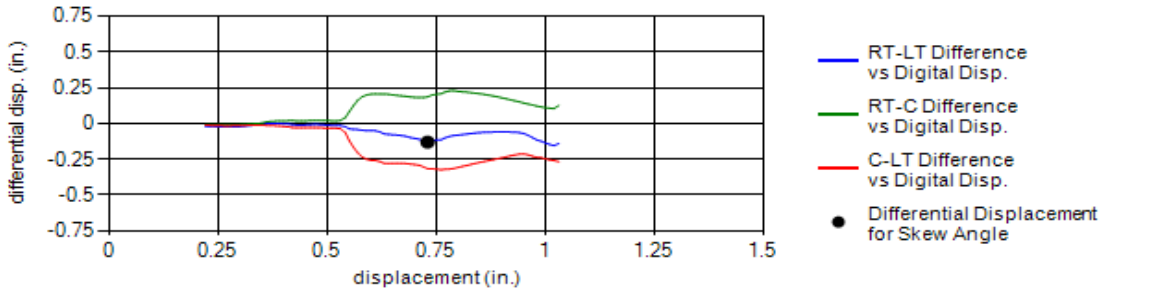
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2666	1728	3084	2591	2029	2419	1.13	2486



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.13	0.19	-0.32	No Data	-0.31	CW



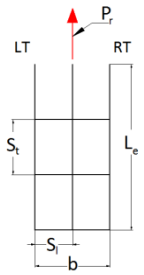
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 12:32:00 PM
Test Identification:	TS41.07-G-2x12-W20xW11-L3-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

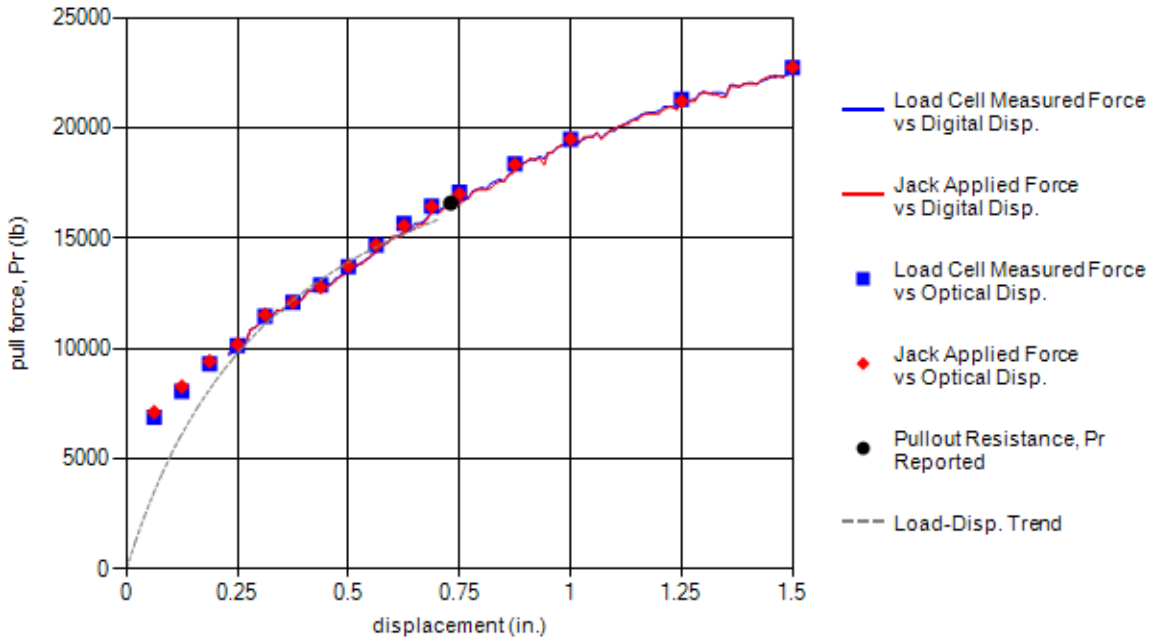
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	4991	16586	40.70	**1.66**

Load-Displacement Curve

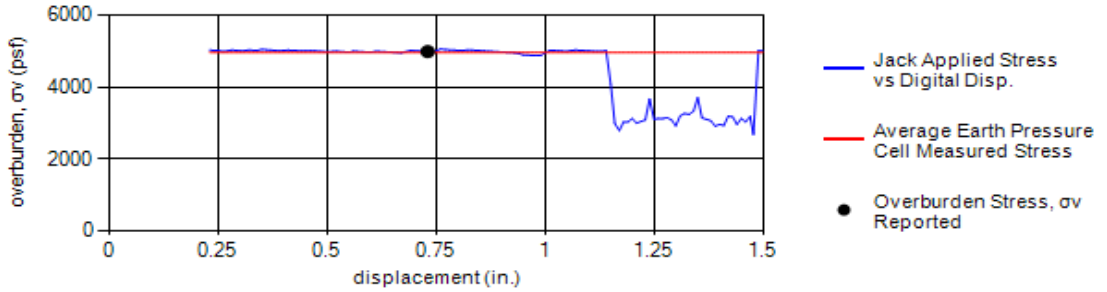


Comments

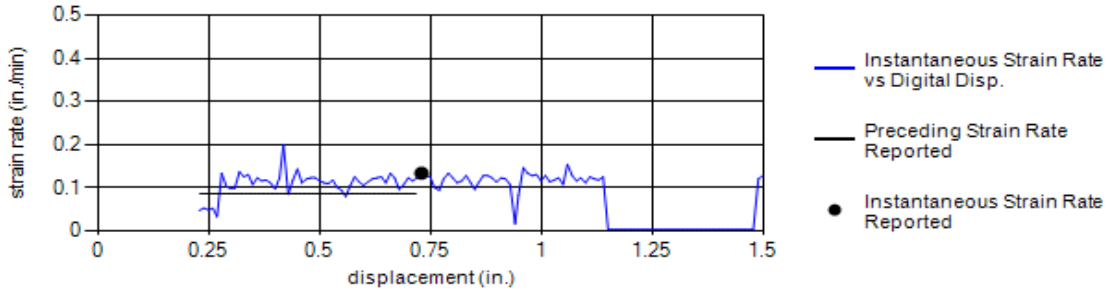
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

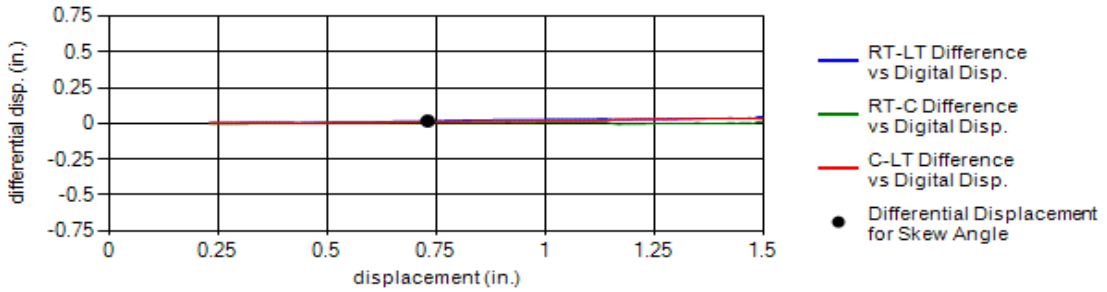
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5291	3588	6519	5210	4225	4966	3.48	4991



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	0.01	0.01	No Data	0.26	CCW



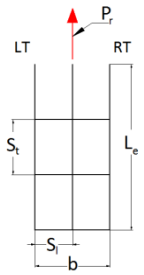
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/5/2012 11:28:00 AM
Test Identification:	TS41.08-G-12x12-W20xW11-L3-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

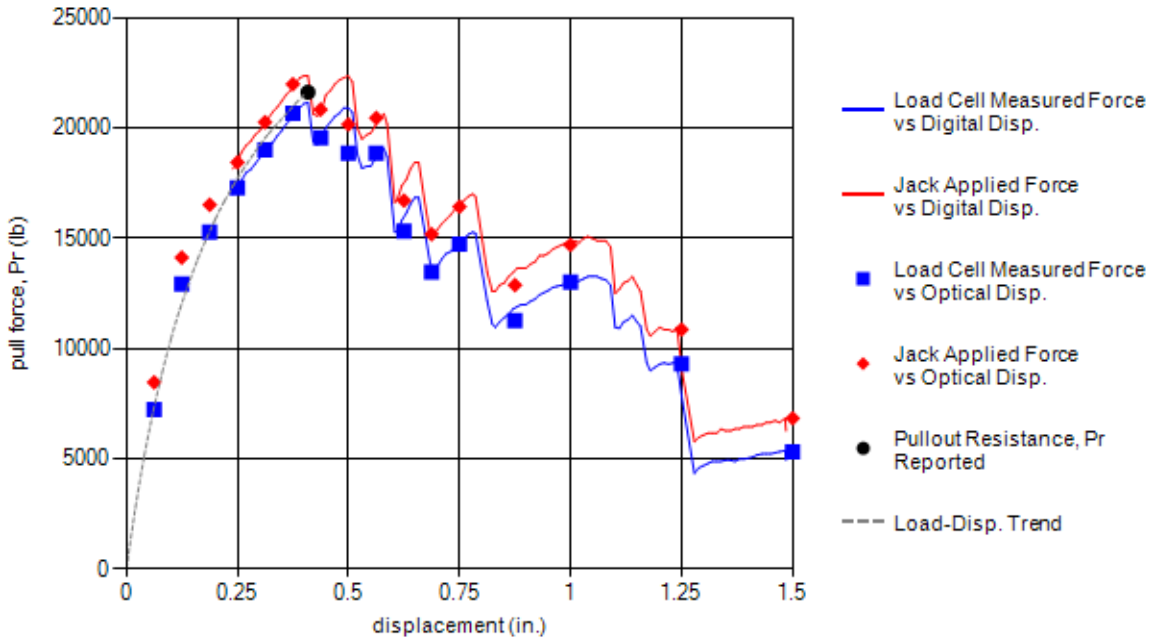
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.41	4992	21608	40.70	**0.36**

Load-Displacement Curve



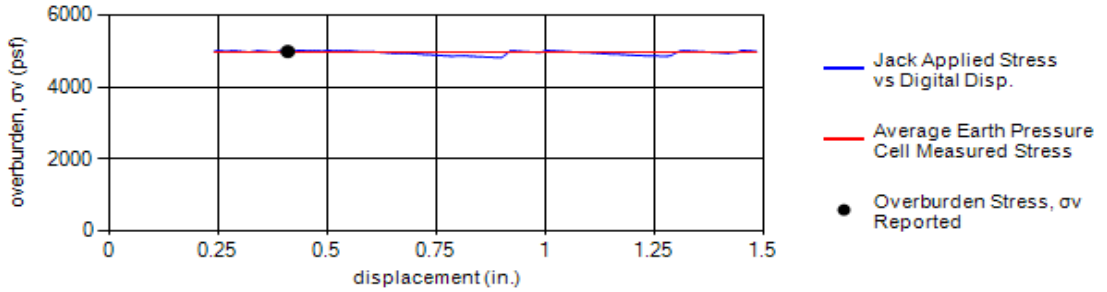
Comments

No incidental skew data.

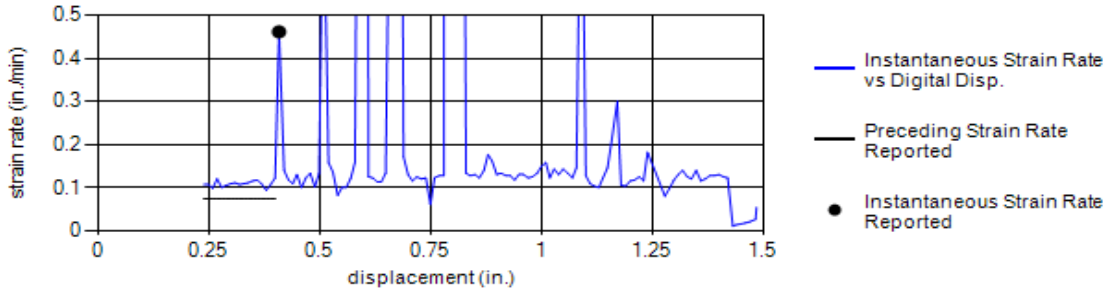
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5308	3549	6555	5231	4234	4975	1.04	4992



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.46	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

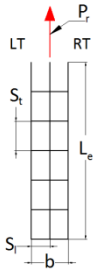
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2011 2:36:00 PM
Test Identification:	TS41.09-G-2x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

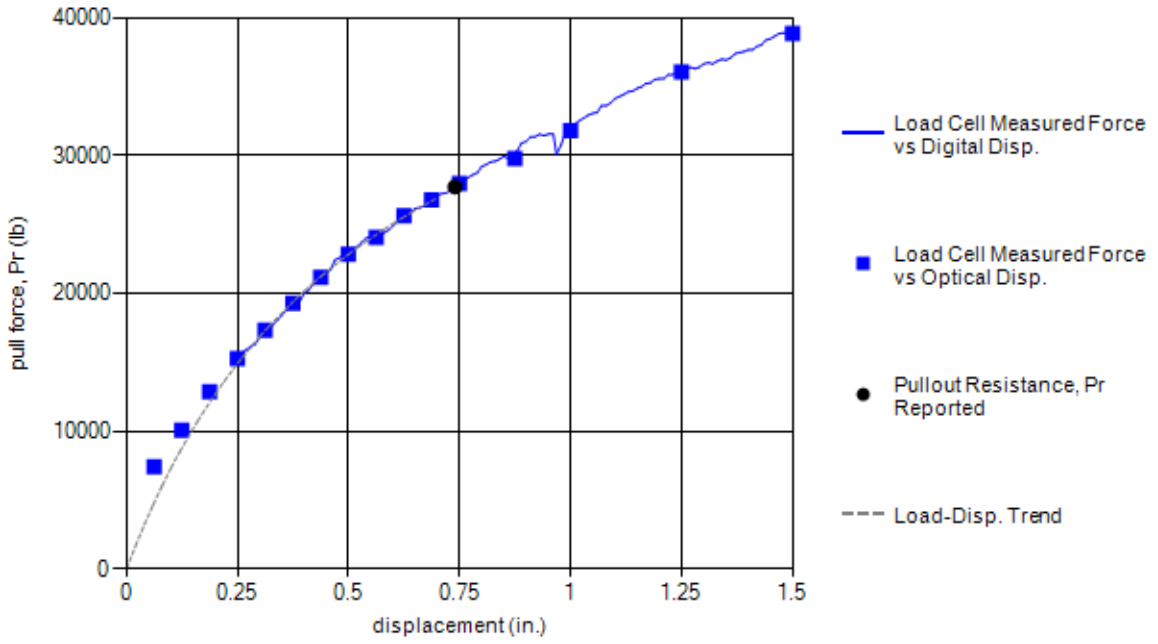
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	2521	27713	19.40	**2.75**

Load-Displacement Curve



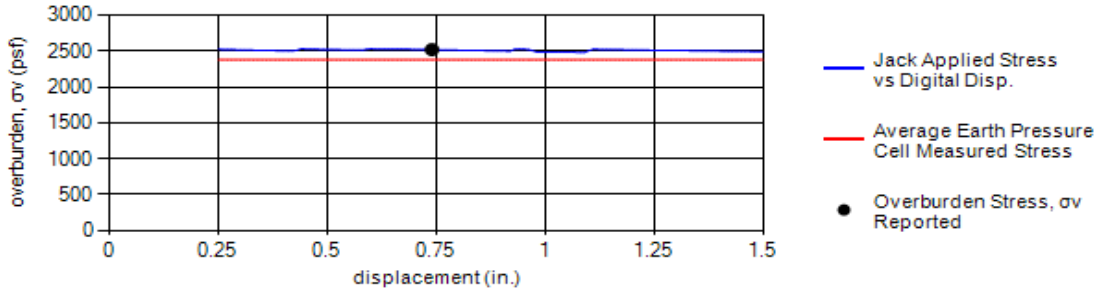
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data. No incidental skew data.

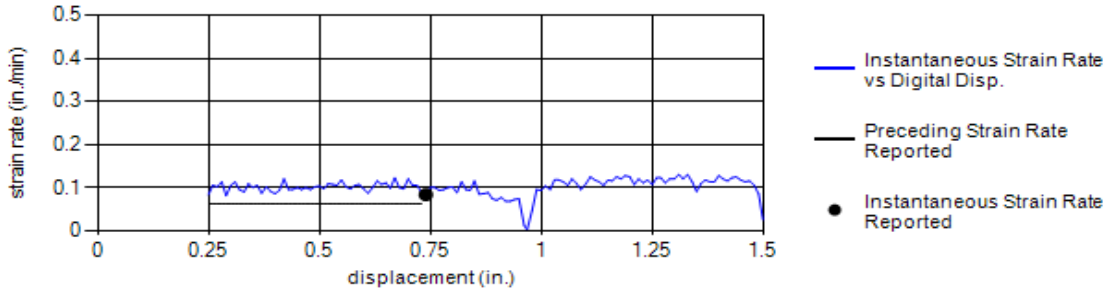
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3077	1005	3176	2571	2066	2379	1.08	2521



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

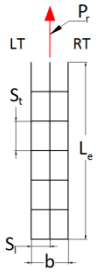
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/22/2011 1:49:00 PM
Test Identification:	TS41.10-G-12x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

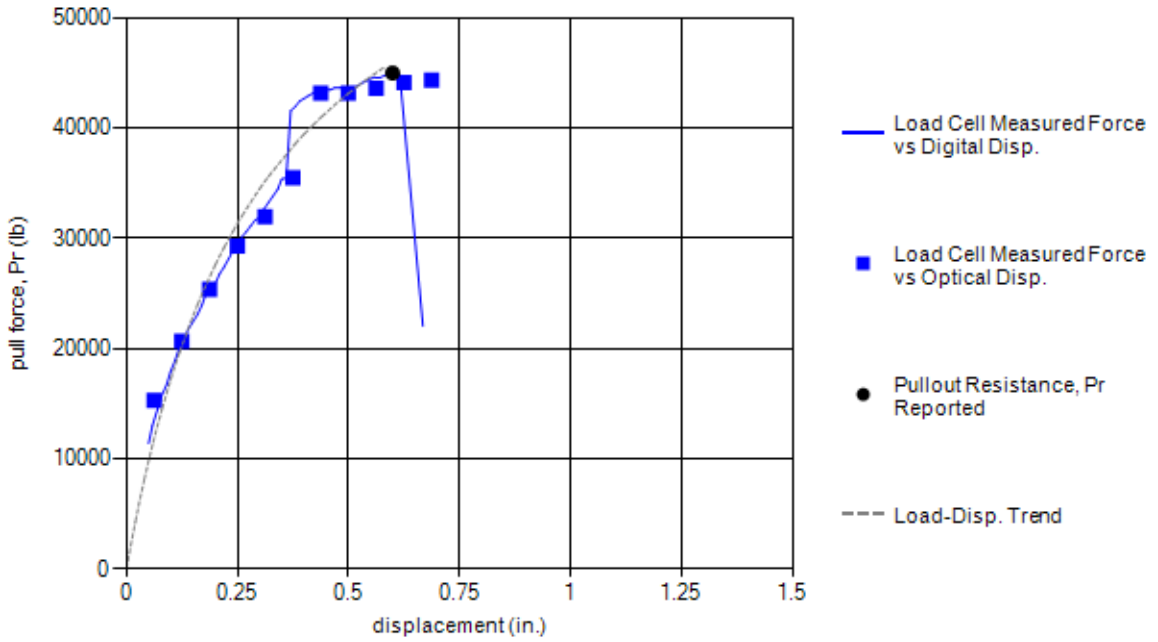
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.60	2493	44959	19.10	**0.75**

Load-Displacement Curve



Comments

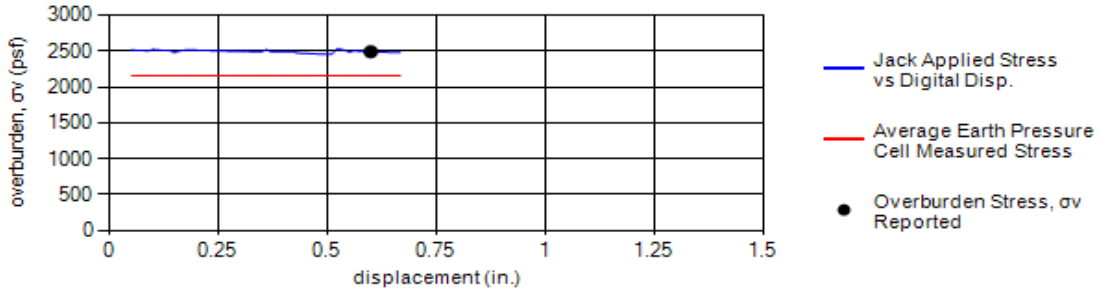
Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

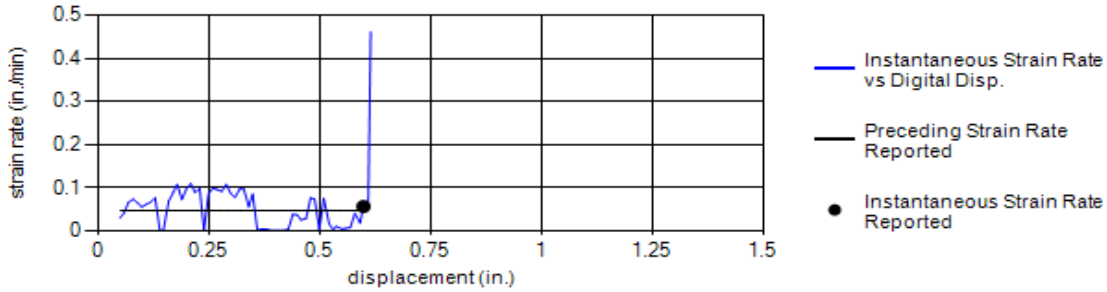
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2198	965	3028	2555	2041	2157	1.04	2493



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.05	0.04

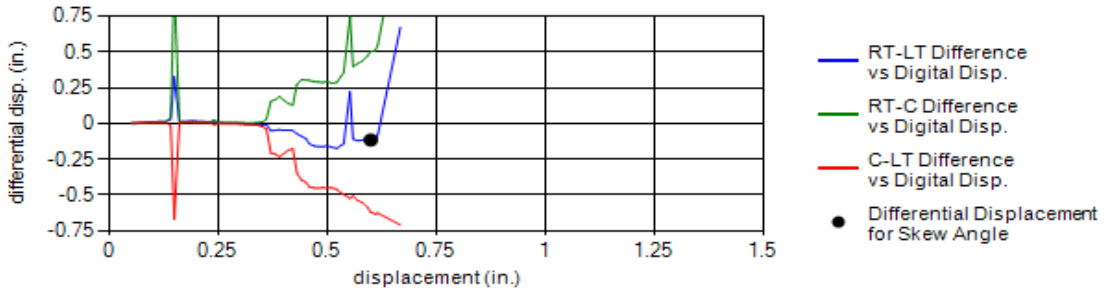


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.12	0.51	-0.62	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.28	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

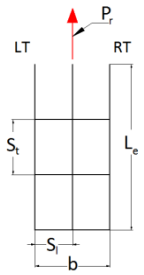
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	2
1/2in.	50-100	60	47
3/8in.		68	57
#4		82	71
#10		89	80
#40	85-100	95	89
#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	12/23/2011 3:26:00 PM
Test Identification:	TS41.11-G-2x12-W20xW11-L3-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

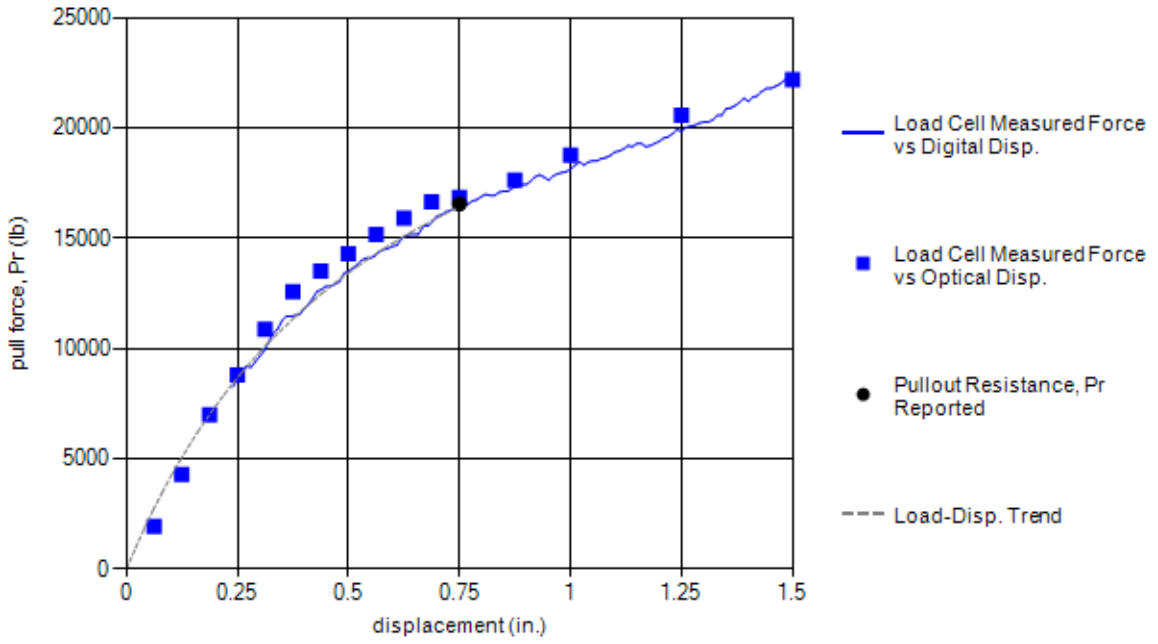
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	4863	16543	37.30	**1.70**

Load-Displacement Curve



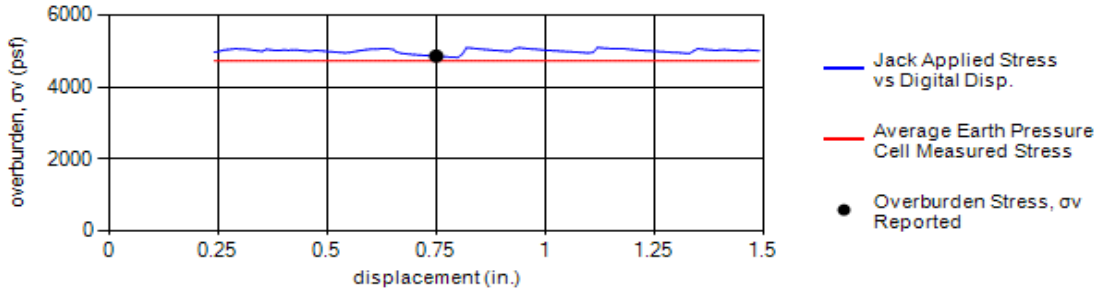
Comments

Hydraulic pullout jack transducer error; no hydraulic pullout jack data.

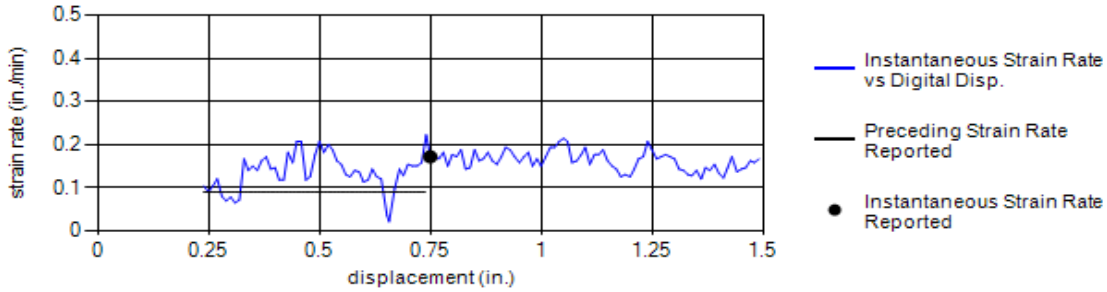
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

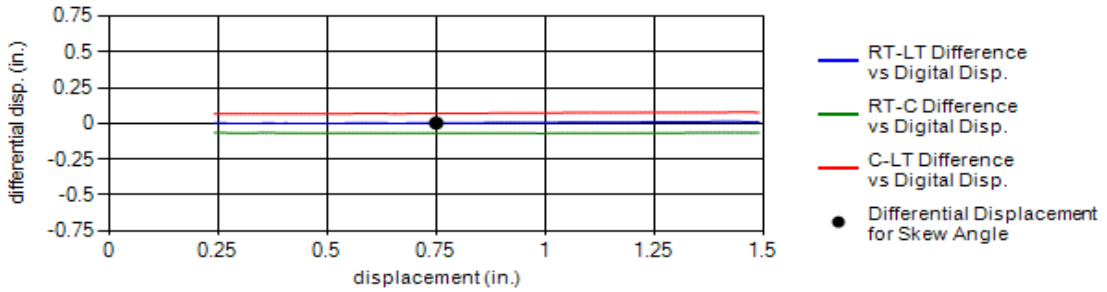
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5036	2824	6446	5174	4175	4731	1.55	4863



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.09	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	-0.07	0.07	No Data	0.05	CCW



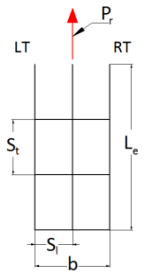
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/3/2012 2:15:00 PM
Test Identification:	TS41.12-G-12x12-W20xW11-L3-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

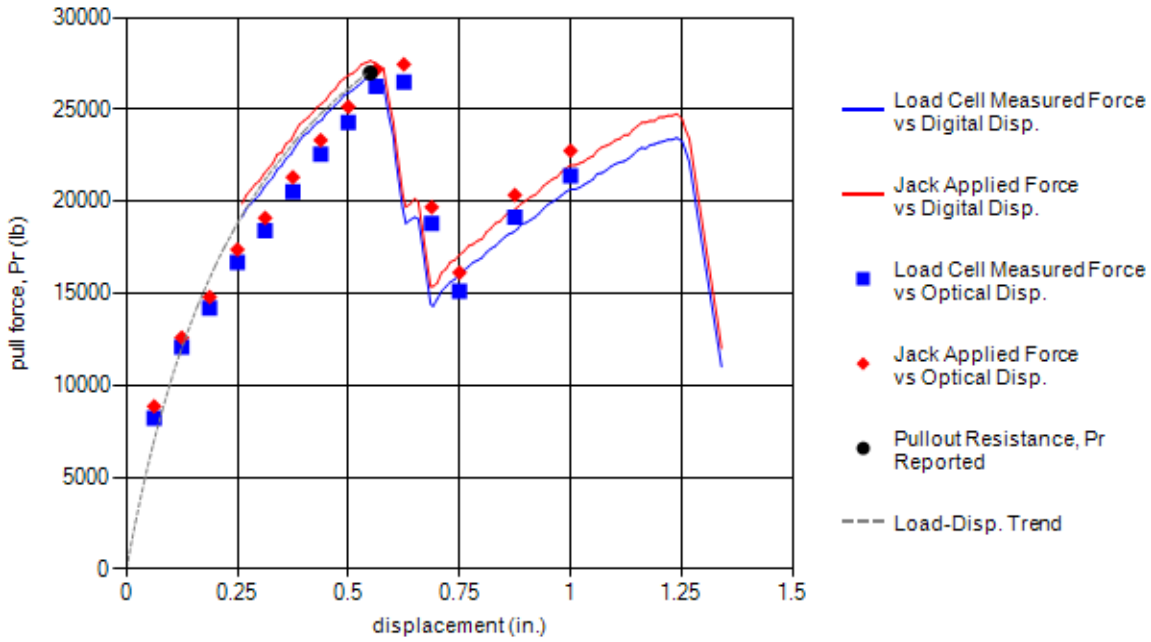
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.55	5024	26982	38.60	**0.45**

Load-Displacement Curve



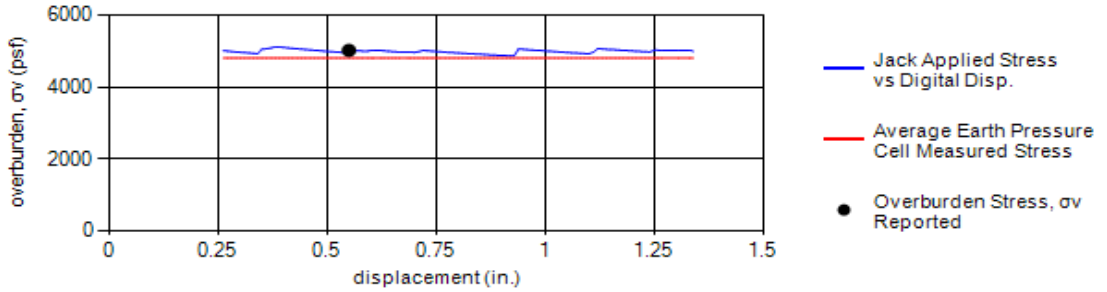
Comments

No incidental skew data.

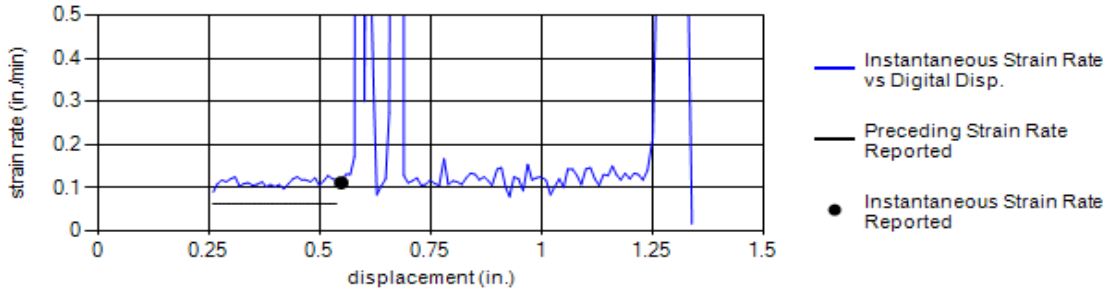
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
5216	2801	6522	5241	4260	4808	1.02	5024



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

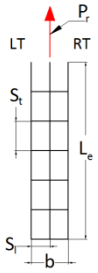
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GW/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	60	47
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		68	57
Liquid Limit, LL (%):	23	#4		82	71
Plastic Limit, PL (%):	20	#10		89	80
Plasticity Index, PI (%):	3	#40	85-100	95	89
Bar Linear Shrinkage, LS (%):	3	#200		98	94

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 2:24:00 PM
Test Identification:	TS42.01-G-2x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

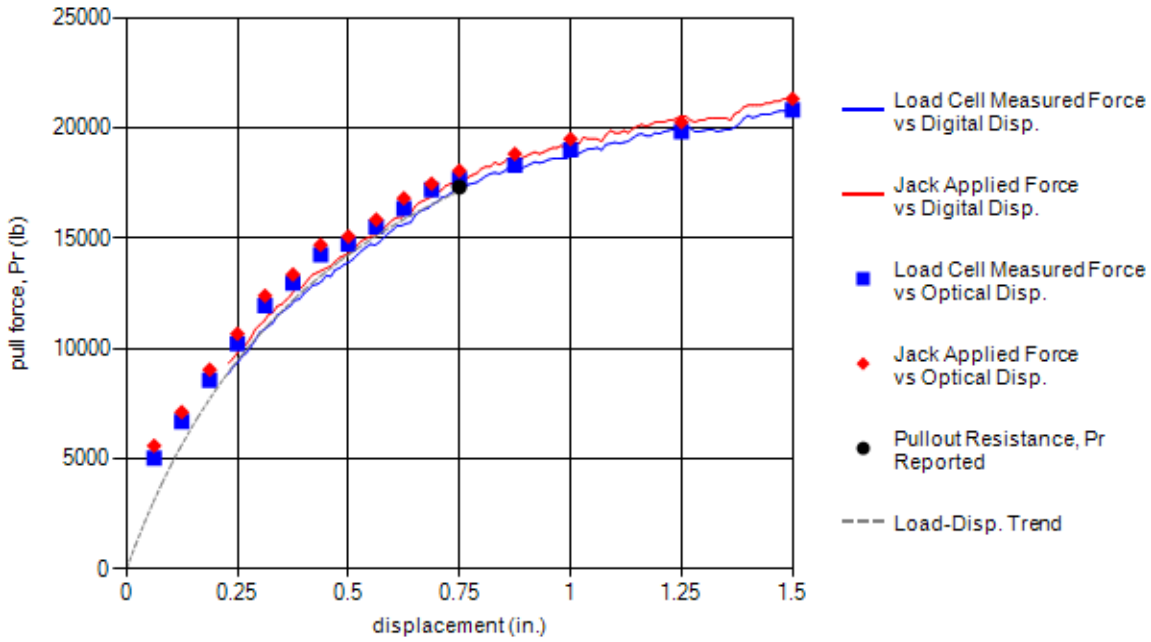
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	664	17313	5.50	**6.52**

Load-Displacement Curve



Comments

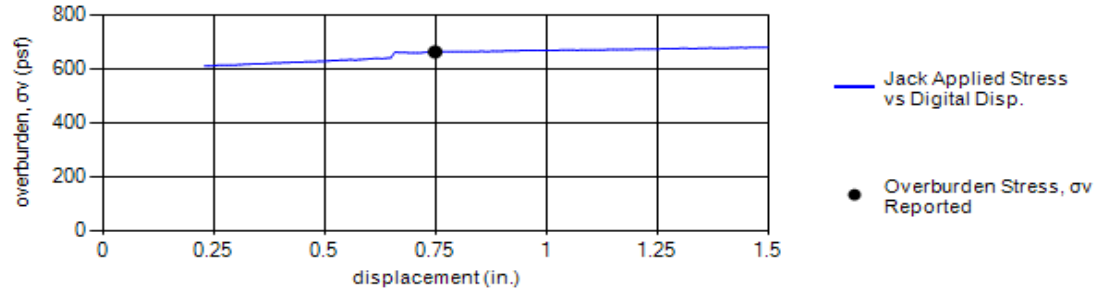
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

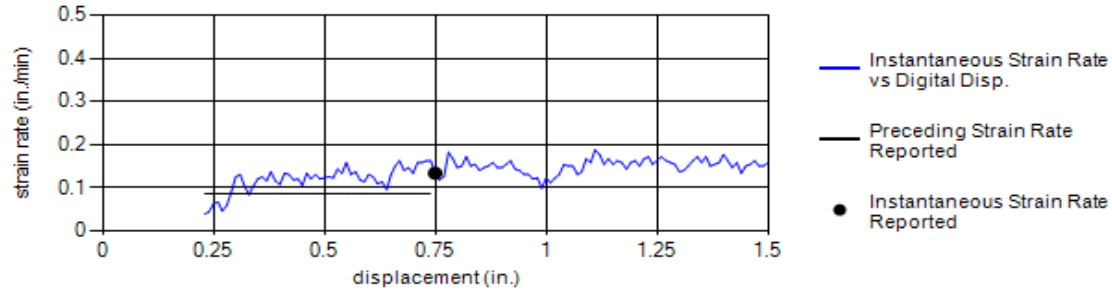
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.39	664



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.09	0.11

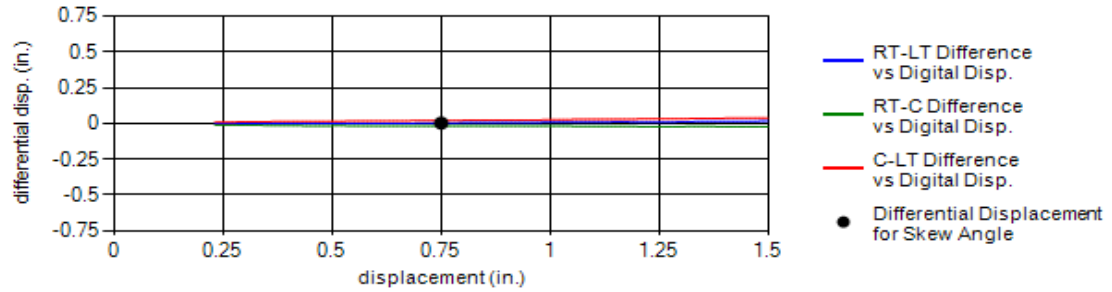


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.00	-0.02	0.02	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.05	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

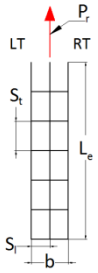
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 4:30:00 PM
Test Identification:	TS42.02-G-12x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

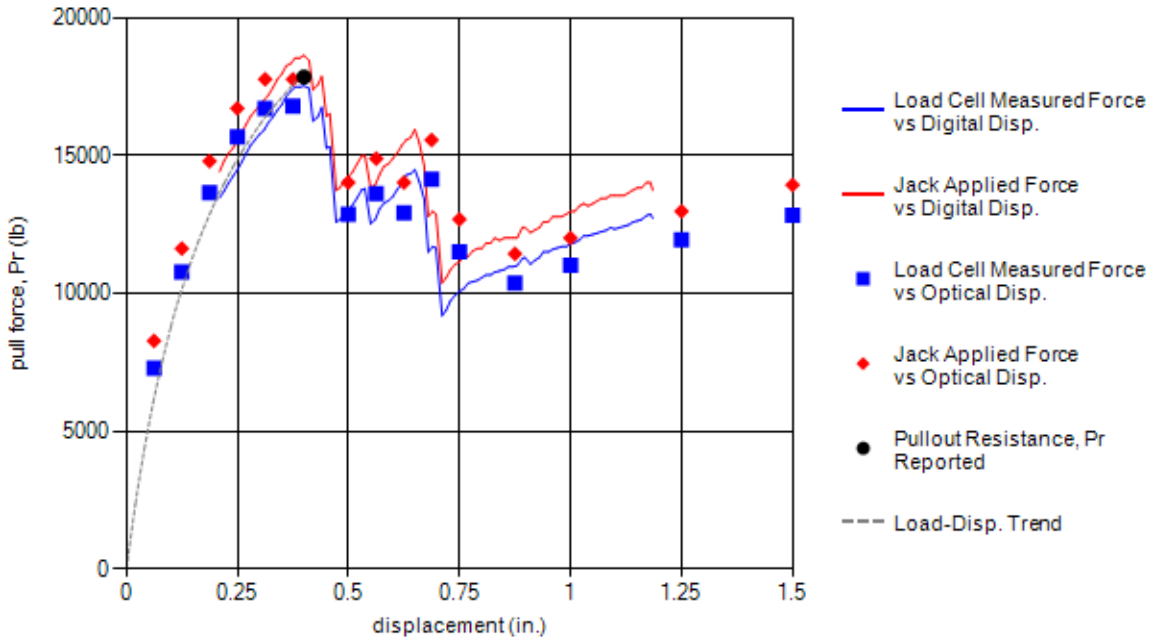
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.40	625	17842	5.20	**1.19**

Load-Displacement Curve



Comments

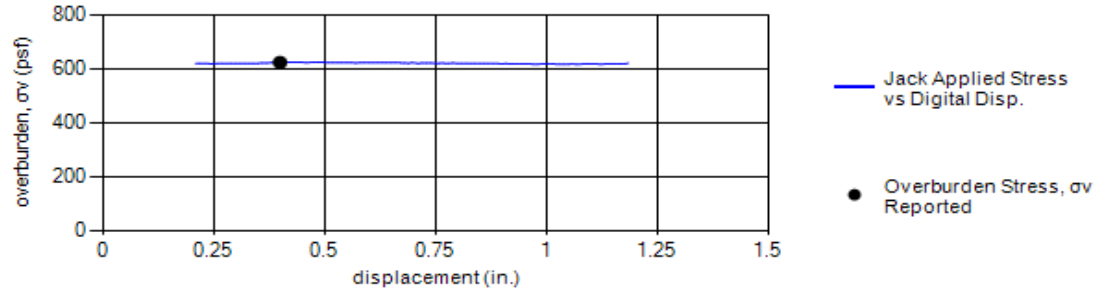
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

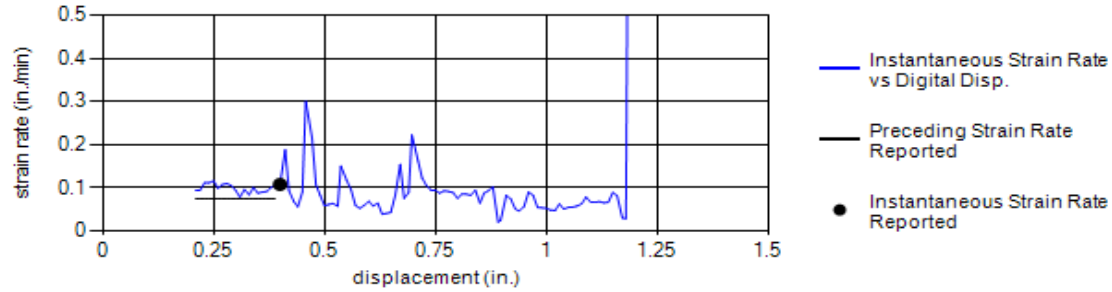
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.60	625



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.07

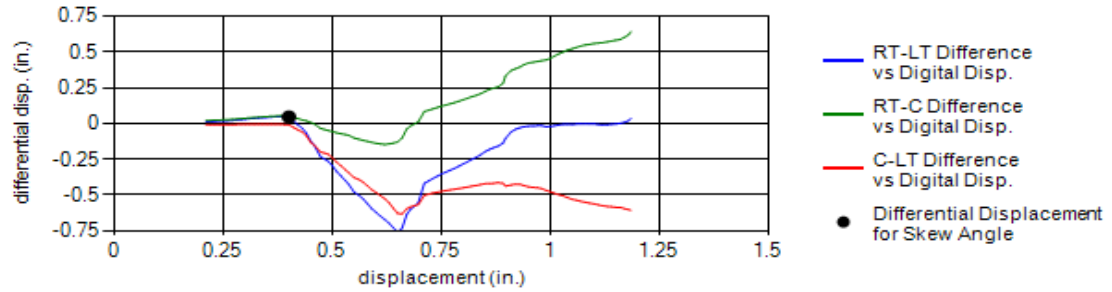


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.05	0.06	-0.01	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.11	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

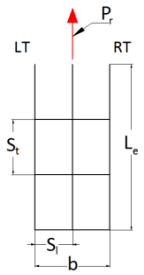
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/25/2012 10:29:00 AM
Test Identification:	TS42.03-G-2x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

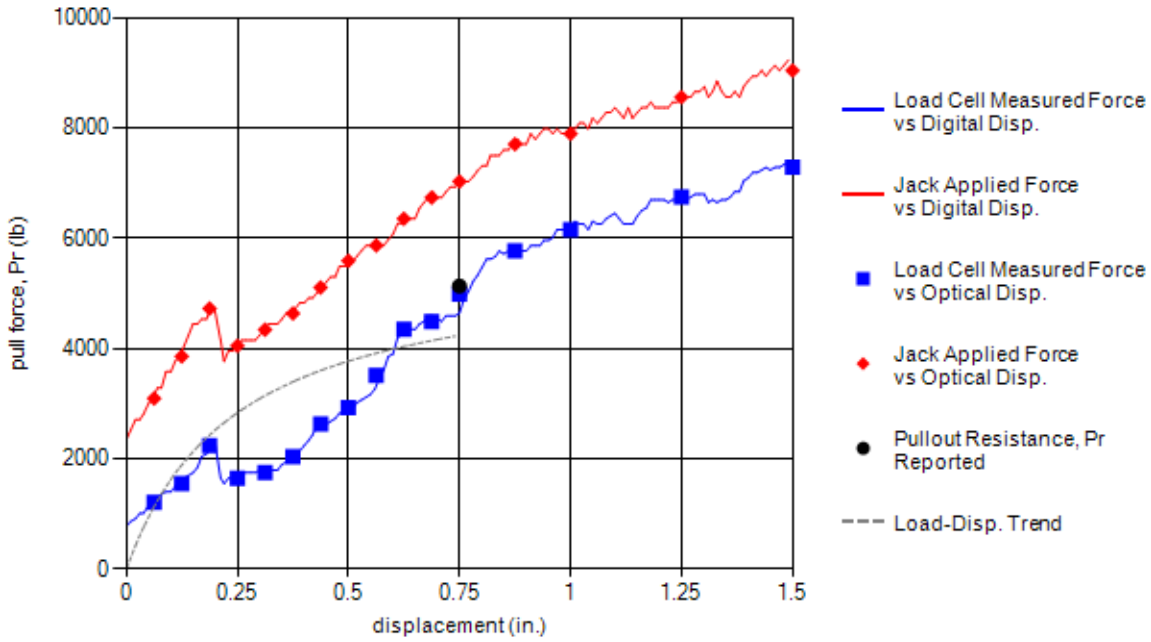
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1495	5131	12.30	**1.72**

Load-Displacement Curve

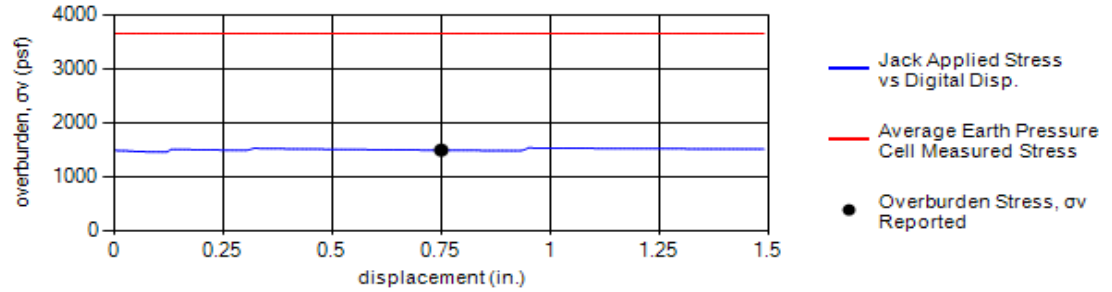


Comments

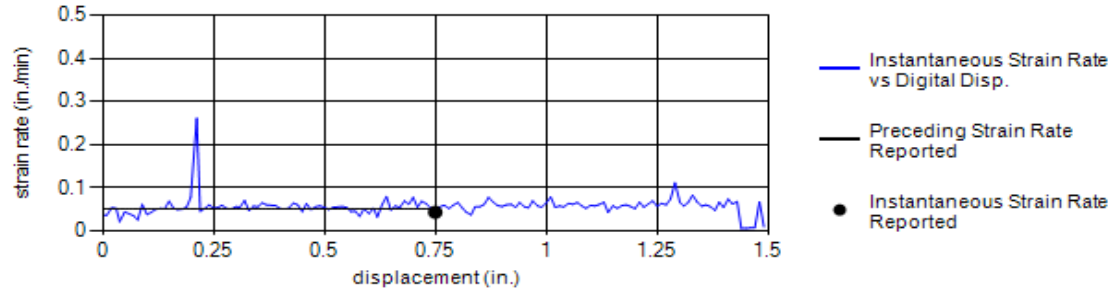
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

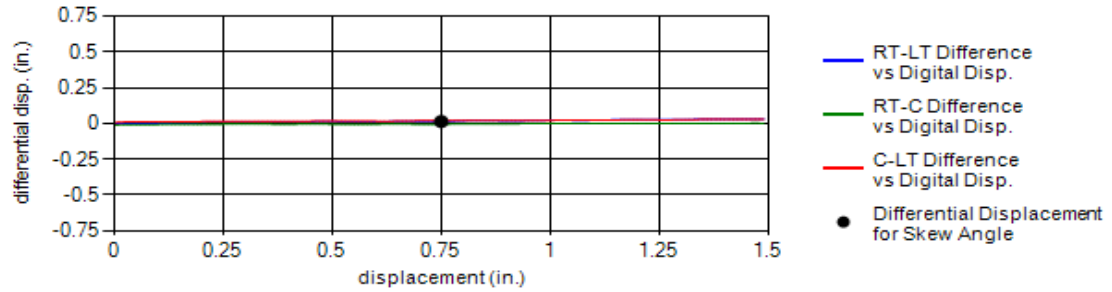
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3554	4060	3429	3564	3677	3657	1.51	1494



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.05	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	-0.01	0.02	No Data	0.20	CCW



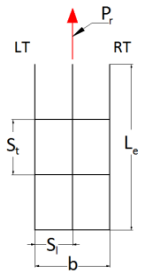
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/24/2012 1:36:00 PM
Test Identification:	TS42.04-G-12x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

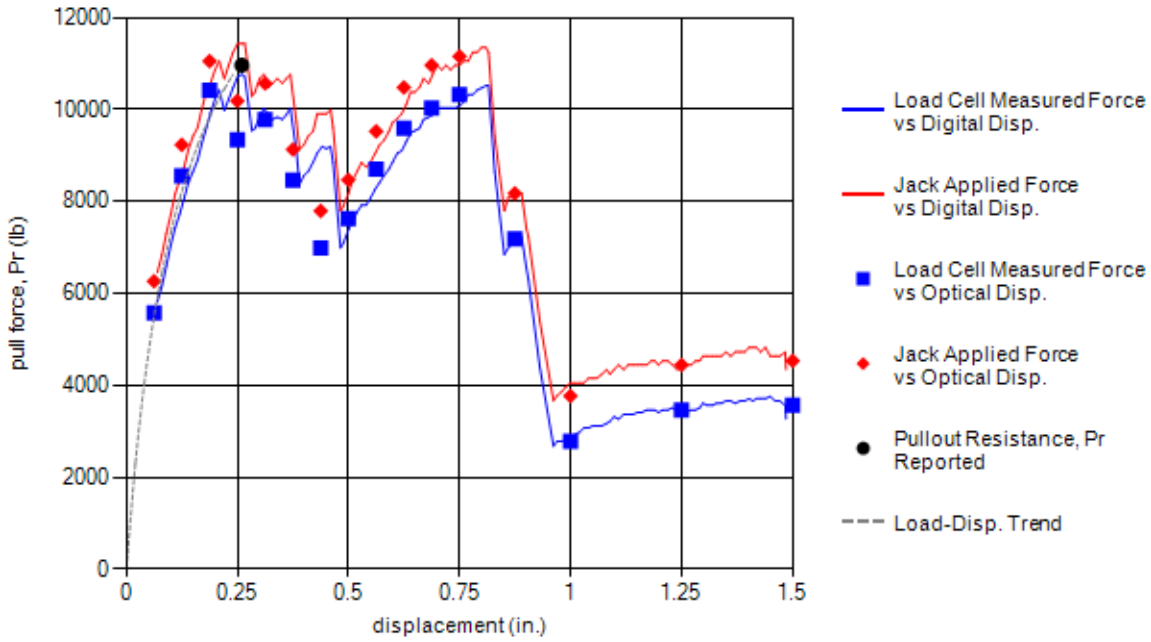
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.26	1489	10961	12.30	**0.61**

Load-Displacement Curve

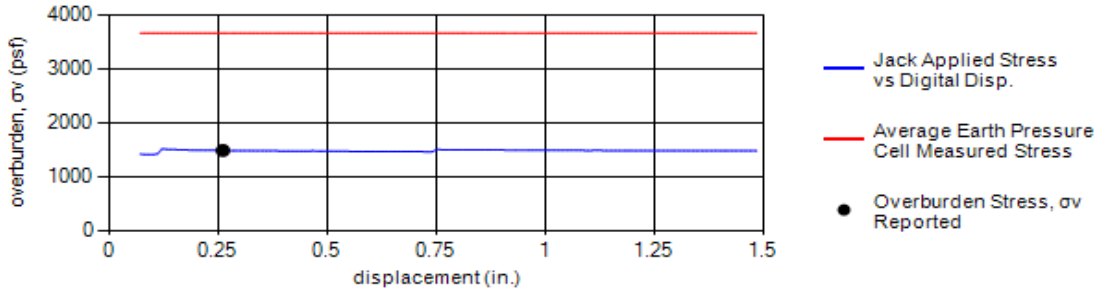


Comments

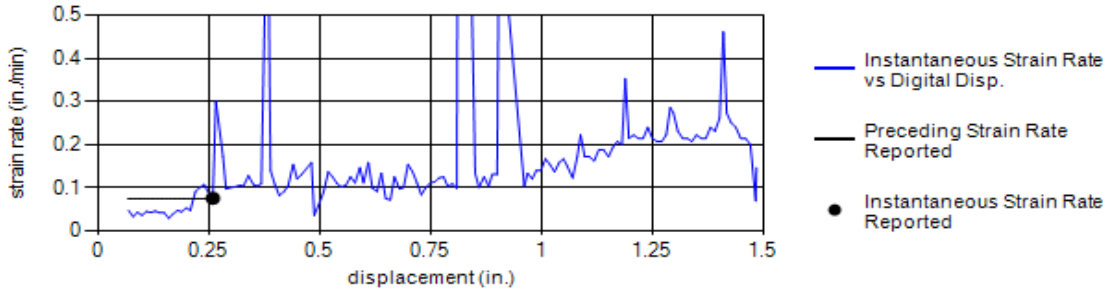
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

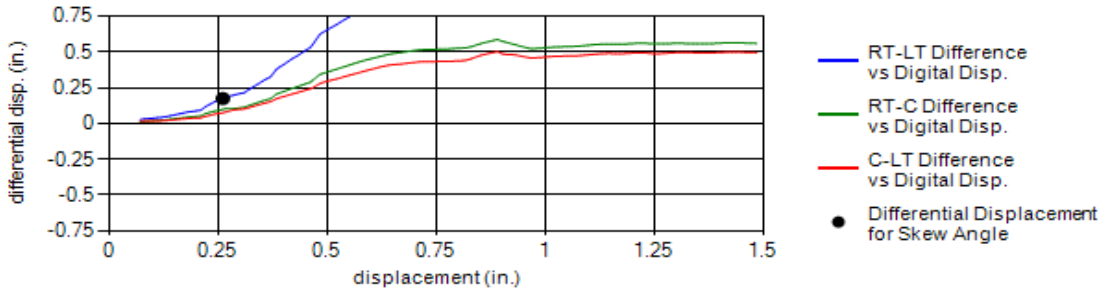
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3580	4072	3439	3589	3681	3672	1.51	1488



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.07	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.17	0.10	0.08	No Data	0.42	CCW



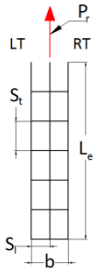
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 3:22:00 PM
Test Identification:	TS42.05-G-2x12-W9.5xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

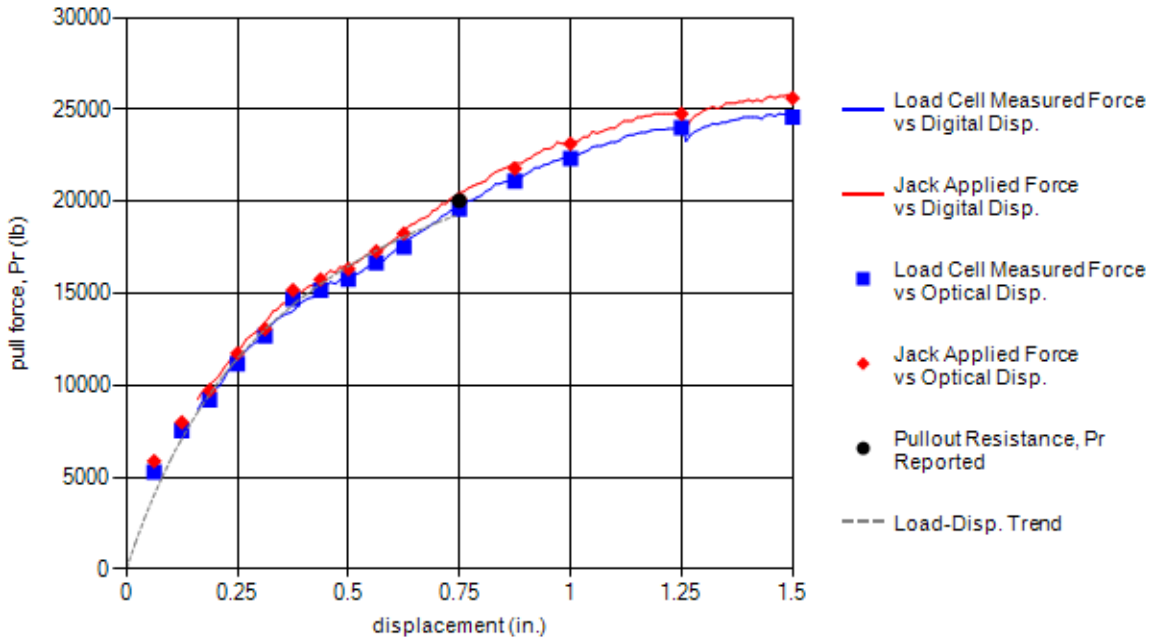
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	642	20036	5.30	**7.81**

Load-Displacement Curve



Comments

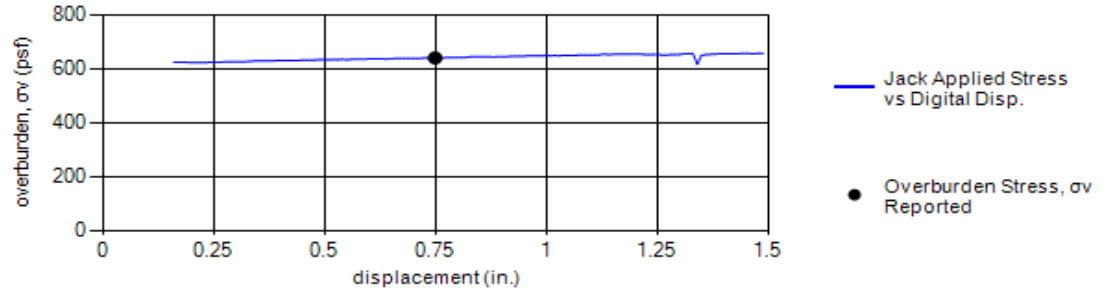
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

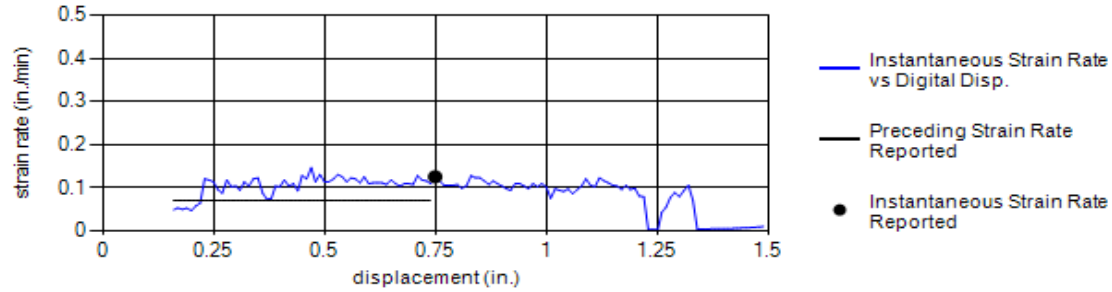
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.70	642



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.06

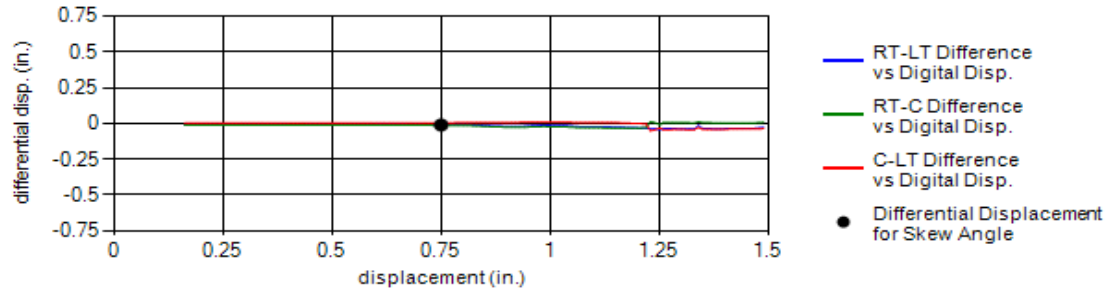


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.01	-0.01	0.00	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.14	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

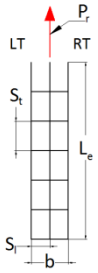
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 1:31:00 PM
Test Identification:	TS42.06-G-12x12-W9.5xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

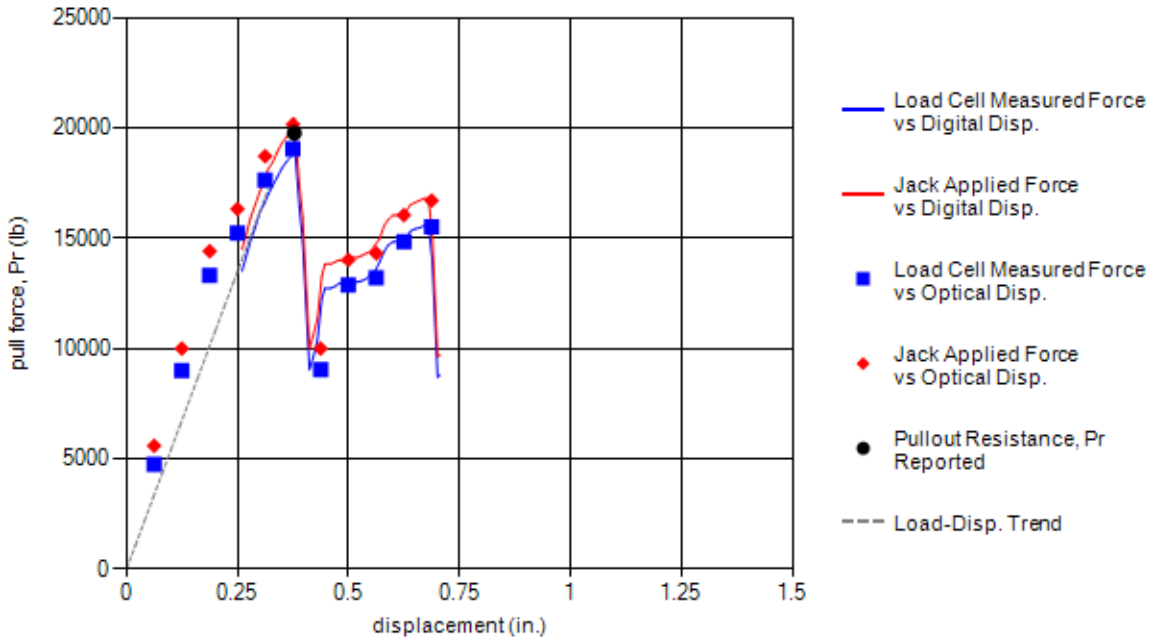
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.38	627	19764	5.20	**1.31**

Load-Displacement Curve



Comments

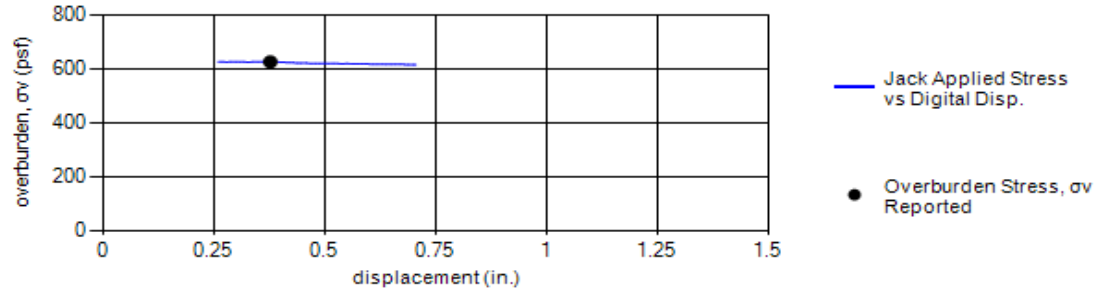
Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

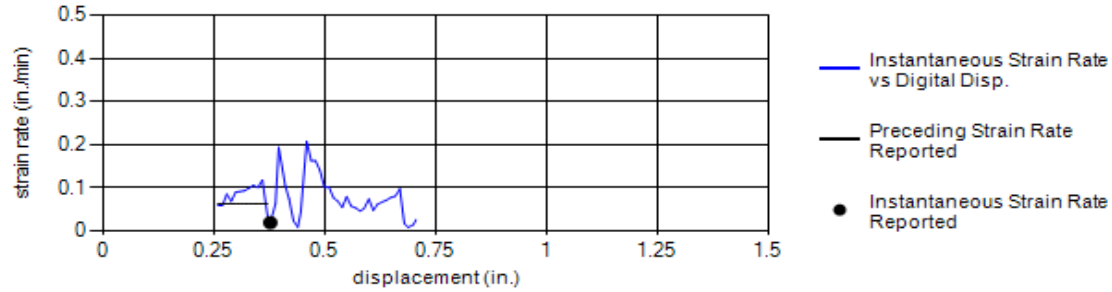
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	3.78	627



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.06	0.04

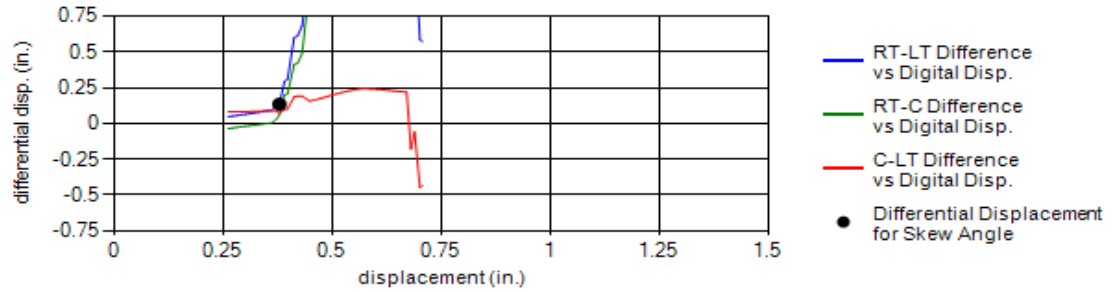


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.14	0.06	0.07	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.32	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

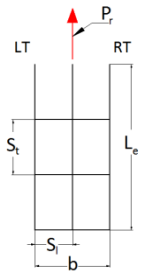
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/23/2012 2:52:00 PM
Test Identification:	TS42.07-G-2x12-W9.5xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

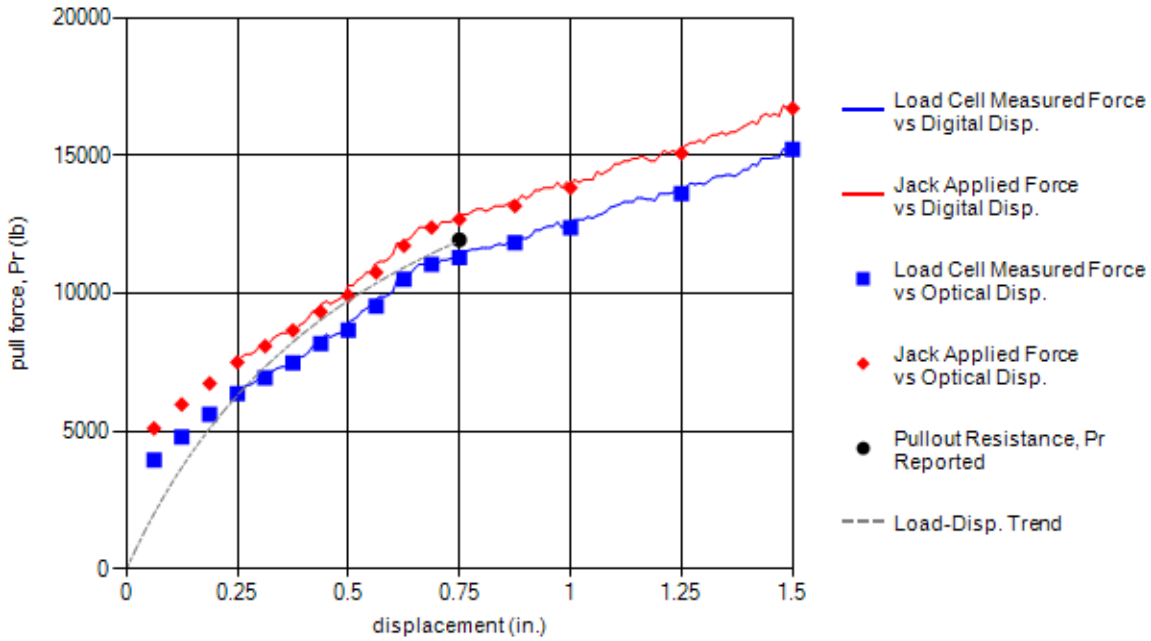
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1468	11935	12.10	**4.07**

Load-Displacement Curve

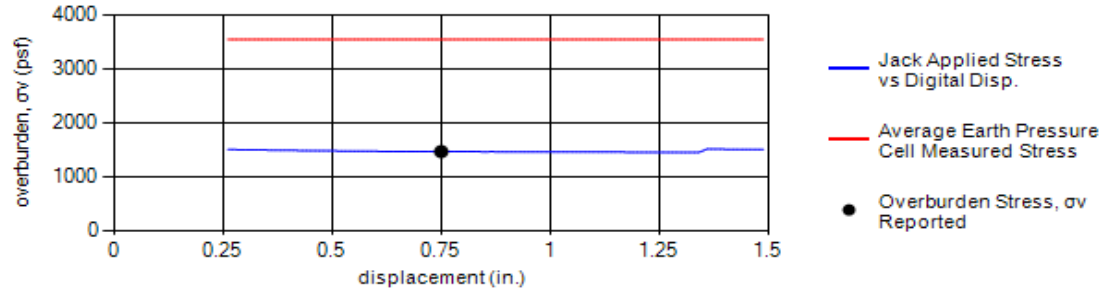


Comments

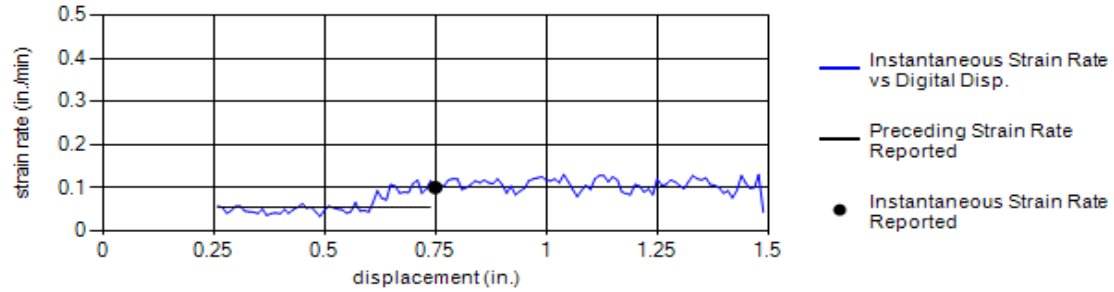
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

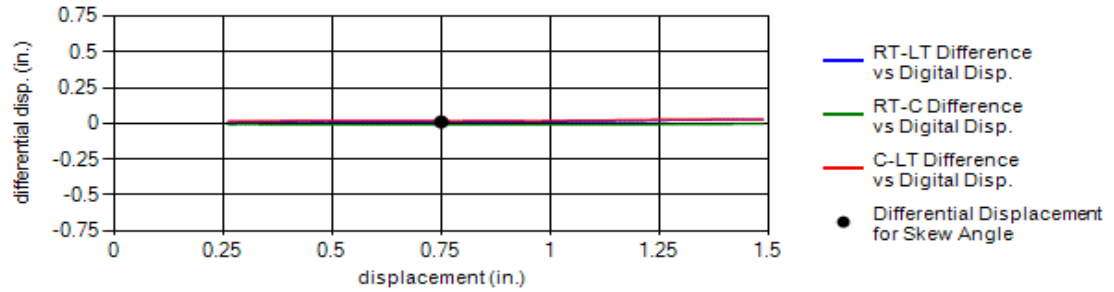
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3480	3953	3313	3464	3553	3552	1.62	1467



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	-0.01	0.02	No Data	0.16	CCW



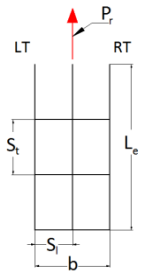
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/23/2012 3:50:00 PM
Test Identification:	TS42.08-G-12x12-W9.5xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

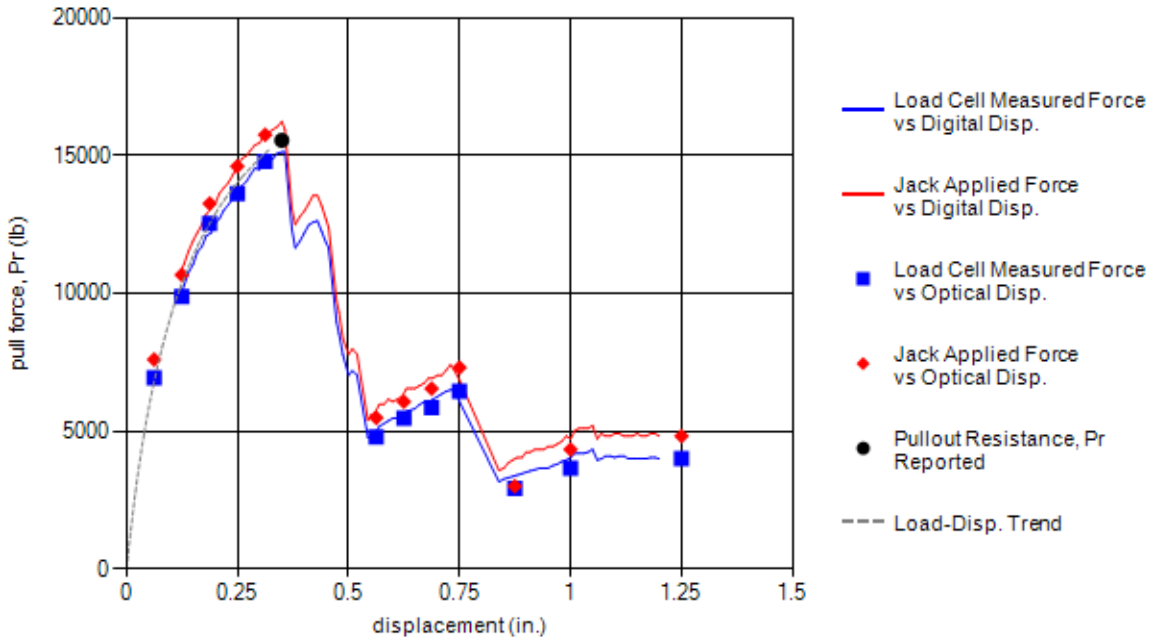
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.35	1507	15545	12.40	**0.86**

Load-Displacement Curve



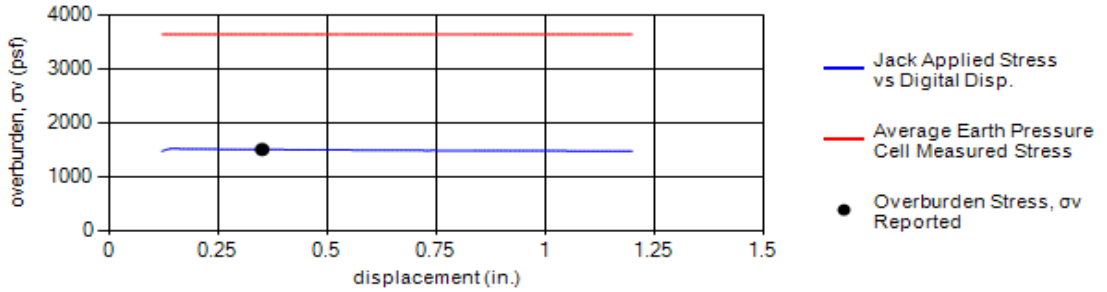
Comments

No incidental skew data.

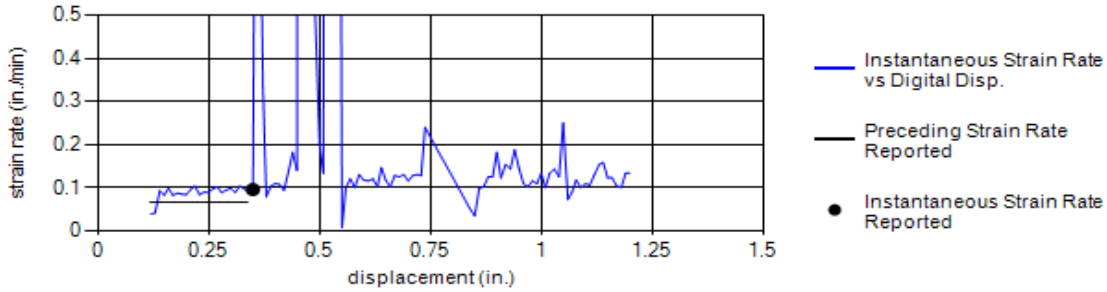
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3571	4046	3416	3552	3648	3647	1.57	1506



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

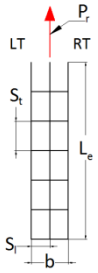
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 11:40:00 AM
Test Identification:	TS42.09-G-2x12-W9.5xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

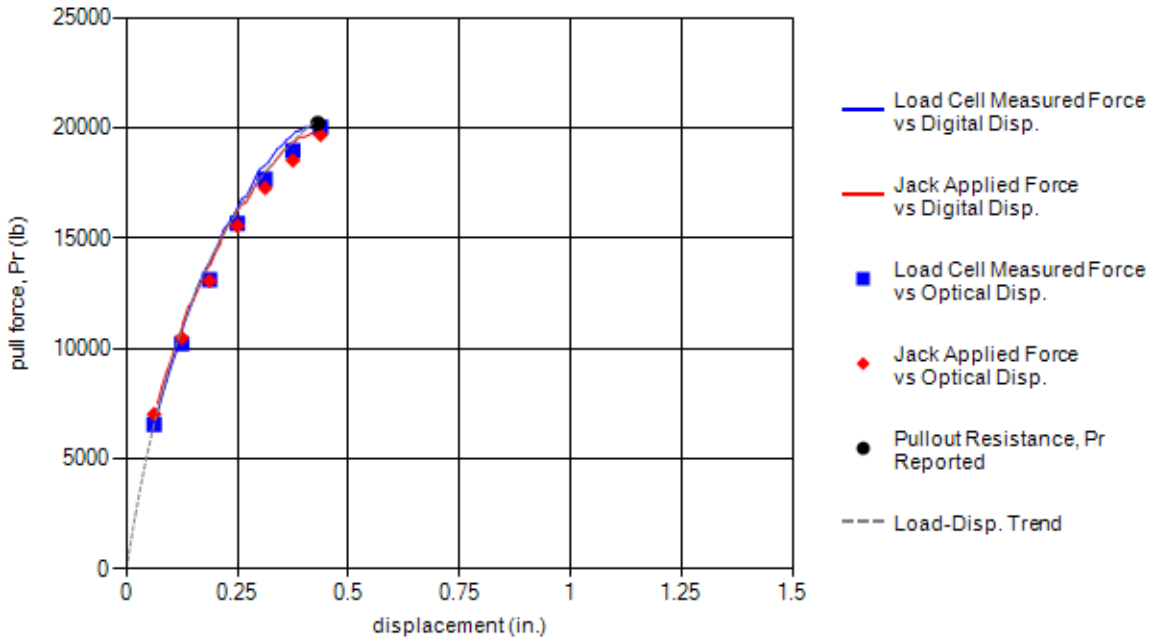
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Rupture	0.43	2506	20198	18.80	**2.01**

Load-Displacement Curve



Comments

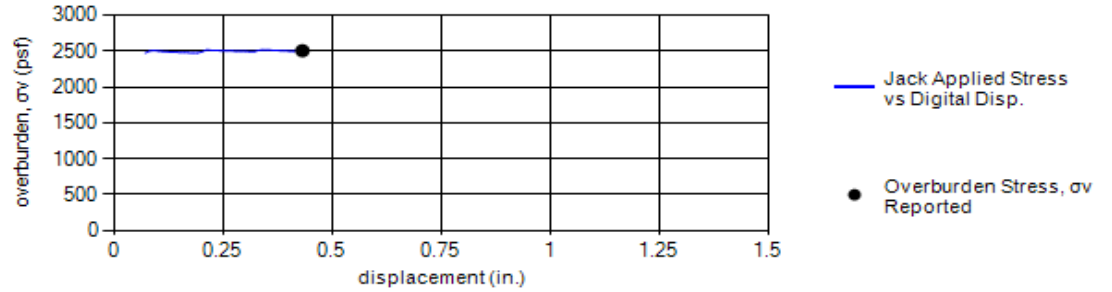
Two bar rupture at 0.43in. No earth pressure cell data.

Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

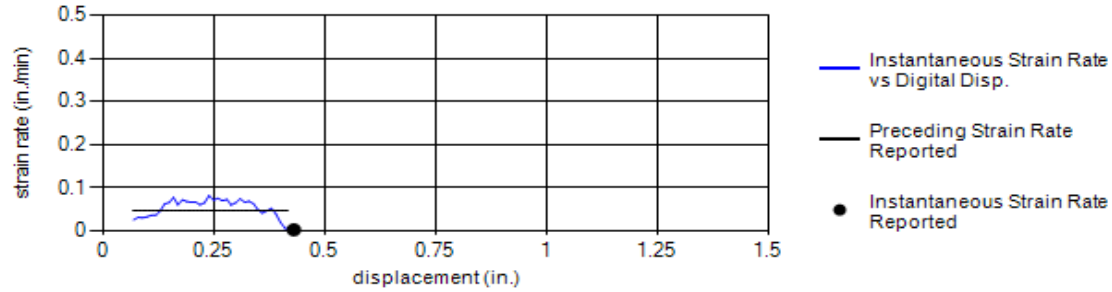
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2506



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.00	0.04	0.02

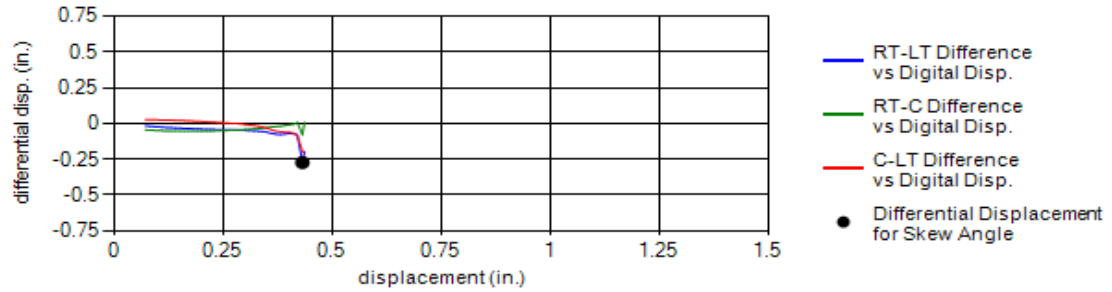


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.27	-0.08	-0.19	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-3.91	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

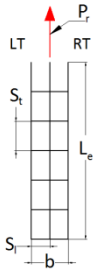
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/20/2012 12:35:00 PM
Test Identification:	TS42.10-G-12x12-W9.5xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

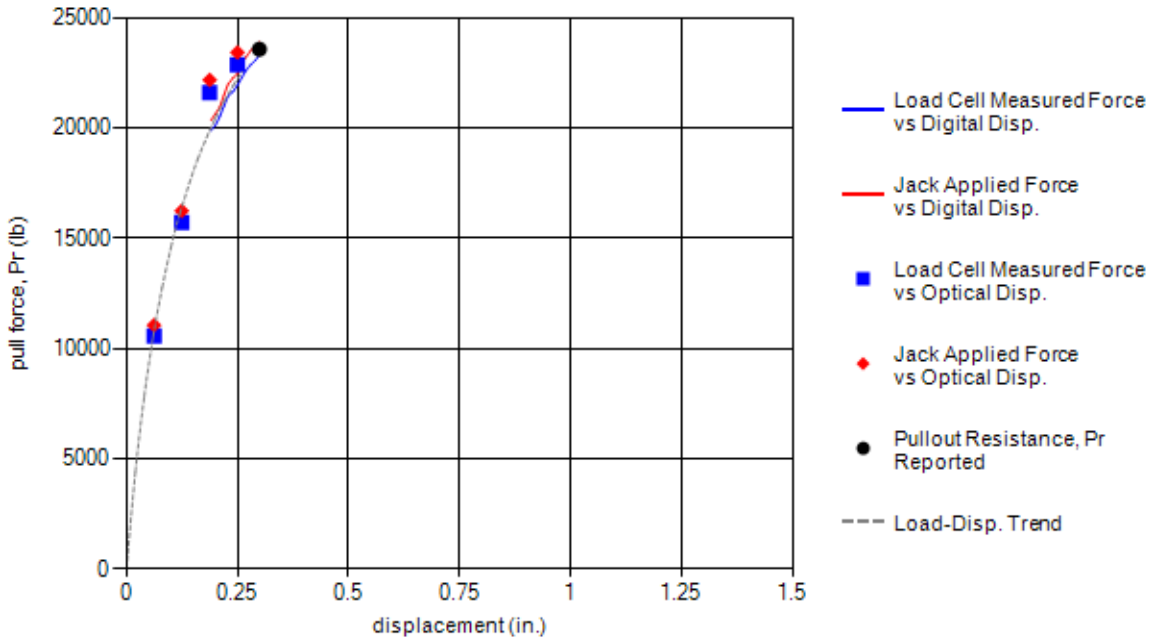
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Rupture	0.30	2529	23558	19.00	**0.39**

Load-Displacement Curve



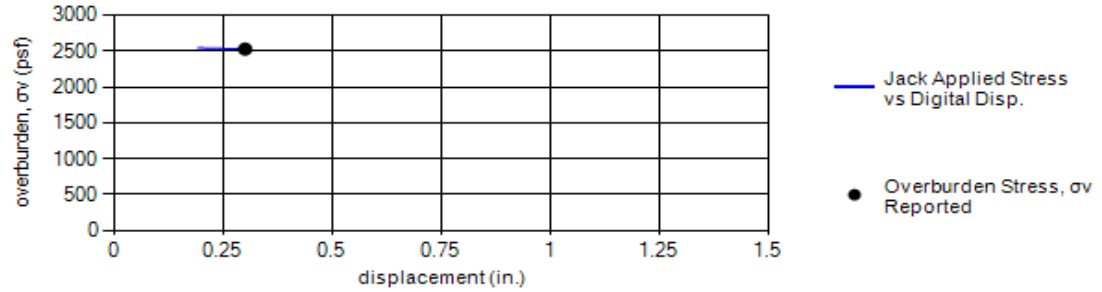
Comments

Single bar rupture at 0.30in. No earth pressure cell data. No incidental skew data.

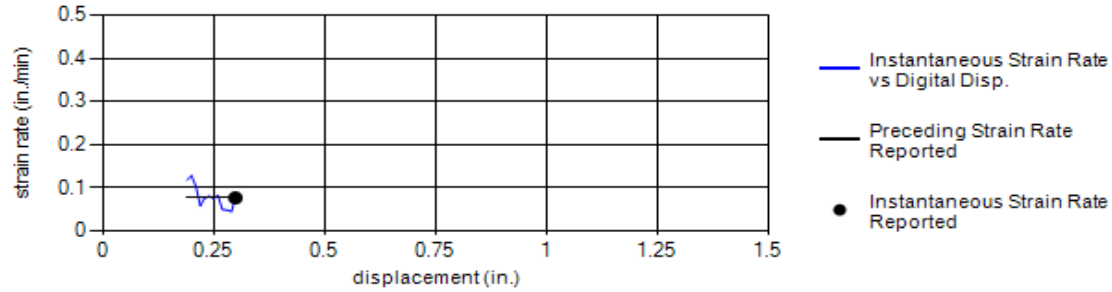
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2529



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.08	0.03



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

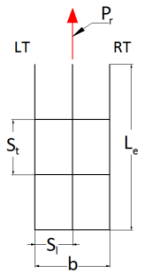
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/23/2012 1:53:00 PM
Test Identification:	TS42.11-G-2x12-W9.5xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	4	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	2

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

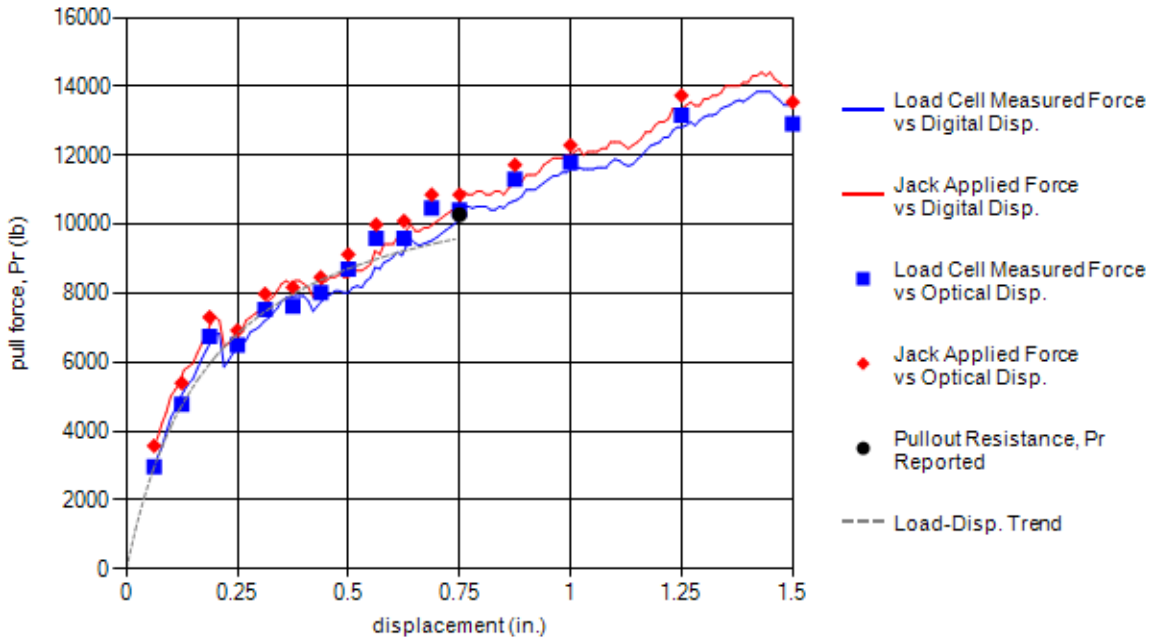
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1510	10277	11.30	**3.40**

Load-Displacement Curve



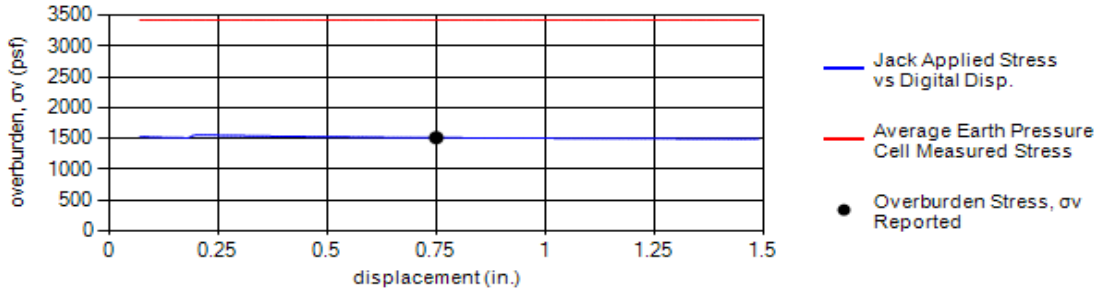
Comments

No incidental skew data.

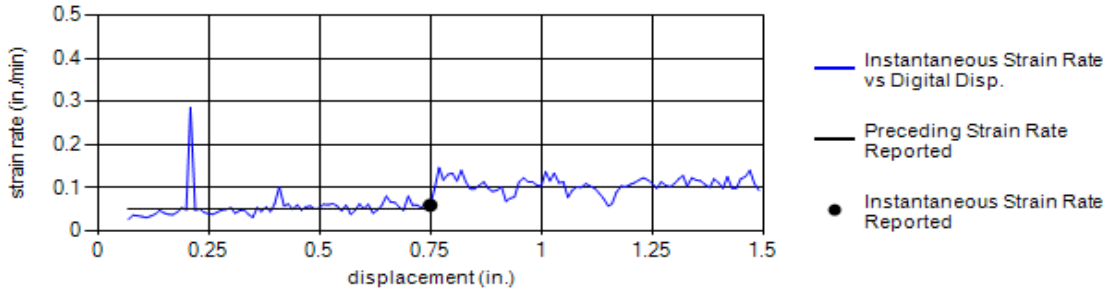
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3368	3824	3191	3330	3409	3424	1.67	1510



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

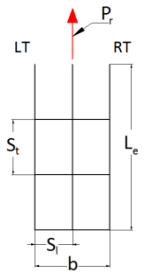
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	1/23/2012 12:05:00 PM
Test Identification:	TS42.12-G-12x12-W9.5xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	24	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	12

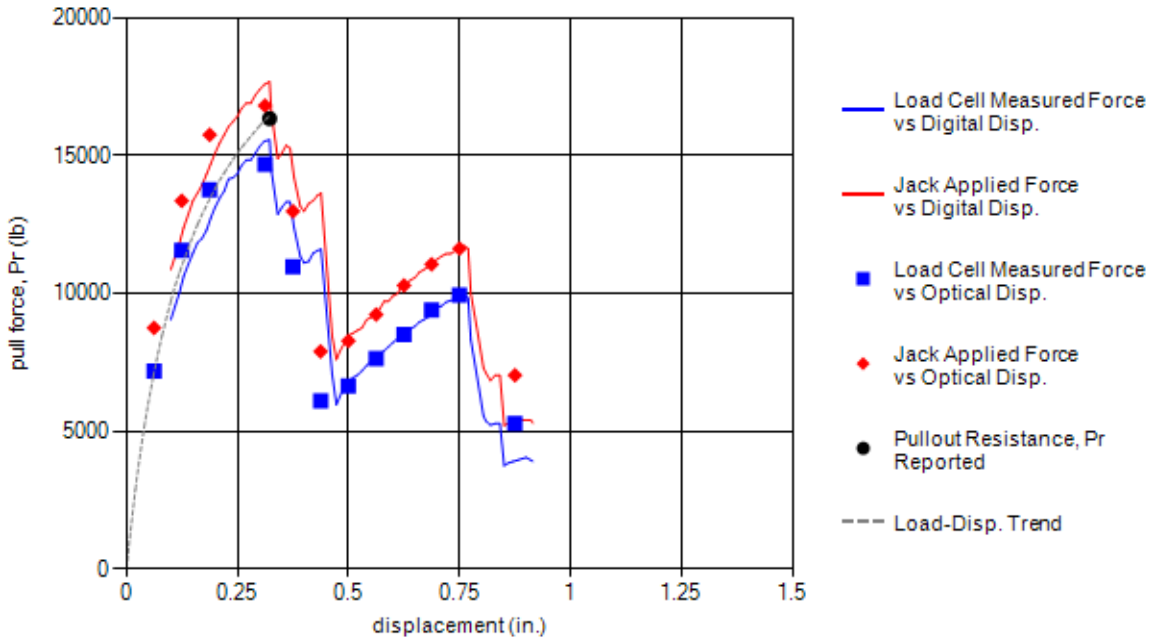
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.32	1570	16332	11.80	**0.87**

Load-Displacement Curve

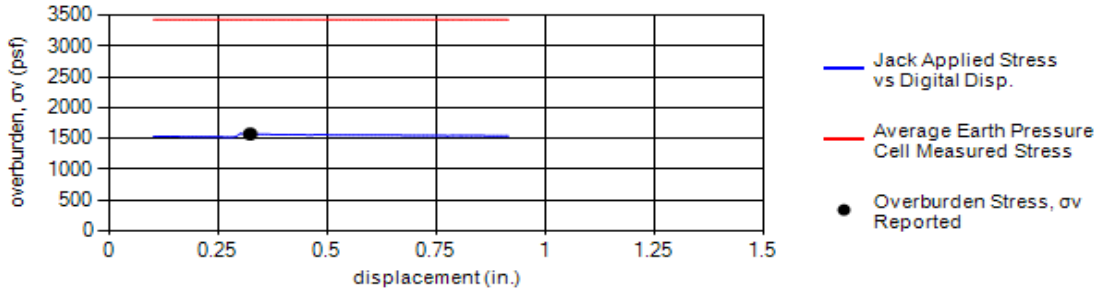


Comments

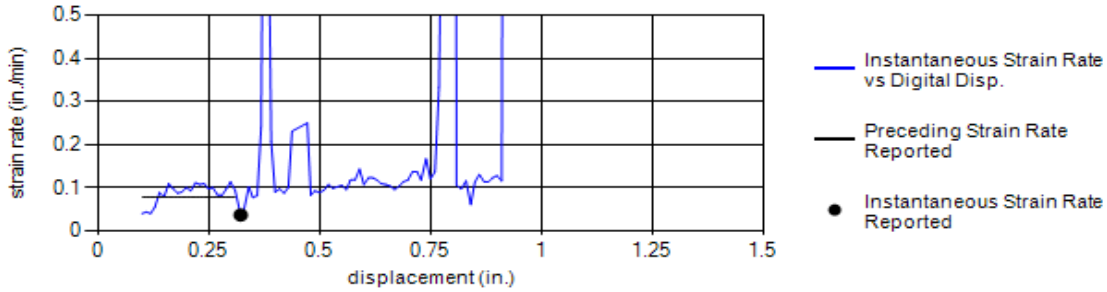
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

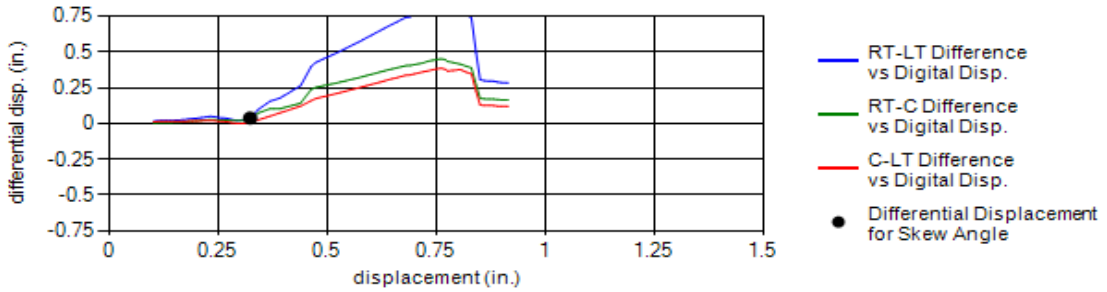
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3380	3939	3141	3294	3380	3427	1.61	1570



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.03	0.01	No Data	0.09	CCW



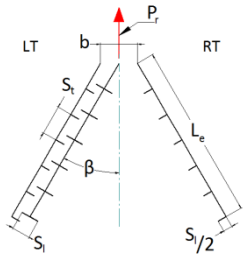
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/15/2012 4:09:00 PM
Test Identification:	TS43.01-G-9x12-W20xW11-L6-ß15°-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

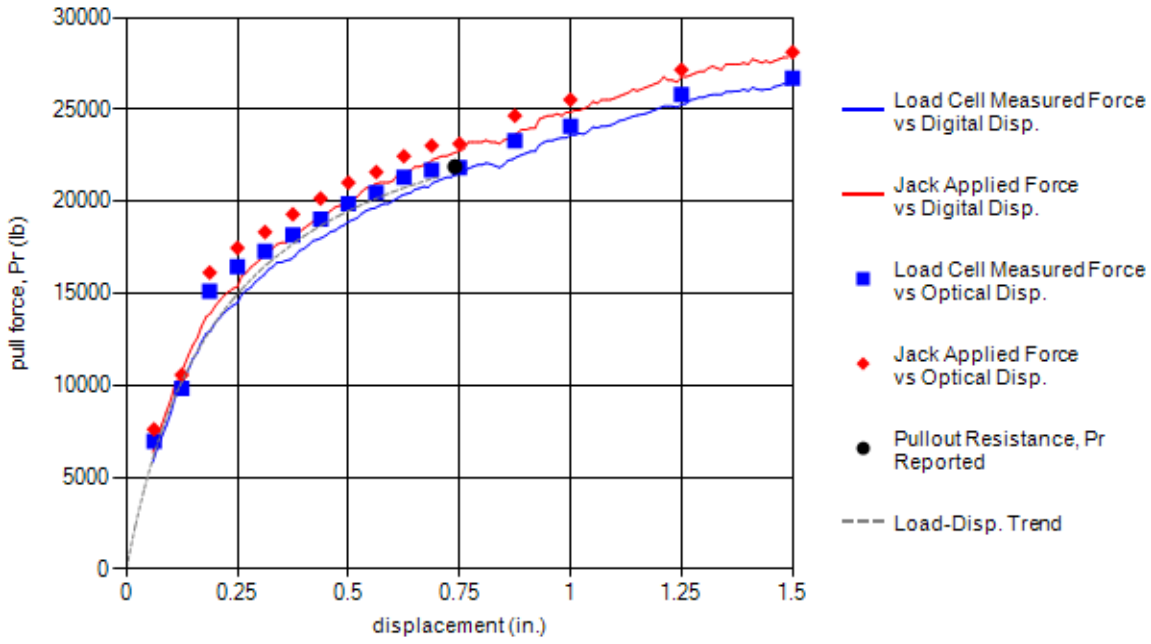
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	624	21883	5.00	**1.95**

Load-Displacement Curve



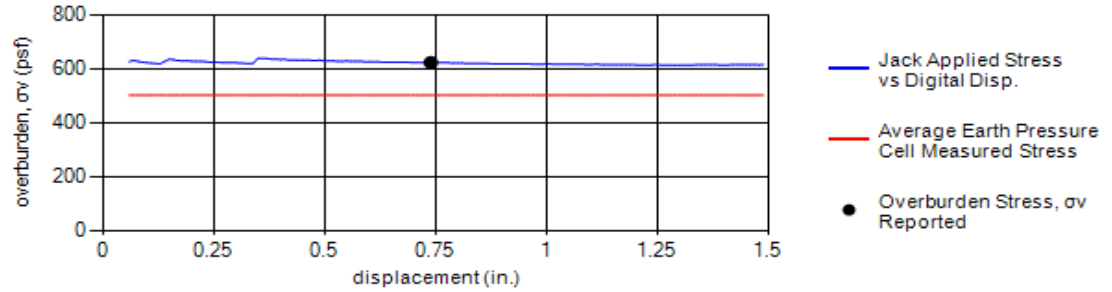
Comments

No incidental skew data.

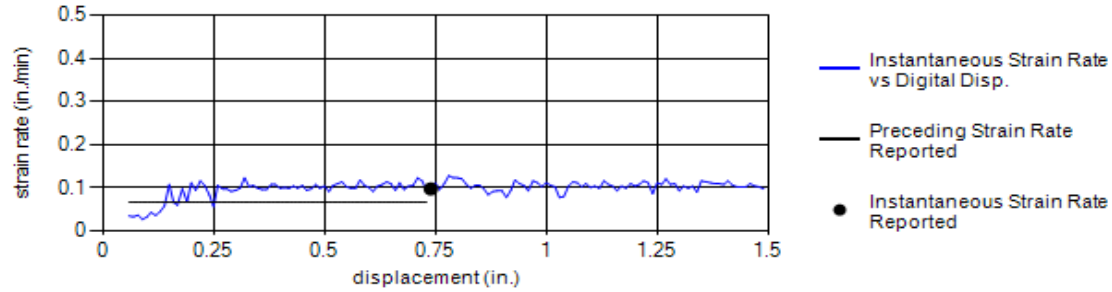
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
557	664	270	453	570	503	1.74	625



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

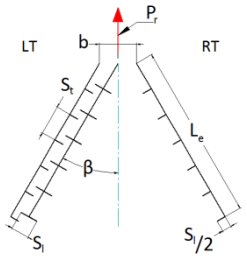
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/17/2012 12:28:00 PM
Test Identification:	TS43.02-G-9x12-W20xW11-L6-ß30°-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

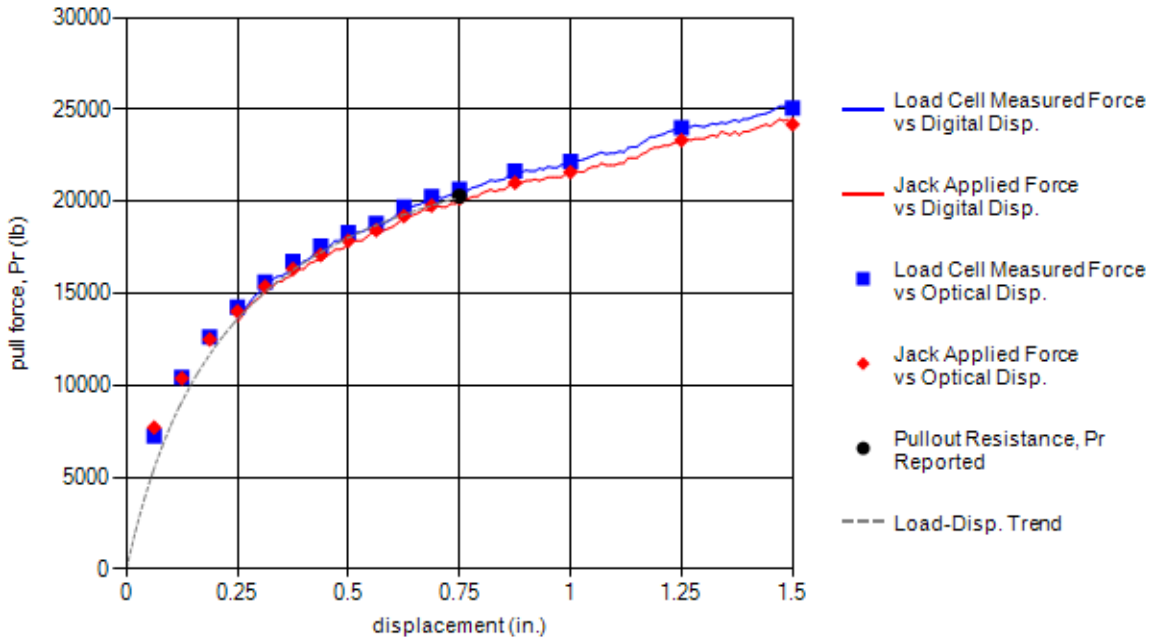
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	631	20277	5.10	**1.78**

Load-Displacement Curve

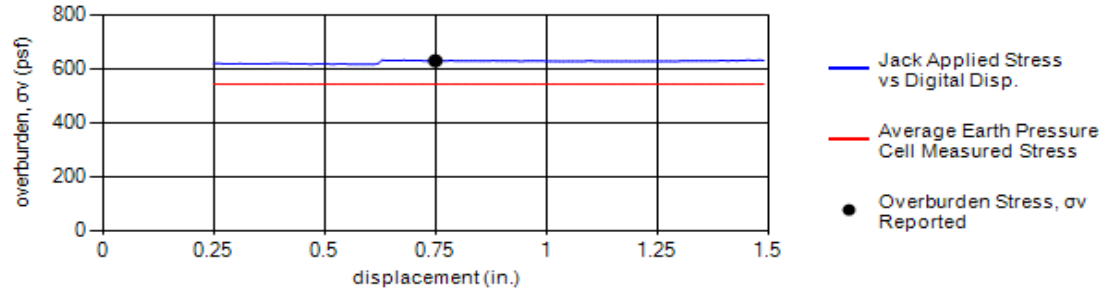


Comments

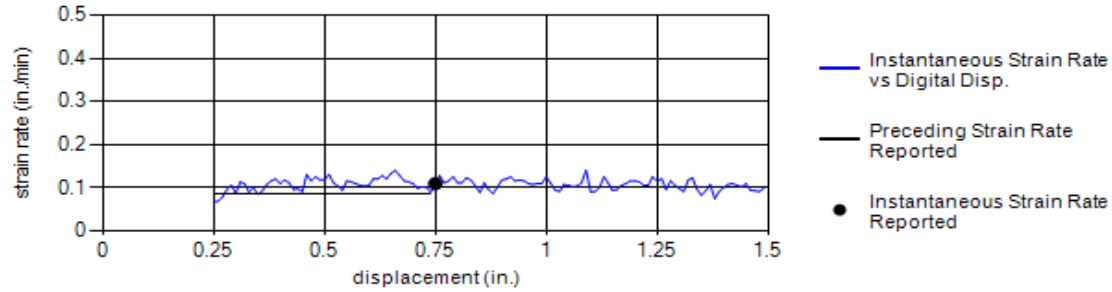
Personnel

Tested:	TW TW ET
Prepared:	SB TW
Checked:	WL PJ

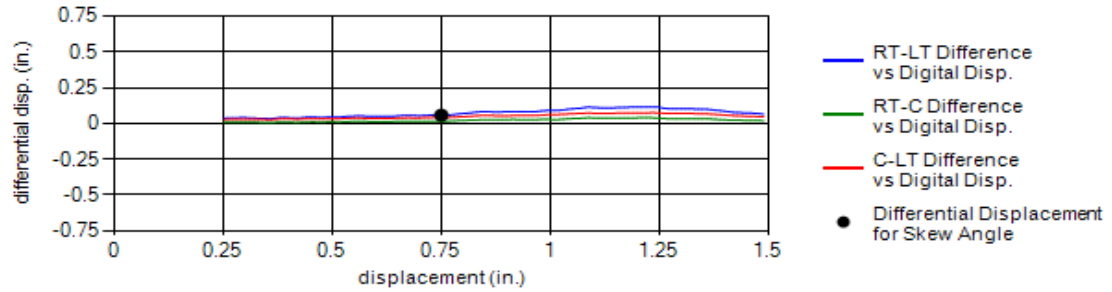
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
443	833	284	548	615	544	1.64	631



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	0.02	0.04	No Data	0.18	CCW



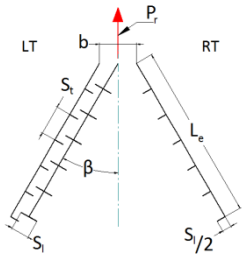
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/13/2012 3:24:00 PM
Test Identification:	TS43.05-G-9x12-W20xW11-L6-ß15°-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

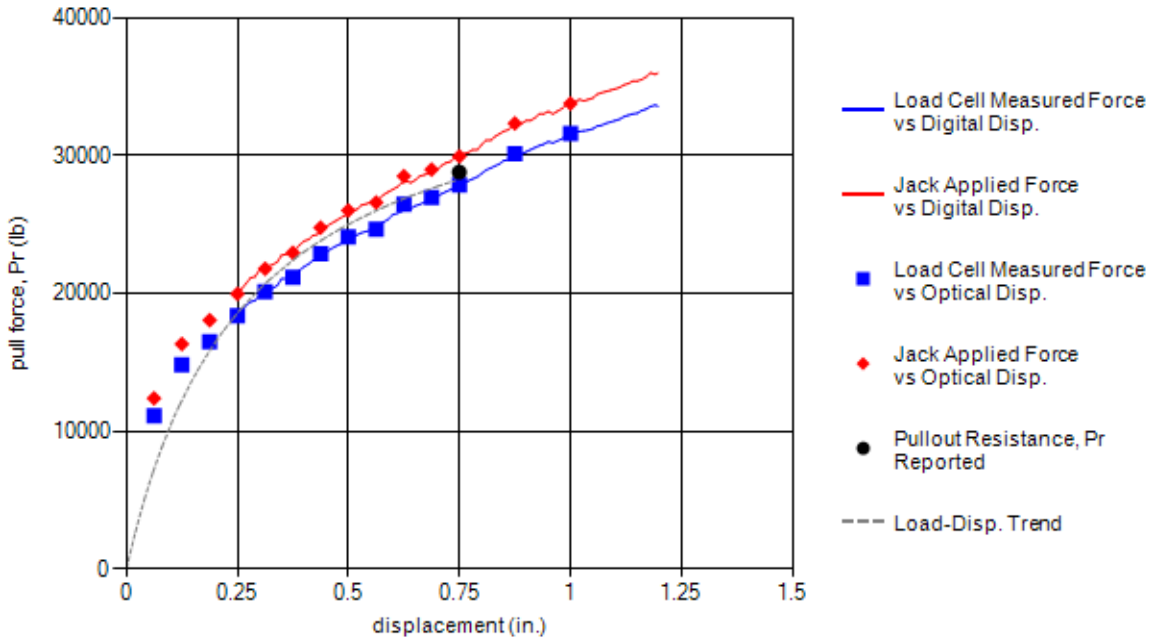
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	626	28783	5.20	**2.55**

Load-Displacement Curve



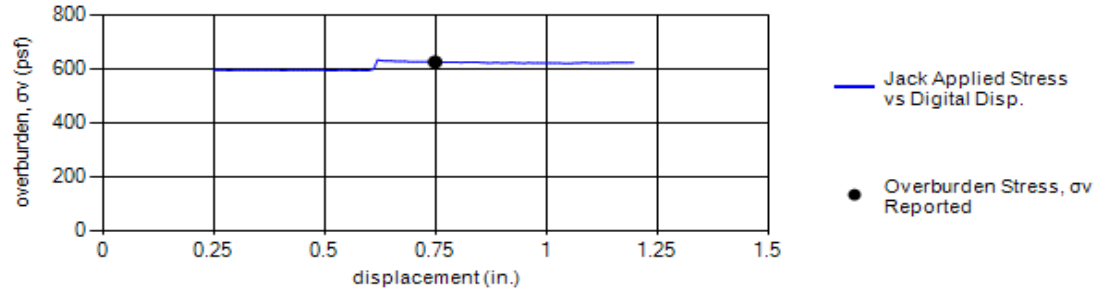
Comments

No earth pressure cell data. No incidental skew data.

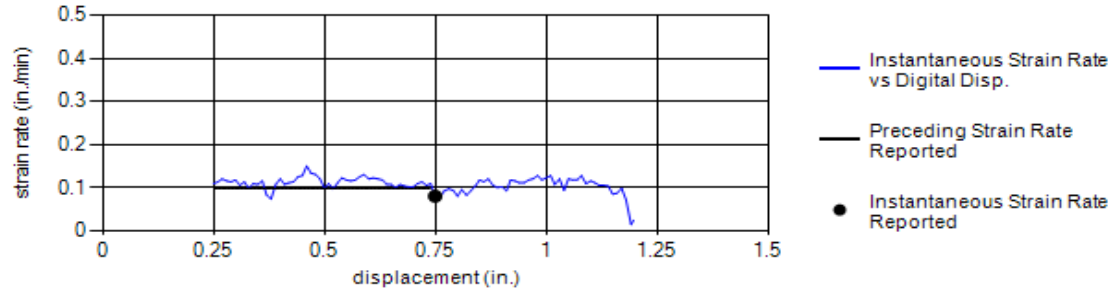
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

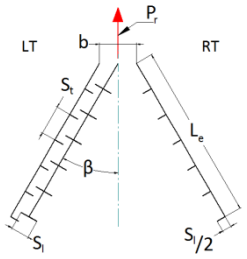
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/13/2012 2:43:00 PM
Test Identification:	TS43.06-G-9x12-W20xW11-L6-ß30°-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

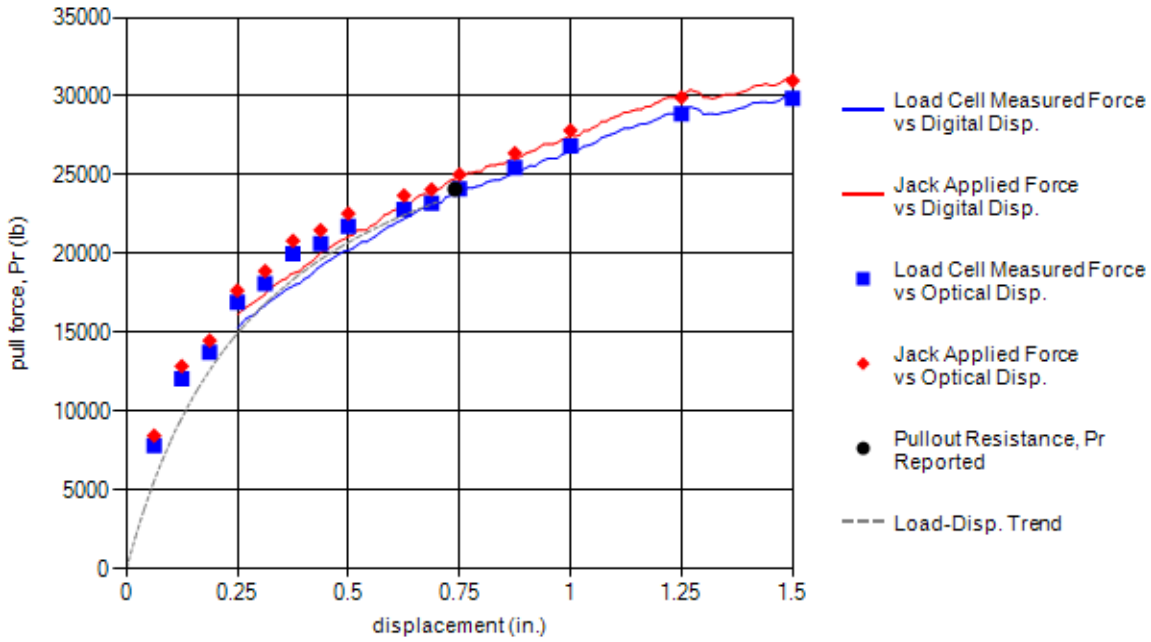
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	609	24108	5.00	**2.20**

Load-Displacement Curve



Comments

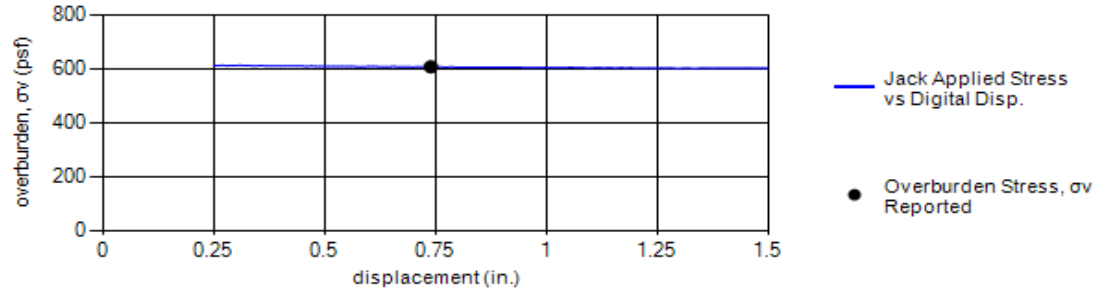
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

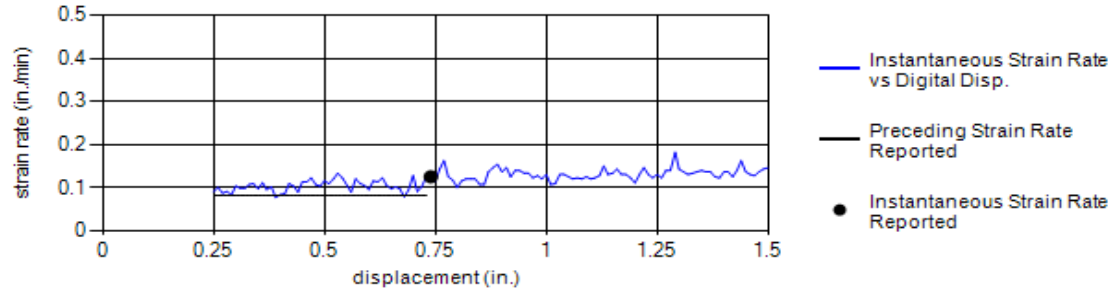
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	609



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.08	0.10

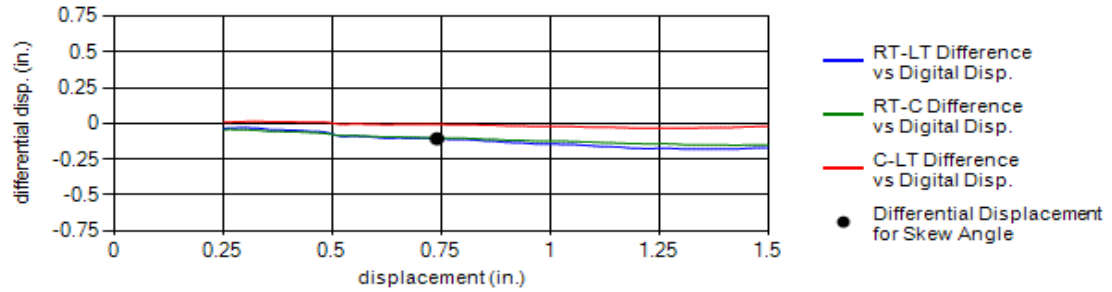


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
-0.11	-0.10	-0.01	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.34	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

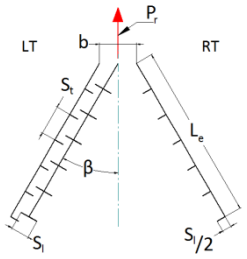
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/8/2012 3:20:00 PM
Test Identification:	TS43.09-G-9x12-W20xW11-L6-ß15°-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

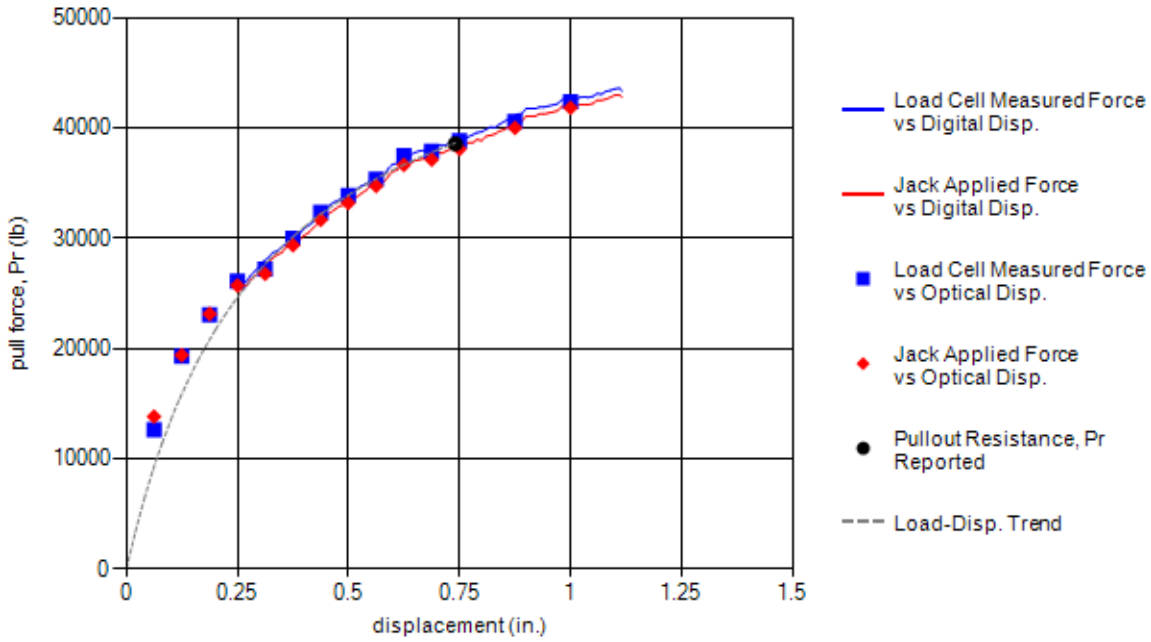
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	624	38550	4.90	**3.43**

Load-Displacement Curve

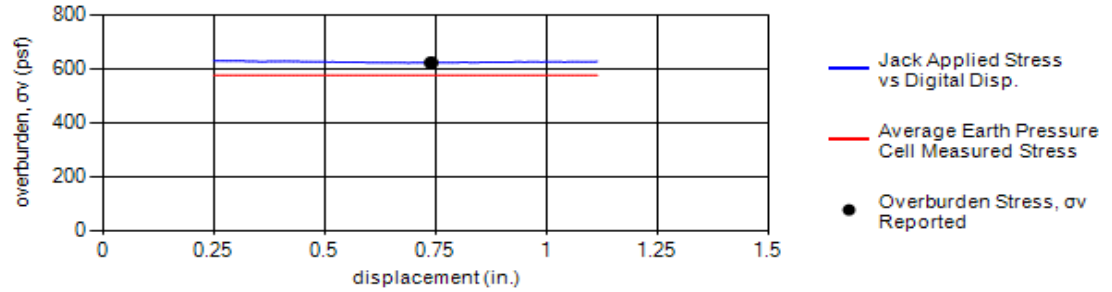


Comments

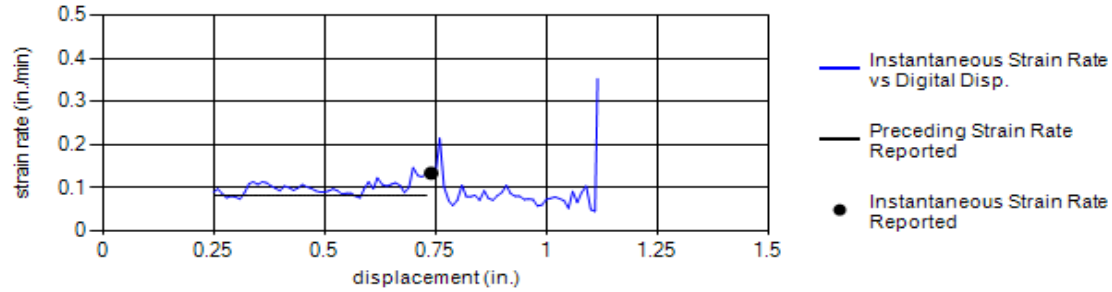
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

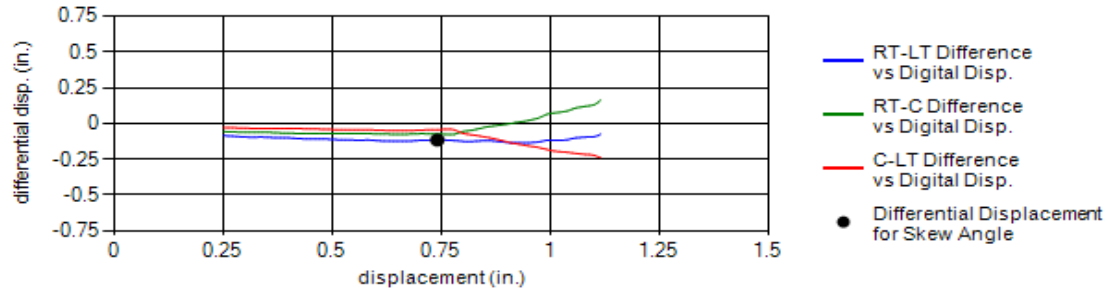
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
586	431	539	660	666	577	1.18	624



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.12	-0.07	-0.04	No Data	-0.37	CW



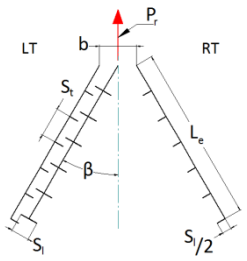
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/10/2012 3:13:00 PM
Test Identification:	TS43.10-G-9x12-W20xW11-L6-ß30°-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

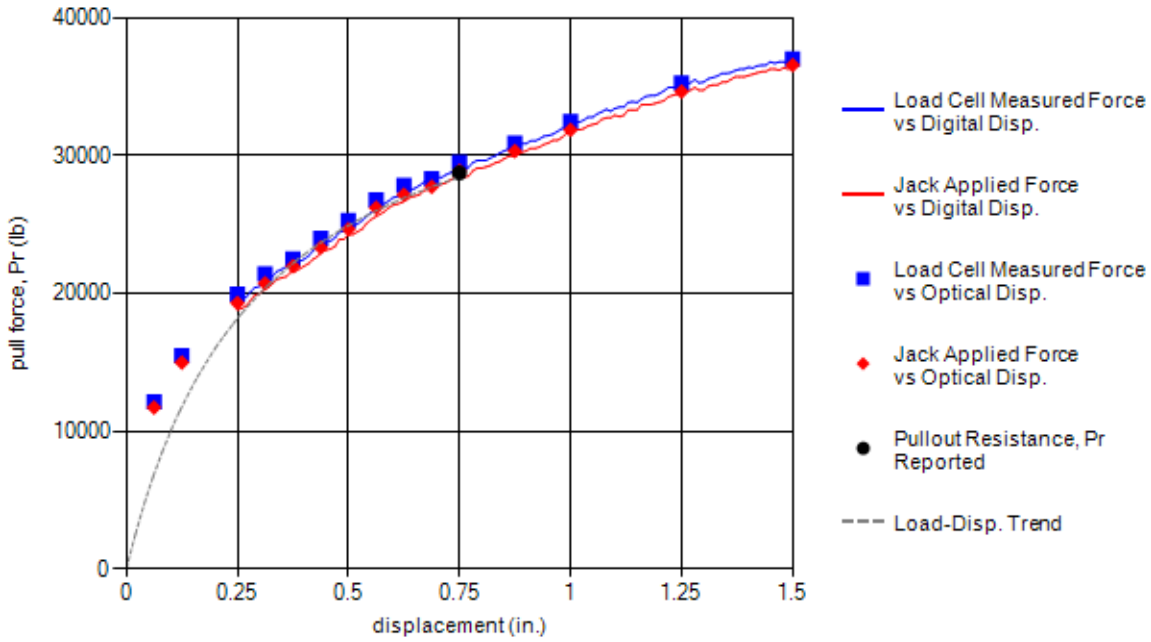
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	621	28731	4.90	**2.57**

Load-Displacement Curve



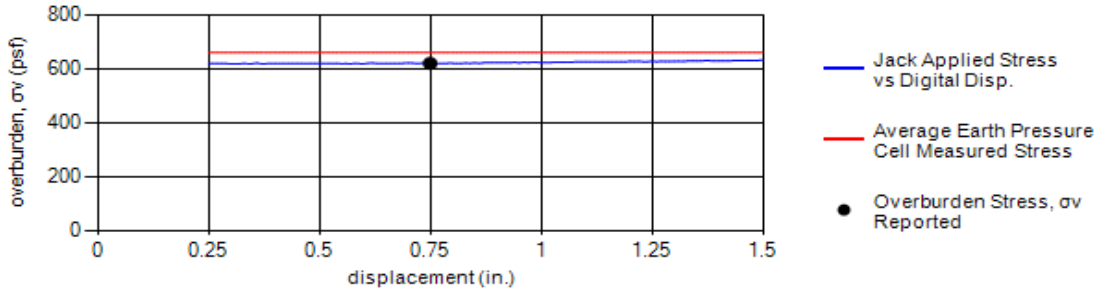
Comments

No incidental skew data.

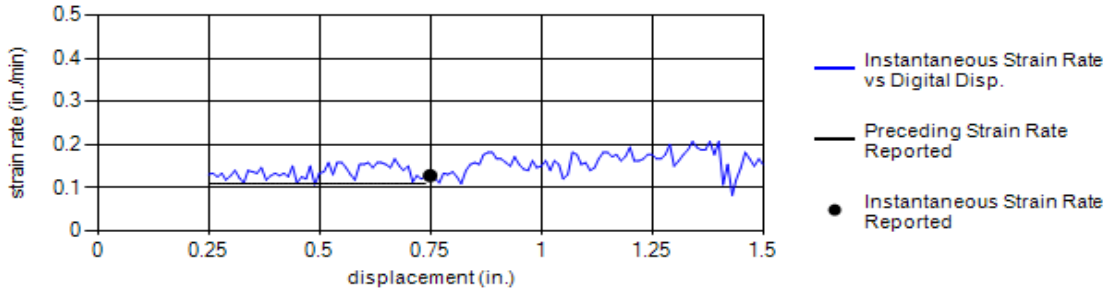
Personnel

Tested:	TW TW SB
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
481	1136	501	592	593	661	1.47	621



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.11	0.12



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

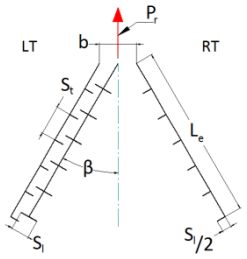
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/5/2012 3:32:00 PM
Test Identification:	TS44.01-G-9x12-W20xW11-L6-ß15°-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

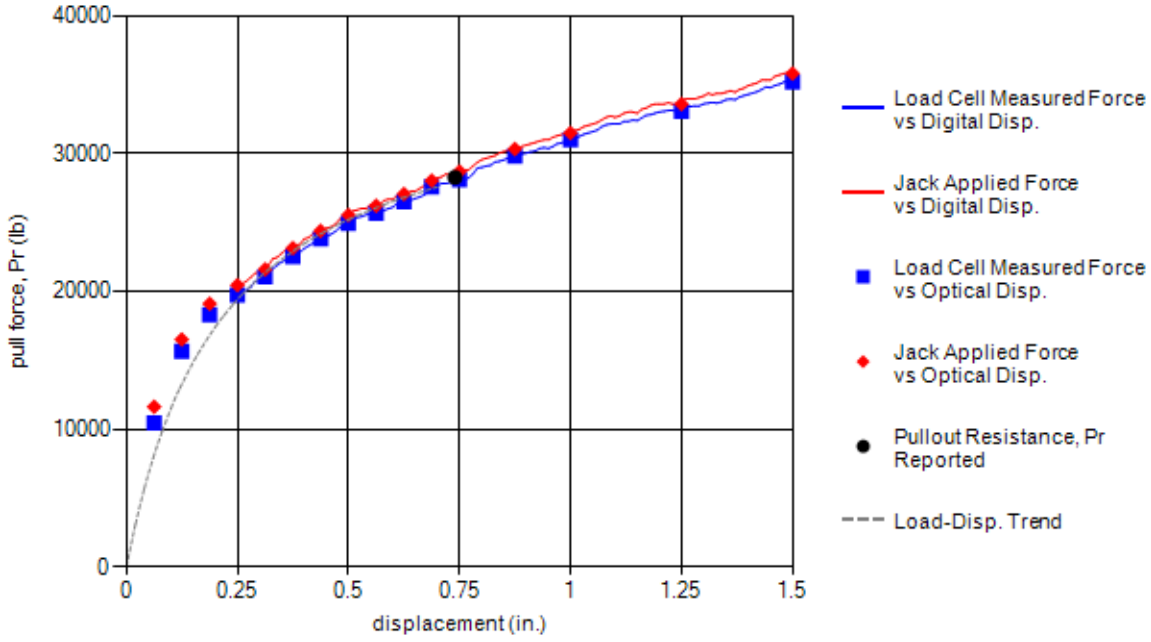
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1501	28254	12.20	**1.05**

Load-Displacement Curve



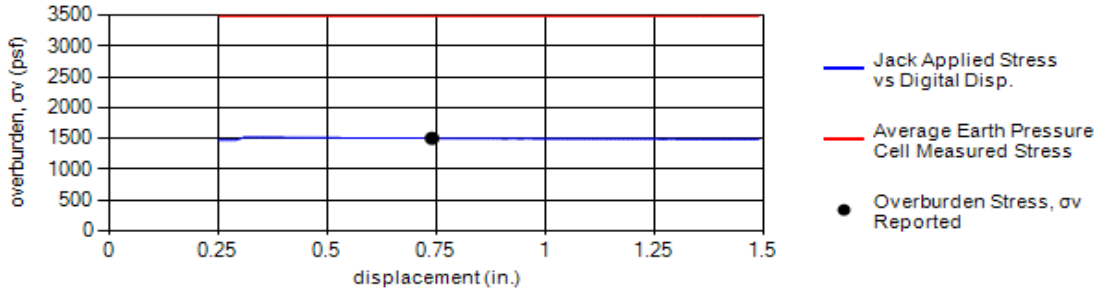
Comments

No incidental skew data.

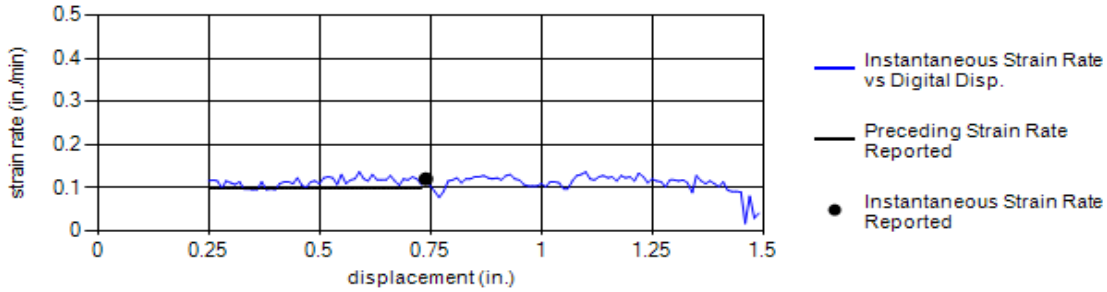
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3382	3961	3340	3395	3359	3487	1.07	1500



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

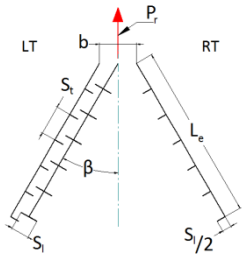
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/5/2012 2:58:00 PM
Test Identification:	TS44.02-G-9x12-W20xW11-L6-ß30°-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

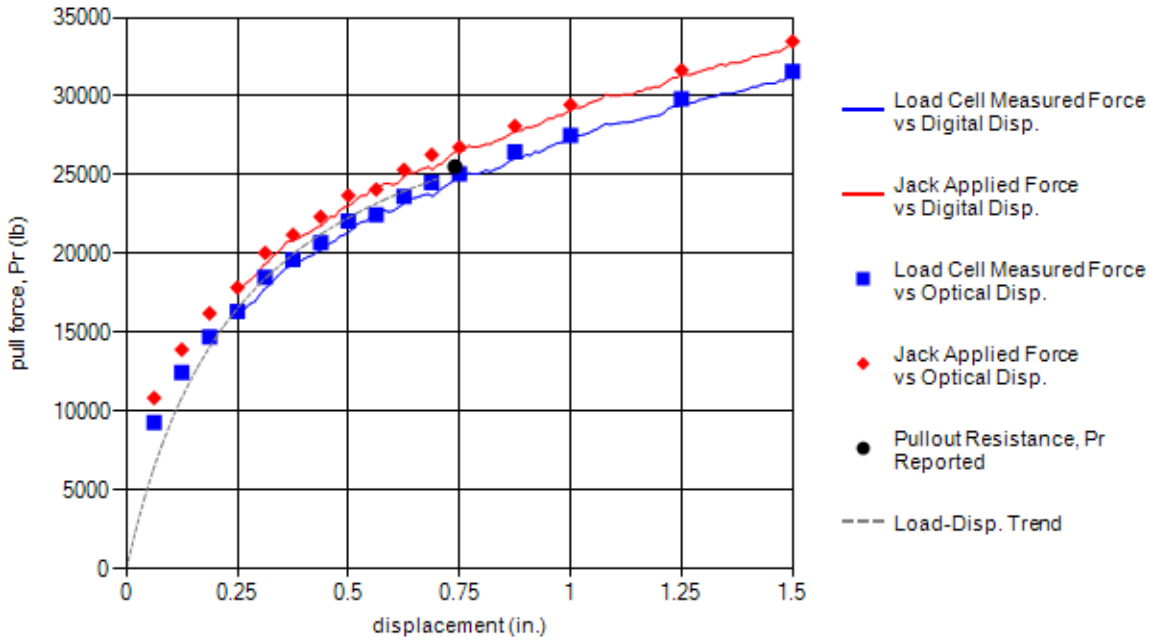
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1497	25531	12.10	**0.95**

Load-Displacement Curve

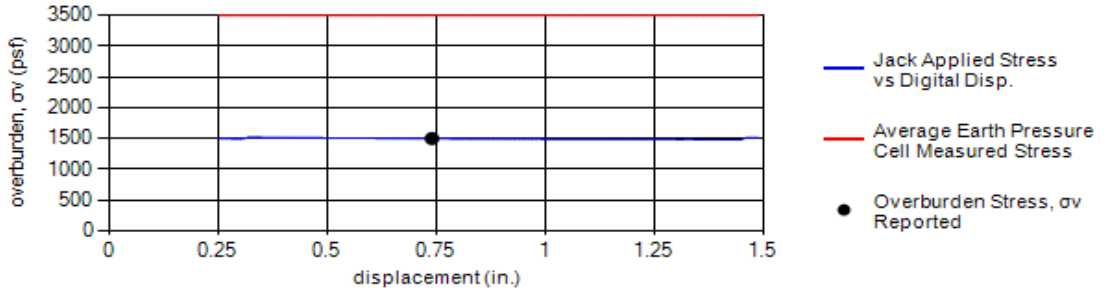


Comments

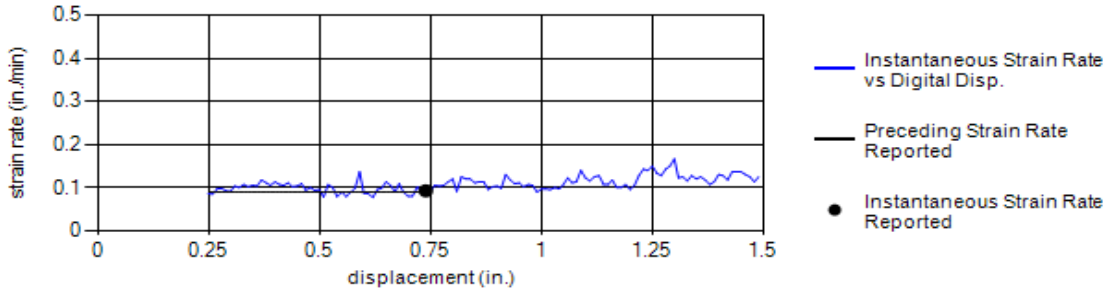
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

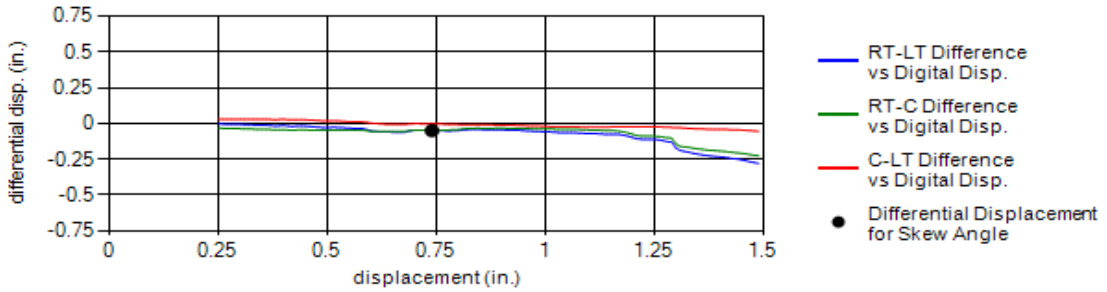
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3177	4222	3349	3389	3338	3495	1.04	1496



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.05	-0.05	0.00	No Data	-0.16	CW



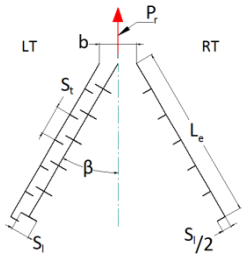
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/2/2012 3:43:00 PM
Test Identification:	TS44.05-G-9x12-W20xW11-L6-ß15°-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

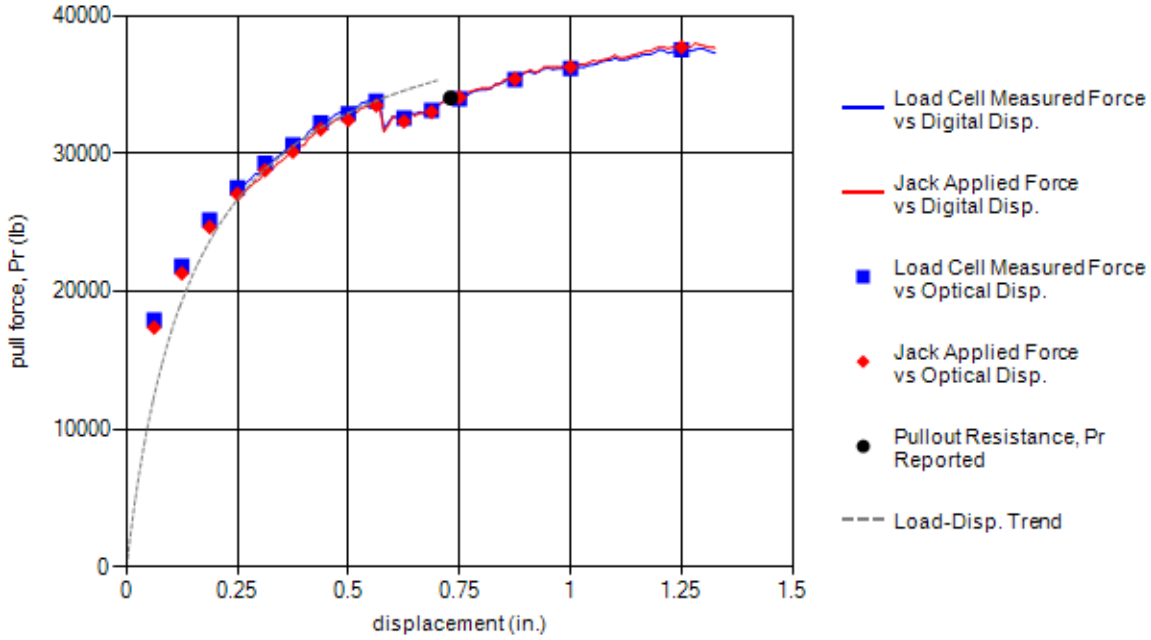
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	1437	34018	11.50	**1.32**

Load-Displacement Curve



Comments

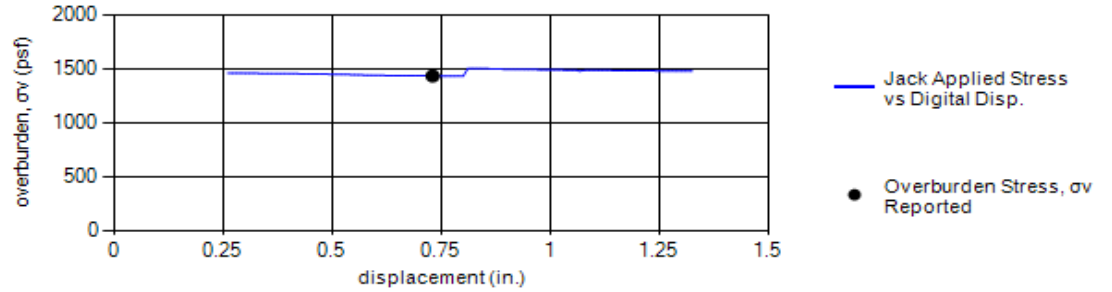
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

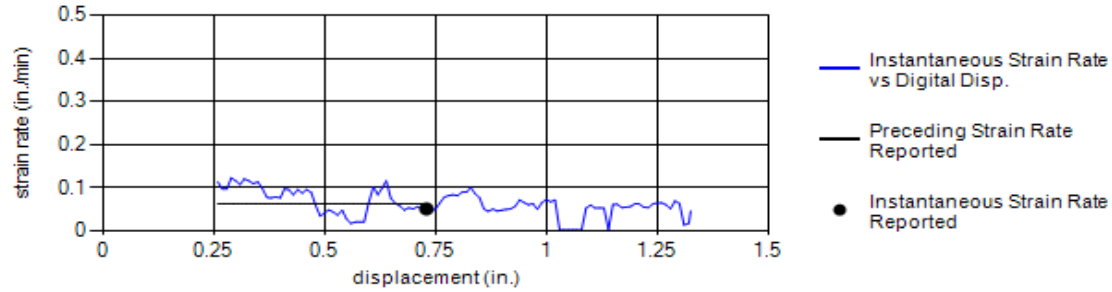
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.10	1437



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.06	0.06

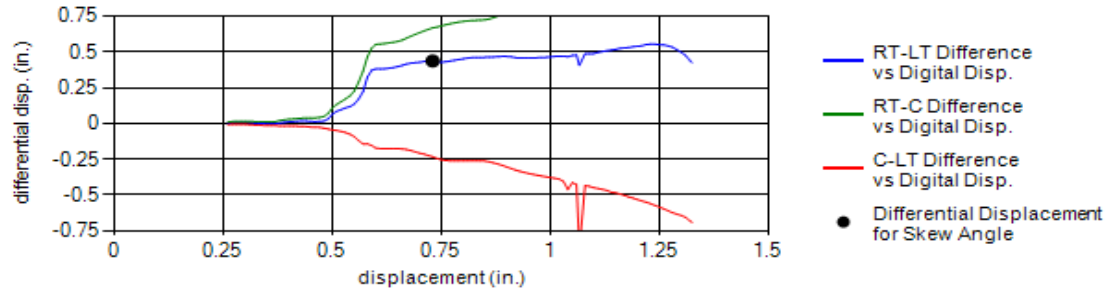


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.44	0.67	-0.23	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
1.39	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

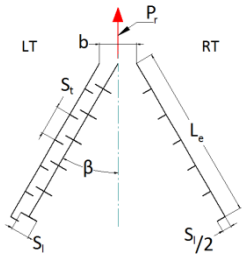
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		2	2
1/2in.	50-100	47	39
3/8in.		57	47
#4		71	61
#10		80	73
#40	85-100	89	84
#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/2/2012 2:10:00 PM
Test Identification:	TS44.06-G-9x12-W20xW11-L6-ß30°-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

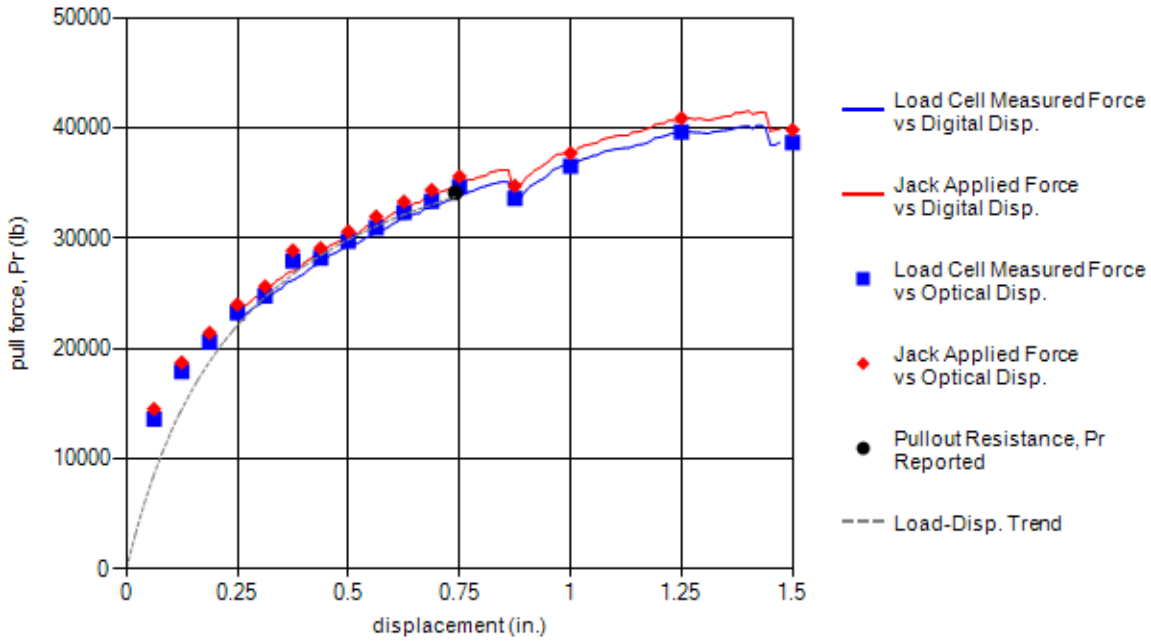
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1487	34105	11.90	**1.27**

Load-Displacement Curve



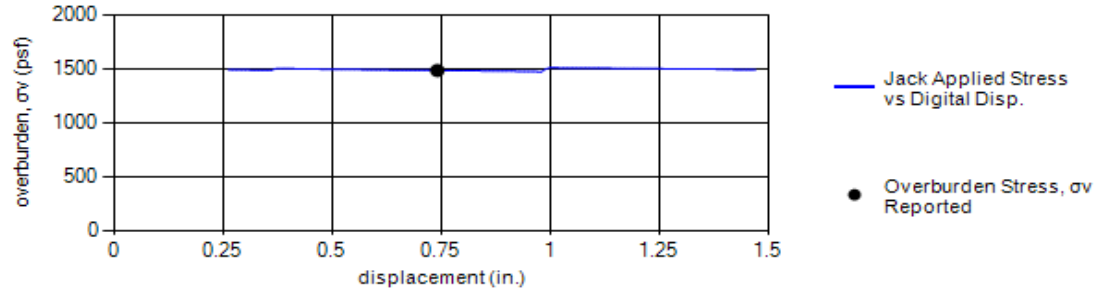
Comments

No earth pressure cell data.

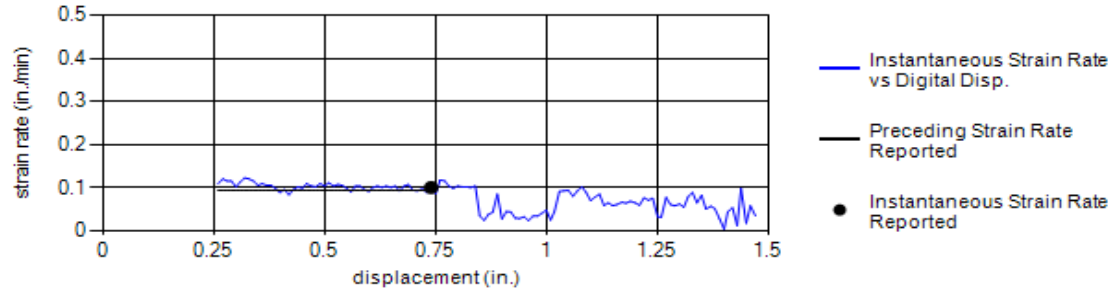
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

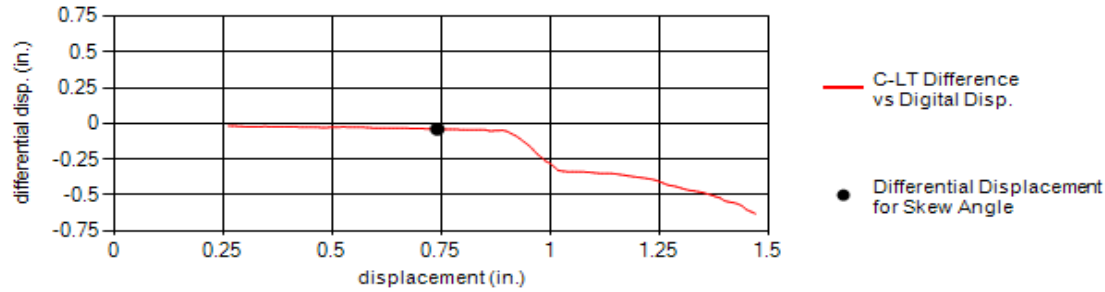
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1487



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.09	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	-0.04	No Data	-0.06	CW



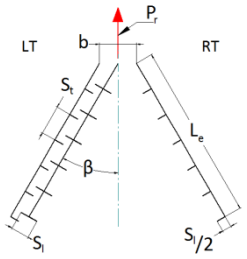
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/2/2012 12:49:00 PM
Test Identification:	TS44.09-G-9x12-W20xW11-L6-ß15°-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	15	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

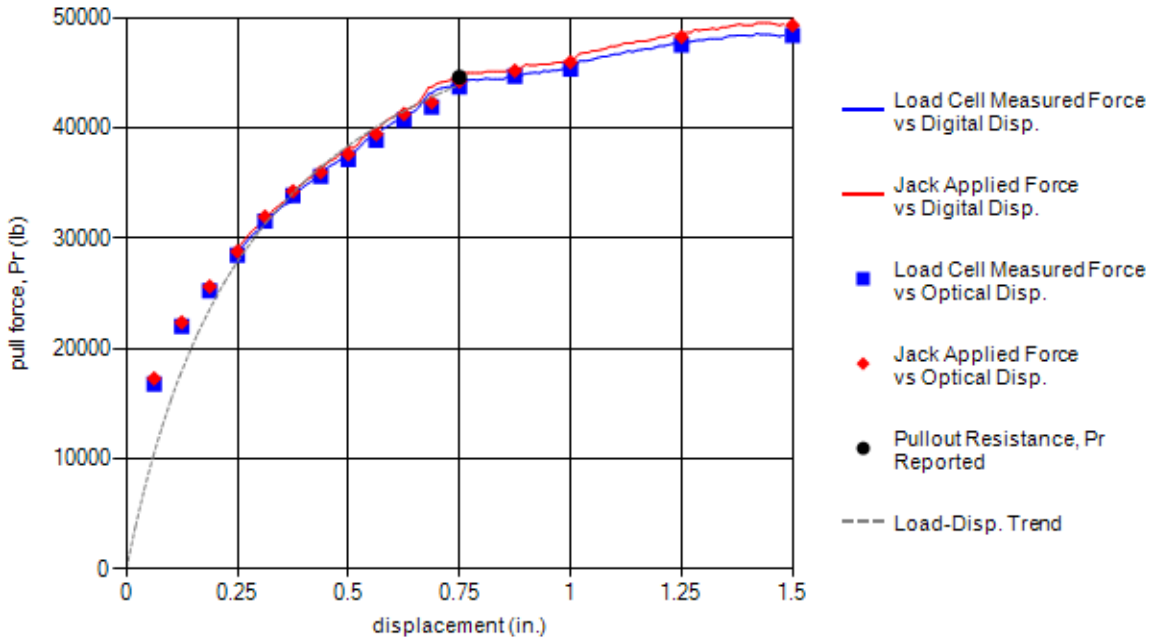
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	1526	44579	11.80	**1.62**

Load-Displacement Curve



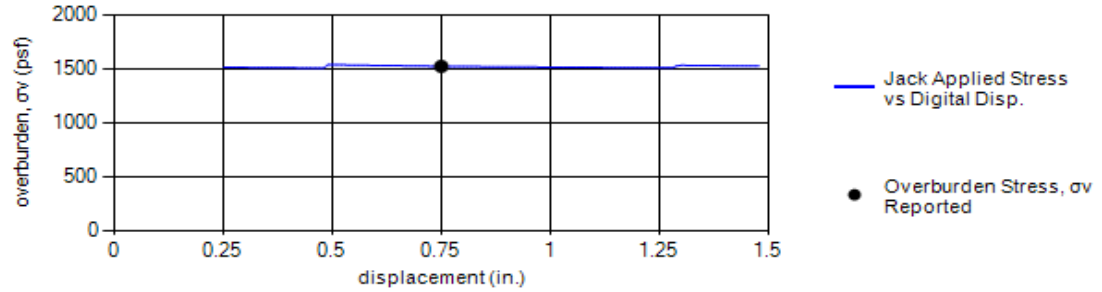
Comments

No earth pressure cell data.

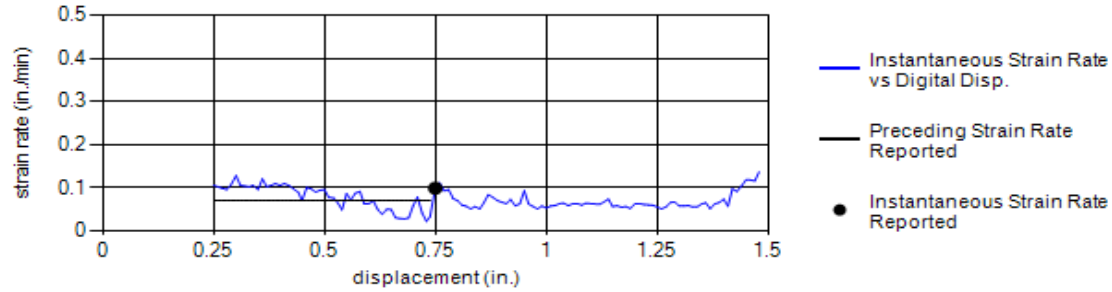
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

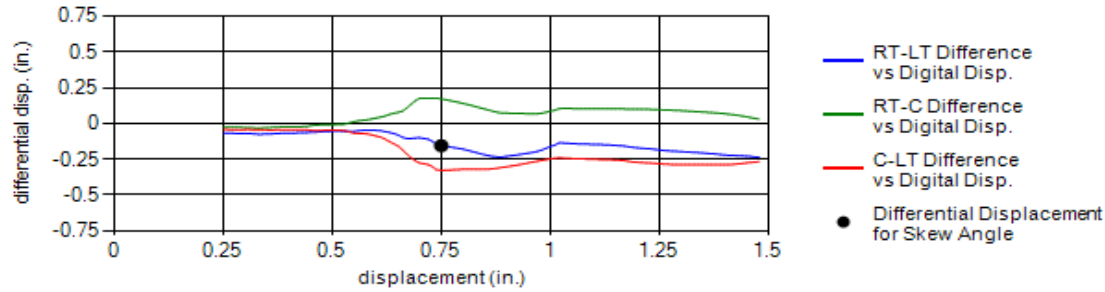
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1526



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.15	0.17	-0.33	No Data	-0.49	CW



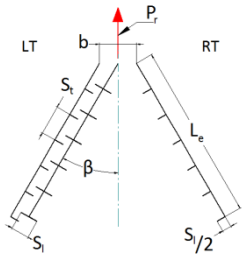
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	2/29/2012 3:41:00 PM
Test Identification:	TS44.10-G-9x12-W20xW11-L6-ß30°-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, ß (°):	30	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

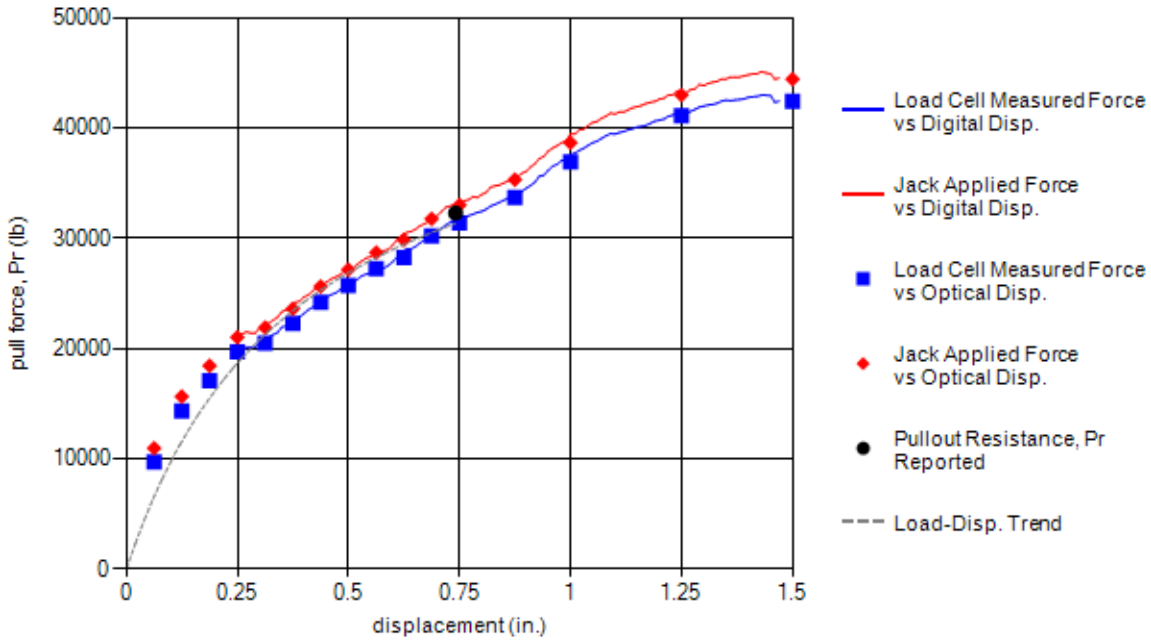
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1485	32266	11.50	**1.21**

Load-Displacement Curve



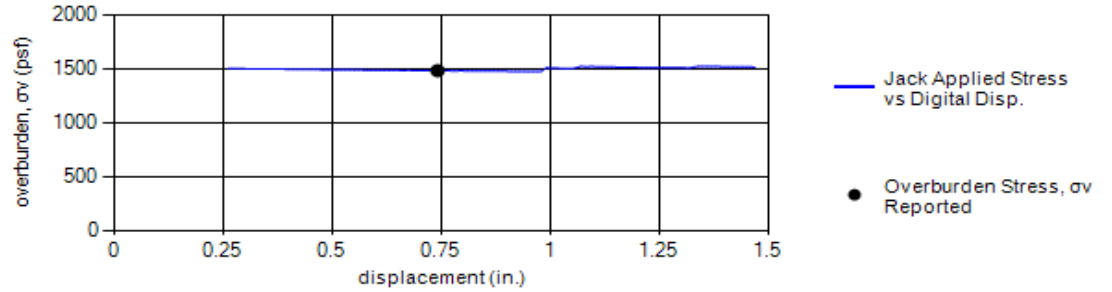
Comments

No earth pressure cell data. No incidental skew data.

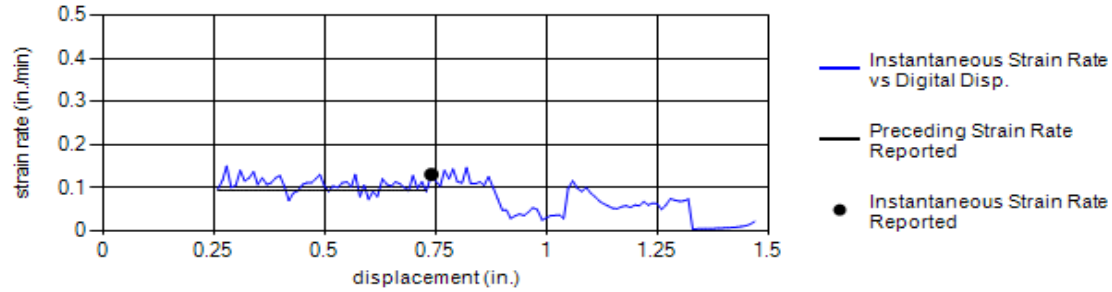
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1485



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.09	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

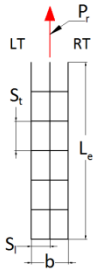
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		2	2
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	47	39
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	47
Liquid Limit, LL (%):	23	#4		71	61
Plastic Limit, PL (%):	20	#10		80	73
Plasticity Index, PI (%):	3	#40	85-100	89	84
Bar Linear Shrinkage, LS (%):	3	#200		94	91

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 8:48:00 AM
Test Identification:	TS45.01-G-9x18-W20xW15-L9-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

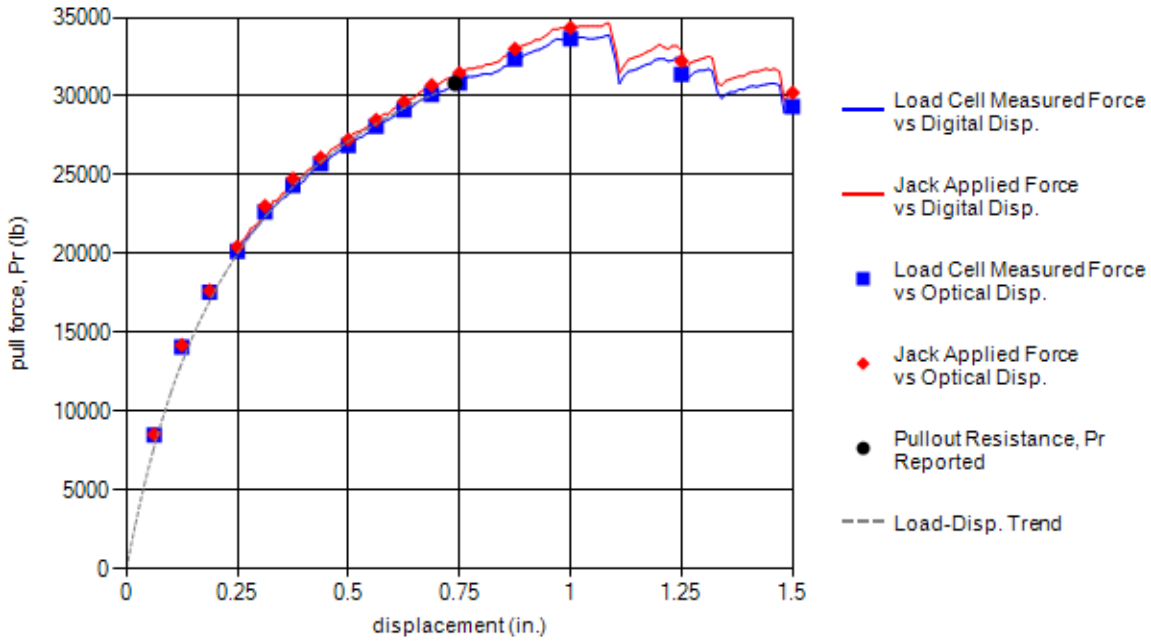
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	657	30815	5.40	**1.74**

Load-Displacement Curve



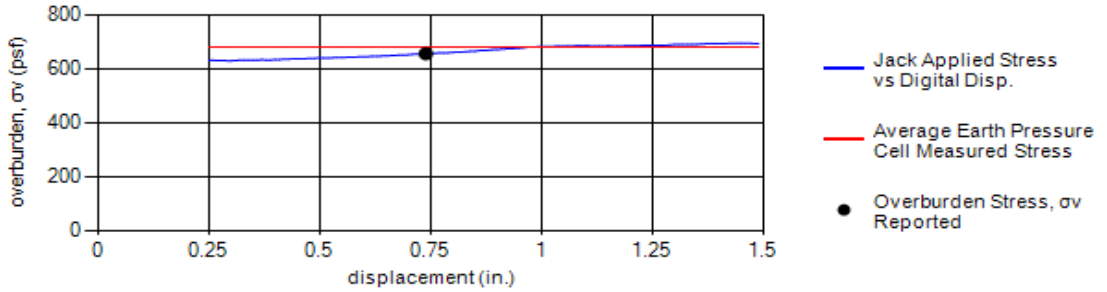
Comments

No incidental skew data.

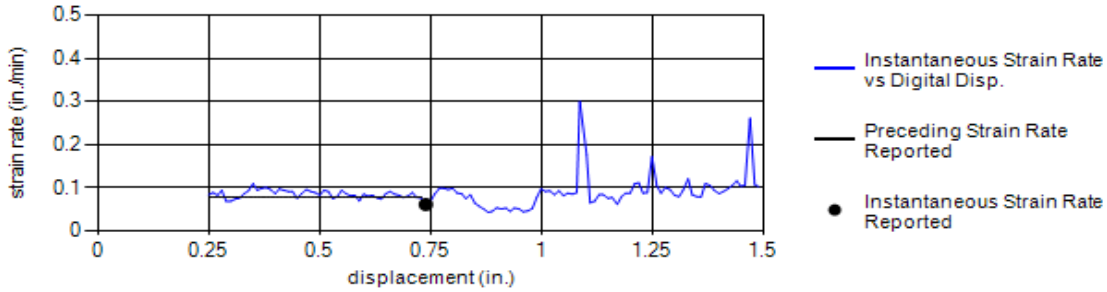
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
703	681	766	562	697	682	1.86	657



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

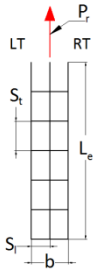
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 10:13:00 AM
Test Identification:	TS45.02-G-9x18-W20xW15-L9-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

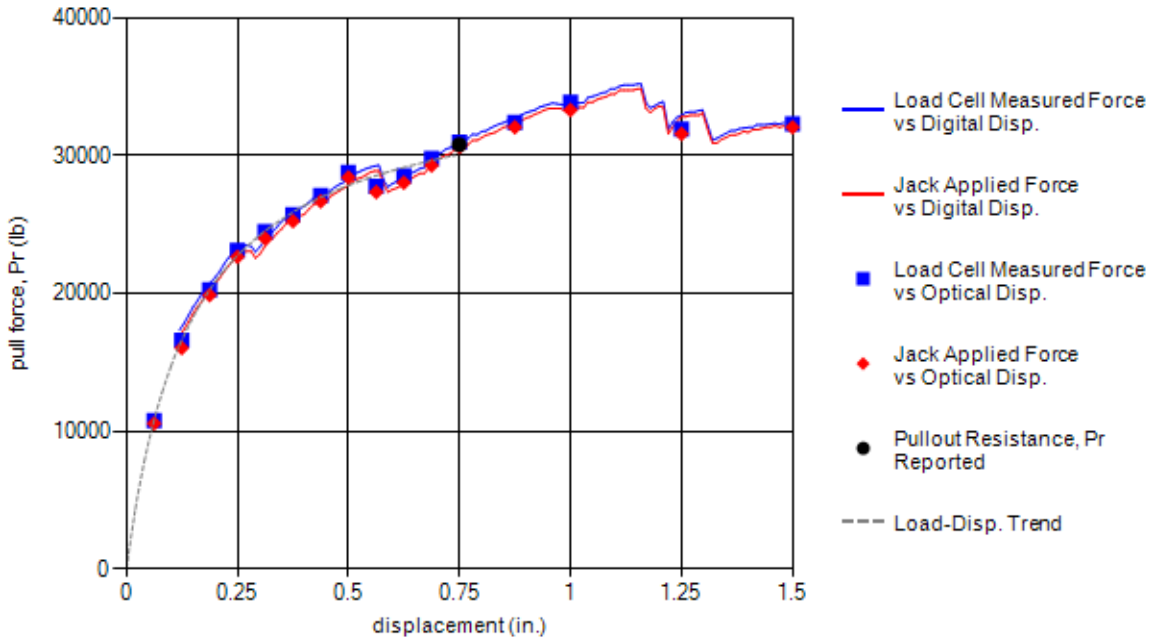
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.75	1465	30774	12.10	**0.78**

Load-Displacement Curve

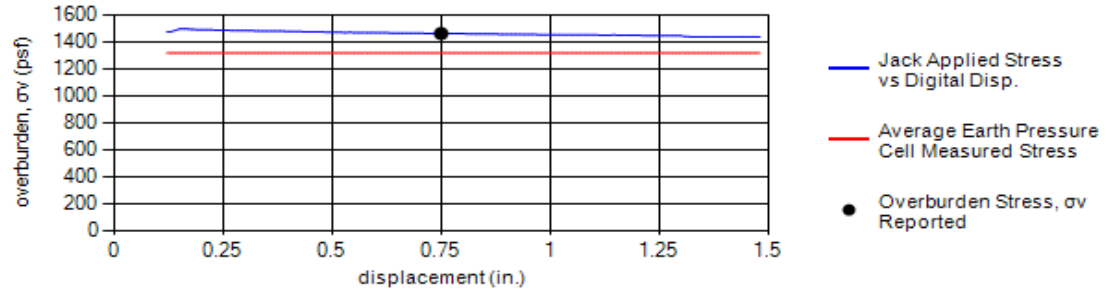


Comments

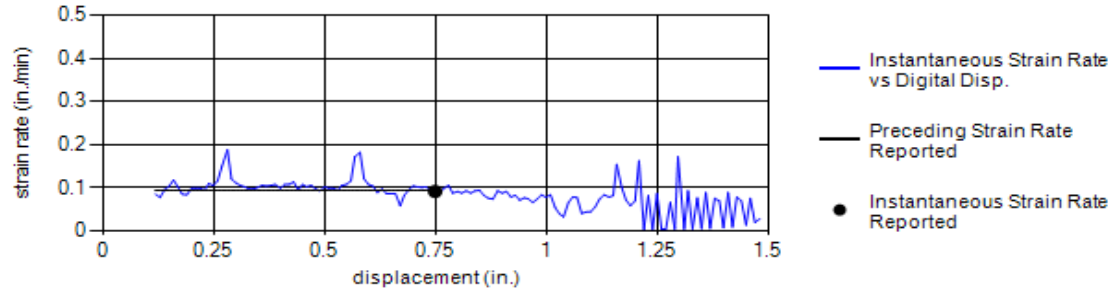
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

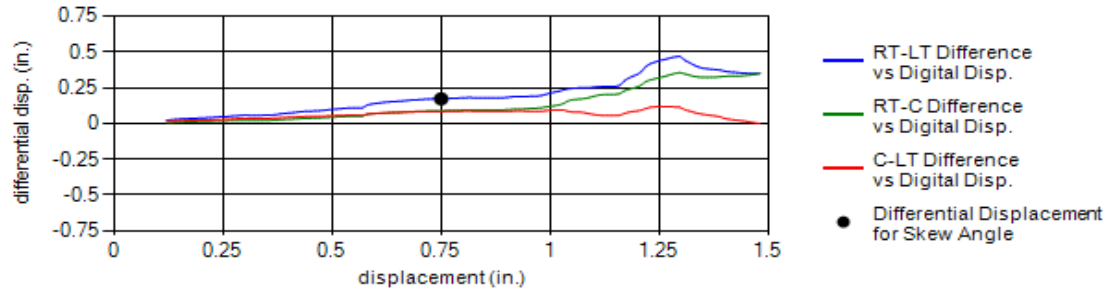
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
979	1345	1715	1276	1279	1319	1.05	1465



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.09	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.17	0.09	0.08	No Data	0.55	CCW



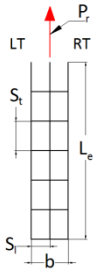
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 1:33:00 PM
Test Identification:	TS45.03-G-9x18-W20xW15-L9-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

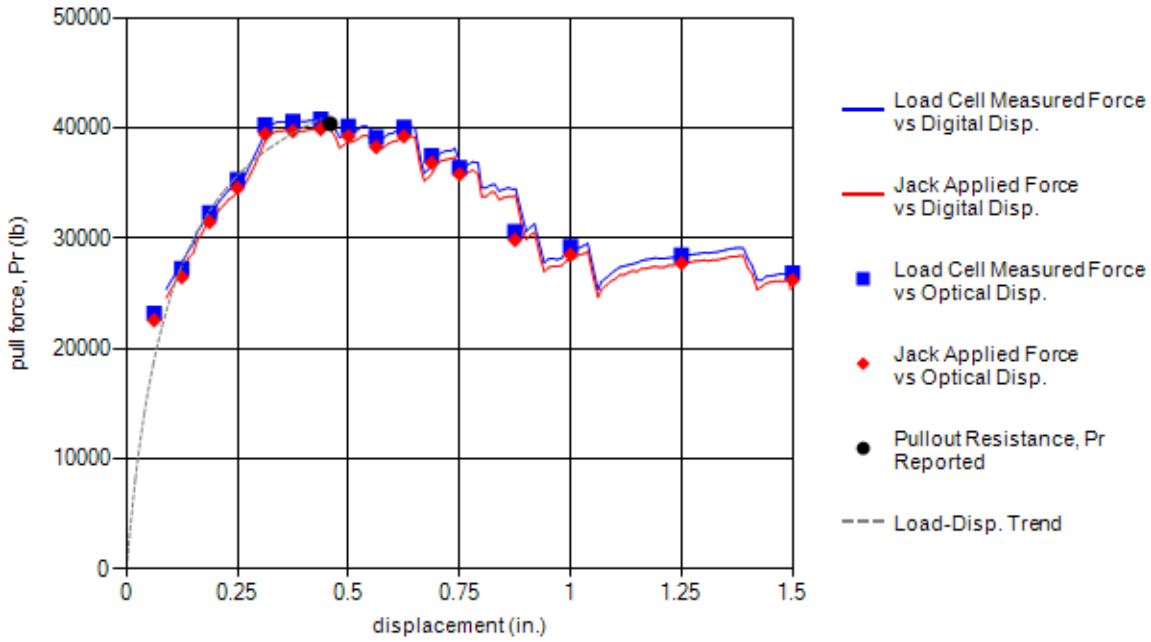
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.46	2426	40363	20.00	**0.62**

Load-Displacement Curve

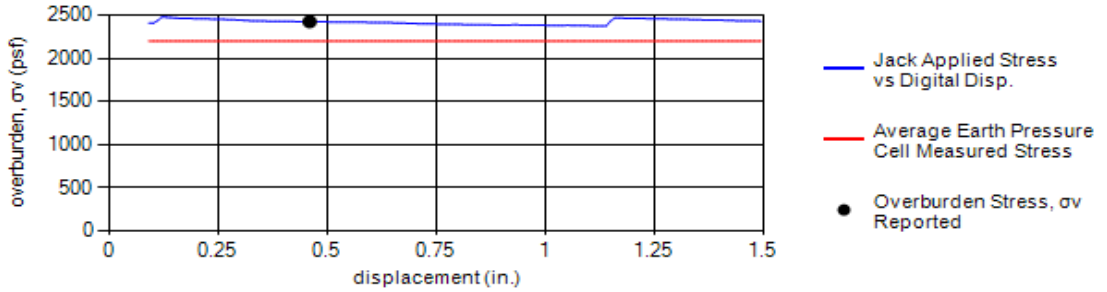


Comments

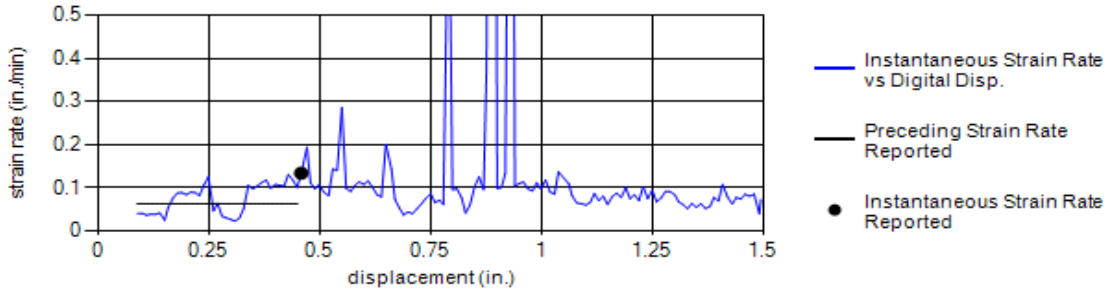
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

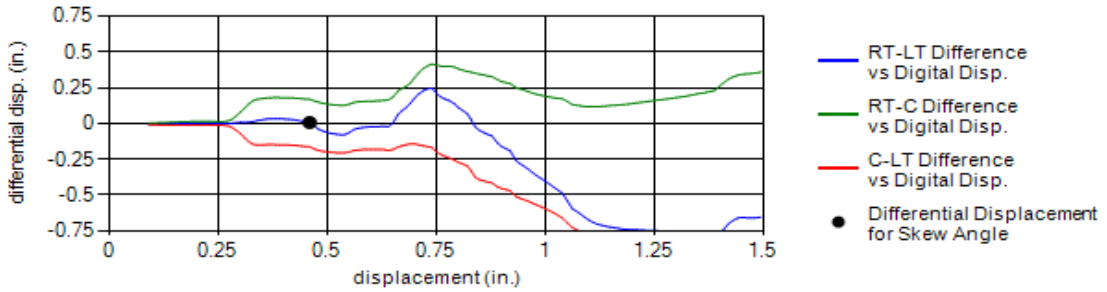
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1574	2344	2866	2083	2143	2202	1.03	2426



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.06	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	0.17	-0.16	No Data	0.02	CCW



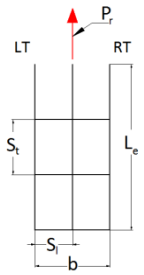
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 3:42:00 PM
Test Identification:	TS45.04-G-9x18-W20xW15-L4.5-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

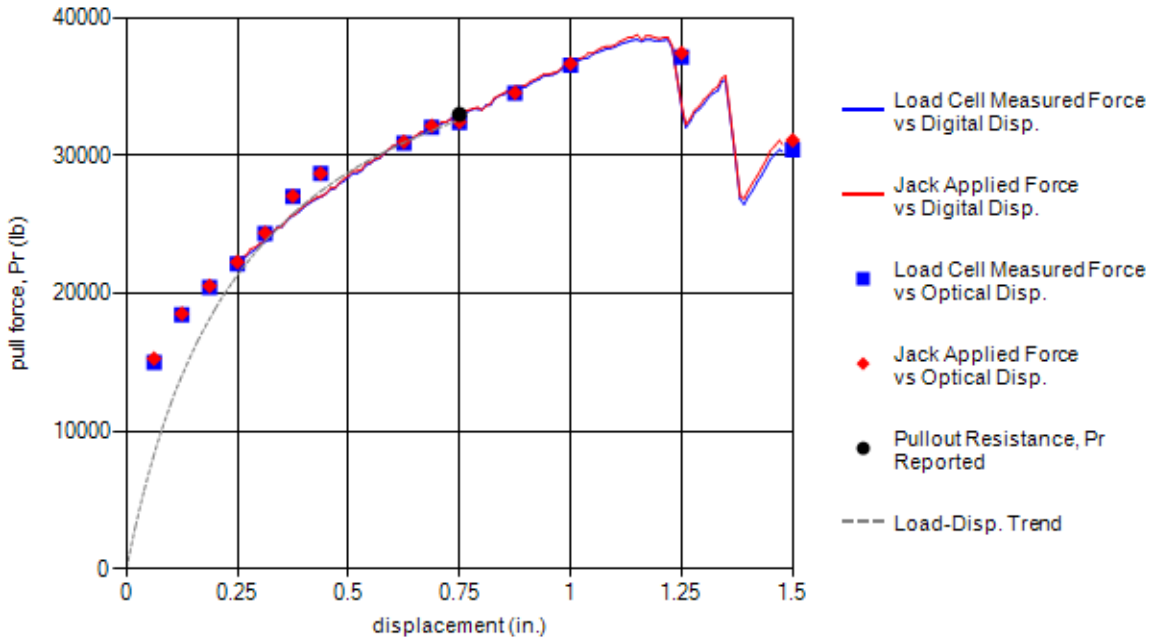
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	4952	32972	40.80	**0.49**

Load-Displacement Curve

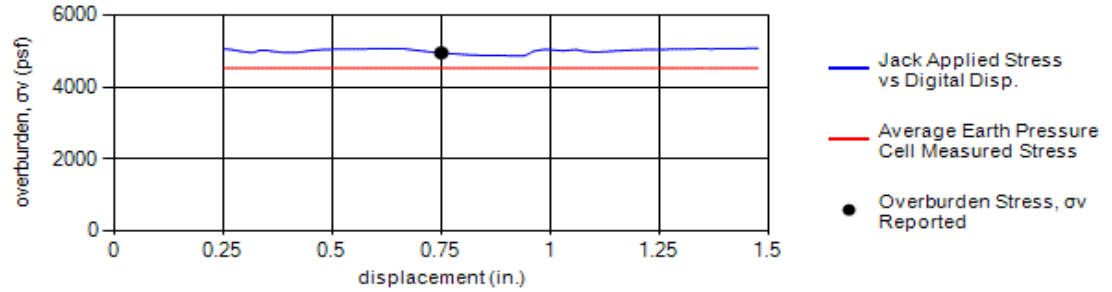


Comments

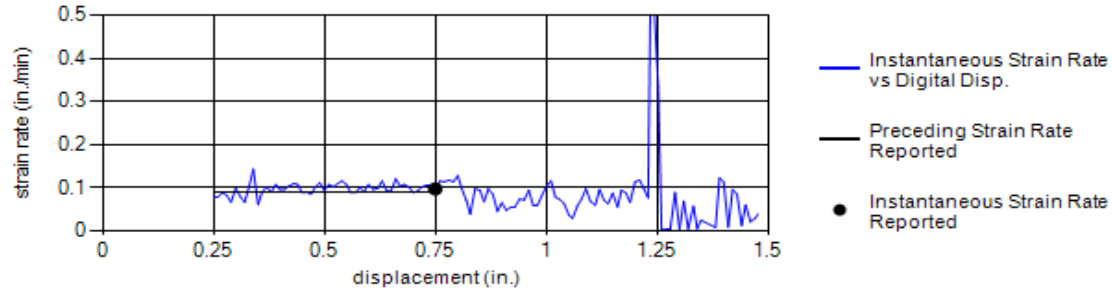
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

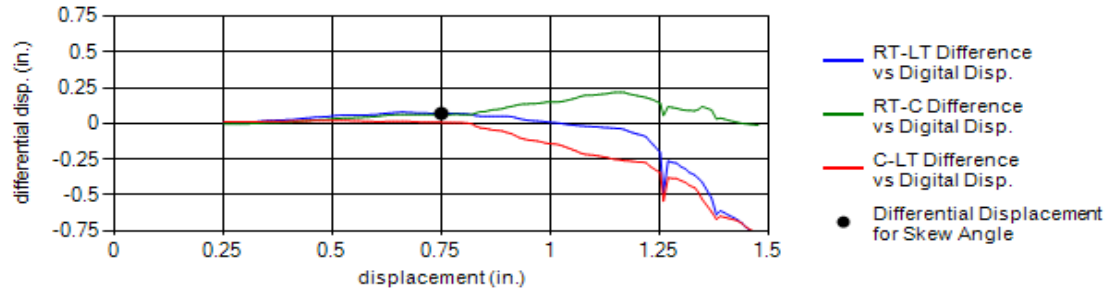
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3679	4539	5305	4363	4757	4528	1.03	4952



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.09	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.07	0.06	0.01	No Data	0.22	CCW



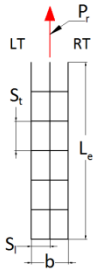
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 1:23:00 PM
Test Identification:	TS45.05-G-9x18-W20xW15-L9-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

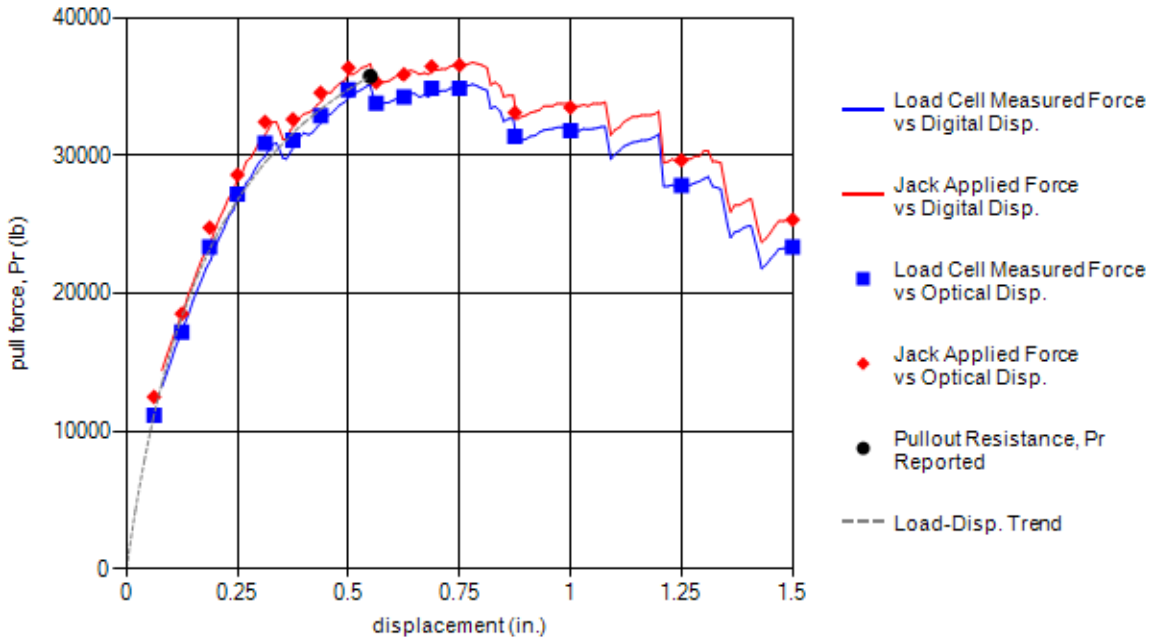
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.55	664	35726	5.50	**1.99**

Load-Displacement Curve

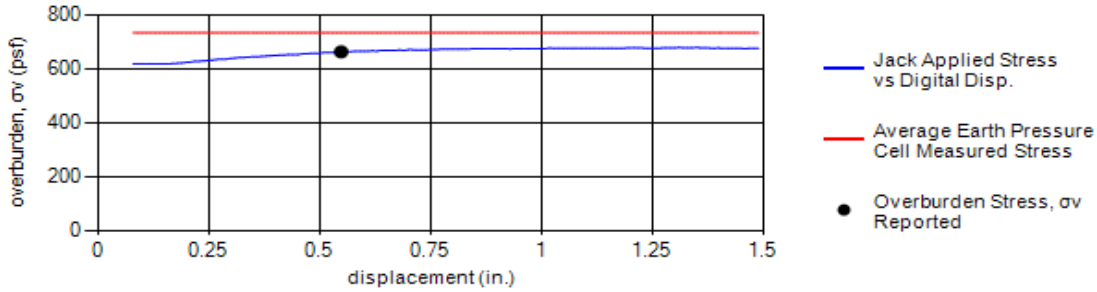


Comments

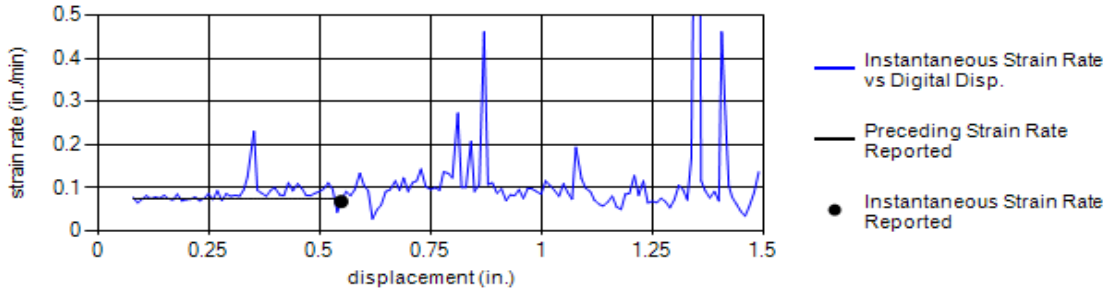
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

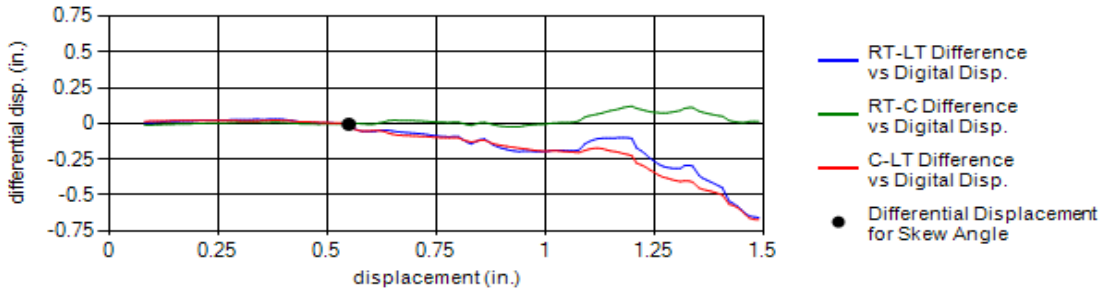
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
896	680	714	583	804	735	2.03	664



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.00	0.01	-0.01	No Data	-0.02	CW



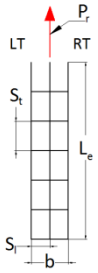
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 9:30:00 AM
Test Identification:	TS45.06-G-9x18-W20xW15-L9-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

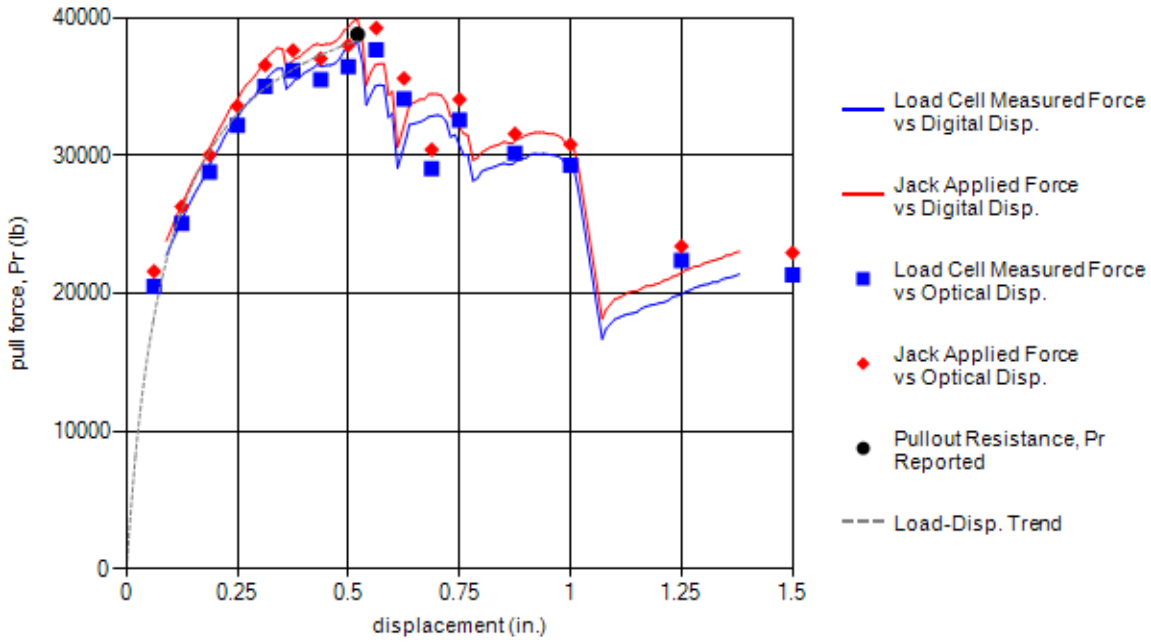
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.52	1432	38775	11.80	**1.00**

Load-Displacement Curve



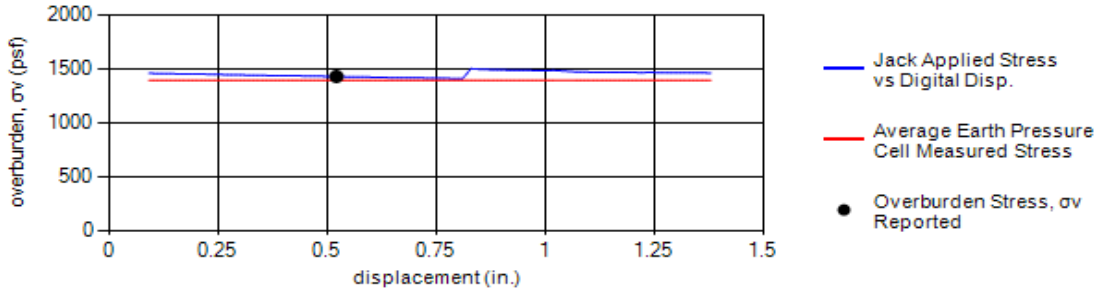
Comments

No incidental skew data.

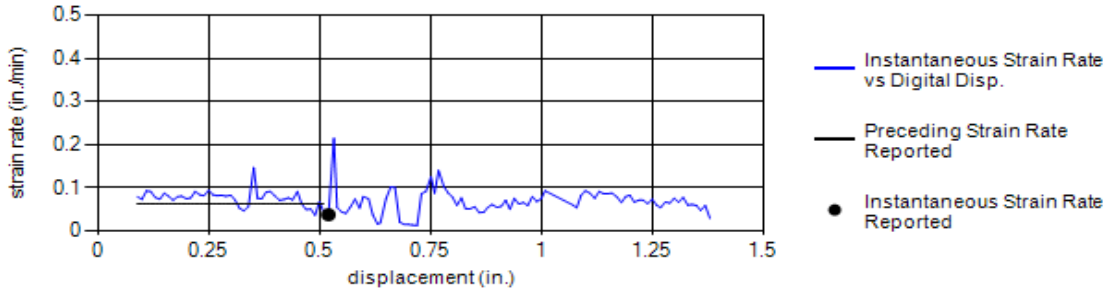
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
994	1423	1759	1407	1396	1396	1.06	1432



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

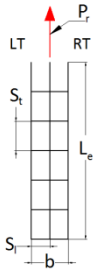
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 11:35:00 AM
Test Identification:	TS45.07-G-9x18-W20xW15-L9-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

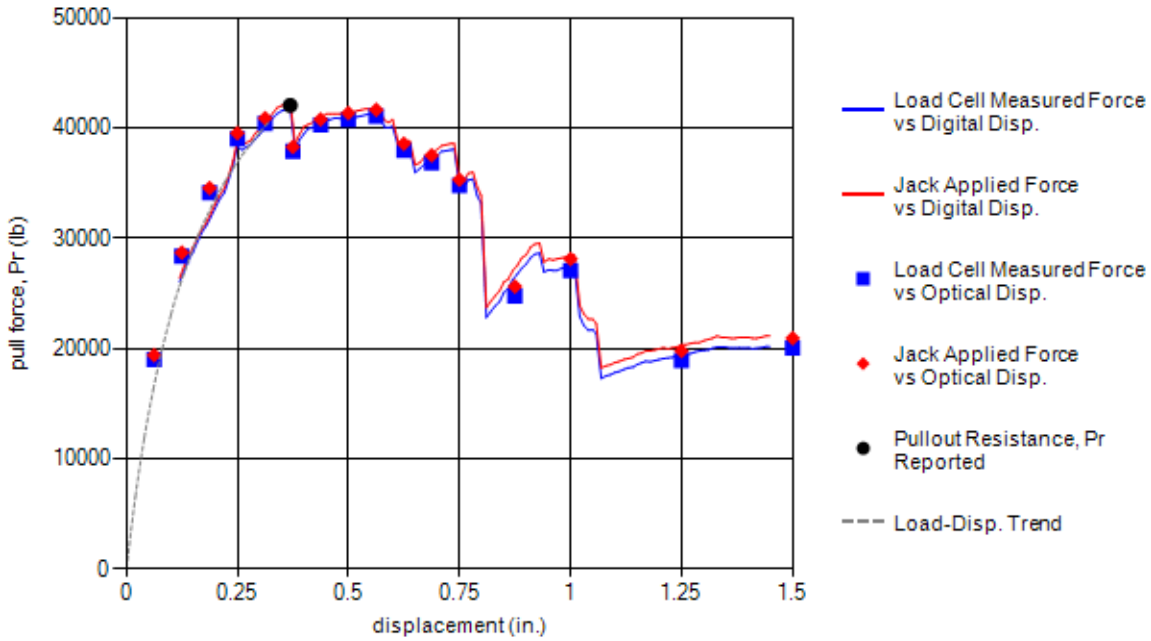
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.37	2427	42035	20.00	**0.64**

Load-Displacement Curve

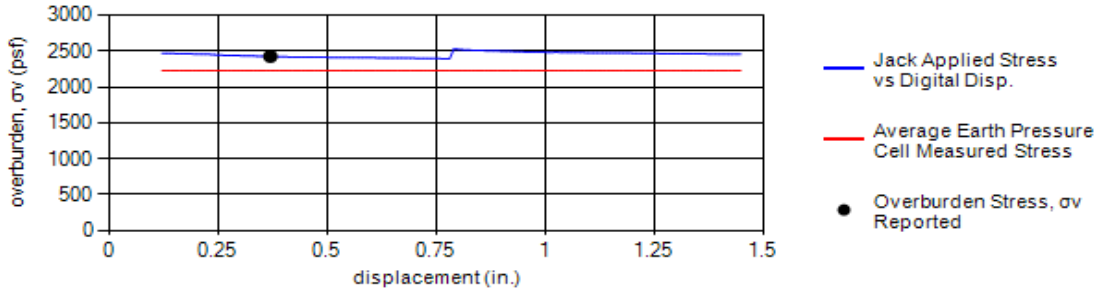


Comments

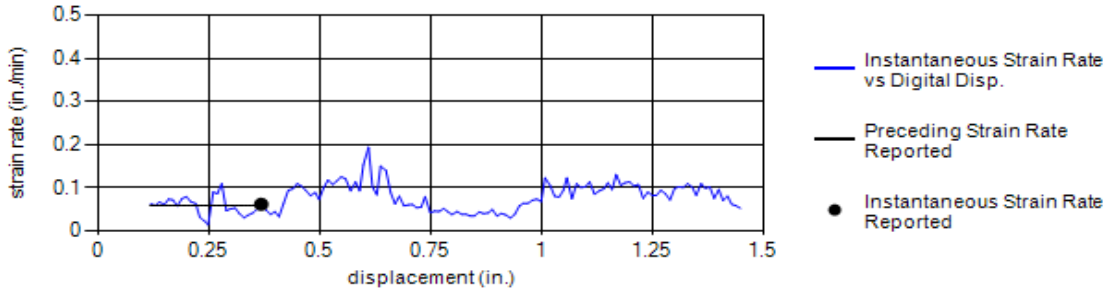
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

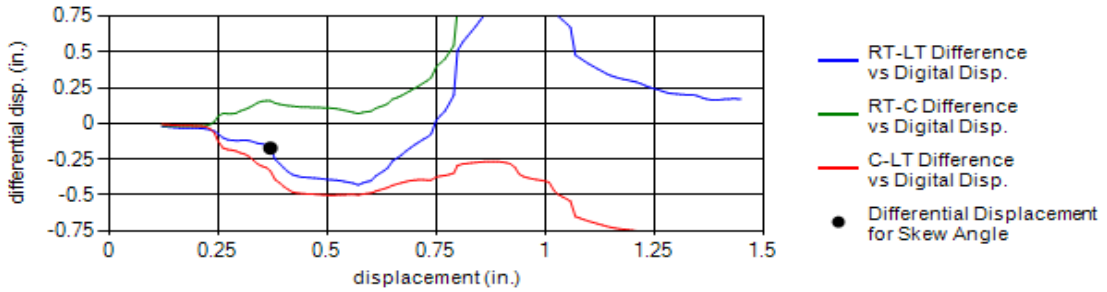
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1610	2299	2885	2136	2204	2227	1.02	2427



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.17	0.16	-0.33	No Data	-0.55	CW



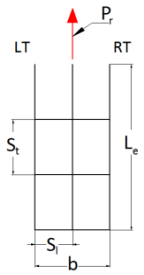
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 3:00:00 PM
Test Identification:	TS45.08-G-9x18-W20xW15-L4.5-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

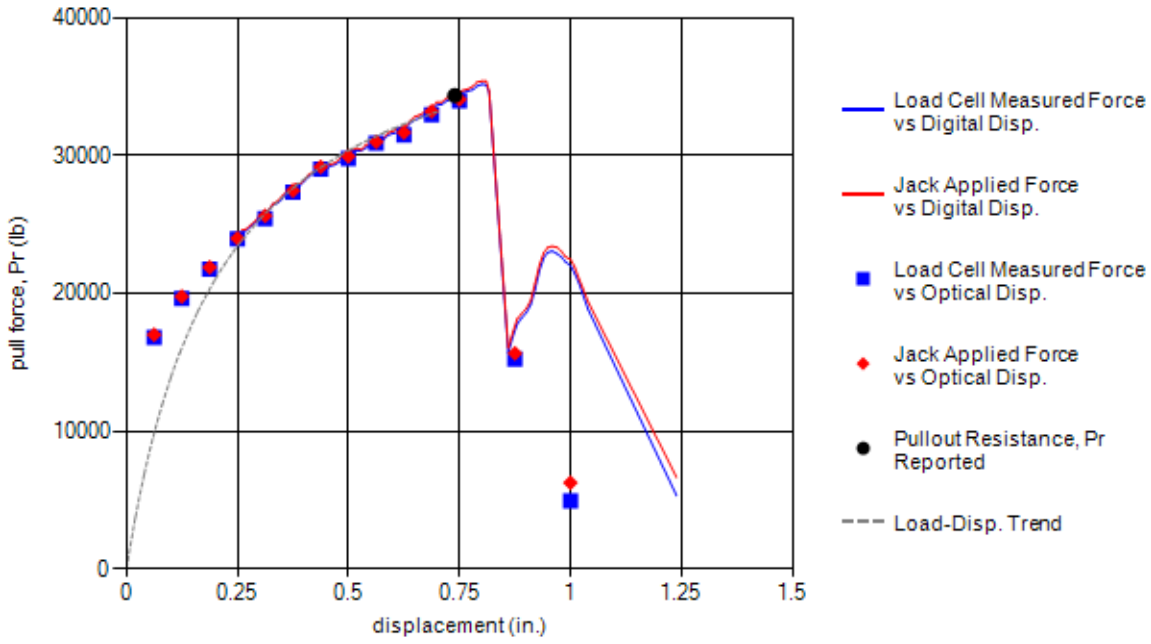
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	4991	34340	41.10	**0.51**

Load-Displacement Curve

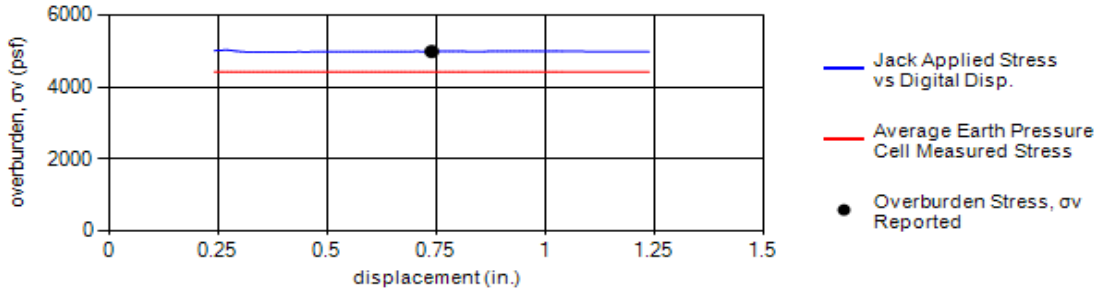


Comments

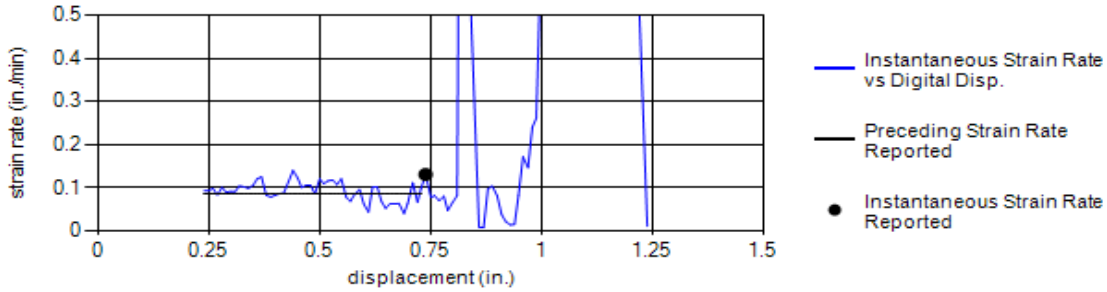
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

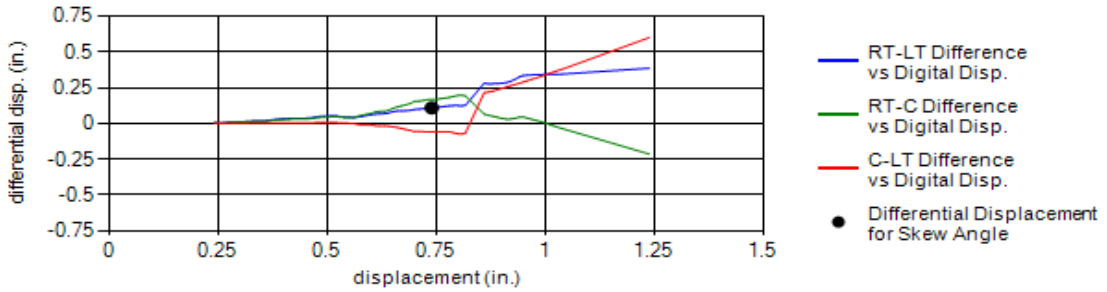
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3527	4345	5286	4313	4664	4427	1.05	4991



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.11	0.17	-0.06	No Data	0.35	CCW



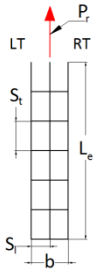
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 8:19:00 AM
Test Identification:	TS45.09-G-9x18-W20xW15-L9-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

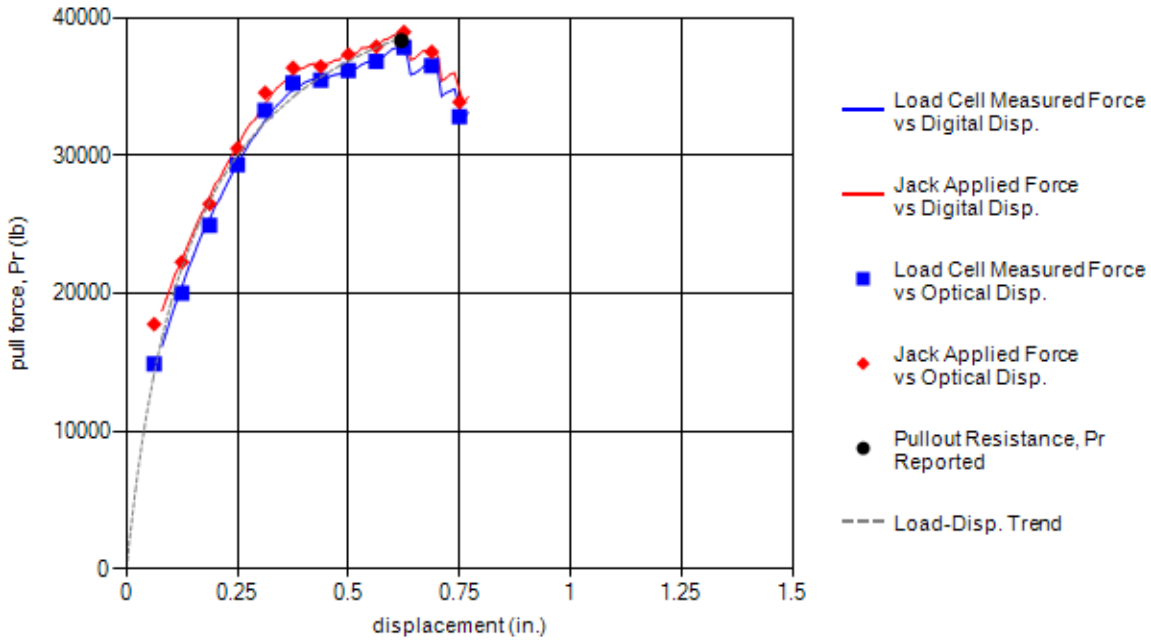
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.62	608	38314	5.20	**2.33**

Load-Displacement Curve



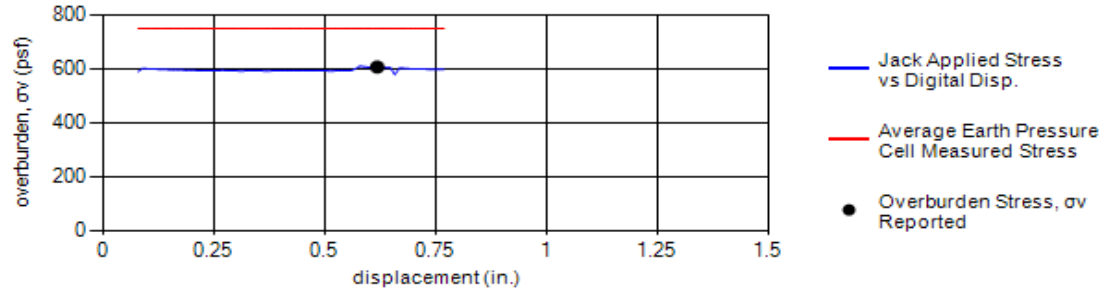
Comments

Center longitudinal bar rupture beyond 0.75in. displacement.

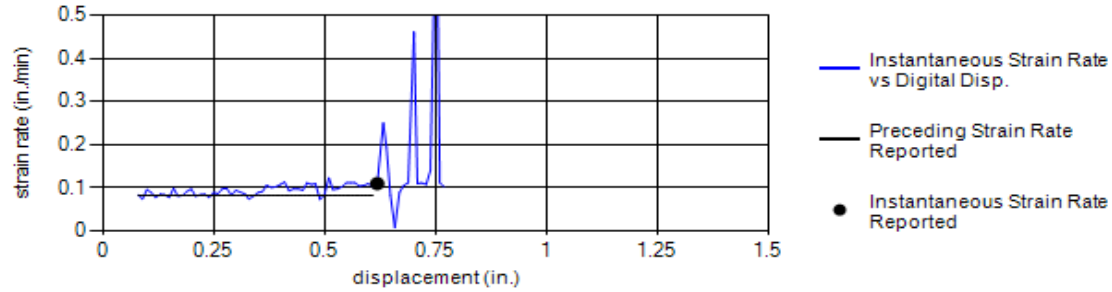
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

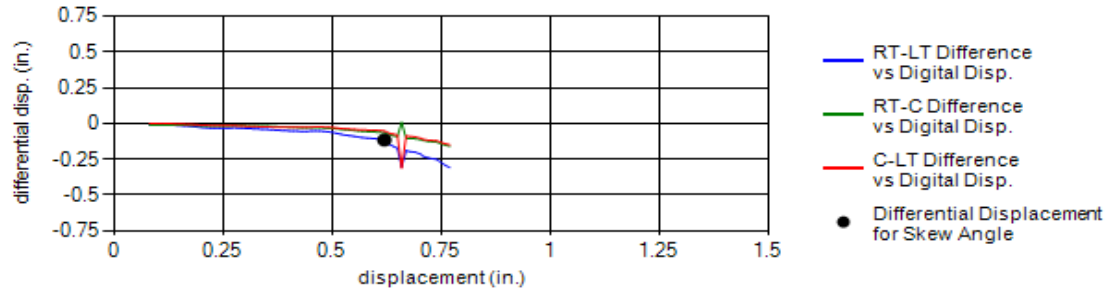
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
742	598	757	769	892	751	1.15	608



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.12	-0.06	-0.05	No Data	-0.37	CW



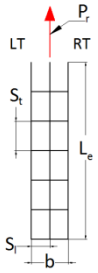
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/14/2012 10:42:00 AM
Test Identification:	TS45.10-G-9x18-W20xW15-L9-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

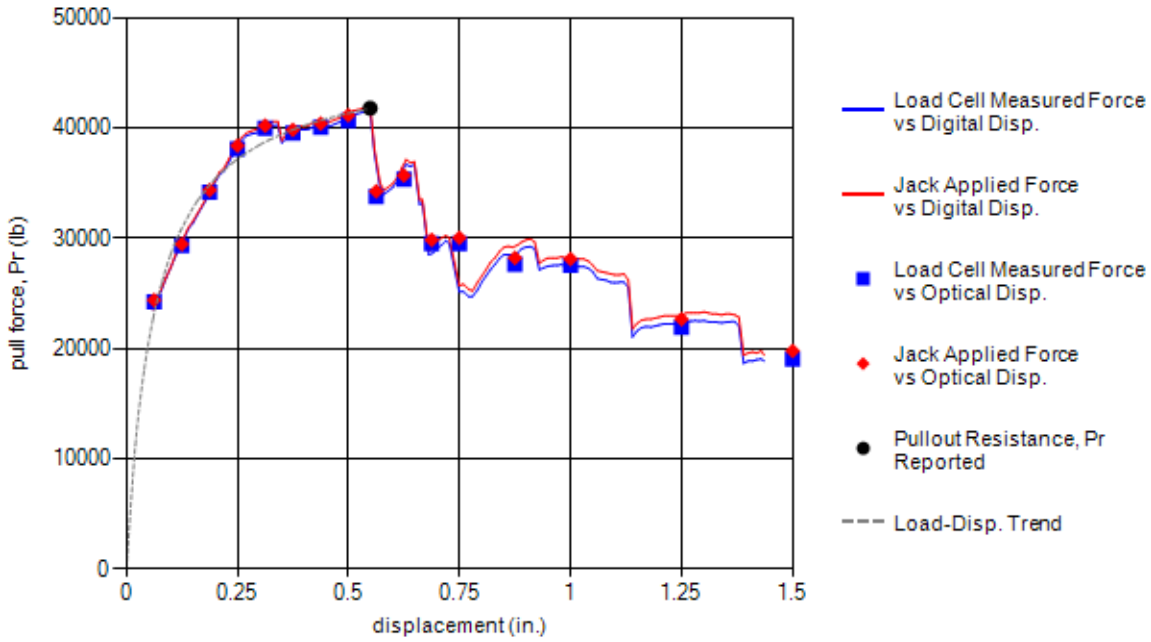
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.55	1458	41774	12.40	**1.06**

Load-Displacement Curve

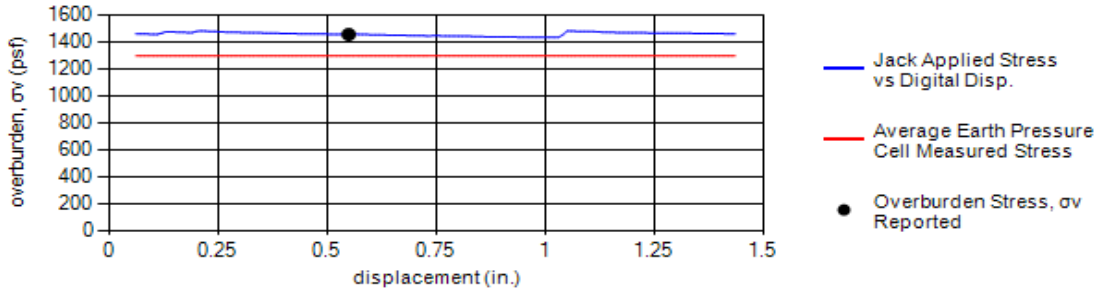


Comments

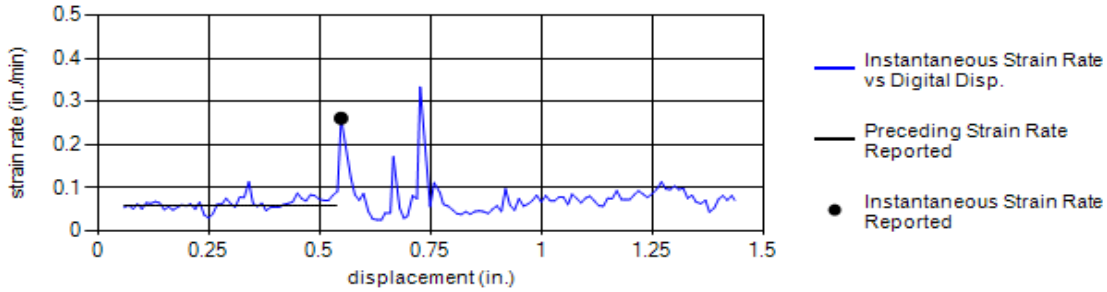
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

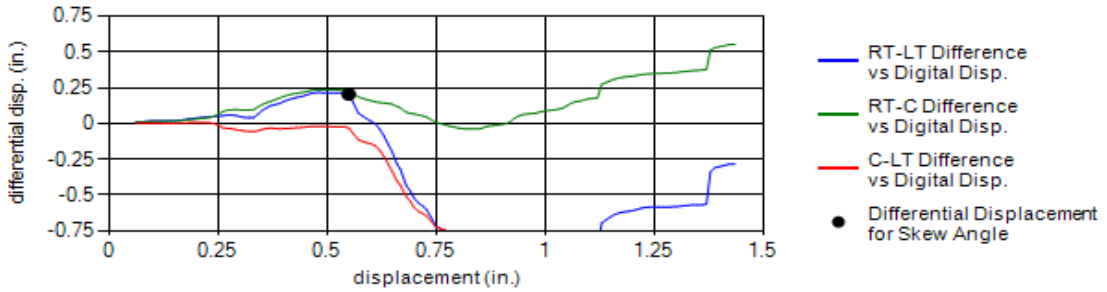
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
836	1199	1601	1460	1390	1297	1.09	1458



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.26	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.20	0.24	-0.03	No Data	0.65	CCW



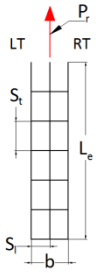
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 10:52:00 AM
Test Identification:	TS45.11-G-9x18-W20xW15-L9-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	9.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

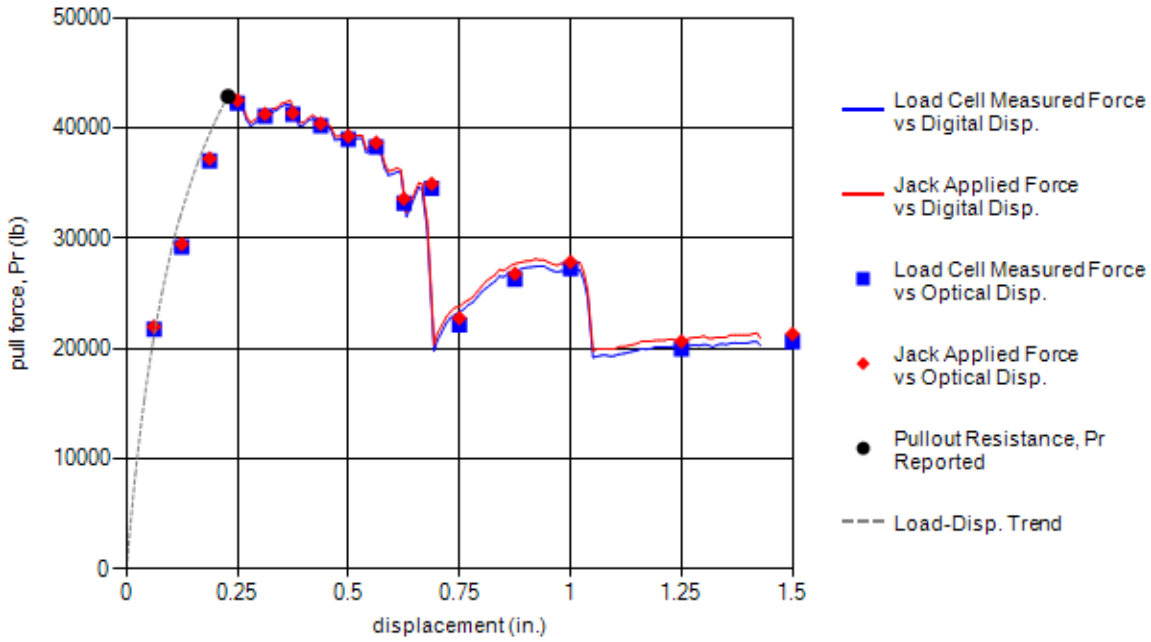
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.23	2464	42835	20.90	**0.64**

Load-Displacement Curve

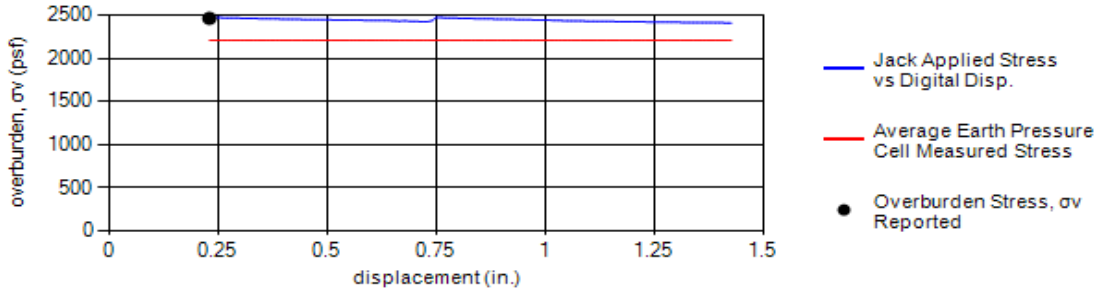


Comments

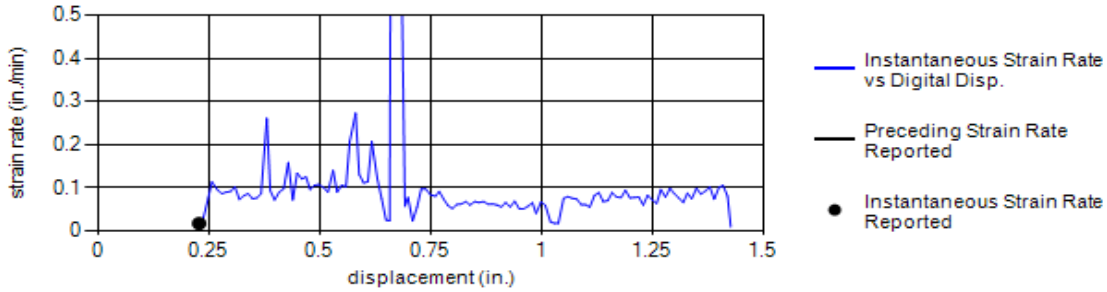
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

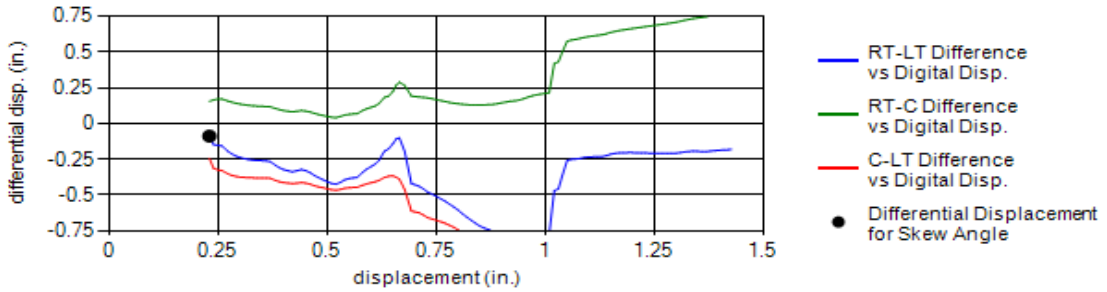
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1604	2126	2916	2225	2191	2212	1.02	2464



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.09	0.16	-0.24	No Data	-0.28	CW



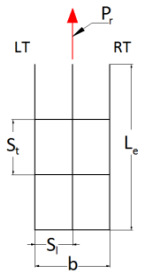
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/15/2012 2:22:00 PM
Test Identification:	TS45.12-G-9x18-W20xW15-L4.5-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	4.5	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	18	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

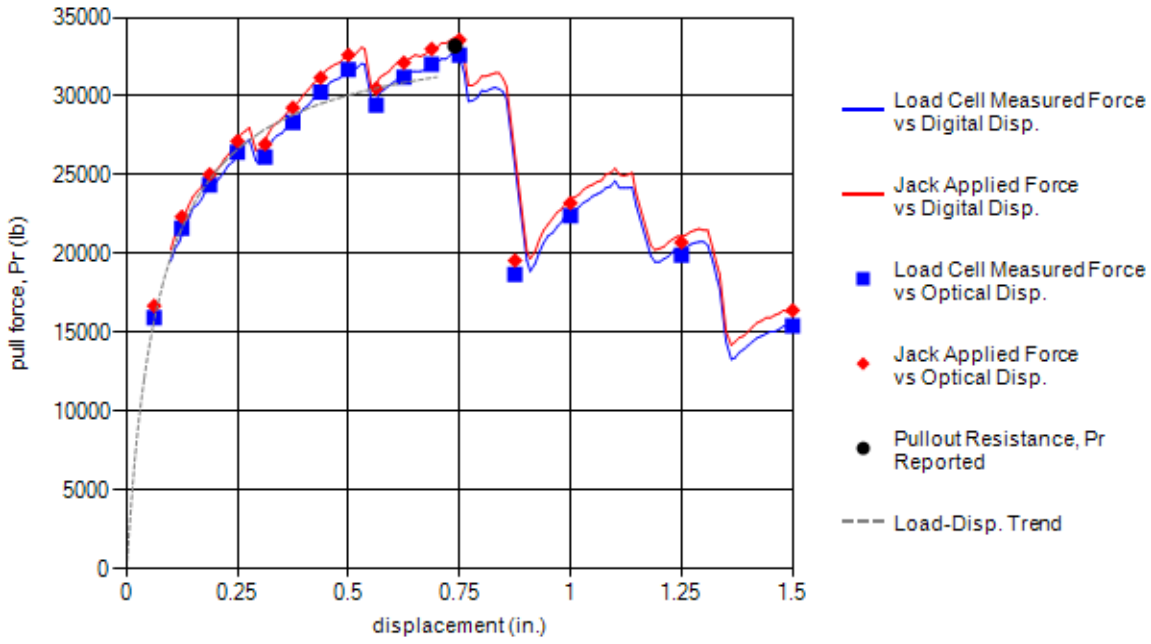
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.74	4984	33184	42.30	**0.49**

Load-Displacement Curve

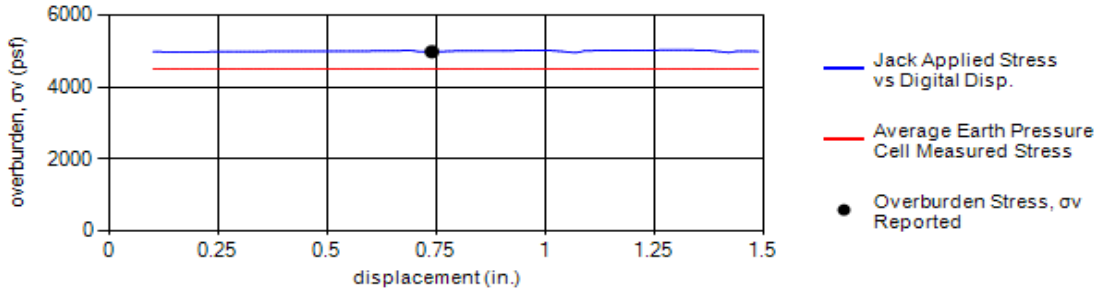


Comments

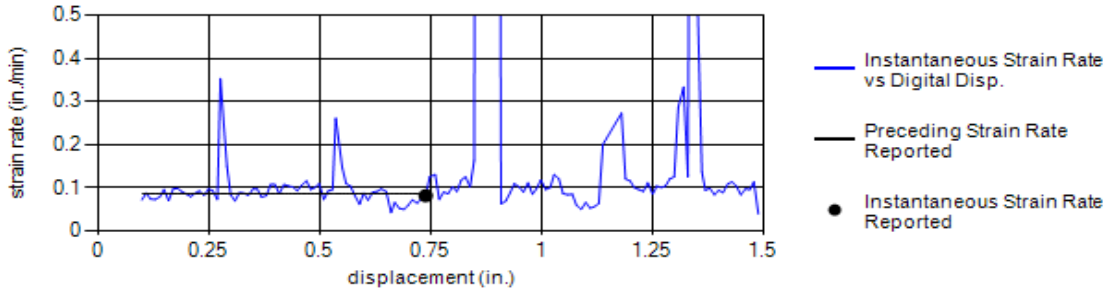
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

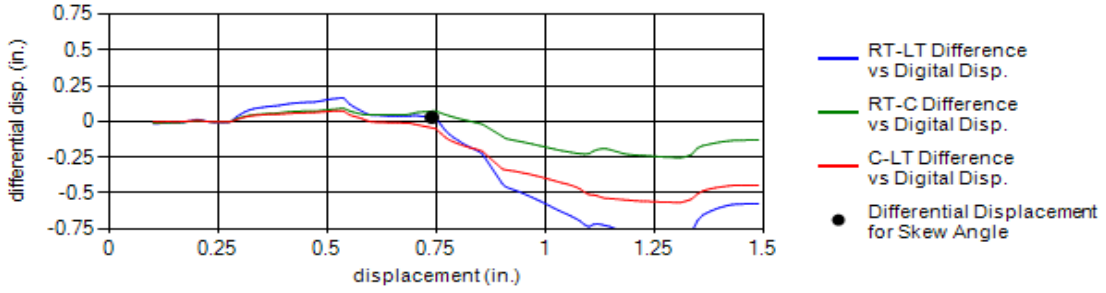
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3466	4587	5450	4386	4608	4499	1.03	4984



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	0.07	-0.04	No Data	0.09	CCW



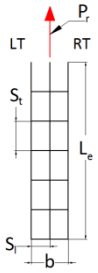
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/28/2012 2:29:00 PM
Test Identification:	TS46.01-G-6x12-W20xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

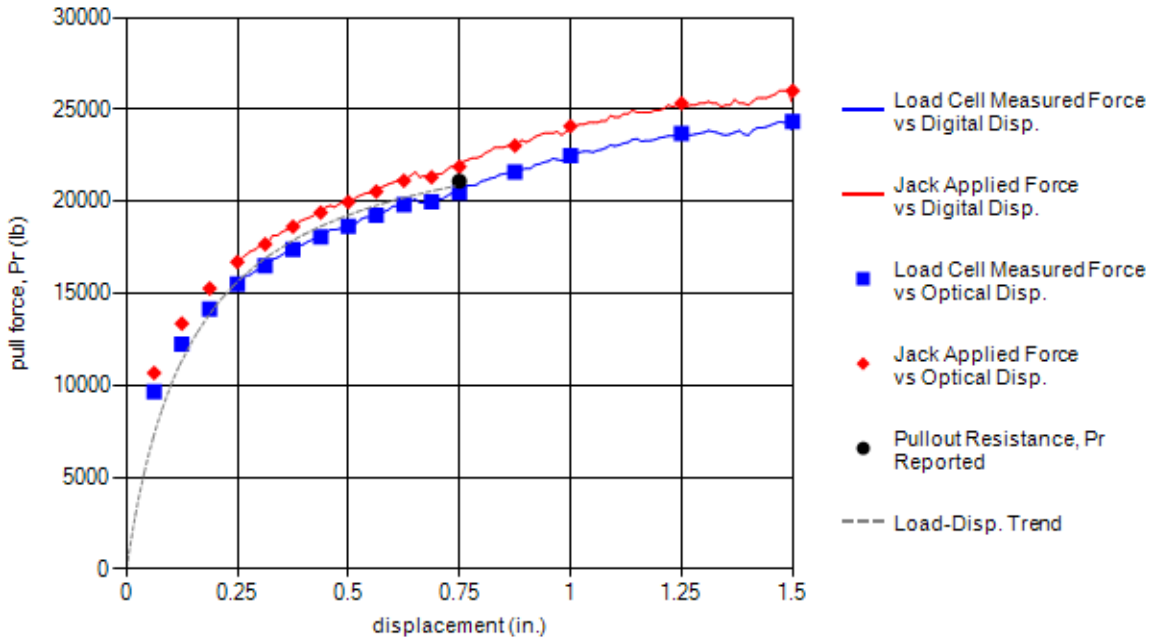
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	627	21097	5.20	**2.80**

Load-Displacement Curve

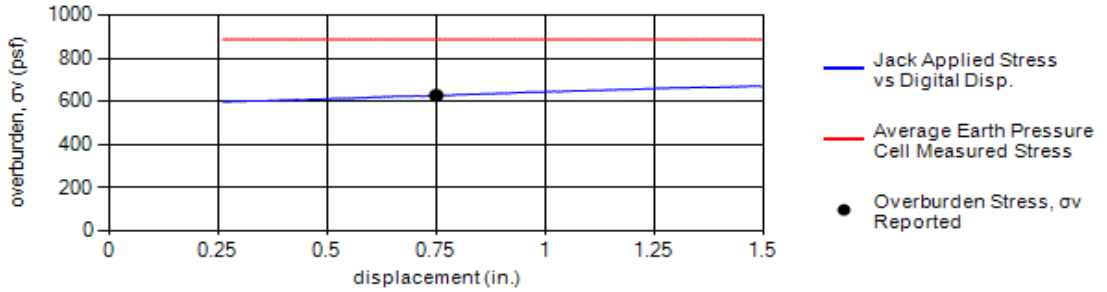


Comments

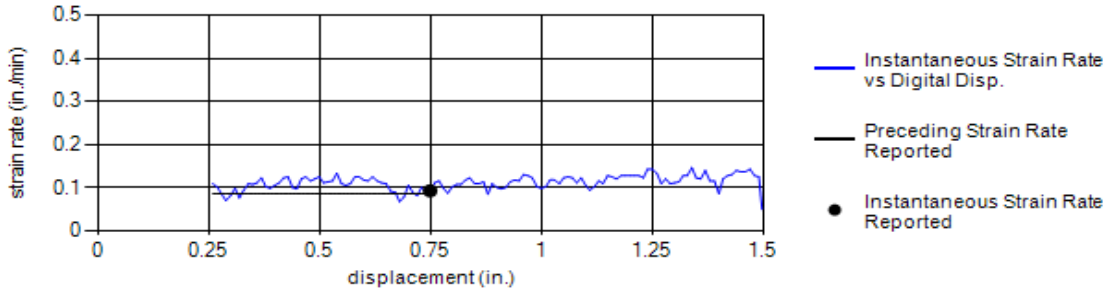
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

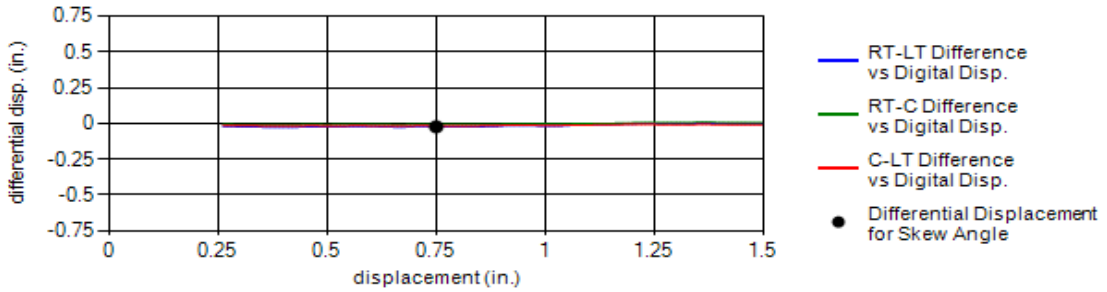
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1292	778	622	878	868	888	1.22	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.09	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.02	-0.01	-0.02	No Data	-0.11	CW



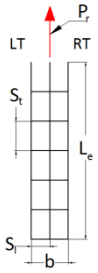
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 1:32:00 PM
Test Identification:	TS46.02-G-6x12-W20xW11-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

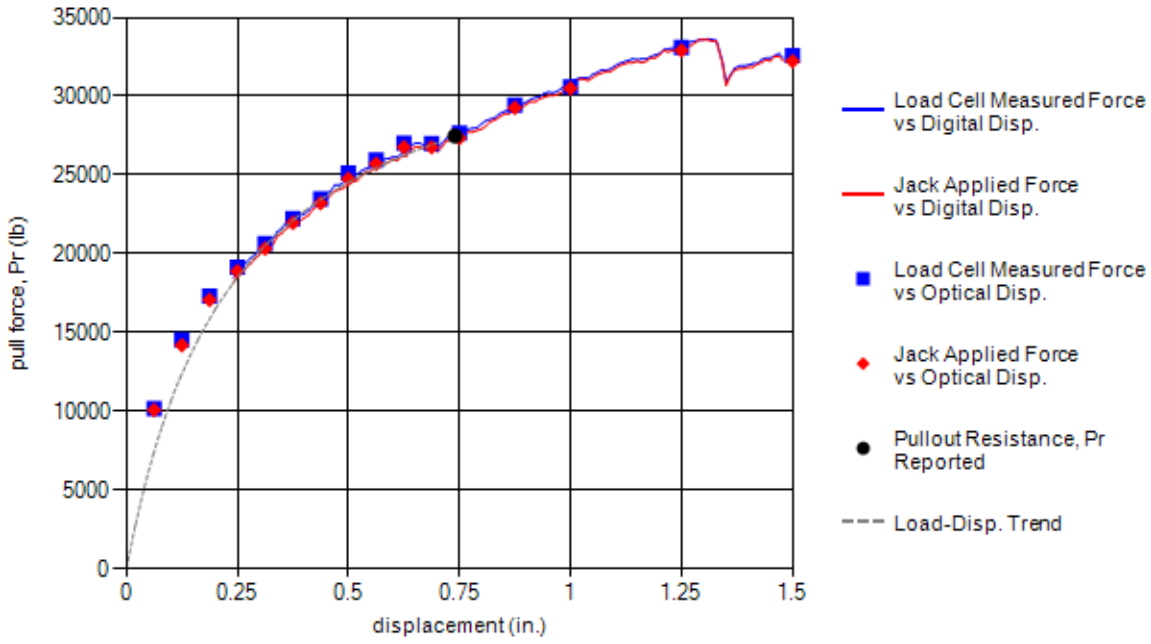
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1451	27479	12.10	**1.58**

Load-Displacement Curve

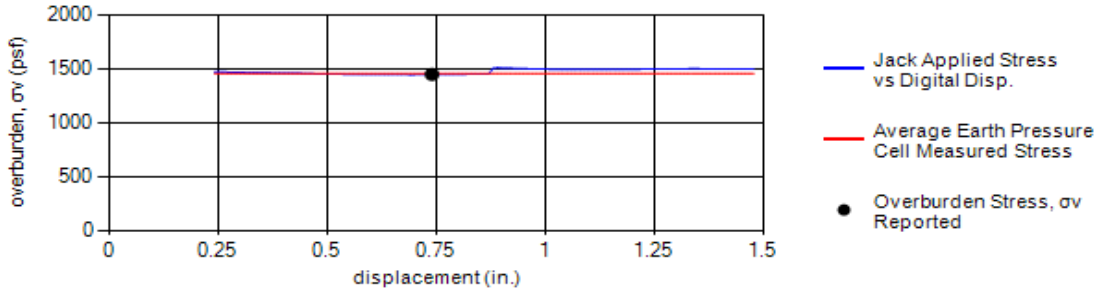


Comments

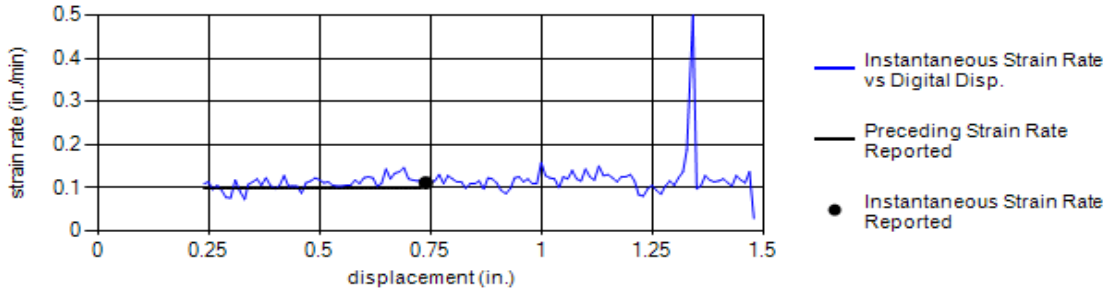
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

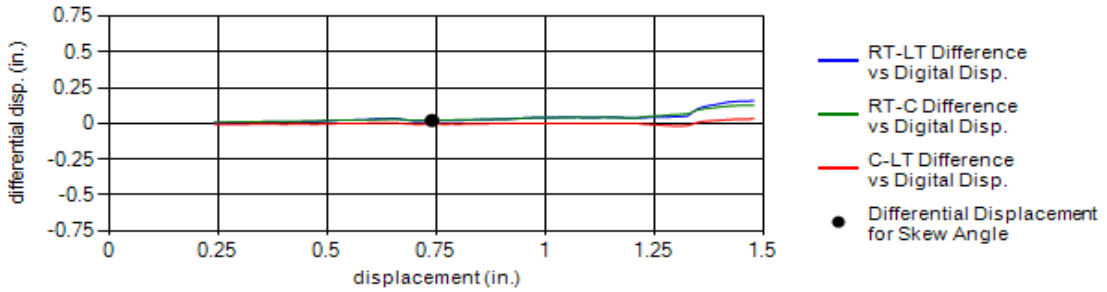
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1597	1550	1187	1538	1422	1459	1.63	1451



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.02	0.02	0.00	No Data	0.10	CCW



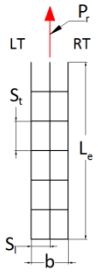
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 4:02:00 PM
Test Identification:	TS46.03-G-6x12-W20xW11-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

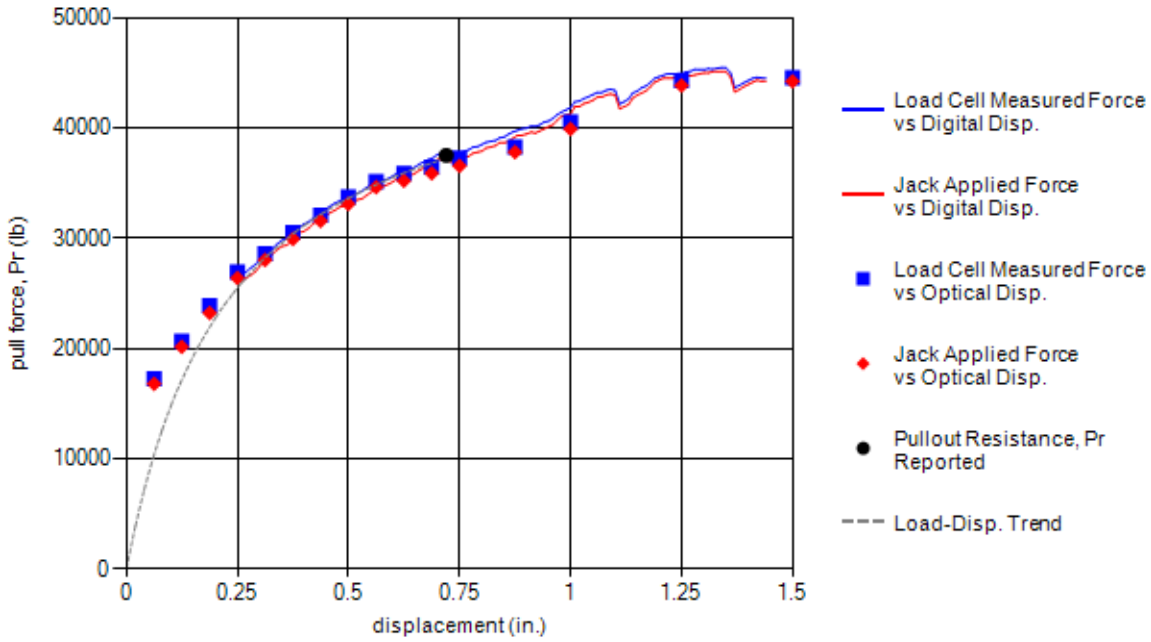
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	2375	37494	19.90	**1.32**

Load-Displacement Curve

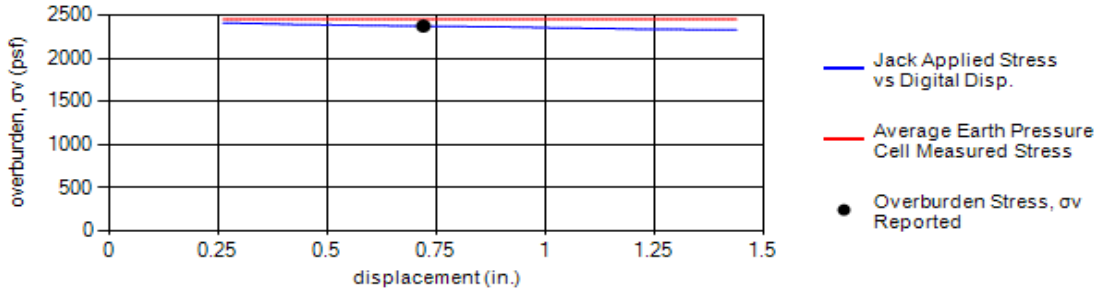


Comments

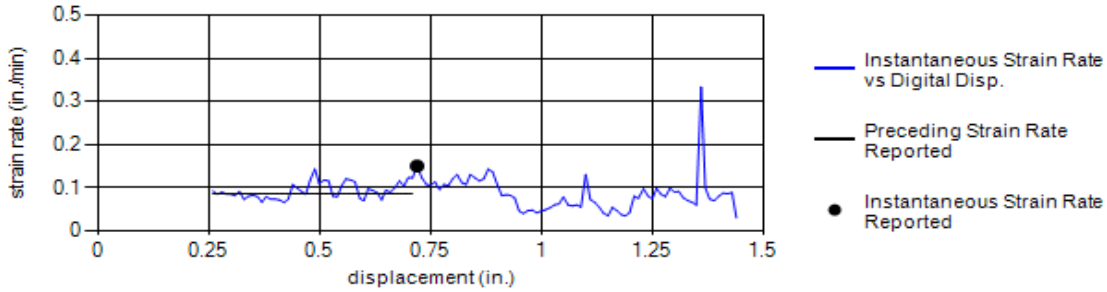
Personnel

Tested:	AJ AJ AJ
Prepared:	SB TW
Checked:	WL PJ

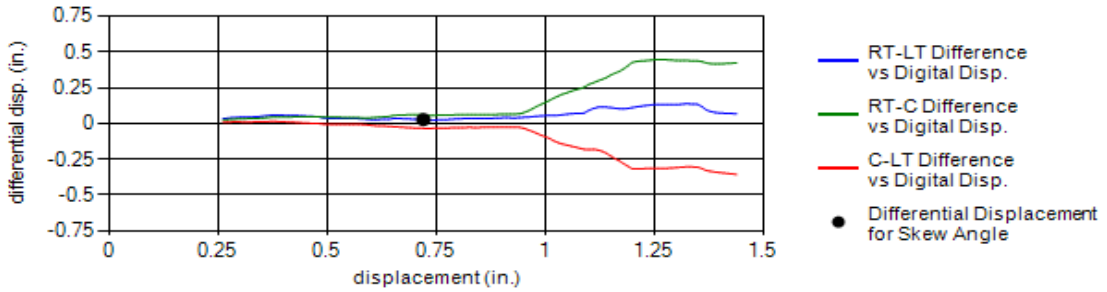
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2724	2802	1849	2489	2404	2454	1.04	2375



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.09	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	0.06	-0.03	No Data	0.13	CCW



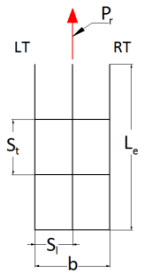
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/2/2012 12:29:00 PM
Test Identification:	TS46.04-G-6x12-W20xW11-L3-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

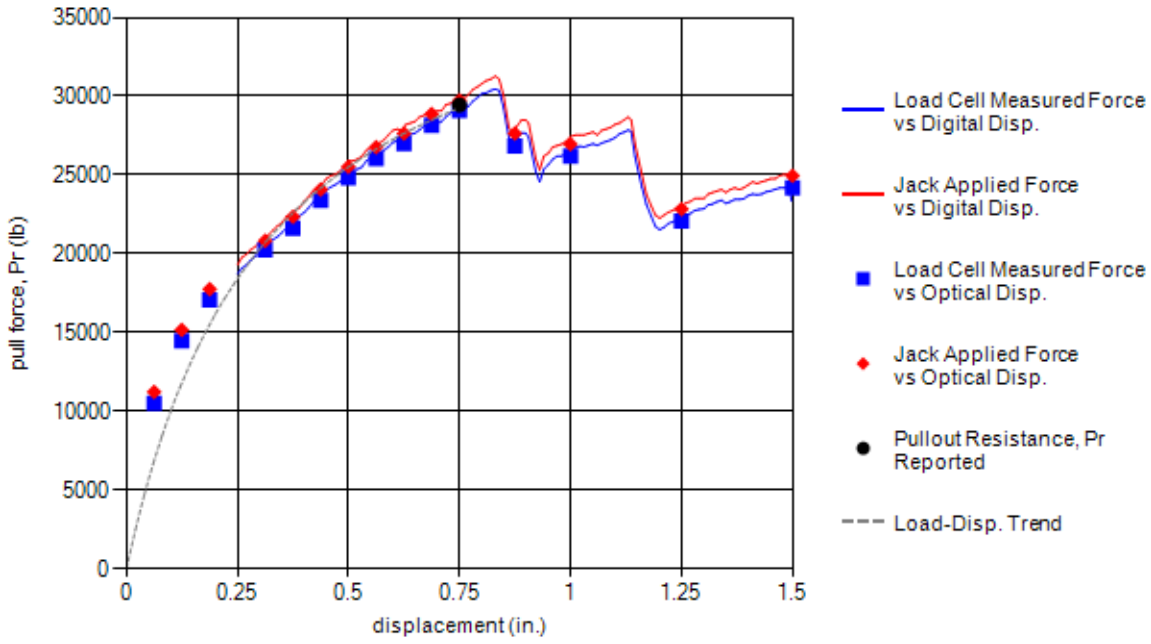
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	5031	29448	42.10	**0.98**

Load-Displacement Curve

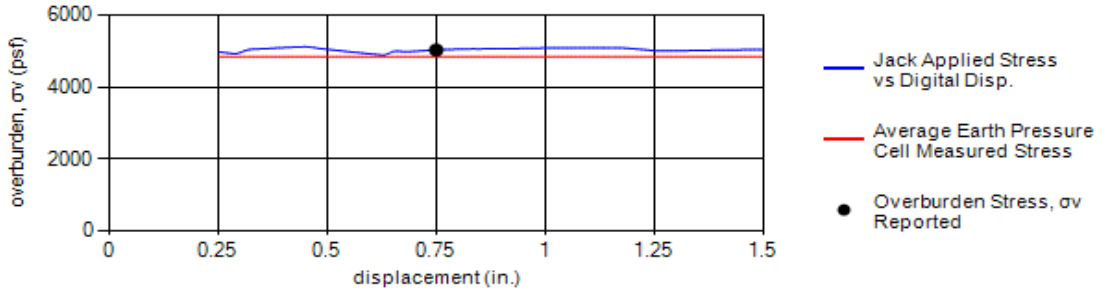


Comments

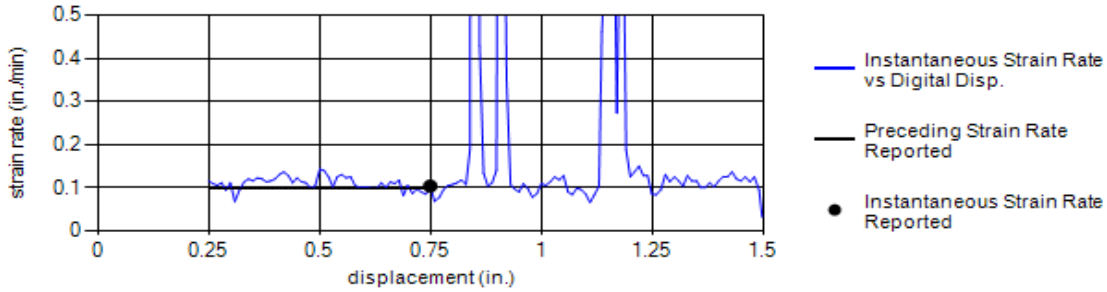
Personnel

Tested:	AJ AJ ET
Prepared:	TW TW
Checked:	WL PJ

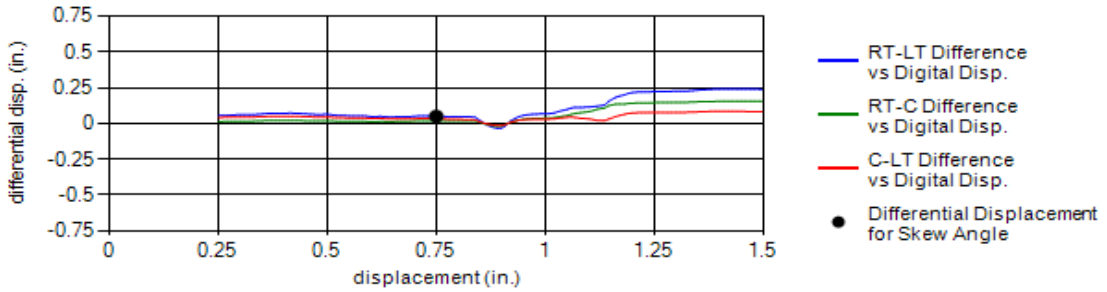
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4822	4672	4308	5049	5400	4851	1.08	5031



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.02	0.03	No Data	0.24	CCW



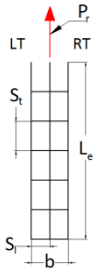
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/28/2012 1:47:00 PM
Test Identification:	TS46.05-G-6x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

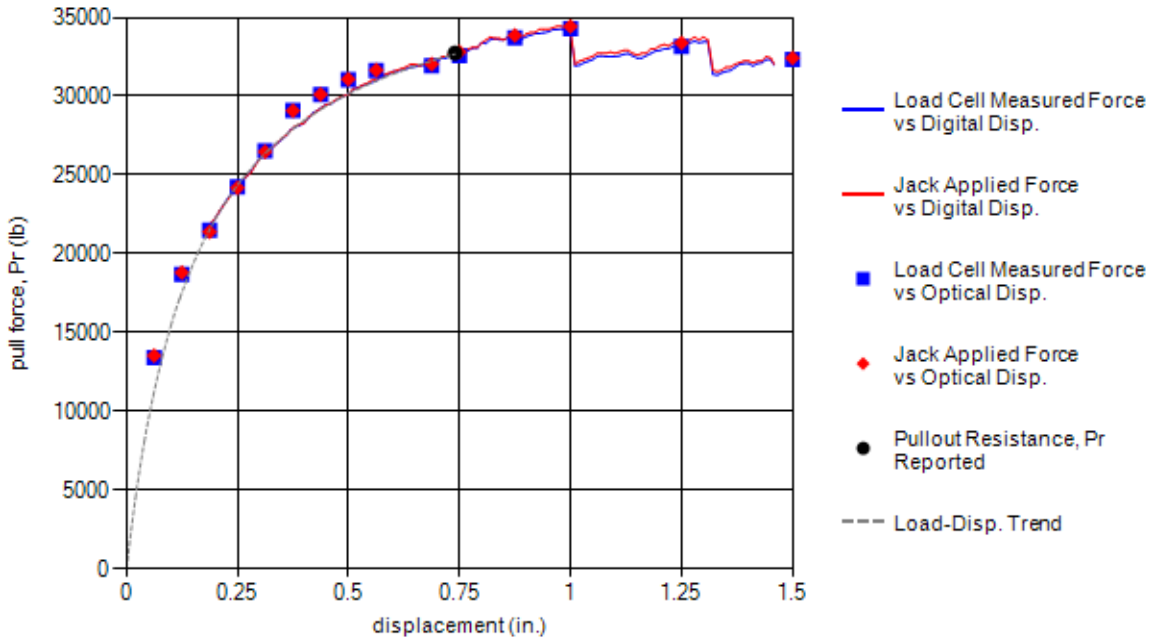
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	633	32739	5.30	**4.31**

Load-Displacement Curve



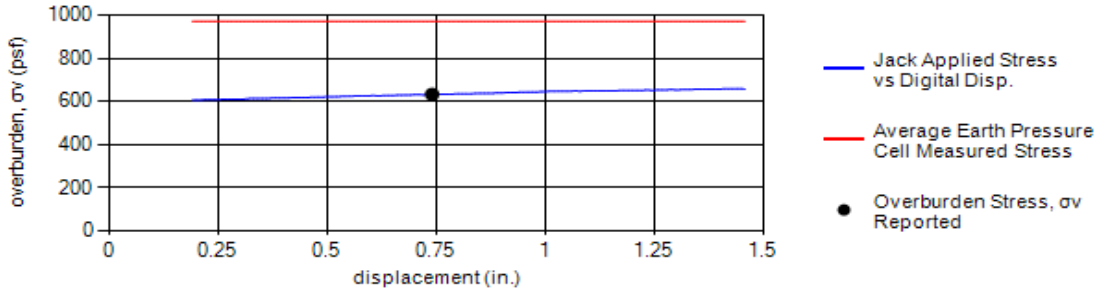
Comments

No incidental skew data.

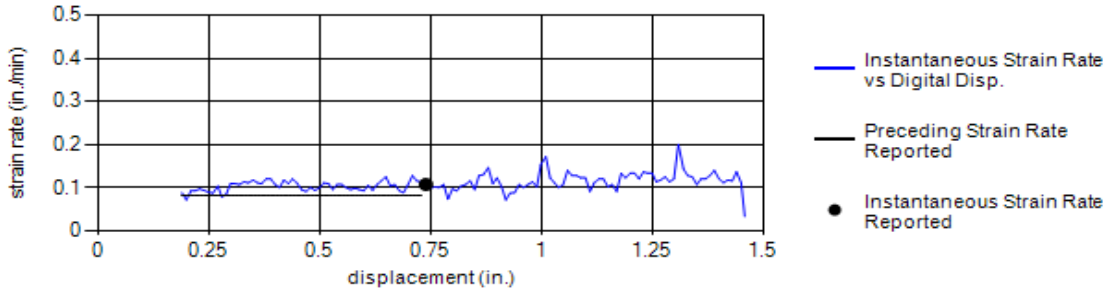
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1417	809	682	981	967	971	1.20	633



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

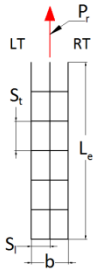
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/29/2012 3:49:00 PM
Test Identification:	TS46.06-G-6x12-W20xW11-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

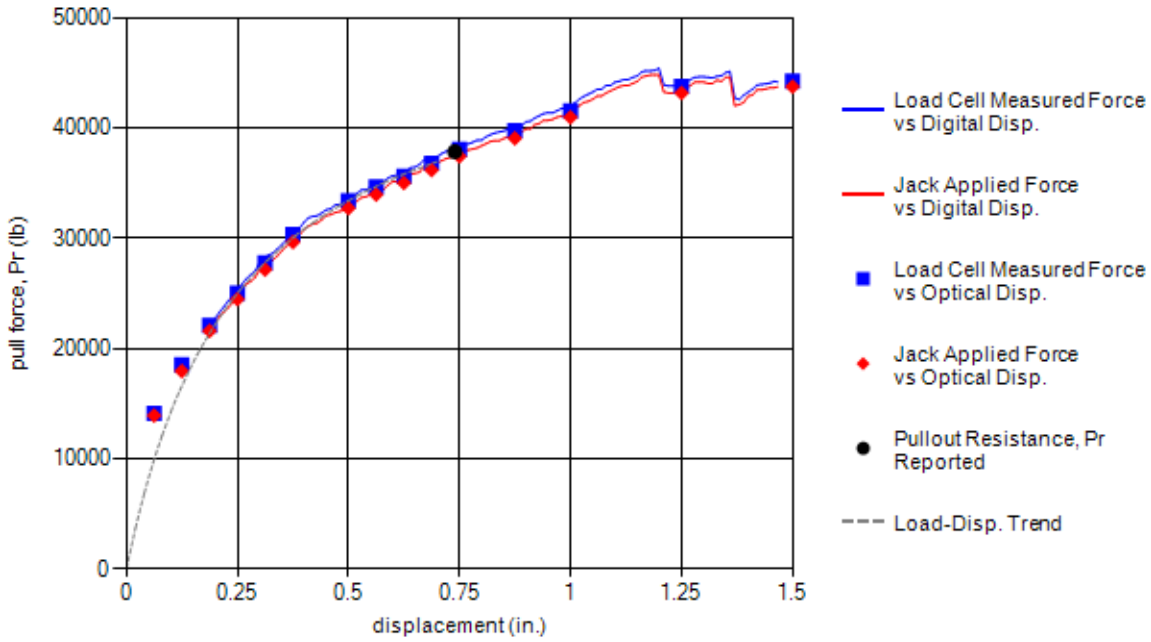
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1448	37831	12.10	**2.18**

Load-Displacement Curve

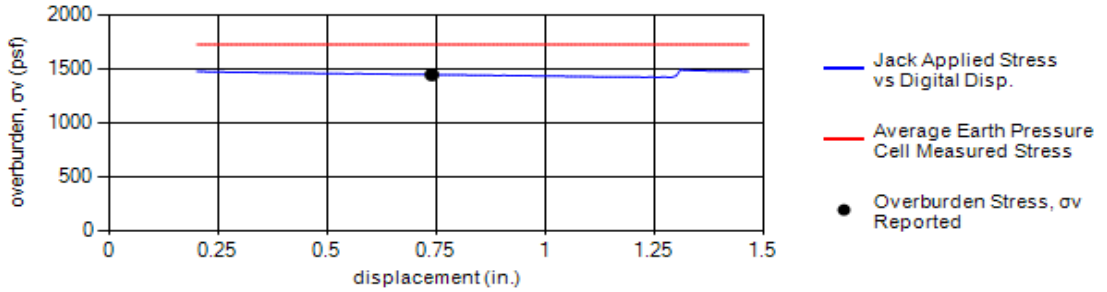


Comments

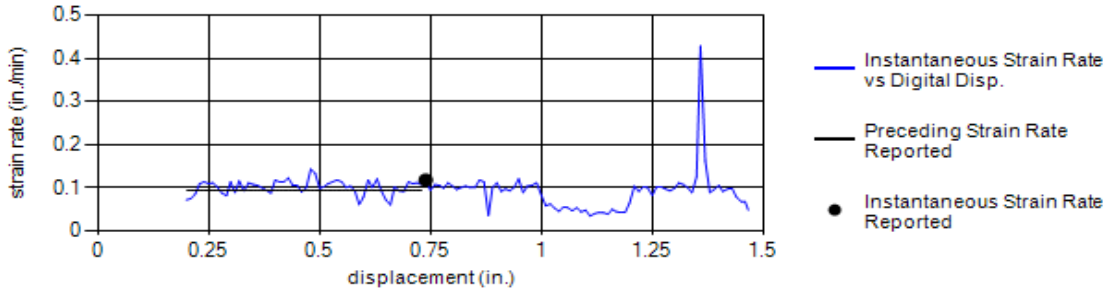
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

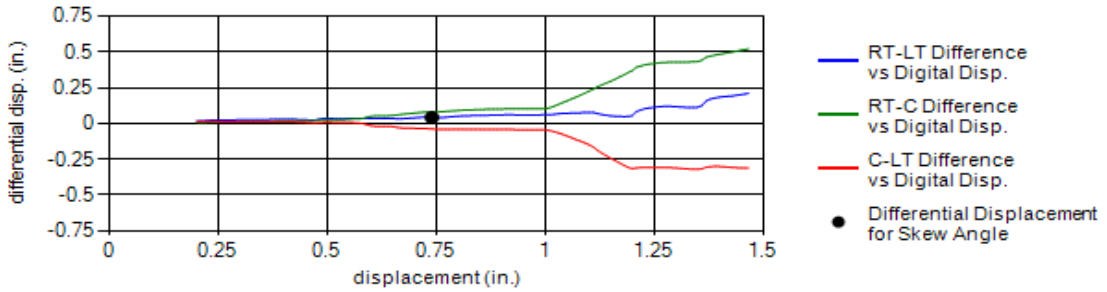
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2069	1754	1257	1812	1754	1729	1.05	1448



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.09	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.08	-0.04	No Data	0.20	CCW



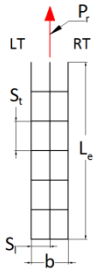
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 3:21:00 PM
Test Identification:	TS46.07-G-6x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

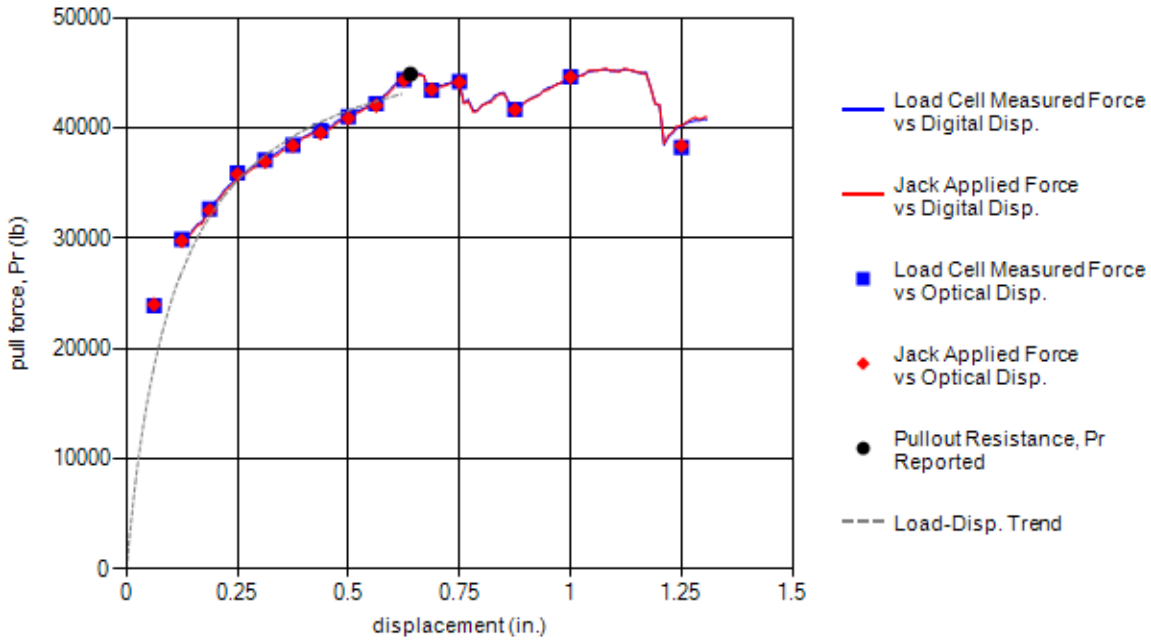
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.64	2348	44863	19.60	**1.59**

Load-Displacement Curve



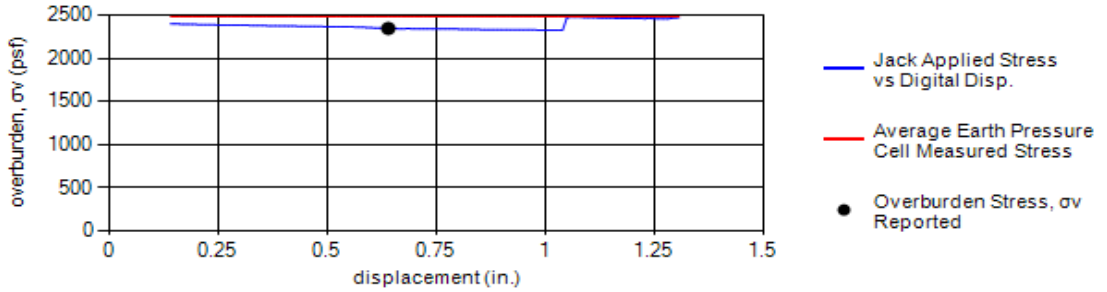
Comments

Center longitudinal bar rupture beyond 0.75in. displacement.

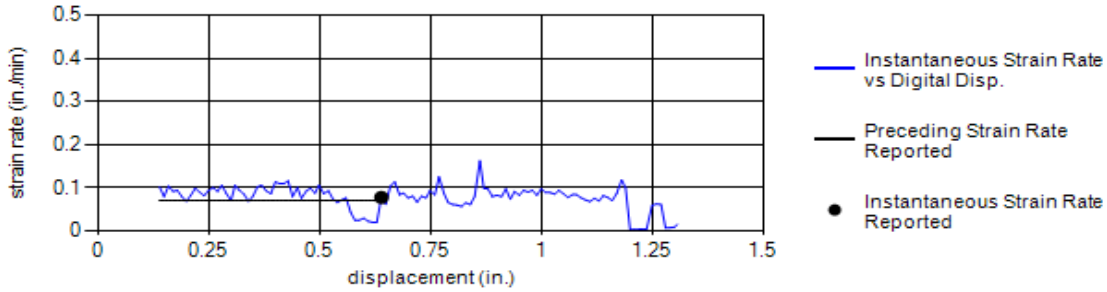
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

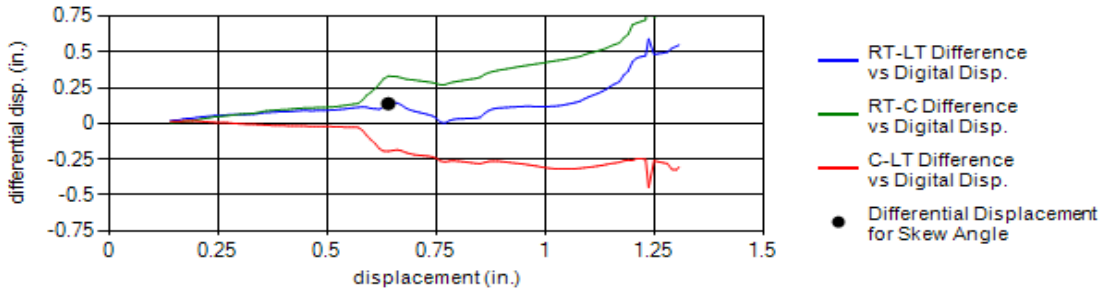
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2723	2628	1988	2608	2464	2482	1.04	2348



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.14	0.33	-0.19	No Data	0.66	CCW



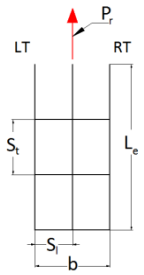
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/2/2012 11:52:00 AM
Test Identification:	TS46.08-G-6x12-W20xW11-L3-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

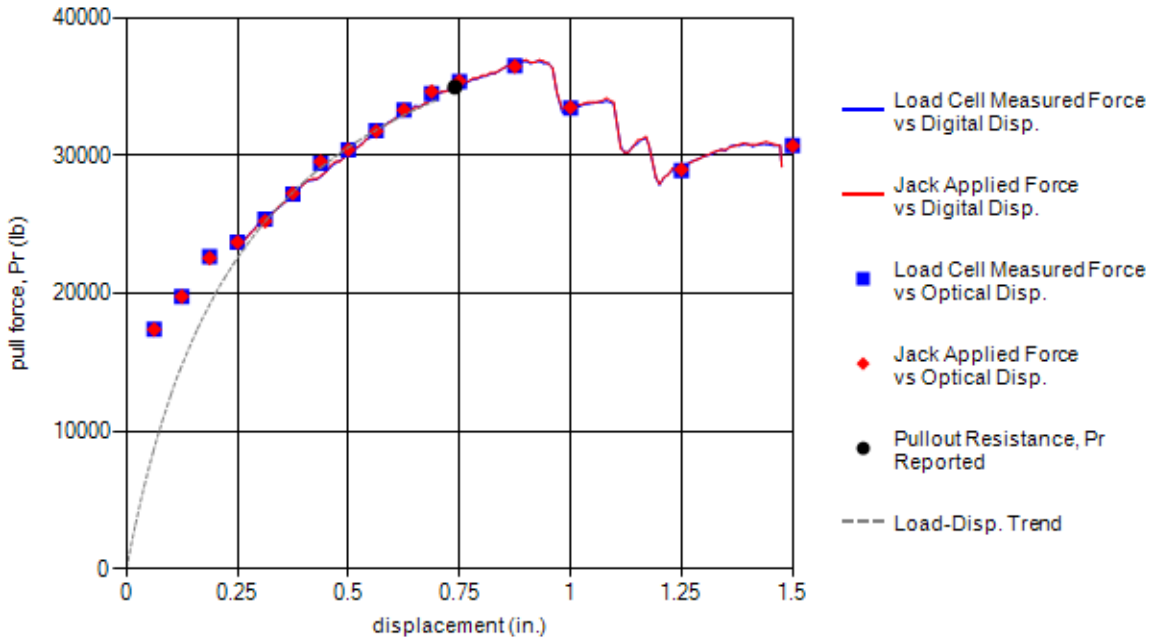
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	5056	34949	42.20	**1.15**

Load-Displacement Curve

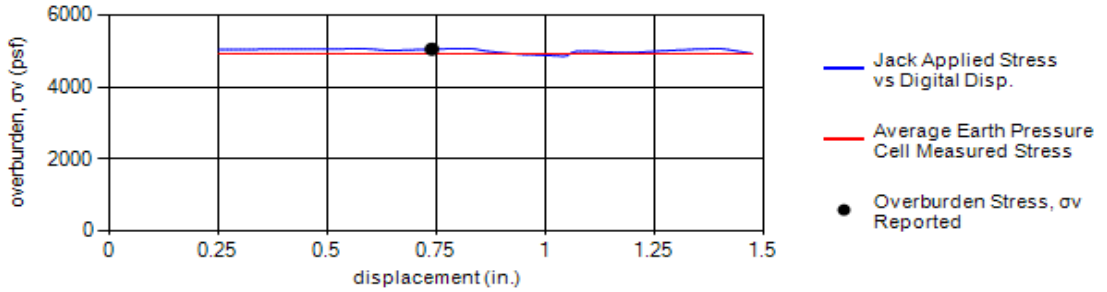


Comments

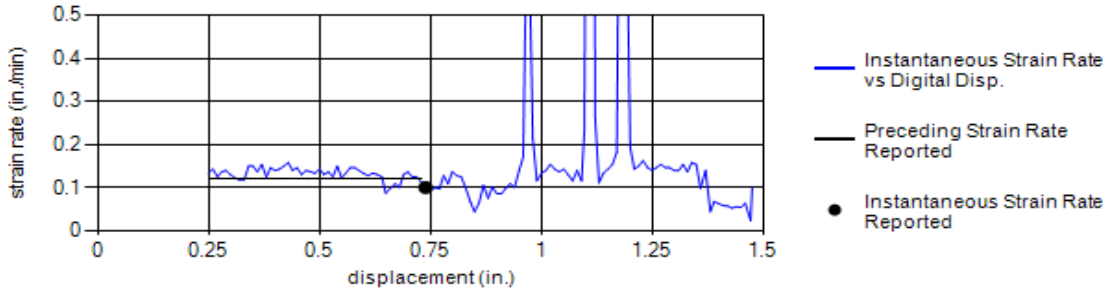
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

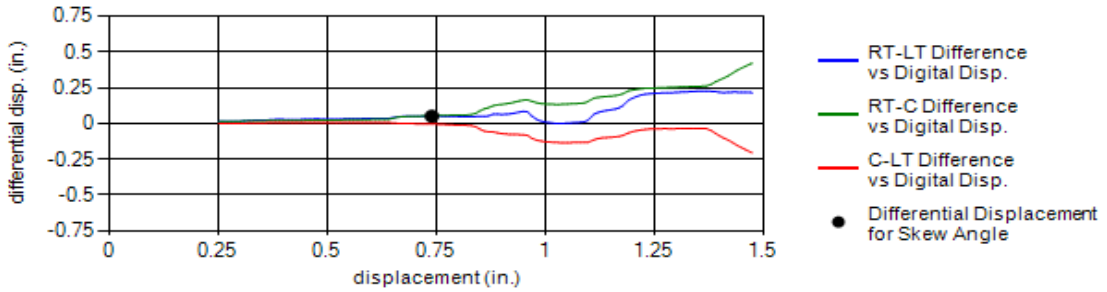
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4822	5079	4304	5070	5364	4928	1.07	5056



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.12	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.05	0.00	No Data	0.25	CCW



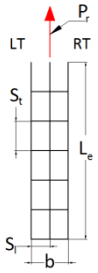
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/28/2012 12:59:00 PM
Test Identification:	TS46.09-G-6x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

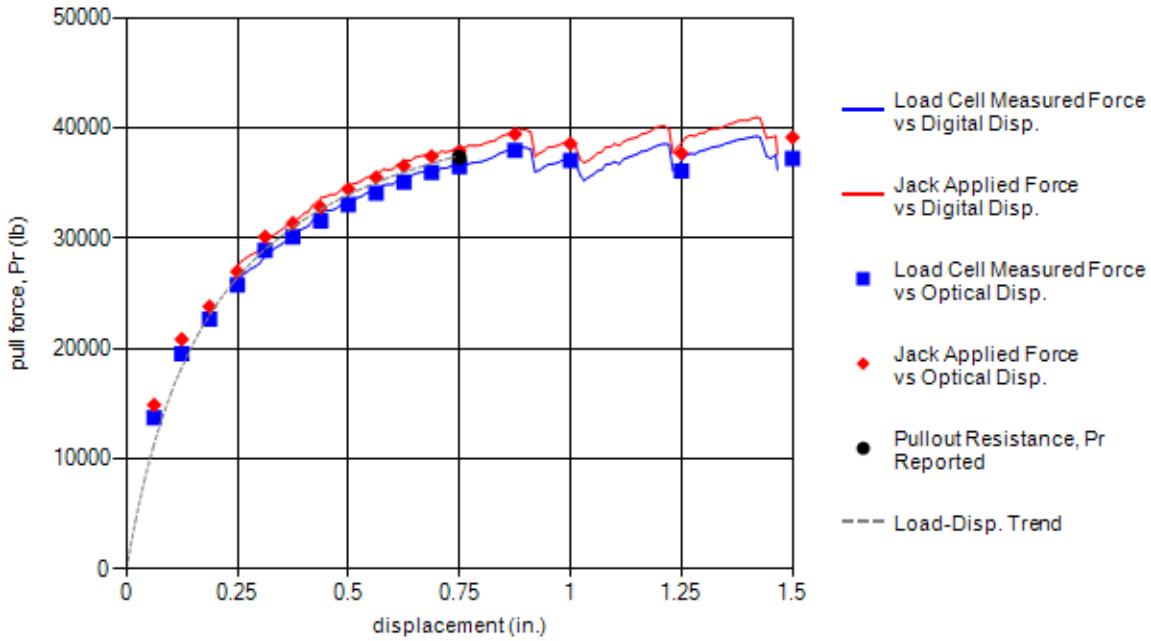
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	627	37325	5.20	**4.96**

Load-Displacement Curve

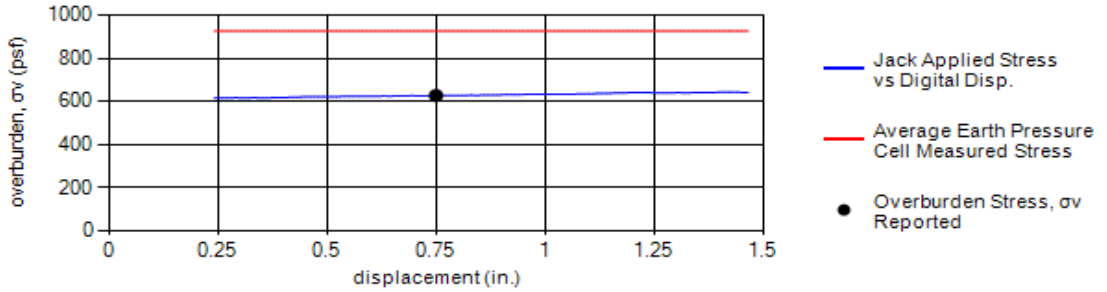


Comments

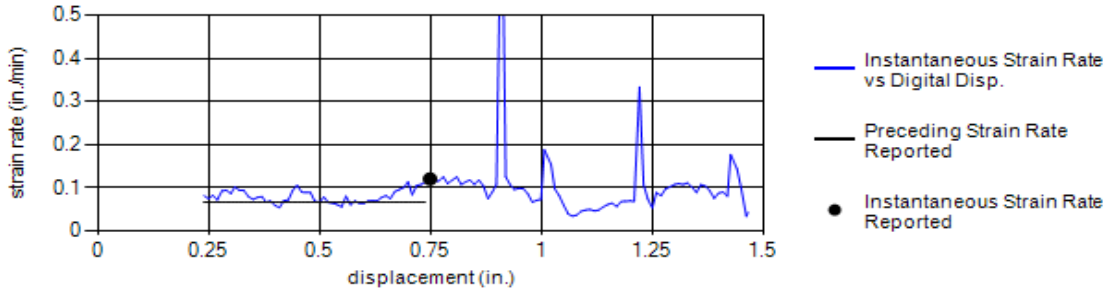
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

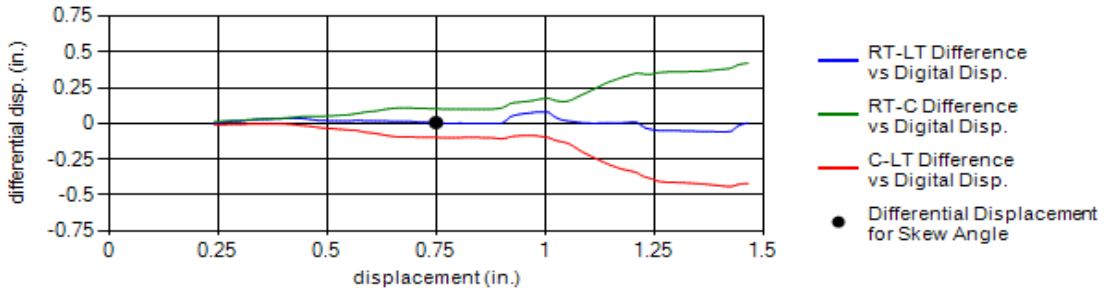
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1566	702	555	892	921	927	1.19	627



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.01	0.10	-0.10	No Data	0.03	CCW



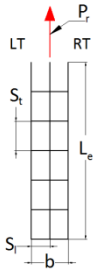
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/29/2012 12:53:00 PM
Test Identification:	TS46.10-G-6x12-W20xW11-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

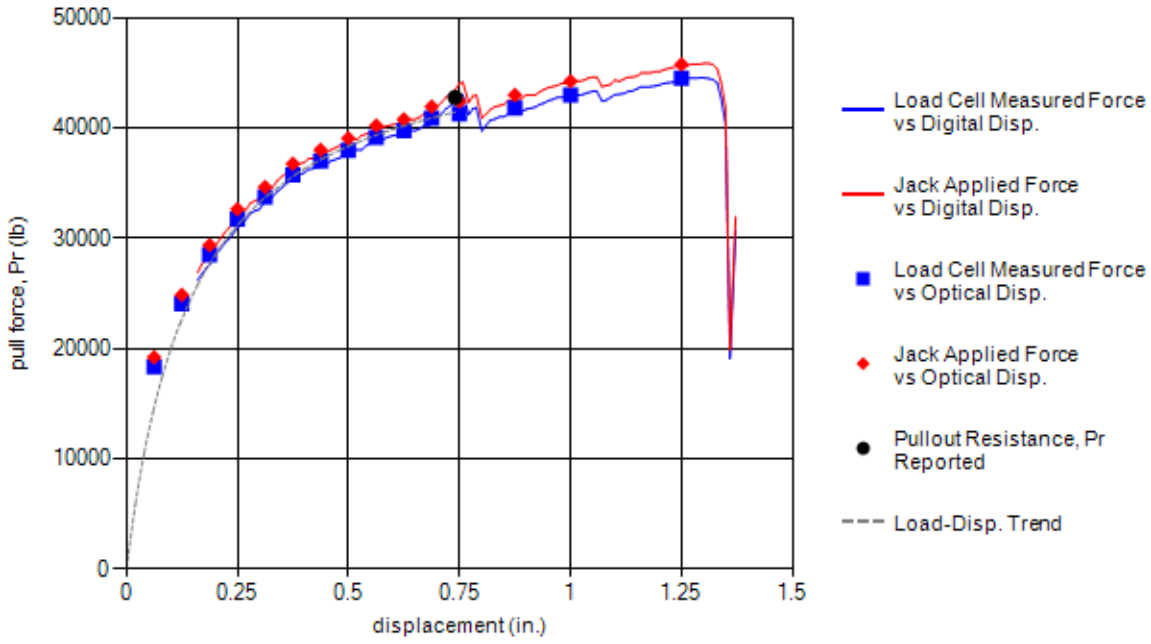
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1488	42755	12.40	**2.39**

Load-Displacement Curve

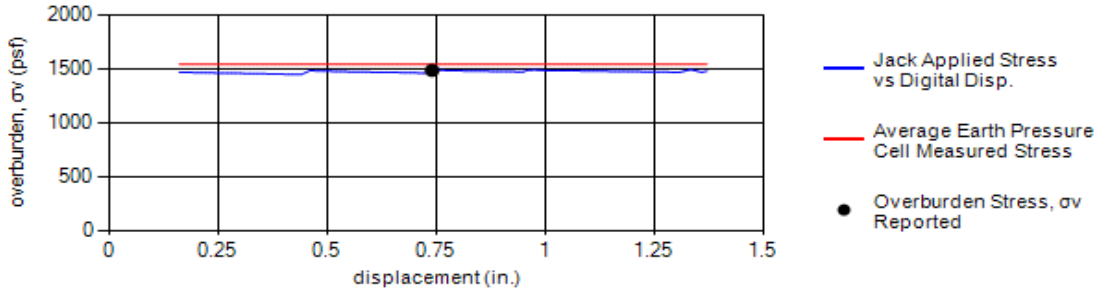


Comments

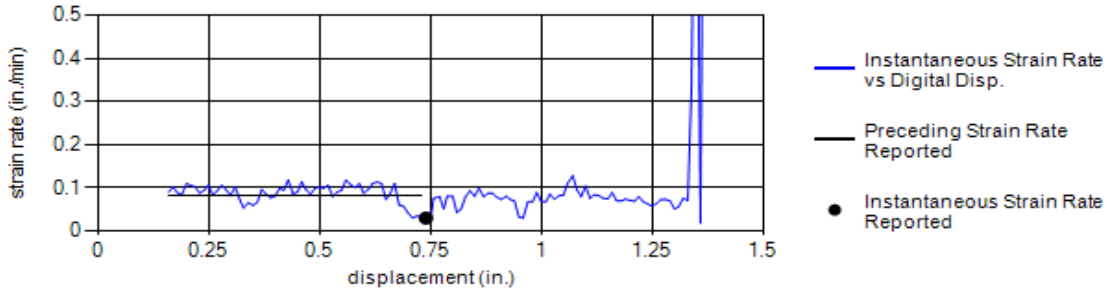
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

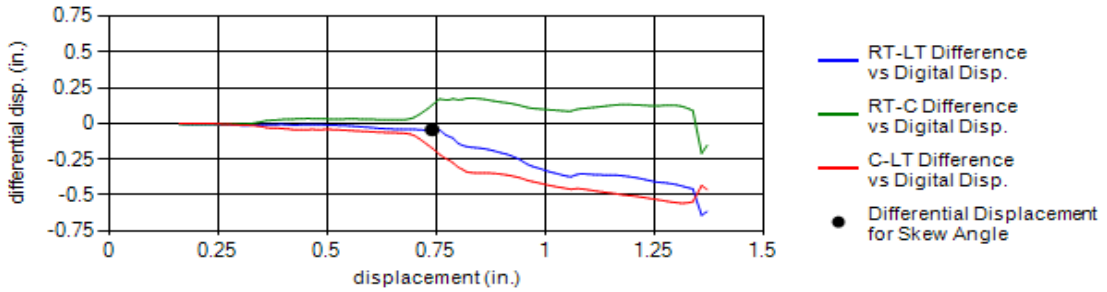
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1896	1500	1066	1668	1594	1545	1.10	1488



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.03	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.04	0.13	-0.17	No Data	-0.20	CW



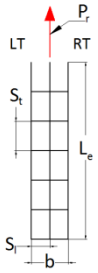
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	3/30/2012 2:25:00 PM
Test Identification:	TS46.11-G-6x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

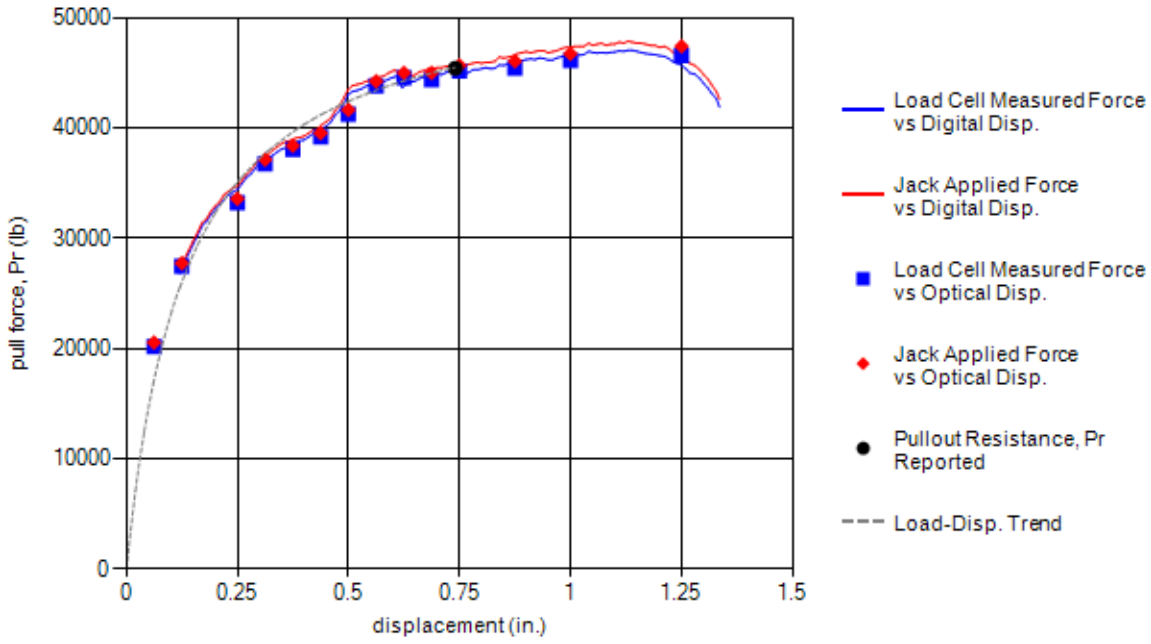
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2454	45391	20.40	**1.54**

Load-Displacement Curve

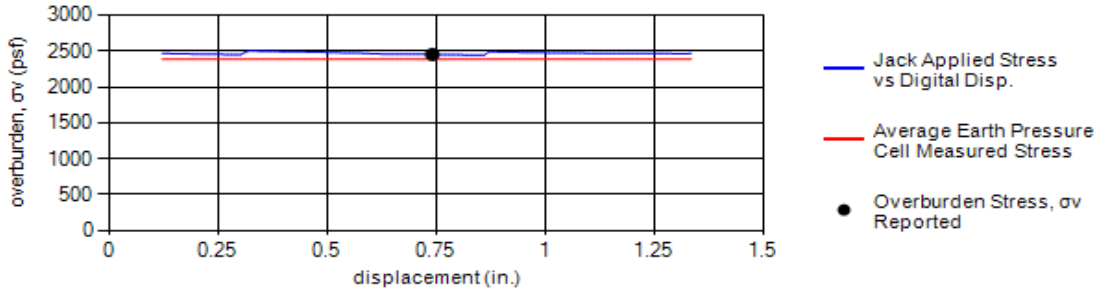


Comments

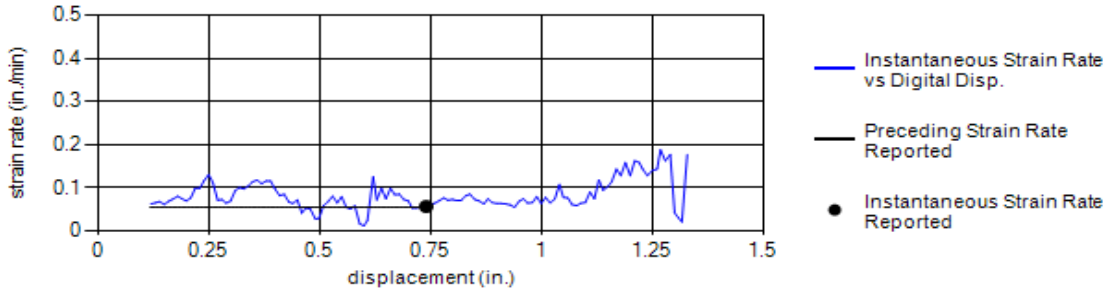
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

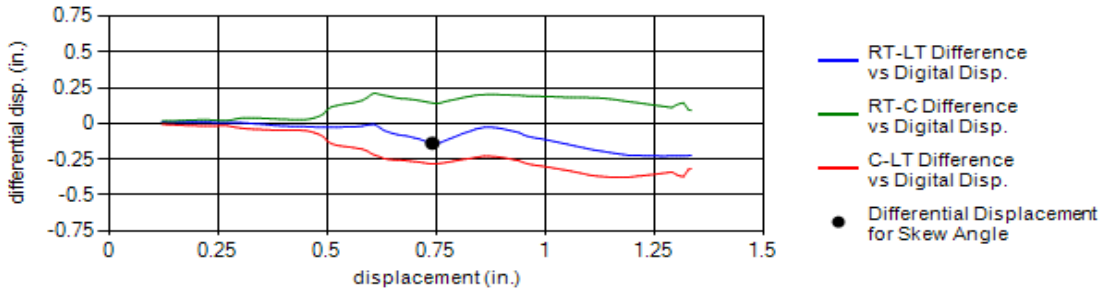
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2734	2417	1878	2553	2367	2390	1.08	2454



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.05	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.14	0.14	-0.28	No Data	-0.66	CW



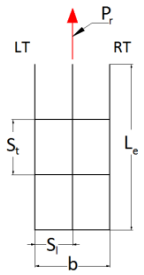
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/2/2012 11:12:00 AM
Test Identification:	TS46.12-G-6x12-W20xW11-L3-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

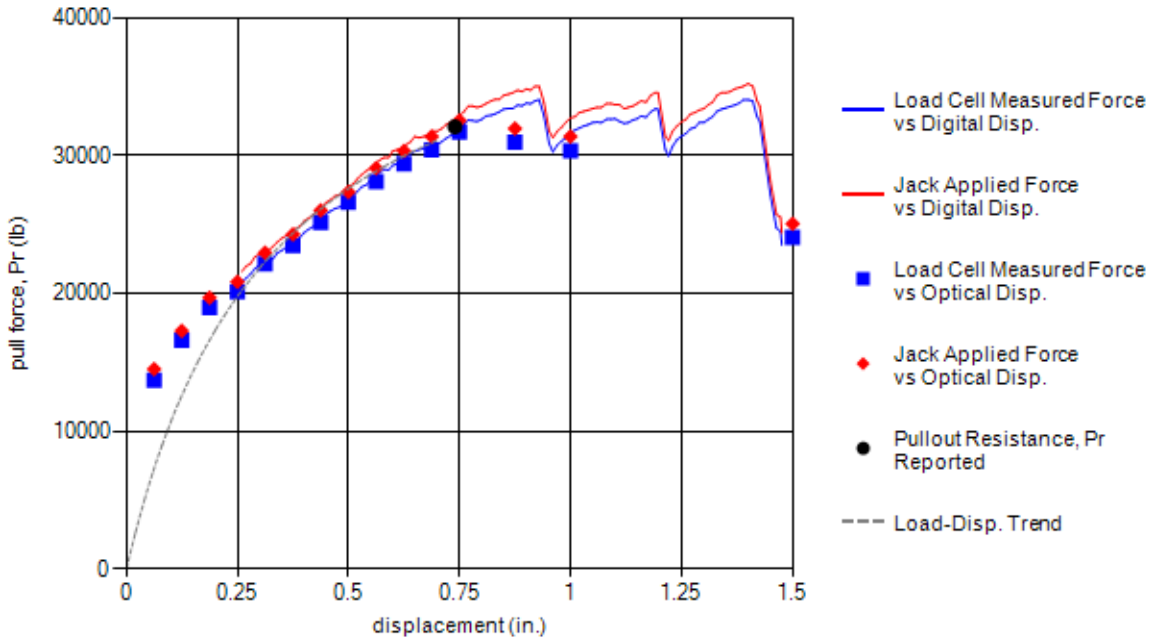
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	4964	32072	41.30	**1.08**

Load-Displacement Curve



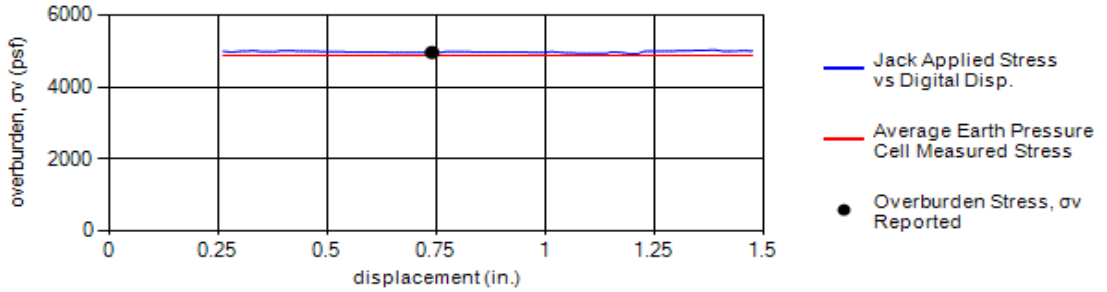
Comments

No incidental skew data.

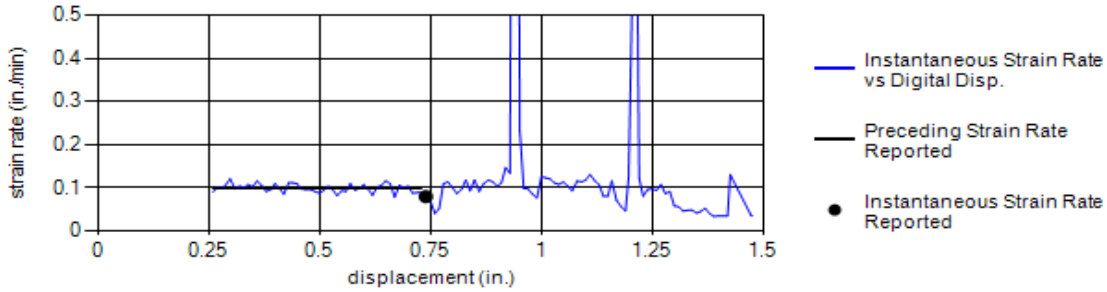
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
4826	5414	4123	4917	5111	4878	1.06	4964



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.10	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

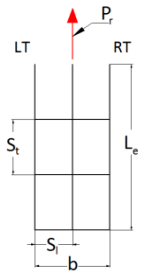
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 11:25:00 AM
Test Identification:	TS47.01-G-9x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

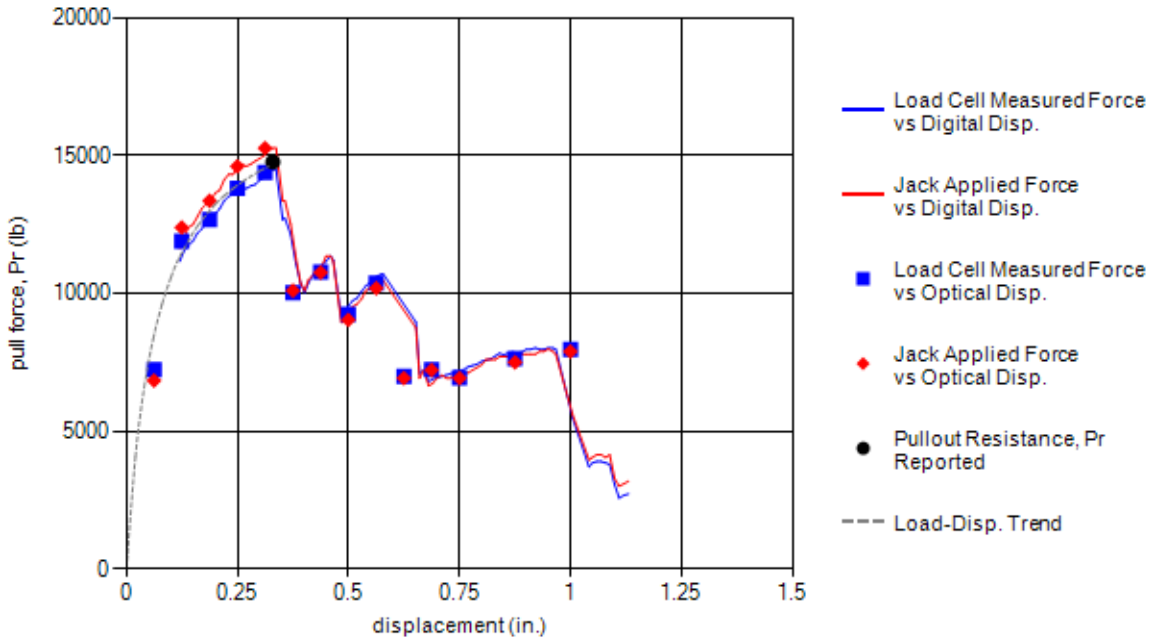
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.33	1428	14761	11.80	**1.15**

Load-Displacement Curve

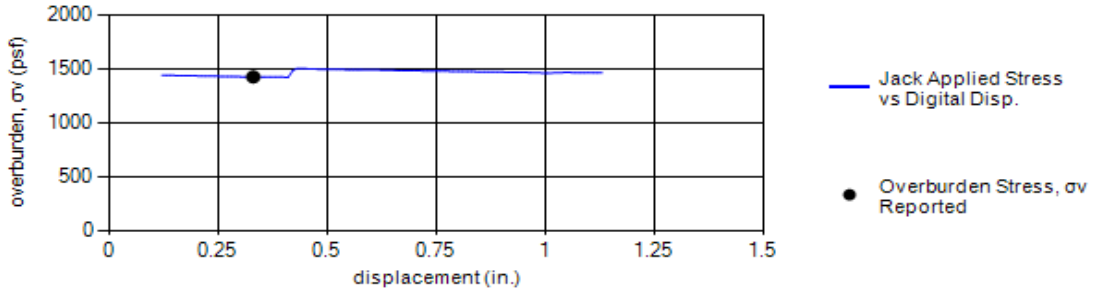


Comments

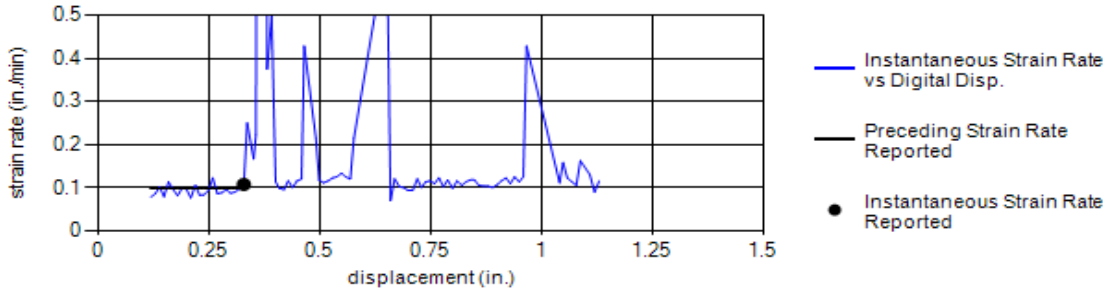
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

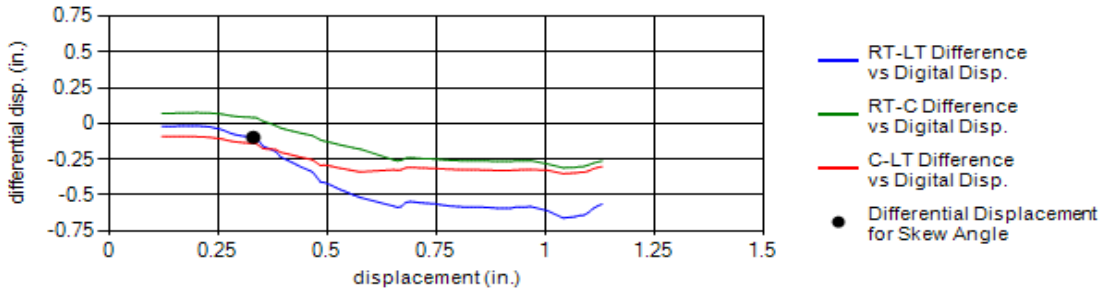
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3442	3921	3346	3084	3422	3443	1.03	1428



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.10	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.10	0.04	-0.14	No Data	-0.31	CW



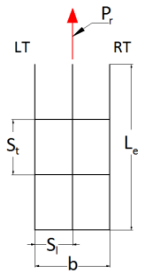
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 10:46:00 AM
Test Identification:	TS47.02-G-6x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

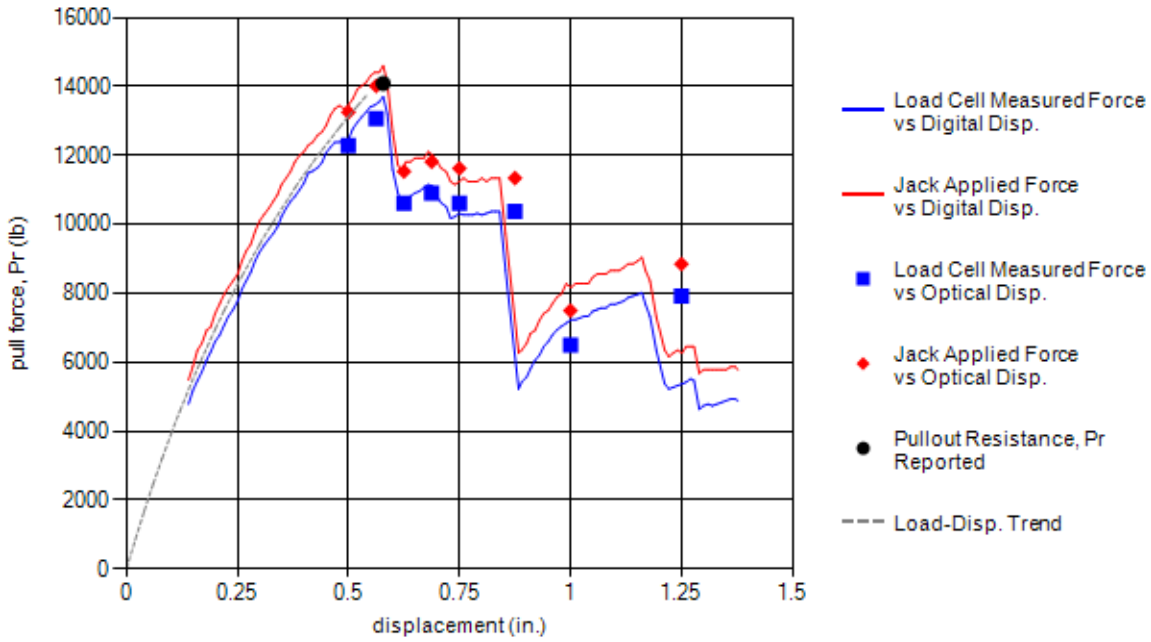
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.58	1470	14085	12.20	**1.60**

Load-Displacement Curve

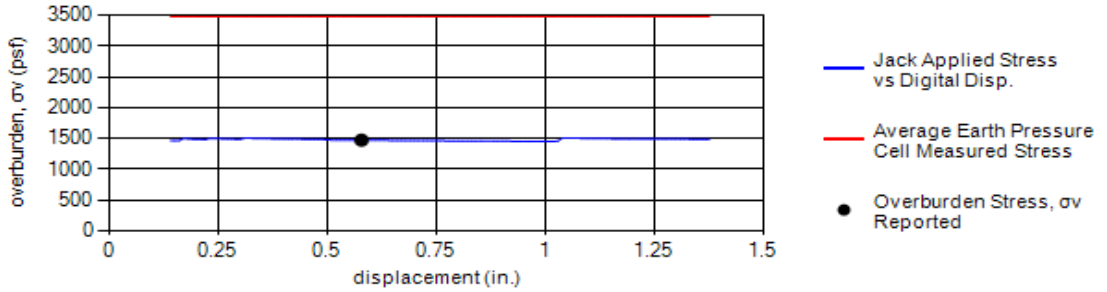


Comments

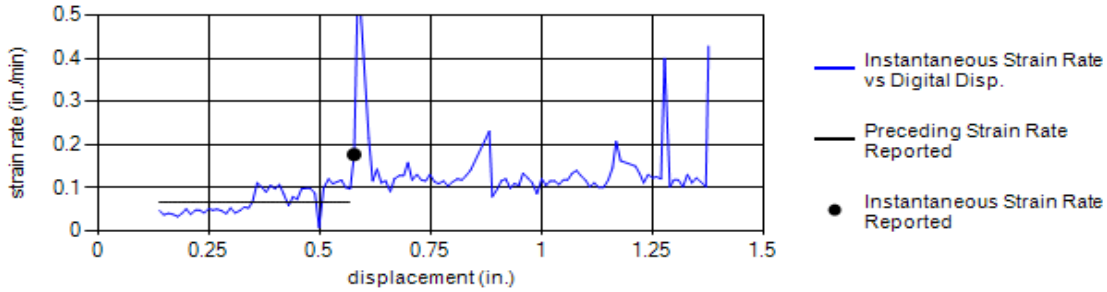
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

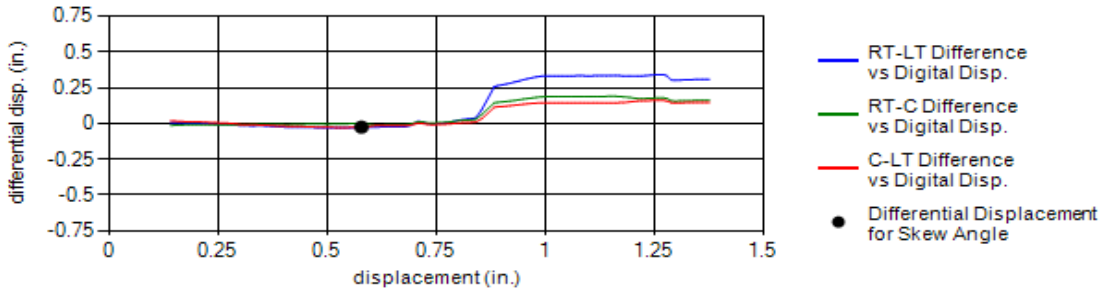
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3473	3956	3379	3122	3465	3479	1.95	1470



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.18	0.06	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.03	0.00	-0.03	No Data	-0.12	CW



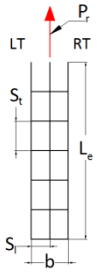
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 3:26:00 PM
Test Identification:	TS47.03-G-9x6-W20xW11-L3-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

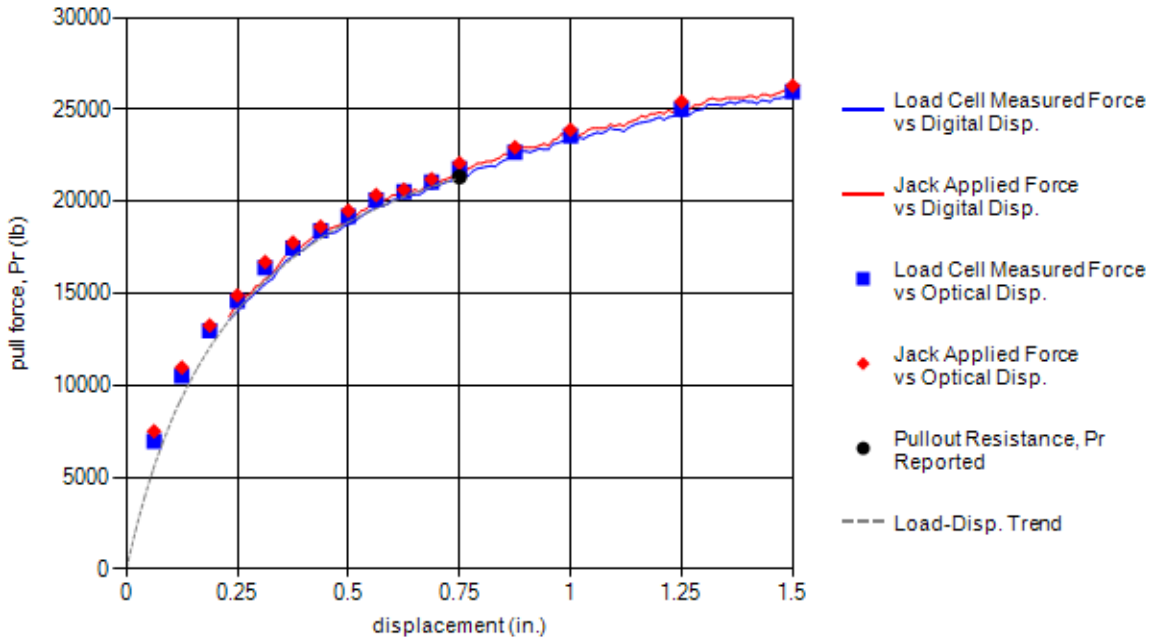
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	637	21328	5.30	**3.72**

Load-Displacement Curve



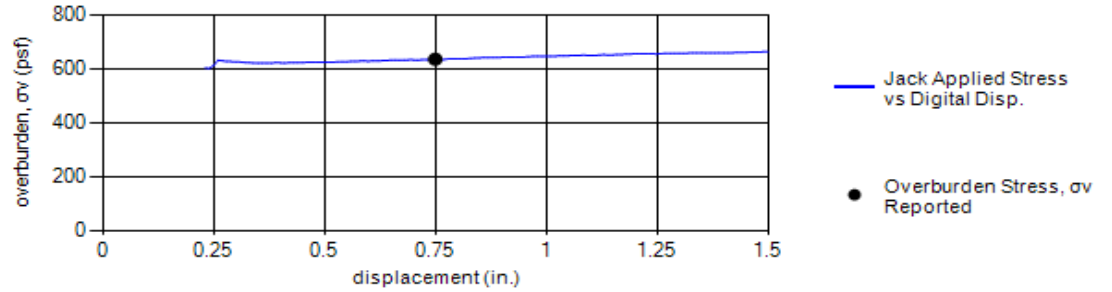
Comments

No earth pressure cell data.

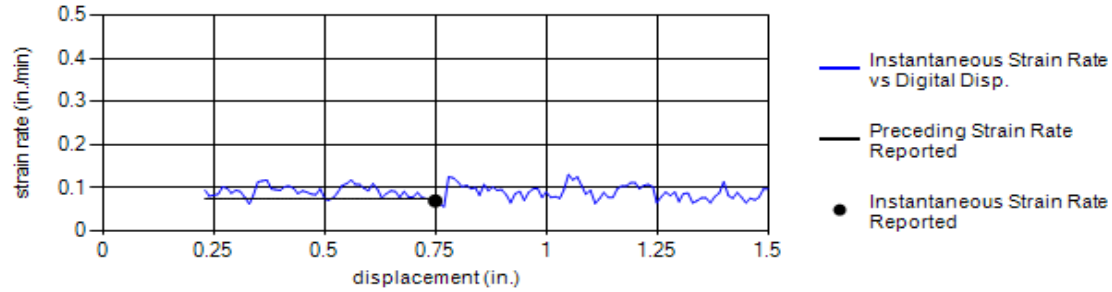
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

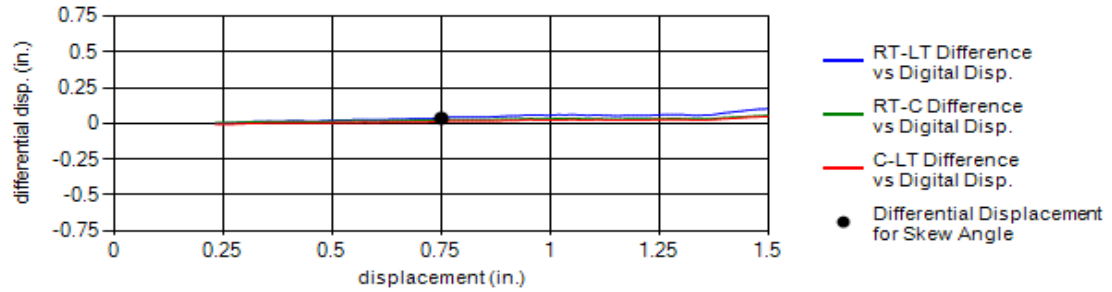
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	2.34	637



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.04	0.02	0.01	No Data	0.12	CCW



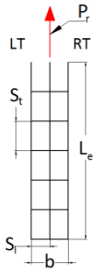
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 12:20:00 PM
Test Identification:	TS47.04-G-9x6-W20xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

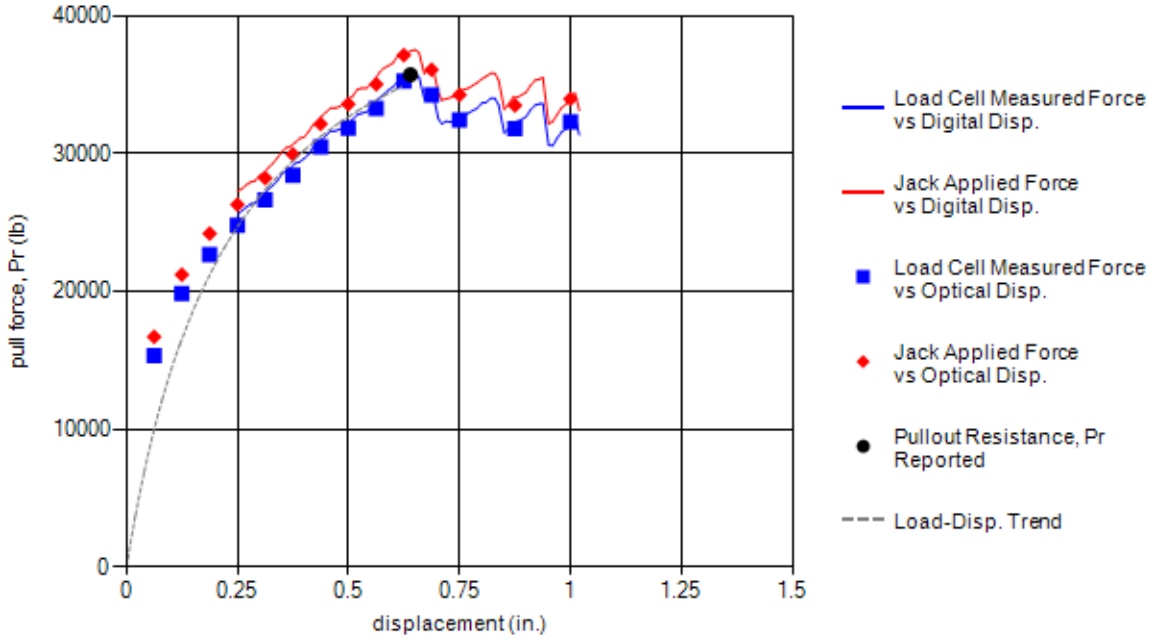
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.64	1487	35703	12.30	**2.67**

Load-Displacement Curve



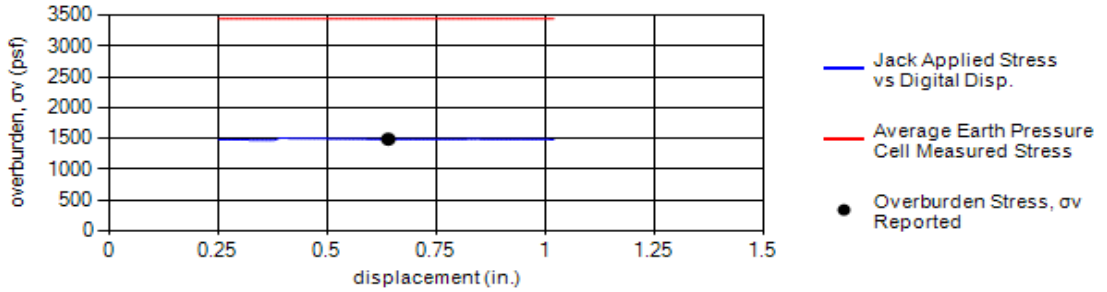
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. No incidental skew data.

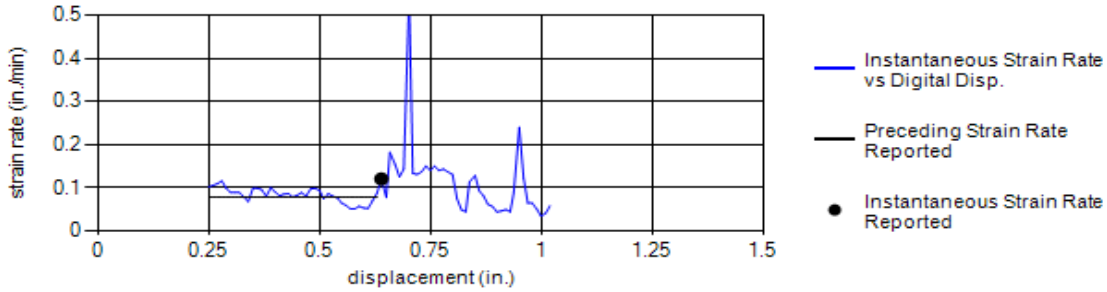
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3333	4211	3276	3021	3380	3444	1.94	1487



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

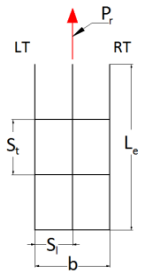
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/27/2012 4:03:00 PM
Test Identification:	TS47.05-G-9x12-W9.5xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

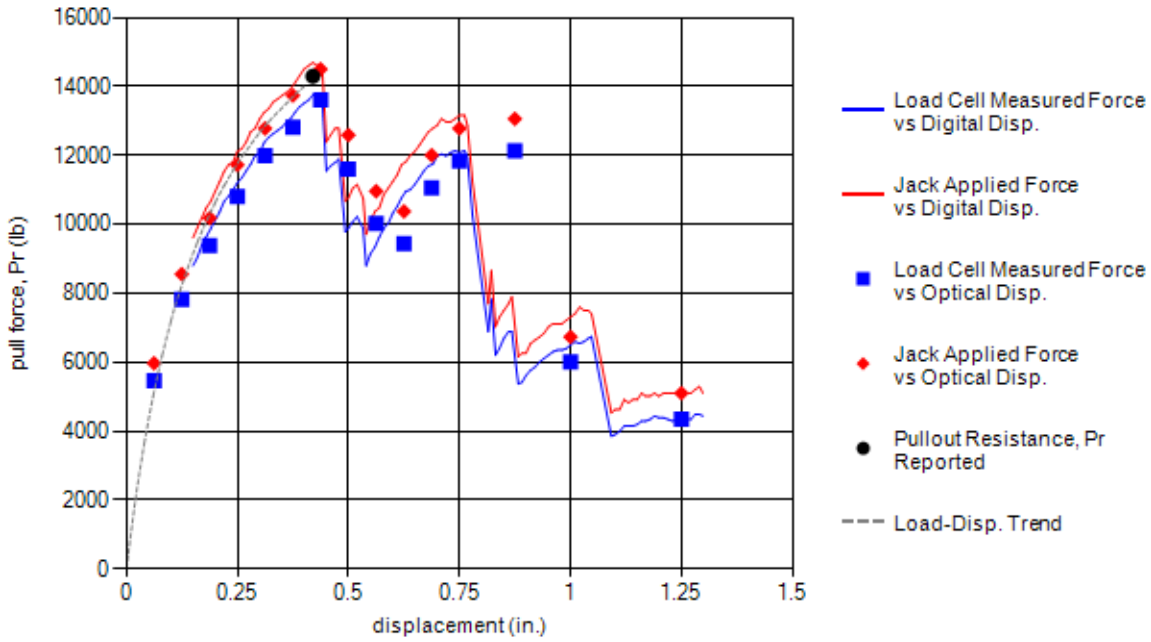
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.42	1494	14294	12.30	**1.06**

Load-Displacement Curve



Comments

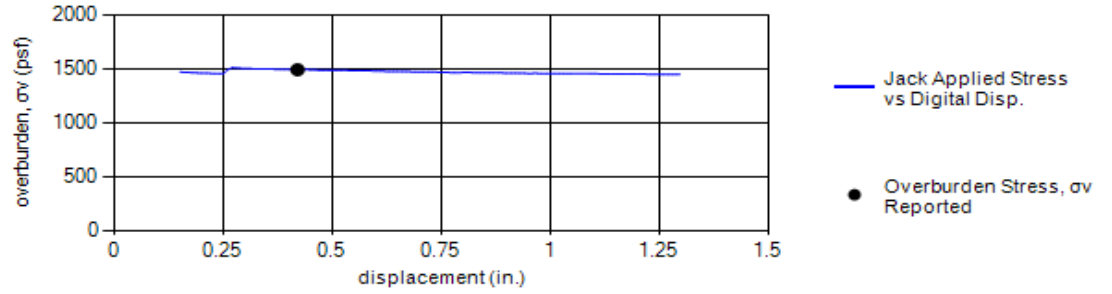
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

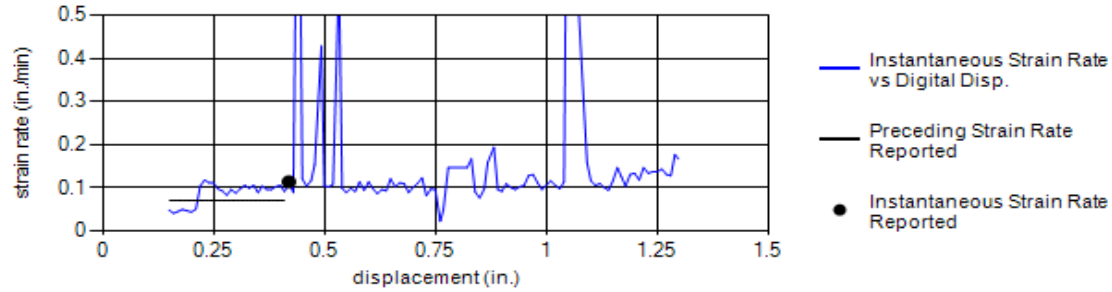
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1494



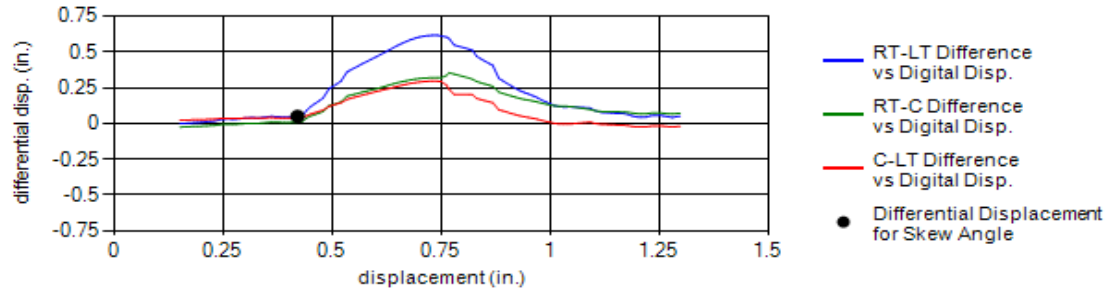
Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.08



Differential Displacement / Incidental Skew

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.01	0.04	No Data	0.16	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

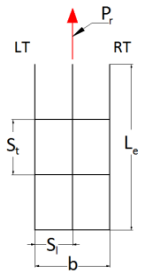
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		3	4
1/2in.	50-100	49	49
3/8in.		58	57
#4		71	70
#10		82	80
#40	85-100	91	89
#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/30/2012 10:08:00 AM
Test Identification:	TS47.06-G-6x12-W9.5xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

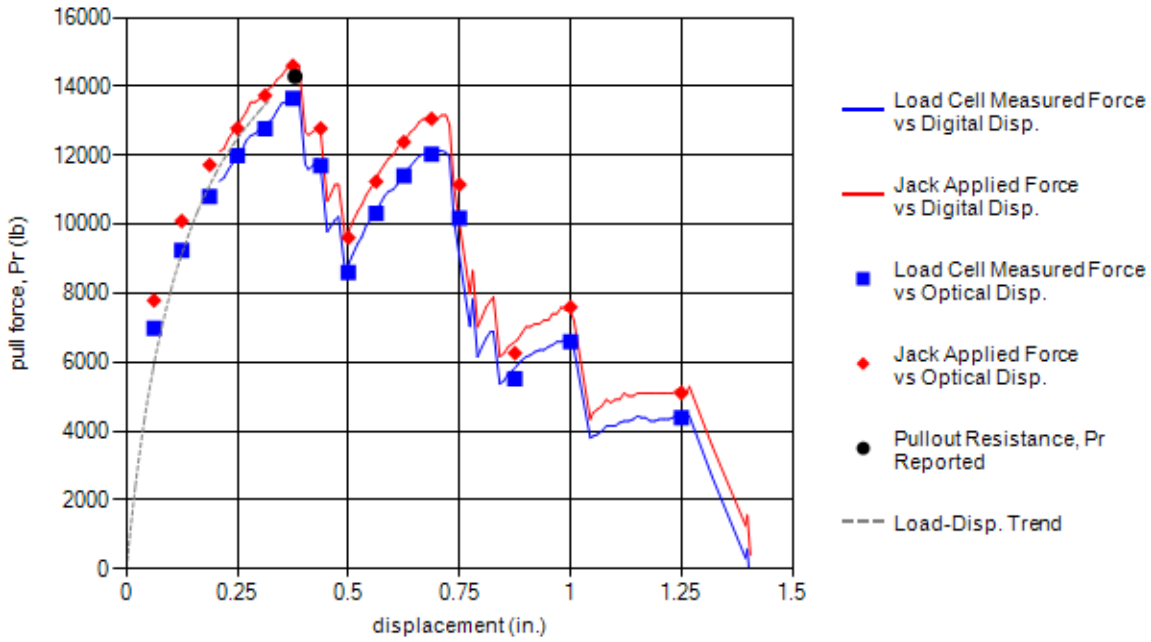
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.38	1494	14286	12.30	**1.59**

Load-Displacement Curve

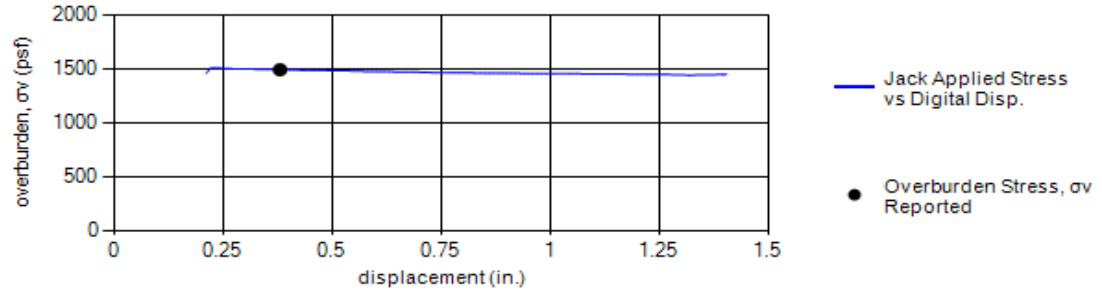


Comments

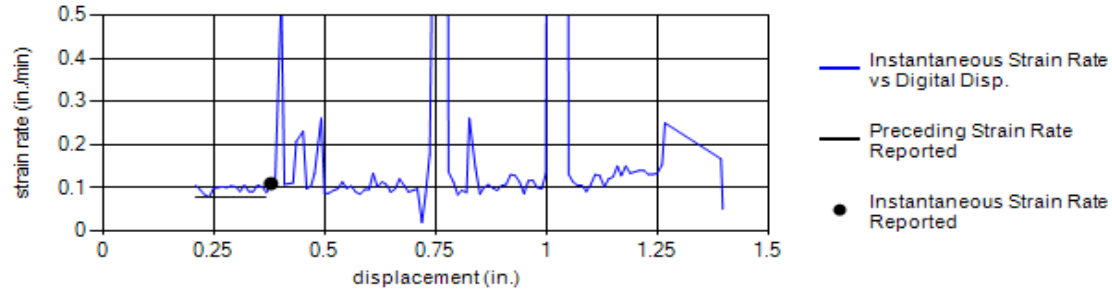
Personnel

Tested:	AJ AJ MN
Prepared:	SB TW
Checked:	WL PJ

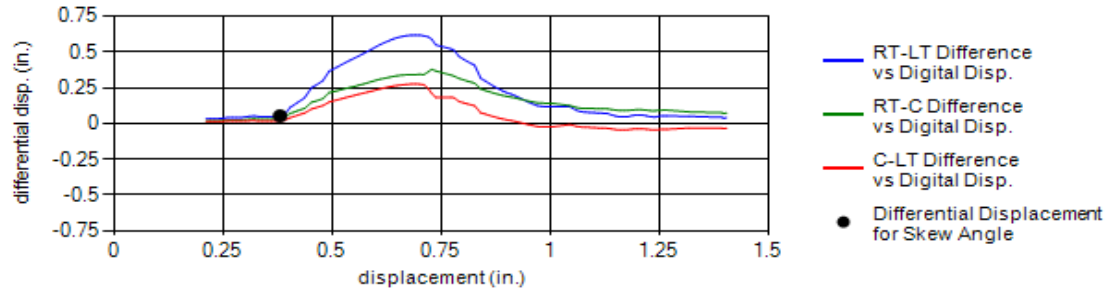
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3257	3744	3206	2954	3287	3290	1.01	1494



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.08	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.03	0.02	No Data	0.26	CCW



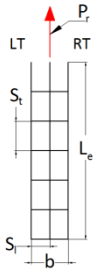
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/18/2012 3:00:00 PM
Test Identification:	TS47.07-G-9x6-W20xW11-L3-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

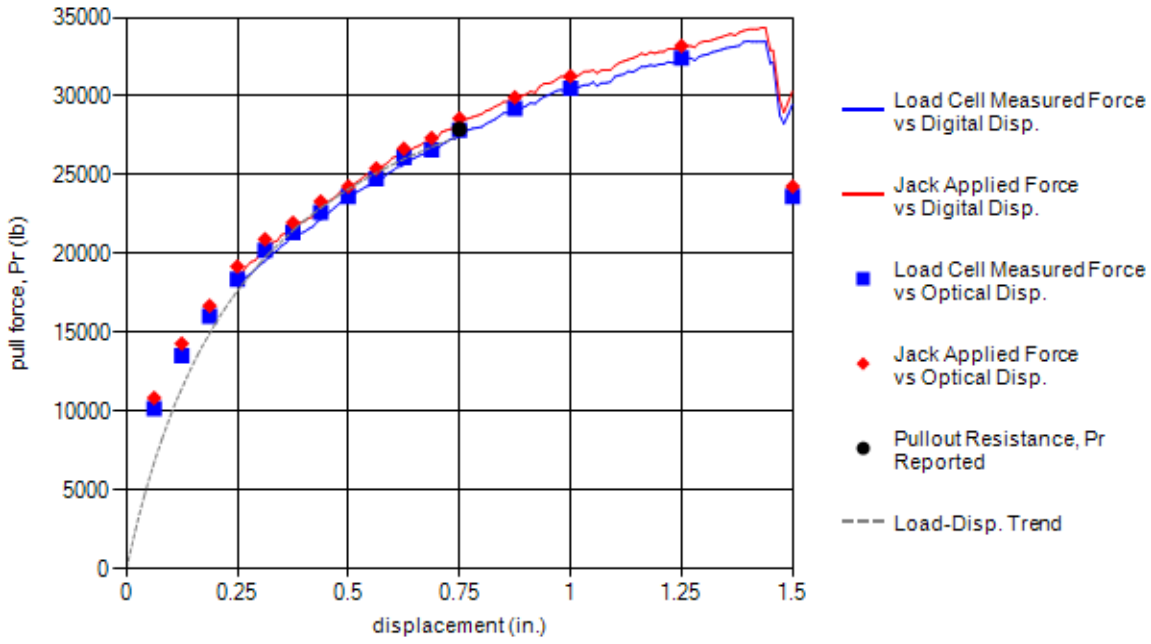
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	625	27914	5.10	**4.96**

Load-Displacement Curve

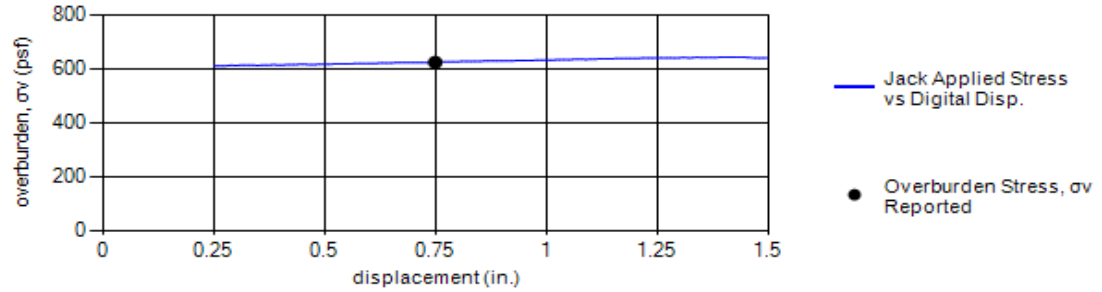


Comments

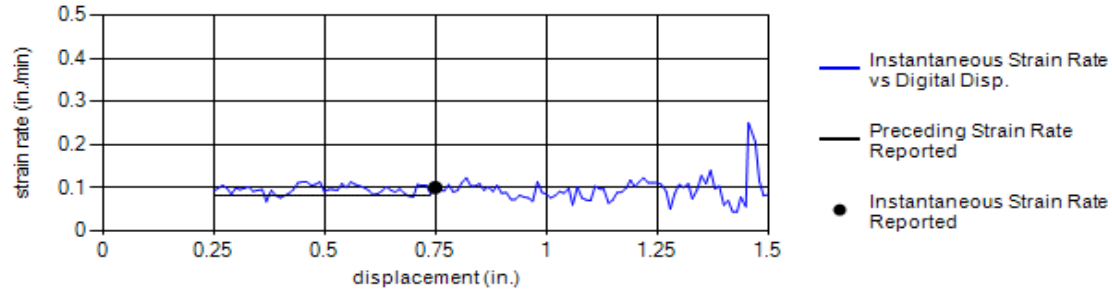
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

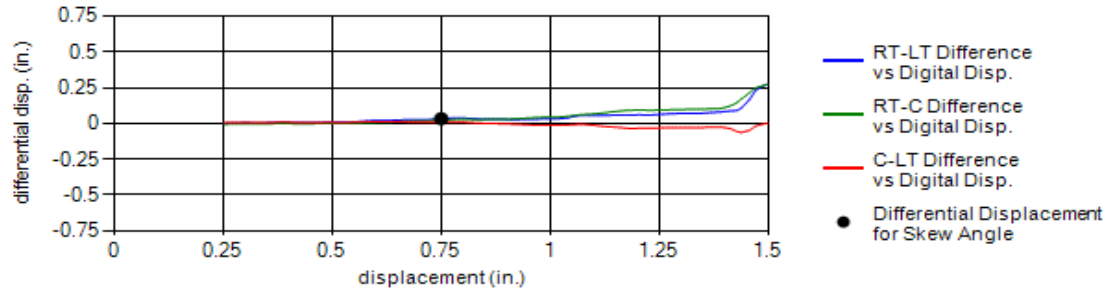
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
2756	2929	2407	2350	2540	2596	1.04	625



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	0.02	0.01	No Data	0.11	CCW



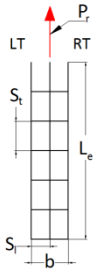
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/20/2012 3:32:00 PM
Test Identification:	TS47.08-G-9x6-W20xW11-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

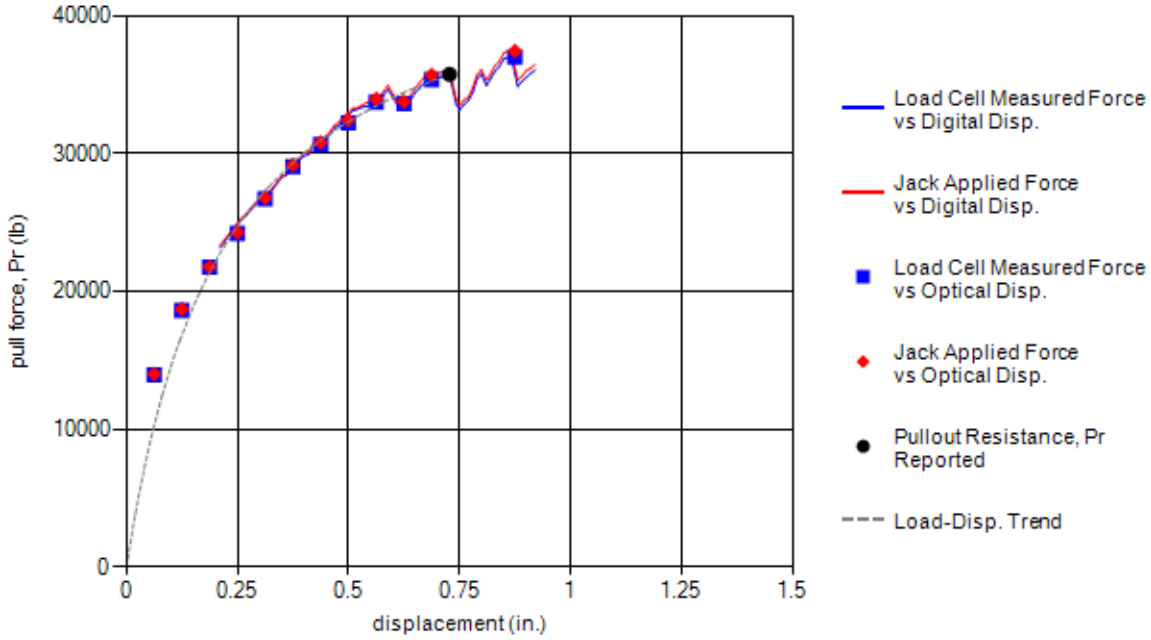
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.73	1460	35726	12.00	**2.72**

Load-Displacement Curve



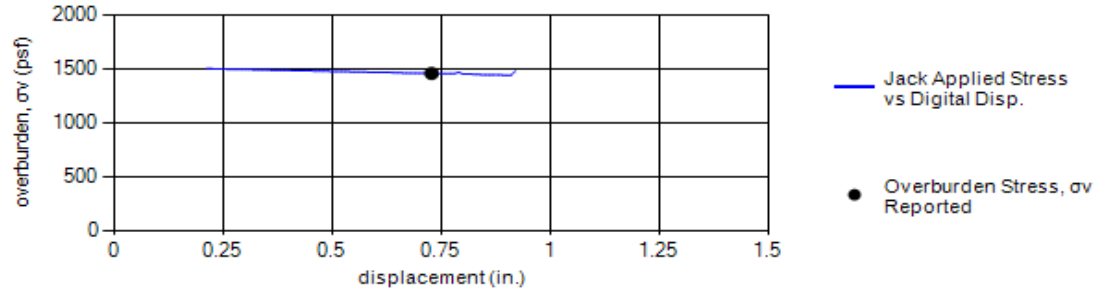
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data.

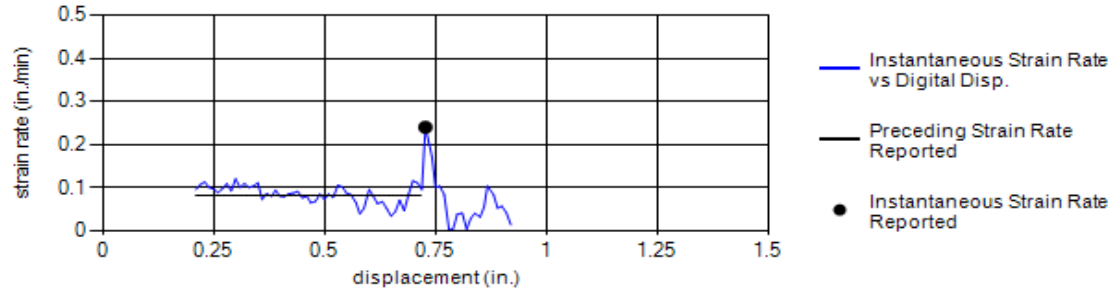
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

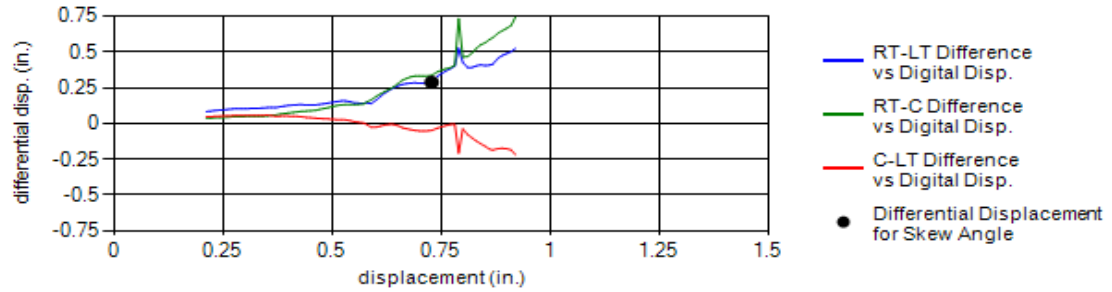
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1460



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.24	0.08	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.29	0.34	-0.05	No Data	0.92	CCW



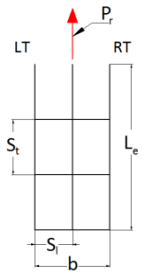
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/20/2012 2:13:00 PM
Test Identification:	TS47.09-G-9x12-W9.5xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

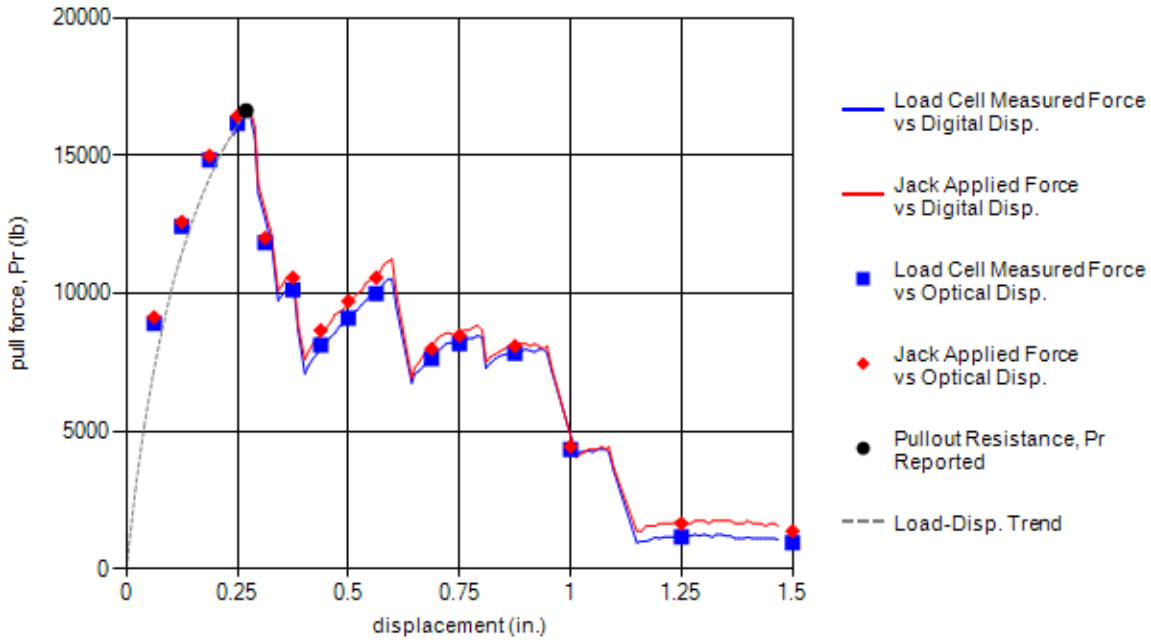
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.27	1475	16621	12.00	**1.25**

Load-Displacement Curve



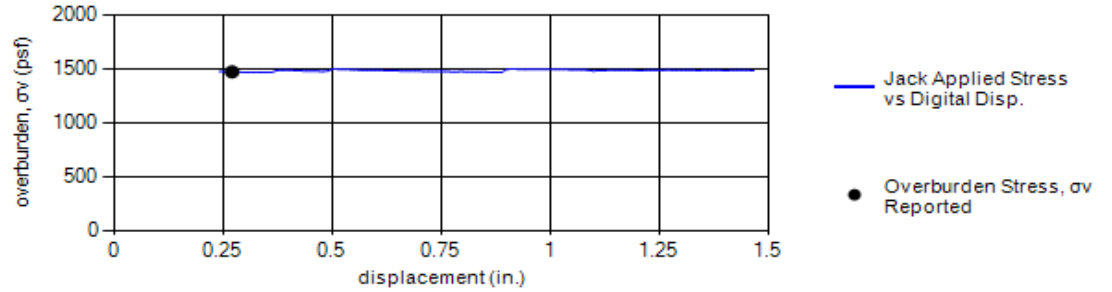
Comments

No earth pressure cell data.

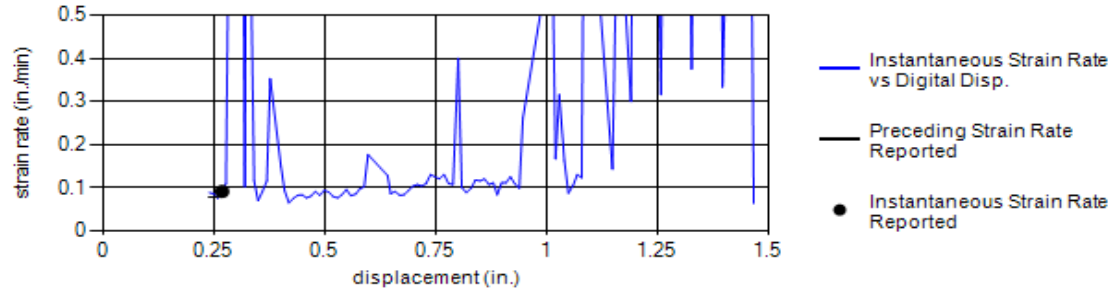
Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

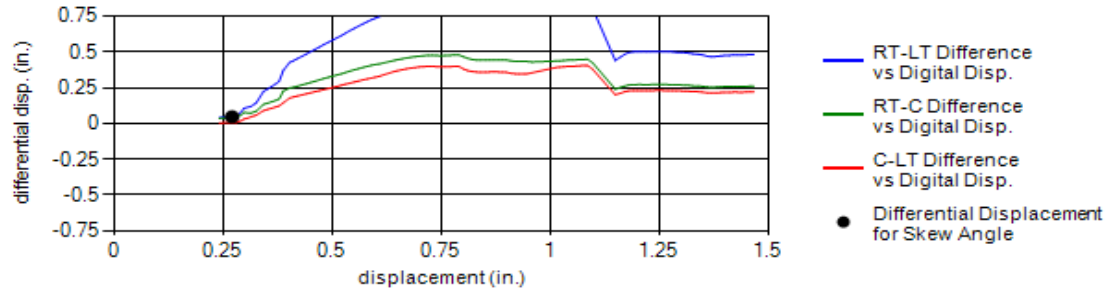
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1475



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.08	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.05	0.04	0.01	No Data	0.15	CCW



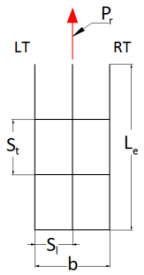
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		3	4
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	49
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		58	57
Liquid Limit, LL (%):	23	#4		71	70
Plastic Limit, PL (%):	20	#10		82	80
Plasticity Index, PI (%):	3	#40	85-100	91	89
Bar Linear Shrinkage, LS (%):	3	#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/20/2012 1:28:00 PM
Test Identification:	TS47.10-G-6x12-W9.5xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

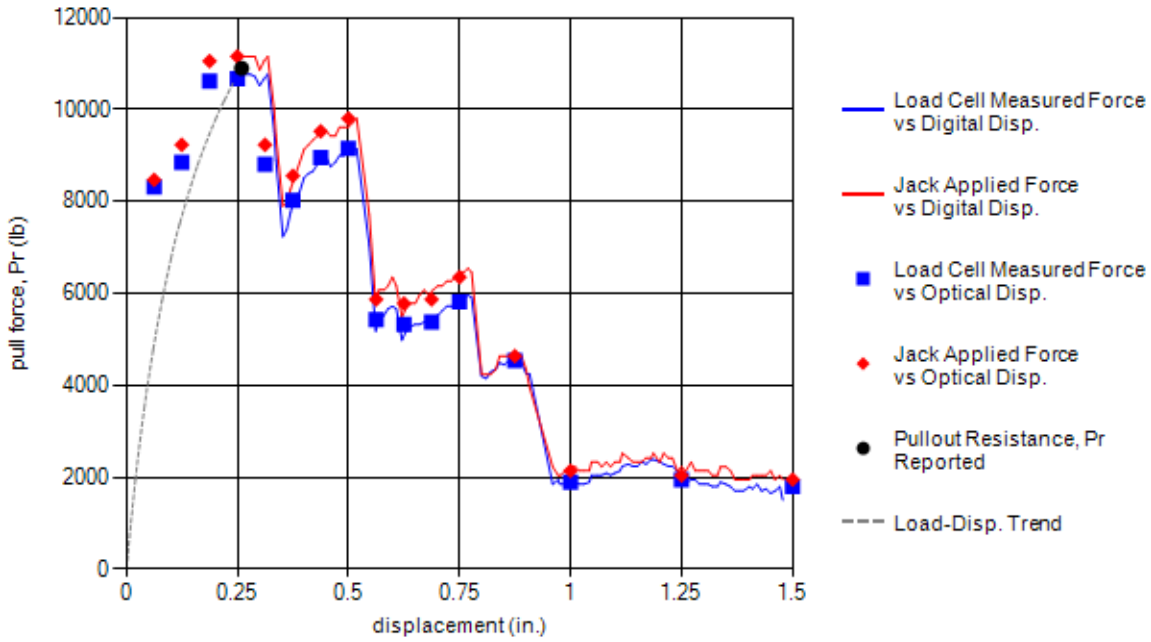
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.26	1468	10892	12.00	**1.24**

Load-Displacement Curve



Comments

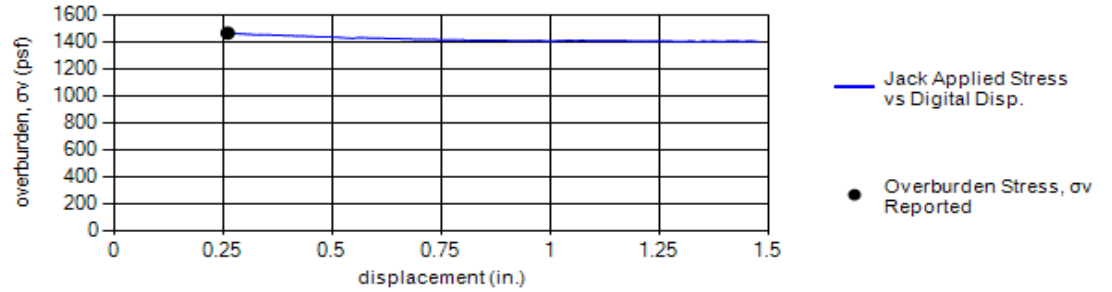
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

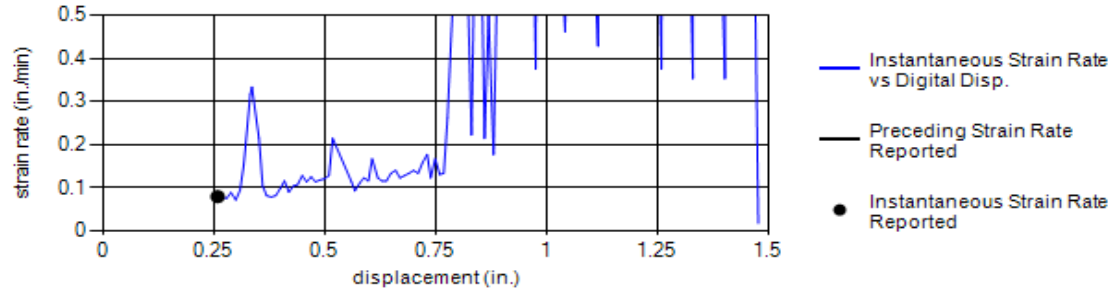
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1468



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.08	0.14

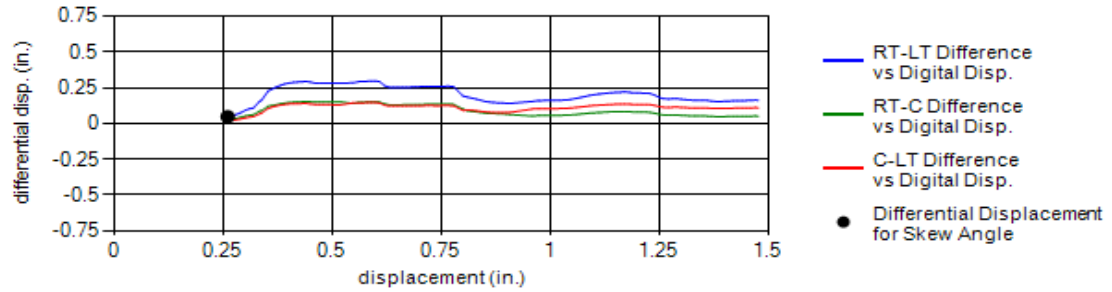


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.05	0.03	0.02	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.23	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

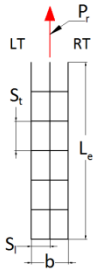
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		3	4
1/2in.	50-100	49	49
3/8in.		58	57
#4		71	70
#10		82	80
#40	85-100	91	89
#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/11/2012 3:07:00 PM
Test Identification:	TS47.11-G-9x6-W20xW11-L3-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

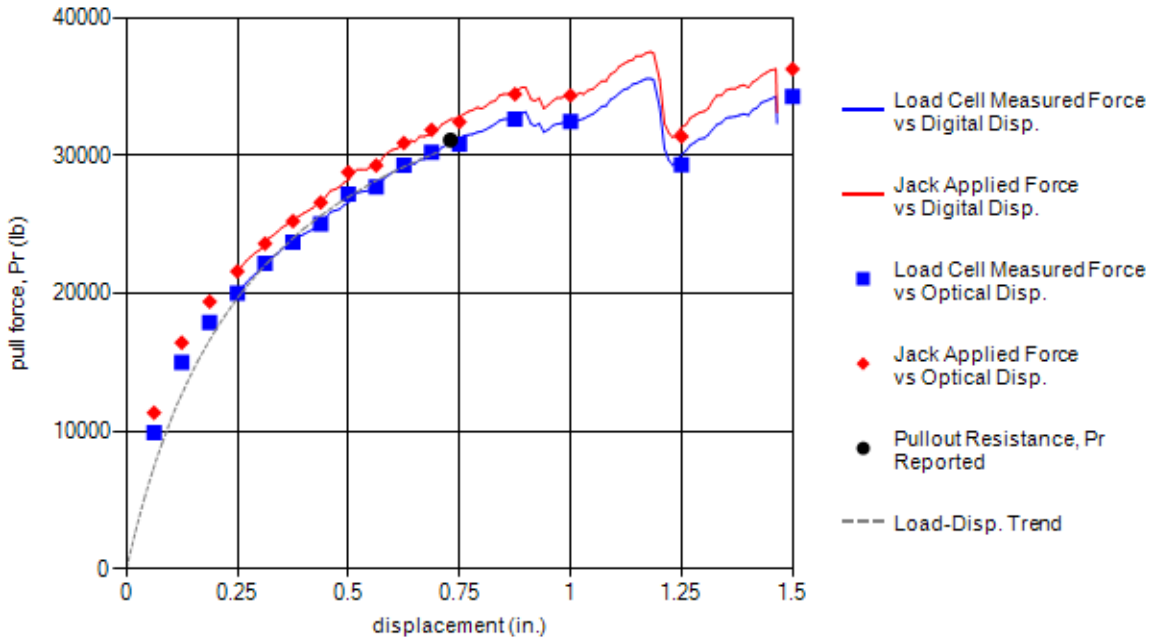
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	625	31106	5.10	**5.53**

Load-Displacement Curve



Comments

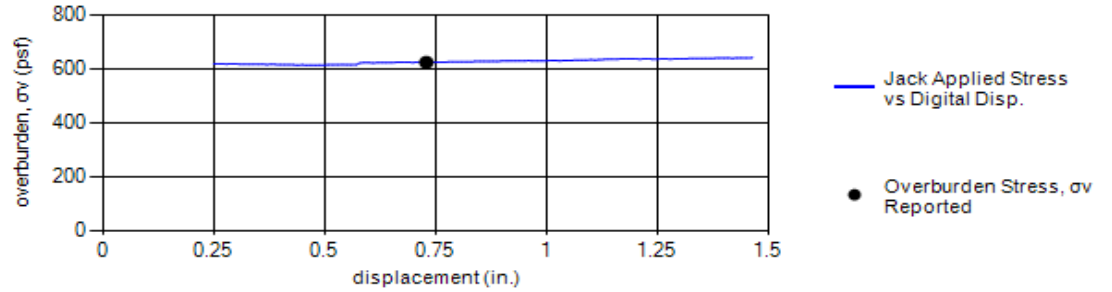
No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

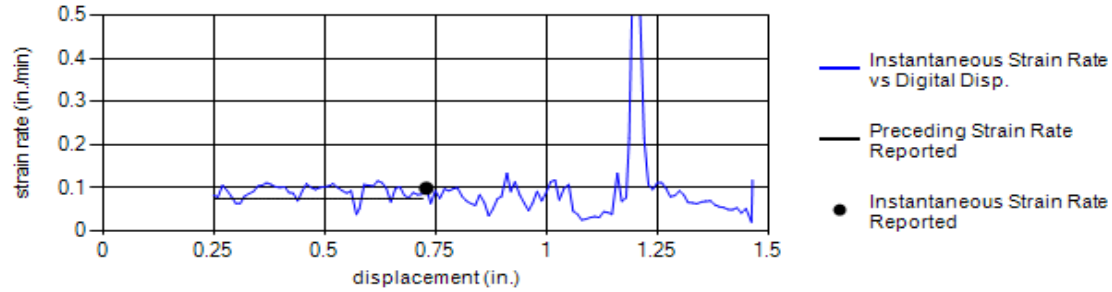
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	No Data	625



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.07	0.07

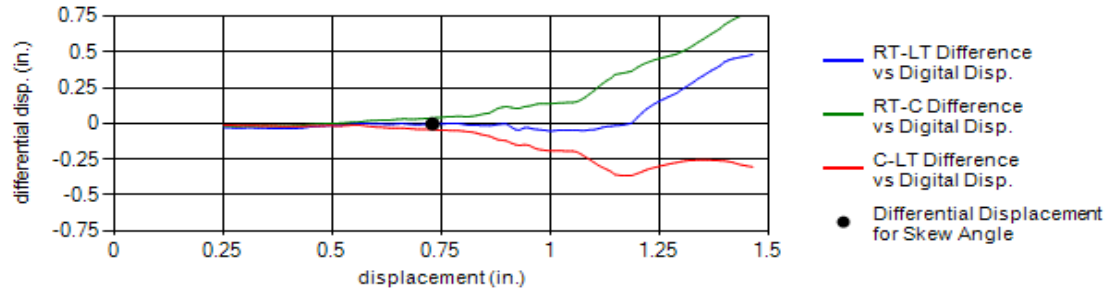


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.00	0.04	-0.04	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
-0.01	CW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

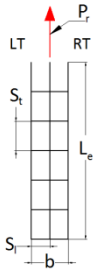
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		3	4
1/2in.	50-100	49	49
3/8in.		58	57
#4		71	70
#10		82	80
#40	85-100	91	89
#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	4/20/2012 2:52:00 PM
Test Identification:	TS47.12-G-9x6-W20xW11-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

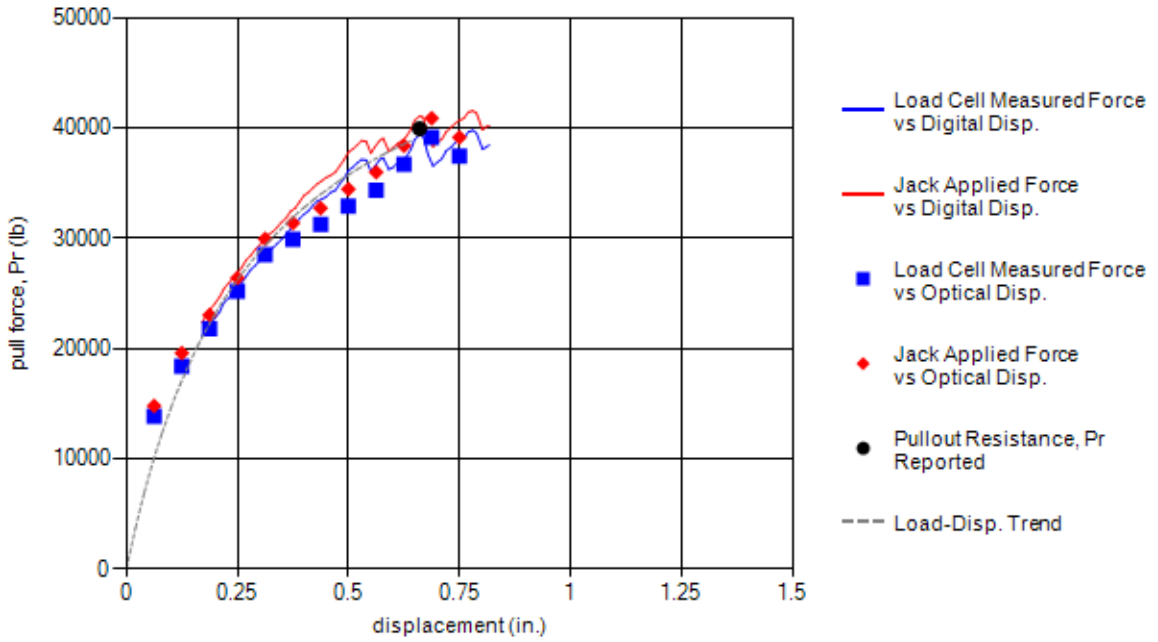
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.66	1484	39921	12.10	**2.99**

Load-Displacement Curve



Comments

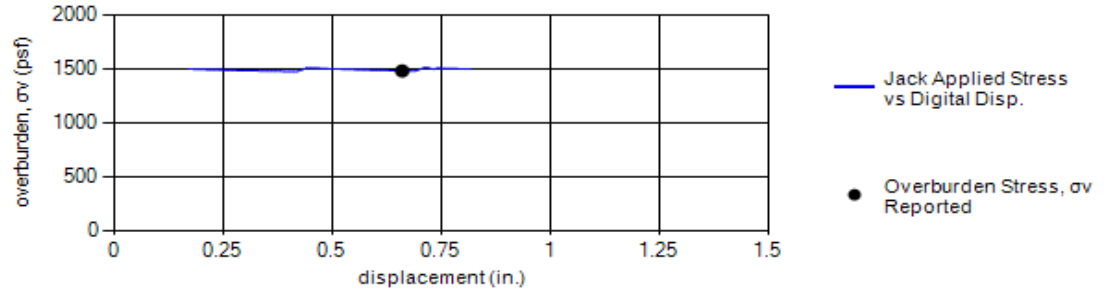
Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	SB TW
Checked:	WL PJ

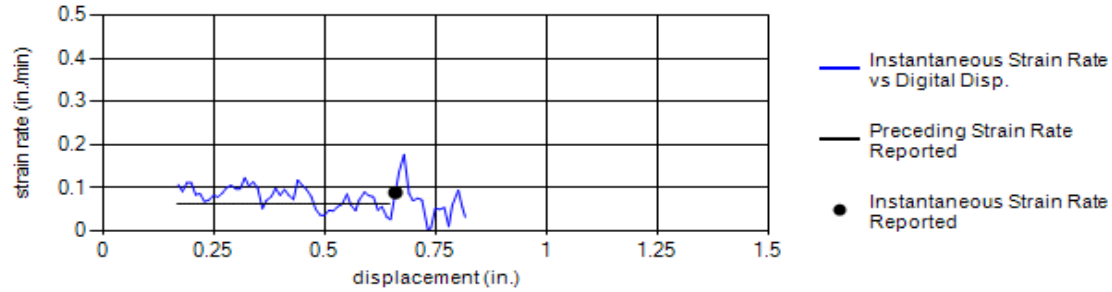
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1484



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.06	0.07

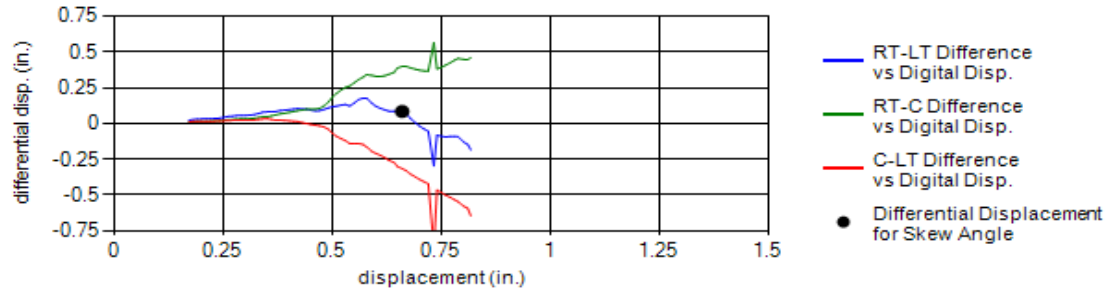


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.08	0.40	-0.32	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.27	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP/GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

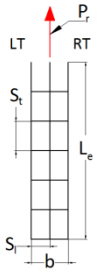
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		3	4
1/2in.	50-100	49	49
3/8in.		58	57
#4		71	70
#10		82	80
#40	85-100	91	89
#200		96	95

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 10:57:00 AM
Test Identification:	TS48.01-G-9x6-W20xW15-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

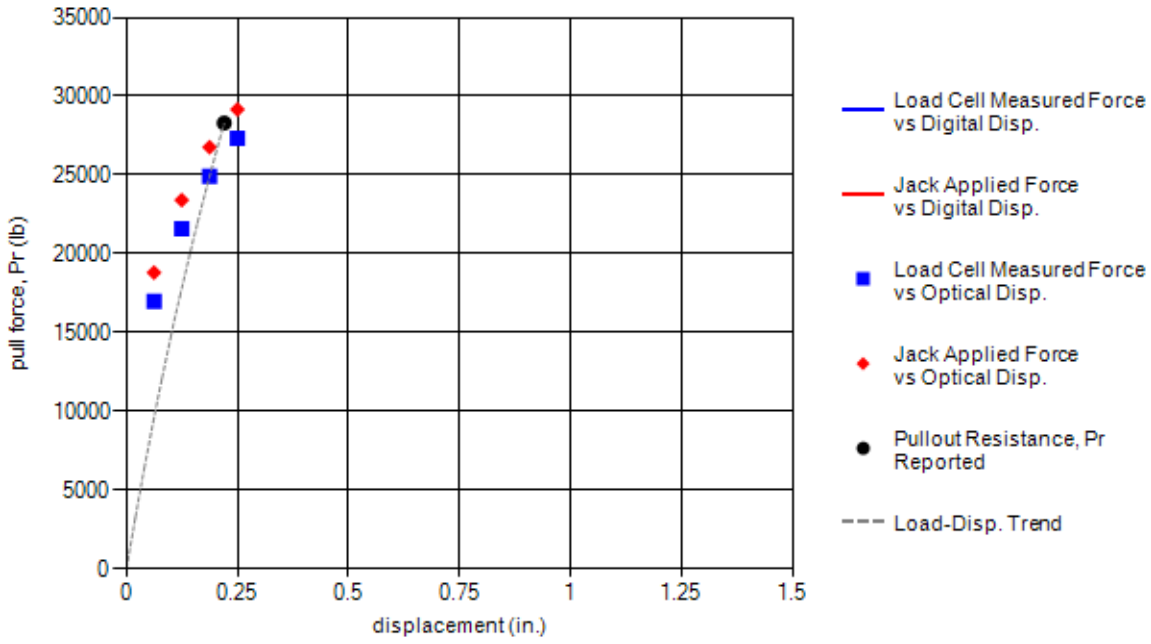
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Rupture	0.22	1474	28298	11.80	**2.13**

Load-Displacement Curve



Comments

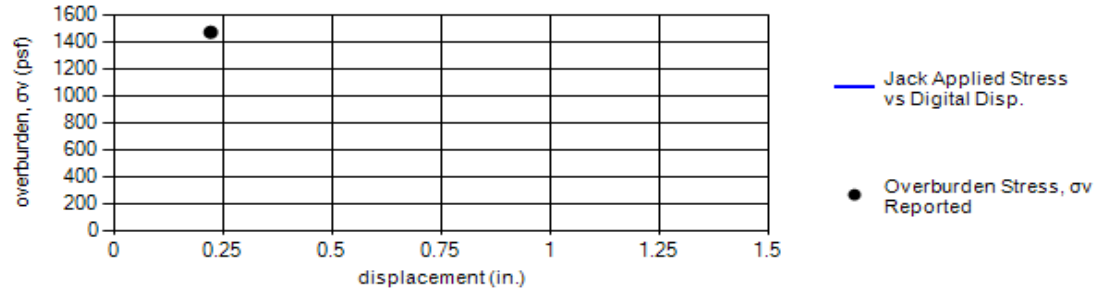
Single bar rupture at 0.22in. No earth pressure cell data.

Personnel

Tested:	AJ AJ ET
Prepared:	TW TW
Checked:	WL PJ

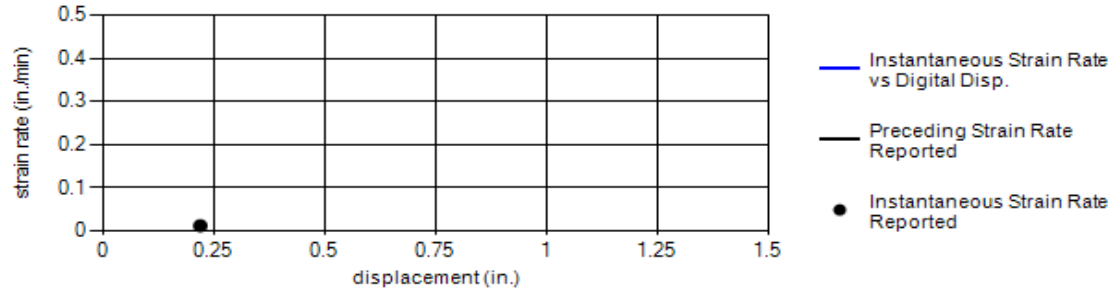
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1474



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.01	0.23	0.07

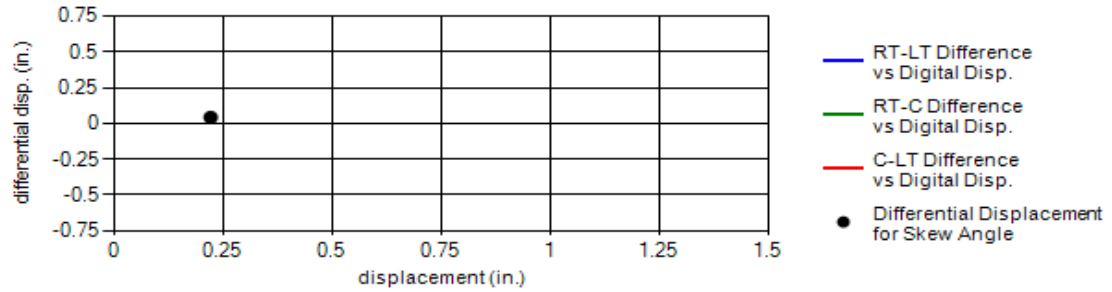


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.04	0.08	-0.03	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.14	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

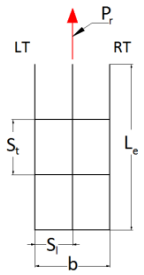
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	1
1/2in.	50-100	49	43
3/8in.		57	52
#4		70	65
#10		80	74
#40	85-100	89	83
#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 11:37:00 AM
Test Identification:	TS48.02-G-9x12-W20xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

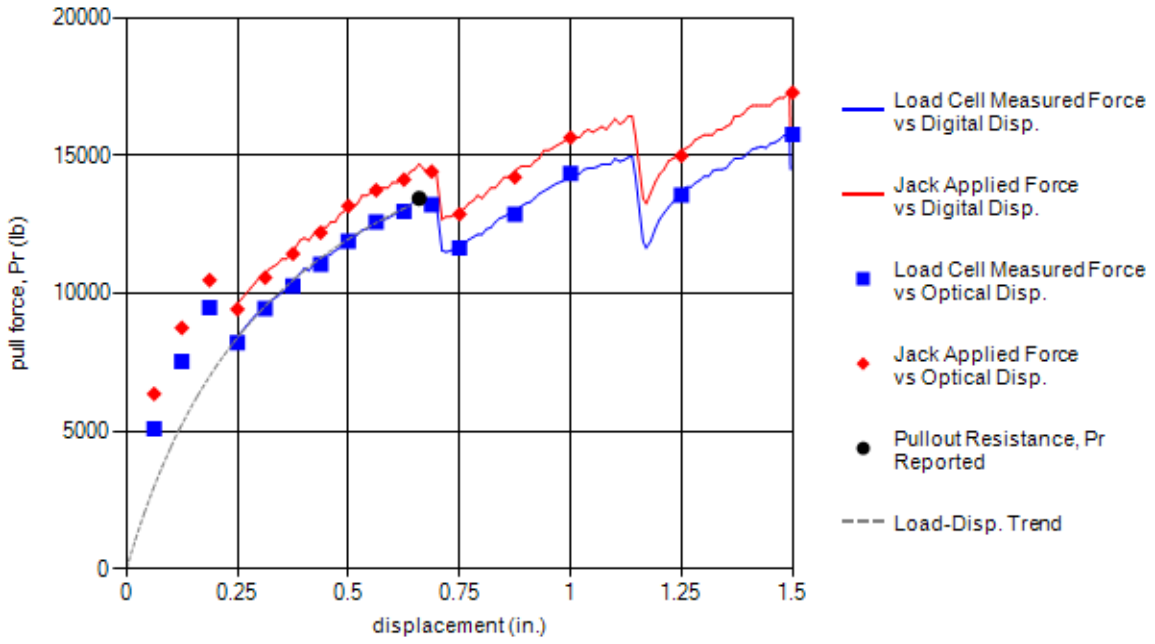
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.66	1501	13439	12.00	**0.99**

Load-Displacement Curve



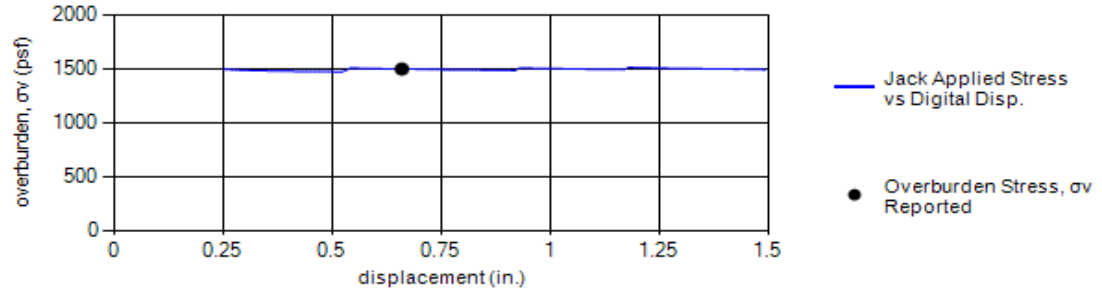
Comments

No earth pressure cell data.

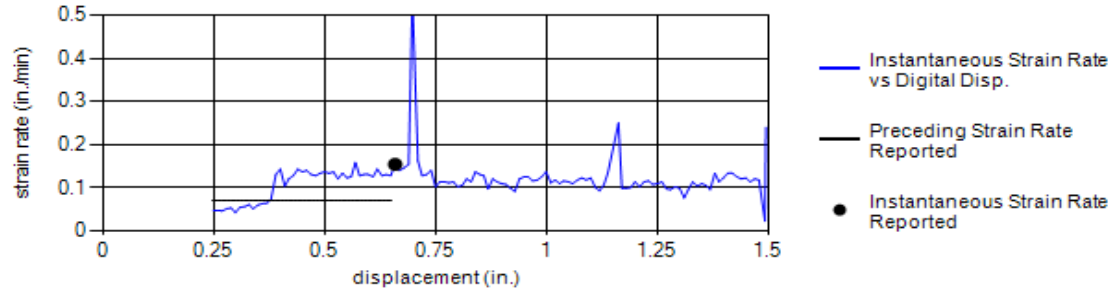
Personnel

Tested:	AJ AJ ET
Prepared:	TW TW
Checked:	WL PJ

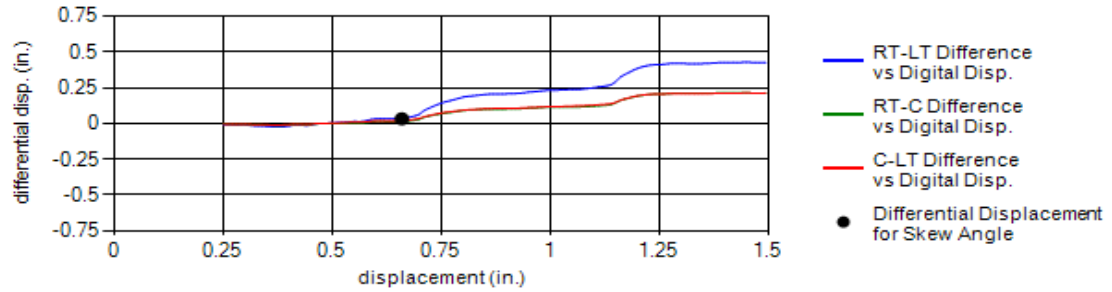
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1501



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.15	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.03	0.01	0.02	No Data	0.11	CCW



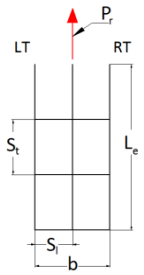
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 2:35:00 PM
Test Identification:	TS48.03-G-6x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

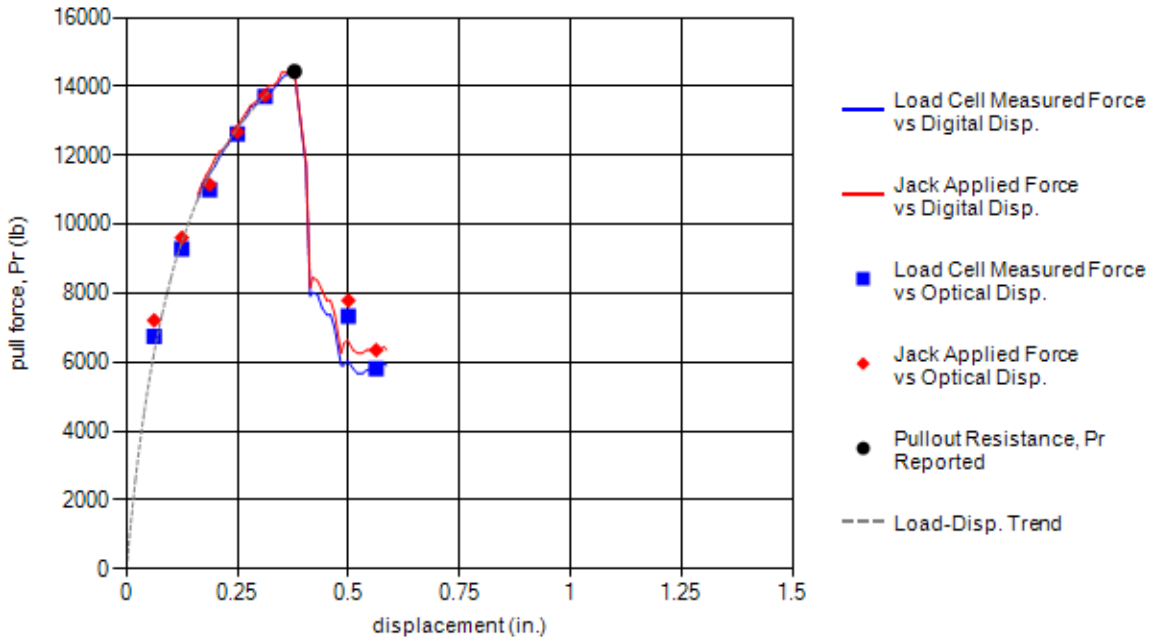
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.38	1467	14434	11.70	**1.64**

Load-Displacement Curve



Comments

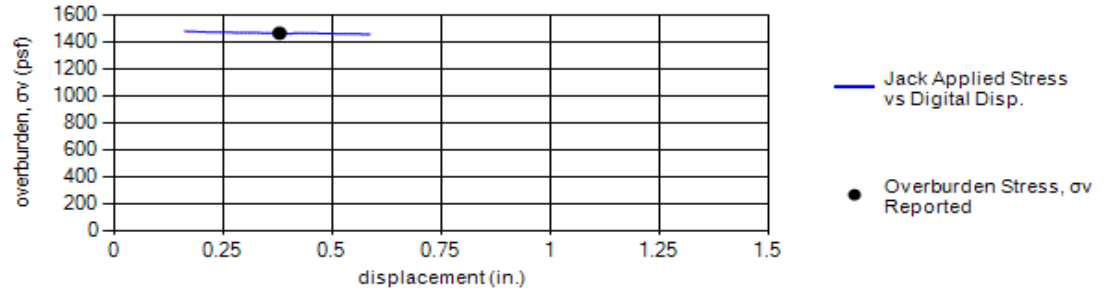
No earth pressure cell data.

Personnel

Tested:	AJ AJ DH
Prepared:	TW TW
Checked:	WL PJ

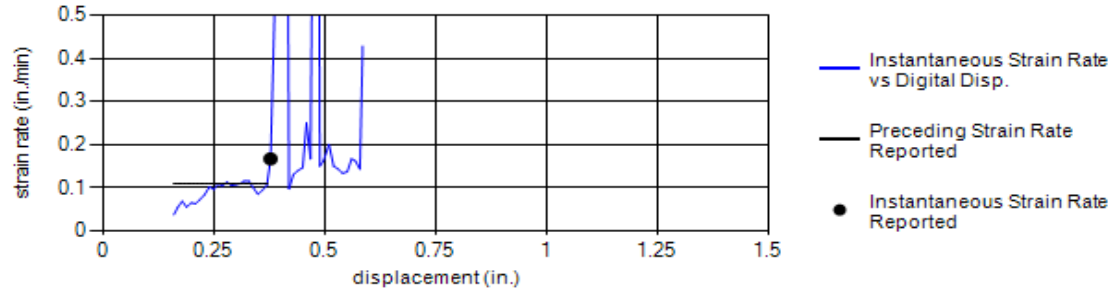
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.03	1467



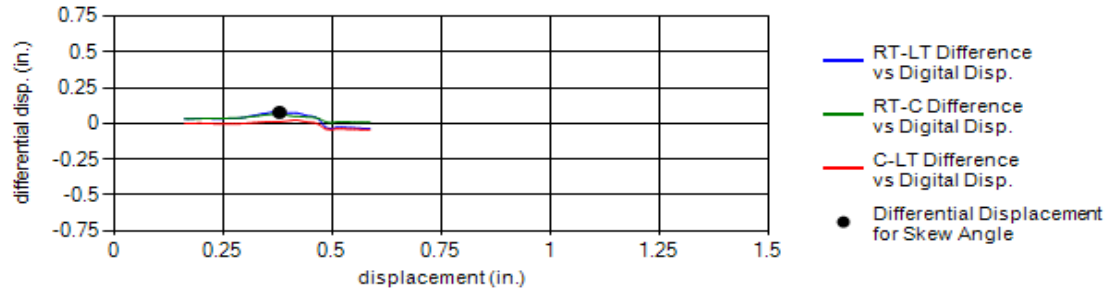
Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.17	0.11	0.08



Differential Displacement / Incidental Skew

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.08	0.07	0.01	No Data	0.37	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

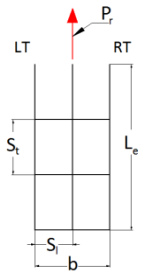
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	1
1/2in.	50-100	49	43
3/8in.		57	52
#4		70	65
#10		80	74
#40	85-100	89	83
#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 1:57:00 PM
Test Identification:	TS48.04-G-9x12-W9.5xW11-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

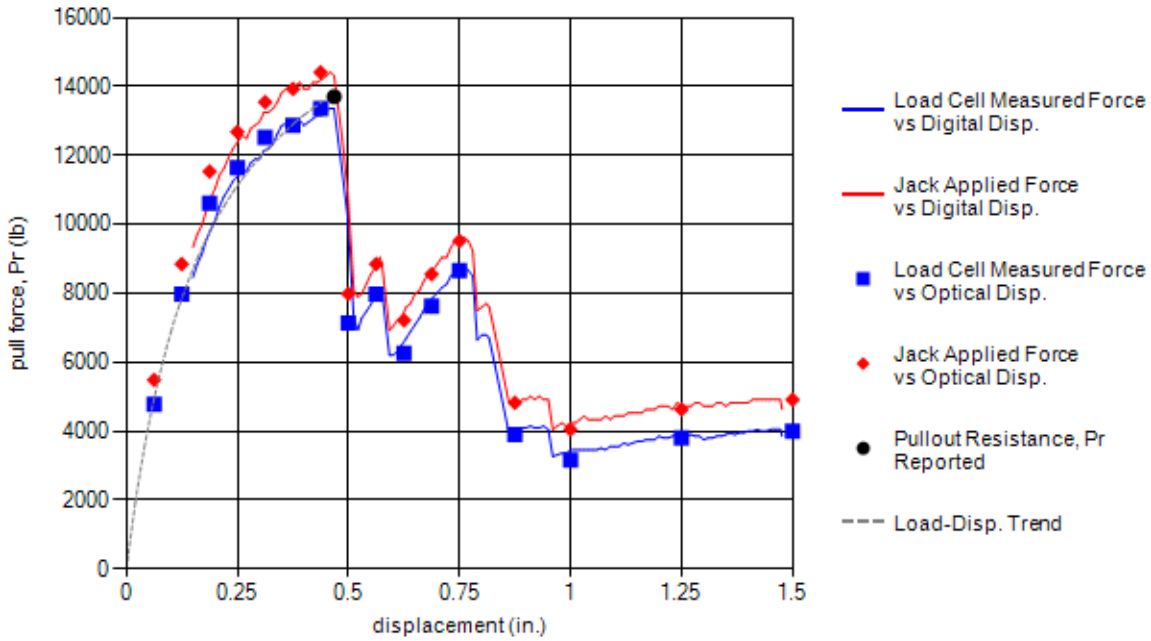
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.47	1506	13703	12.00	**1.01**

Load-Displacement Curve



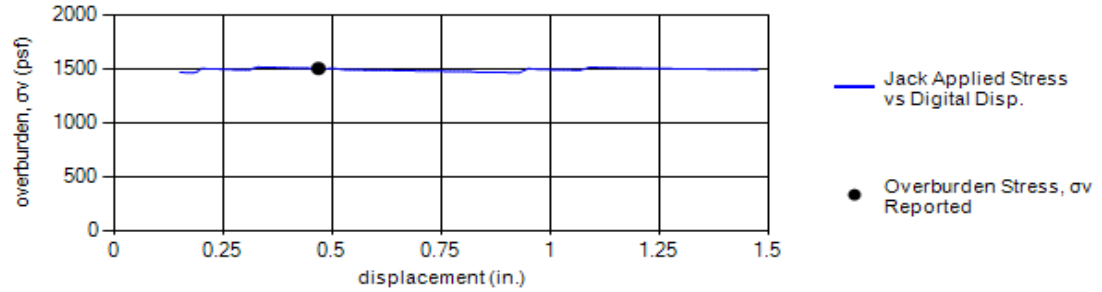
Comments

No earth pressure cell data. No incidental skew data.

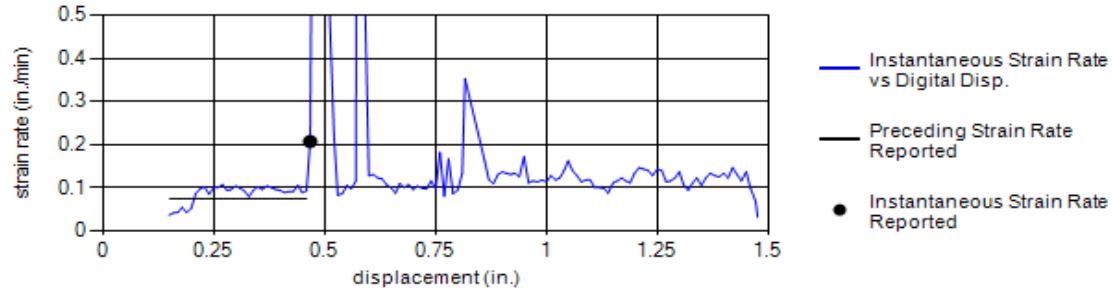
Personnel

Tested:	AJ AJ DH
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1506



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.21	0.07	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

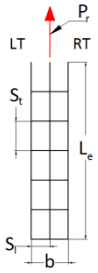
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/10/2012 11:15:00 AM
Test Identification:	TS48.05-G-9x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

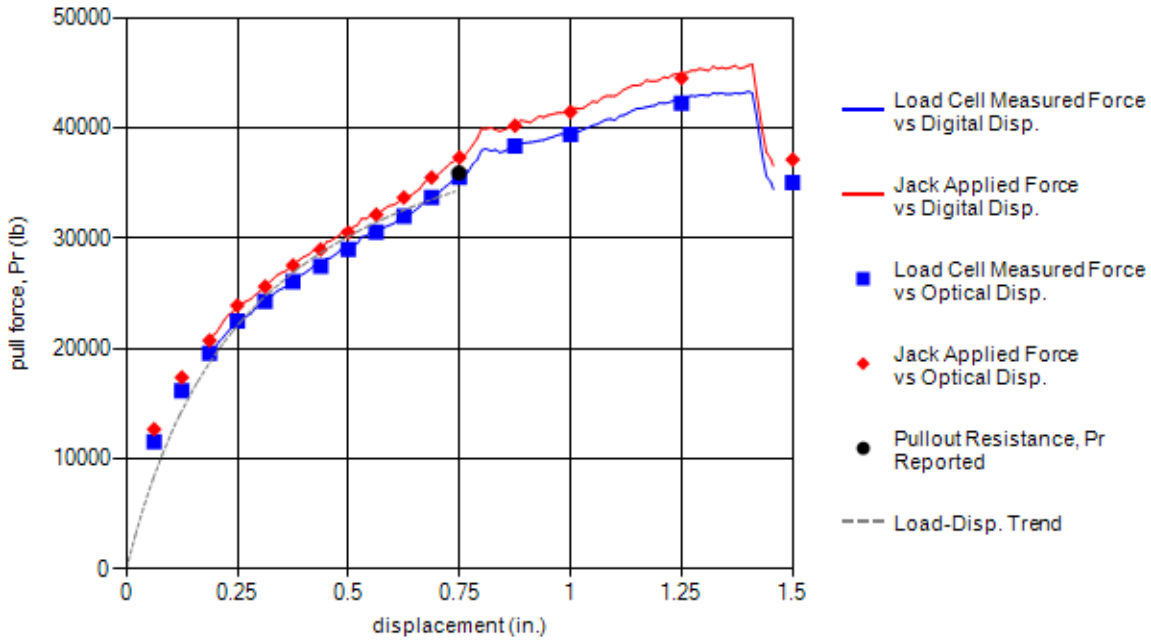
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	652	35903	5.30	**3.06**

Load-Displacement Curve



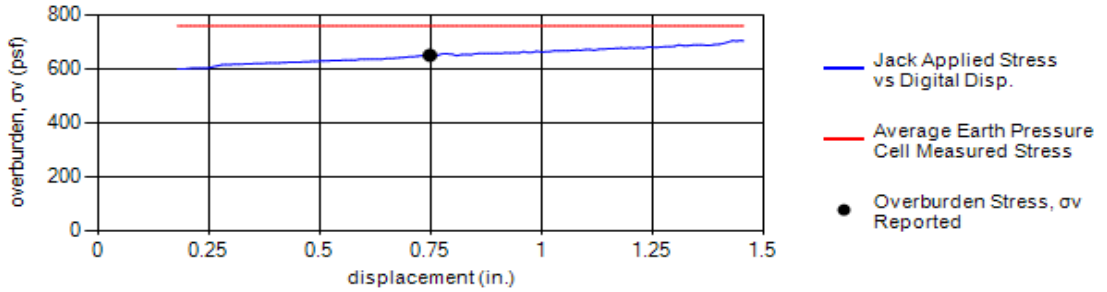
Comments

No incidental skew data.

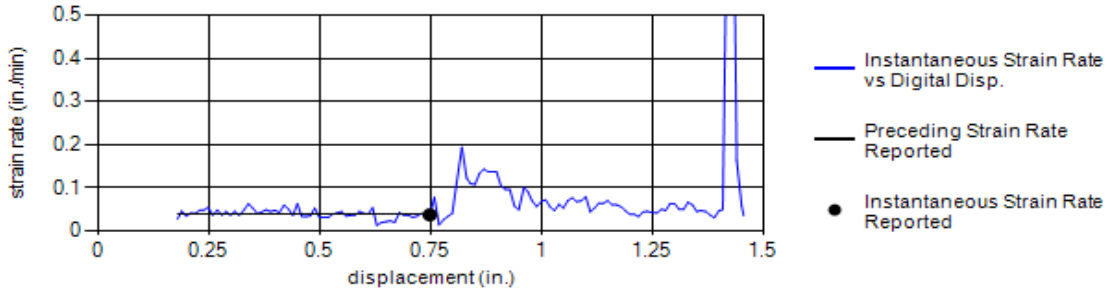
Personnel

Tested:	TW TW AJ
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1024	554	602	768	858	761	1.23	651



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.04	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

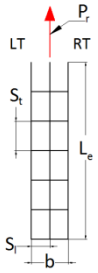
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/15/2012 11:28:00 AM
Test Identification:	TS48.06-G-9x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

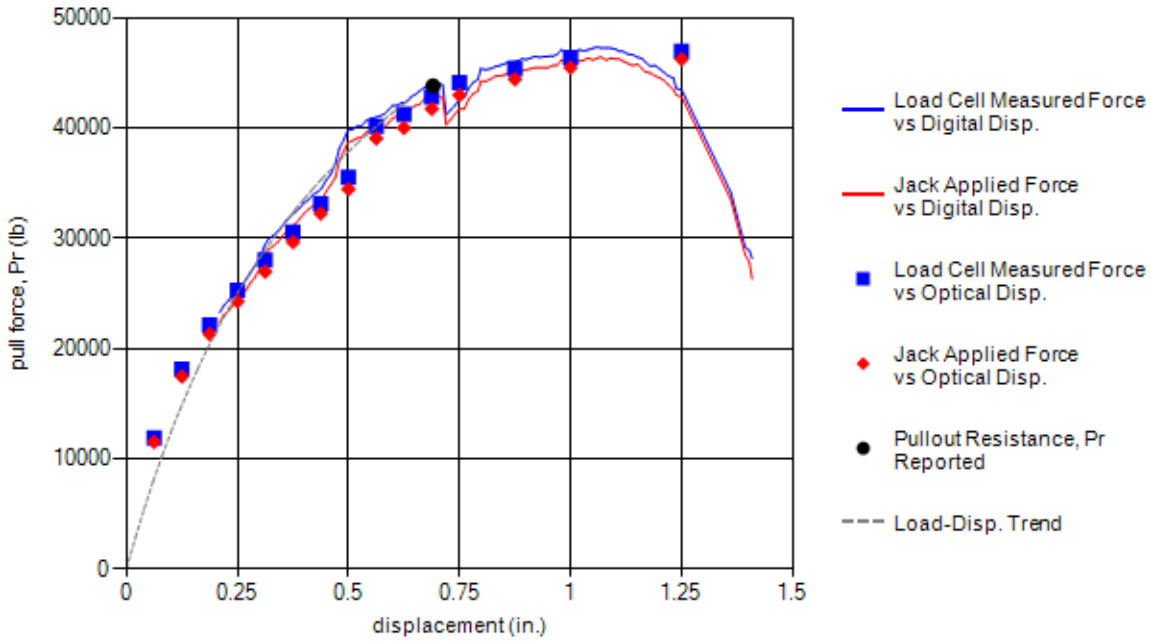
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.69	2479	43794	20.00	**0.98**

Load-Displacement Curve



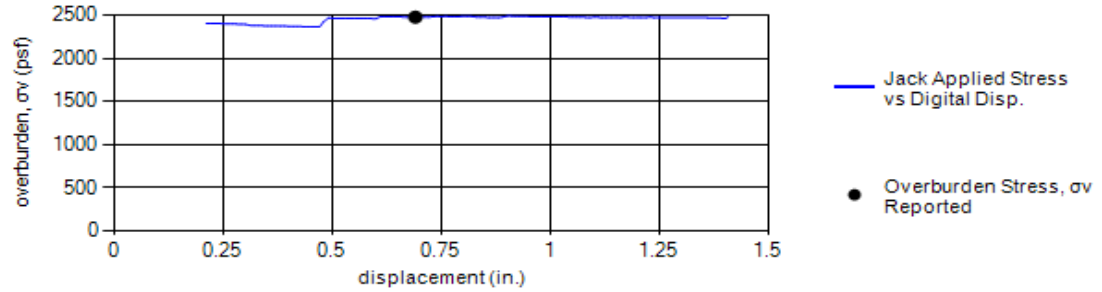
Comments

No earth pressure cell data. No incidental skew data.

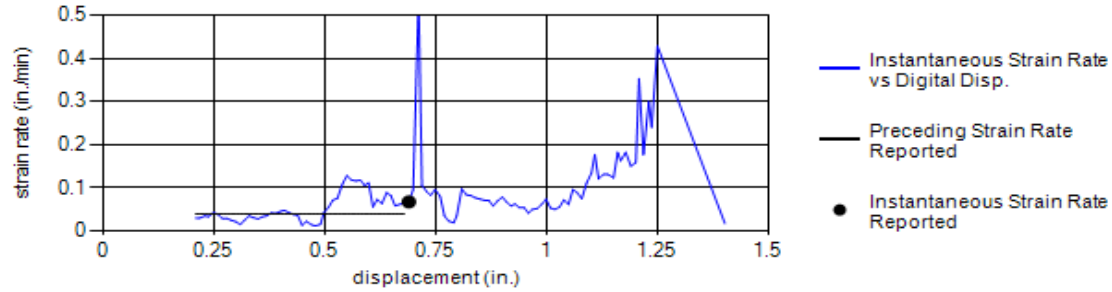
Personnel

Tested:	TW TW AJ
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2479



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.04	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

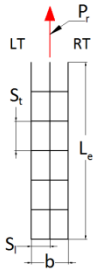
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/10/2012 4:16:00 PM
Test Identification:	TS48.07-G-9x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

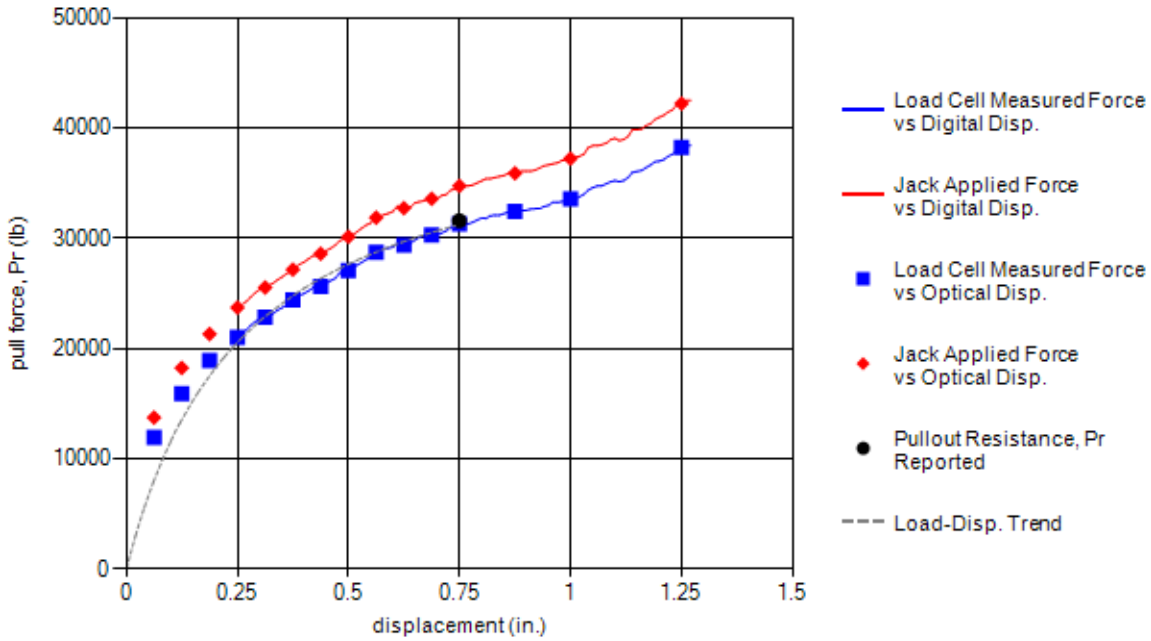
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	653	31567	5.30	**2.68**

Load-Displacement Curve



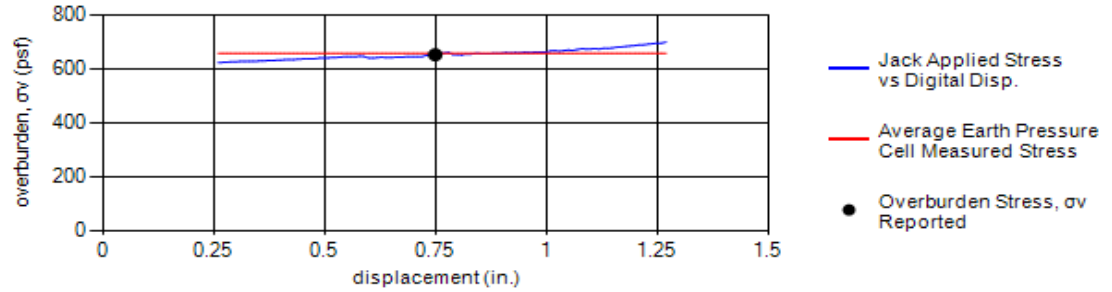
Comments

No incidental skew data.

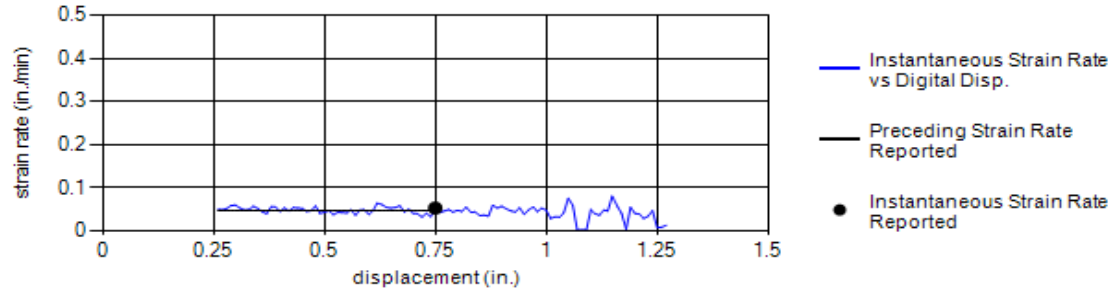
Personnel

Tested:	TW TW MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
662	509	509	773	845	659	1.43	653



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.05	0.04



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

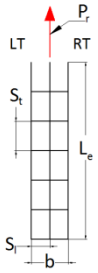
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/15/2012 4:35:00 PM
Test Identification:	TS48.08-G-9x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

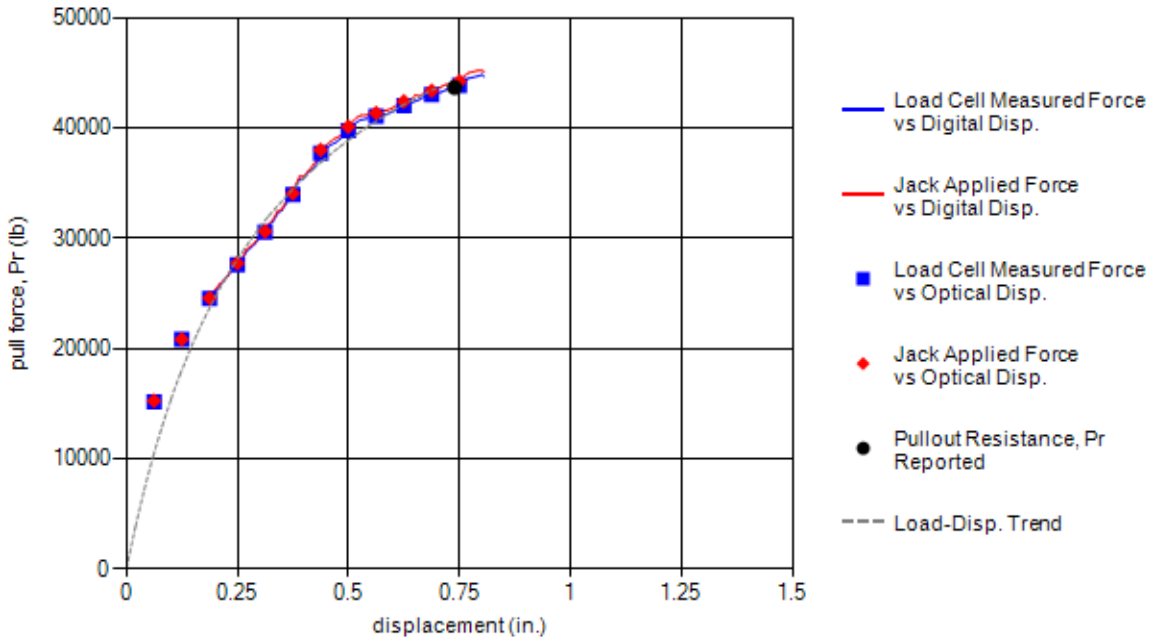
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.74	2460	43645	19.90	**0.99**

Load-Displacement Curve



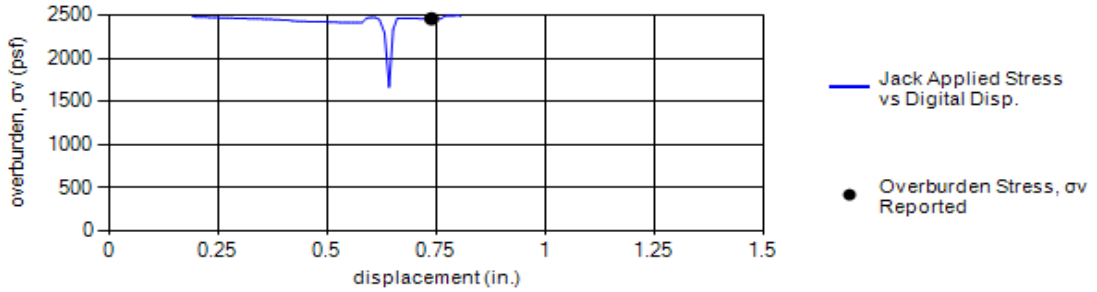
Comments

No earth pressure cell data. No incidental skew data.

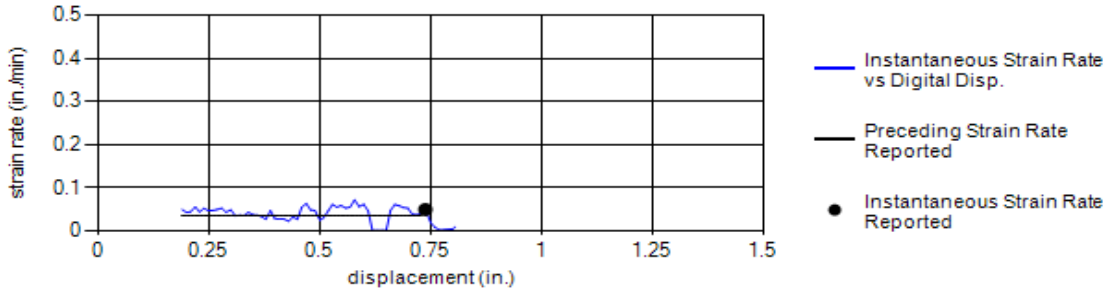
Personnel

Tested:	TW TW MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.01	2460



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.03	0.03



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

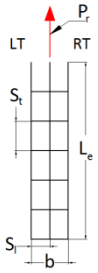
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 4:32:00 PM
Test Identification:	TS48.10-G-9x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

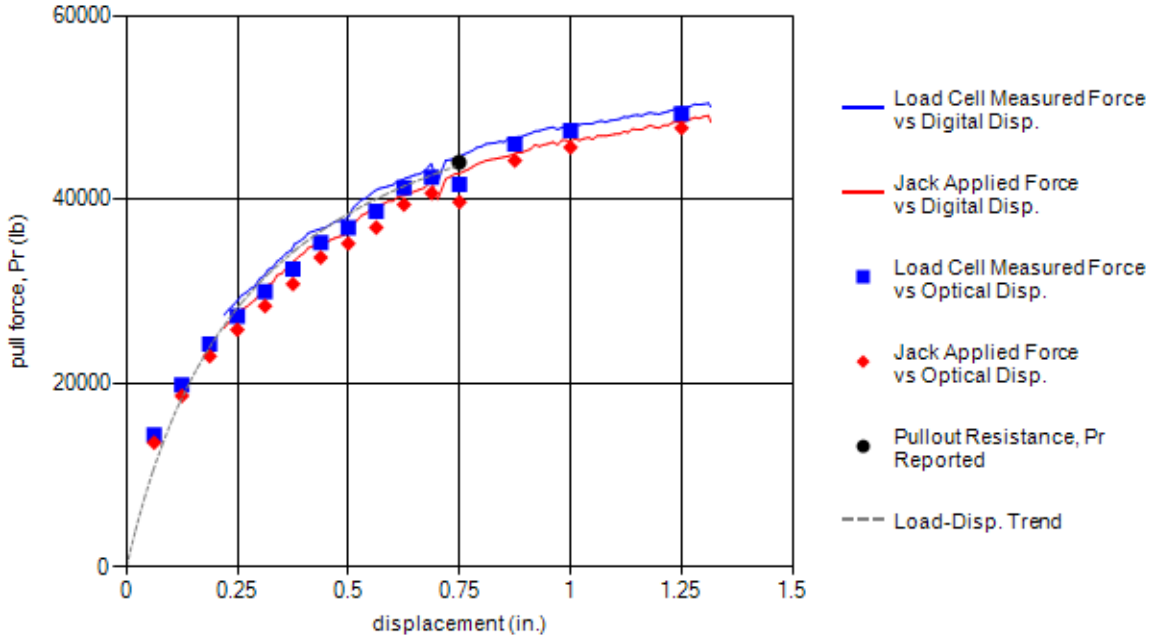
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Pullout	0.75	2460	44021	20.00	**0.99**

Load-Displacement Curve



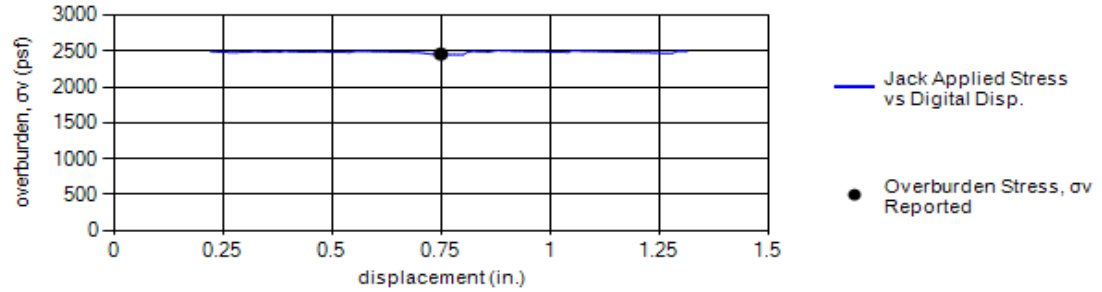
Comments

No earth pressure cell data. No incidental skew data.

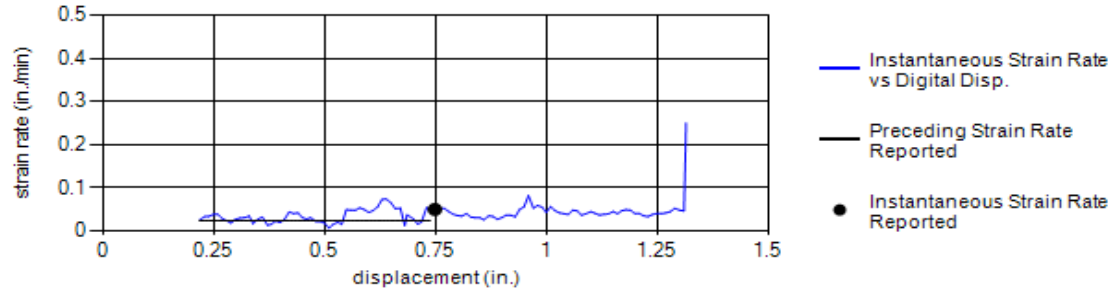
Personnel

Tested:	TW TW AJ
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2460



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.02	0.03



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

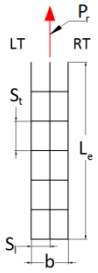
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/8/2012 12:36:00 PM
Test Identification:	TS48.11-G-9x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

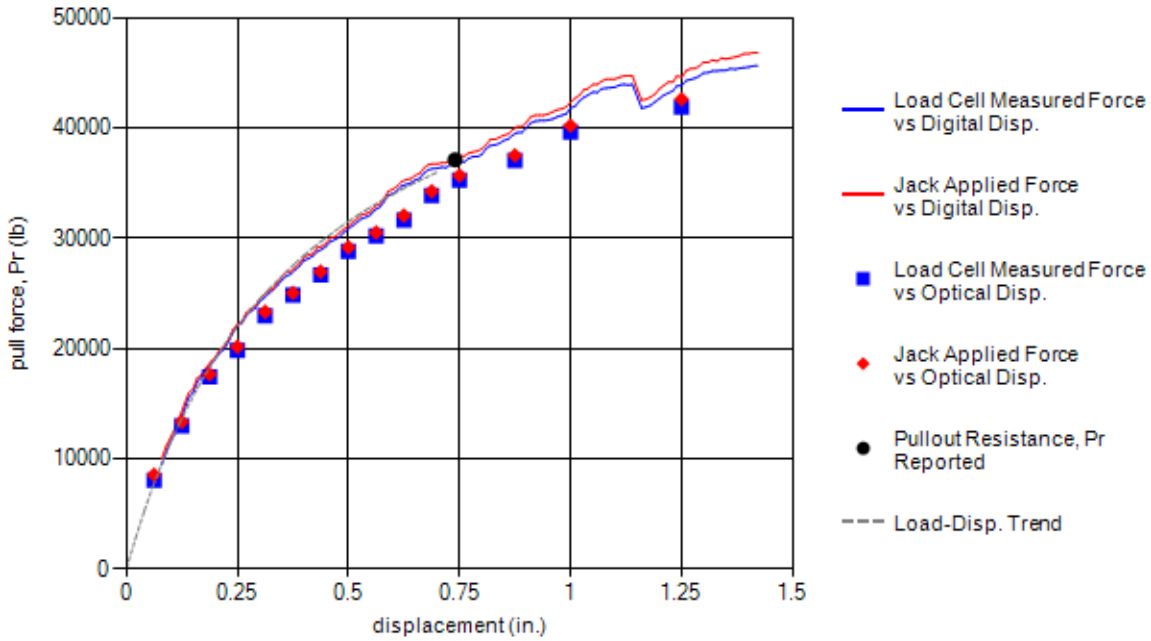
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	638	37091	5.20	**3.23**

Load-Displacement Curve



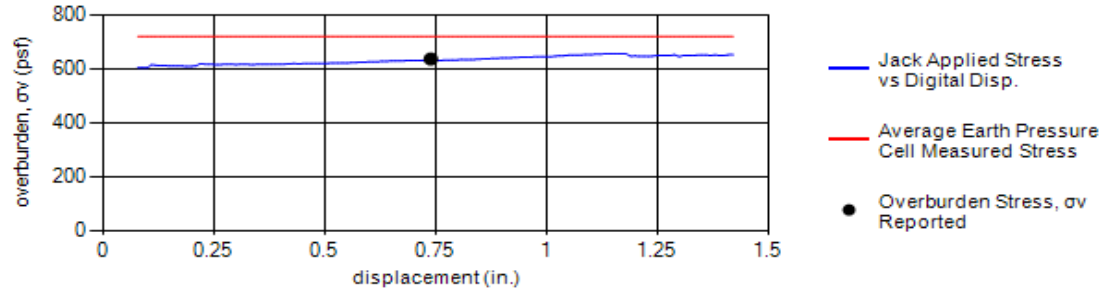
Comments

No incidental skew data.

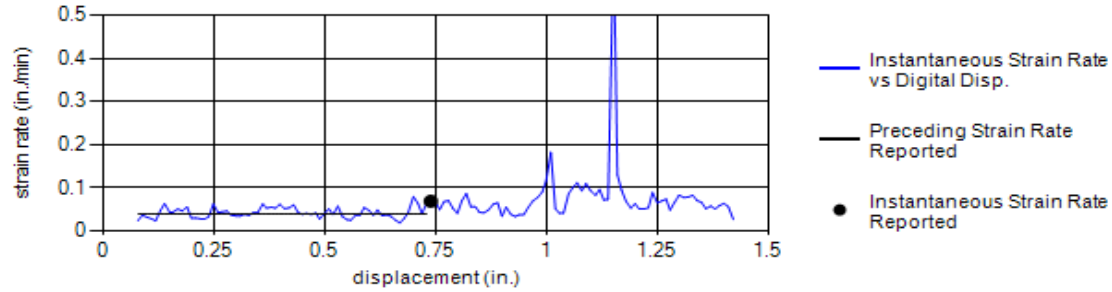
Personnel

Tested:	TW TW AJ
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
838	468	543	834	924	721	1.38	632



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.04	0.04



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

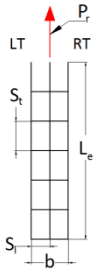
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/14/2012 11:19:00 AM
Test Identification:	TS48.12-G-9x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

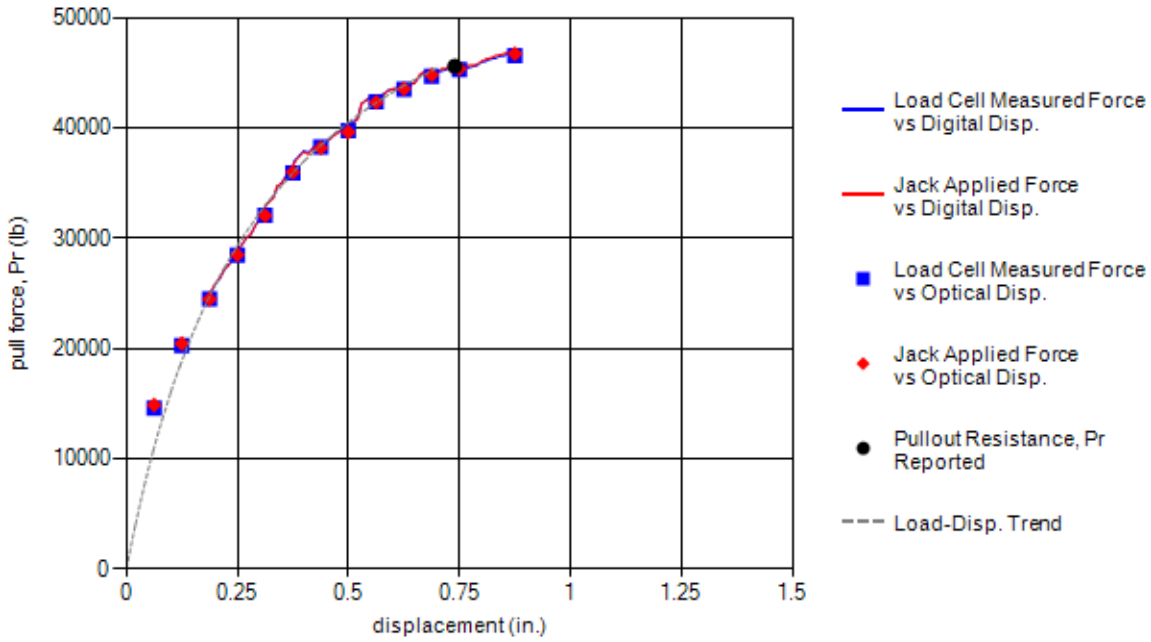
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	2472	45569	20.10	**1.02**

Load-Displacement Curve



Comments

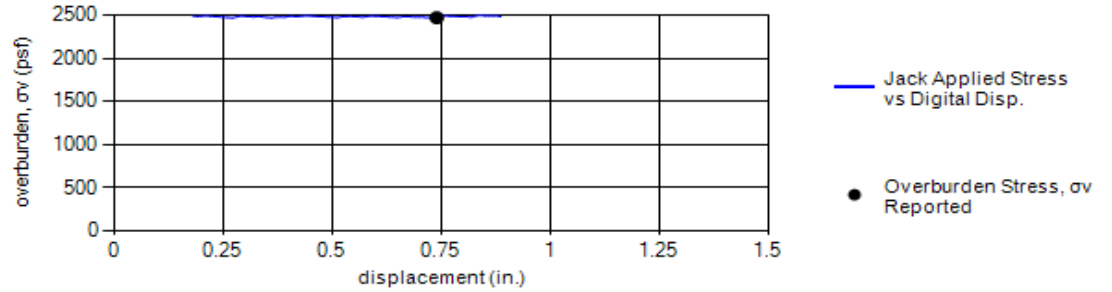
Center longitudinal bar rupture beyond 0.75in. displacement. No earth pressure cell data.

Personnel

Tested:	TW TW AJ
Prepared:	TW TW
Checked:	WL PJ

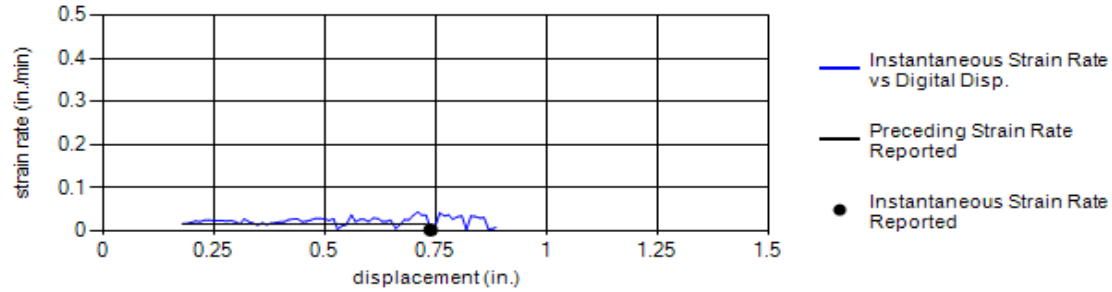
Vertical Stress, σ_v (psf)

EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	2472



Strain Rate

instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.00	0.02	0.02

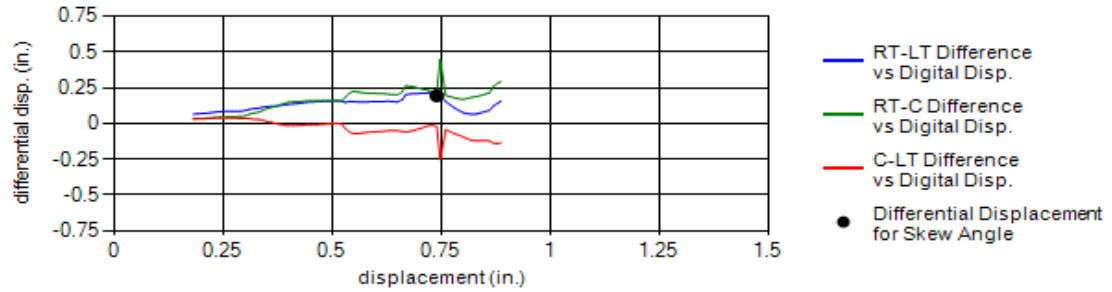


Differential Displacement

right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*
0.19	0.22	-0.02	No Data

Incidental Skew

skew angle (degrees)	*skew rotation*
0.62	CCW



Backfill Material Properties

Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM
Resistivity (TEX-129-E) *(ohm-cm):*	6670
Soil pH (TEX-128-E)*:*	7.6
Shear Strength Properties (ASTM D 3080)	
Cohesion, c (psf):	181
Internal Friction Angle, φ (deg.):	53
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)	
Liquid Limit, LL (%):	23
Plastic Limit, PL (%):	20
Plasticity Index, PI (%):	3
Bar Linear Shrinkage, LS (%):	3

Gradation (TEX-110-E) (% Retained)

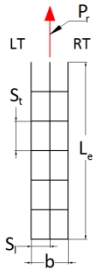
Sieve	*Spec*	*Pre-test*	*Post-test*
3in.	0	0	0
1.5in.		0	0
1in.		4	1
1/2in.	50-100	49	43
3/8in.		57	52
#4		70	65
#10		80	74
#40	85-100	89	83
#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/21/2012 3:31:00 PM
Test Identification:	TS49.01-G-6x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

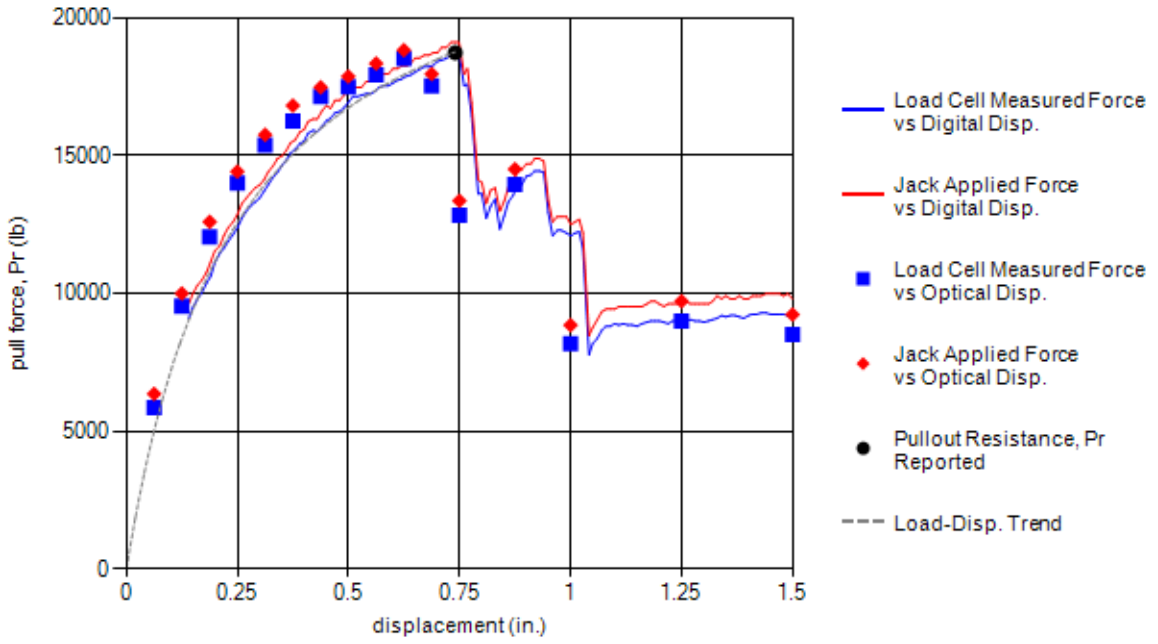
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	638	18722	5.10	**2.45**

Load-Displacement Curve

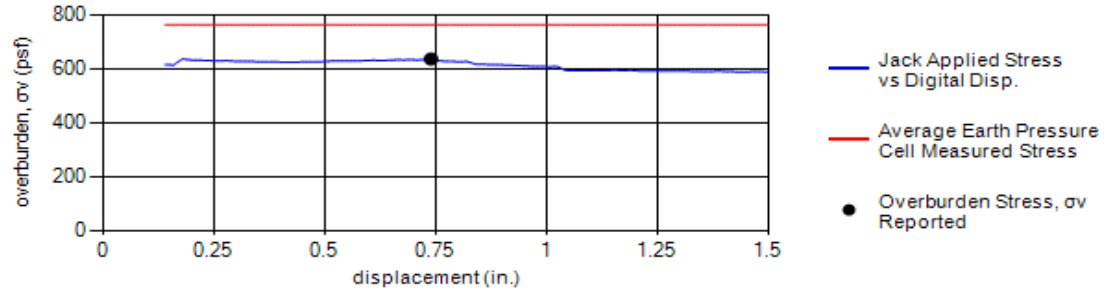


Comments

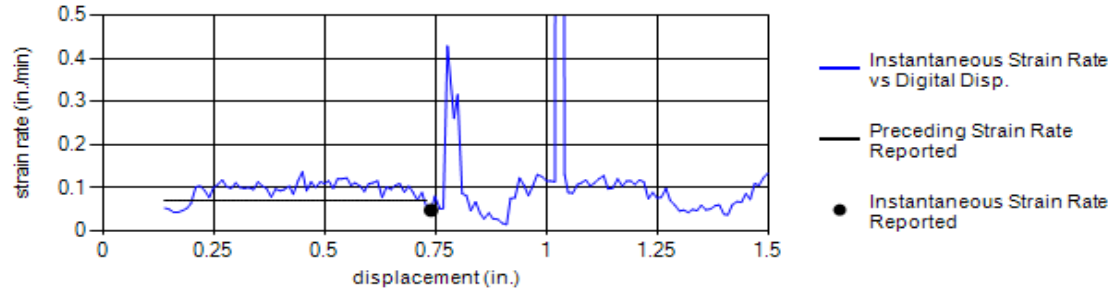
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

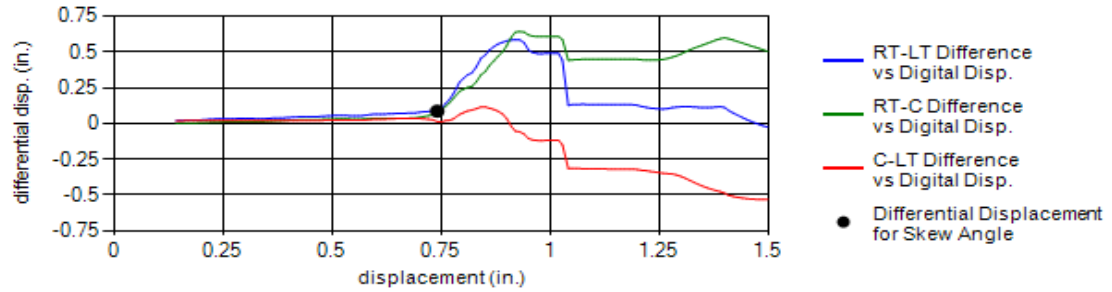
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
686	738	845	842	716	765	1.08	637



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.09	0.07	0.01	No Data	0.41	CCW



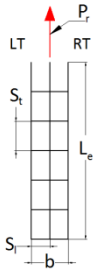
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/21/2012 2:50:00 PM
Test Identification:	TS49.02-G-9x12-W9.5xW11-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

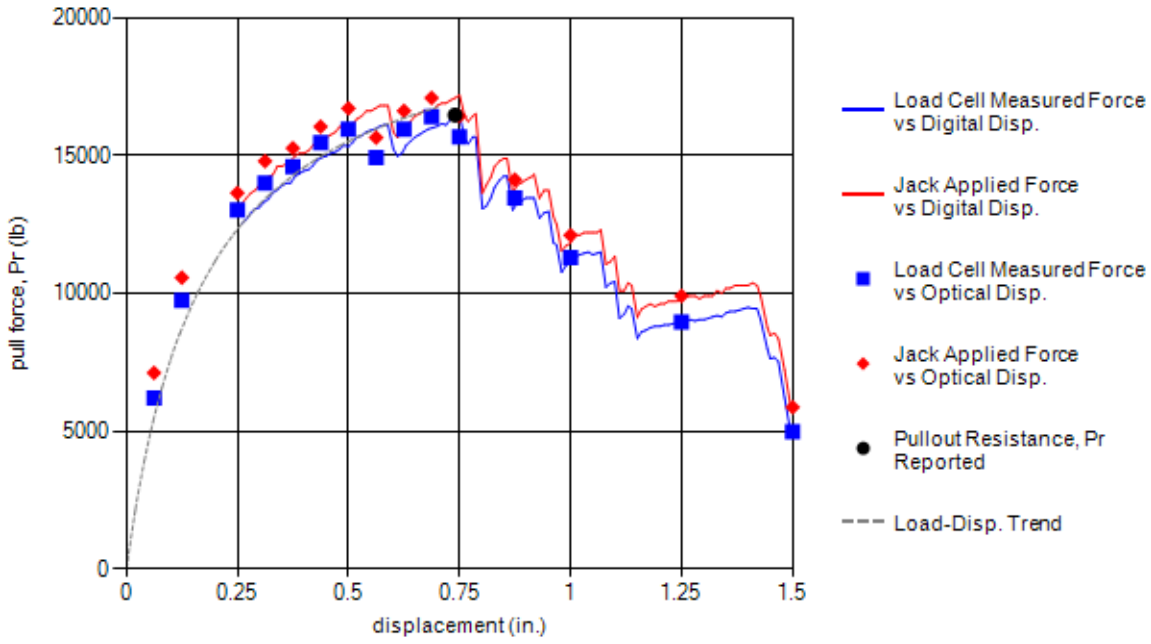
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.74	591	16460	4.70	**1.55**

Load-Displacement Curve

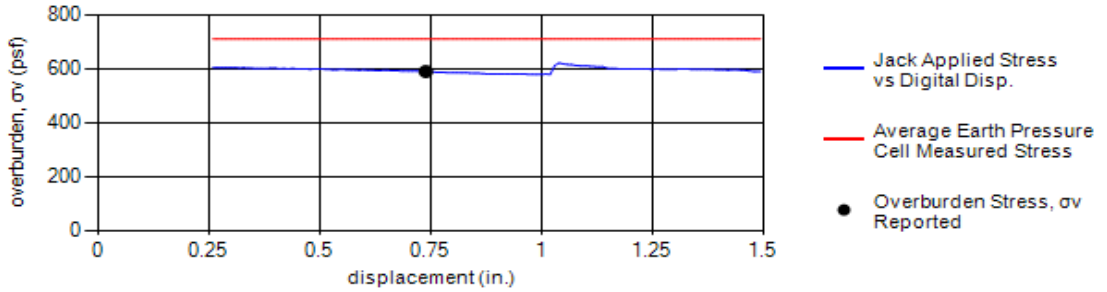


Comments

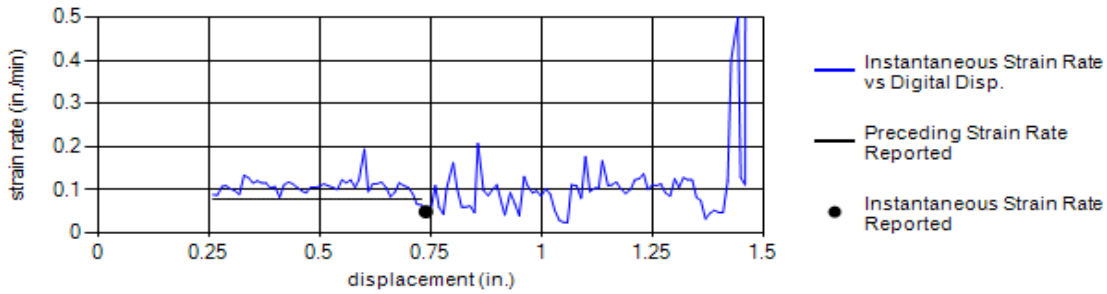
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

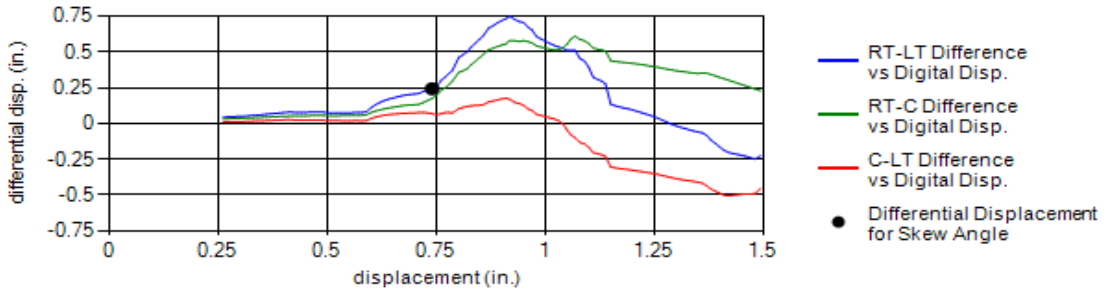
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
625	725	712	805	692	712	1.12	591



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.24	0.17	0.07	No Data	0.77	CCW



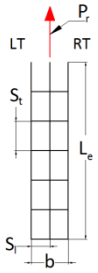
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 1:23:00 PM
Test Identification:	TS49.03-G-9x12-W20xW15-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

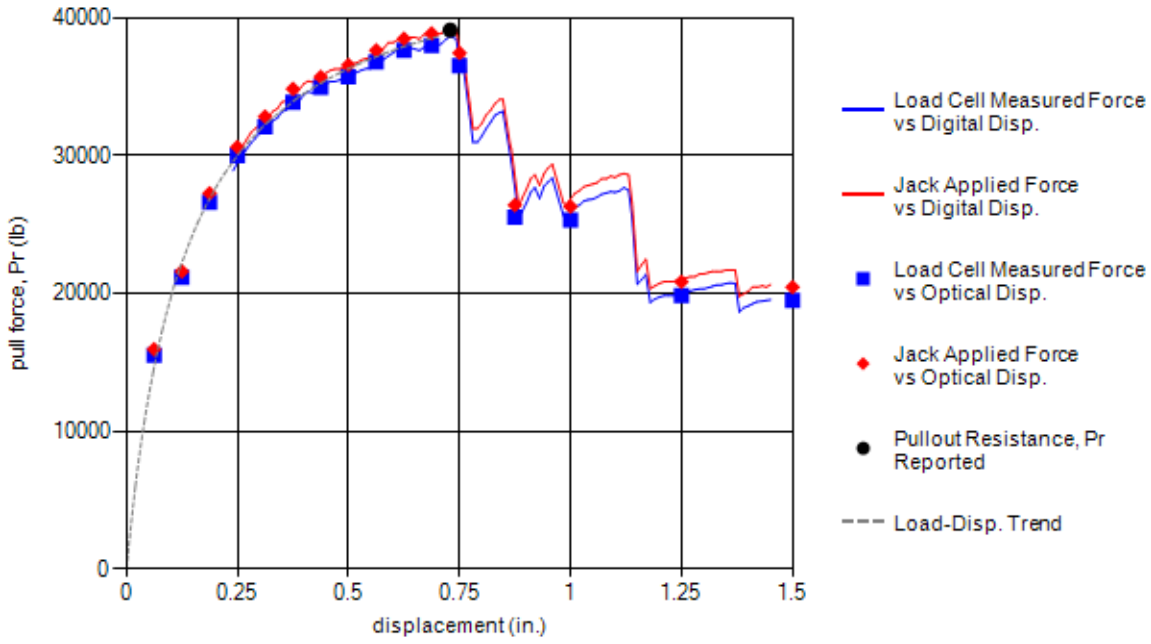
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.73	2474	39079	19.80	**0.88**

Load-Displacement Curve

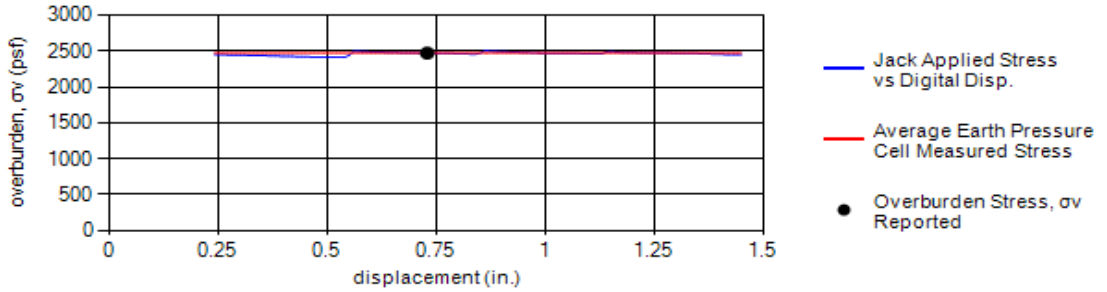


Comments

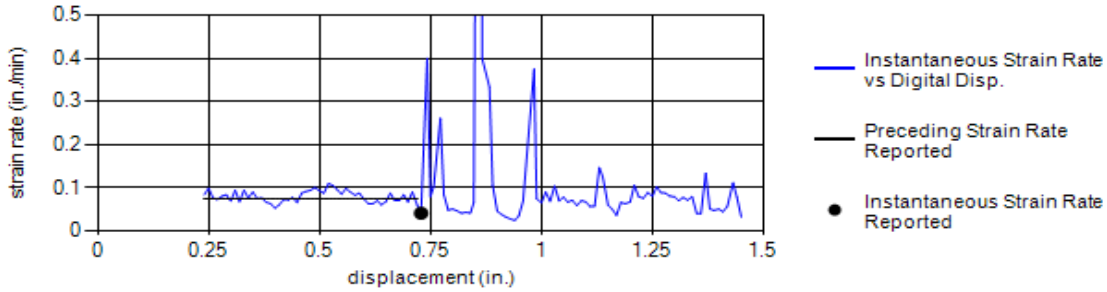
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

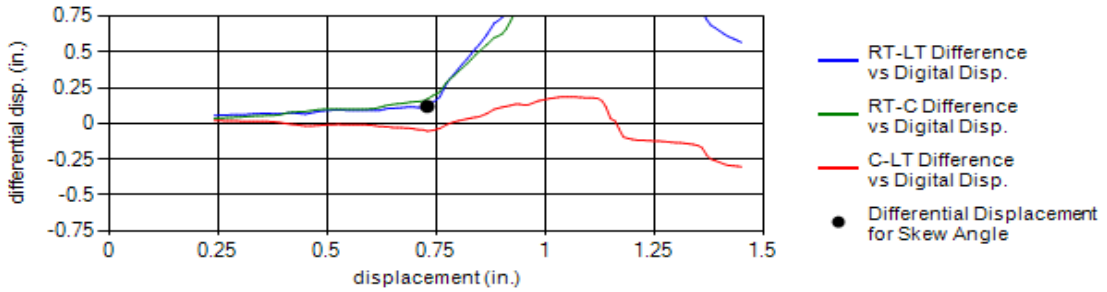
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1826	2834	2837	2746	2132	2475	1.03	2472



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.04	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.12	0.17	-0.05	No Data	0.38	CCW



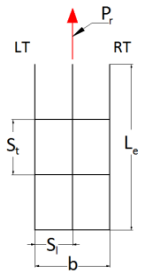
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 3:11:00 PM
Test Identification:	TS49.04-G-9x12-W20xW11-L3-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

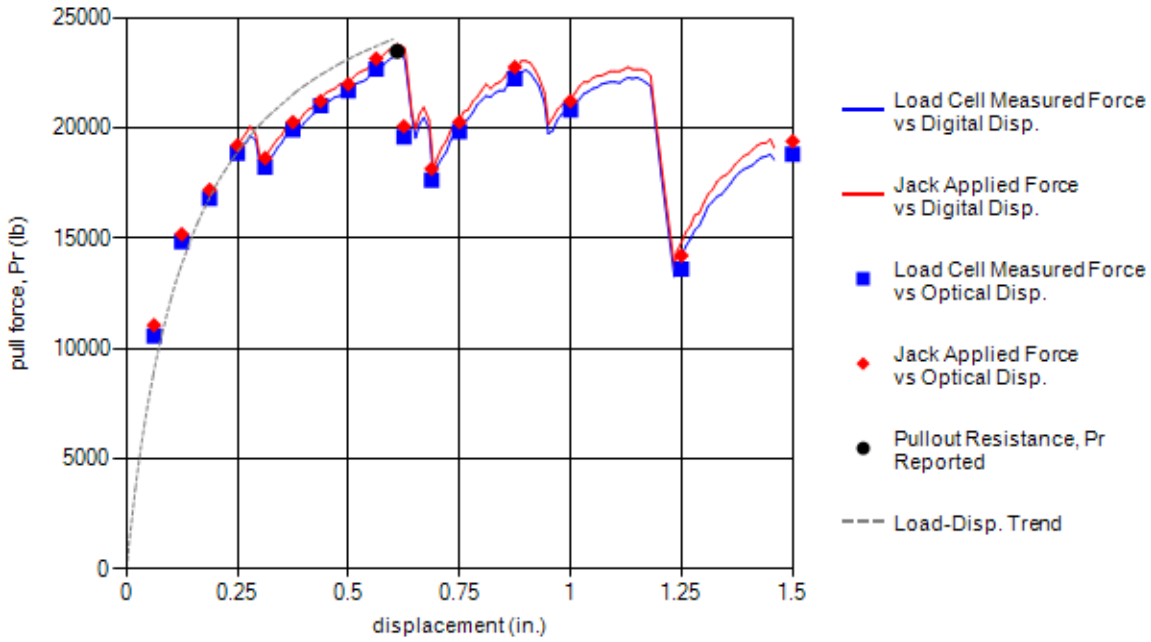
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.61	4839	23470	38.60	**0.54**

Load-Displacement Curve

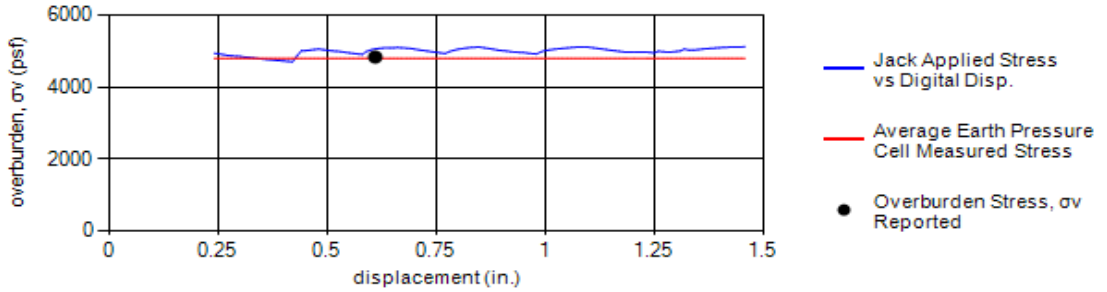


Comments

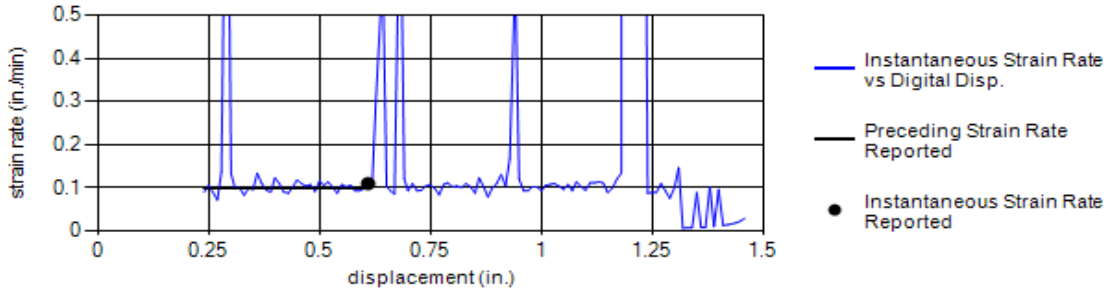
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

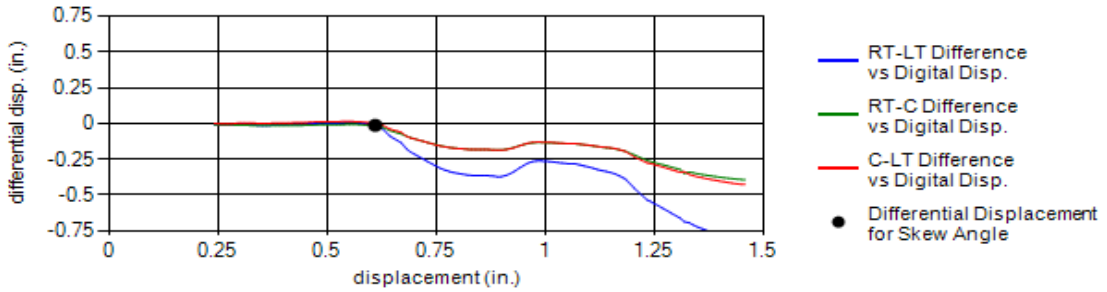
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3777	4596	5521	5449	4675	4803	1.06	5063



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.10	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
-0.01	-0.02	0.00	No Data	-0.04	CW



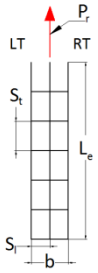
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/21/2012 12:12:00 PM
Test Identification:	TS49.05-G-6x12-W9.5xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

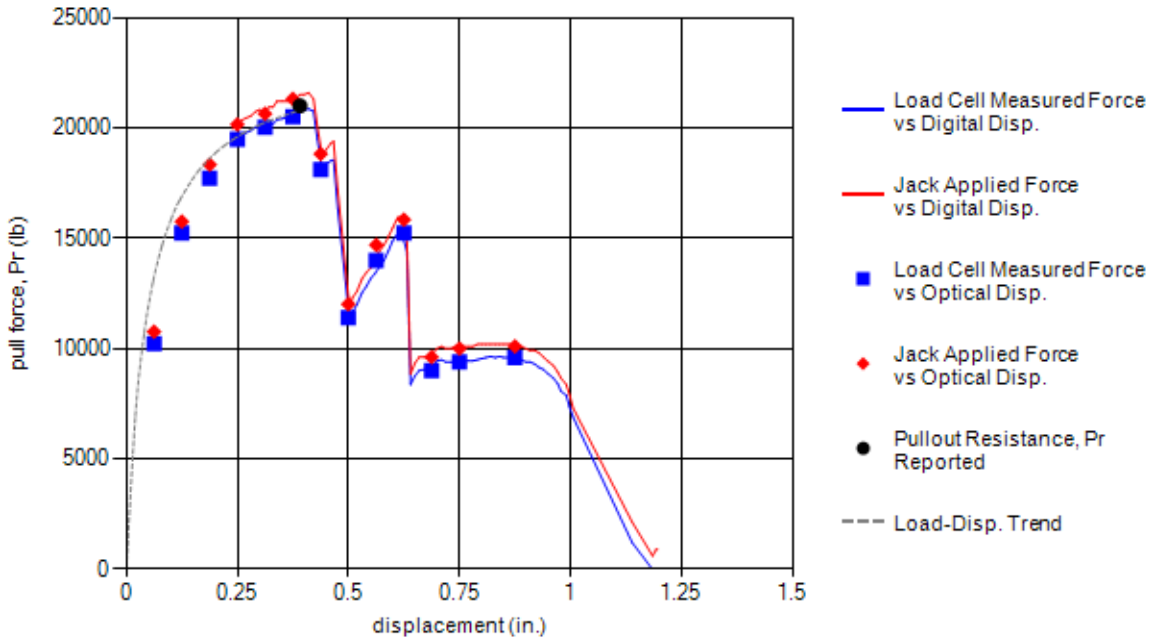
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.39	600	20996	4.80	**2.91**

Load-Displacement Curve



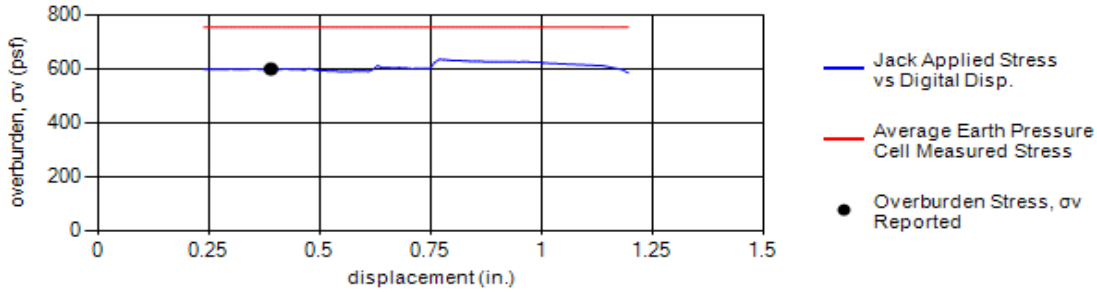
Comments

Center longitudinal bar rupture beyond 0.75in. displacement.

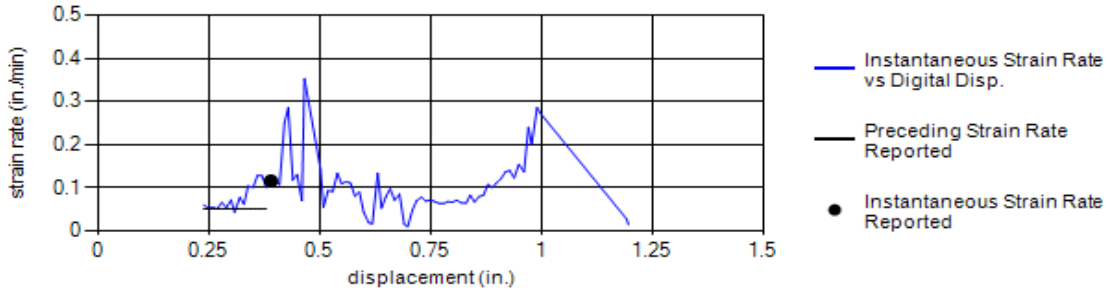
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

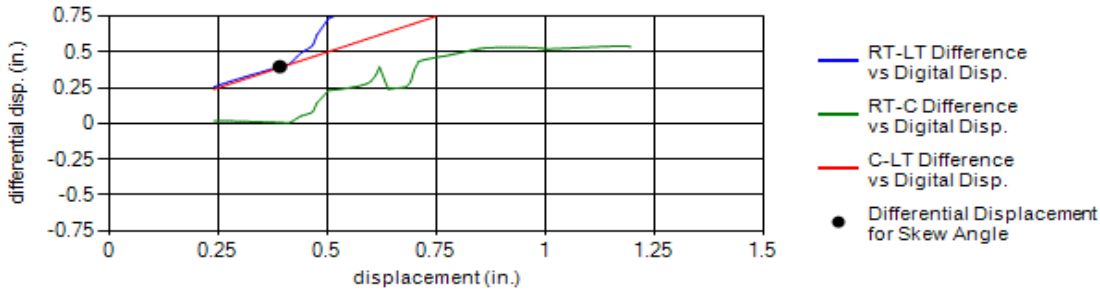
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
698	706	763	860	753	756	1.09	600



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.05	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.40	0.01	0.39	No Data	1.90	CCW



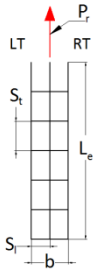
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/21/2012 2:10:00 PM
Test Identification:	TS49.06-G-9x12-W9.5xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

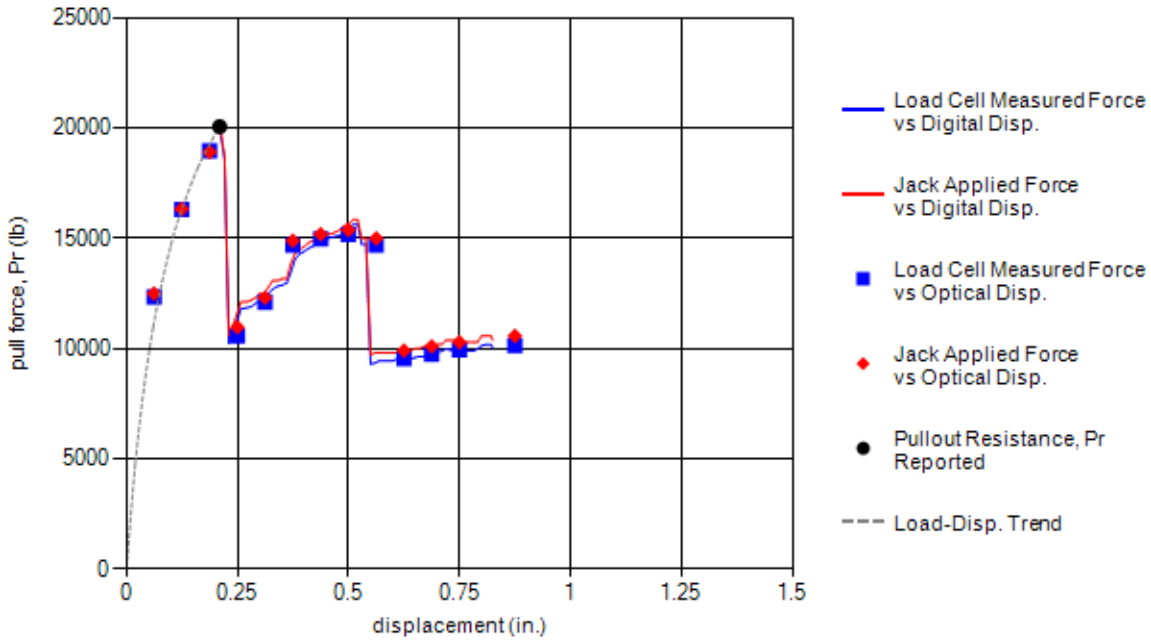
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.21	698	20050	5.50	**1.59**

Load-Displacement Curve



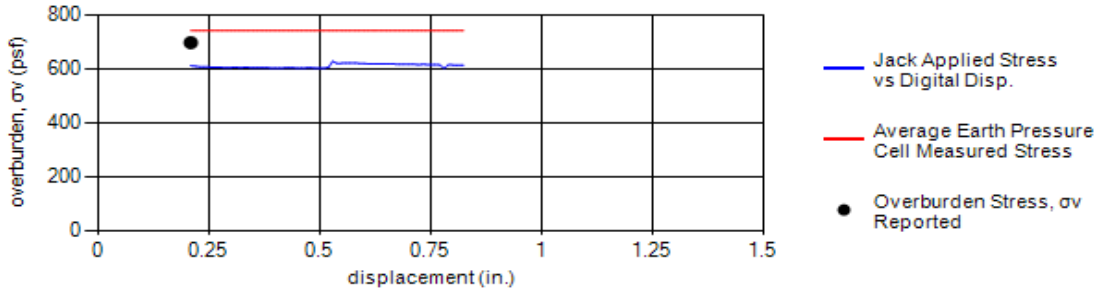
Comments

Center longitudinal bar rupture beyond 0.75in. displacement.

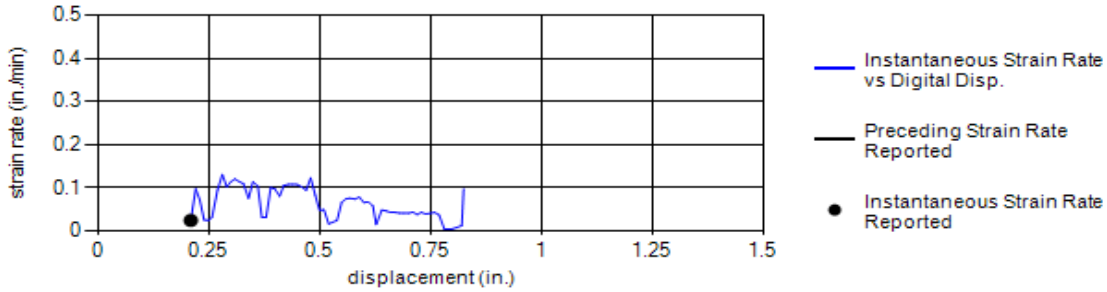
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

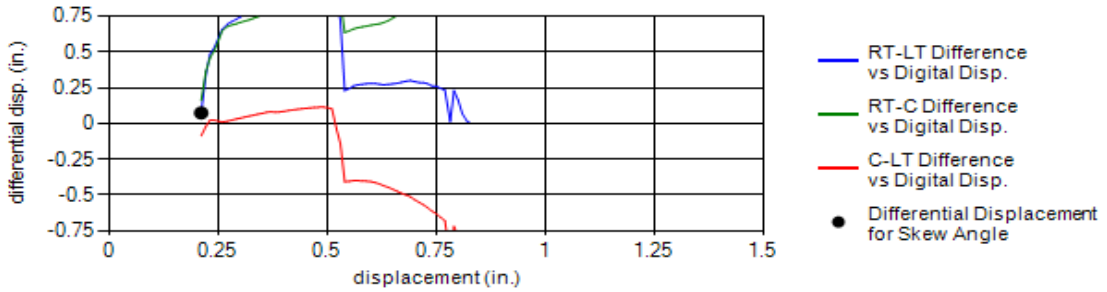
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
573	740	757	885	761	743	1.15	613



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.05	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.07	0.16	-0.09	No Data	0.24	CCW



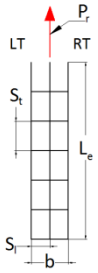
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 12:51:00 PM
Test Identification:	TS49.07-G-9x12-W20xW15-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

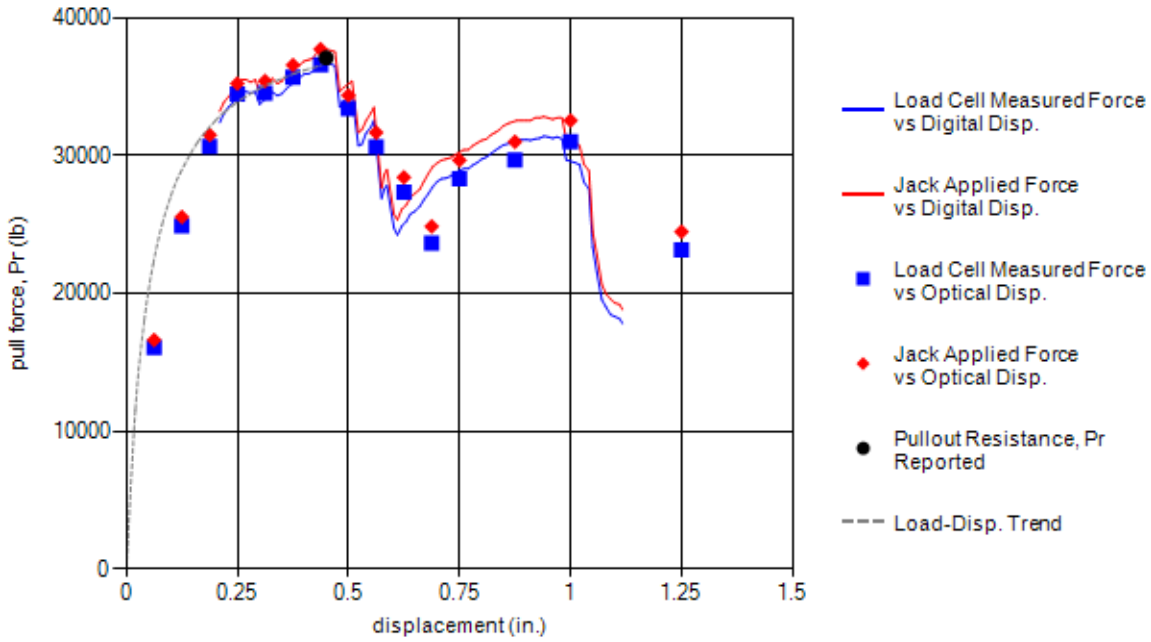
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.45	2456	37065	19.50	**0.84**

Load-Displacement Curve



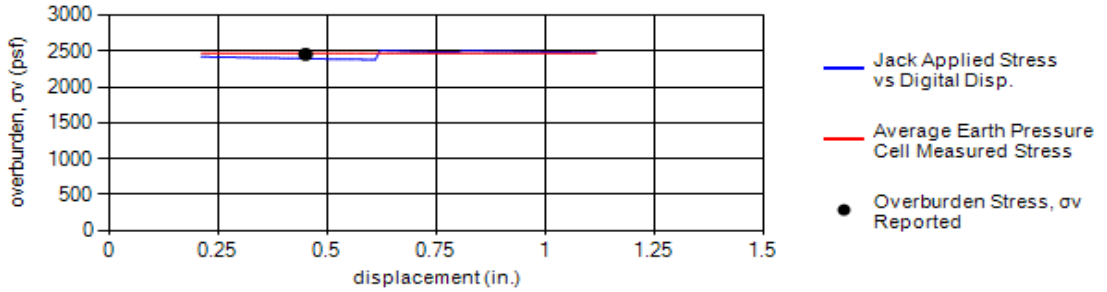
Comments

Center longitudinal bar rupture beyond 0.75in. displacement. No incidental skew data.

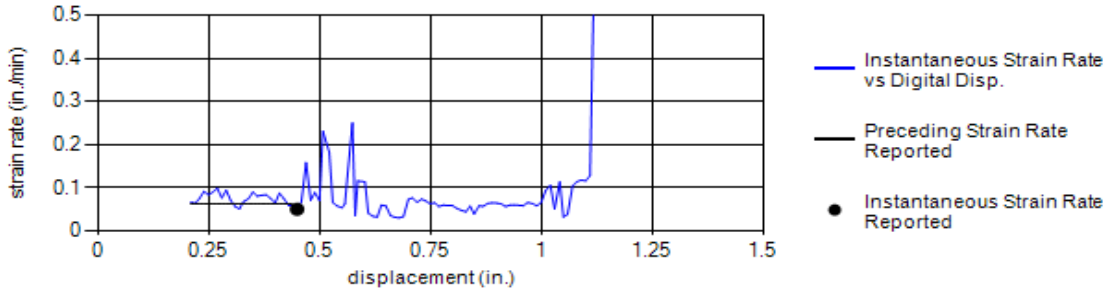
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1817	2672	2888	2801	2175	2471	1.06	2396



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.05	0.06	0.06



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

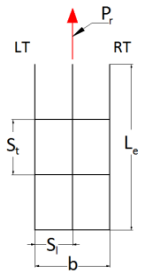
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 2:36:00 PM
Test Identification:	TS49.08-G-9x12-W20xW11-L3-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Welded Steel Grid				
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

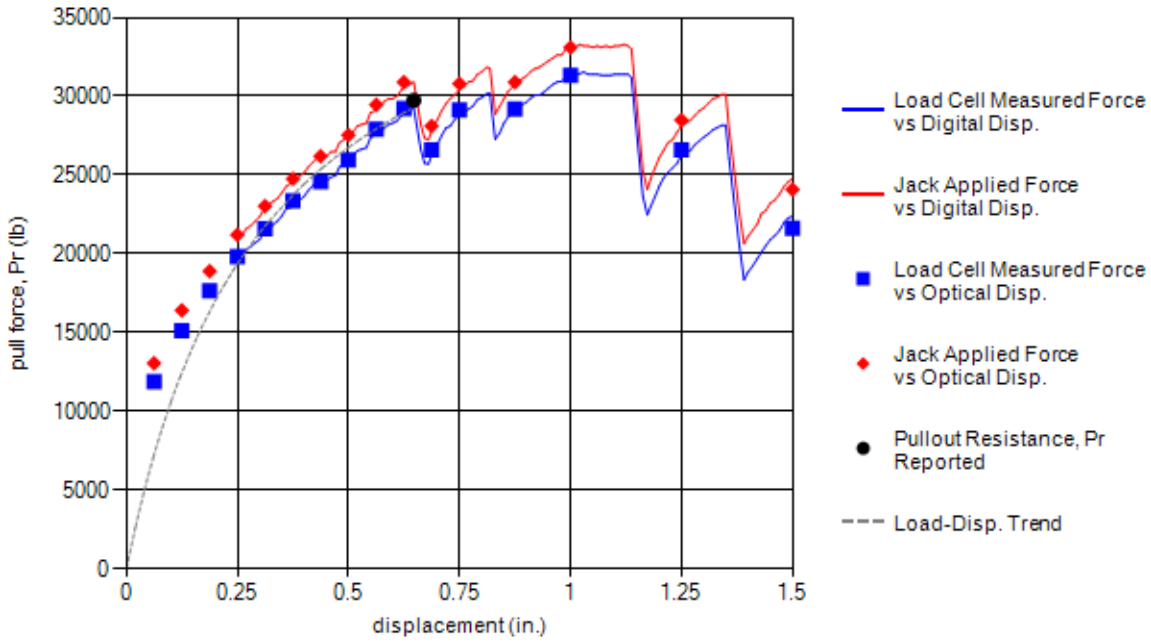
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured *Displacement (in.)*	Measured *Vertical Stress, σ_v (psf)*	Measured *Pullout Resistance, P_r (lb)*	Calculated *Effective Fill Depth, z_{eff} (ft)*	Calculated ***Pullout Resistance Factor, F****
Progressive Rupture	0.65	4917	29741	39.00	**0.67**

Load-Displacement Curve

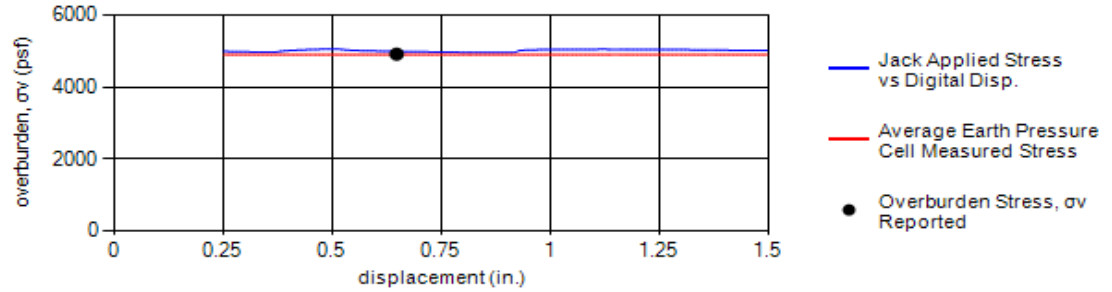


Comments

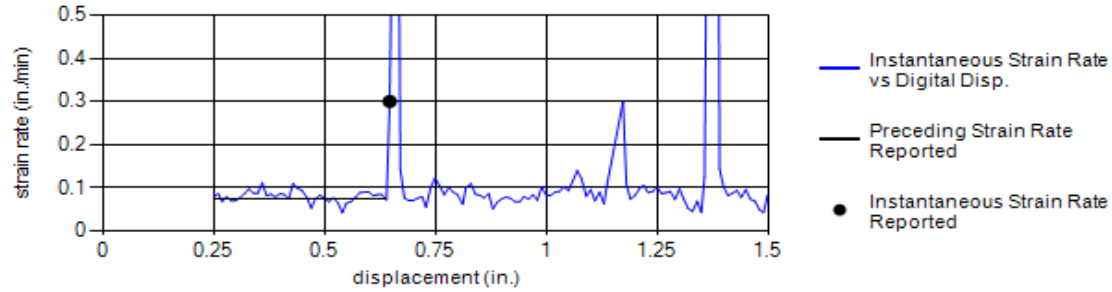
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

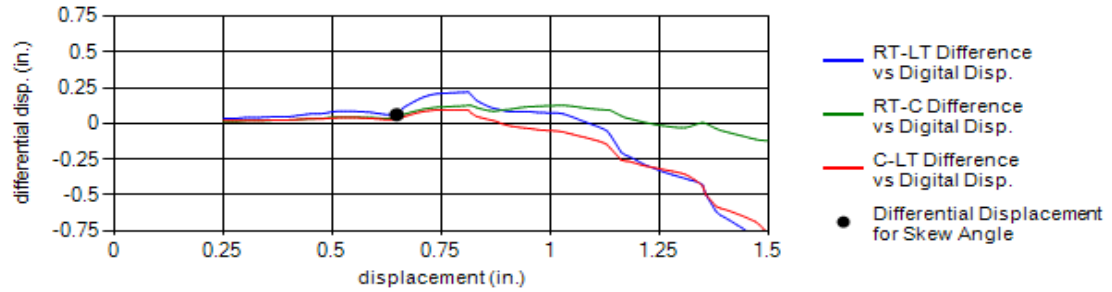
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3692	5075	5595	5485	4653	4900	1.05	4993



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.30	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.06	0.04	0.03	No Data	0.20	CCW



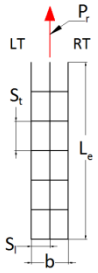
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/21/2012 10:19:00 AM
Test Identification:	TS49.09-G-6x12-W9.5xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	12	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	6

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

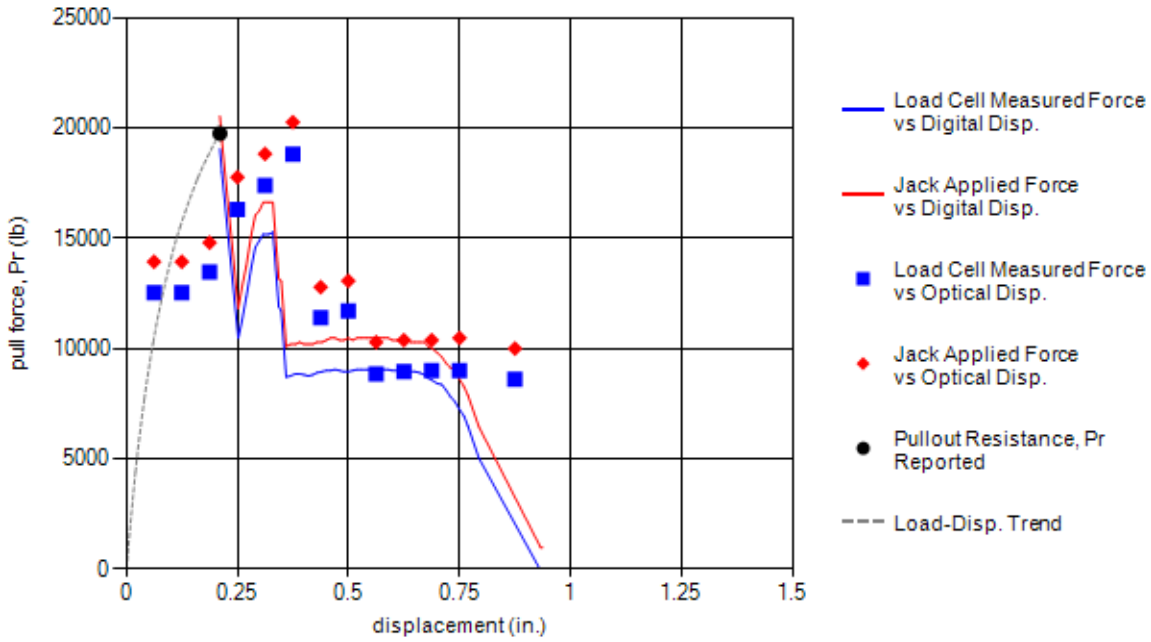
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.21	656	19740	5.20	**2.51**

Load-Displacement Curve



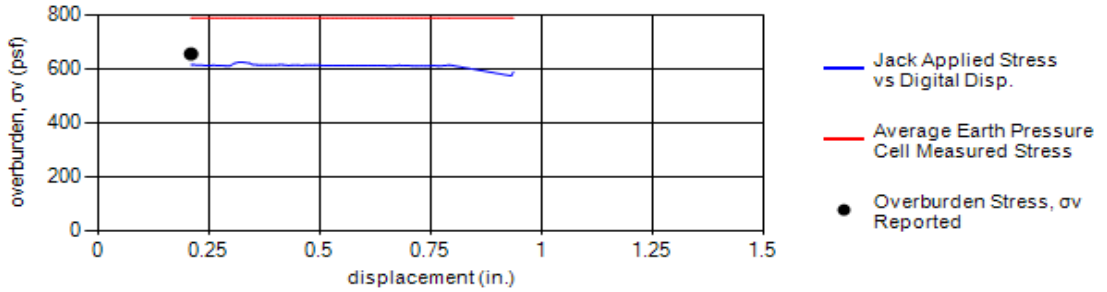
Comments

Center longitudinal bar rupture beyond 0.75in. displacement.

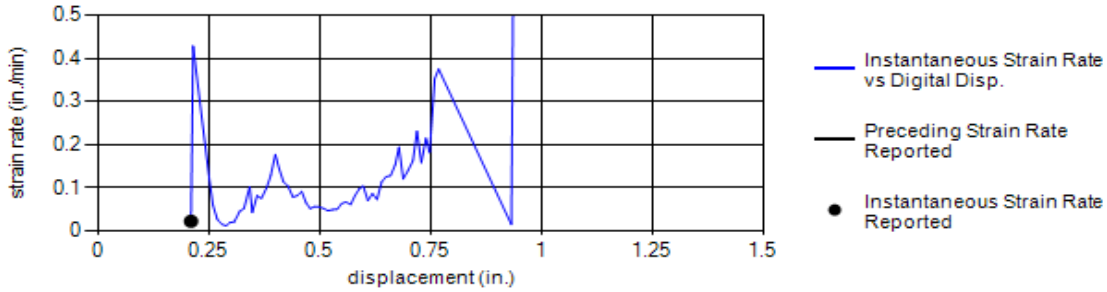
Personnel

Tested:	AJ AJ ET
Prepared:	TW TW
Checked:	WL PJ

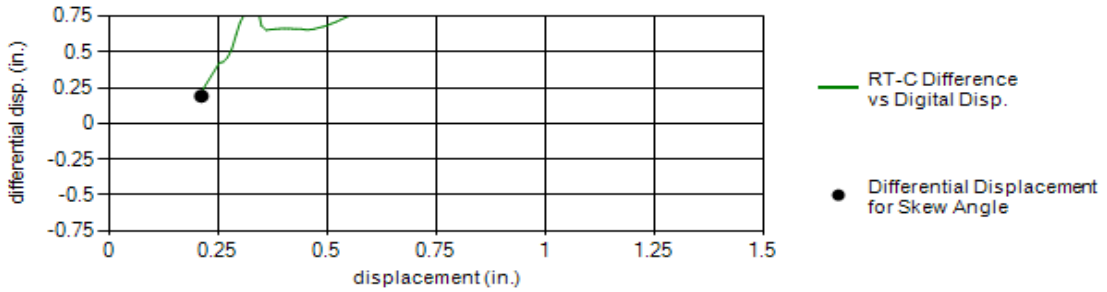
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
685	722	785	916	843	790	1.10	617



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.02	0.04	0.04



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	0.19	No Data	No Data	0.46	CCW



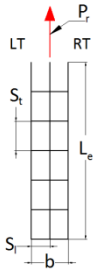
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 12:18:00 PM
Test Identification:	TS49.11-G-9x12-W20xW15-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

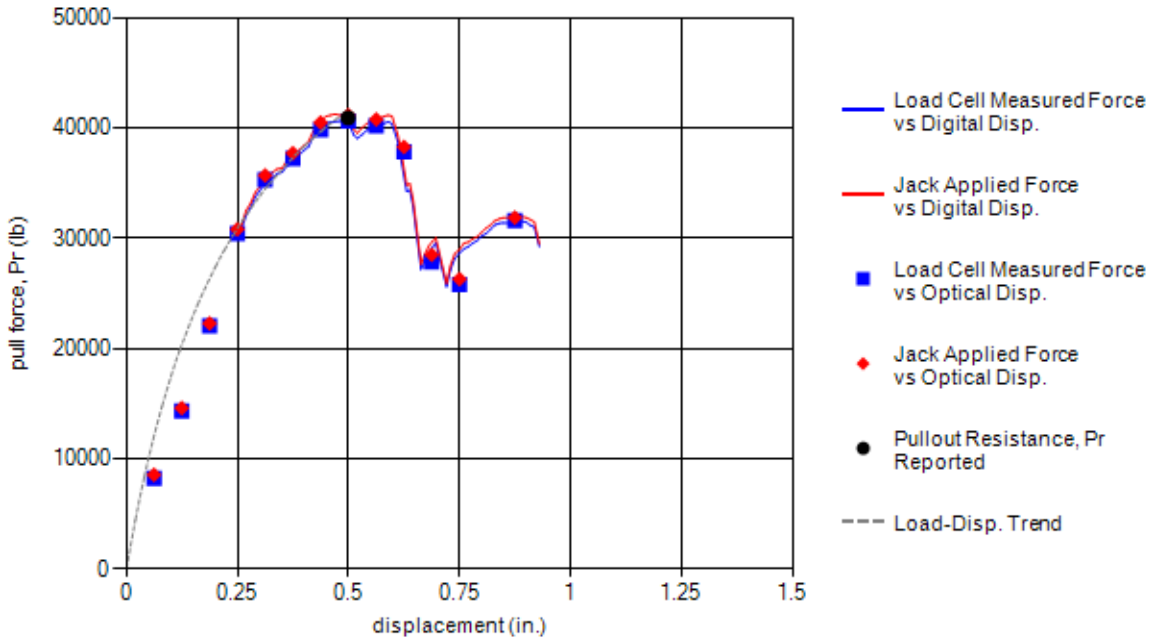
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.50	2402	40894	19.20	**0.95**

Load-Displacement Curve

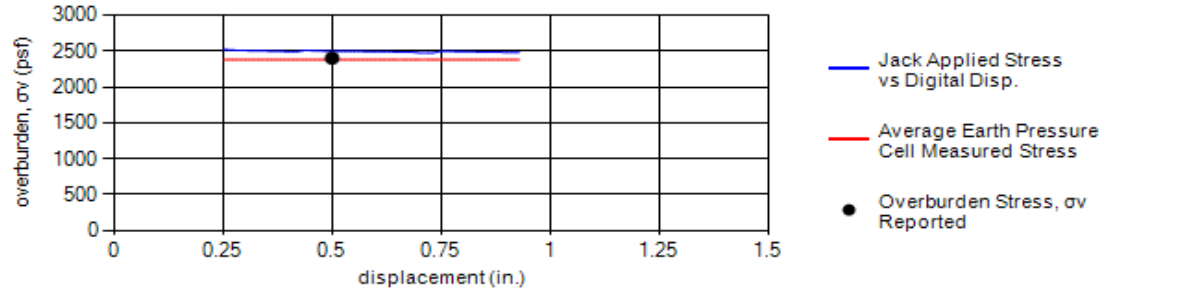


Comments

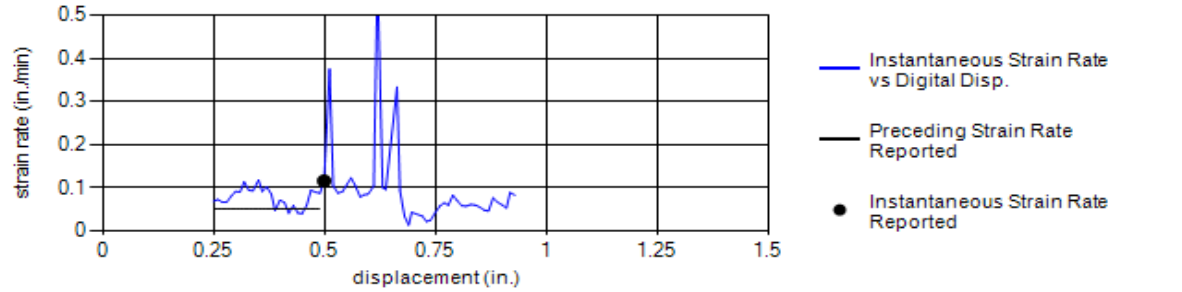
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

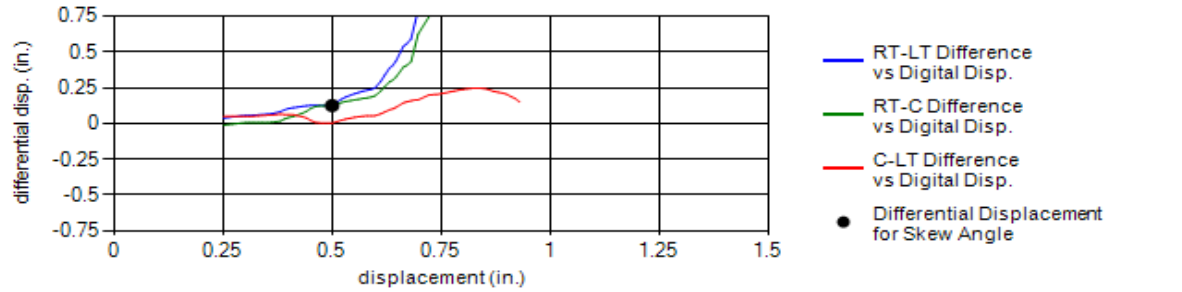
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1763	2431	2822	2765	2137	2384	1.03	2501



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.05	0.05



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.13	0.12	0.00	No Data	0.40	CCW



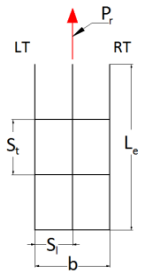
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/22/2012 2:04:00 PM
Test Identification:	TS49.12-G-9x12-W20xW11-L3-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

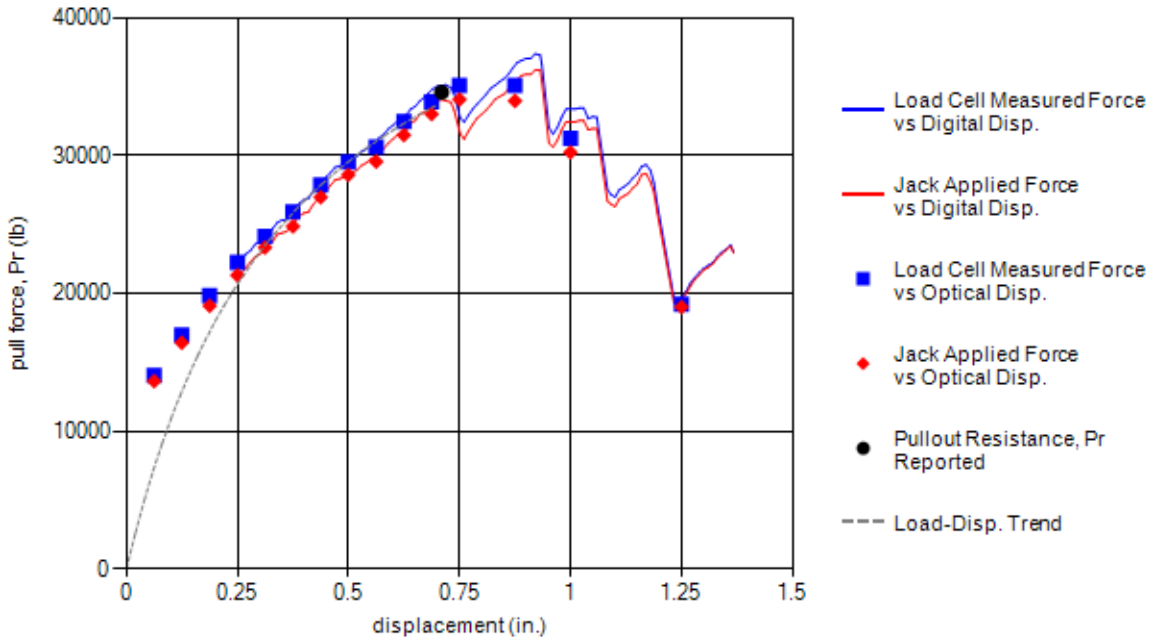
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.71	5067	34574	40.40	**0.76**

Load-Displacement Curve



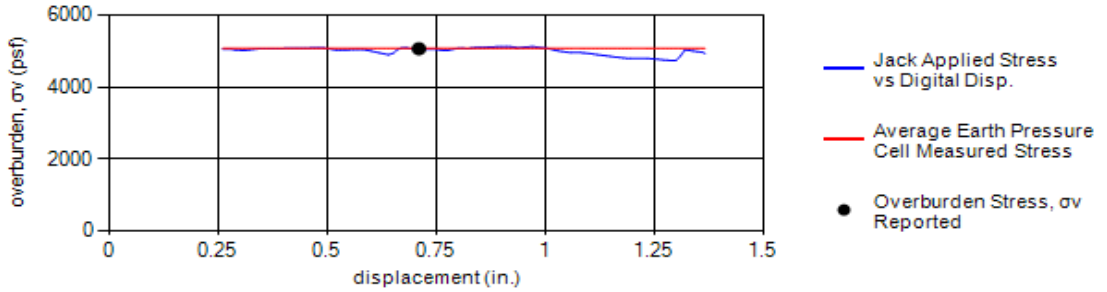
Comments

No incidental skew data.

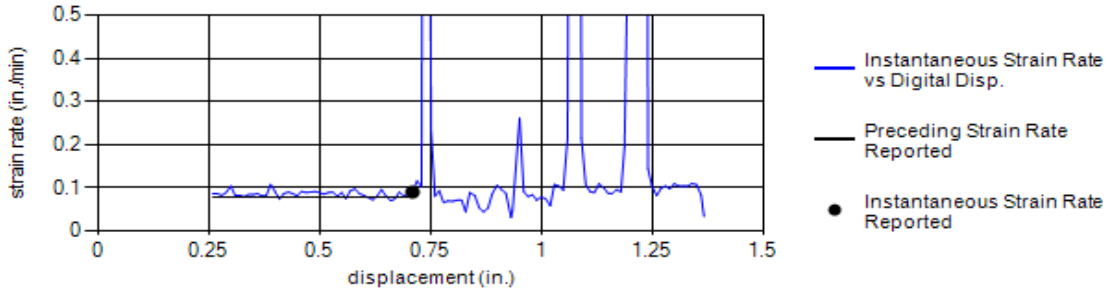
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3696	5517	5797	5629	4746	5077	1.03	5035



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.08	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

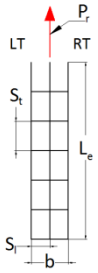
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 9:59:00 AM
Test Identification:	TS50.07-G-9x6-W20xW15-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	6	*Spacing, S_l (in.):*	9

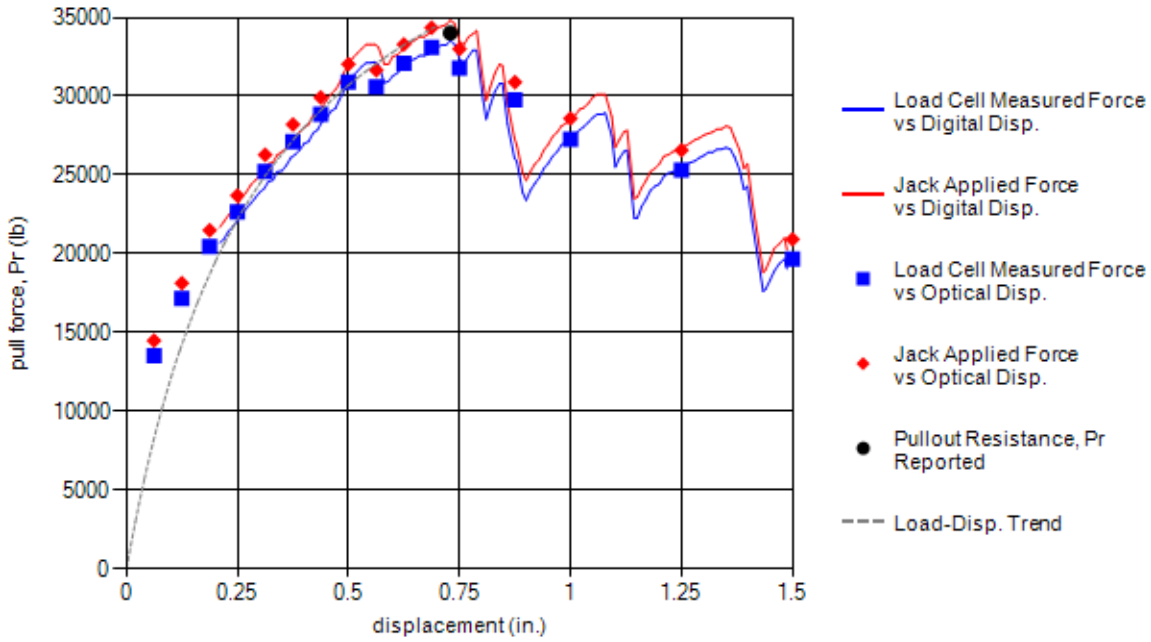
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	1572	34015	12.80	**2.40**

Load-Displacement Curve

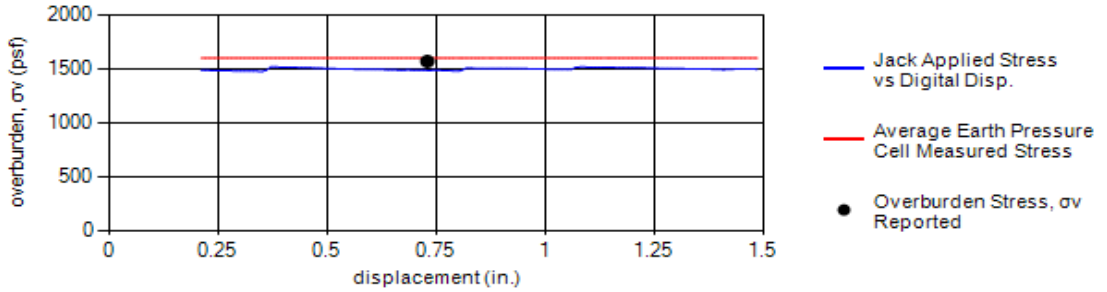


Comments

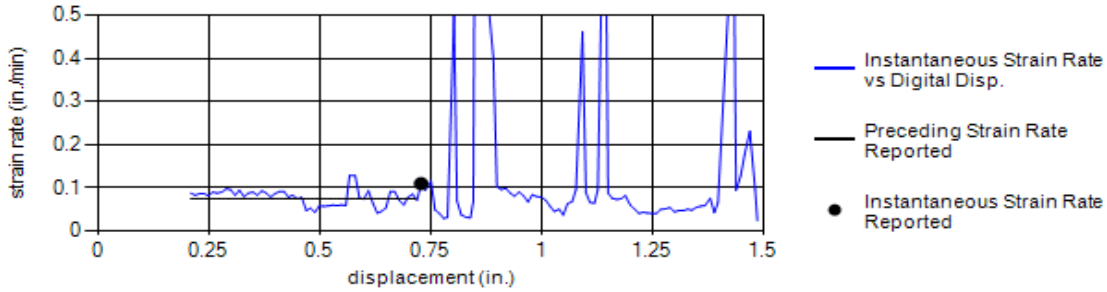
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

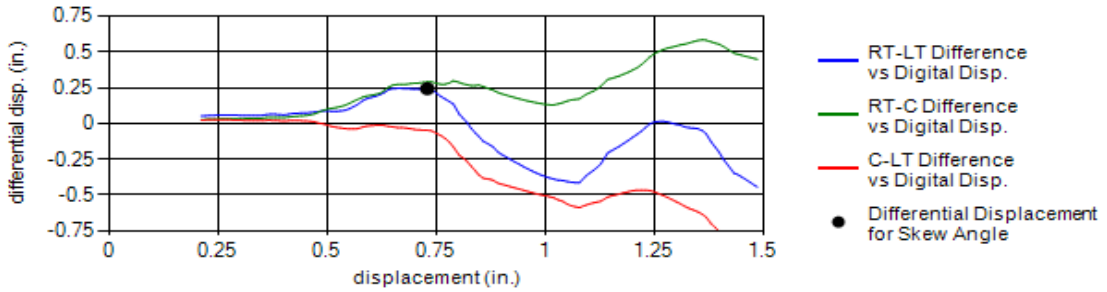
Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
930	1831	1726	1579	1947	1603	1.10	1488



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.11	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
0.24	0.29	-0.05	No Data	0.77	CCW



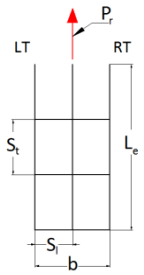
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 4:30:00 PM
Test Identification:	TS50.14-G-9x24-W20xW15-L6-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

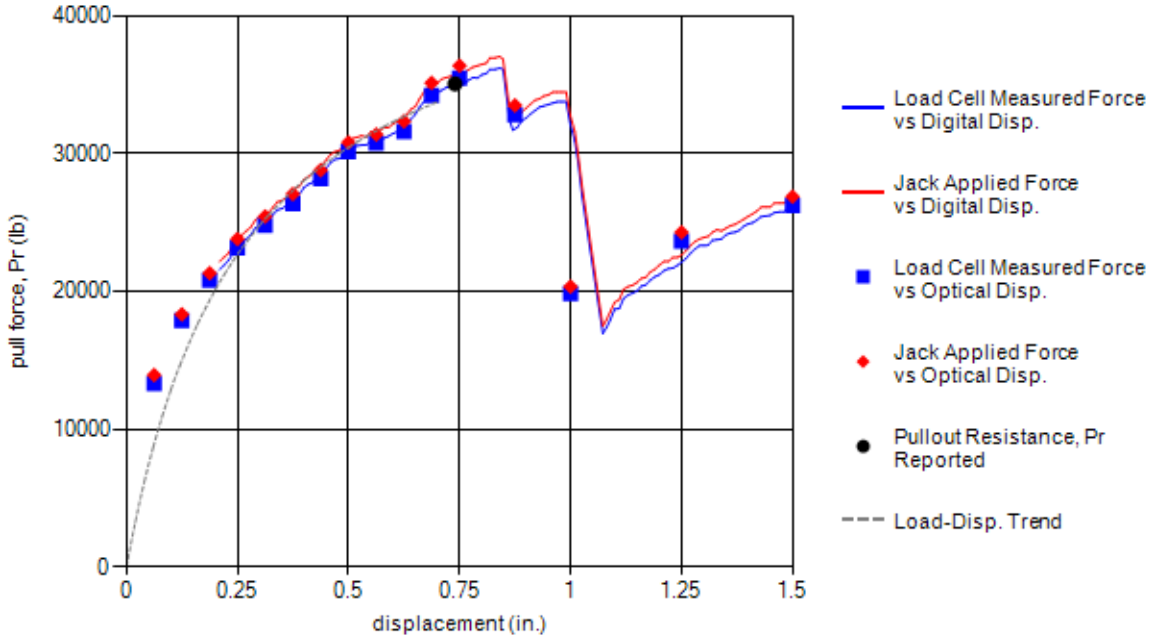
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	5061	35041	40.30	**0.38**

Load-Displacement Curve



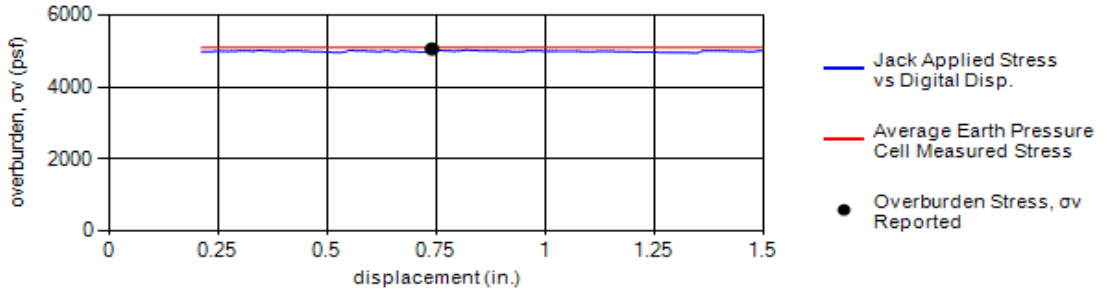
Comments

No incidental skew data.

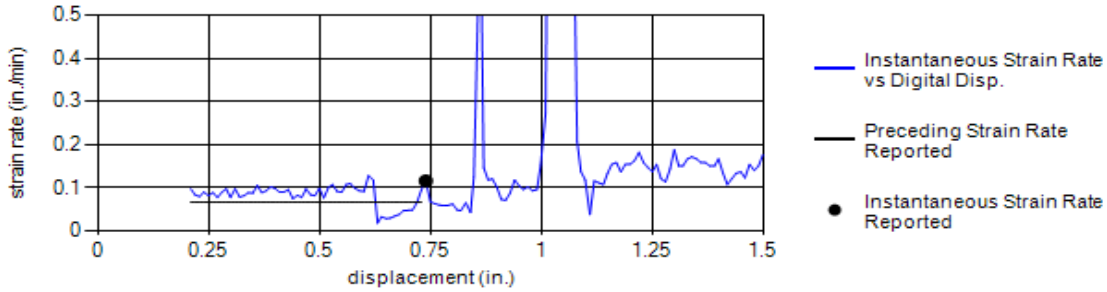
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3694	5475	5303	4920	6102	5099	1.02	5011



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.07	0.08



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

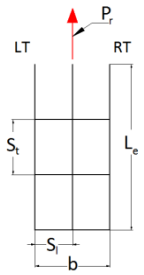
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 2:12:00 PM
Test Identification:	TS50.21-G-9x24-W20xW15-L6-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	3	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.44	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	24	*Spacing, S_l (in.):*	9

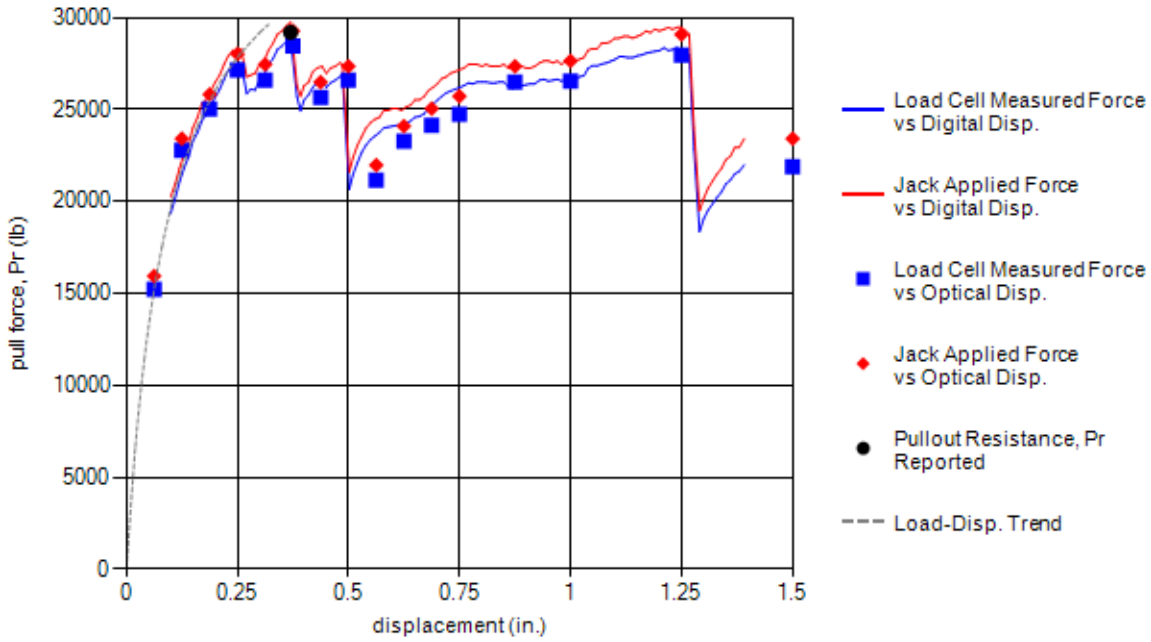
Backfill Material

Specification:	TxDOT Item 423 - Type A	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)		Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5	
Optimum Moisture Content, OMC (%):	6.6%	

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Progressive Rupture	0.37	5053	29185	39.30	**0.32**

Load-Displacement Curve



Comments

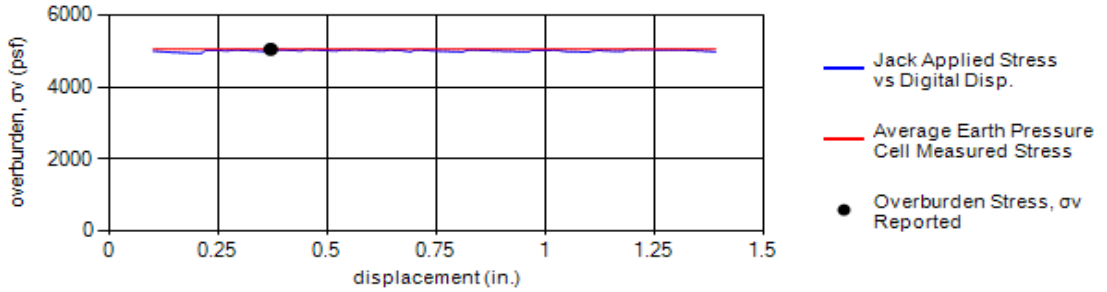
No incidental skew data.

Personnel

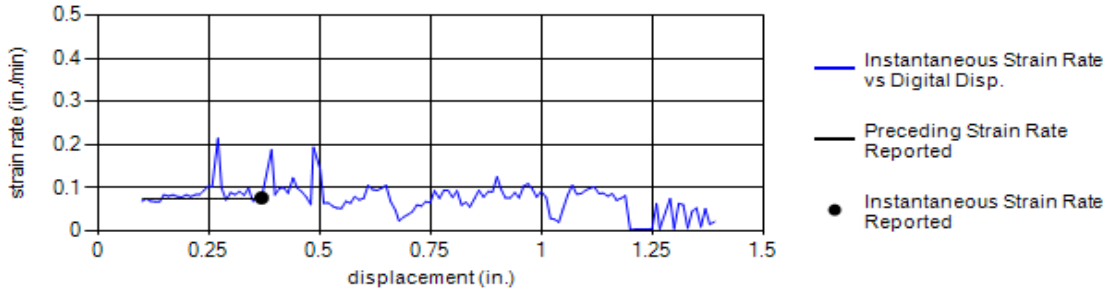
Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3609	5320	5288	4983	6080	5056	1.05	5037



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.07	0.07



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
No Data	No Data	No Data	No Data	No Data	No Data

Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

Appendix N

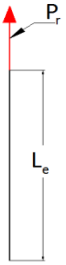
MSE Reinforcement Pullout Test Reports: Smooth Bars in Type A Backfill

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 1:51:00 PM
Test Identification:	TS50.01-B-W9.5-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

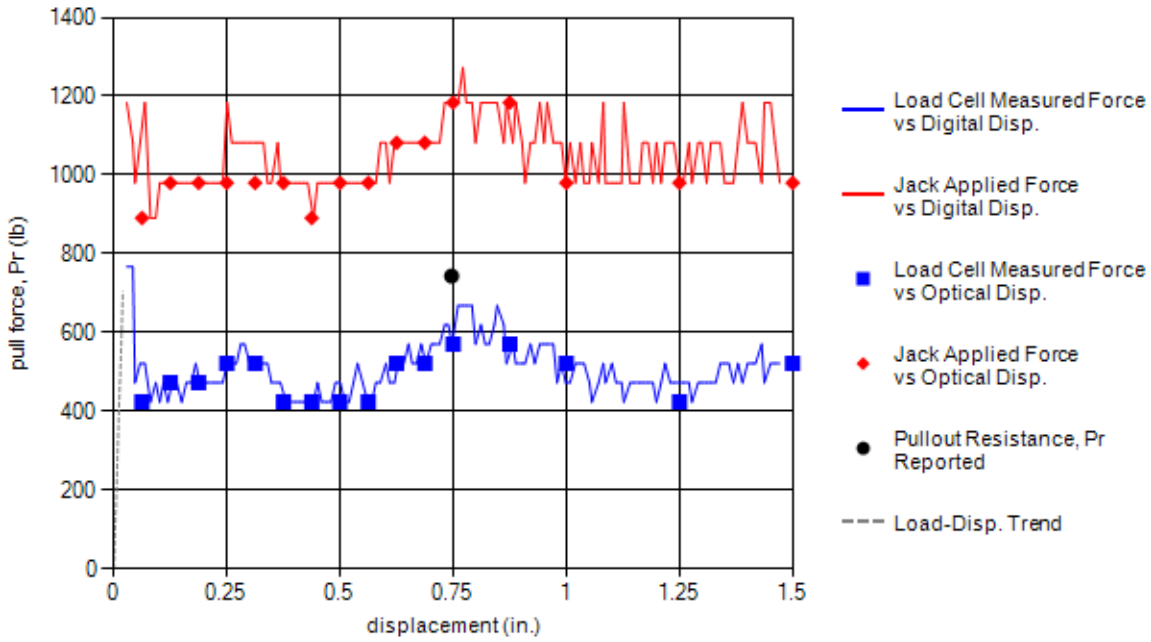
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.75	621	744	5.10	--

Load-Displacement Curve



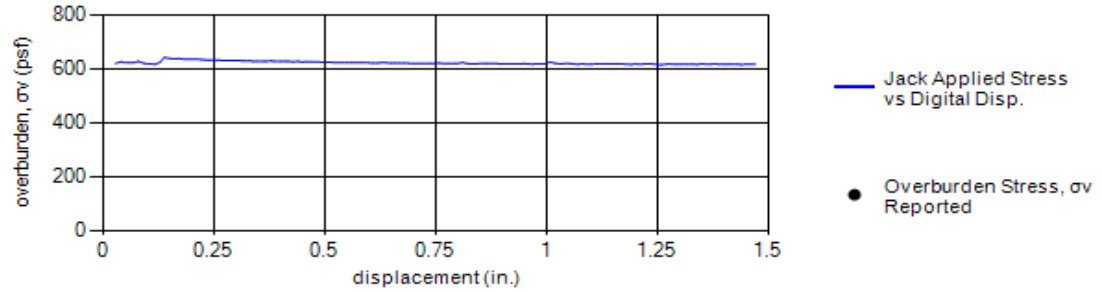
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

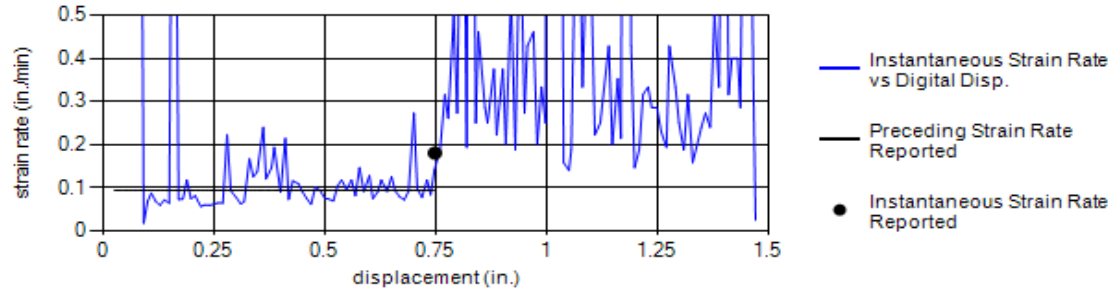
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	621



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.09	0.45



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

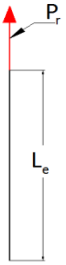
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 2:18:00 PM
Test Identification:	TS50.02-B-W20-L6-Z5-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

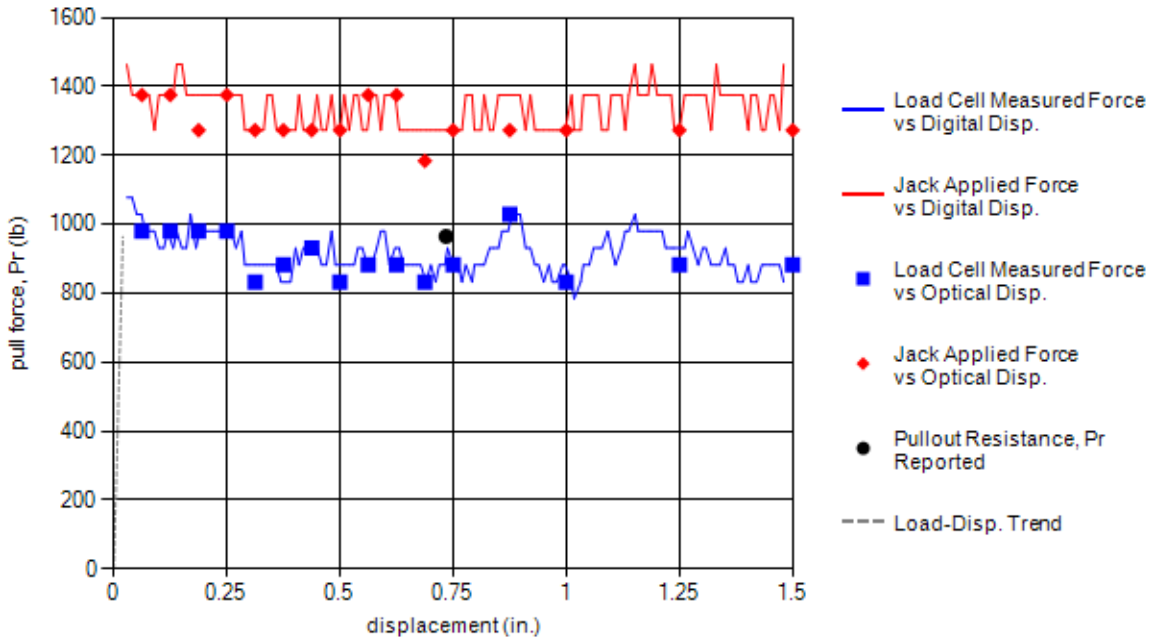
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	639	965	5.20	--

Load-Displacement Curve



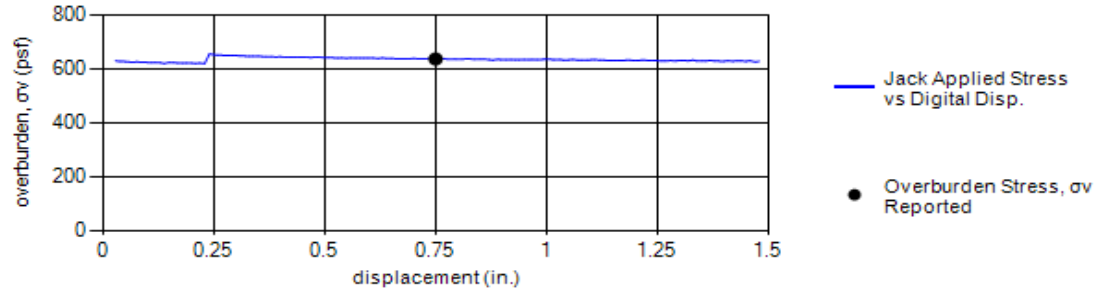
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

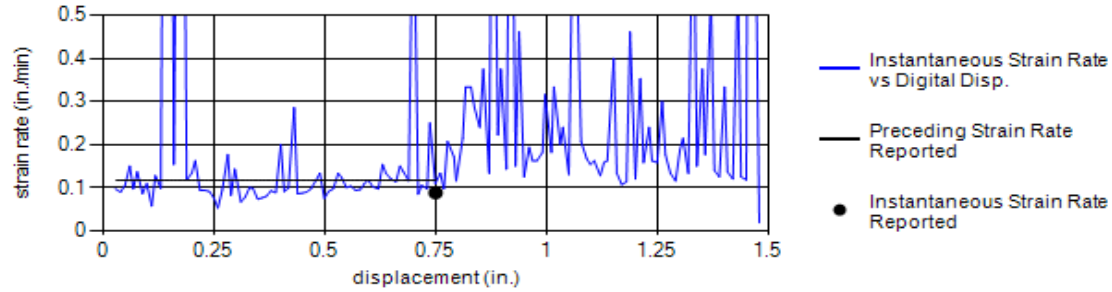
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	639



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.11	0.13



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

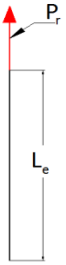
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 8:57:00 AM
Test Identification:	TS50.03-B-W20-L6-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

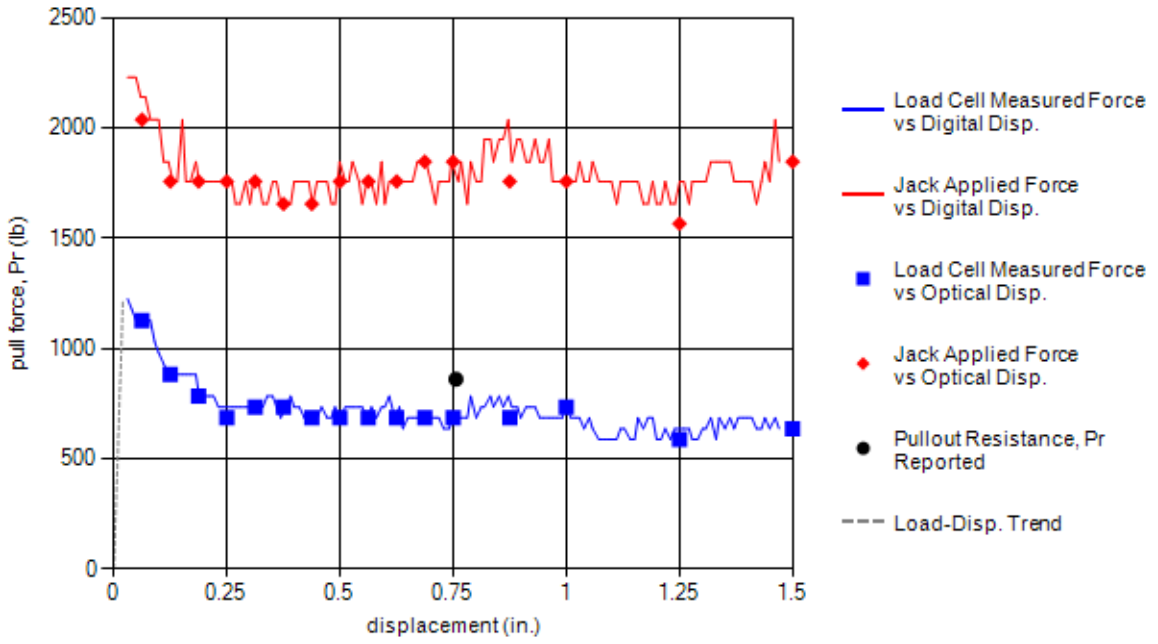
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.76	1484	861	12.10	--

Load-Displacement Curve



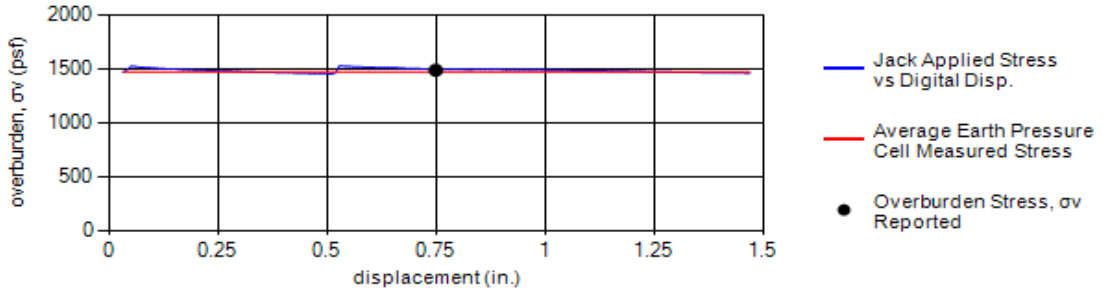
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

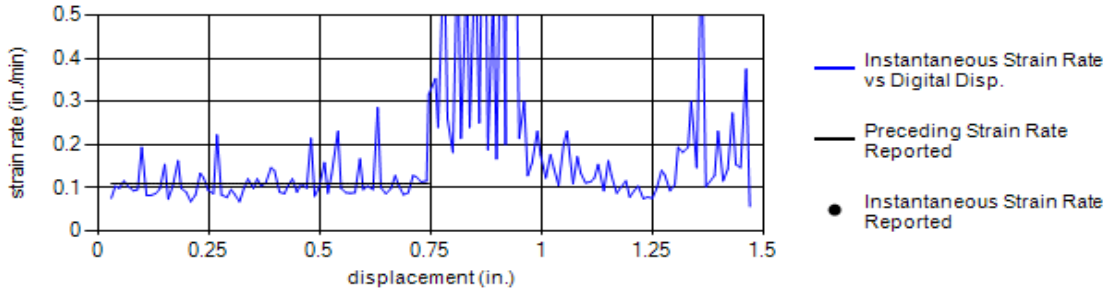
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
880	1533	1618	1496	1849	1475	1.05	1502



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
1.20	0.11	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

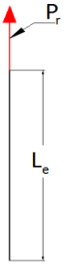
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 10:45:00 AM
Test Identification:	TS50.04-B-W20-L6-Z20-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

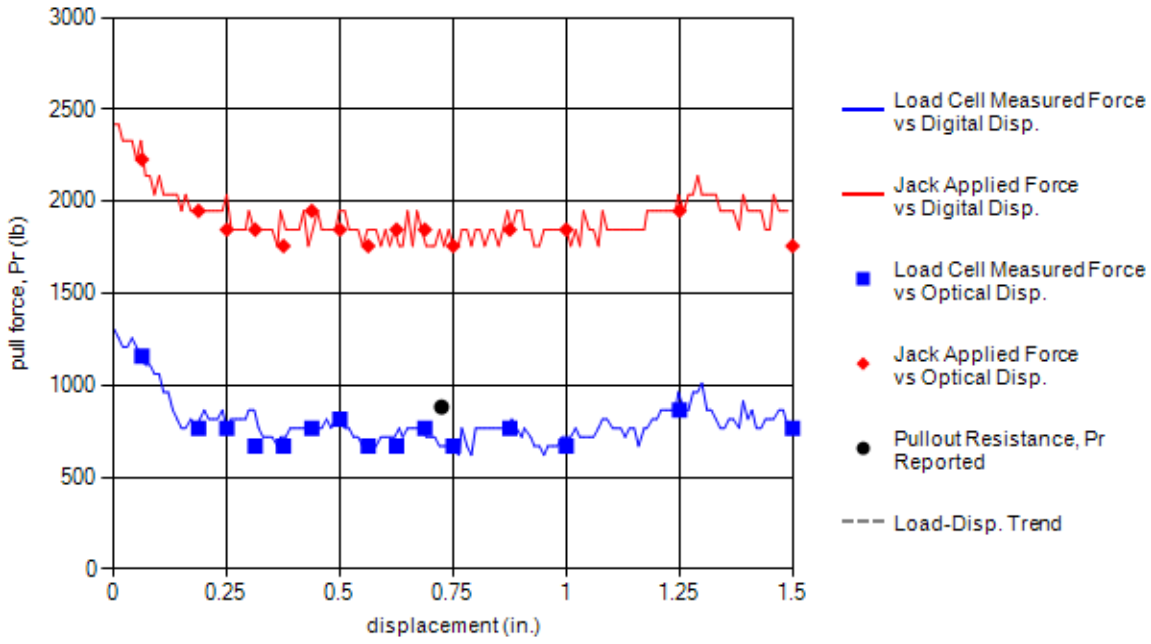
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	2444	882	19.90	--

Load-Displacement Curve



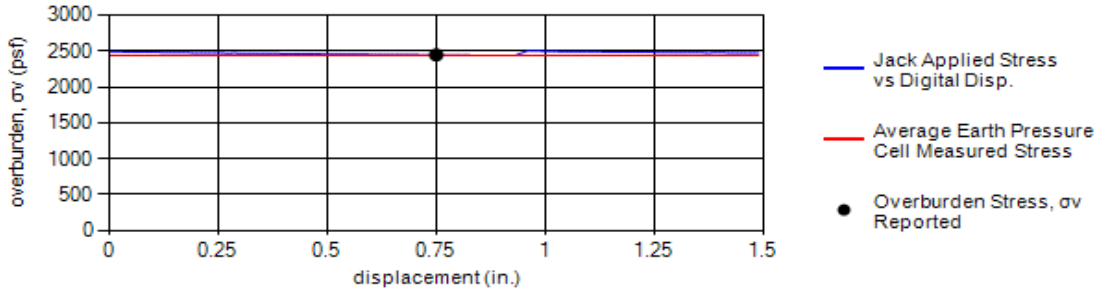
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

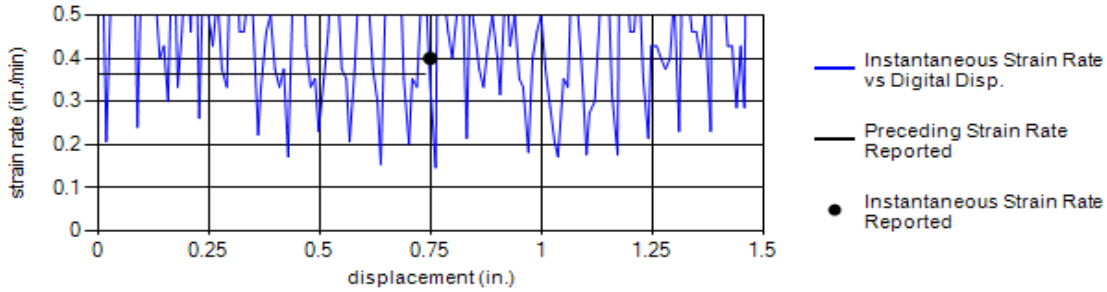
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
1568	2577	2673	2402	2996	2443	1.02	2448



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.45	0.34	0.36



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

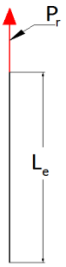
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 5:39:00 PM
Test Identification:	TS50.05-B-W20-L3-Z40-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

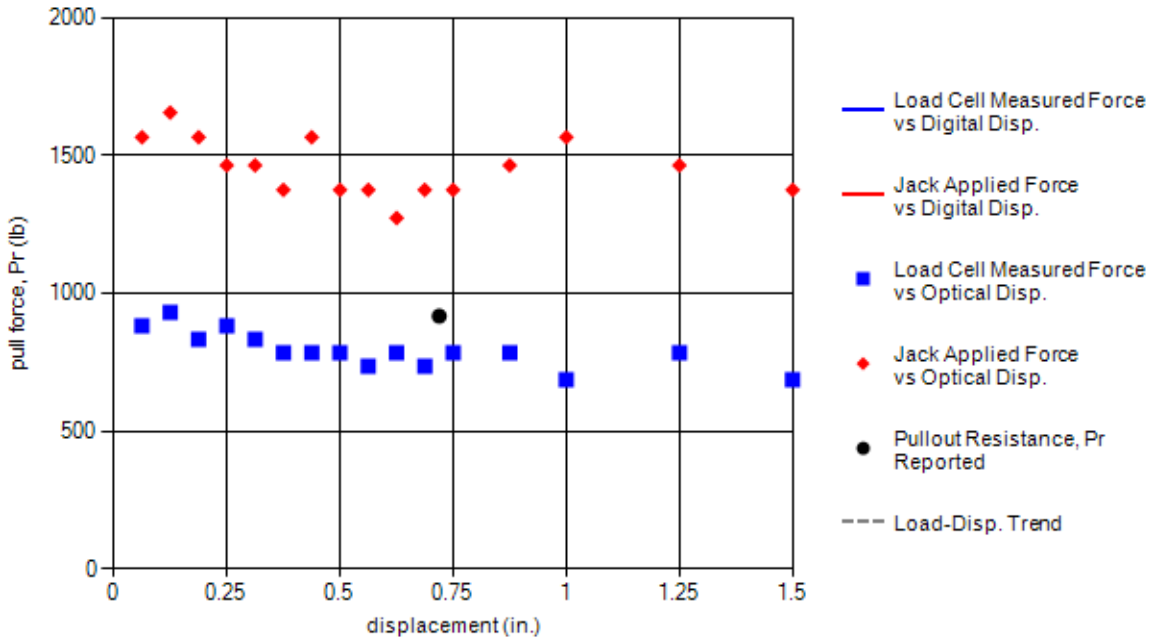
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.72	4899	917	39.90	--

Load-Displacement Curve



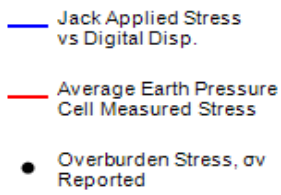
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3668	5083	5107	4782	5916	4911	1.06	4866



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.48	0.73

Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

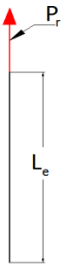
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 9:25:00 AM
Test Identification:	TS50.06-B-W9.5-L3-Z12-T
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

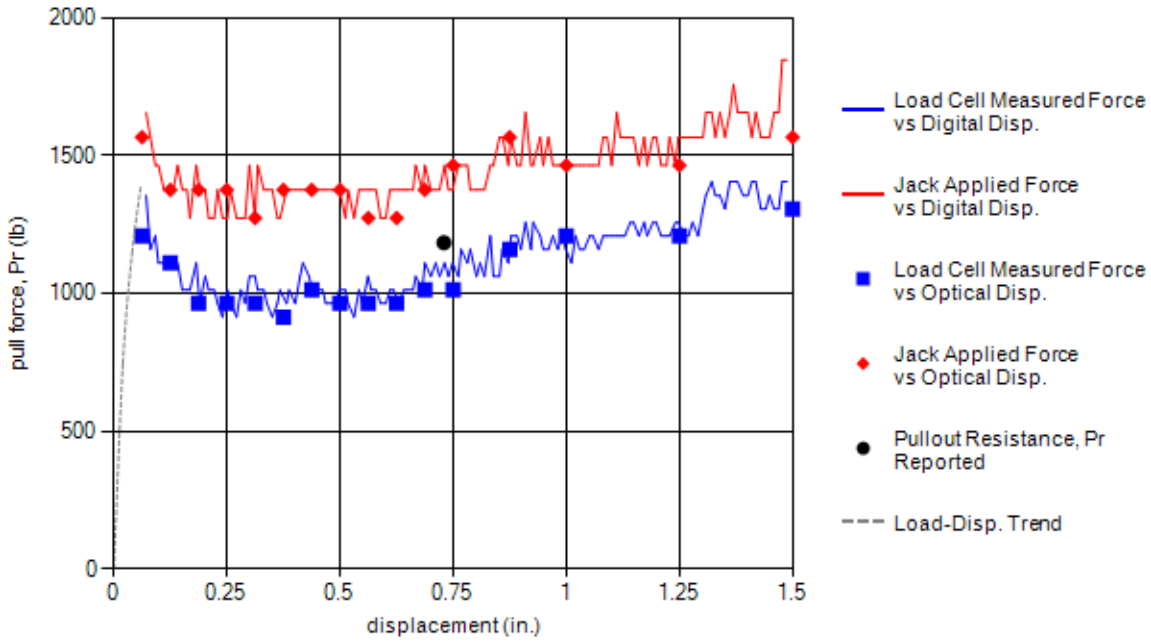
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	1566	1183	12.70	--

Load-Displacement Curve



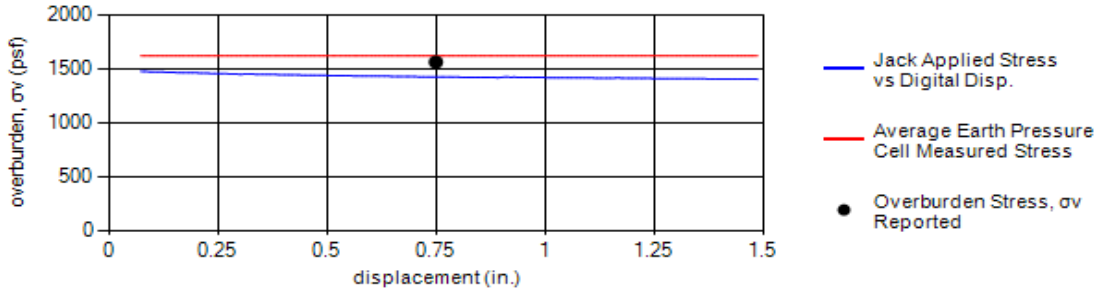
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

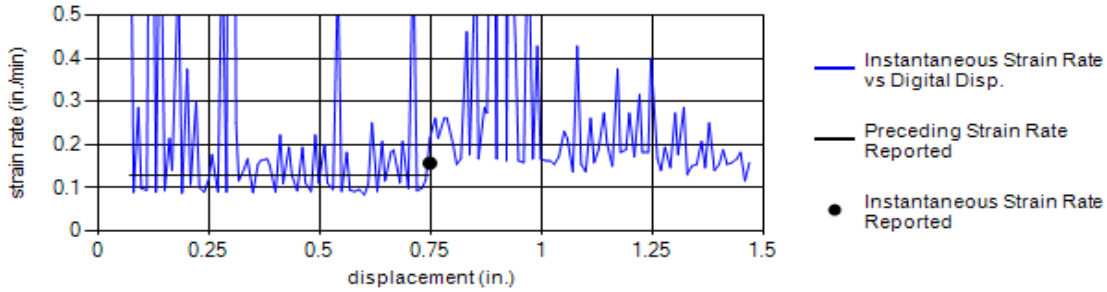
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
973	1691	1805	1632	2016	1623	1.05	1429



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.12	0.13	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

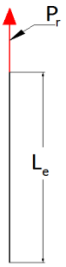
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 10:40:00 AM
Test Identification:	TS50.08-B-W9.5-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

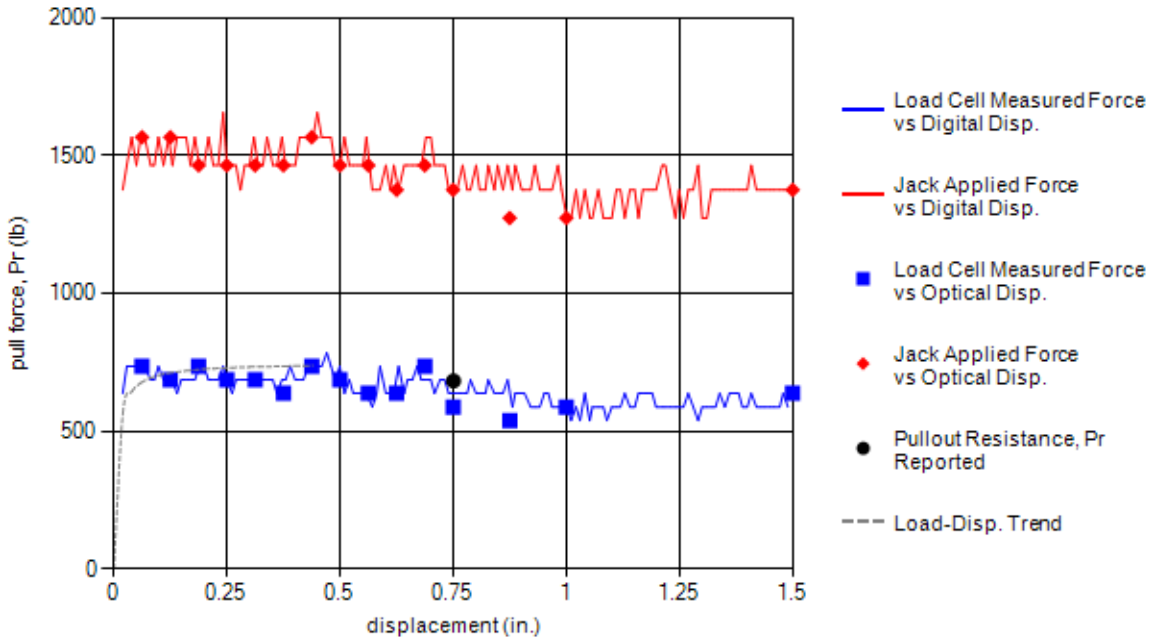
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	607	683	4.80	--

Load-Displacement Curve



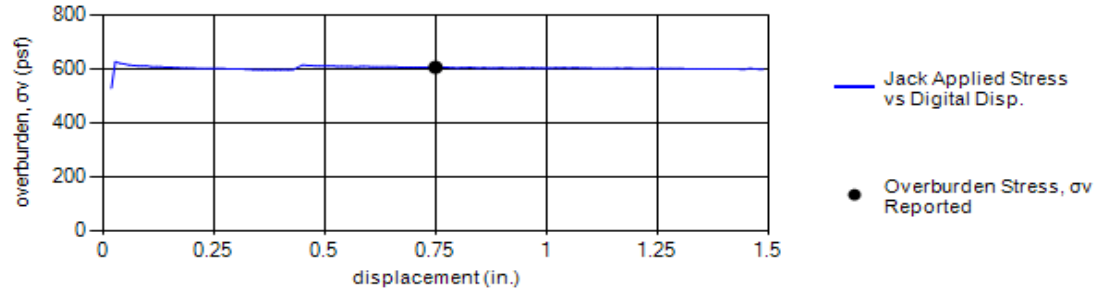
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

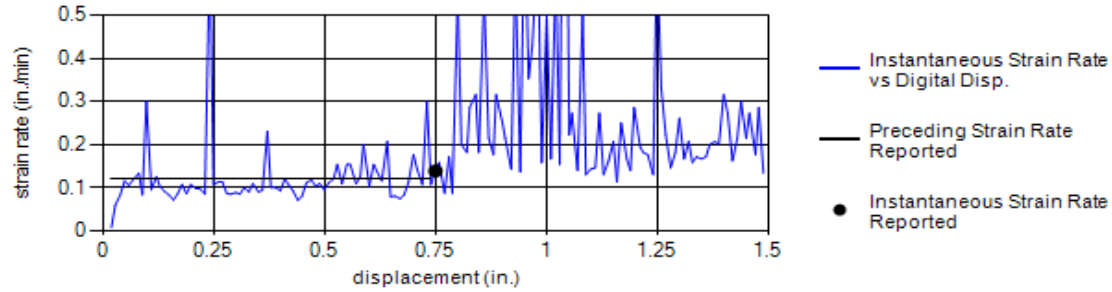
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	607



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.13	0.12	0.19



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

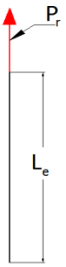
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 11:00:00 AM
Test Identification:	TS50.09-B-W20-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.5	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

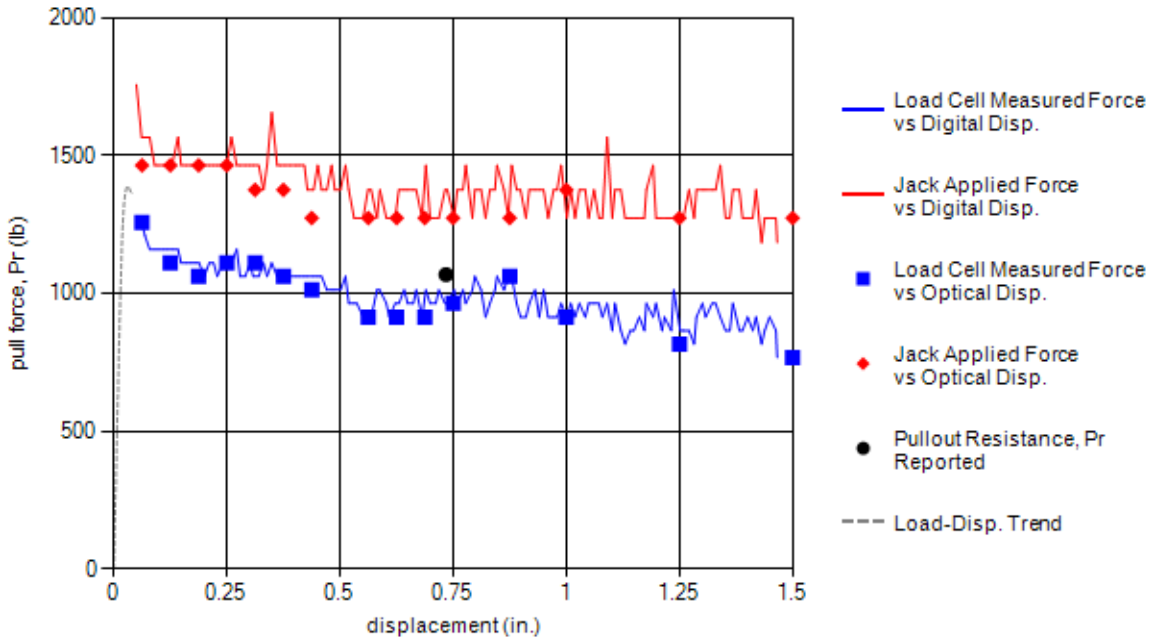
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	616	1068	4.90	--

Load-Displacement Curve



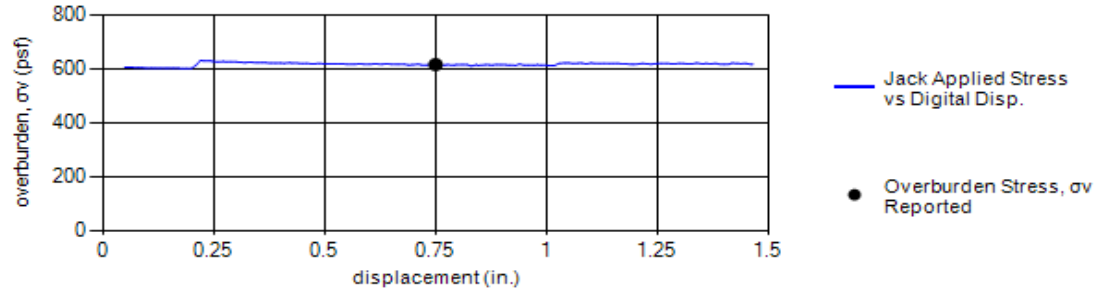
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

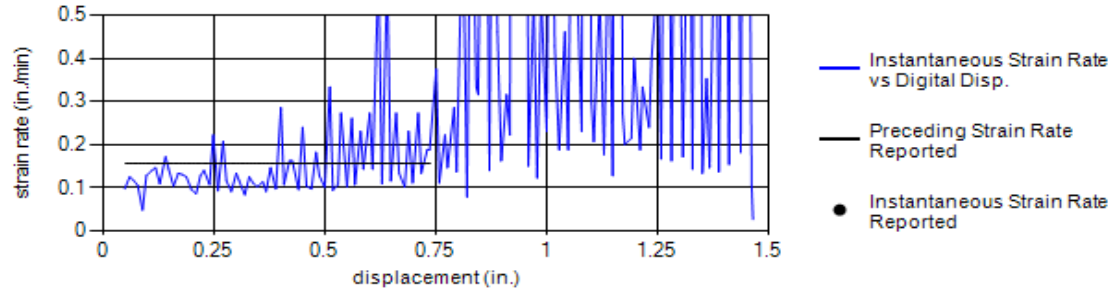
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.01	616



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.10	0.15	0.15



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

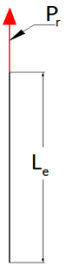
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 8:09:00 AM
Test Identification:	TS50.10-B-W20-L6-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

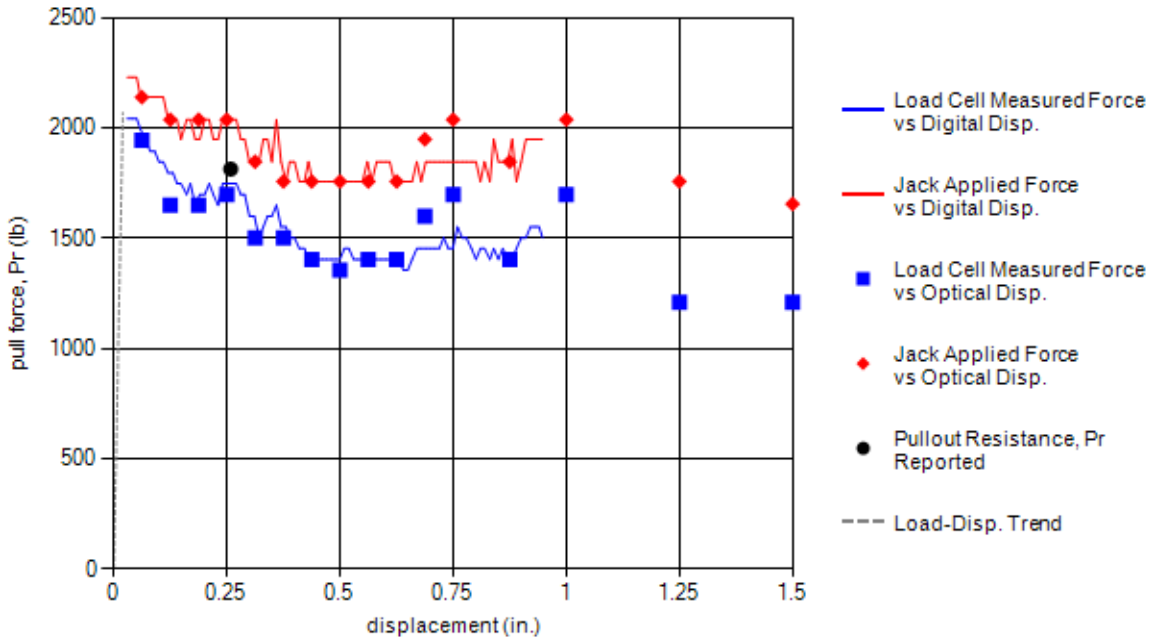
Specification:	TxDOT Item 423 - Type A
	Ordinary Compaction (TxDOT Item 132.3.D.1)
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.26	1528	1813	12.20	--

Load-Displacement Curve



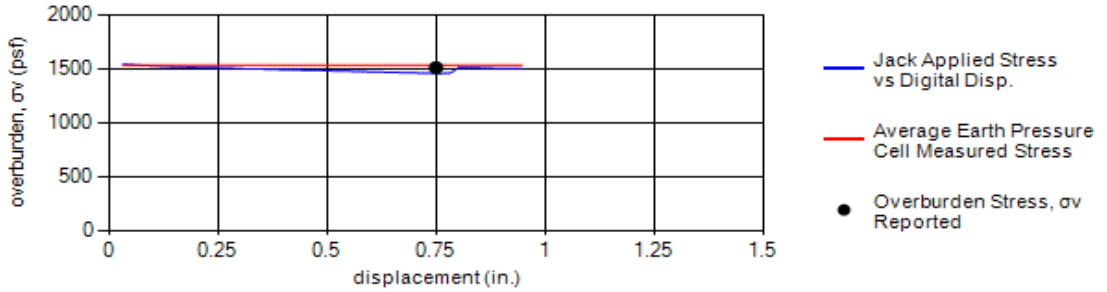
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

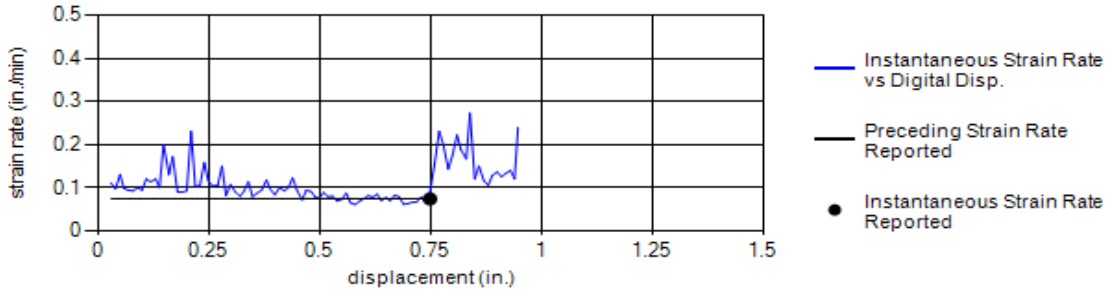
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
920	1591	1724	1574	1877	1537	1.06	1510



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.08	0.11	0.10



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

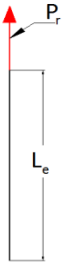
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 4:09:00 PM
Test Identification:	TS50.12-B-W20-L3-Z40-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	3.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

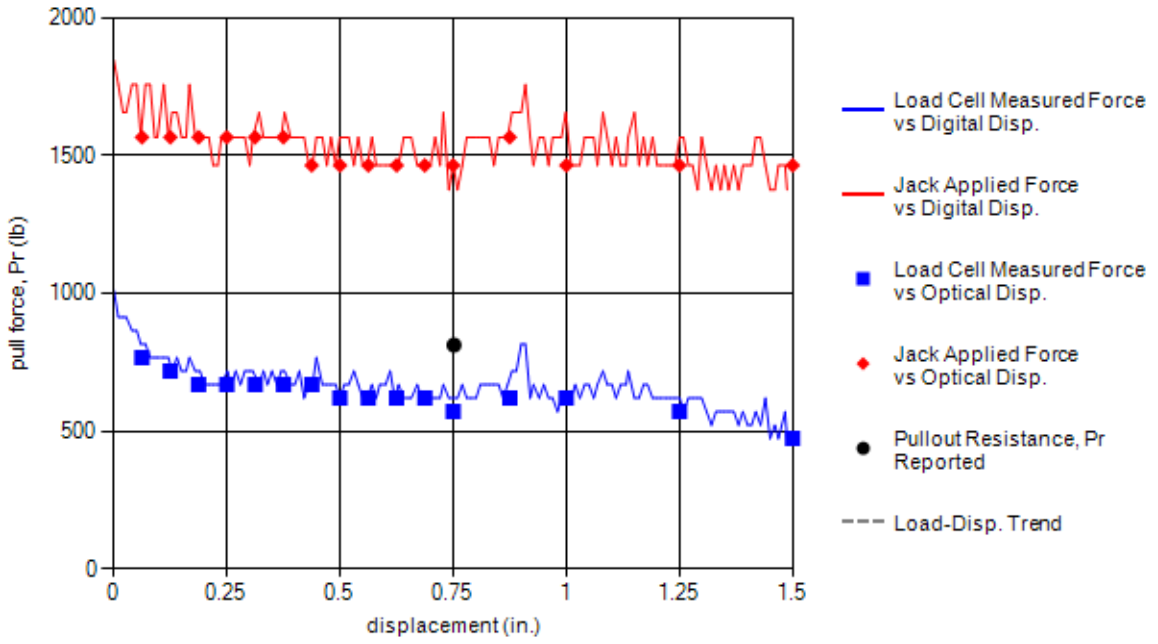
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.75	5126	812	40.80	--

Load-Displacement Curve



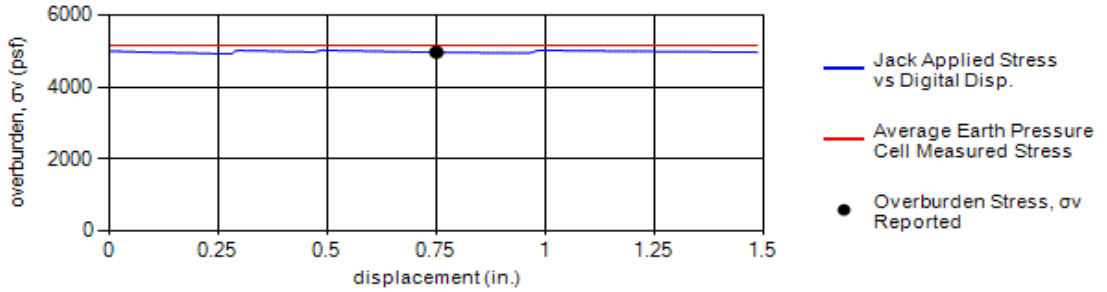
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

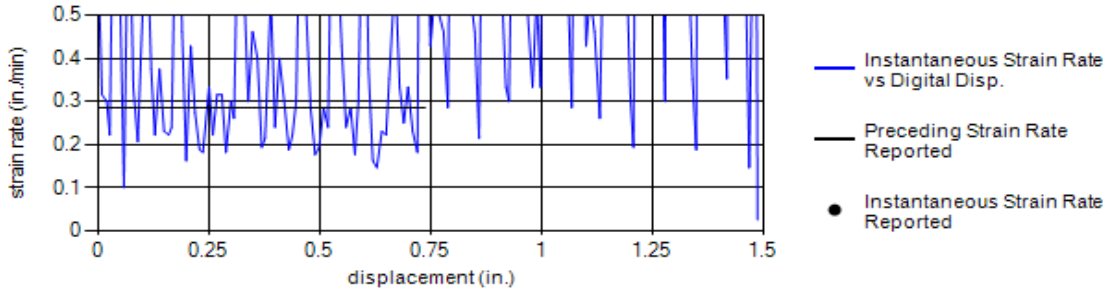
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3776	5485	5354	5021	6192	5166	1.01	4970



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.45	0.29	0.62



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

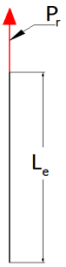
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 8:36:00 AM
Test Identification:	TS50.13-B-W9.5-L3-Z12-M
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

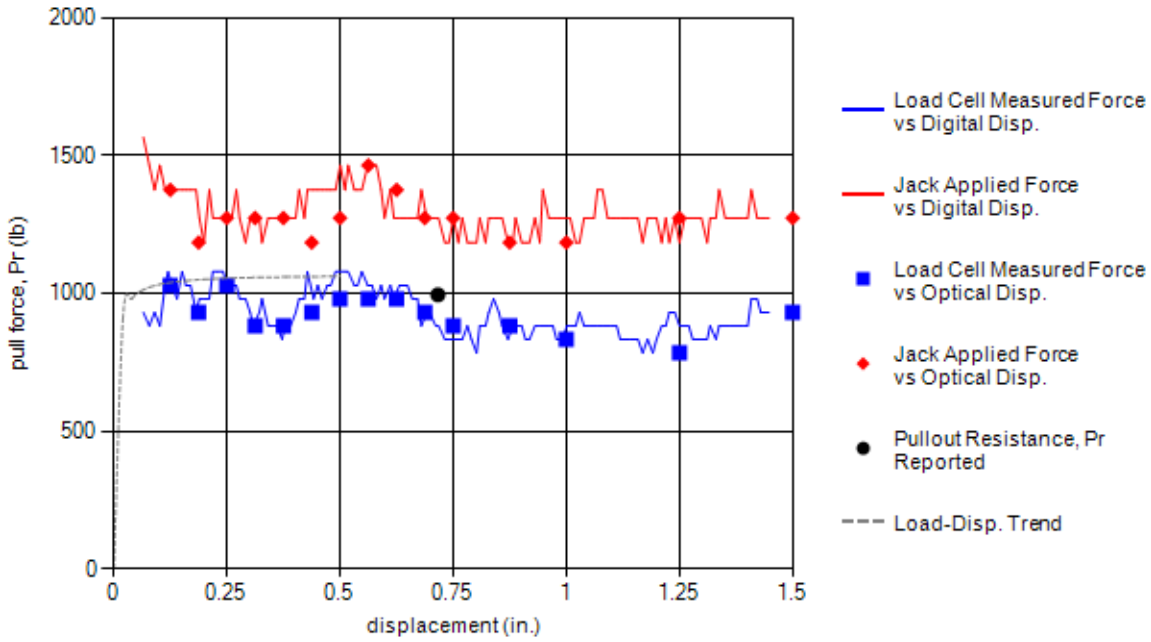
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured			Calculated	
	Displacement (in.)	*Vertical Stress, σ_v (psf)*	*Pullout Resistance, P_r (lb)*	*Effective Fill Depth, z_{eff} (ft)*	***Pullout Resistance Factor, F****
Pullout	0.72	1539	994	12.30	--

Load-Displacement Curve



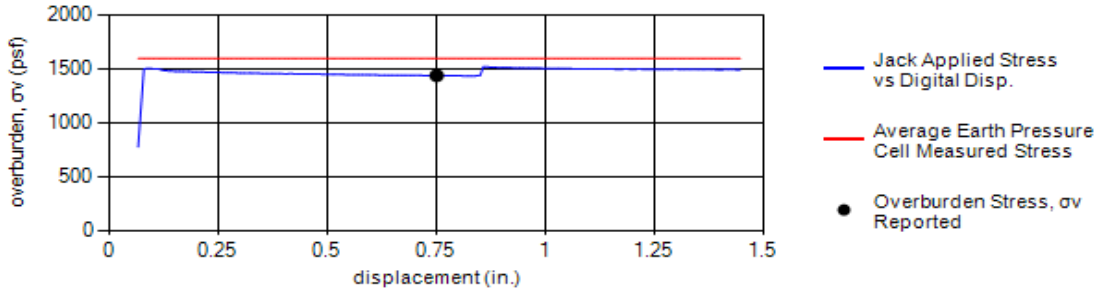
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

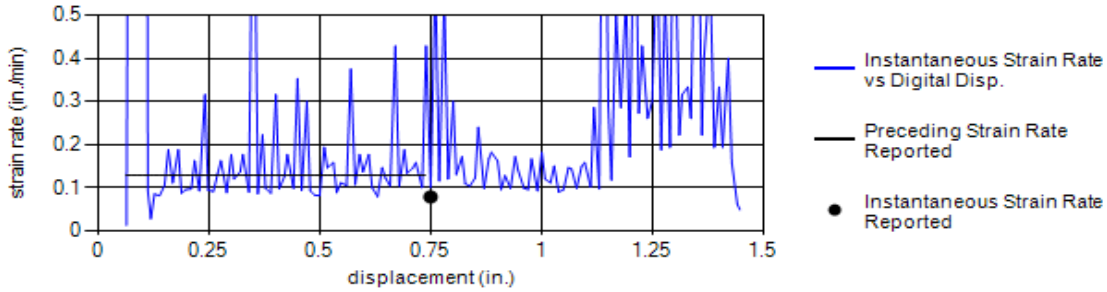
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
963	1661	1789	1634	1945	1598	1.04	1441



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.12	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

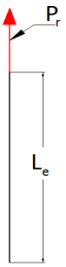
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 8:45:00 AM
Test Identification:	TS50.15-B-W9.5-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

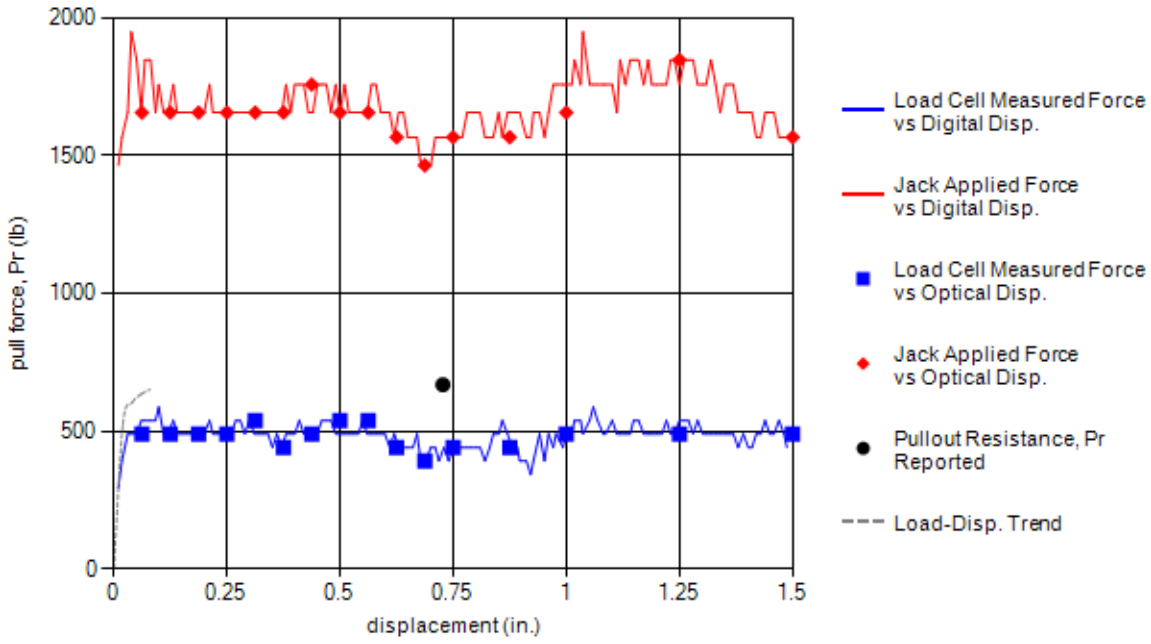
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	626	669	4.90	--

Load-Displacement Curve



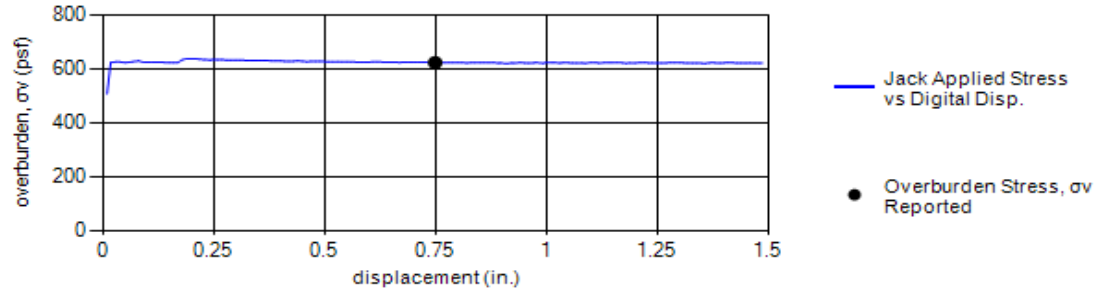
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

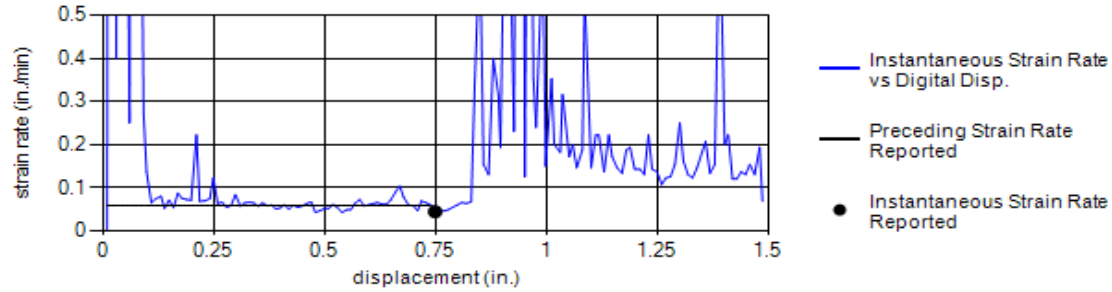
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	626



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.07	0.06	0.29



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

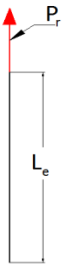
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 9:54:00 AM
Test Identification:	TS50.16-B-W20-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

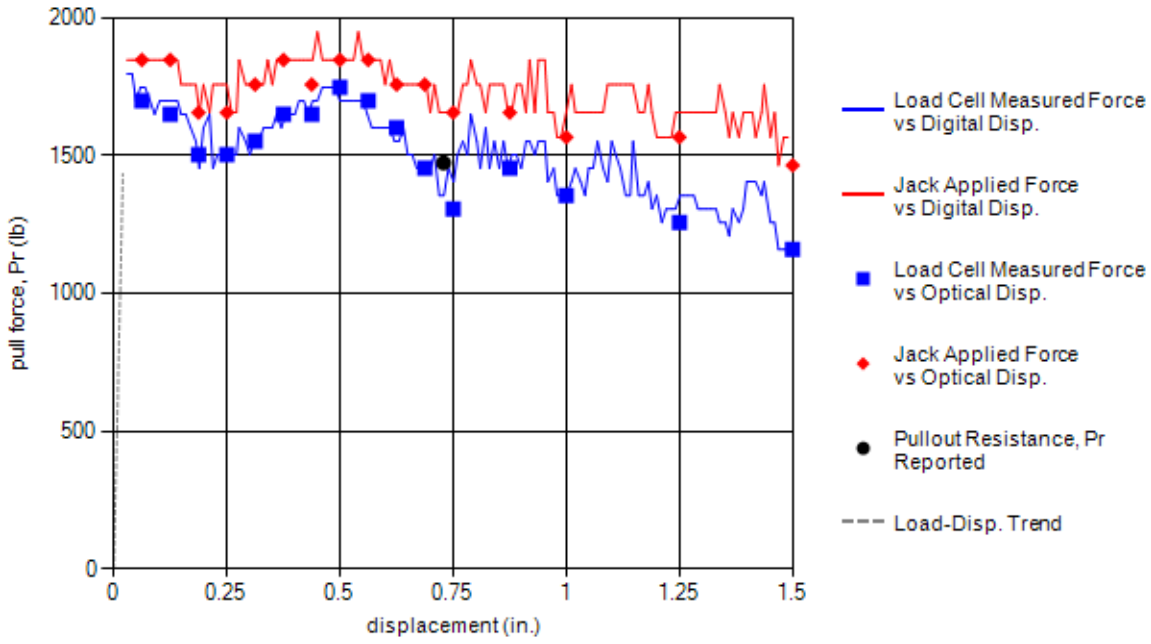
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	632	1473	4.90	--

Load-Displacement Curve



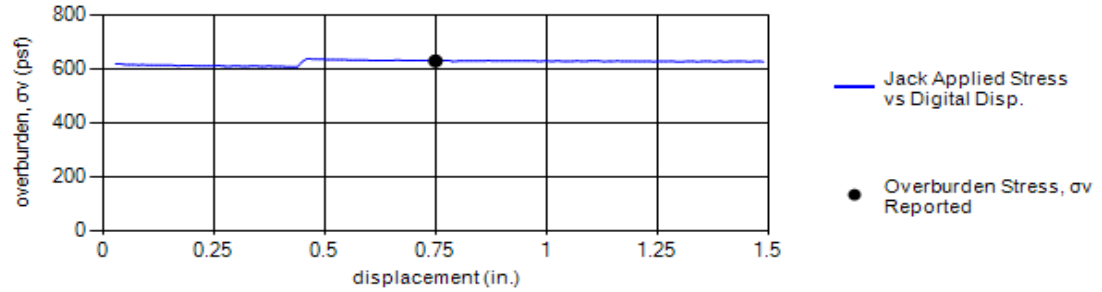
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

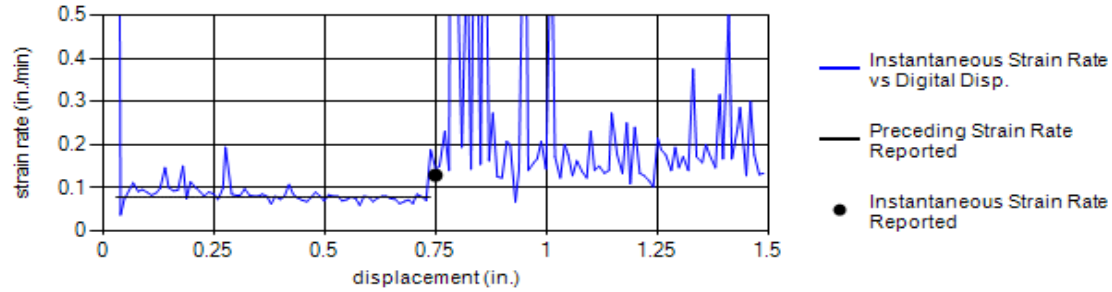
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.01	632



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.06	0.07	0.11



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

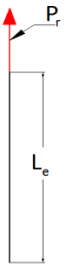
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/25/2012 2:54:00 PM
Test Identification:	TS50.17-B-W20-L6-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	6.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

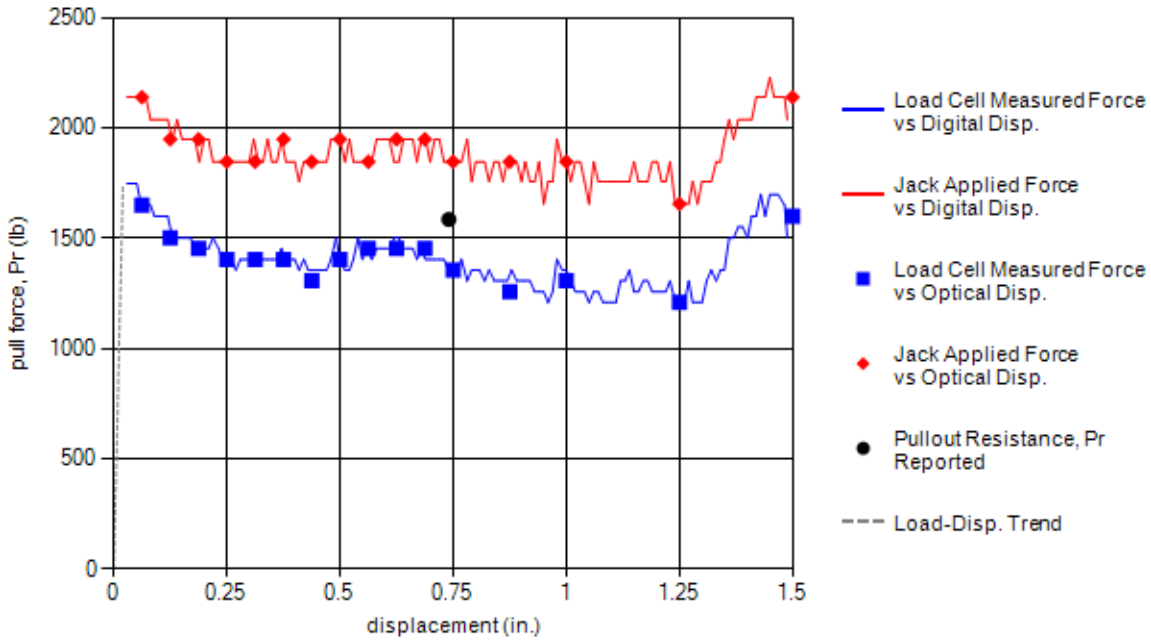
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.74	1487	1585	11.60	--

Load-Displacement Curve



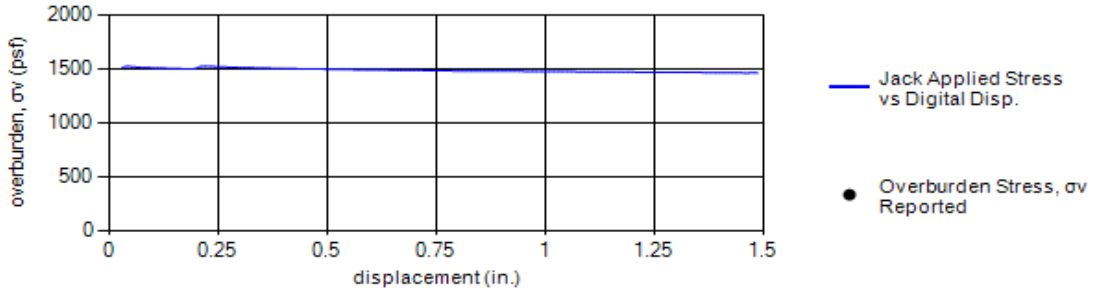
Comments

No earth pressure cell data. Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

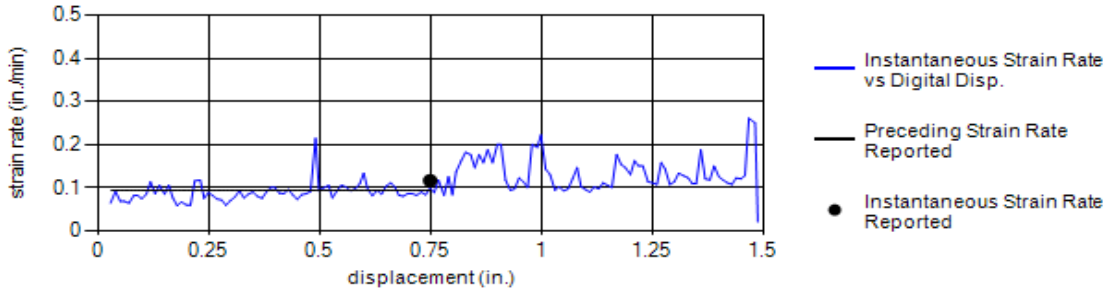
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
No Data	No Data	No Data	No Data	No Data	No Data	1.00	1487



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.09	0.09	0.09



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

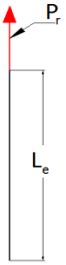
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 1:49:00 PM
Test Identification:	TS50.19-B-W20-L3-Z40-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

		Transverse Bars		Longitudinal Bars	
Type:	Smooth Bar	*Number, N_t:*	--	*Number, N_l:*	1
Length, L_e (ft):	3.0	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.50
Width, b (in.):	0.5	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--
Skew Angle, β (°):	0				

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

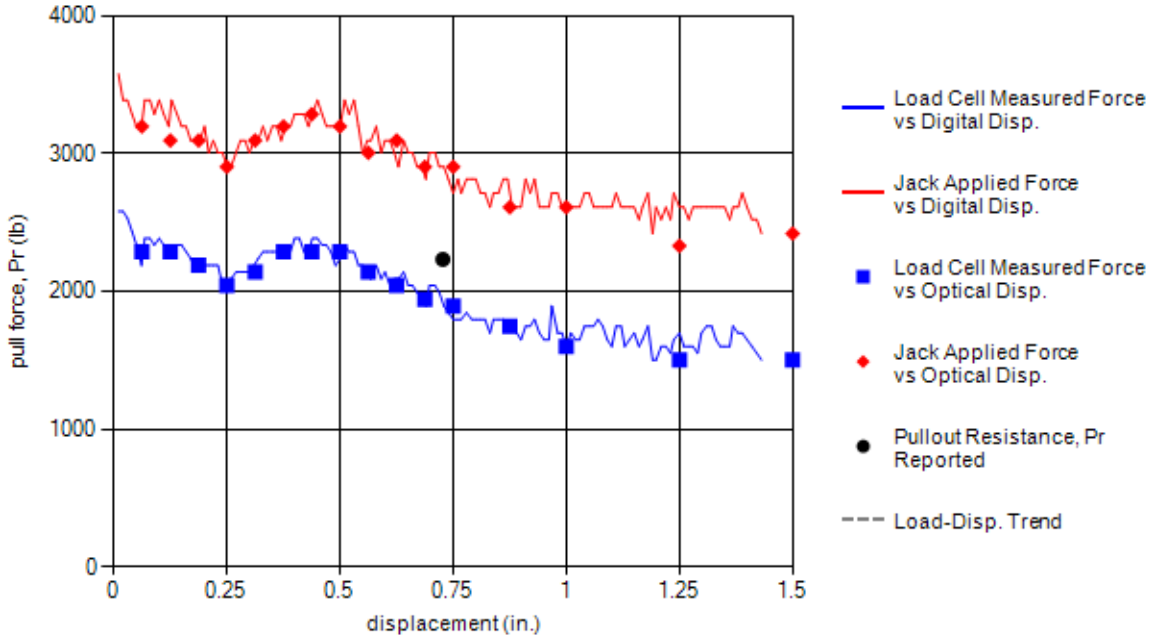
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.73	5134	2231	39.90	--

Load-Displacement Curve



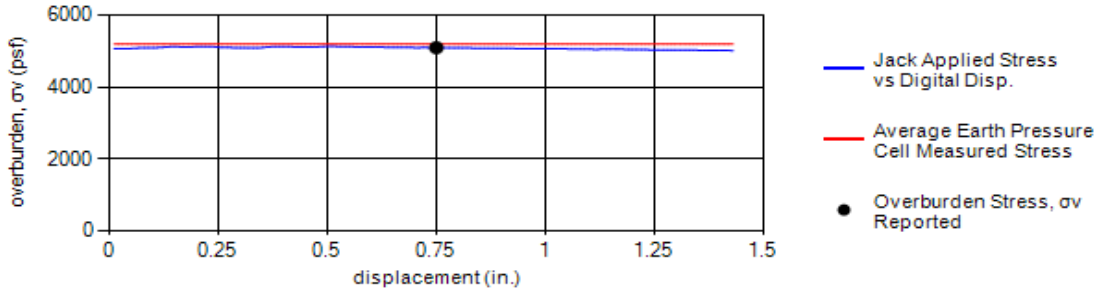
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

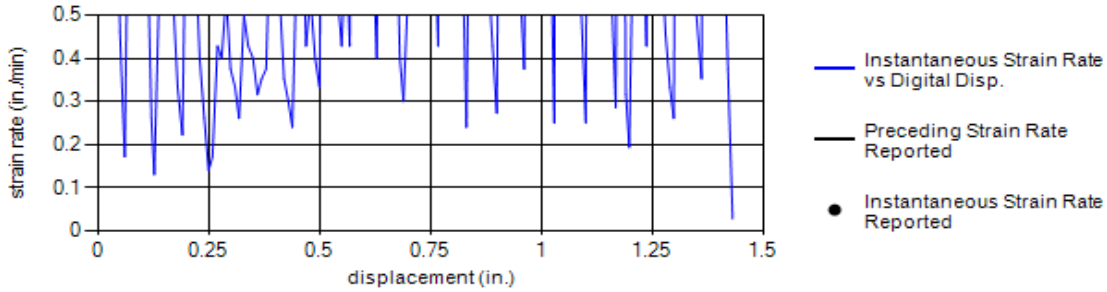
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
3638	5652	5371	5105	6193	5192	1.02	5106



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
3.60	0.60	0.47



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

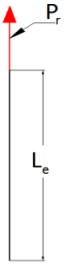
Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

REPORT OF MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/28/2012 7:04:00 AM
Test Identification:	TS50.20-B-W9.5-L3-Z12-B
Test Facility:	12'x12'x4' MSE Test Box

Test Specimen Sketch



MSE Reinforcement

Type:	Smooth Bar	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	3.0	*Number, N_t:*	--	*Number, N_l:*	1
Width, b (in.):	0.348	*Diameter, t (in.):*	--	*Diameter, t_l (in.):*	0.35
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	--	*Spacing, S_l (in.):*	--

Backfill Material

Specification:	TxDOT Item 423 - Type A
Moisture Density Relationship (TEX-114-E)	
Maximum Dry Unit Weight, γ_{dmax} (pcf):	122.5
Optimum Moisture Content, OMC (%):	6.6%

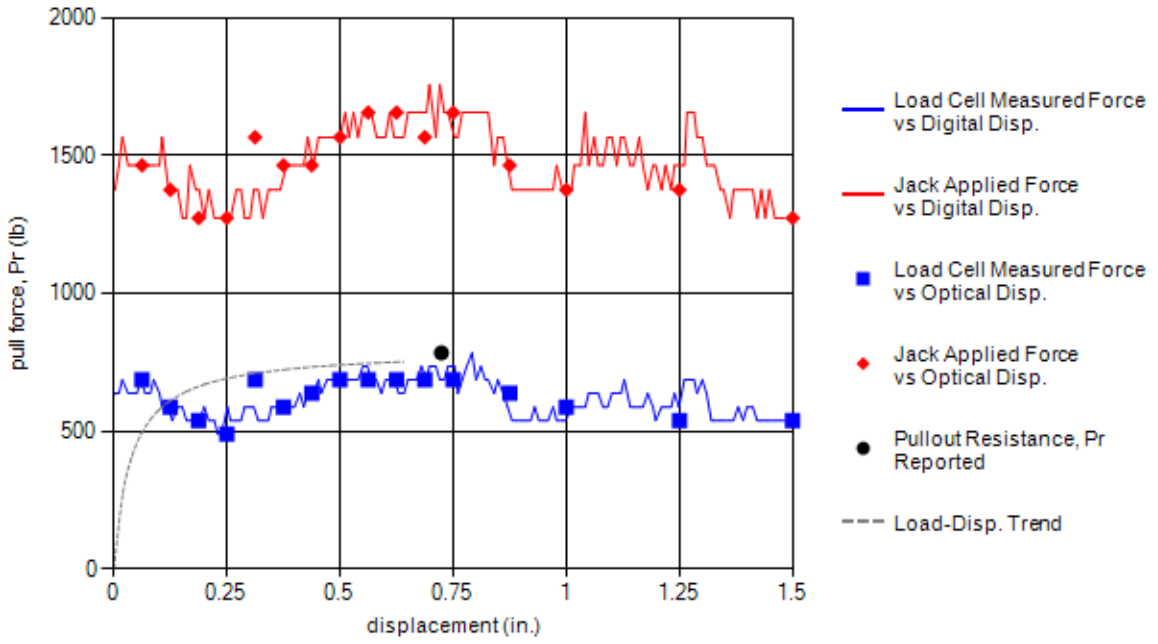
Ordinary Compaction (TxDOT Item 132.3.D.1)

Backfill placed in 3.5in. loose lifts. Each lift compacted with 4 passes of a vibratory plate compactor according to specification such that "there is no evidence of further consolidation."

Pullout Test Results

Reinforcement Behavior	Measured: *Displacement (in.)*	Measured: *Vertical Stress, σ_v (psf)*	Measured: *Pullout Resistance, P_r (lb)*	Calculated: *Effective Fill Depth, z_{eff} (ft)*	Calculated: ***Pullout Resistance Factor, F****
Pullout	0.72	1530	784	11.90	--

Load-Displacement Curve



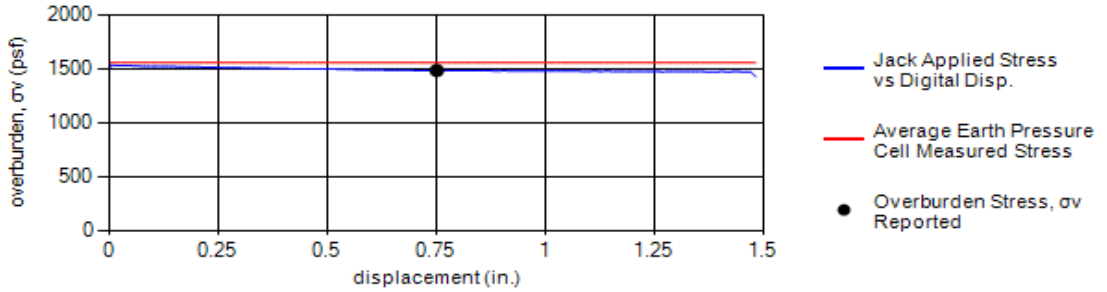
Comments

Reported pullout resistance corresponds to longitudinal bar contribution to welded steel grid system.

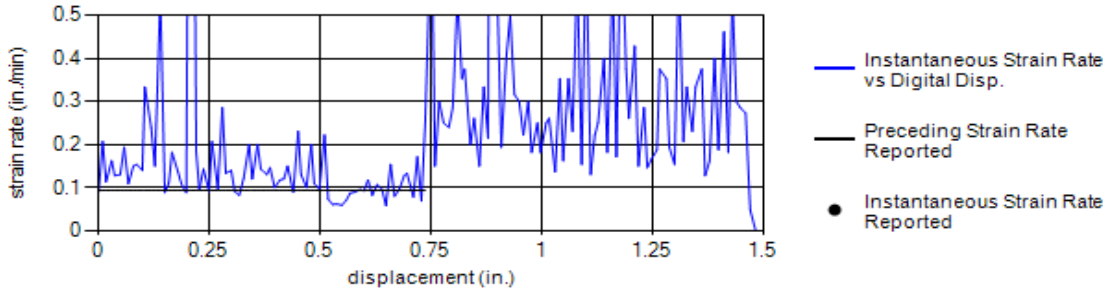
Personnel

Tested:	AJ AJ MN
Prepared:	TW TW
Checked:	WL PJ

Vertical Stress, σ_v (psf)							
EPC0	EPC1	EPC2	EPC3	EPC4	Avg. EPC	OCR	Jack
985	1596	1743	1616	1852	1559	1.05	1488



Strain Rate		
instantaneous rate (in./min)	*rate to reported displacement (in./min)*	*overall rate (in./min)*
0.14	0.09	0.24



Differential Displacement				Incidental Skew	
right-left (in.)	*right-center (in.)*	*center-left (in.)*	*elongation (in.)*	*skew angle (degrees)*	*skew rotation*
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Backfill Material Properties					
Unified Soil Classification, Pre-test/Post-test (ASTM D 2487):	GP-GM	Gradation (TEX-110-E) (% Retained)			
Resistivity (TEX-129-E) *(ohm-cm):*	6670	*Sieve*	*Spec*	*Pre-test*	*Post-test*
Soil pH (TEX-128-E)*:*	7.6	3in.	0	0	0
Shear Strength Properties (ASTM D 3080)		1.5in.		0	0
Cohesion, c (psf):	181	1in.		4	1
Internal Friction Angle, φ (deg.):	53	1/2in.	50-100	49	43
Atterberg Limits (TEX-104-E, TEX-105-E,TEX-106-E, TEX-107-E)		3/8in.		57	52
Liquid Limit, LL (%):	23	#4		70	65
Plastic Limit, PL (%):	20	#10		80	74
Plasticity Index, PI (%):	3	#40	85-100	89	83
Bar Linear Shrinkage, LS (%):	3	#200		95	90

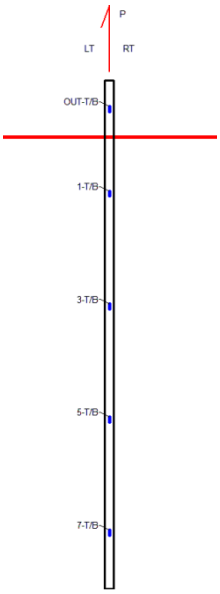
Appendix O

MSE Reinforcement Pullout Test Strain Gage Reports: Ribbed Strips in Type A Backfill

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

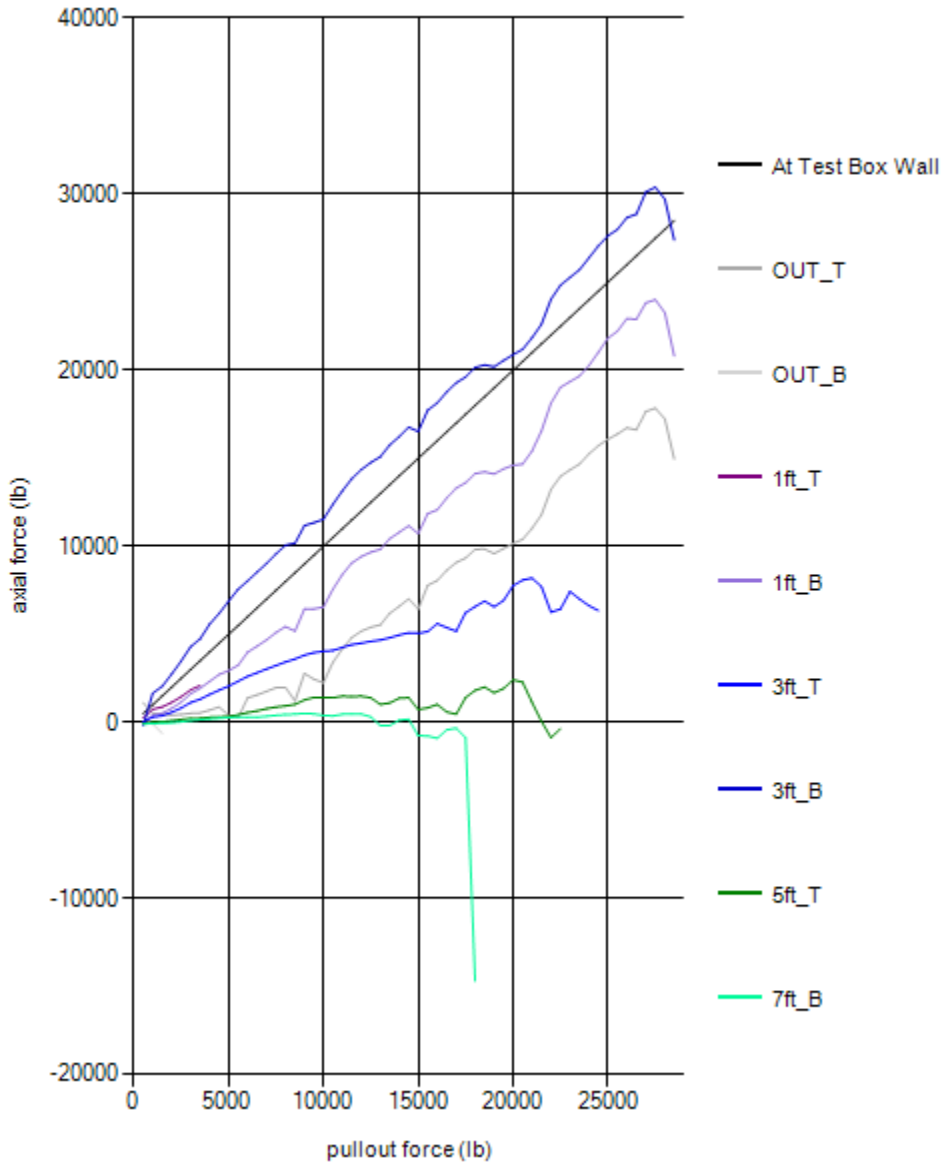
Test Information	
Test Date:	5/14/2012 3:38:00 PM
Test Identification:	TS48.17-S-L8-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

Sketch

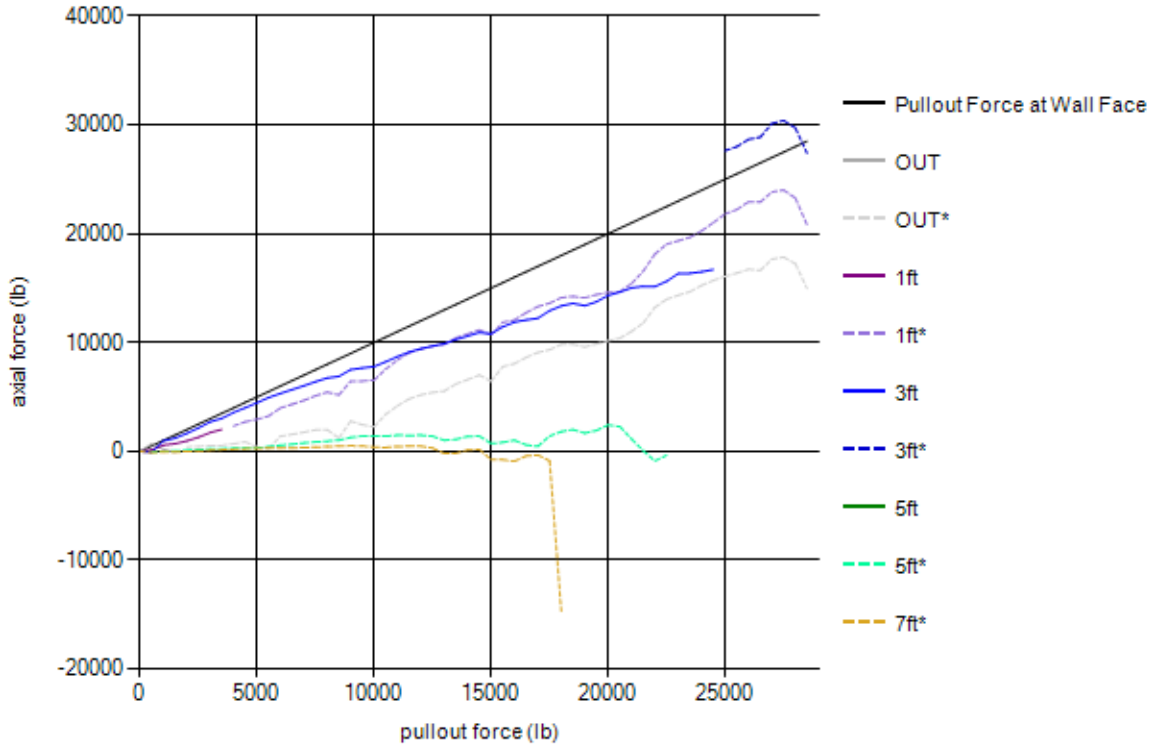


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

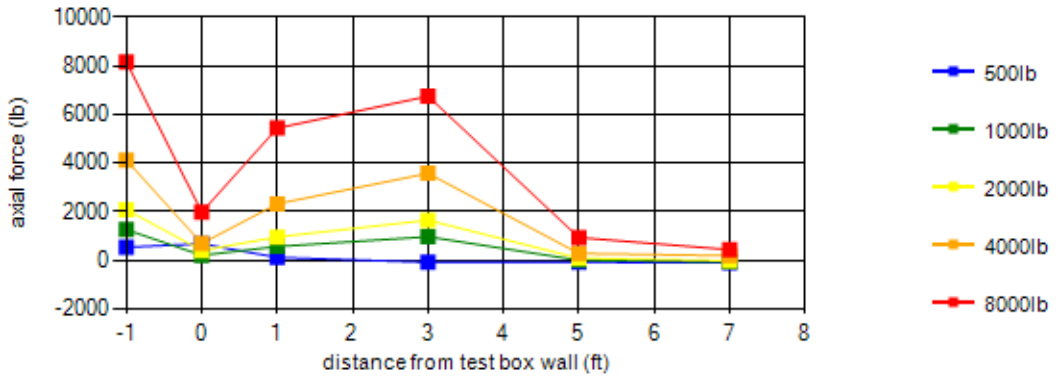
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

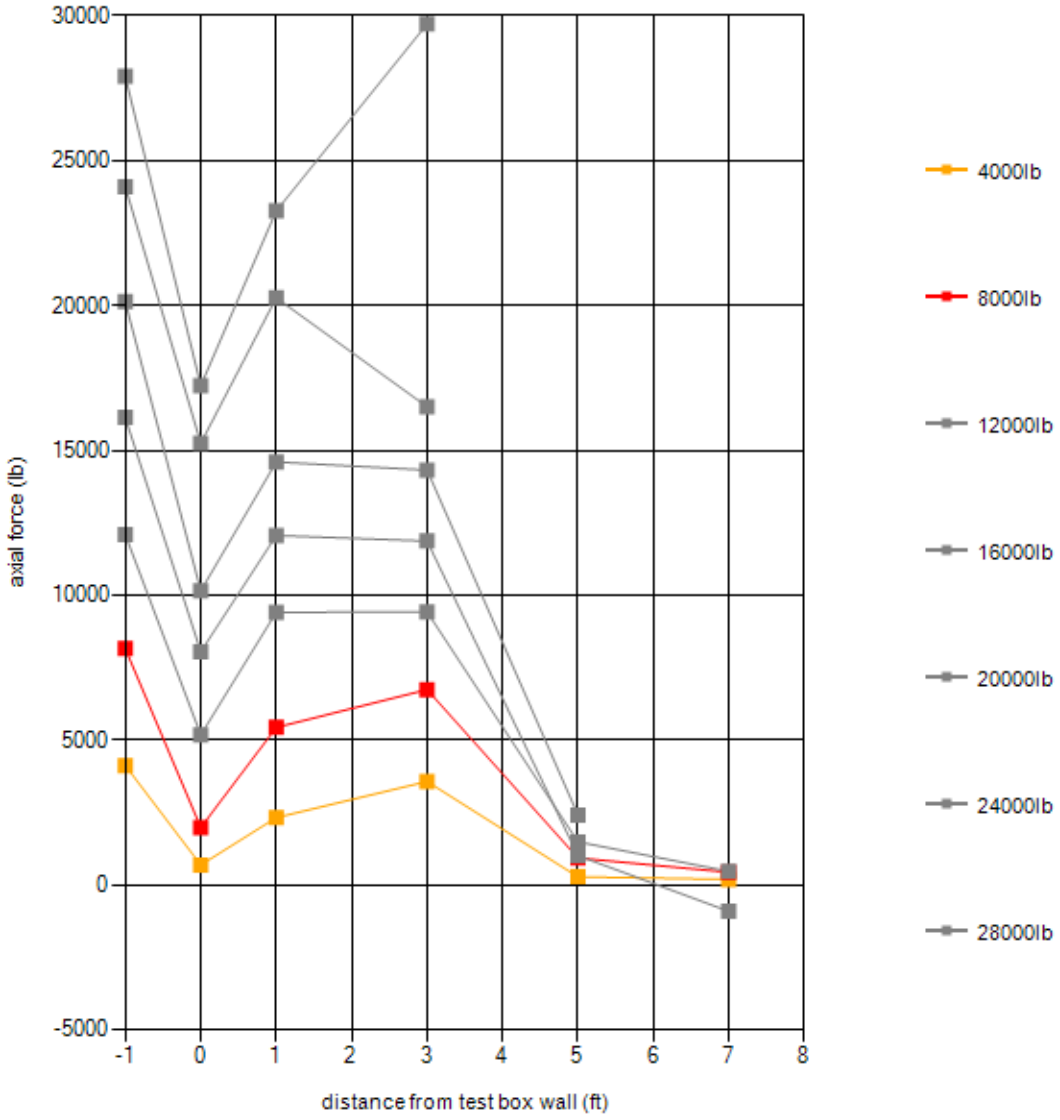


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*				
	OUT	*1ft*	*3ft*	*5ft**	*7ft**
500	689	126	-76	-73*	-96*
1000	212	573	975	9*	-59*
2000	410*	964	1658	94*	-16*
3000	514*	1735	2709	225*	106*
4000	695*	2330*	3579	287*	198*
5000	408*	2942*	4469	328*	273*
6000	1388*	3986*	5322	560*	285*
7000	1757*	4681*	6026	776*	347*
8000	1987*	5440*	6746	938*	445*
9000	2783*	6446*	7502	1278*	515*
10000	2254*	6547*	7787	1396*	397*
11000	4185*	8401*	8705	1487*	455*
12000	5186*	9418*	9431	1492*	476*
13000	5538*	9832*	9885	1023*	-184*
14000	6594*	10796*	10599	1377*	124*
15000	6449*	10727*	10792	726*	-753*
16000	8056*	12068*	11877	1018*	-906*
17000	9087*	13307*	12232	464*	-329*
18000	9828*	14127*	13367	1818*	-14687*
19000	9592*	14110*	13384	1679*	ND
20000	10159*	14603*	14324	2421*	ND
21000	11017*	15411*	15018	1147*	ND
22000	13232*	18129*	15146	-873*	ND
23000	14344*	19350*	16351	ND	ND
24000	15254*	20267*	16507	ND	ND
25000	16080*	21819*	27629*	ND	ND
26000	16728*	22934*	28667*	ND	ND
27000	17661*	23833*	30122*	ND	ND
28000	17238*	23269*	29719*	ND	ND

* calculated from 1 strain gage.

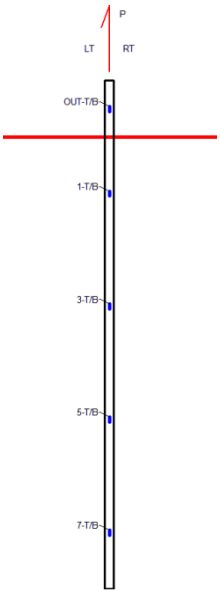
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

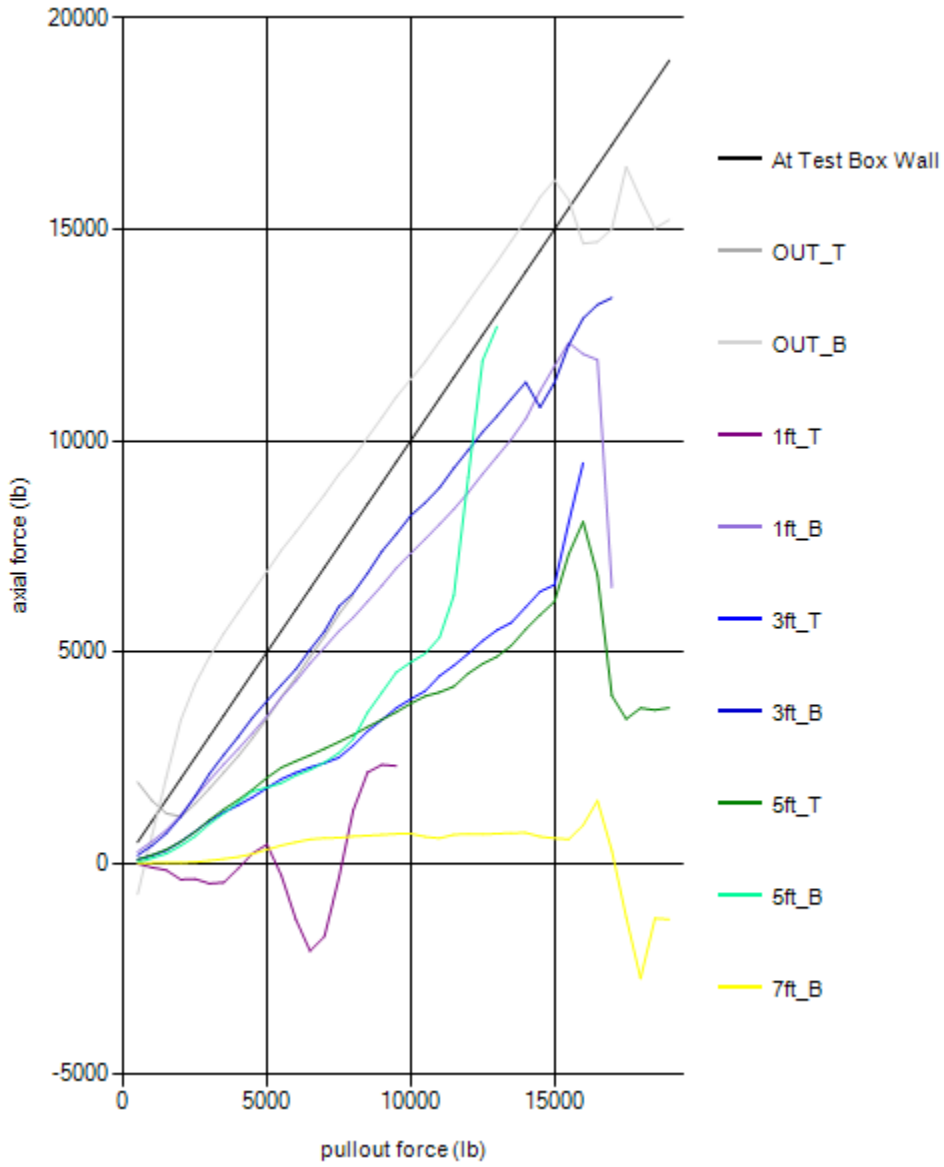
Test Information	
Test Date:	5/8/2012 2:04:00 PM
Test Identification:	TS48.18-S-L8-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

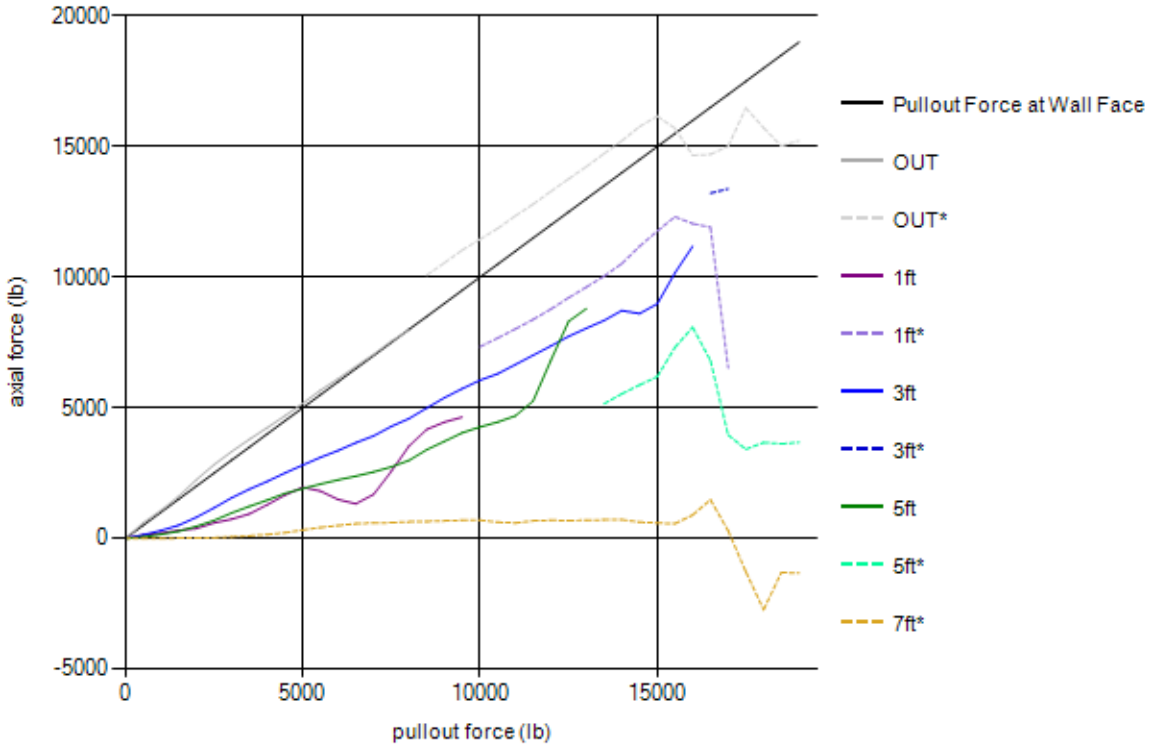


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

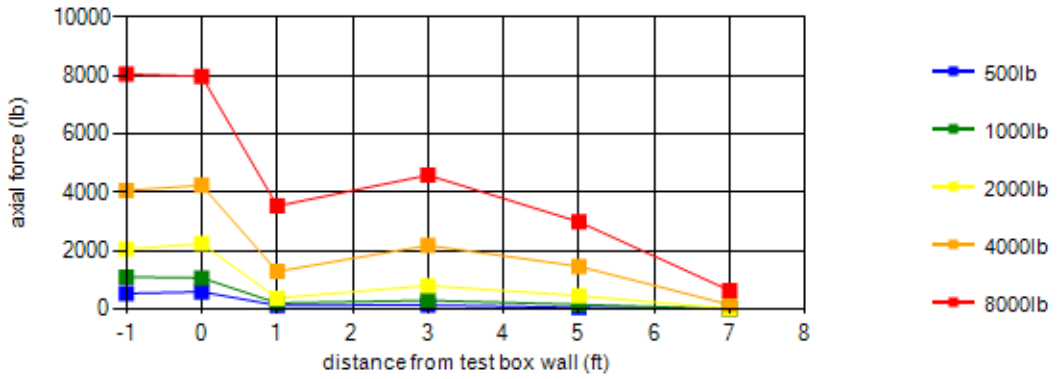
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

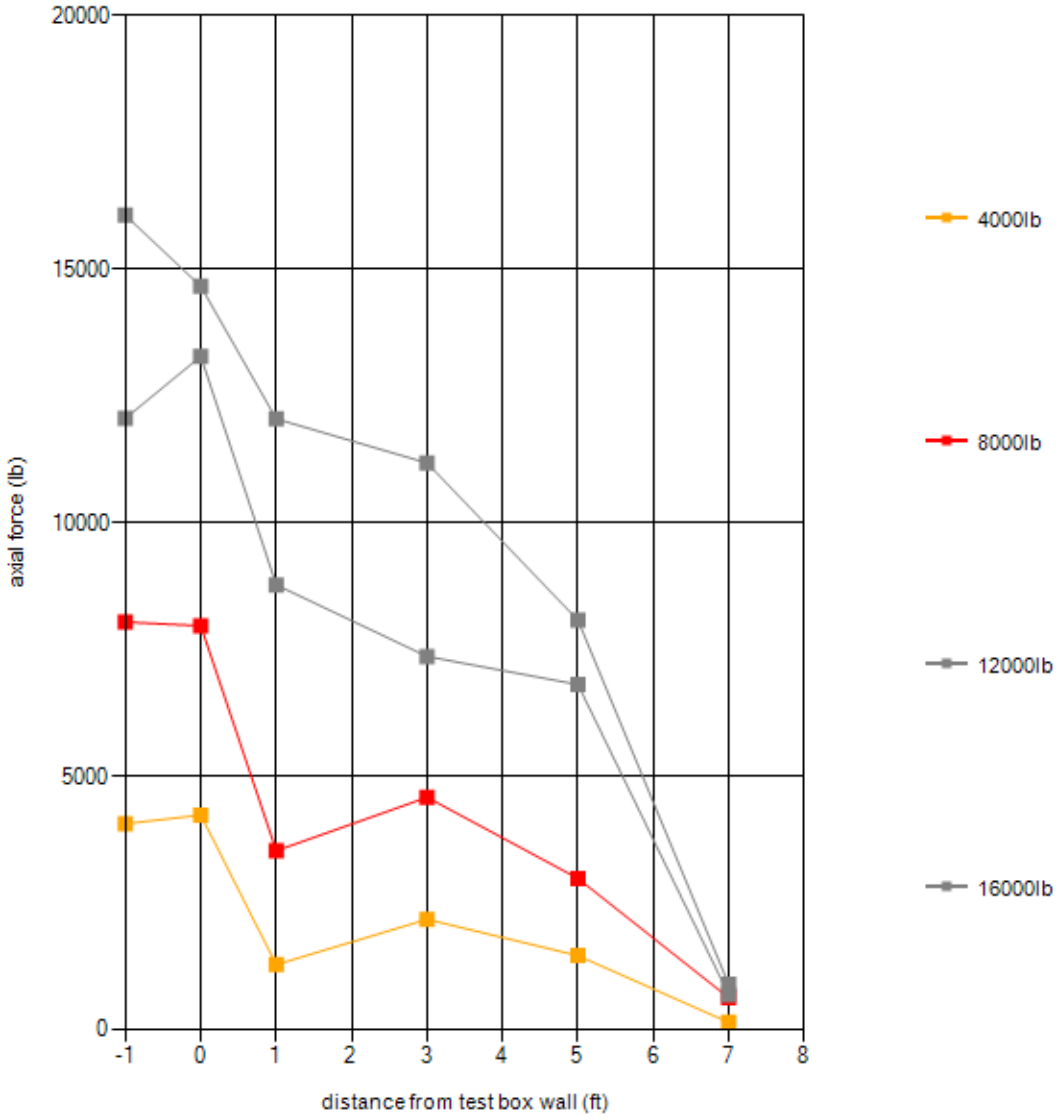


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*				
	OUT	*1ft*	*3ft*	*5ft*	*7ft**
500	591	131	138	56	3*
1000	1069	207	300	158	8*
2000	2245	377	807	461	14*
3000	3327	740	1559	976	61*
4000	4238	1290	2182	1467	150*
5000	5167	1964	2811	1908	325*
6000	6109	1493	3365	2244	495*
7000	7047	1688	3928	2548	592*
8000	7971	3535	4589	2989	636*
9000	10550*	4453	5390	3720	672*
10000	11451*	7336*	6054	4268	700*
11000	12350*	8018*	6657	4693	591*
12000	13286*	8778*	7367	6814	695*
13000	14233*	9622*	8048	8796	700*
14000	15220*	10518*	8721	5534*	720*
15000	16163*	11765*	8983	6191*	590*
16000	14666*	12051*	11183	8082*	898*
17000	15011*	6526*	13382*	3964*	298*
18000	15722*	ND	ND	3673*	-2729*
19000	15228*	ND	ND	3678*	-1328*

* calculated from 1 strain gage.

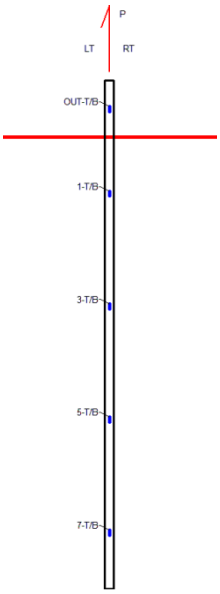
Axial Load-Distance from Test Box Wall Plot – All



STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

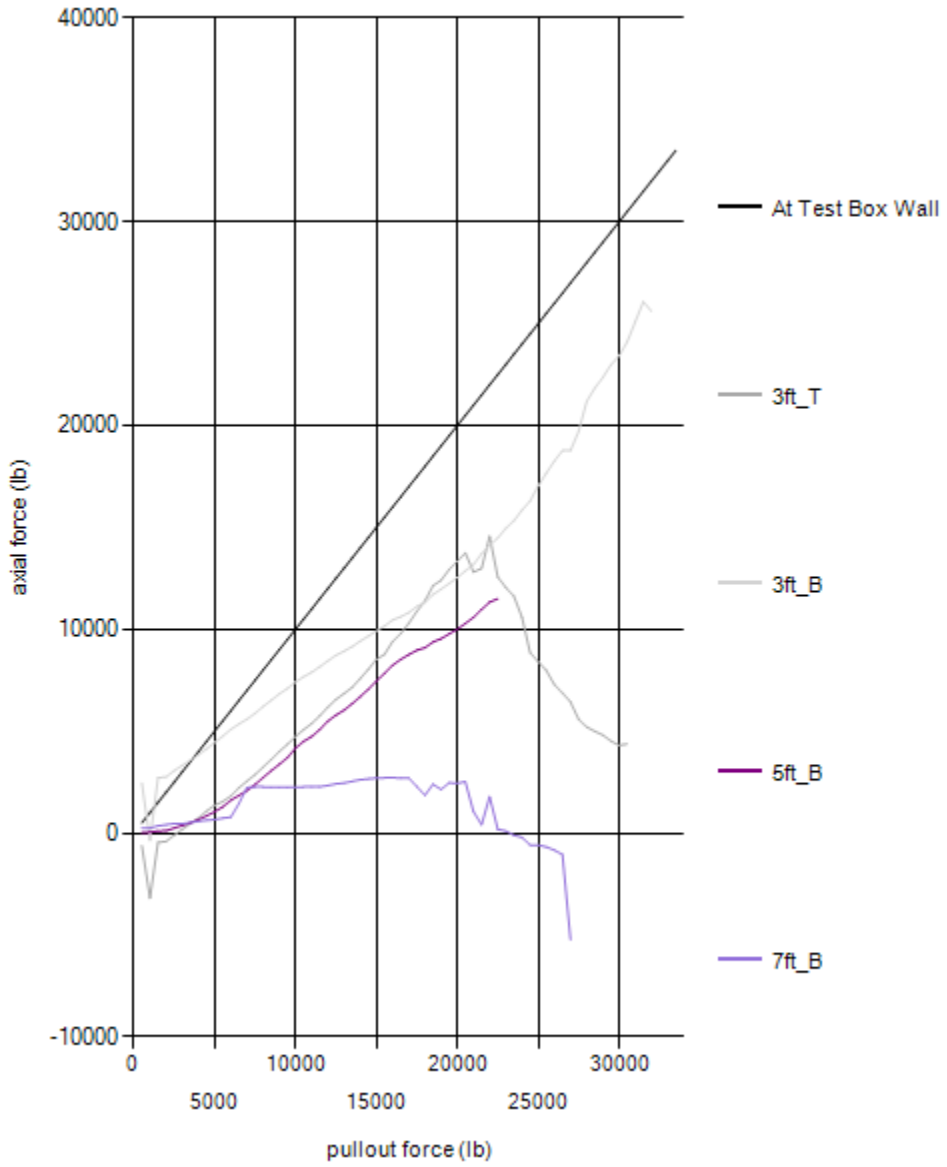
Test Information	
Test Date:	5/14/2012 2:29:00 PM
Test Identification:	TS48.19-S-L8-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

Sketch

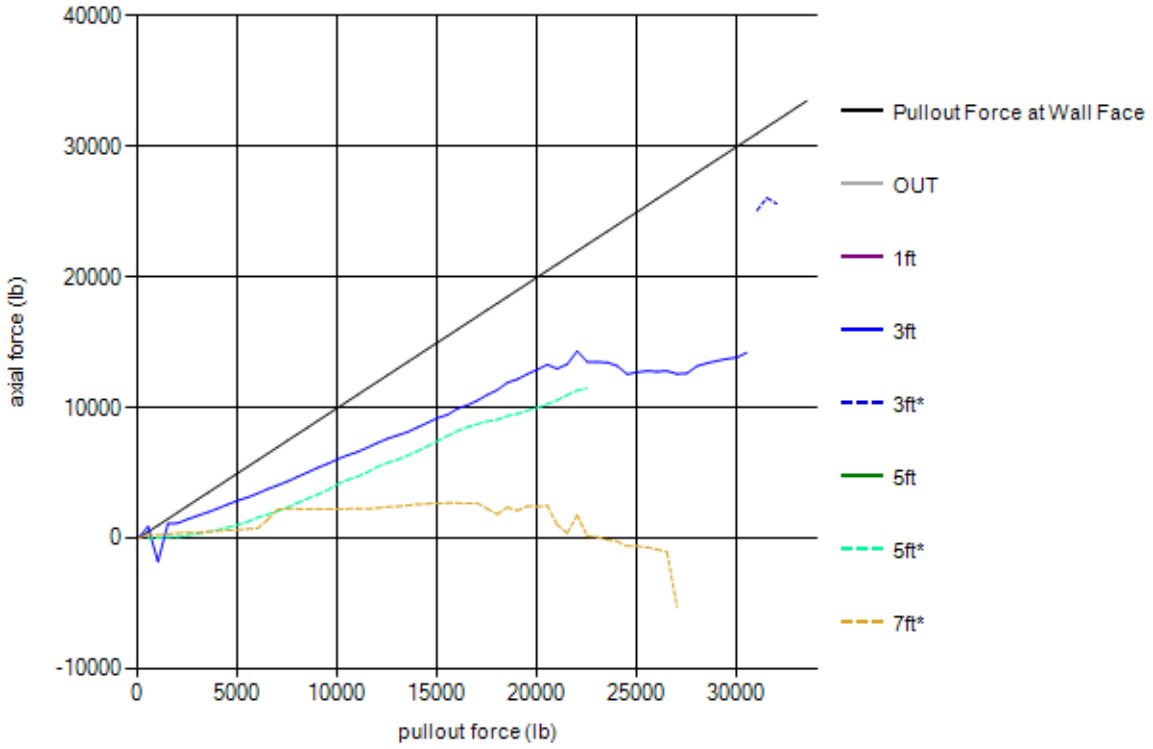


MSE Reinforcement	
Type:	Ribbed Strip
Length, L_e (ft):	8
Width, b (in.):	2
Skew Angle, β (°):	0

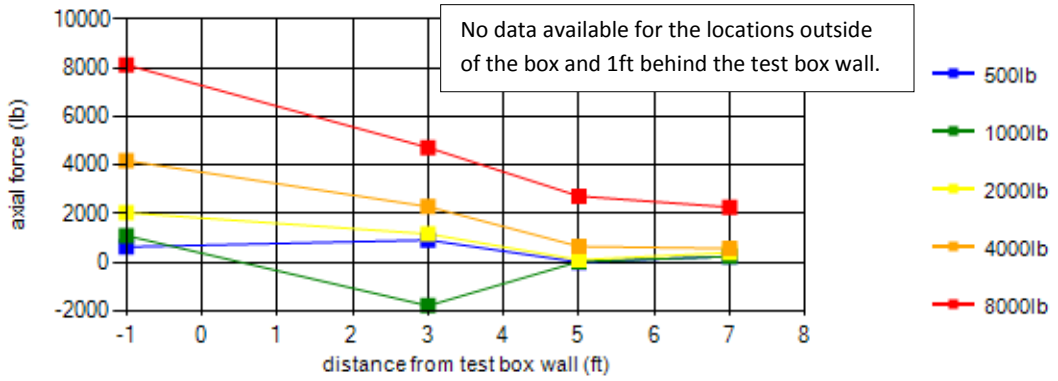
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



Axial Load-Distance from Test Box Wall Plot – Service Loads

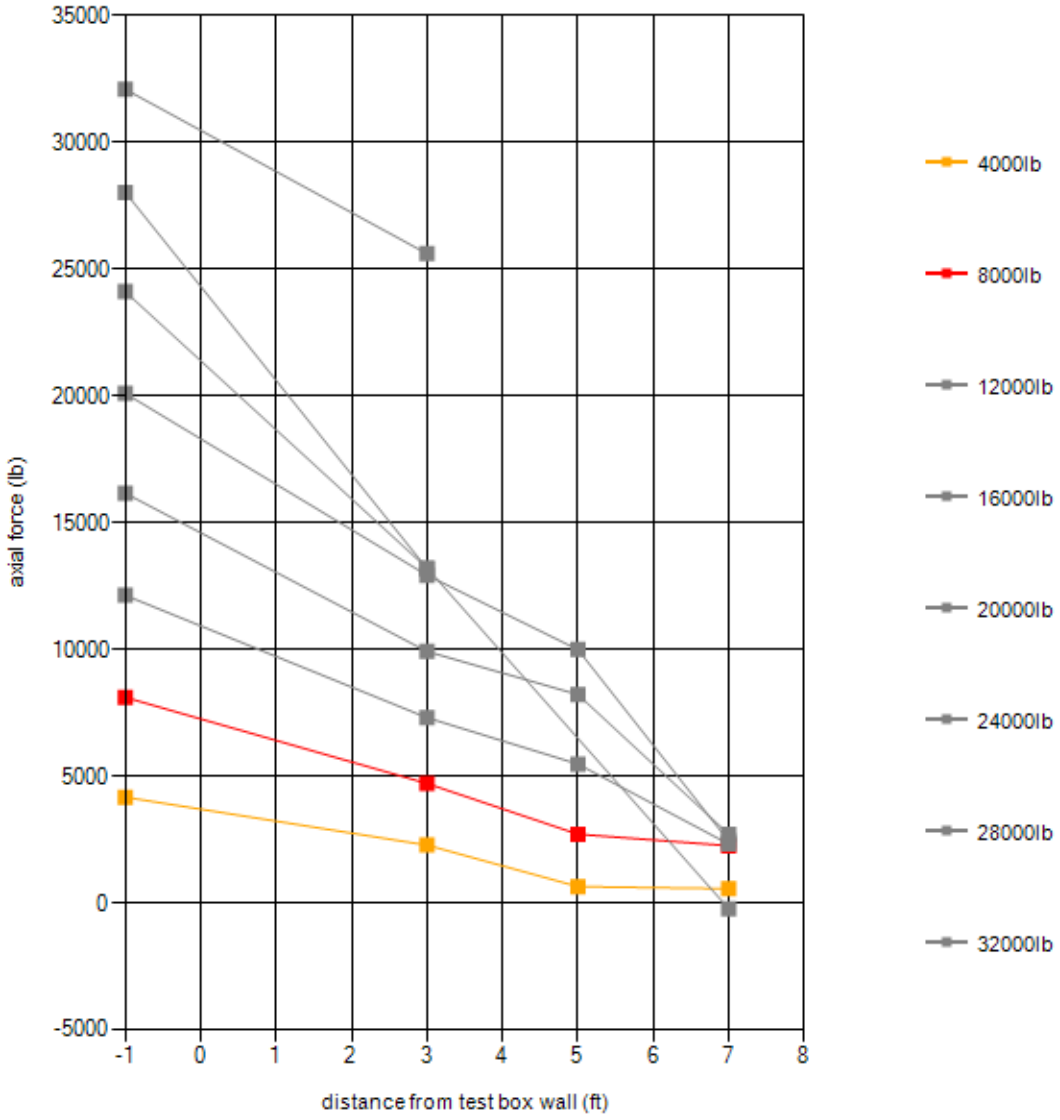


Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*		
	3ft	*5ft**	*7ft**
500	917	8*	254*
1000	-1779	36*	245*
2000	1170	110*	406*
3000	1746	366*	451*
4000	2292	659*	574*
5000	2899	1046*	659*
6000	3454	1609*	781*
7000	4069	2084*	2231*
8000	4722	2722*	2268*
9000	5417	3369*	2247*
10000	6072	4161*	2249*
11000	6632	4735*	2265*
12000	7315	5487*	2333*
13000	7885	6027*	2458*
14000	8501	6691*	2615*
15000	9223	7453*	2698*
16000	9930	8231*	2720*
17000	10556	8759*	2699*
18000	11364	9093*	1851*
19000	12187	9538*	2134*
20000	12934	10003*	2446*
21000	12995	10589*	1052*
22000	14344	11329*	1779*
23000	13502	ND	95*
24000	13219	ND	-218*
25000	12724	ND	-597*
26000	12771	ND	-842*
27000	12602	ND	-5241*
28000	13195	ND	ND
29000	13588	ND	ND
30000	13863	ND	ND
31000	25098*	ND	ND
32000	25619*	ND	ND
33000	ND	ND	ND

* calculated from 1 strain gage.

Axial Load-Distance from Test Box Wall Plot – All



Appendix P

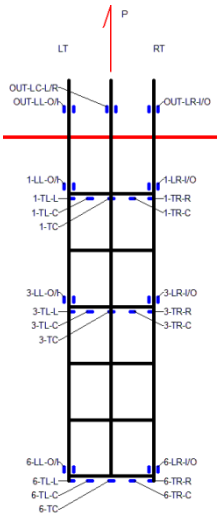
MSE Reinforcement Pullout Test Strain Gage Reports: Welded Steel Grids in Type A Backfill

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/10/2012 11:15:00 AM
Test Identification:	TS48.05-G-9x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

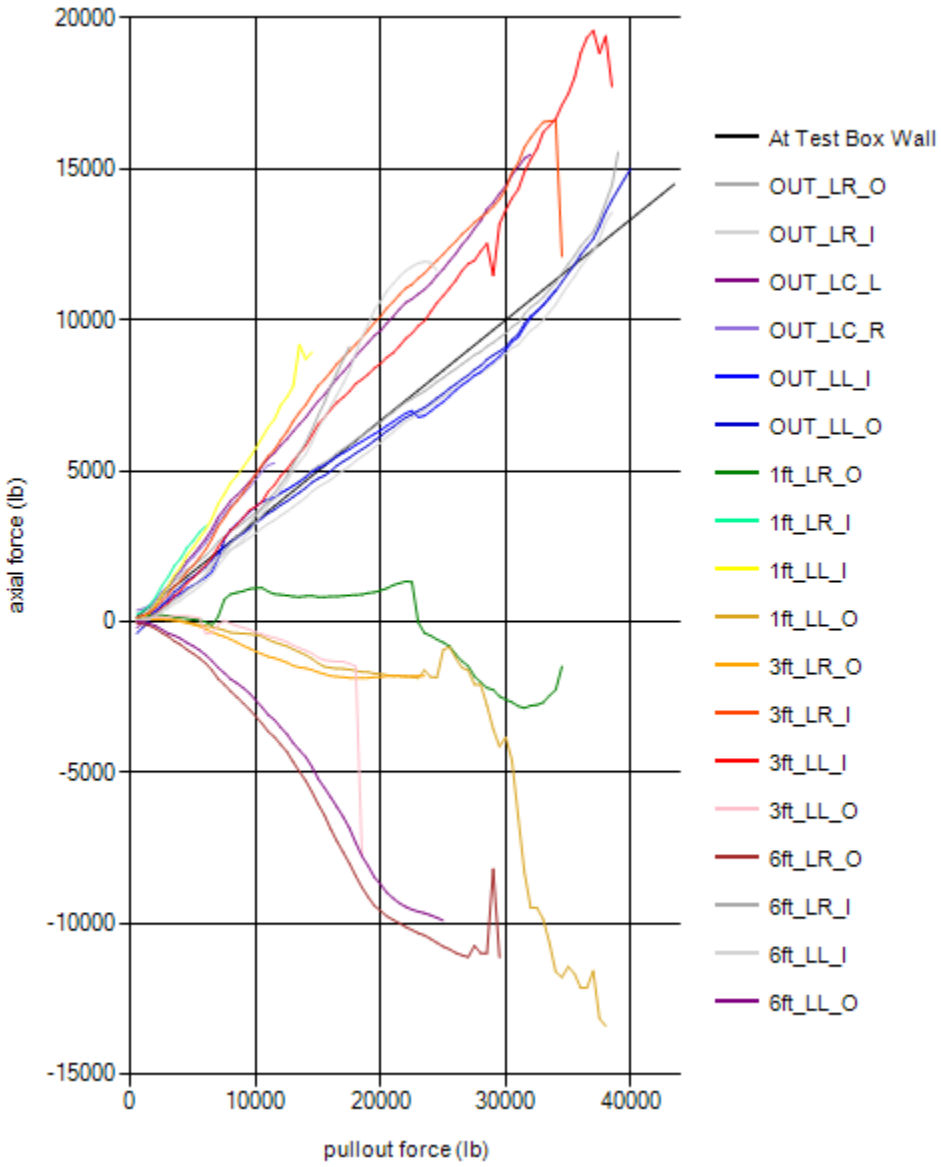
Sketch



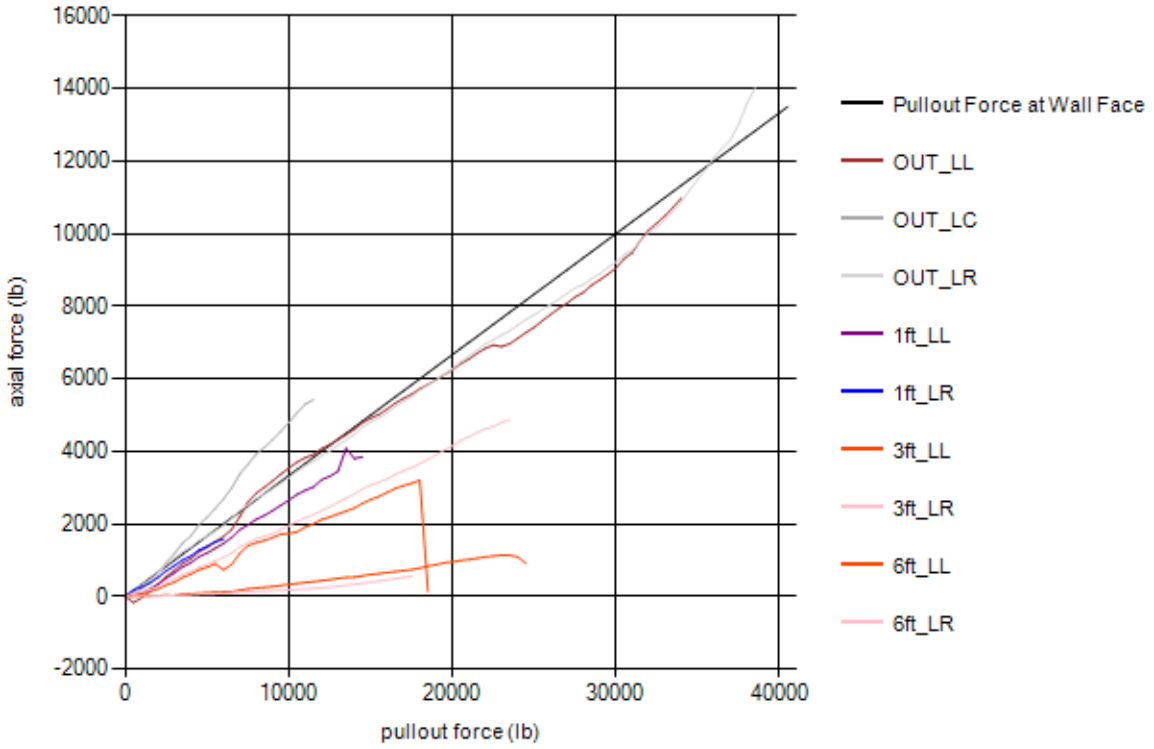
MSE Reinforcement

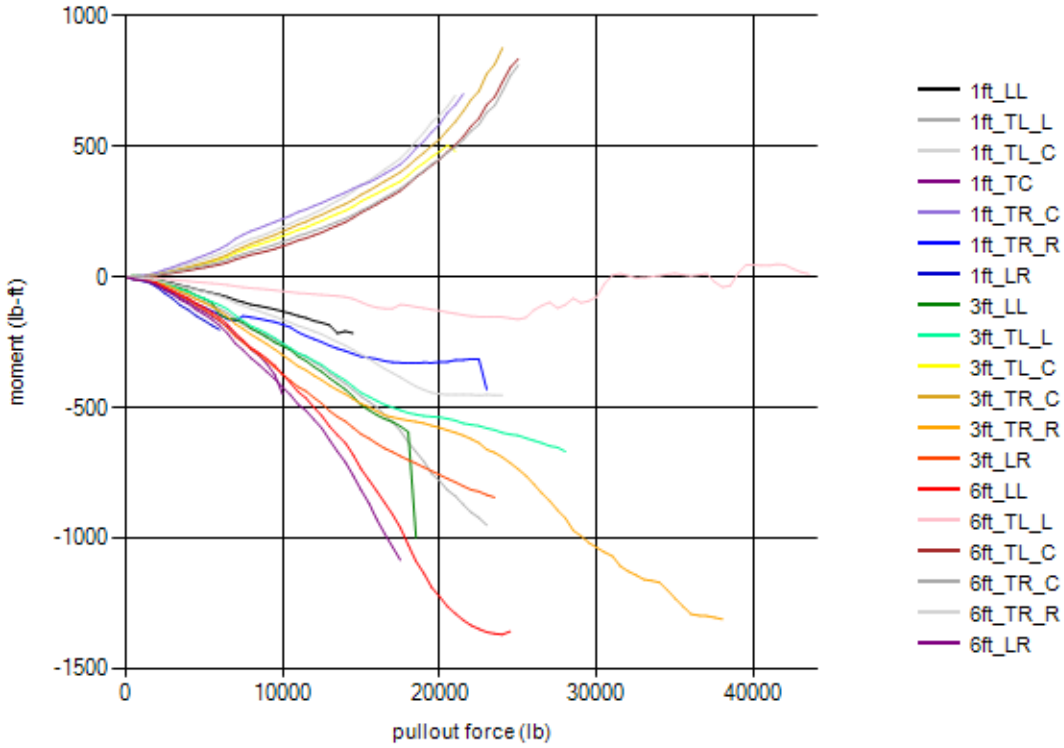
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

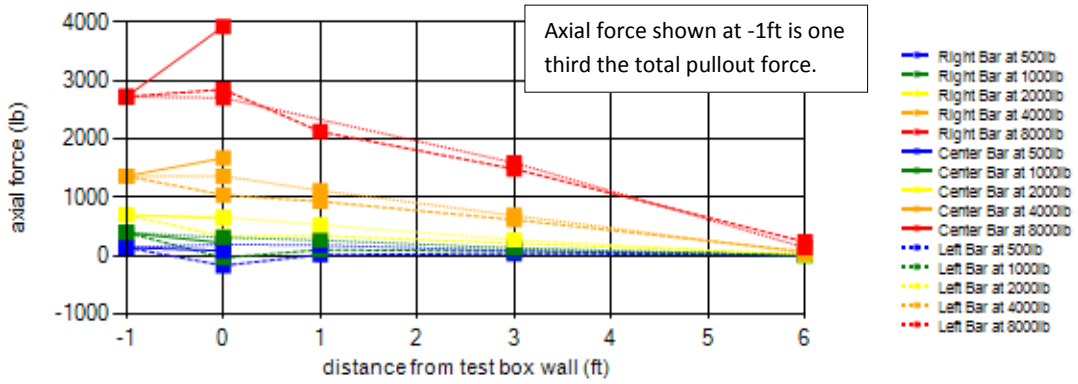


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





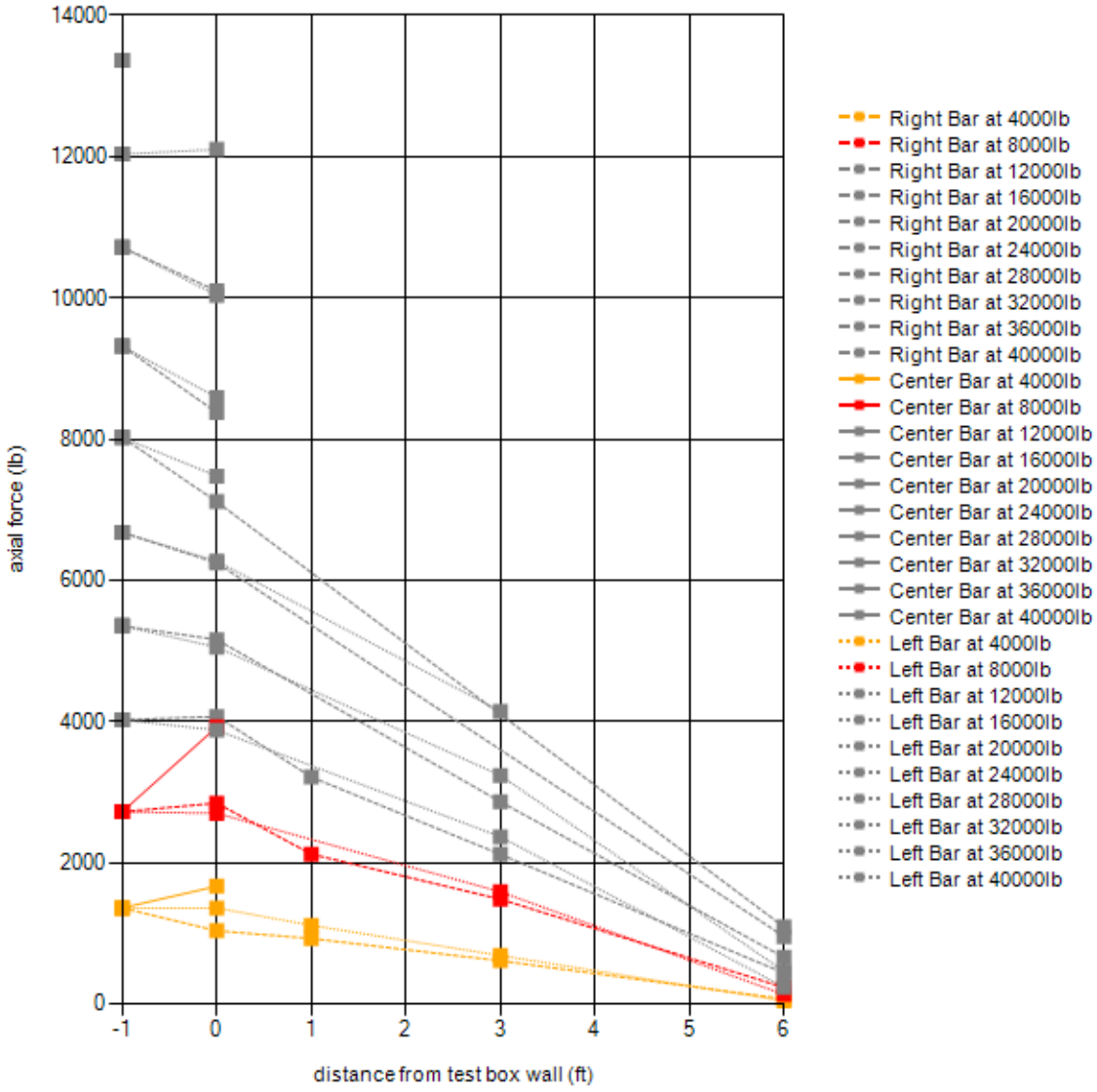
Axial Load-Distance from Test Box Wall Plot – Service Loads



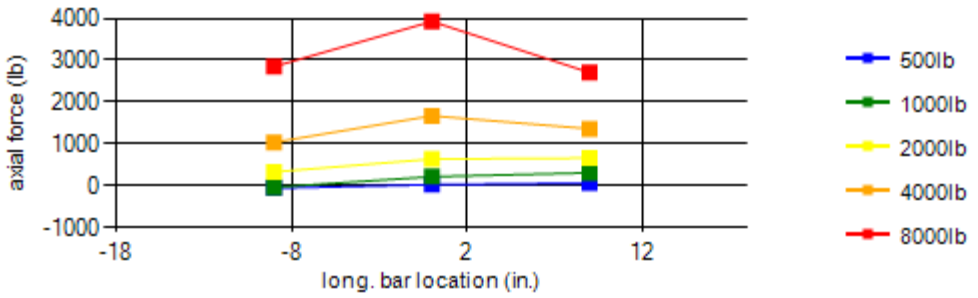
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*								
	OUT_LL	*OUT_LC*	*OUT_LR*	*1ft_LL*	*1ft_LR*	*3ft_LL*	*3ft_LR*	*6ft_LL*	*6ft_LR*
500	-168	86	192	18	181	37	89	16	6
1000	-35	218	312	102	263	77	132	14	4
2000	332	640	663	342	527	214	276	30	14
3000	722	1176	1054	648	847	393	485	30	31
4000	1040	1672	1363	931	1116	615	690	75	46
5000	1353	2180	1665	1201	1382	808	886	102	65
6000	1654	2686	1954	1460	1580	738	1080	125	83
7000	2206	3382	2372	1844	ND	1195	1369	175	115
8000	2847	3926	2704	2125	ND	1487	1592	238	138
9000	3184	4319	2961	2368	ND	1626	1740	277	160
10000	3538	4795	3278	2657	ND	1737	1954	333	184
11000	3829	5300	3604	2928	ND	1916	2169	389	213
12000	4075	ND	3881	3217	ND	2122	2372	441	241
13000	4324	ND	4164	3446	ND	2275	2594	501	286
14000	4613	ND	4470	3801	ND	2439	2823	536	335
15000	4915	ND	4815	ND	ND	2672	3073	605	397
16000	5163	ND	5056	ND	ND	2866	3239	662	464
17000	5455	ND	5375	ND	ND	3057	3464	714	524
18000	5721	ND	5680	ND	ND	3206	3666	782	ND
19000	5974	ND	5966	ND	ND	ND	3900	877	ND
20000	6249	ND	6275	ND	ND	ND	4145	958	ND
21000	6544	ND	6615	ND	ND	ND	4400	1020	ND
22000	6837	ND	6957	ND	ND	ND	4618	1093	ND
23000	6886	ND	7204	ND	ND	ND	4791	1139	ND
24000	7115	ND	7478	ND	ND	ND	ND	1093	ND
25000	7421	ND	7766	ND	ND	ND	ND	ND	ND
26000	7771	ND	8047	ND	ND	ND	ND	ND	ND
27000	8077	ND	8344	ND	ND	ND	ND	ND	ND
28000	8378	ND	8591	ND	ND	ND	ND	ND	ND
29000	8725	ND	8894	ND	ND	ND	ND	ND	ND
30000	9052	ND	9221	ND	ND	ND	ND	ND	ND
31000	9474	ND	9540	ND	ND	ND	ND	ND	ND
32000	10099	ND	10037	ND	ND	ND	ND	ND	ND
33000	10494	ND	10374	ND	ND	ND	ND	ND	ND
34000	10980	ND	10878	ND	ND	ND	ND	ND	ND
35000	ND	ND	11506	ND	ND	ND	ND	ND	ND
36000	ND	ND	12102	ND	ND	ND	ND	ND	ND
37000	ND	ND	12585	ND	ND	ND	ND	ND	ND
38000	ND	ND	13574	ND	ND	ND	ND	ND	ND
39000	ND	ND	ND	ND	ND	ND	ND	ND	ND
40000	ND	ND	ND	ND	ND	ND	ND	ND	ND

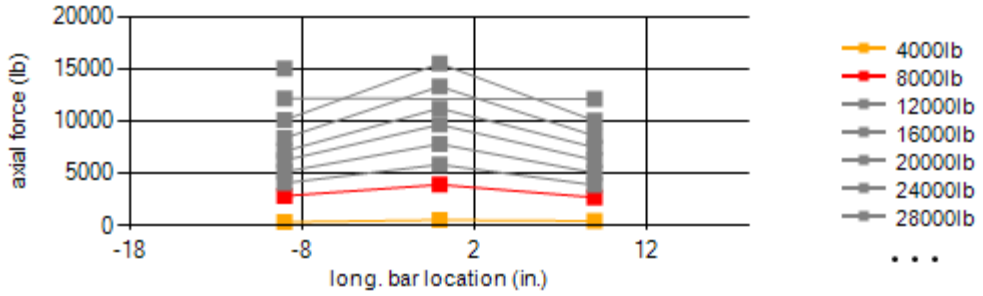
Axial Load-Distance from Test Box Wall Plot – All



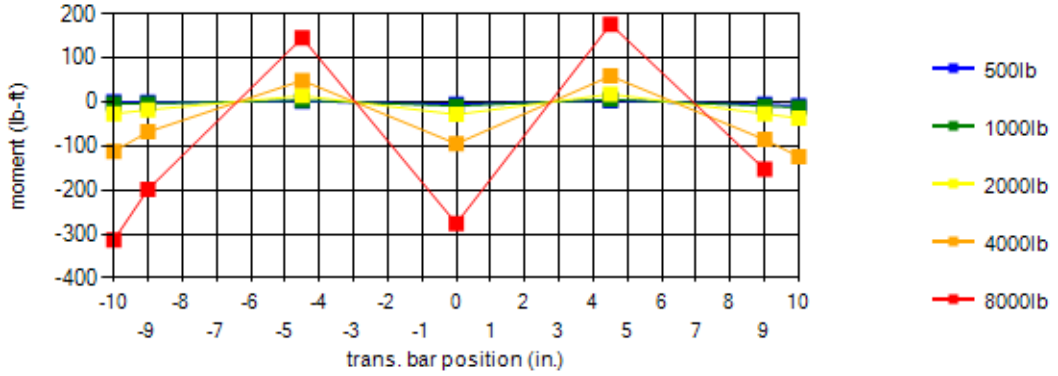
Axial Load Distribution among the Longitudinal Bars – Service Loads

Distance from box wall	*Plot*
outside	

Axial Load Distribution among the Longitudinal Bars – All

Distance from box wall	*Plot*
outside	

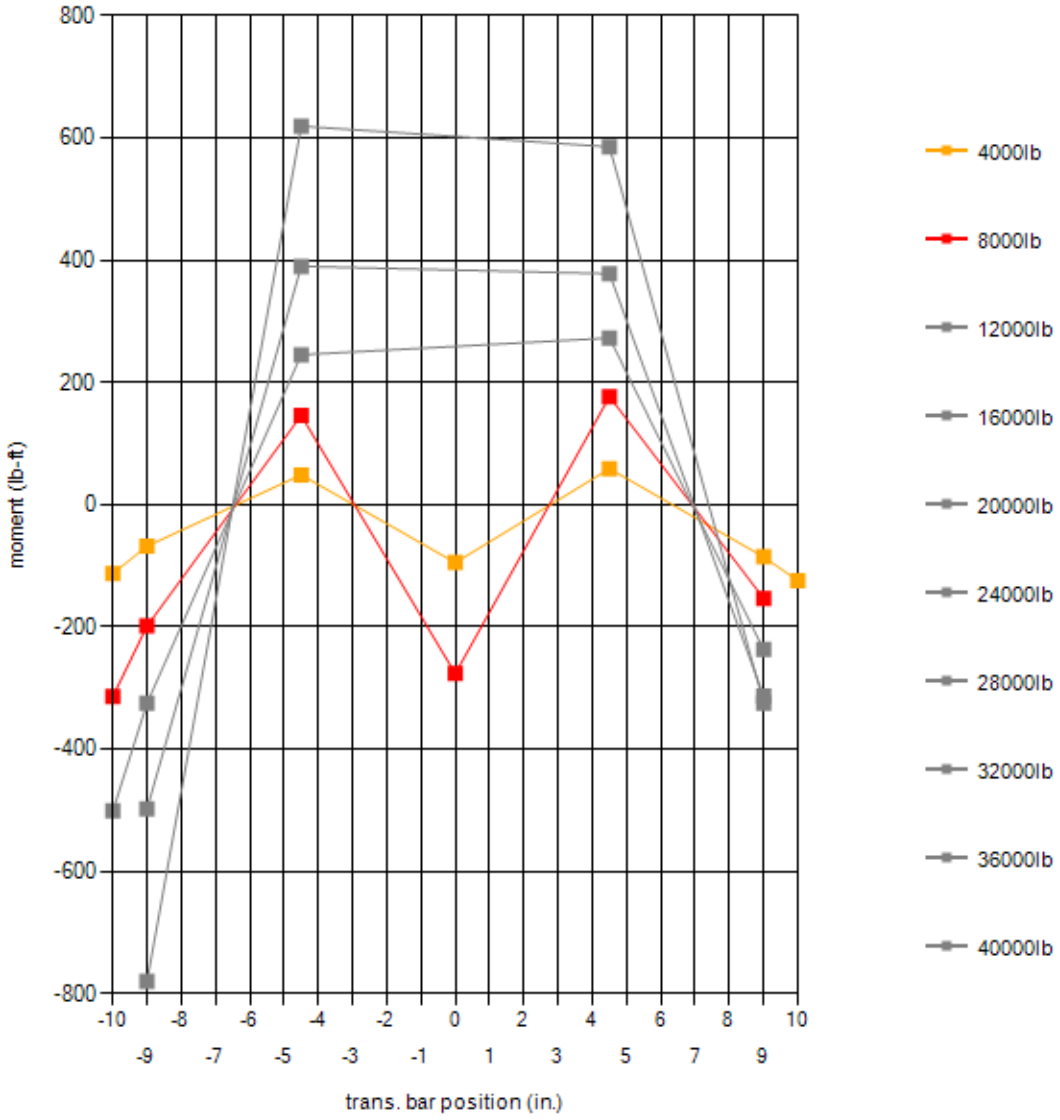
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



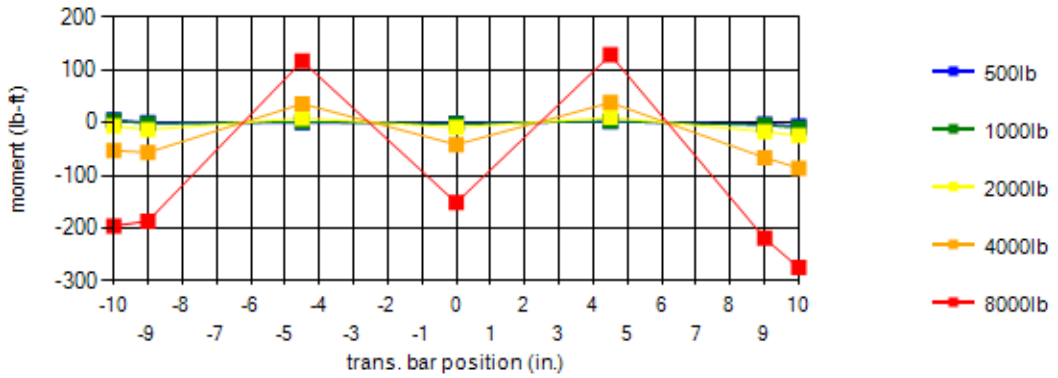
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*						
	1ft_LL	*1ft_TL_L*	*1ft_TL_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	0	-1	2	-4	3	-5	-8
1000	-4	-3	4	-9	6	-9	-13
2000	-27	-18	14	-28	18	-27	-37
3000	-67	-42	31	-61	38	-55	-81
4000	-112	-68	49	-95	59	-85	-124
5000	-159	-94	69	-131	83	-115	-165
6000	-202	-121	90	-168	108	-143	-201
7000	-261	-161	120	-223	147	-167	ND
8000	-314	-198	146	-276	177	-153	ND
9000	-349	-223	166	-332	199	-165	ND
10000	-391	-256	193	-447	223	-181	ND
11000	-446	-292	220	ND	250	-211	ND
12000	-501	-325	245	ND	273	-237	ND
13000	-551	-368	277	ND	298	-262	ND
14000	-620	-407	309	ND	324	-282	ND
15000	ND	-457	352	ND	353	-303	ND
16000	ND	-498	390	ND	378	-313	ND
17000	ND	-555	433	ND	413	-325	ND
18000	ND	-631	485	ND	460	-329	ND
19000	ND	-706	554	ND	521	-327	ND
20000	ND	-780	619	ND	586	-324	ND
21000	ND	-838	695	ND	659	-317	ND
22000	ND	-900	ND	ND	ND	-313	ND
23000	ND	-949	ND	ND	ND	-430	ND

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



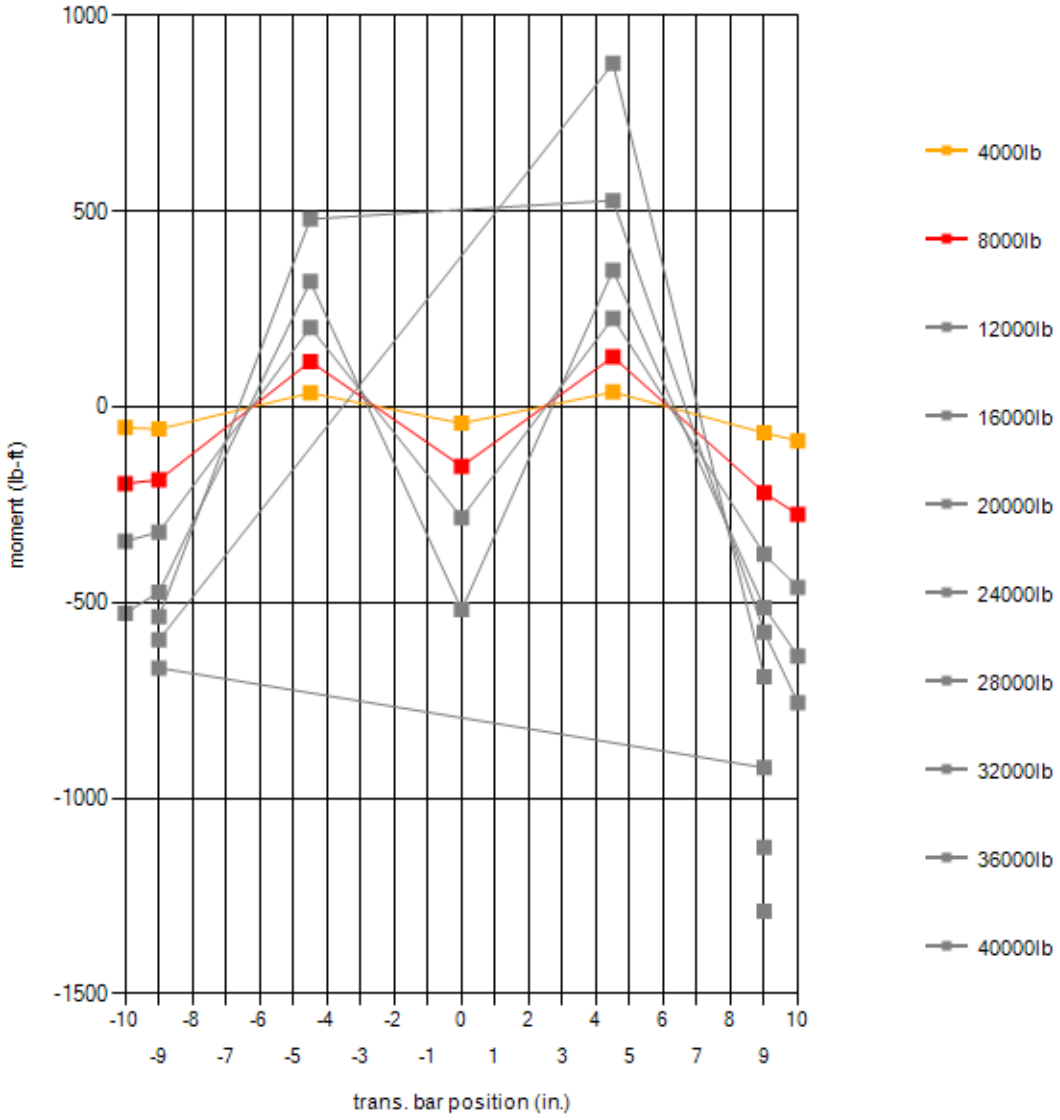
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



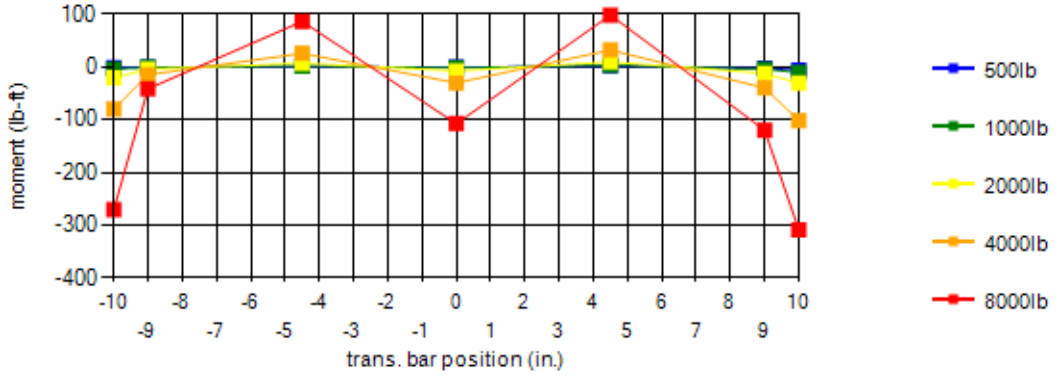
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	3ft_LL	*3ft_TL_L*	*3ft_TL_C*	*3ft_TR_C*	*3ft_TR_R*	*3ft_LR*
500	6	0	0	1	-3	-6
1000	4	-2	2	3	-5	-10
2000	-7	-13	9	10	-17	-25
3000	-29	-34	22	23	-39	-53
4000	-53	-56	36	38	-66	-86
5000	-82	-81	51	55	-97	-123
6000	-144	-107	68	74	-129	-166
7000	-163	-146	93	102	-179	-227
8000	-196	-187	116	128	-219	-275
9000	-230	-215	135	150	-256	-321
10000	-263	-252	157	175	-298	-371
11000	-303	-290	181	202	-341	-420
12000	-343	-320	203	227	-376	-461
13000	-387	-358	230	254	-414	-512
14000	-429	-395	255	280	-447	-552
15000	-489	-442	290	316	-484	-600
16000	-527	-473	320	349	-513	-637
17000	-554	-498	352	384	-536	-669
18000	-592	-519	390	426	-549	-699
19000	ND	-531	438	477	-559	-728
20000	ND	-536	480	528	-576	-756
21000	ND	-549	482	595	-595	-785
22000	ND	-565	ND	679	-619	-814
23000	ND	-578	ND	778	-660	-833
24000	ND	-595	ND	878	-689	ND
25000	ND	-605	ND	ND	-735	ND
26000	ND	-625	ND	ND	-792	ND
27000	ND	-646	ND	ND	-856	ND
28000	ND	-667	ND	ND	-922	ND
29000	ND	ND	ND	ND	-990	ND
30000	ND	ND	ND	ND	-1035	ND
31000	ND	ND	ND	ND	-1068	ND
32000	ND	ND	ND	ND	-1126	ND
33000	ND	ND	ND	ND	-1157	ND
34000	ND	ND	ND	ND	-1168	ND
35000	ND	ND	ND	ND	-1231	ND
36000	ND	ND	ND	ND	-1290	ND
37000	ND	ND	ND	ND	-1297	ND
38000	ND	ND	ND	ND	-1309	ND

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



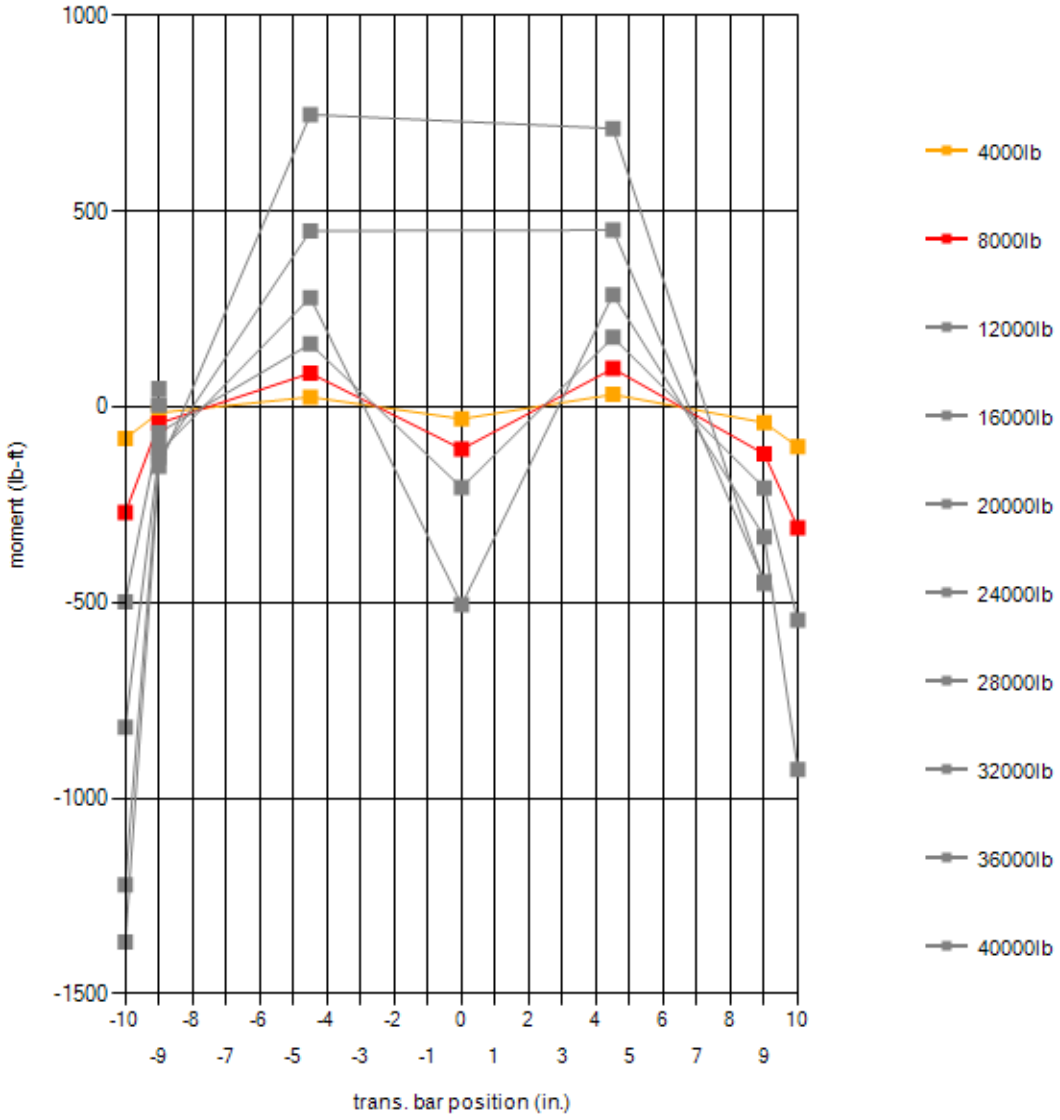
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



Moment Results along Transverse Bar at 6ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	6ft_LL	*6ft_TL_L*	*6ft_TL_C*	*6ft_TR_C*	*6ft_TR_R*	*6ft_LR*
500	-1	-1	1	2	-3	-6
1000	-4	-1	2	3	-4	-11
2000	-21	-4	7	9	-12	-31
3000	-52	-9	16	20	-26	-65
4000	-80	-15	25	32	-40	-102
5000	-115	-21	36	44	-56	-142
6000	-155	-26	49	58	-72	-185
7000	-214	-34	68	79	-99	-254
8000	-270	-42	86	98	-120	-309
9000	-312	-47	100	115	-140	-362
10000	-371	-53	119	135	-162	-420
11000	-439	-60	141	159	-187	-487
12000	-498	-65	161	178	-207	-545
13000	-572	-70	186	200	-234	-624
14000	-634	-76	211	224	-261	-708
15000	-734	-96	248	255	-296	-815
16000	-819	-116	280	287	-332	-927
17000	-908	-120	313	322	-367	-1032
18000	-1025	-108	356	362	-401	ND
19000	-1134	-118	405	408	-431	ND
20000	-1222	-128	450	452	-447	ND
21000	-1287	-139	506	498	-449	ND
22000	-1333	-149	577	559	-450	ND
23000	-1358	-152	660	631	-450	ND
24000	-1368	-152	747	712	-452	ND
25000	ND	-162	836	812	ND	ND
26000	ND	-126	ND	ND	ND	ND
27000	ND	-96	ND	ND	ND	ND
28000	ND	-106	ND	ND	ND	ND
29000	ND	-98	ND	ND	ND	ND
30000	ND	-75	ND	ND	ND	ND
31000	ND	8	ND	ND	ND	ND
32000	ND	6	ND	ND	ND	ND
33000	ND	-1	ND	ND	ND	ND
34000	ND	6	ND	ND	ND	ND
35000	ND	14	ND	ND	ND	ND
36000	ND	5	ND	ND	ND	ND
37000	ND	13	ND	ND	ND	ND
38000	ND	-38	ND	ND	ND	ND
39000	ND	16	ND	ND	ND	ND
40000	ND	47	ND	ND	ND	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All

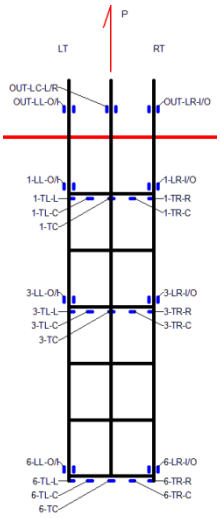


STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/15/2012 11:28:00 AM
Test Identification:	TS48.06-G-9x12-W20xW11-L6-Z20-M
Test Facility:	12'x12'x4' MSE Test Box

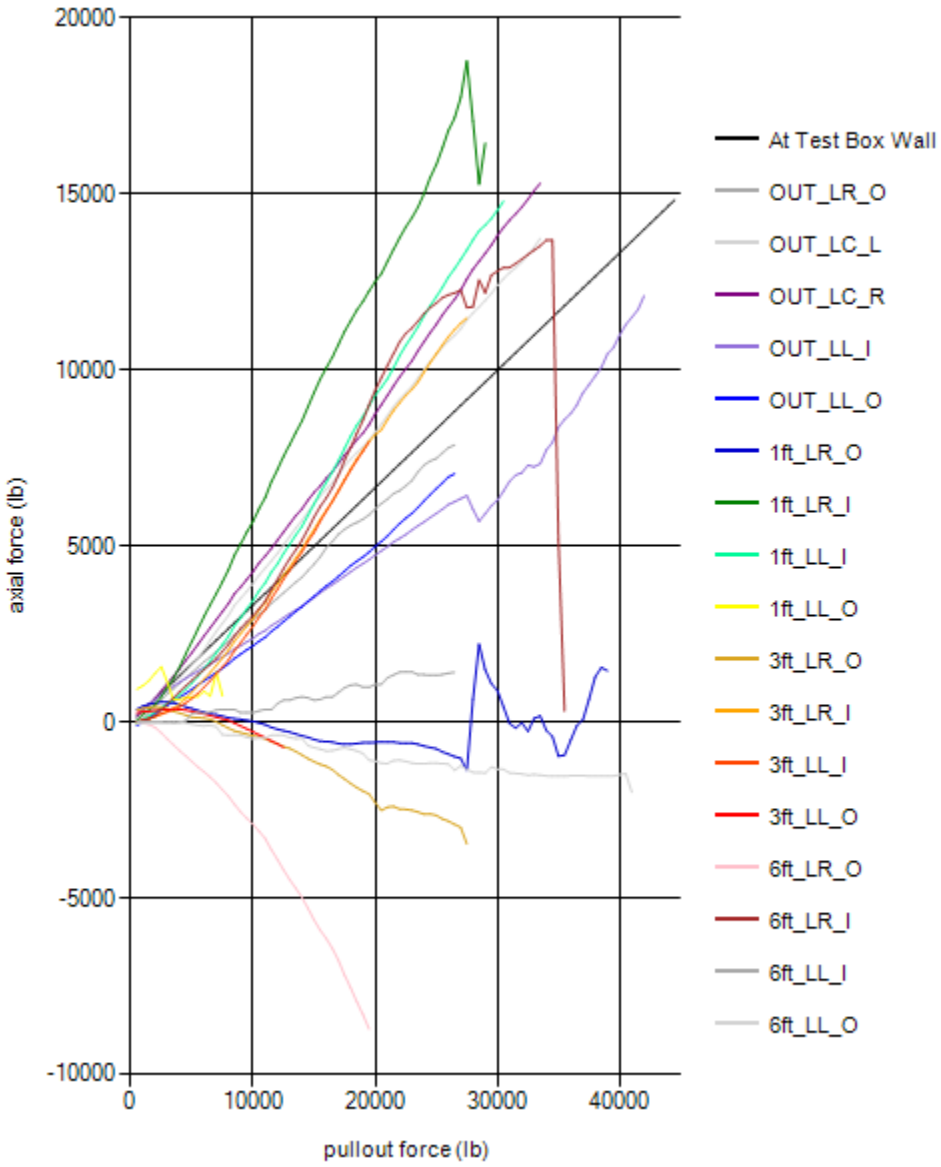
Sketch



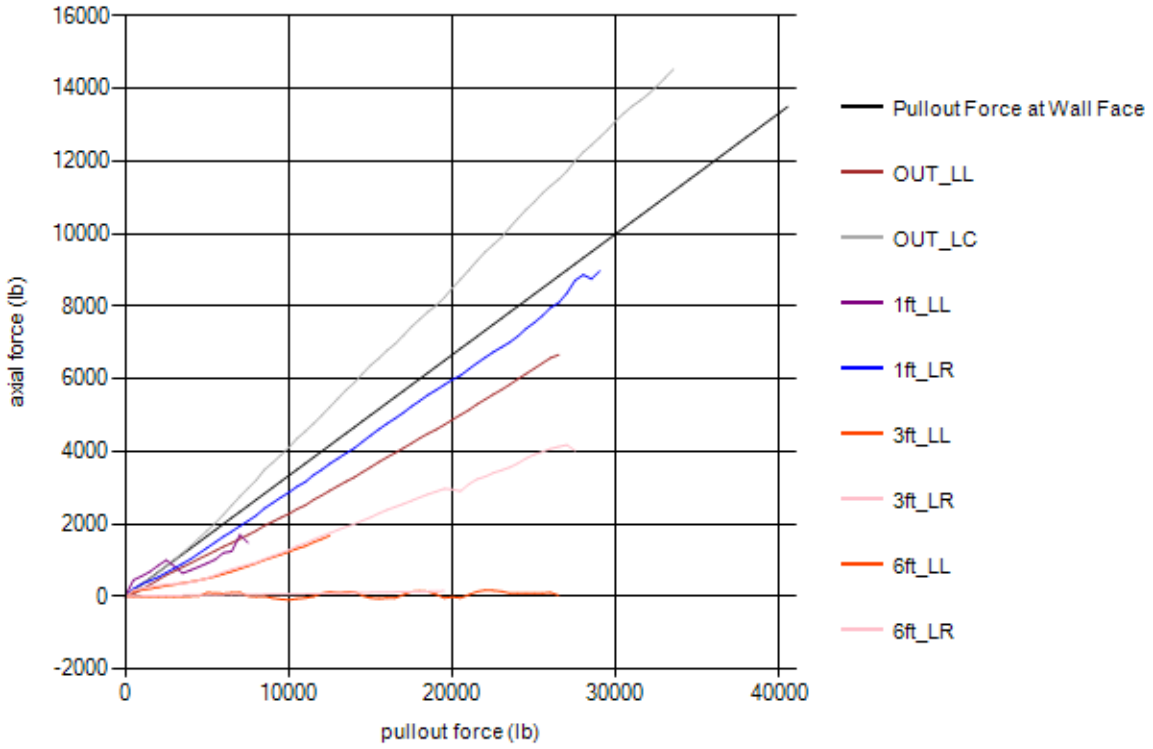
MSE Reinforcement

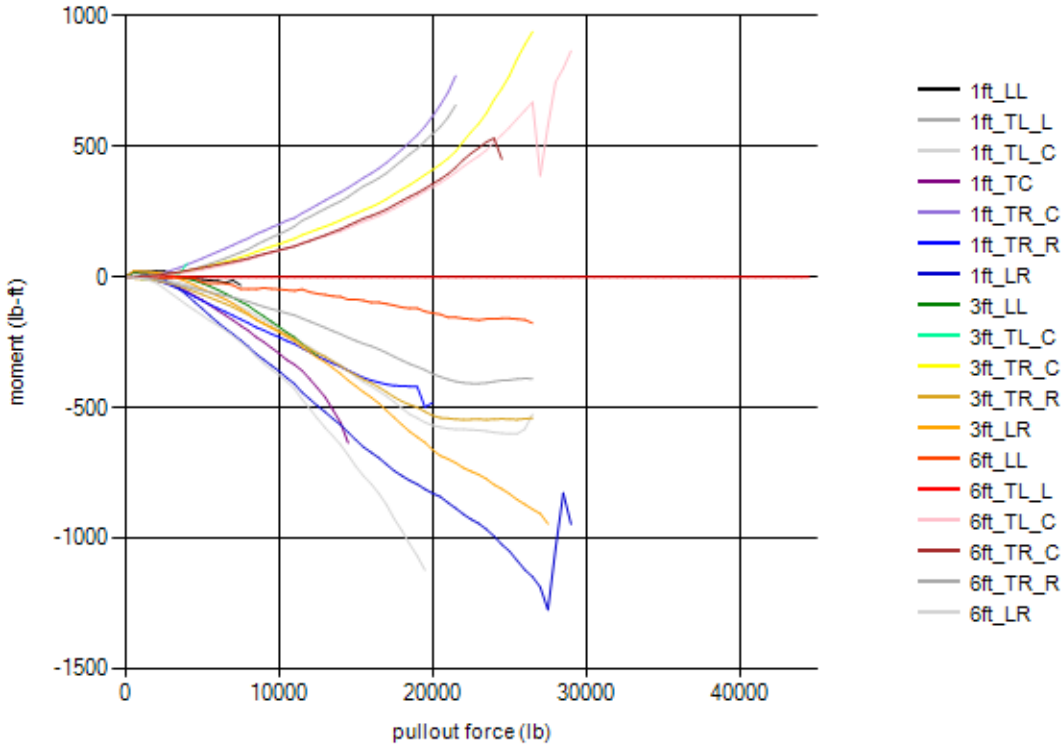
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

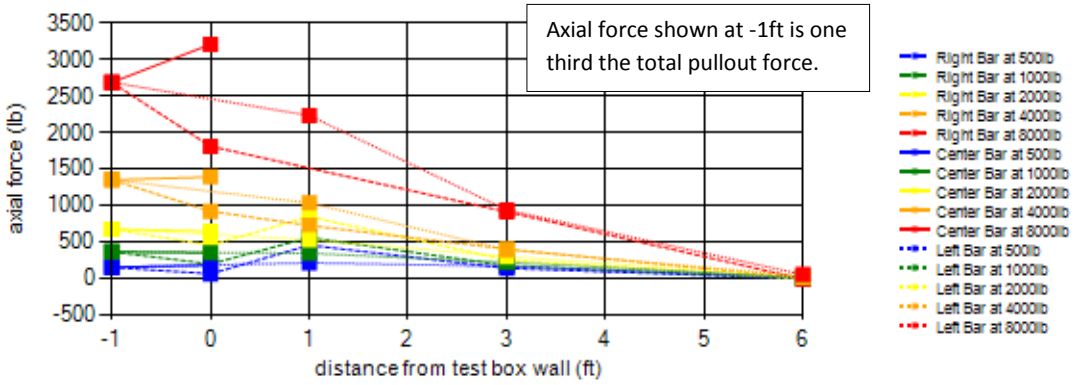


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





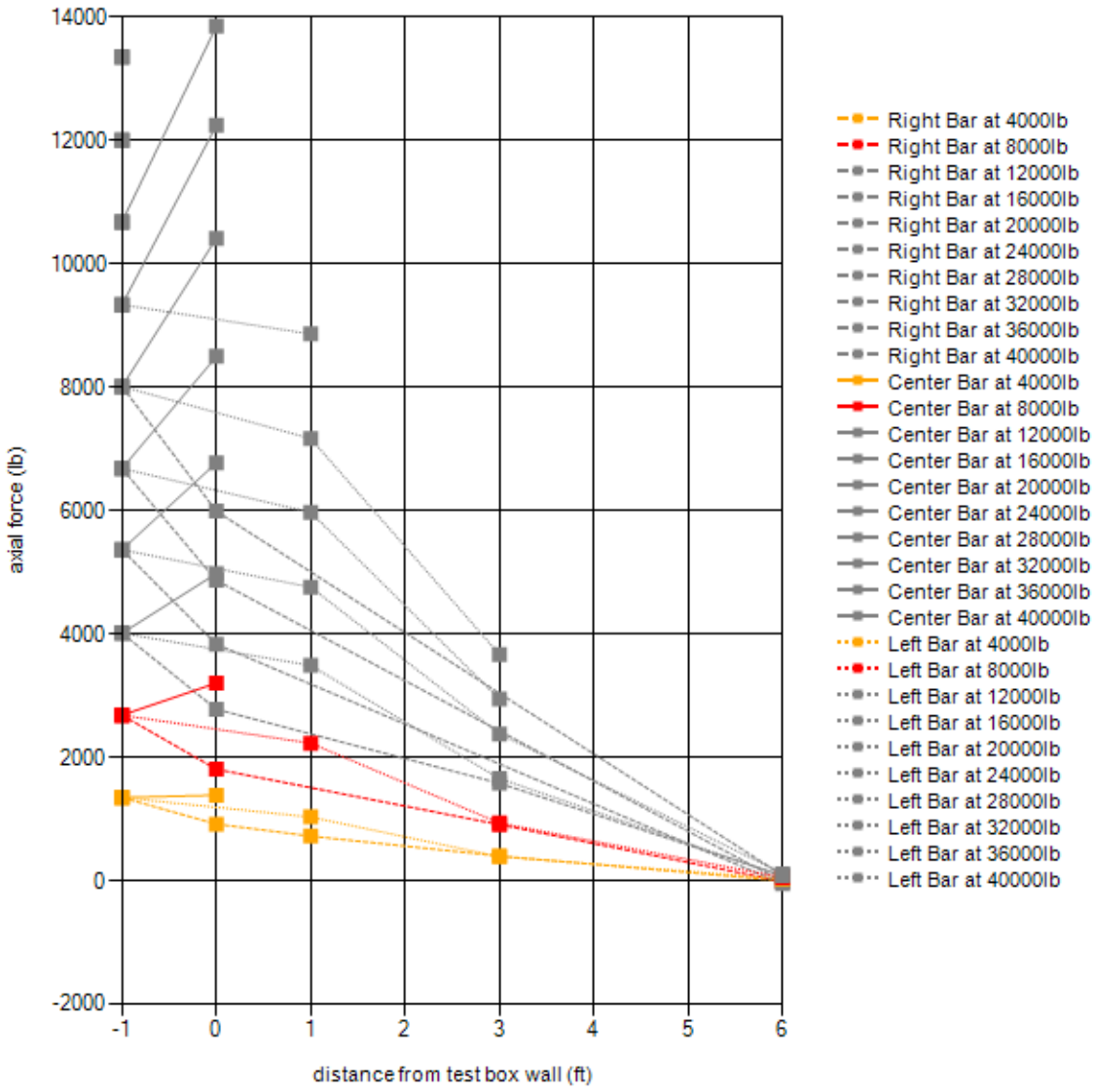
Axial Load-Distance from Test Box Wall Plot – Service Loads



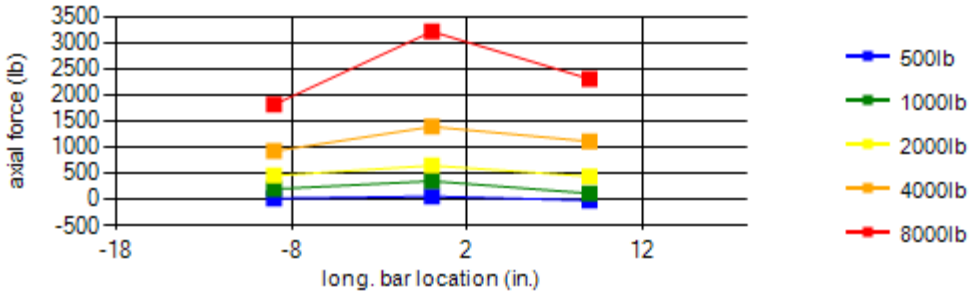
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*							
	OUT_LL	*OUT_LC*	*1ft_LL*	*1ft_LR*	*3ft_LL*	*3ft_LR*	*6ft_LL*	*6ft_LR*
500	65	183	458	216	143	170	1	17
1000	201	355	562	347	179	222	0	19
2000	457	650	850	532	255	303	0	21
3000	699	1021	835	781	332	353	-3	29
4000	923	1392	727	1037	405	395	4	36
5000	1149	1810	917	1341	498	502	101	42
6000	1374	2258	1204	1651	620	675	83	46
7000	1590	2754	1698	1939	764	816	112	49
8000	1812	3209	ND	2234	915	940	-6	55
9000	2058	3686	ND	2579	1078	1115	-45	62
10000	2279	4110	ND	2866	1230	1278	-96	65
11000	2513	4552	ND	3158	1388	1466	-40	71
12000	2784	4986	ND	3494	1584	1660	86	82
13000	3045	5456	ND	3805	ND	1836	100	93
14000	3288	5894	ND	4088	ND	1995	140	101
15000	3563	6374	ND	4441	ND	2181	-43	111
16000	3838	6781	ND	4763	ND	2386	-45	119
17000	4087	7196	ND	5066	ND	2549	48	130
18000	4363	7643	ND	5394	ND	2732	150	134
19000	4603	8020	ND	5689	ND	2891	59	144
20000	4874	8503	ND	5976	ND	2948	-10	ND
21000	5143	8998	ND	6268	ND	3095	49	ND
22000	5433	9496	ND	6586	ND	3305	176	ND
23000	5698	9901	ND	6871	ND	3480	141	ND
24000	5994	10419	ND	7171	ND	3670	91	ND
25000	6286	10876	ND	7547	ND	3914	91	ND
26000	6577	11314	ND	7959	ND	4074	108	ND
27000	ND	11724	ND	8360	ND	4178	ND	ND
28000	ND	12249	ND	8867	ND	ND	ND	ND
29000	ND	12653	ND	8970	ND	ND	ND	ND
30000	ND	13118	ND	ND	ND	ND	ND	ND
31000	ND	13517	ND	ND	ND	ND	ND	ND
32000	ND	13856	ND	ND	ND	ND	ND	ND
33000	ND	14295	ND	ND	ND	ND	ND	ND
34000	ND	ND	ND	ND	ND	ND	ND	ND
35000	ND	ND	ND	ND	ND	ND	ND	ND
36000	ND	ND	ND	ND	ND	ND	ND	ND
37000	ND	ND	ND	ND	ND	ND	ND	ND
38000	ND	ND	ND	ND	ND	ND	ND	ND
39000	ND	ND	ND	ND	ND	ND	ND	ND
40000	ND	ND	ND	ND	ND	ND	ND	ND

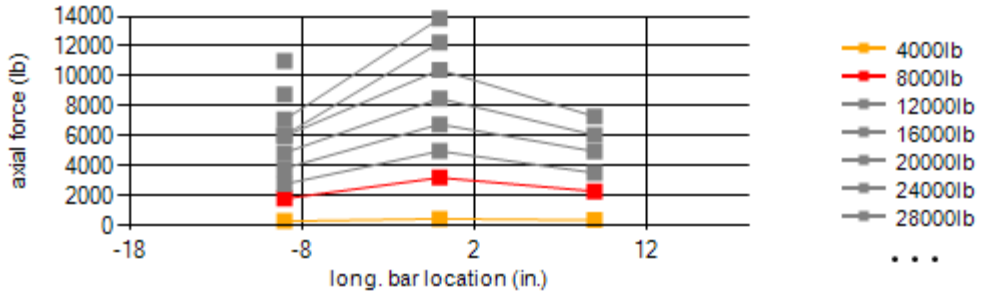
Axial Load-Distance from Test Box Wall Plot – All



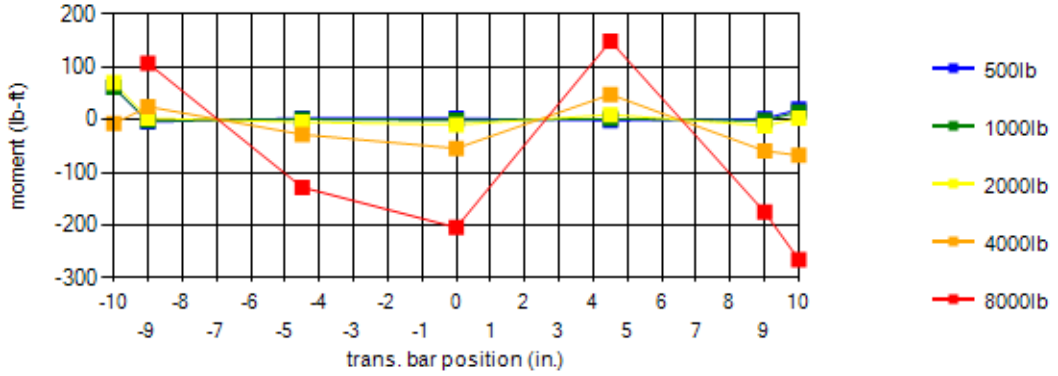
Axial Load Distribution among the Longitudinal Bars – Service Loads

Distance from box wall	*Plot*
outside	

Axial Load Distribution among the Longitudinal Bars – All

Distance from box wall	*Plot*
outside	

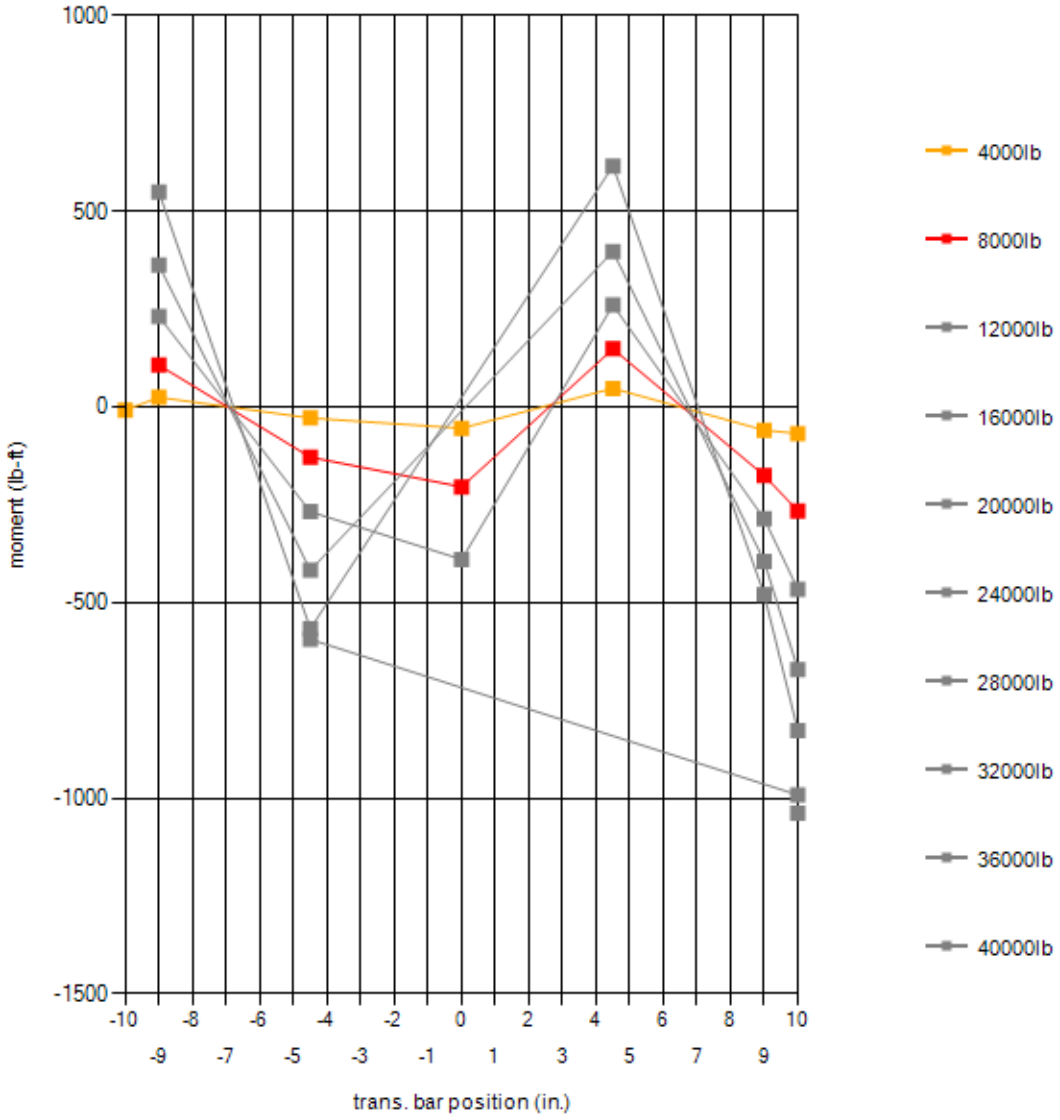
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



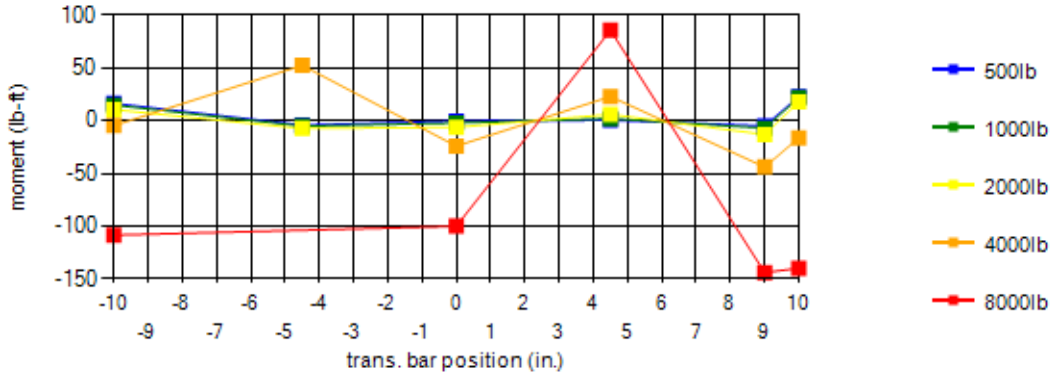
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*						
	1ft_LL	*1ft_TL_L*	*1ft_TL_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	61	-4	3	2	-2	2	20
1000	61	-2	1	-1	1	-2	15
2000	70	3	-5	-10	9	-11	2
3000	38	12	-15	-29	27	-33	-26
4000	-8	24	-28	-54	48	-59	-68
5000	-25	41	-47	-88	72	-89	-120
6000	-41	61	-73	-126	97	-119	-172
7000	-35	83	-100	-164	123	-147	-218
8000	ND	107	-128	-204	149	-175	-266
9000	ND	138	-163	-248	177	-203	-315
10000	ND	165	-195	-291	203	-229	-359
11000	ND	194	-229	-334	226	-255	-408
12000	ND	231	-268	-390	261	-286	-466
13000	ND	262	-303	-459	294	-316	-516
14000	ND	290	-335	-556	325	-342	-565
15000	ND	329	-382	ND	361	-371	-623
16000	ND	362	-417	ND	398	-395	-671
17000	ND	399	-456	ND	438	-410	-717
18000	ND	447	-502	ND	489	-416	-760
19000	ND	492	-539	ND	544	-419	-792
20000	ND	549	-567	ND	616	-480	-827
21000	ND	612	-579	ND	707	ND	-863
22000	ND	ND	-582	ND	ND	ND	-907
23000	ND	ND	-586	ND	ND	ND	-943
24000	ND	ND	-594	ND	ND	ND	-992
25000	ND	ND	-599	ND	ND	ND	-1049
26000	ND	ND	-581	ND	ND	ND	-1120
27000	ND	ND	ND	ND	ND	ND	-1186
28000	ND	ND	ND	ND	ND	ND	-1038
29000	ND	ND	ND	ND	ND	ND	-946

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



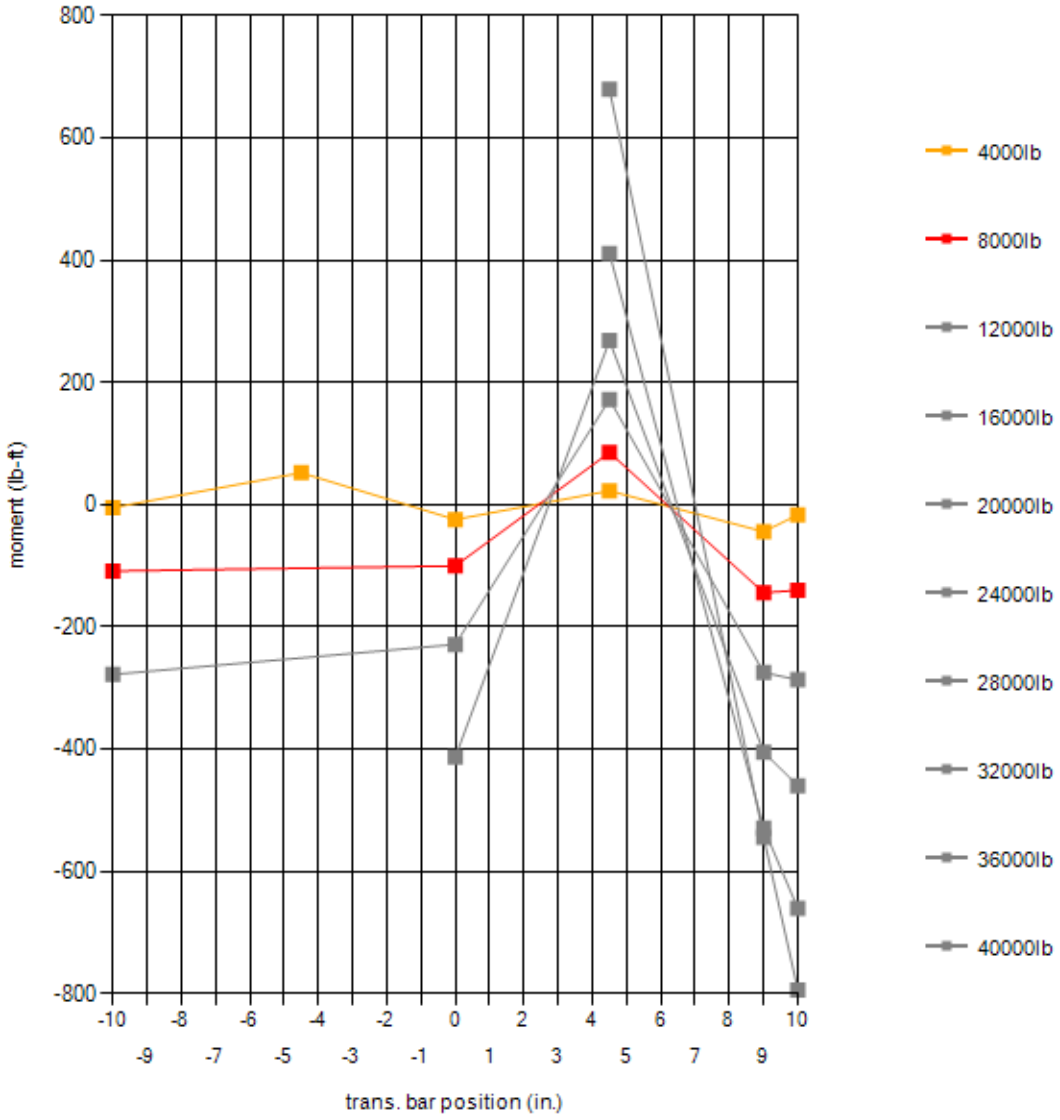
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



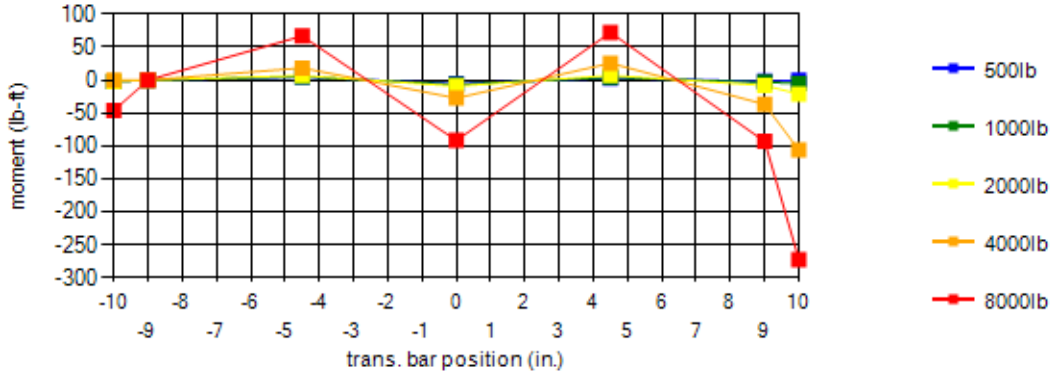
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*				
	3ft_LL	*3ft_TL_C*	*3ft_TR_C*	*3ft_TR_R*	*3ft_LR*
500	16	-4	0	-5	23
1000	15	-5	2	-7	22
2000	10	-7	6	-13	18
3000	4	2	13	-26	5
4000	-5	52	23	-44	-16
5000	-23	ND	36	-66	-45
6000	-48	ND	51	-90	-70
7000	-78	ND	67	-114	-101
8000	-108	ND	86	-144	-140
9000	-149	ND	107	-177	-178
10000	-189	ND	126	-205	-210
11000	-230	ND	148	-237	-245
12000	-278	ND	172	-274	-287
13000	ND	ND	194	-304	-325
14000	ND	ND	218	-340	-369
15000	ND	ND	243	-375	-417
16000	ND	ND	269	-405	-460
17000	ND	ND	299	-440	-510
18000	ND	ND	336	-476	-565
19000	ND	ND	372	-499	-612
20000	ND	ND	411	-529	-661
21000	ND	ND	455	-540	-696
22000	ND	ND	520	-545	-730
23000	ND	ND	588	-544	-755
24000	ND	ND	680	-544	-794
25000	ND	ND	772	-543	-829
26000	ND	ND	891	-541	-870
27000	ND	ND	ND	ND	-905

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



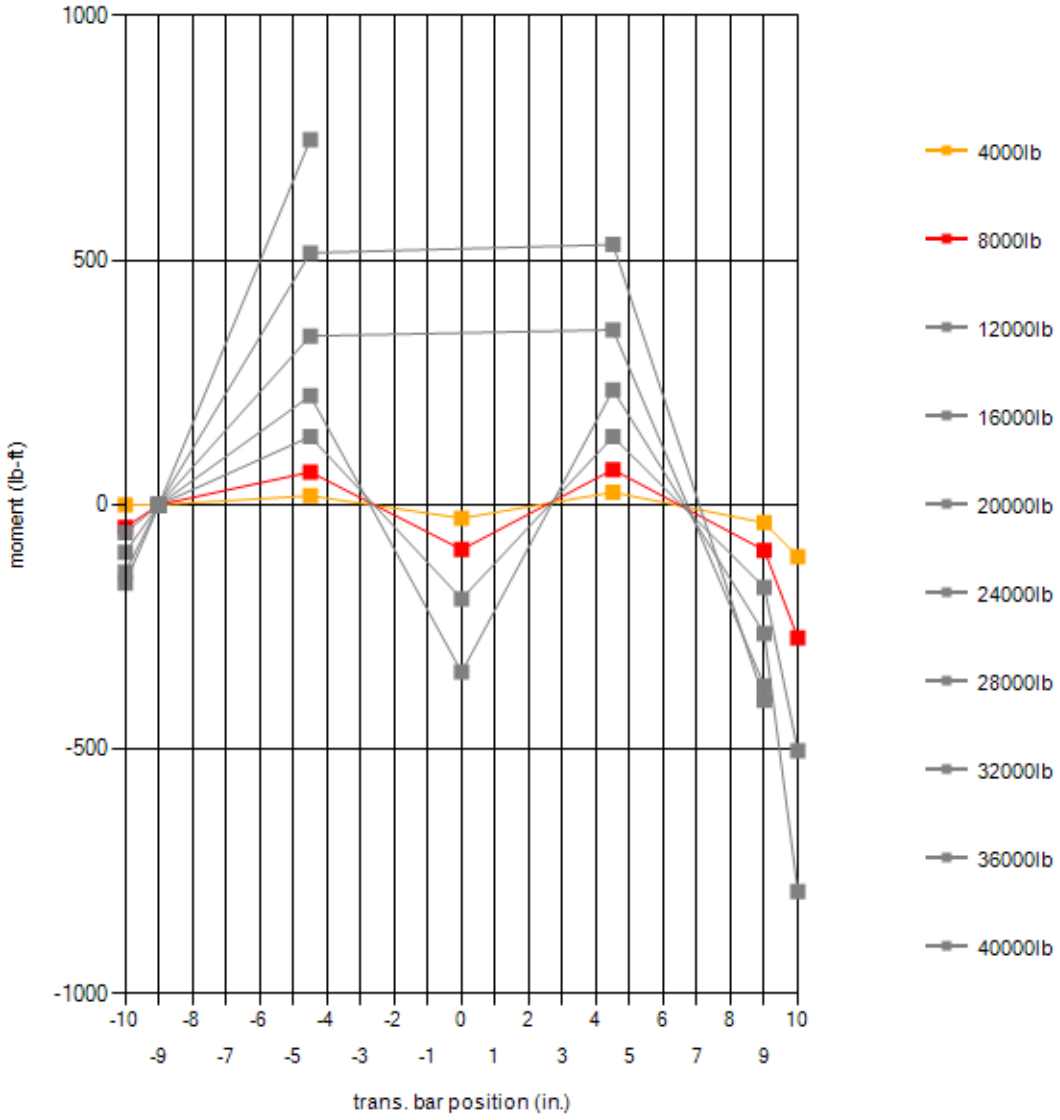
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



Moment Results along Transverse Bar at 6ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	6ft_LL	*6ft_TL_L*	*6ft_TL_C*	*6ft_TR_C*	*6ft_TR_R*	*6ft_LR*
500	-2	0	5	3	-2	0
1000	-2	0	5	4	-3	-5
2000	-2	0	7	7	-8	-21
3000	-2	0	11	15	-22	-63
4000	0	0	18	26	-37	-106
5000	-19	0	28	36	-51	-146
6000	-23	0	40	48	-64	-183
7000	-30	0	53	59	-78	-224
8000	-46	0	67	72	-93	-272
9000	-41	0	85	89	-113	-330
10000	-46	0	102	103	-129	-374
11000	-52	0	120	118	-145	-427
12000	-57	0	139	139	-169	-503
13000	-67	0	157	161	-193	-576
14000	-74	0	176	184	-217	-641
15000	-85	0	201	211	-243	-724
16000	-97	0	223	235	-264	-791
17000	-102	0	248	260	-289	-871
18000	-115	0	279	292	-318	-970
19000	-119	0	310	322	-343	-1067
20000	-137	0	345	358	-370	ND
21000	-154	0	380	395	-391	ND
22000	-158	0	424	449	-404	ND
23000	-164	0	464	495	-407	ND
24000	-160	0	515	532	-400	ND
25000	-158	0	574	ND	-394	ND
26000	-163	0	639	ND	-387	ND
27000	ND	0	389	ND	ND	ND
28000	ND	0	747	ND	ND	ND
29000	ND	0	866	ND	ND	ND
30000	ND	0	ND	ND	ND	ND
31000	ND	0	ND	ND	ND	ND
32000	ND	0	ND	ND	ND	ND
33000	ND	0	ND	ND	ND	ND
34000	ND	0	ND	ND	ND	ND
35000	ND	0	ND	ND	ND	ND
36000	ND	0	ND	ND	ND	ND
37000	ND	0	ND	ND	ND	ND
38000	ND	0	ND	ND	ND	ND
39000	ND	0	ND	ND	ND	ND
40000	ND	0	ND	ND	ND	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All

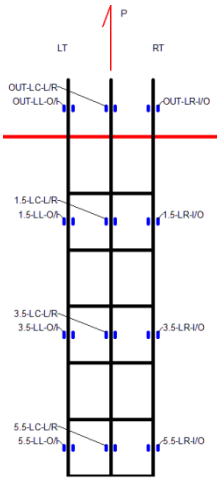


STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/10/2012 4:16:00 PM
Test Identification:	TS48.07-G-9x12-W20xW11-L6-Z5-M
Test Facility:	12'x12'x4' MSE Test Box

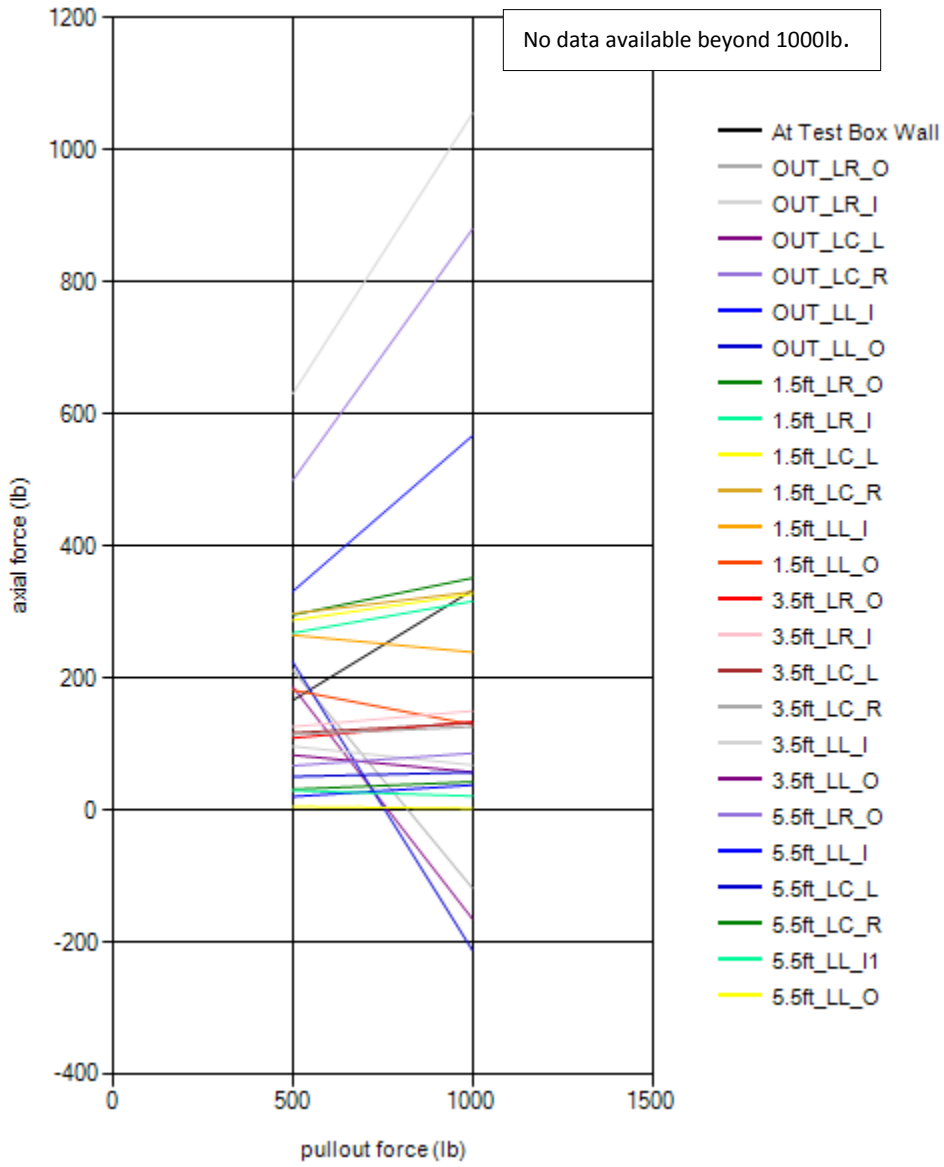
Sketch



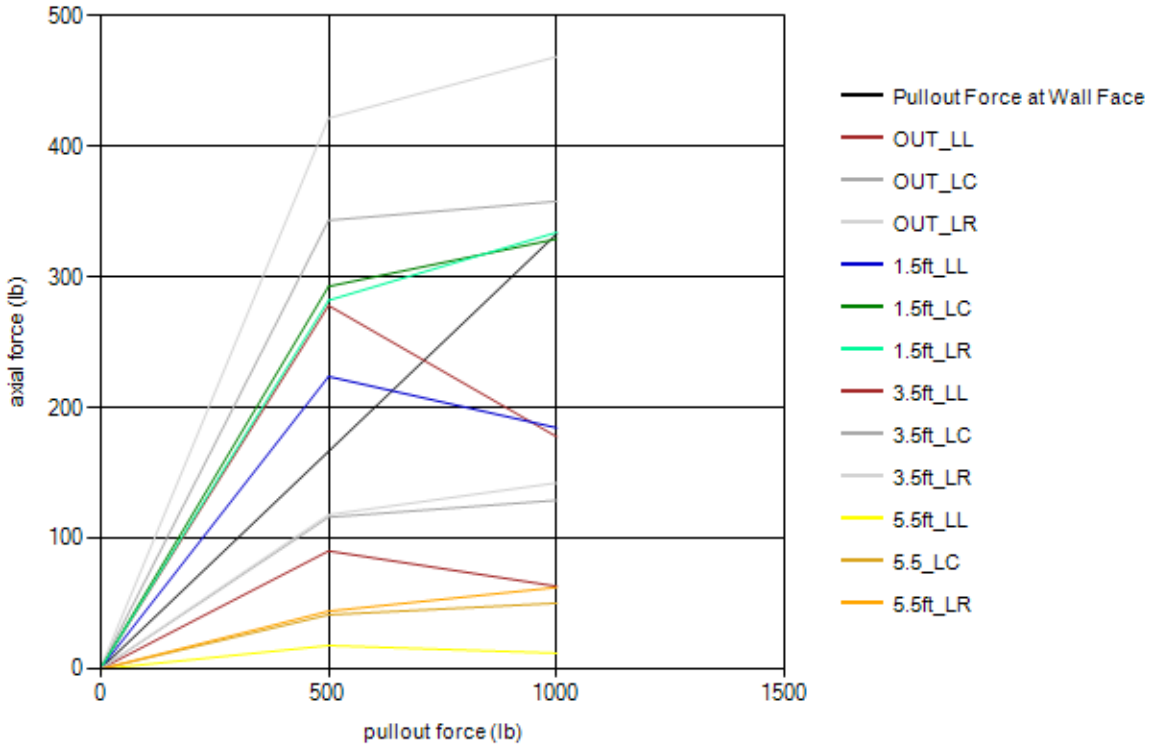
MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

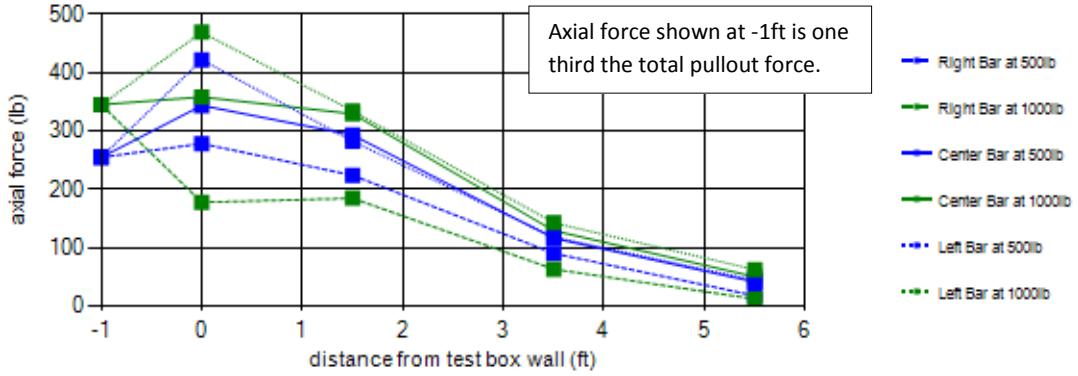
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



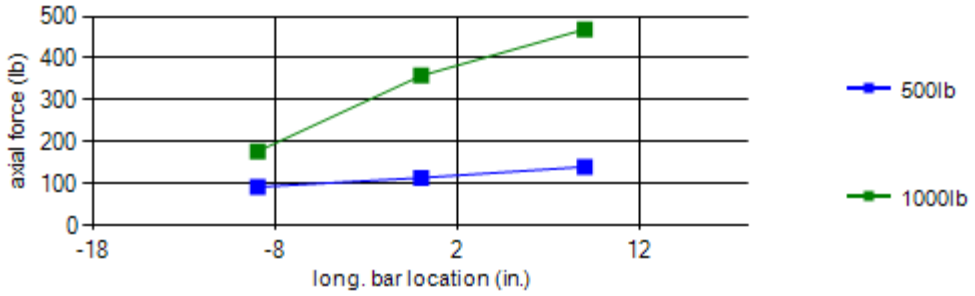
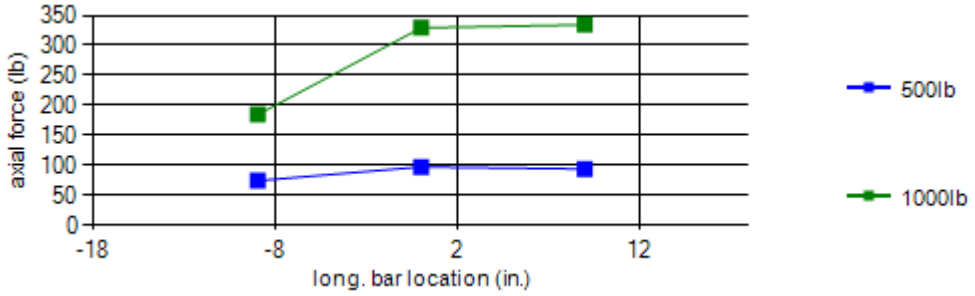
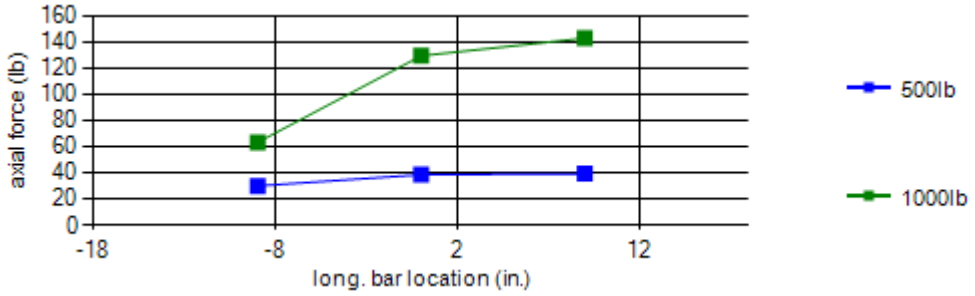
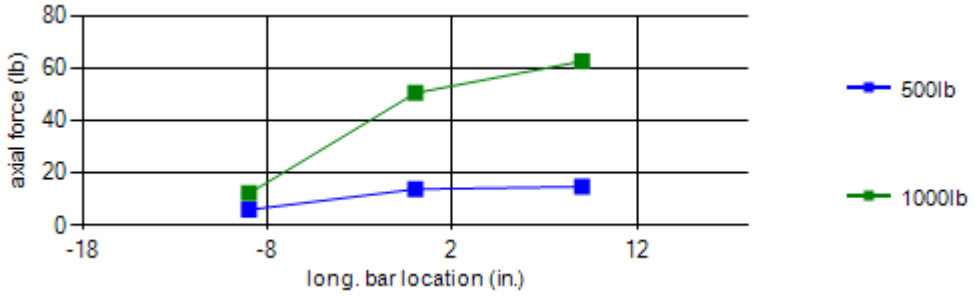
Axial Load-Distance from Test Box Wall Plot – Service Loads



Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*											
	OUT_LL	*OUT_LC*	*OUT_LR*	*1.5ft_LL*	*1.5ft_LC*	*1.5ft_LR*	*3.5ft_LL*	*3.5ft_LC*	*3.5ft_LR*	*5.5ft_LL*	*5.5_LC*	*5.5ft_LR*
500	278	344	422	224	293	282	90	116	118	18	42	44
1000	178	358	469	185	329	334	63	129	143	12	50	63

Axial Load Distribution among the Longitudinal Bars – Service Loads

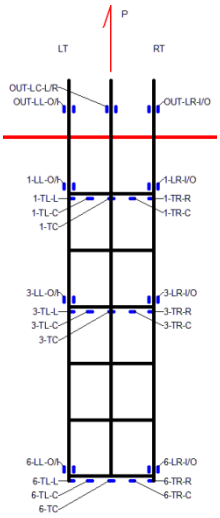
Distance from box wall	*Plot*
outside	
1.5ft	
3.5ft	
5.5ft	

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/11/2012 4:32:00 PM
Test Identification:	TS48.10-G-9x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

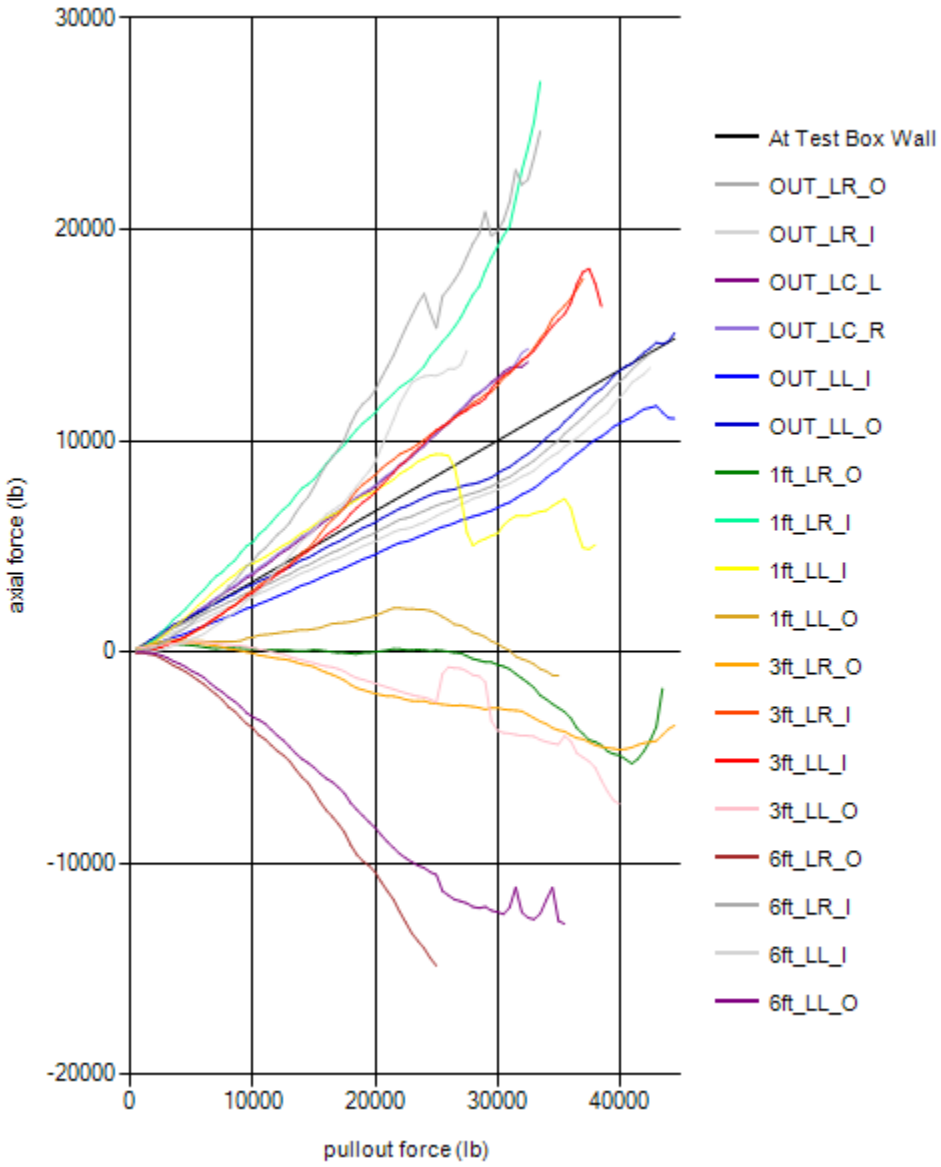
Sketch



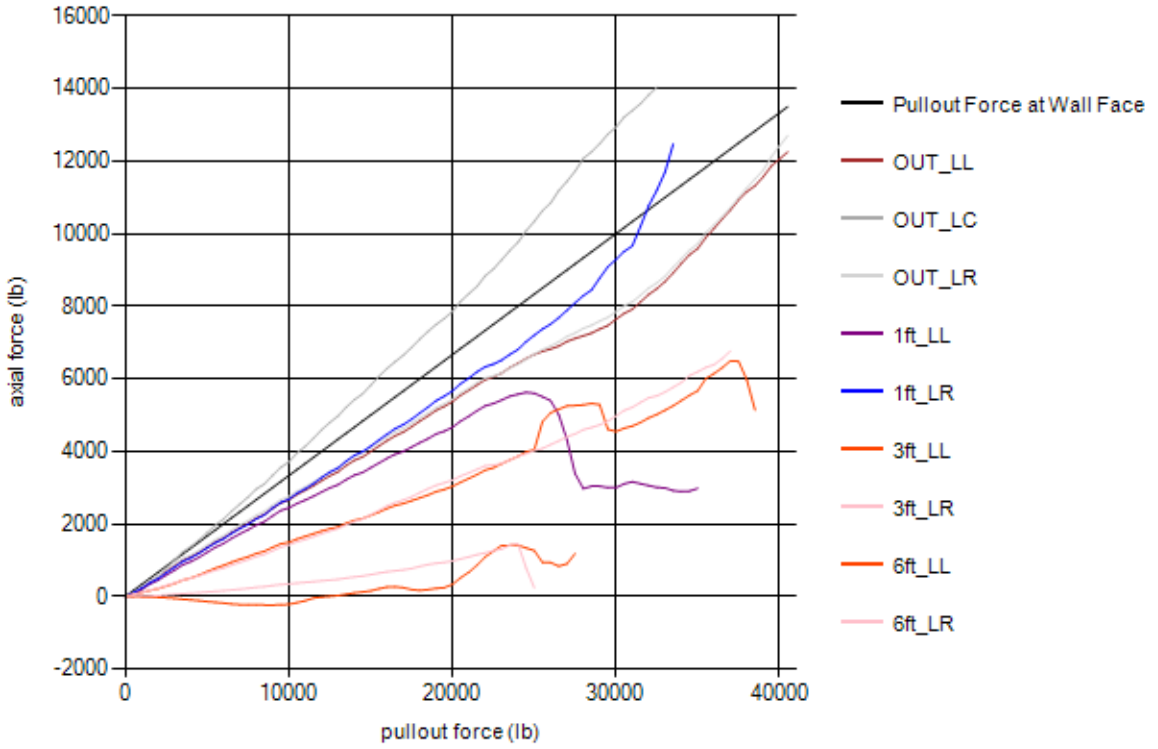
MSE Reinforcement

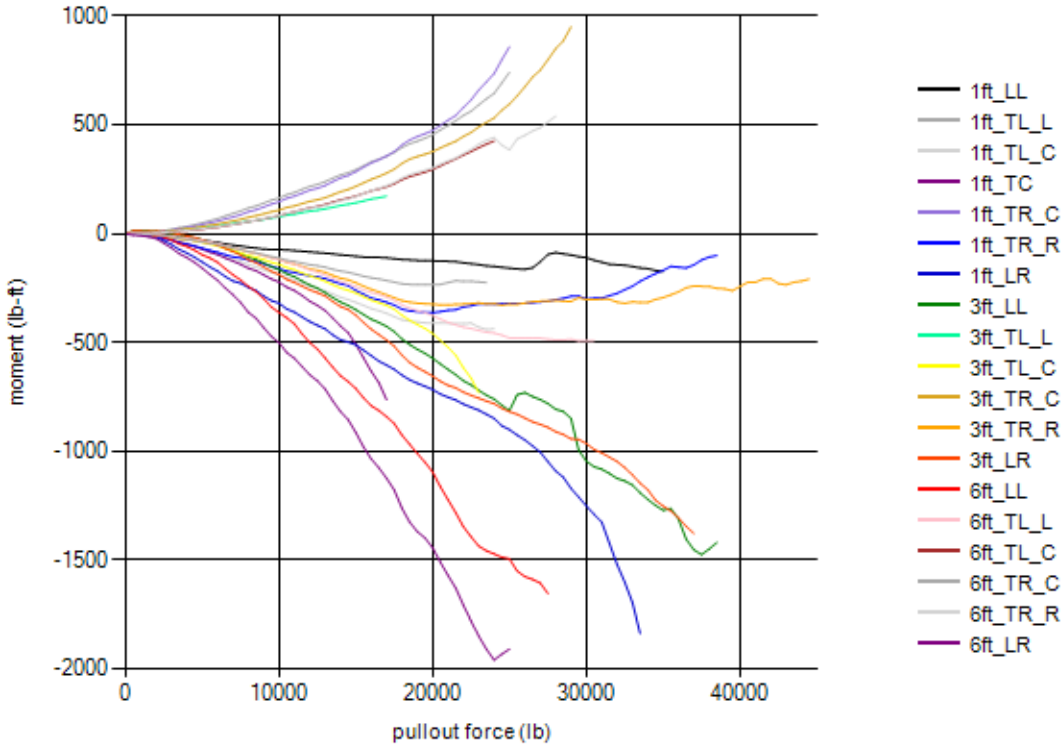
Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

Axial Load-Pullout Load Data by Gage

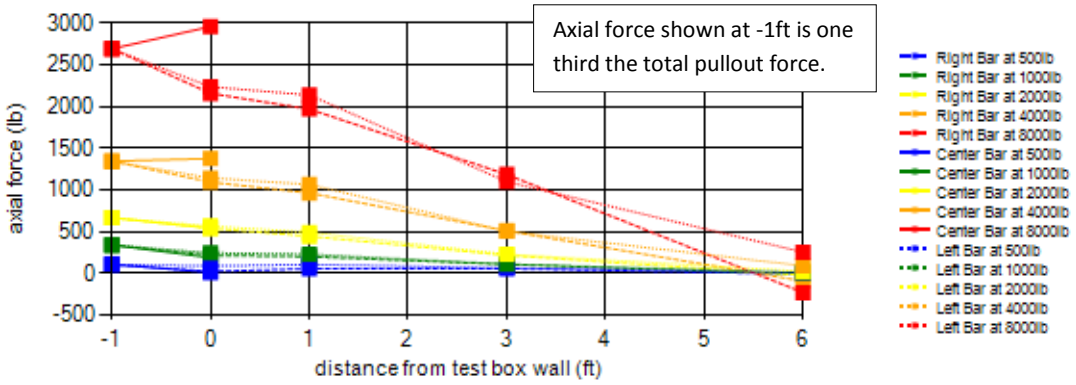


Axial Load-Pullout Load And Moment-Pullout Load Data by Location





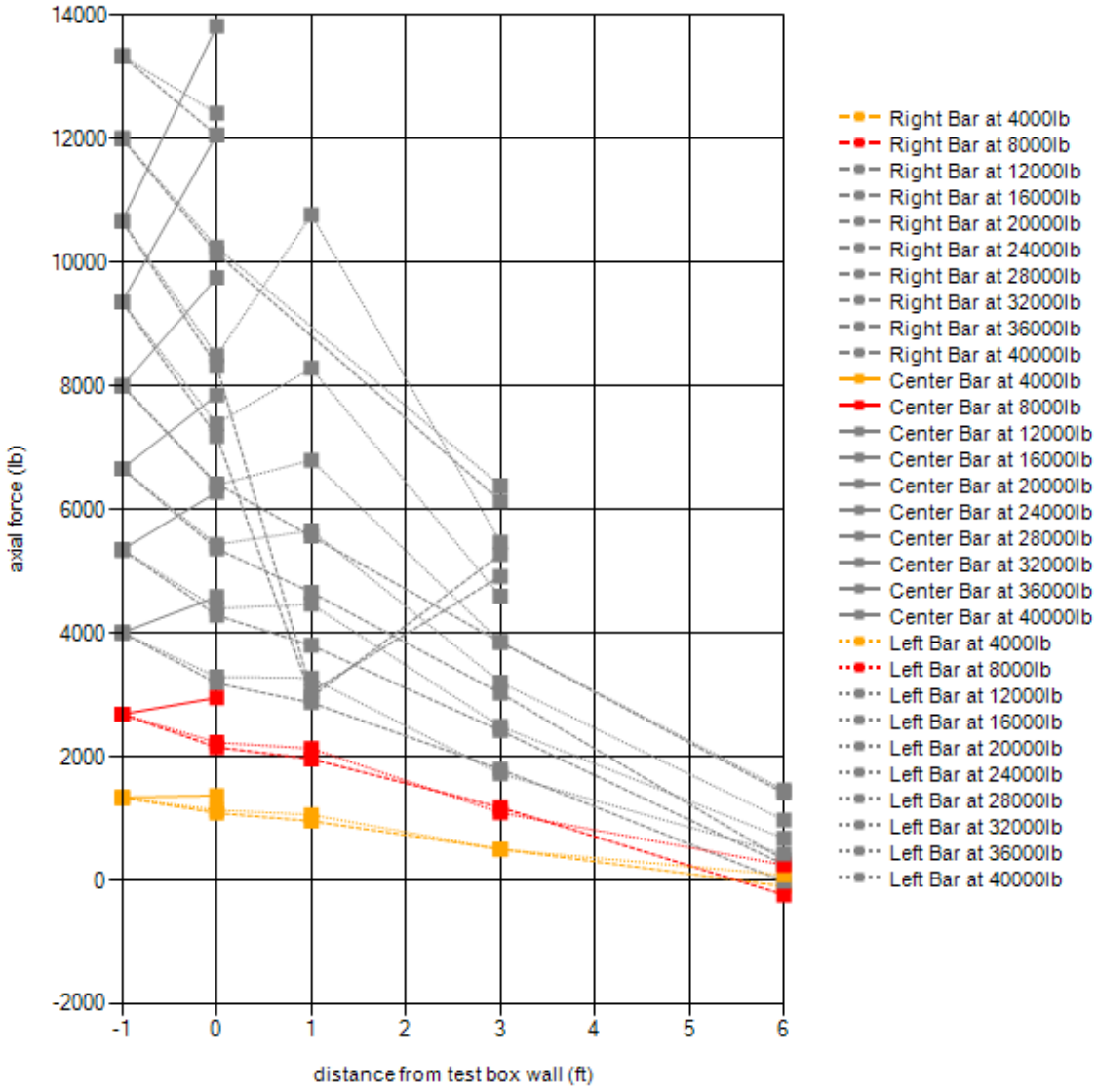
Axial Load-Distance from Test Box Wall Plot – Service Loads



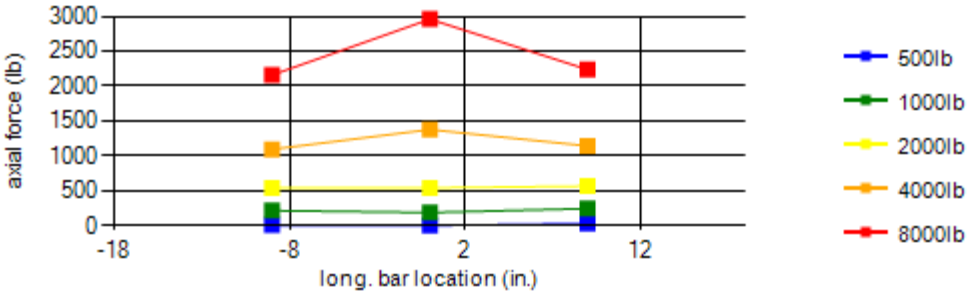
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*								
	OUT_LL	*OUT_LC*	*OUT_LR*	*1ft_LL*	*1ft_LR*	*3ft_LL*	*3ft_LR*	*6ft_LL*	*6ft_LR*
500	22	13	87	57	107	58	65	-7	9
1000	217	189	247	202	230	109	111	-9	12
2000	541	541	568	446	492	216	230	-22	25
3000	849	995	885	722	799	358	370	-51	59
4000	1095	1377	1143	964	1067	510	506	-92	90
5000	1358	1758	1417	1217	1337	683	648	-141	123
6000	1608	2132	1676	1461	1589	856	779	-180	158
7000	1892	2547	1968	1727	1872	1024	938	-222	201
8000	2158	2959	2236	1969	2138	1185	1100	-229	254
9000	2431	3338	2515	2220	2438	1354	1260	-235	304
10000	2663	3707	2751	2442	2678	1493	1424	-217	348
11000	2928	4138	3021	2659	2966	1657	1572	-118	389
12000	3193	4594	3297	2879	3278	1803	1729	-14	433
13000	3433	4973	3549	3077	3541	1915	1872	26	474
14000	3756	5423	3877	3344	3890	2097	2065	97	540
15000	3991	5820	4111	3548	4143	2237	2254	153	603
16000	4293	6285	4406	3806	4473	2426	2495	261	683
17000	4532	6654	4633	4000	4738	2562	2659	243	734
18000	4833	7097	4917	4238	5056	2719	2859	168	831
19000	5132	7498	5205	4478	5396	2890	3065	225	917
20000	5370	7854	5440	4666	5665	3034	3209	335	980
21000	5684	8348	5740	4971	6019	3253	3408	667	1092
22000	5978	8837	6021	5256	6332	3483	3601	1092	1202
23000	6156	9274	6155	5413	6512	3659	3664	1407	1304
24000	6423	9755	6399	5573	6805	3860	3863	1416	1463
25000	6671	10338	6678	5603	7203	4043	4025	1268	239
26000	6821	10845	6898	5399	7507	5062	4184	935	ND
27000	7029	11440	7166	4326	7887	5250	4406	899	ND
28000	7186	12072	7392	2972	8292	5280	4600	ND	ND
29000	7370	12479	7593	3038	8774	5291	4732	ND	ND
30000	7642	12936	7847	2999	9290	4549	4977	ND	ND
31000	7918	13394	8120	3162	9663	4698	5216	ND	ND
32000	8325	13825	8499	3059	10771	4925	5476	ND	ND
33000	8681	ND	8827	2992	11702	5134	5635	ND	ND
34000	9179	ND	9311	2892	ND	5401	5897	ND	ND
35000	9593	ND	9724	2978	ND	5672	6194	ND	ND
36000	10148	ND	10249	ND	ND	6145	6391	ND	ND
37000	10654	ND	10719	ND	ND	6496	6767	ND	ND
38000	11156	ND	11260	ND	ND	5977	ND	ND	ND
39000	11567	ND	11754	ND	ND	ND	ND	ND	ND
40000	12061	ND	12416	ND	ND	ND	ND	ND	ND

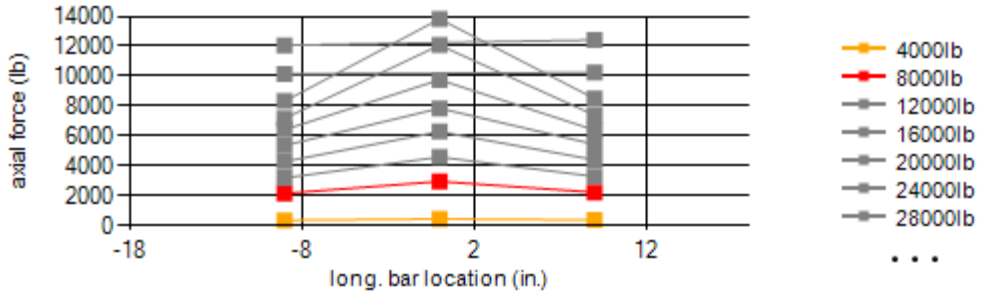
Axial Load-Distance from Test Box Wall Plot – All



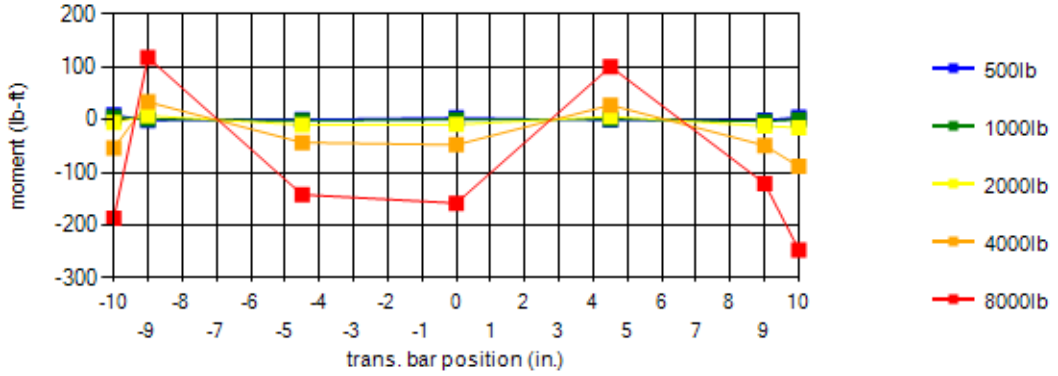
Axial Load Distribution among the Longitudinal Bars – Service Loads

Distance from box wall	*Plot*
outside	

Axial Load Distribution among the Longitudinal Bars – All

Distance from box wall	*Plot*
outside	

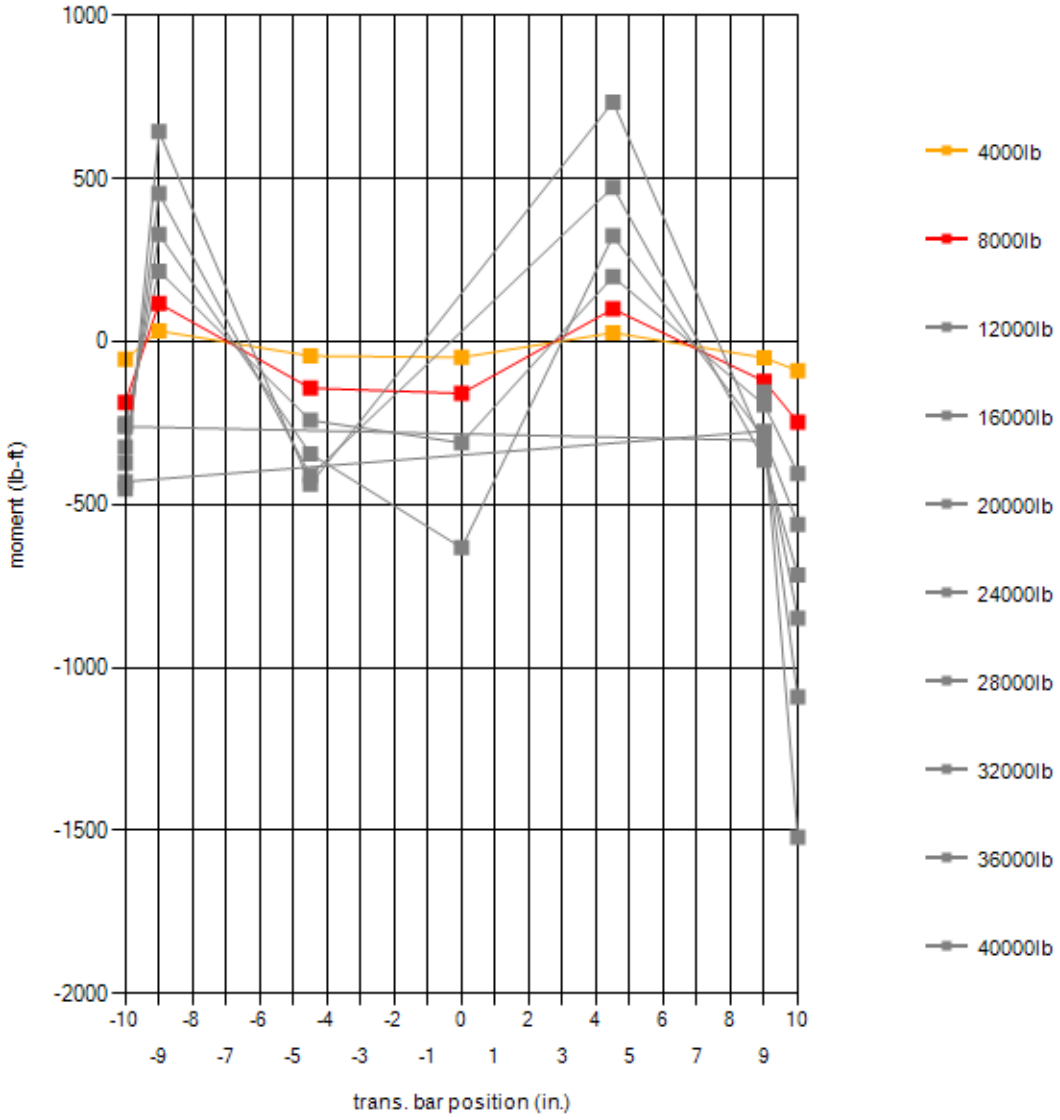
Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – Service Loads



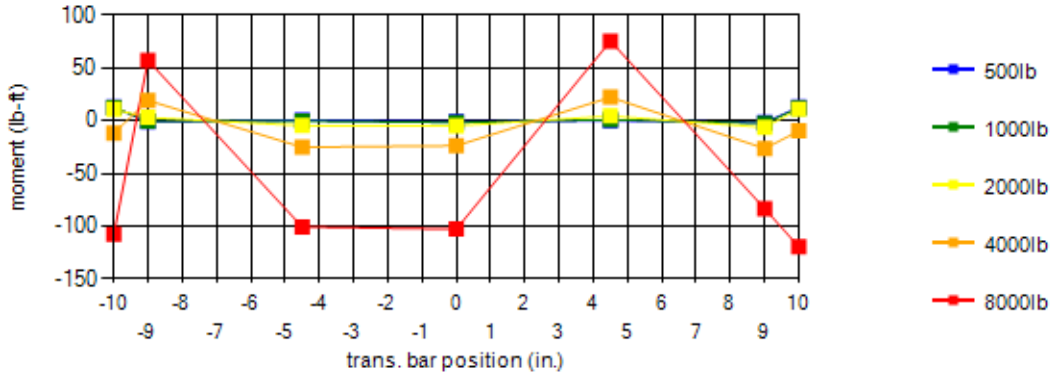
Moment Results along Transverse Bar at 1ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*						
	1ft_LL	*1ft_TL_L*	*1ft_TL_C*	*1ft_TC*	*1ft_TR_C*	*1ft_TR_R*	*1ft_LR*
500	9	-1	0	4	-1	-1	5
1000	5	1	-2	0	1	-3	0
2000	-5	7	-10	-9	6	-12	-15
3000	-25	20	-25	-27	16	-31	-50
4000	-54	33	-43	-48	28	-49	-89
5000	-88	50	-66	-72	42	-67	-130
6000	-121	69	-89	-96	57	-85	-172
7000	-157	93	-116	-126	76	-106	-217
8000	-187	118	-142	-158	101	-121	-247
9000	-213	140	-166	-189	123	-139	-287
10000	-221	164	-187	-222	146	-161	-319
11000	-232	189	-213	-261	172	-178	-361
12000	-251	217	-241	-310	200	-194	-404
13000	-268	239	-263	-353	221	-207	-437
14000	-291	269	-292	-424	256	-229	-487
15000	-311	294	-316	-508	285	-261	-510
16000	-323	330	-344	-632	325	-296	-560
17000	-333	356	-366	-763	357	-315	-604
18000	-355	396	-396	ND	407	-346	-650
19000	-367	425	-406	ND	446	-358	-687
20000	-373	455	-410	ND	474	-363	-716
21000	-380	497	-411	ND	521	-352	-751
22000	-401	543	-413	ND	580	-336	-783
23000	-426	592	-430	ND	660	-322	-811
24000	-451	644	-437	ND	735	-323	-848
25000	-475	741	ND	ND	858	-320	-900
26000	-492	ND	ND	ND	ND	-320	-947
27000	-388	ND	ND	ND	ND	-313	-1004
28000	-260	ND	ND	ND	ND	-303	-1090
29000	-293	ND	ND	ND	ND	-288	-1170
30000	-329	ND	ND	ND	ND	-300	-1251
31000	-391	ND	ND	ND	ND	-296	-1324
32000	-429	ND	ND	ND	ND	-274	-1520
33000	-452	ND	ND	ND	ND	-241	-1694
34000	-481	ND	ND	ND	ND	-201	ND
35000	-519	ND	ND	ND	ND	-169	ND
36000	ND	ND	ND	ND	ND	-154	ND
37000	ND	ND	ND	ND	ND	-144	ND
38000	ND	ND	ND	ND	ND	-107	ND

Moment Results along Transverse Bar at 1ft from Test Box Wall – Plot – All



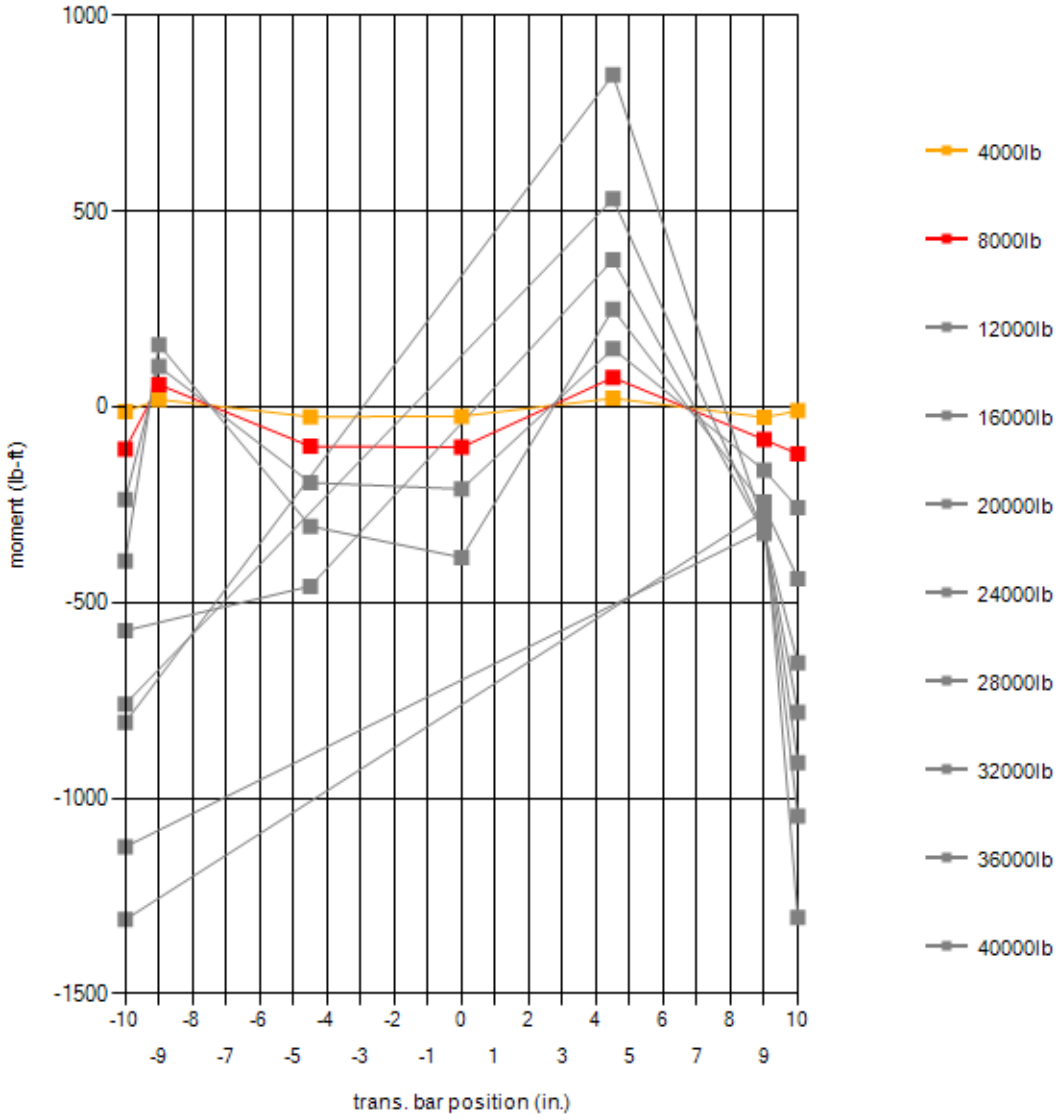
Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – Service Loads



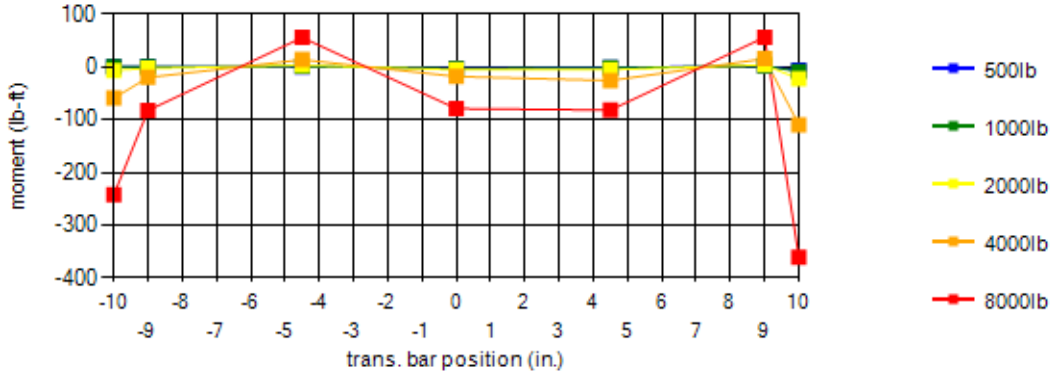
Moment Results along Transverse Bar at 3ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	3ft_LL	*3ft_TL_L*	*3ft_TL_C*	*3ft_TR_C*	*3ft_TR_R*	*3ft_LR*
500	13	-1	1	0	-2	13
1000	13	0	0	1	-3	12
2000	11	3	-5	4	-6	11
3000	1	11	-15	13	-16	4
4000	-12	19	-25	22	-26	-10
5000	-29	29	-39	33	-38	-28
6000	-51	37	-56	44	-50	-52
7000	-79	47	-79	58	-65	-82
8000	-108	57	-101	75	-83	-120
9000	-134	67	-119	91	-101	-153
10000	-165	77	-141	108	-118	-188
11000	-197	90	-165	127	-140	-224
12000	-236	103	-194	149	-162	-258
13000	-271	114	-218	165	-177	-286
14000	-314	129	-249	193	-204	-334
15000	-349	142	-272	218	-225	-375
16000	-393	159	-305	250	-255	-439
17000	-426	172	-330	278	-281	-488
18000	-484	ND	-375	323	-307	-558
19000	-531	ND	-417	355	-319	-615
20000	-572	ND	-458	376	-324	-654
21000	-624	ND	-521	410	-327	-696
22000	-676	ND	-616	447	-323	-728
23000	-720	ND	-731	490	-318	-755
24000	-759	ND	ND	532	-321	-781
25000	-813	ND	ND	595	-323	-817
26000	-730	ND	ND	675	-318	-847
27000	-762	ND	ND	751	-310	-876
28000	-806	ND	ND	849	-306	-909
29000	-848	ND	ND	950	-312	-943
30000	-1045	ND	ND	ND	-303	-963
31000	-1082	ND	ND	ND	-300	-1007
32000	-1124	ND	ND	ND	-314	-1046
33000	-1155	ND	ND	ND	-314	-1108
34000	-1221	ND	ND	ND	-316	-1176
35000	-1270	ND	ND	ND	-293	-1251
36000	-1311	ND	ND	ND	-267	-1305
37000	-1452	ND	ND	ND	-240	-1377
38000	-1448	ND	ND	ND	-243	ND
39000	ND	ND	ND	ND	-254	ND
40000	ND	ND	ND	ND	-243	ND

Moment Results along Transverse Bar at 3ft from Test Box Wall – Plot – All



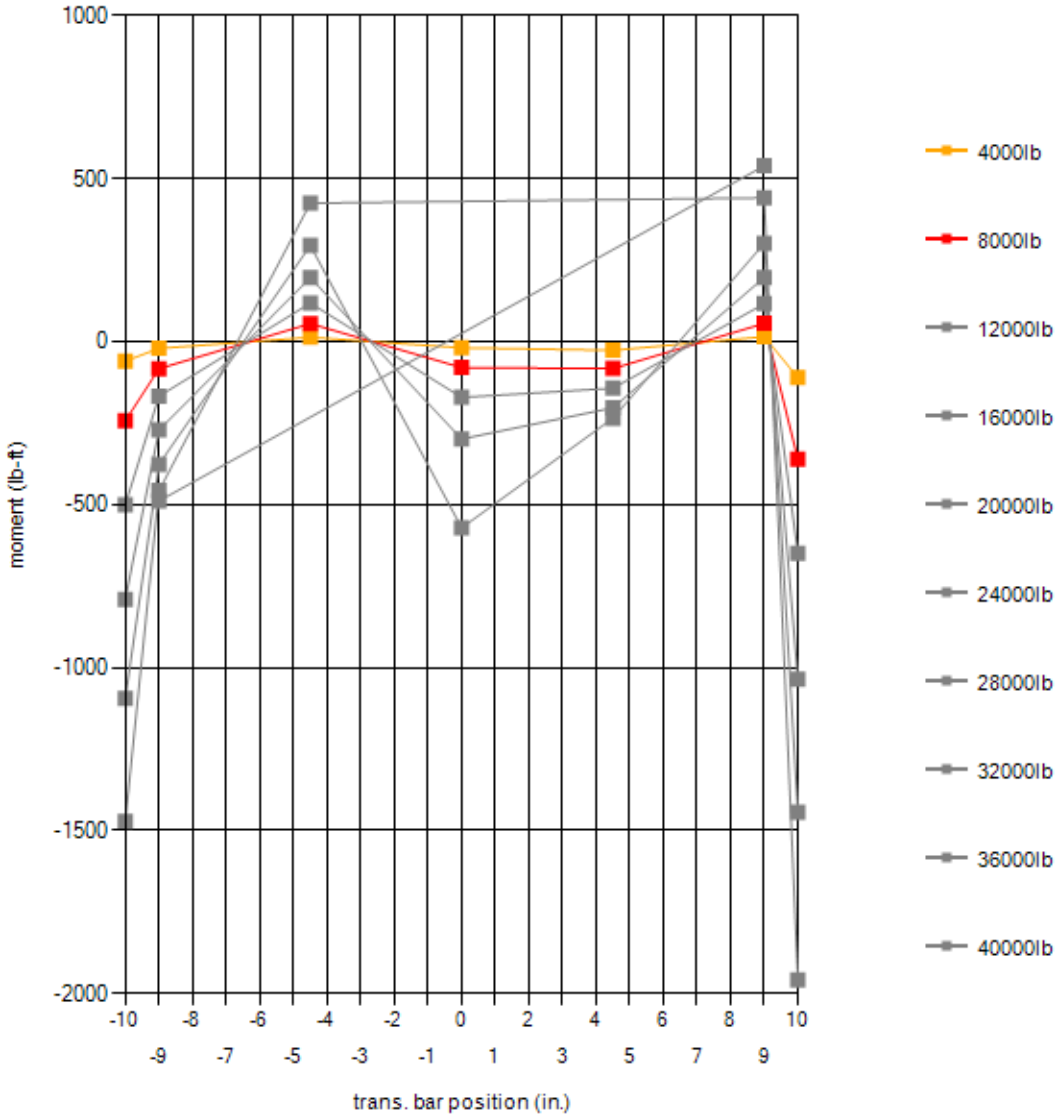
Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – Service Loads



Moment Results along Transverse Bar at 6ft from Test Box Wall – Data

Pullout Resistance, P_r (lb)	*Moment (lb-ft) calculated from strain data at distances from test box wall*					
	6ft_LL	*6ft_TL_L*	*6ft_TL_C*	*6ft_TR_C*	*6ft_TR_R*	*6ft_LR*
500	1	0	1	-1	2	-6
1000	0	0	1	-2	2	-9
2000	-7	-3	3	-5	4	-23
3000	-29	-10	8	-15	9	-65
4000	-59	-20	14	-26	15	-110
5000	-97	-32	21	-38	23	-159
6000	-131	-45	30	-50	32	-214
7000	-189	-64	42	-65	43	-280
8000	-242	-82	56	-82	56	-361
9000	-299	-100	68	-97	69	-432
10000	-362	-120	82	-111	83	-501
11000	-414	-139	100	-127	100	-572
12000	-500	-167	119	-142	117	-648
13000	-571	-190	134	-154	130	-713
14000	-652	-220	155	-171	151	-817
15000	-711	-243	173	-186	171	-913
16000	-790	-271	197	-203	197	-1035
17000	-841	-291	216	-215	220	-1123
18000	-925	-326	248	-230	255	-1261
19000	-1010	-353	272	-234	281	-1368
20000	-1094	-376	296	-234	302	-1443
21000	-1222	-407	328	-224	334	-1570
22000	-1346	-429	362	-218	368	-1706
23000	-1435	-444	395	-221	411	-1849
24000	-1471	-456	425	ND	441	-1958
25000	-1493	-479	ND	ND	385	-1908
26000	-1575	-478	ND	ND	452	ND
27000	-1605	-480	ND	ND	487	ND
28000	ND	-488	ND	ND	540	ND
29000	ND	-485	ND	ND	ND	ND
30000	ND	-492	ND	ND	ND	ND

Moment Results along Transverse Bar at 6ft from Test Box Wall – Plot – All

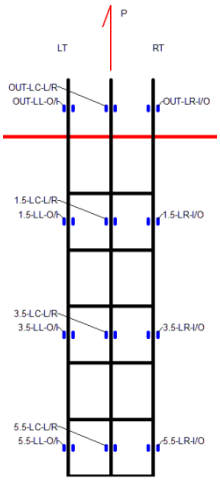


STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/8/2012 12:36:00 PM
Test Identification:	TS48.11-G-9x12-W20xW11-L6-Z5-B
Test Facility:	12'x12'x4' MSE Test Box

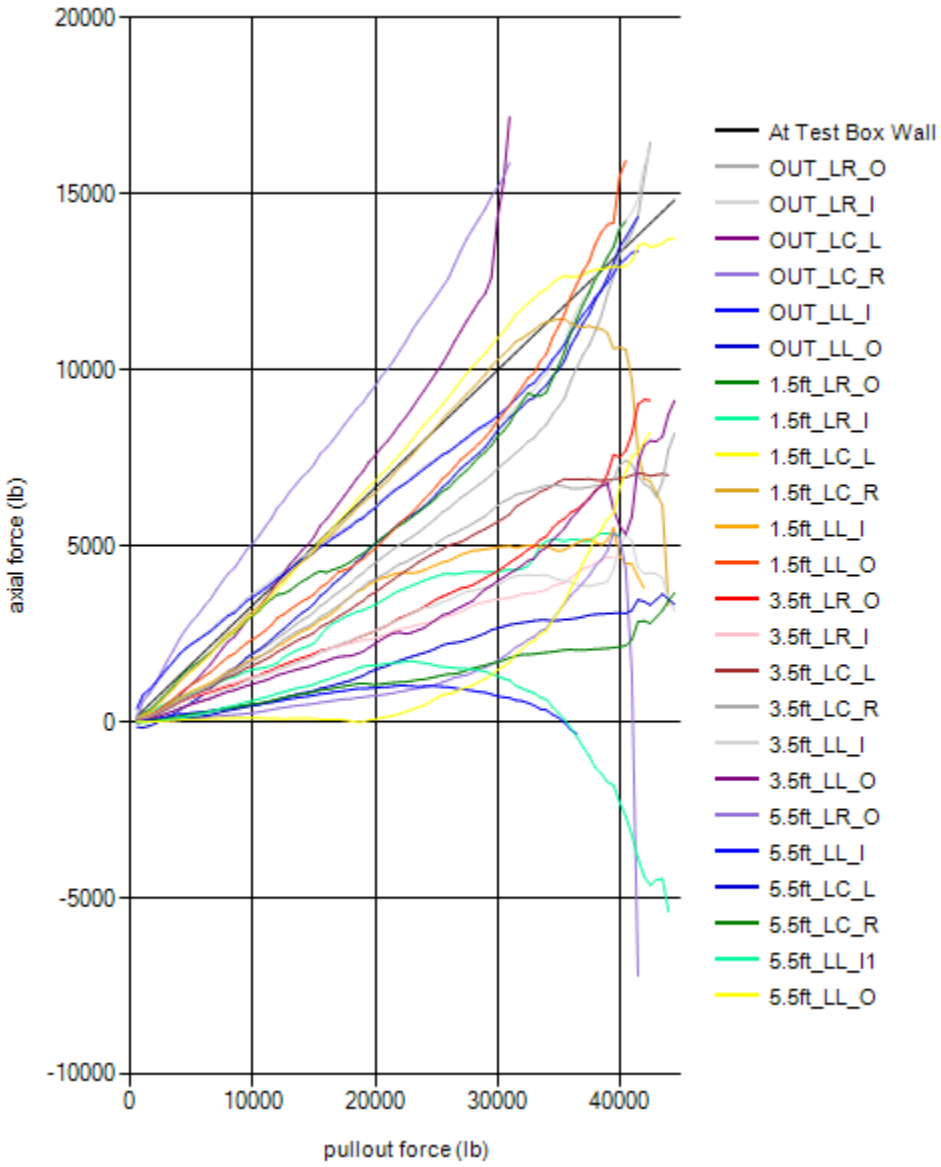
Sketch



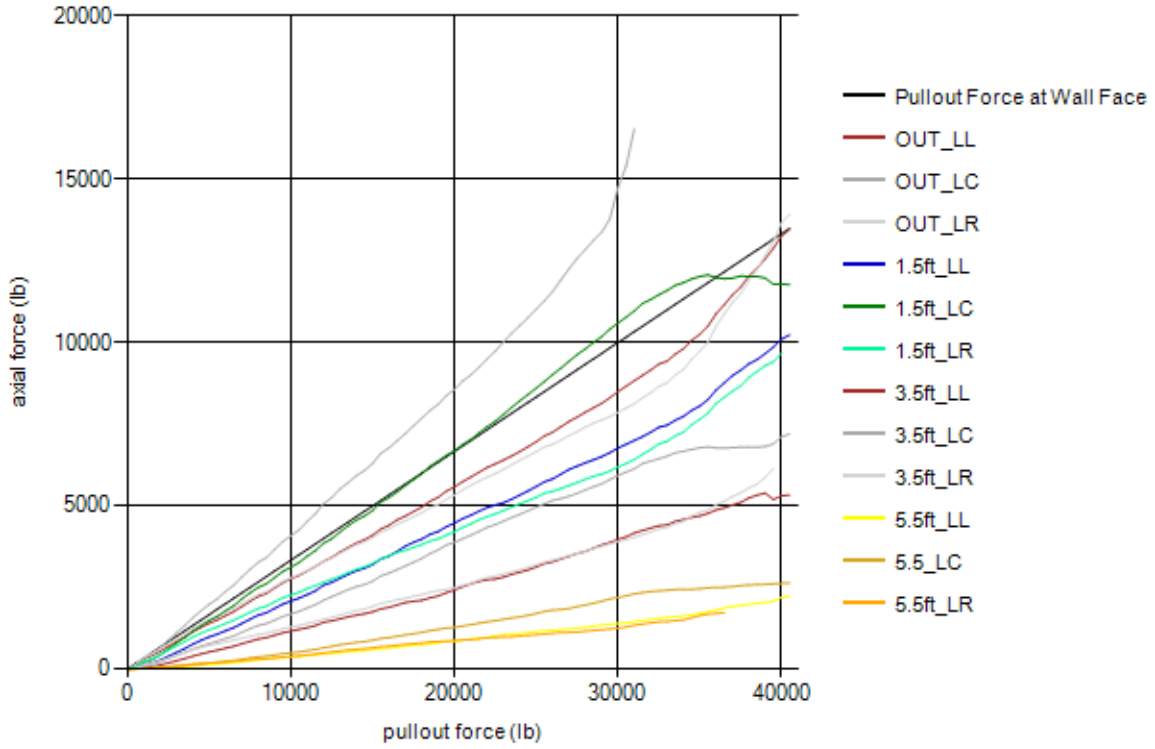
MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

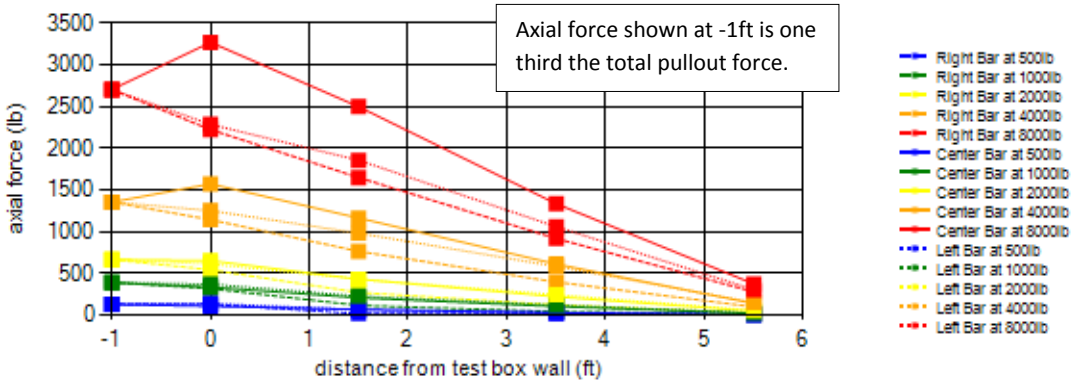
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



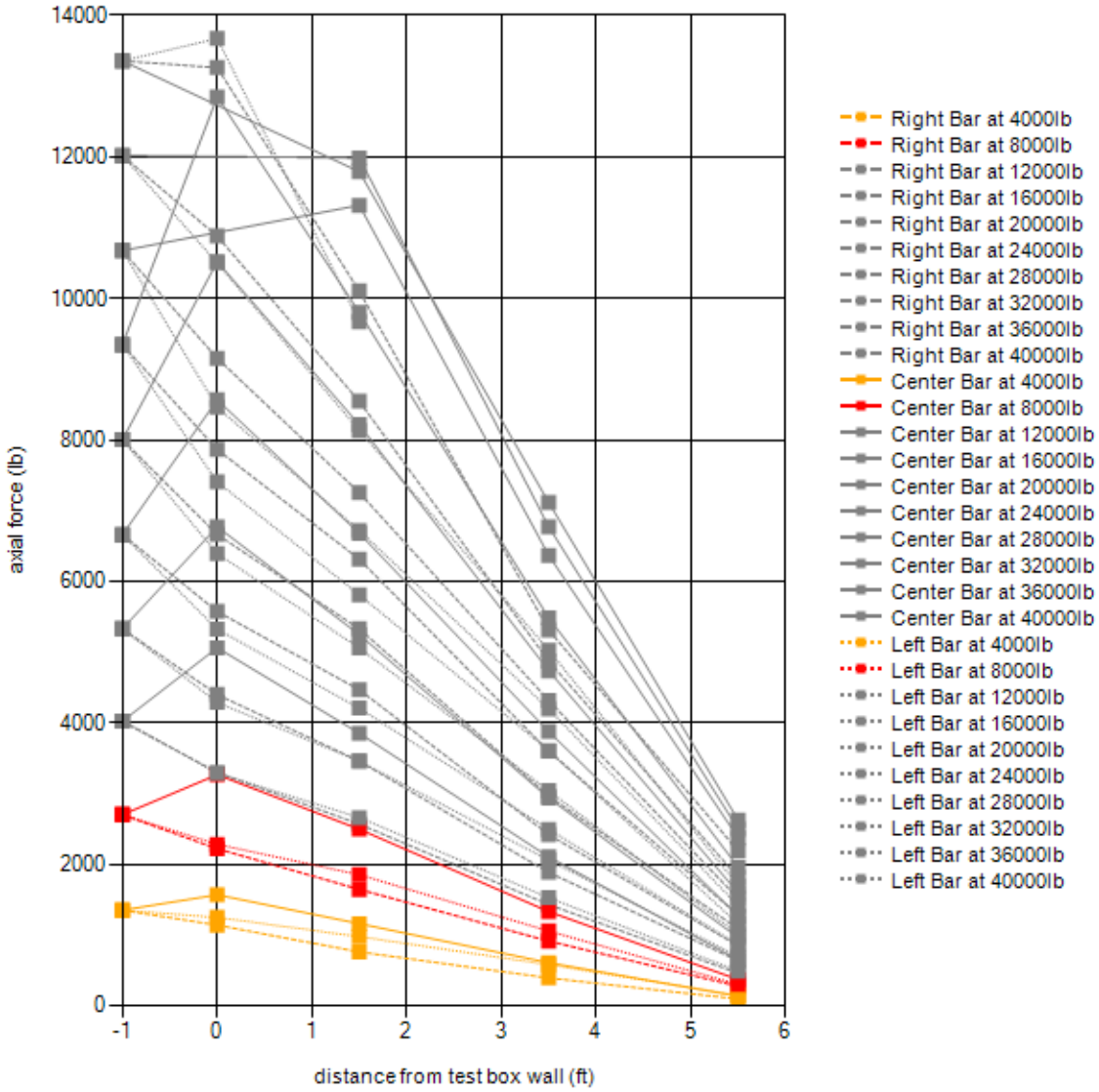
Axial Load-Distance from Test Box Wall Plot – Service Loads



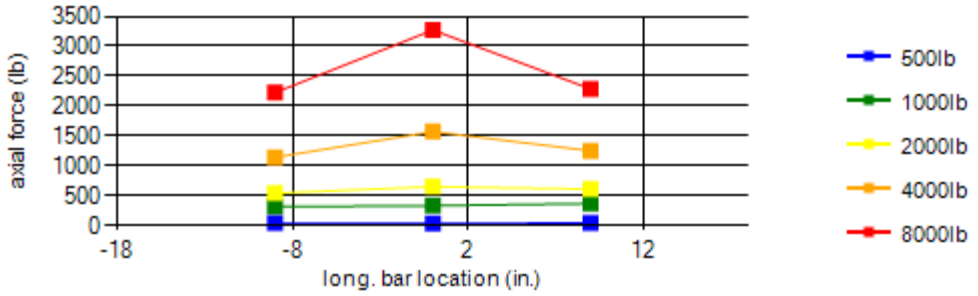
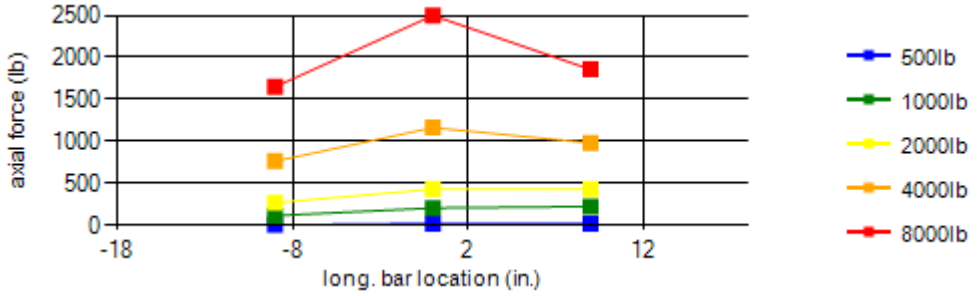
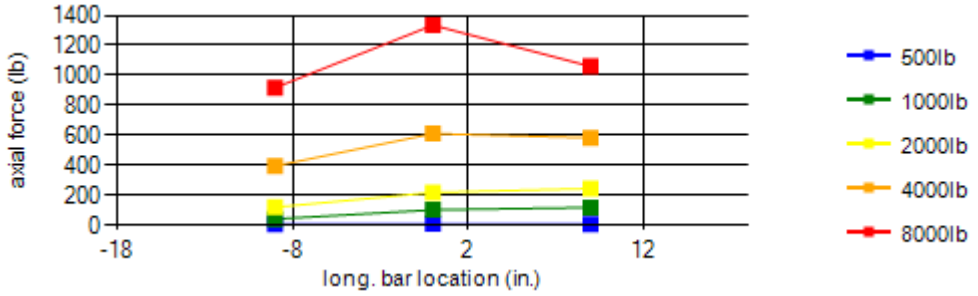
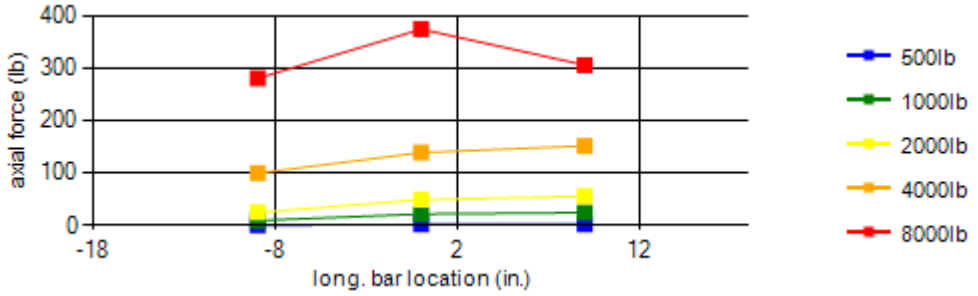
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*											
	OUT_LL	*OUT_LC*	*OUT_LR*	*1.5ft_LL*	*1.5ft_LC*	*1.5ft_LR*	*3.5ft_LL*	*3.5ft_LC*	*3.5ft_LR*	*5.5ft_LL*	*5.5_LC*	*5.5ft_LR*
500	130	107	140	18	68	63	21	31	26	2	6	6
1000	318	335	371	117	208	227	43	104	120	10	22	25
2000	544	653	614	271	432	431	122	221	246	25	49	56
3000	840	1109	930	507	793	705	253	415	415	57	89	103
4000	1144	1572	1252	765	1164	982	397	612	585	100	139	152
5000	1401	1983	1508	983	1482	1202	525	780	721	141	185	187
6000	1638	2375	1735	1174	1787	1396	640	935	827	180	233	220
7000	1916	2816	1999	1398	2151	1616	776	1127	943	227	298	265
8000	2223	3270	2286	1649	2499	1857	918	1335	1060	280	374	306
9000	2478	3659	2525	1858	2799	2053	1037	1496	1166	324	433	341
10000	2764	4078	2795	2081	3117	2268	1163	1689	1283	371	497	384
11000	3004	4523	3017	2279	3460	2465	1269	1873	1399	412	566	436
12000	3300	5065	3292	2572	3855	2664	1434	2107	1531	463	653	495
13000	3577	5514	3542	2781	4199	2844	1537	2326	1656	506	744	556
14000	3858	5923	3802	3008	4561	3053	1652	2522	1790	552	817	606
15000	4100	6299	4023	3201	4861	3228	1754	2693	1919	590	882	650
16000	4402	6773	4291	3462	5249	3461	1888	2940	2061	641	967	700
17000	4687	7216	4545	3762	5620	3637	2035	3159	2165	706	1047	756
18000	4957	7680	4785	3979	5977	3812	2105	3388	2278	734	1125	797
19000	5258	8104	5039	4210	6366	3988	2236	3649	2396	803	1216	840
20000	5576	8567	5326	4470	6680	4209	2422	3878	2497	850	1276	868
21000	5882	9009	5627	4713	7030	4448	2612	4102	2627	919	1362	904
22000	6172	9501	5880	4949	7426	4670	2739	4340	2808	971	1449	958
23000	6403	10020	6119	5097	7800	4855	2819	4533	2912	1051	1524	983
24000	6664	10521	6394	5330	8215	5061	2969	4739	3043	1088	1599	1013
25000	6965	11026	6655	5590	8605	5261	3128	4958	3199	1147	1703	1050
26000	7249	11556	6881	5823	9018	5441	3285	5164	3335	1188	1805	1098
27000	7583	12252	7150	6112	9421	5623	3456	5291	3476	1231	1853	1126
28000	7866	12849	7410	6316	9804	5812	3600	5485	3610	1283	1963	1160
29000	8136	13377	7631	6508	10181	5968	3801	5674	3756	1344	2077	1205
30000	8495	14745	7863	6769	10597	6187	3970	5927	3894	1397	2193	1251
31000	8833	16543	8125	7002	10967	6415	4169	6131	4036	1451	2301	1341
32000	9156	ND	8463	7256	11318	6722	4318	6368	4200	1518	2376	1417
33000	9429	ND	8763	7470	11593	6974	4416	6518	4340	1579	2411	1457
34000	9804	ND	9173	7736	11834	7256	4576	6669	4521	1628	2445	1505
35000	10250	ND	9742	8056	12023	7654	4691	6777	4805	1707	2462	1639
36000	10882	ND	10503	8546	11988	8135	4874	6774	5031	1816	2499	1701
37000	11456	ND	11225	8989	11971	8508	5024	6779	5281	1920	2525	ND
38000	12028	ND	11885	9344	12026	8928	5238	6800	5549	1987	2576	ND
39000	12564	ND	12677	9662	11977	9295	5391	6813	5877	2041	2595	ND
40000	13263	ND	13674	10105	11792	9670	5310	7116	ND	2194	2627	ND

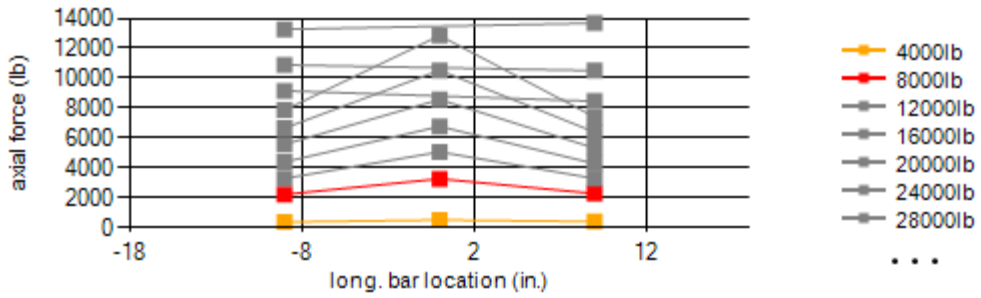
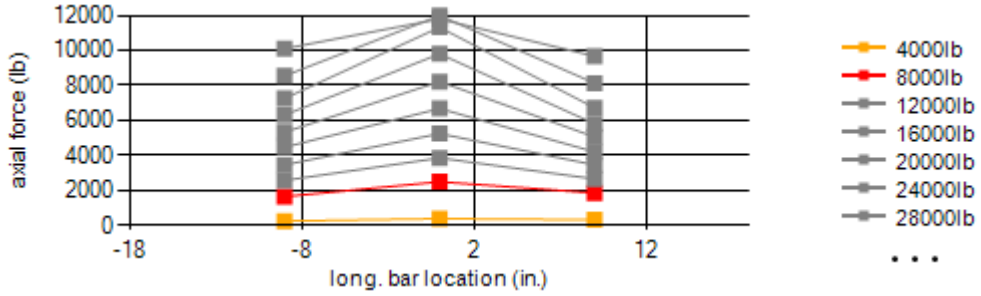
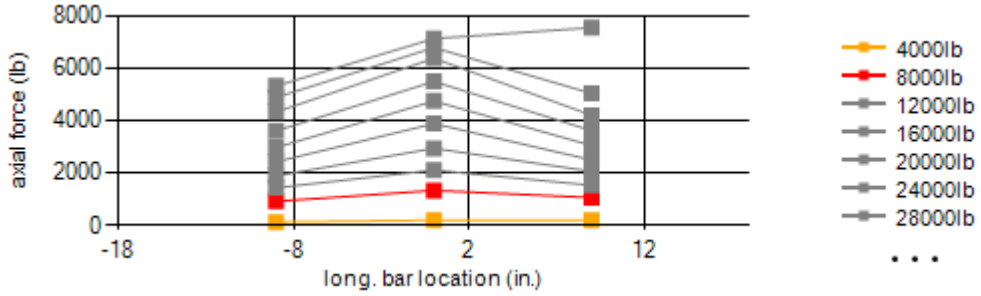
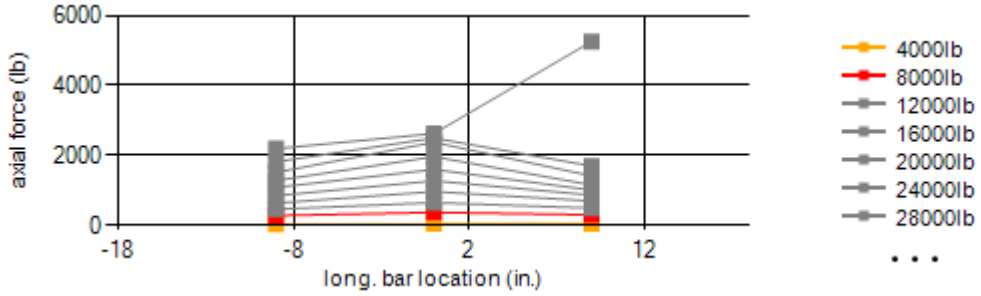
Axial Load-Distance from Test Box Wall Plot – All



Axial Load Distribution among the Longitudinal Bars – Service Loads

Distance from box wall	*Plot*
outside	
1.5ft	
3.5ft	
5.5ft	

Axial Load Distribution among the Longitudinal Bars – All

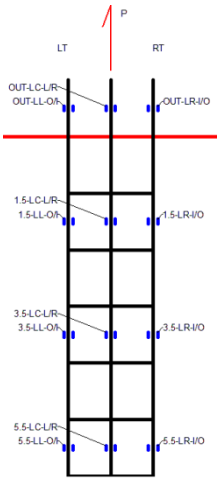
Distance from box wall	*Plot*
outside	
1.5ft	
3.5ft	
5.5ft	

STRAIN GAGE REPORT FOR MSE REINFORCEMENT PULLOUT TEST

Test Information

Test Date:	5/14/2012 11:19:00 AM
Test Identification:	TS48.12-G-9x12-W20xW11-L6-Z20-B
Test Facility:	12'x12'x4' MSE Test Box

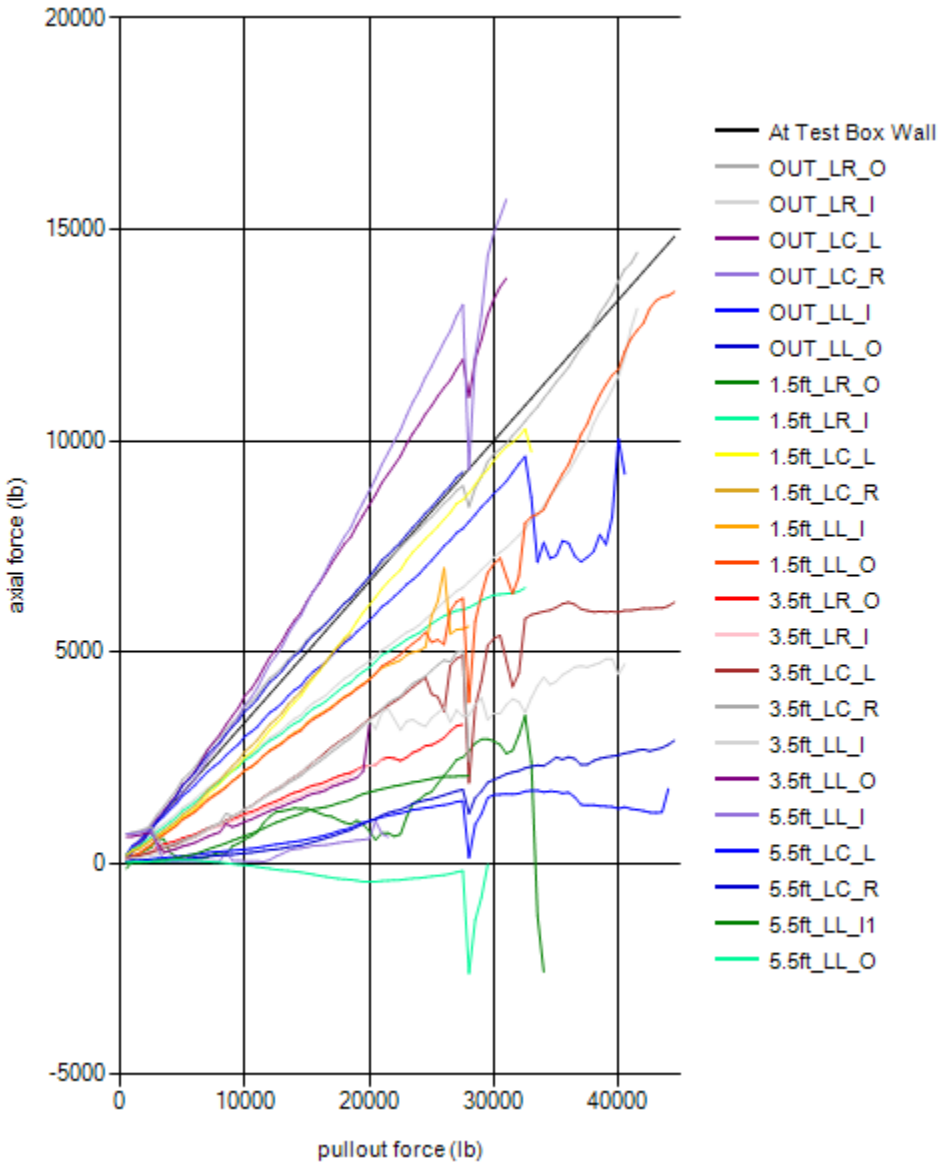
Sketch



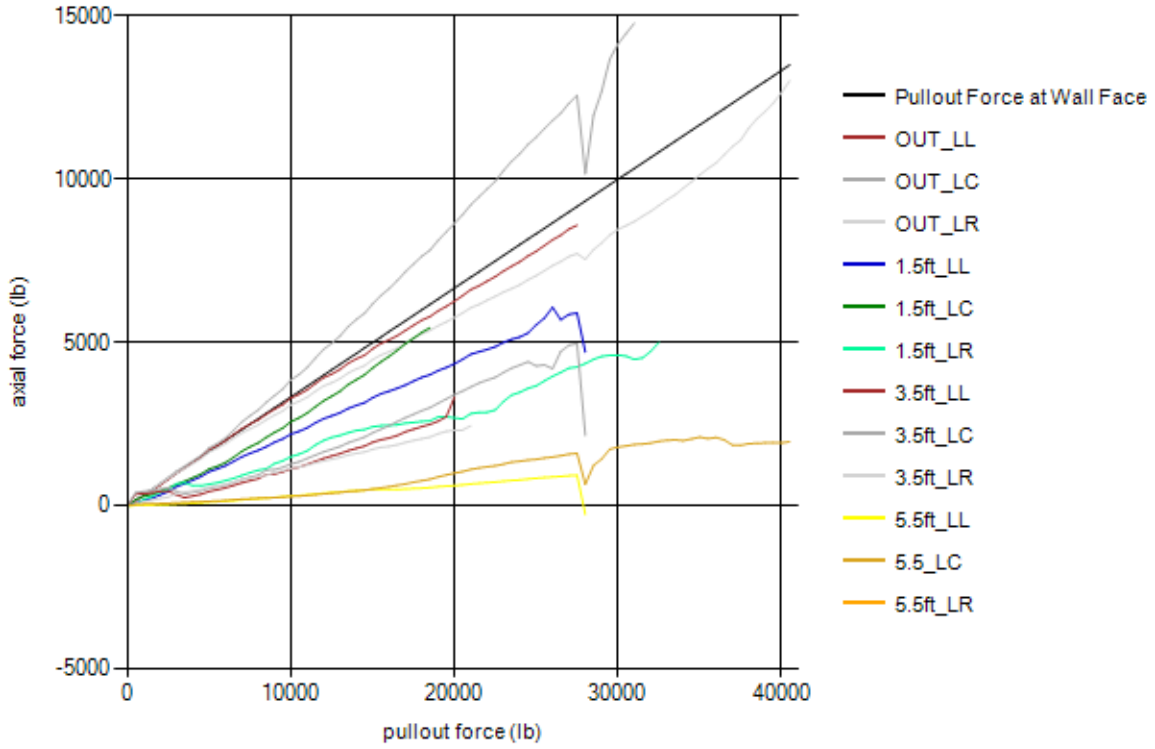
MSE Reinforcement

Type:	Welded Steel Grid	Transverse Bars		Longitudinal Bars	
Length, L_e (ft):	6	*Number, N_t:*	6	*Number, N_l:*	3
Width, b (in.):	18	*Diameter, t (in.):*	0.37	*Diameter, t_l (in.):*	0.5
Skew Angle, β (°):	0	*Spacing, S_t (in.):*	12	*Spacing, S_l (in.):*	9

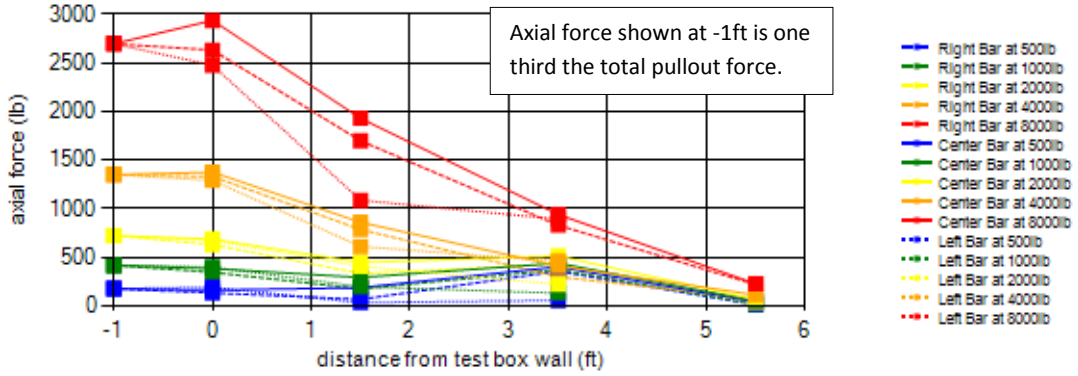
Axial Load-Pullout Load Data by Gage



Axial Load-Pullout Load And Moment-Pullout Load Data by Location



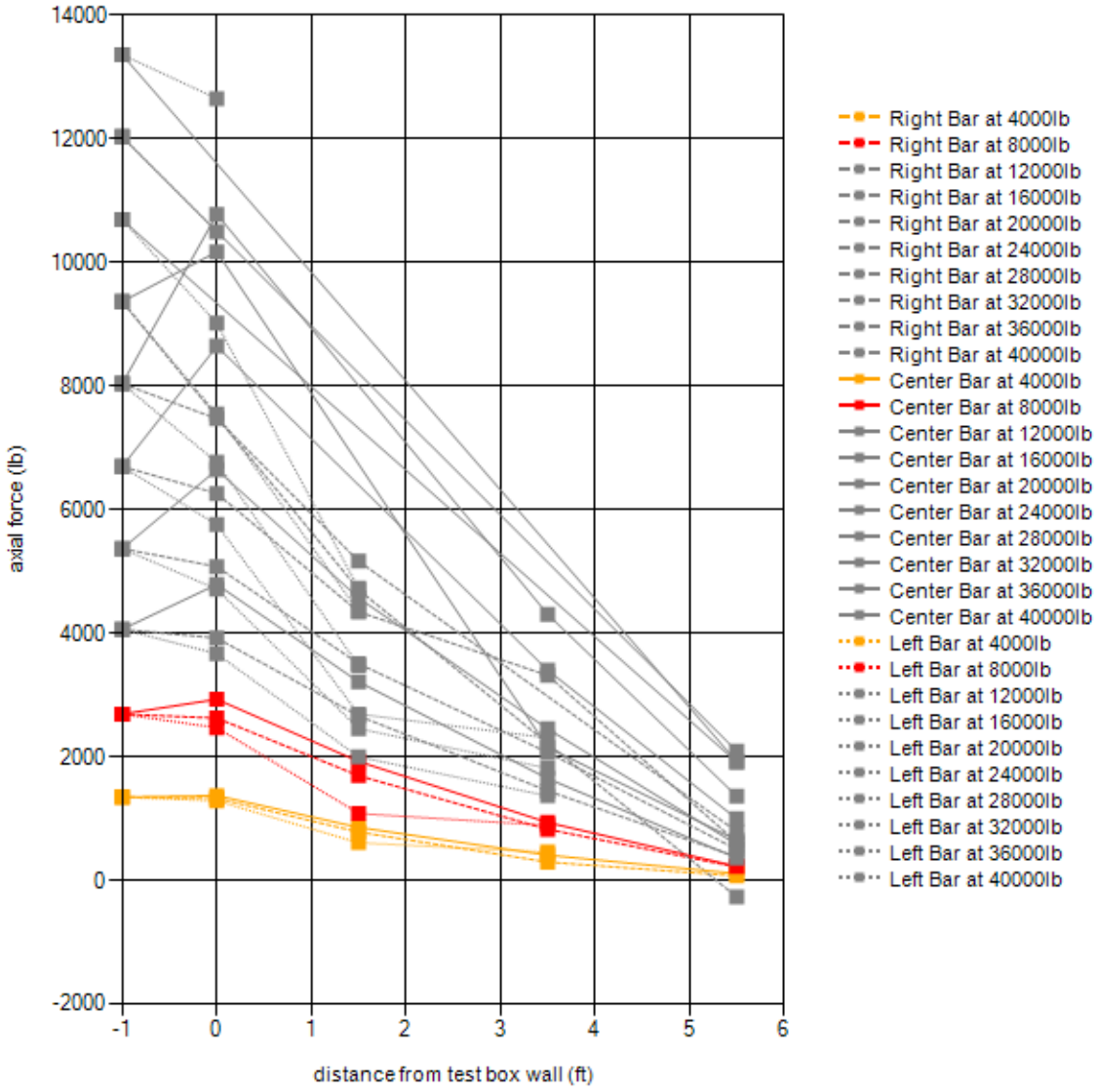
Axial Load-Distance from Test Box Wall Plot – Service Loads



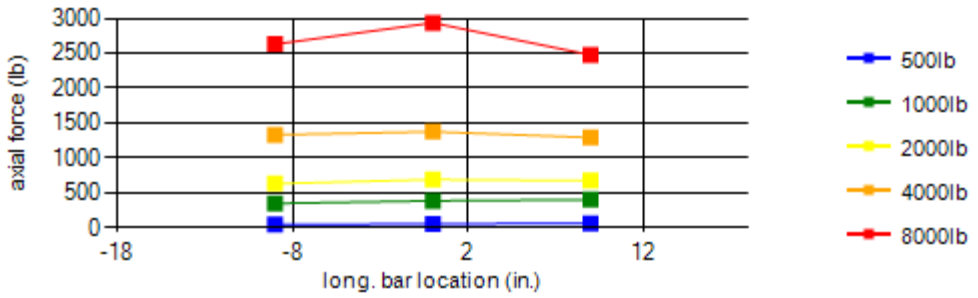
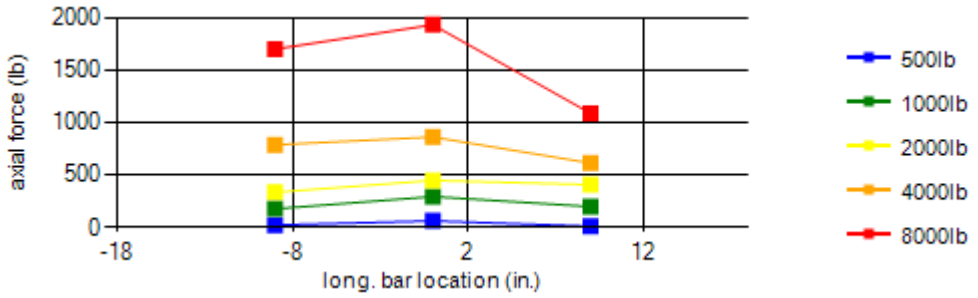
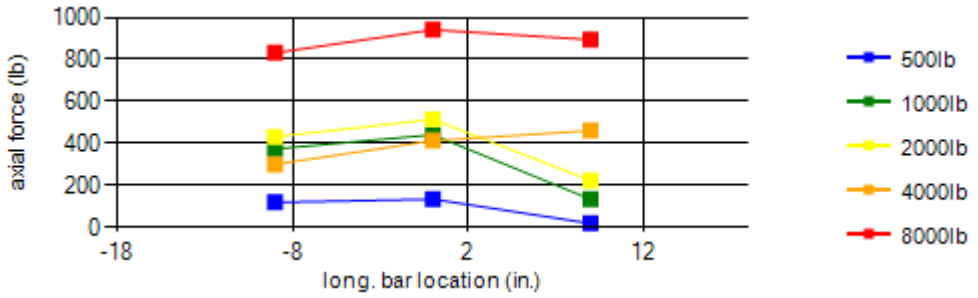
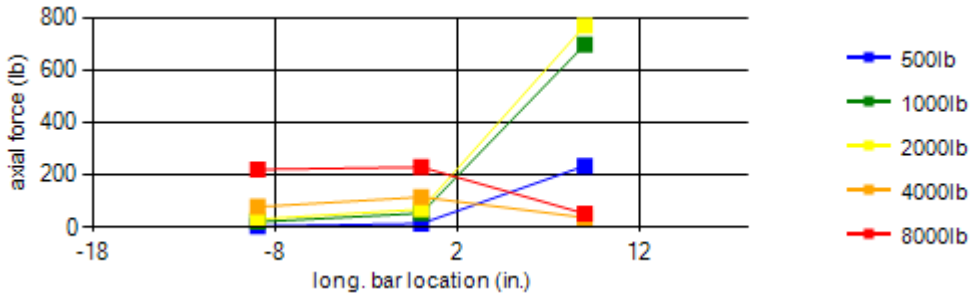
Axial Load Results

Pullout Resistance, P_r (lb)	*Axial Load, P (lb) calculated from strain data at distances from test box wall*										
	OUT_LL	*OUT_LC*	*OUT_LR*	*1.5ft_LL*	*1.5ft_LC*	*1.5ft_LR*	*3.5ft_LL*	*3.5ft_LC*	*3.5ft_LR*	*5.5ft_LL*	*5.5_LC*
500	136	163	193	70	189	36	359	404	59	14	43
1000	348	386	402	177	295	199	374	442	134	21	54
2000	632	689	675	335	449	408	432	515	224	32	69
3000	997	1056	1000	583	655	671	340	450	378	53	93
4000	1331	1376	1292	787	861	613	301	413	461	78	116
5000	1720	1773	1648	1043	1125	660	440	537	572	115	141
6000	1997	2079	1899	1227	1323	773	551	637	657	143	164
7000	2363	2569	2230	1500	1669	929	706	813	804	184	205
8000	2630	2935	2475	1698	1929	1087	831	941	894	221	230
9000	2958	3373	2778	1945	2246	1290	975	1105	1020	259	251
10000	3301	3857	3099	2197	2579	1504	1133	1283	1149	304	285
11000	3552	4241	3331	2391	2842	1685	1268	1453	1242	338	318
12000	3925	4794	3672	2667	3217	2002	1453	1652	1372	384	368
13000	4176	5200	3896	2848	3504	2154	1597	1812	1482	423	408
14000	4502	5705	4192	3074	3862	2307	1760	2017	1607	463	456
15000	4814	6185	4476	3310	4225	2419	1946	2236	1734	503	515
16000	5082	6649	4716	3510	4573	2460	2073	2455	1818	505	585
17000	5366	7166	4977	3696	4959	2531	2265	2697	1940	515	670
18000	5685	7641	5266	3933	5310	2581	2425	2913	2052	541	768
19000	5968	8128	5513	4140	ND	2719	2588	3143	2208	583	886
20000	6266	8647	5761	4349	ND	2694	3322	3404	2310	618	1000
21000	6623	9220	6068	4643	ND	2824	ND	3641	2453	669	1114
22000	6882	9702	6294	4788	ND	2866	ND	3852	ND	711	1194
23000	7188	10267	6545	5005	ND	3198	ND	4082	ND	754	1277
24000	7474	10782	6767	5169	ND	3478	ND	4308	ND	793	1366
25000	7797	11290	7050	5541	ND	3676	ND	4282	ND	844	1424
26000	8144	11800	7356	6079	ND	3966	ND	4199	ND	883	1495
27000	8475	12325	7633	5860	ND	4216	ND	4920	ND	922	1581
28000	ND	10175	7548	4707	ND	4354	ND	2155	ND	-267	656
29000	ND	12690	8051	ND	ND	4576	ND	ND	ND	ND	1435
30000	ND	14142	8465	ND	ND	4619	ND	ND	ND	ND	1799
31000	ND	14777	8705	ND	ND	4487	ND	ND	ND	ND	1876
32000	ND	ND	9018	ND	ND	4730	ND	ND	ND	ND	1919
33000	ND	ND	9372	ND	ND	ND	ND	ND	ND	ND	2004
34000	ND	ND	9729	ND	ND	ND	ND	ND	ND	ND	1993
35000	ND	ND	10134	ND	ND	ND	ND	ND	ND	ND	2104
36000	ND	ND	10501	ND	ND	ND	ND	ND	ND	ND	2094
37000	ND	ND	11000	ND	ND	ND	ND	ND	ND	ND	1857
38000	ND	ND	11567	ND	ND	ND	ND	ND	ND	ND	1901
39000	ND	ND	12077	ND	ND	ND	ND	ND	ND	ND	1926
40000	ND	ND	12655	ND	ND	ND	ND	ND	ND	ND	1923

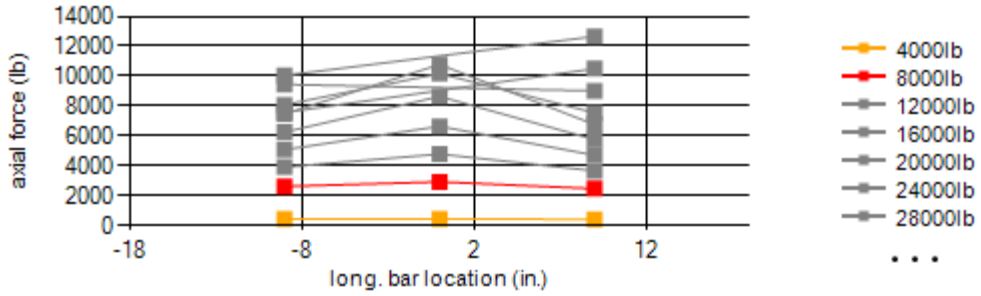
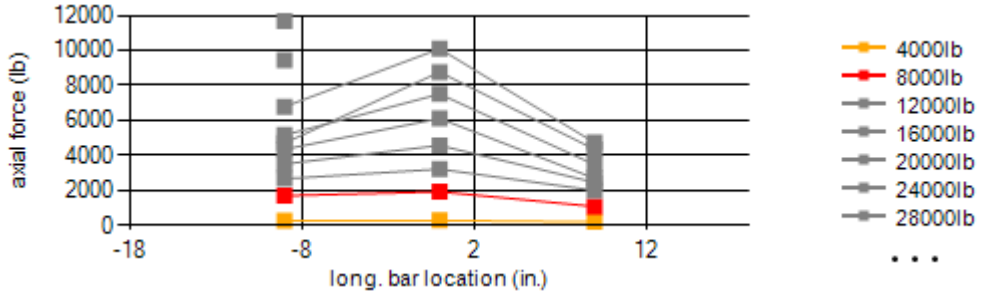
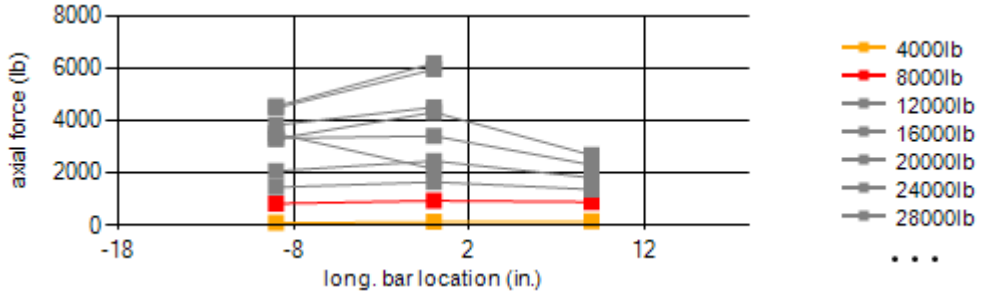
Axial Load-Distance from Test Box Wall Plot – All



Axial Load Distribution among the Longitudinal Bars – Service Loads

Distance from box wall	*Plot*
outside	
1.5ft	
3.5ft	
5.5ft	

Axial Load Distribution among the Longitudinal Bars – All

Distance from box wall	*Plot*
outside	
1.5ft	
3.5ft	
5.5ft